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Social Connectedness, Adolescent Mental Health and Well-Being at the Later Stages of the COVID-19 Pandemic: A Mixed Methods Exploration

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A thesis submitted in partial fulfillment of the requirements for the Master of Science degree in Epidemiology and Biostatistics

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Abstract

COVID-19 posed novel challenges by limiting in-person interactions and shifting interactions online. Effects of online and offline social connectedness on adolescent mental health and well-being, and the moderating role of the social determinants of health (SDoH) were explored. Canadian adolescents ($n=1,586$; $M_{age}=15.3$, range 13 to 18 years; surveyed summer 2022) reported their social connectedness, psychological distress, and mental well-being. An ordinal logistic regression was performed to examine the association between social connectedness (online and offline) and dual-factor mental health. Responses to two open-ended survey questions were analyzed. Social disconnection was associated with higher odds of being in a poorer mental state, with a stronger association for offline than online social connectedness. The SDoH may moderate this relationship. Participants described negative and positive pandemic-related changes to relationships, mental health and well-being. Although online and offline social connectedness both contribute to adolescent mental health and well-being, offline social connectedness appears more impactful.

Keywords

Mental health and Well-Being; Adolescence; COVID-19; Social Connectedness; Social Determinants of Health

Summary for Lay Audience

COVID-19 posed novel challenges to mental health and well-being by limiting opportunities for in-person interactions and shifting them to the online setting. These challenges differentially burdened adolescents according to the Social Determinants of Health (SDoH). The SDoH are socioeconomic and structural factors which influence one's state of health and well-being. The understanding of mental health and well-being in this thesis was informed by the dual-factor model, which considers both mental illness and mental well-being to understand an individual's complete state of mental health. Social connectedness encompasses feelings of belongingness, closeness, and interpersonal connection with friends, family, peers, and society. Social connectedness may be derived both from online (i.e., social media) and in-person sources. Existing studies have not compared the impact of online and offline social connectedness on adolescent mental health and well-being at the late stages of the pandemic. This thesis aimed to: (1) compare the effects of online and offline social connectedness on the mental health and well-being of adolescents during the late stages of the COVID-19 pandemic; (2) explore the way this relationship may differ in various groups according to the SDoH; and (3) describe adolescents' experience of pandemic-related changes to their relationships, mental health and well-being. Canadian adolescents surveyed during the late stages of the pandemic (June - July 2022) were asked about their levels of online and offline social connectedness, mental health, and mental well-being. They also responded to open-ended questions about pandemic-related changes to relationships, mental health and well-being.

Feeling socially disconnected was associated with higher odds of being in a poorer dual-factor mental health state. Offline social connectedness had a stronger effect than online social connectedness. This relationship may differ according to the SDoH. Negative pandemic-related changes included feeling socially disconnected, mental health challenges, and missing out on experiences. Positive changes included staying connected, decompressing or self-improving during lockdowns. For some, the negative impacts of the pandemic reversed during the later stages, while others reported lasting effects. These findings suggest that although online and offline social connectedness were both important contributors to adolescent mental health and well-being, offline social connectedness was more impactful.

Acknowledgments

I would like to begin by thanking Dr. Kelly Anderson for her support, understanding, guidance, encouragement, and mentorship. I would not be where I am today if it weren't for you. I would also like to thank my co-supervisor Dr. Jason Gilliland for taking me under his wing offering the opportunity to work in his lab and providing invaluable mentorship. To Dr. Jamie Seabrook, thank you for lending your statistical expertise to this thesis, and providing your guidance and reassurance as a member of my supervisory committee. I am honoured to have worked with all of you.

I would like to extend a special thank you to Dr. Kendra Nelson Ferguson for always being there for me, going above and beyond as a mentor and friend. To Dr. Gina Martin, thank you for your faith in me and the valuable help you have provided to me throughout this project. To my friends and colleagues in the HEAL lab, thank you for welcoming me and providing a supportive environment.

I owe an enormous debt of gratitude to my parents without the support and encouragement of whom I would not have had the privilege to complete this thesis and continue my education. I am humbled by your immense sacrifices to provide me with opportunities those who came before me never had. To my mother, thank you is not enough. For your selfless dedication to being there for me when I needed you the most and believing in me especially when I did not believe in myself, I owe you the world.

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Chapter 1

1 Introduction

1.1 Thesis Overview

The COVID-19 pandemic has had a drastic impact on the lives of Canadian adolescents, particularly concerning their ability to maintain social connections, as school closures and social distancing restrictions limited opportunities for in-person social interactions (Detsky & Bogoch, 2020). This has generated concern regarding the potential impact of these limited interactions on mental health and well-being, as well as the capacity for online interactions to replace missed in-person connections.

The overarching goal of the present thesis was to understand the role that social connectedness played with regard to adolescent mental health and well-being during the late stages of the COVID-19 pandemic (June to July 2022). We used a convergent parallel mixed methods design to serve this goal. Specifically, in the quantitative section, this thesis compared the impacts of online and offline social connectedness on adolescent mental health and well-being, as defined by the dual-factor model of mental health. In addition, the potential moderating role of various social determinants of health in this relationship was explored. The qualitative portion incorporated responses from open-ended survey questions to attempt to understand the changes adolescents perceived to their relationships, in addition to their mental health and well-being.

This chapter provides a brief primer on how adolescents were affected by the COVID-19 crisis, in particular, the impacts it has had on their social connectedness, mental health, and well-being. This chapter also introduces the theoretical basis and objectives for this thesis. Chapter 2 provides a review of the existing literature surrounding the relationship between aspects of social connectedness and adolescent mental health and well-being during the COVID-19 pandemic, as well as the association between various social determinants of health and these factors. In Chapter 3 the methods are described, including the research approach, measures, and data analysis procedures. Chapter 4 presents both the quantitative and qualitative findings of this research. Finally,

Chapter 5 integrates the quantitative and qualitative findings together and also with existing research, and describes the contributions of this thesis to the literature on adolescent mental health and well-being during the COVID-19 pandemic.

1.2 Background

1.2.1 The COVID-19 Pandemic

In January of 2020, the World Health Organization (WHO) identified the emerging outbreak of a novel coronavirus disease - COVID-19 – as a “Public Health Emergency of International Concern” (World Health Organization, 2020). By March 2020, the WHO recognized this COVID-19 outbreak as a pandemic (World Health Organization, 2020). Canada swiftly responded by implementing efforts to mitigate the spread of the virus, such as limiting international travel and implementing *The Quarantine Act*, requiring all those entering the country to self-quarantine for a 14-day period (Detsky & Bogoch, 2020). Late March 2020 saw a nation-wide response involving the closing of schools and non-essential businesses, with social interactions with people outside of one’s household being strongly discouraged, even punishable by fines in some jurisdictions (Detsky & Bogoch, 2020). Provinces implemented limits of 5-to-10 people for gatherings with those outside of one’s household (depending on the province), with the requirement of physical distancing (Detsky & Bogoch, 2020). In December 2020, Pfizer and Moderna mRNA COVID-19 vaccinations were authorized for use in Canada in people older than 16 years, and on May 5 and August 27, 2021 Health Canada expanded the authorization of the Pfizer and Moderna vaccines, respectively, to 12-to-15-year-olds (National Advisory Committee on Immunization (NACI), 2021). The vaccination campaign in Canada was highly successful relative to other countries, where 72% of Canadians received at least one dose and 61% received two doses (the requirement to be considered “fully vaccinated”) by August 5, 2021 (Our World in Data, 2021; as cited in Detsky & Bogoch, 2021). COVID-19 infection rates saw a sharp decline in the summer of 2021 (Detsky & Bogoch, 2022). At this time, public health restrictions on non-essential business began to ease at varying rates across the provinces, and provinces began to require proof of vaccination to access non-essential services (e.g., restaurants and theatres) in Fall 2021. Although secondary schools did not require proof

of vaccination to attend, many extracurricular activities did (Detsky & Bogoch, 2022). Schools re-opened for in-person or hybrid instruction in September 2020 (Coulas et al., 2022) with additional social distancing and mask-wearing requirements, but by December of 2021, the rise in infection rates from the Omicron variant led jurisdictions to respond by re-implementing restrictions on gatherings, with some delaying school re-openings in January after Winter Break (Detsky & Bogoch, 2022). The high case burden which triggered the disruption to in-person instruction quickly receded in February of 2022, and by May 2022, very few public health measures remained in place (mainly mask mandates and capacity limits) (Detsky & Bogoch, 2022). Though pandemic restrictions limiting in-person social interaction had largely been lifted by this late stage of the pandemic, the potential lasting impacts of the pandemic on adolescent mental health and well-being are cause for concern (Solmi et al., 2022).

1.2.2 Adolescence as a Vulnerable Life Stage

Adolescence represents a particularly vulnerable period in the lifespan, both in terms of social connection and mental ill-health and well-being. Social interaction has an integral role in the development of adolescents. As opposed to infancy (birth to weaning), where sociality is primarily based in the child-caregiver dyad, and the juvenile phase (weaning to puberty) where the caregiver-child dyad remains as a base but is gradually replaced by play behaviour with peers, the adolescent phase (between puberty and full maturity) is marked by the transition of social behaviour to full integration with larger groups of peers (Nelson et al., 2016). Peer relationships are therefore integral to typical adolescent development, as they gain independence and de-emphasize the caregiver-child relationship.

Mental ill-health during adolescence has potential to show ripple effects throughout the lifespan, as 48.4% of individuals with mental disorders report an onset of the disorder occurring before the age of 18 years (Solmi et al., 2022). Indeed, a subset of mental disorders, namely social anxiety disorder and eating disorders, as well as major depressive disorder and generalized anxiety disorder have been referred to as “disorders of adolescence” due to the peak onset of the first two occurring between the ages of 13 and 19 years, as well as the latter two having an elevated incidence in adolescence (Rapee

et al., 2019). Although adolescence is generally a sensitive period for both peer interaction and mental ill-health, the COVID-19 pandemic has greatly affected adolescents by limiting opportunities for in-person peer interaction at a time where these interactions are essential to their development. This thesis specifically focused on adolescents aged 13 to 18 years, consistent with the age of secondary school in Canada.

1.2.3 Social Connectedness

Social connectedness is defined as “the subjective awareness of being in a close relationship with the social world” (R. M. Lee & Robbins, 1998, p. 338) including feelings of interpersonal closeness in relationships with family, friends, peers, and society as a whole (R. M. Lee & Robbins, 1998). Social connectedness, combined with companionship and affiliation, are two aspects of the construct of belongingness, which people seek out to avoid feelings of loneliness and alienation (Kohut, 1984, as cited in R. M. Lee & Robbins, 1995). During the pandemic, adolescents spent less time with friends, which led to a rise in loneliness (Rogers et al., 2021). This heightened loneliness was associated with high levels of depressive (S. R. Liu et al., 2022; Murata et al., 2020) and anxiety symptoms (Murata et al., 2020). Additionally, the online learning environment contributed to poorer school and peer connectedness (Widnall et al., 2020), which was associated with poorer mental health and well-being (Jones et al., 2022; Widnall et al., 2020). There is evidence to support that maintaining a higher degree of social connection throughout the pandemic may have protected against the negative effects of the pandemic on mental health and well-being among adolescents. For instance, friend support was linked to less stress (Espinoza & Hernandez, 2022) and lower levels of depressive symptoms (Rogers et al., 2021) among adolescents during the pandemic.

Limits to in-person interactions because of pandemic restrictions have driven adolescents to virtual methods of communication to supplement or replace these missing in-person interactions (Parent et al., 2021). During the pandemic, when in-person interactions were limited, a sharp increase in social media use among adolescents was observed, with one report suggesting the number of Canadian adolescents using social media for more than three hours per day increased to more than double pre-pandemic levels (31.9% to 77.2%; Ellis et al., 2020). Although some adolescents found online

modes of communication to foster feelings of intimacy and interpersonal connection, others found it more effortful, less intimate, and less beneficial for their mental health and well-being (Parent et al., 2021) serving as a poor surrogate for in-person interaction (Rogers et al., 2021). Although traditionally, social connectedness was understood to be formed from in-person interactions, Grieve and colleagues (2013) proposed that a sense of social connectedness could be derived from social media (namely Facebook). There is a need to understand how social connectedness derived from social media contributed to adolescent mental health and well-being during the COVID-19 pandemic in relation to social connectedness derived from in-person interactions.

1.2.4 Mental Health and Well-Being

Mental health has been traditionally viewed in a *psychiatric* or *dichotomous* model (Keyes, 2005), which conceptualizes mental illness and mental health as extreme ends of the same spectrum (Iasiello et al., 2020; Keyes, 2005). This view is in line with the medical model of health and illness, where the absence of psychopathology was seen as indicative of mental well-being (or positive mental health) (Greenspoon & Saklofske, 2001). The WHO offered the following definition of health in 1964: “health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity” (1964, p. 1; as cited in Greenspoon & Saklofske, 2001). This definition challenged traditional views to incorporate positive indicators of well-being into an understanding of health (Greenspoon & Saklofske, 2001). Under this model, mental ill-health (i.e., psychopathology) and mental well-being are viewed as two separate, yet interrelated constructs (Greenspoon & Saklofske, 2001), acknowledging that “the absence of disease may constitute a necessary, *but not sufficient*, criterion for mental health” (Jahoda, 1958; as cited in Greenspoon & Saklofske, 2001). Under this model, a person may belong to one of four categories as determined by the absence or presence of psychopathology and their degree of subjective [mental] well-being, listed here in order from least-to-most favourable: (1) troubled; (2) symptomatic but content; (3) vulnerable; and finally (4) complete mental health (Suldo & Shaffer, 2008). Though the term mental illness may refer to a broad range of mental disorders, varying in their degree of severity, this thesis focused on psychological distress, which shares some overlap of symptoms

with depression and anxiety, but forms its own construct (Drapeau et al., 2012). The dual-factor model of mental health forms the theoretical basis for the understanding of mental health adopted by this thesis, and is described in detail in Chapter 2.

1.2.5 The Social Determinants of Health (SDoH)

The social determinants of health (SDoH) are the social and economic factors which influence health (Raphael, 2016). Not only are the SDoH the “primary determinants of whether individuals stay healthy or become ill” (Raphael, 2016, p. 3), but they determine “the extent to which a person possesses the physical, social, and personal resources to identify and achieve personal aspirations, satisfy needs, and cope with the environment” (Raphael, 2016, p. 3). This framework highlights the way in which structural, sociopolitical, and socioeconomic factors combine with intermediary determinants (i.e., material circumstances, behavioural factors, and biological factors) to contribute to health inequities (Solar & Irwin, 2010). In the Canadian context, the following SDoH are among the most commonly considered: (1) Indigenous ancestry; (2) disability; (3) early child development; (4) education; (5) employment and working conditions; (6) food security; (7) gender; (8) geography; (9) globalization; (10) health care services; (11) housing; (12) immigrant status; (13) income and its distribution; (14) race; (15) social safety net (e.g., employment insurance); (16) social exclusion; and (17) unemployment and job security (Raphael et al., 2020). The following SDoH have been associated with deterioration in mental health among Canadian adults during the COVID-19 pandemic: income, sexuality, gender, ethnicity, pre-existing mental health conditions, and disability (Jenkins et al., 2021).

1.3 The Present Study

The overarching aim of this study was to examine the relationship between social connectedness and the mental health and well-being of Canadian adolescents in the late stages of the COVID-19 pandemic. Specifically, the thesis had following three objectives:

1. To compare the effects of online and offline social connectedness on the mental health and well-being of Canadian adolescents during the late stages of the COVID-19 pandemic.
2. To investigate the potential moderating role of several SDoH in the relationship between social connectedness and the mental health and well-being of Canadian adolescents during the late stages of the COVID-19 pandemic.
3. To describe Canadian adolescents' experience of pandemic-related changes to their relationships as well as their mental health and well-being.

Objectives 1 and 2 were addressed through a quantitative analysis of data from Time 1 (June-to-July 2022) of the QuaranTEENing online survey, part of a national longitudinal project which aimed to understand the impact of the COVID-19 pandemic on health-related behaviours of Canadian adolescents, and how adolescents coped with such changes. Objective 3 was addressed through a qualitative descriptive analysis of the responses to open-ended questions on the QuaranTEENing survey. The results were integrated in the discussion with respect to the overarching aim of examining the relationship between social connectedness and mental health and well-being among Canadian adolescents during the late stages of the COVID-19 pandemic.

Chapter 2

2 Literature Review

This chapter provides a brief background on the concepts of mental illness and mental well-being (Sections 2.1 and 2.2), as well as an introduction to the dual-factor model of mental health (Section 2.3). Next, the concepts of belongingness and social connectedness are described (Section 2.4), followed by a summary of existing research on the mental health and well-being effects of social connectedness on adolescents during the COVID-19 pandemic. This chapter then provides a description of the SDoH (Section 2.5), followed by a summary of current research on the role of these determinants in the relationship between social connectedness and adolescent mental health, and mental well-being during the pandemic. The chapter concludes by outlining gaps in the existing literature (Section 2.6).

2.1 Mental Illness and Psychological Distress

Mental illness is defined by the presence of a mental disorder, such as depression, anxiety, panic disorder, or substance dependence (Keyes, 2005). However, as understood by the dual-factor model of mental health (Section 2.3), the absence of mental illness does not necessarily constitute a state of complete mental health or mental well-being (Greenspoon & Saklofske, 2001; Iasiello et al., 2020; Keyes, 2002; Suldo & Shaffer, 2008). Instead, absence of mental illness is only one factor that contributes to a state of complete mental health (Keyes, 2002).

A commonly measured form of mental illness in epidemiologic research is psychological distress (Drapeau et al., 2012; Kessler et al., 2002). Non-specific psychological distress refers to a set of heterogeneous emotional, behavioural, cognitive, and psychophysiological symptoms that are elevated in people with a range of mental illnesses (Kessler et al., 2002). Psychological distress may include symptoms of depression and anxiety, as well as somatic symptoms such as insomnia and lack of energy (Mirowsky and Ross, 2002, Kleinman, 1991, Kiramayer, 1989, as cited in Drapeau et al., 2012). Despite the heterogeneity of these symptoms, psychometric

evaluations of scales screening for these symptoms have shown that together they represent the single underlying core dimension of psychological distress (Kessler et al., 2002). Although symptoms of anxiety and depression share some overlap with those of psychological distress, psychological distress is a distinct phenomenon (Drapeau et al., 2012). Kessler and colleagues (2002) developed a six-item scale (K6) intended to screen for psychological distress in population-level surveys. Elements of psychological distress captured by the K6 include feelings of depression, nervousness, restlessness, worthlessness, hopelessness, feeling tired, and feeling as if everything is an effort (Kessler et al., 2002). This thesis used psychological distress as the psychopathology dimension of the dual-factor model of mental health.

2.2 Positive Mental Health or Mental Well-Being

The WHO defines positive mental health, a term used interchangeably with mental well-being or sometimes “subjective well-being”, as a state “which allows individuals to realize their abilities, cope with the stresses of normal life, work productively and fruitfully, and make a contribution to their community” (WHO, 2001, as cited in WHO, 2004) and as the “foundation for well-being and effective functioning for both the individual and the community” (WHO, 2004).

As illustrated in Figure 2.1, there are two different perspectives on mental well-being: the *hedonic* perspective, and the *eudaimonic* perspective (Ryff et al., 2021; Tennant et al., 2007). The contemporary perspective on *hedonia* incorporates three components: (1) life satisfaction; (2) positive affect; and (3) negative affect (Ryff et al., 2021). Life satisfaction may refer to overall life satisfaction, or incorporate domain specific assessments, such as satisfaction with work or relationship satisfaction (Ryff et al., 2021). Positive affect is indicated by feelings of cheerfulness, happiness, and calmness, whereas negative affect is indicated by feelings of hopelessness, deep sadness, and worthlessness (Ryff et al., 2021).

Ryff and colleagues (2021) provide six dimensions of *eudaimonic* well-being: (1) autonomy; (2) environmental mastery; (3) personal growth; (4) positive relations with others; (5) purpose in life; and (6) self-acceptance. A person demonstrating high levels of

autonomy is resistant to social pressures, regulates their behaviour from within, and evaluates themselves by their own standards rather than those of others (Ryff et al., 2021). A person demonstrating a high degree of environmental mastery is adept at managing the responsibilities of their everyday life (Ryff et al., 2021). Personal growth is characterized by a “feeling of continued development” and is present when a person has a sense of reaching their own potential (Ryff et al., 2021, p. 99). A person who demonstrates positive relations with others is capable of empathy, affection, and intimacy (Ryff et al., 2021). They are concerned with the welfare of others, and their relationships may be described as “warm,” “satisfying,” or “trusting,” (Ryff et al., 2021). One demonstrates strong purpose in life when they have goals and feel a sense of meaning in their past and present life (Ryff et al., 2021). Self-acceptance is characterized by a positive attitude towards the self, accepting both positive and negative aspects of oneself, as well as experiencing positive feelings towards their past life (Ryff et al., 2021). In summary, where the *hedonic* perspective is most concerned with subjective feelings such as happiness and positive affect, the *eudaimonic* perspective is concerned with aspects of psychological functioning or human potential (Ryff et al., 2021; Tennant et al., 2007).

The Short Warwick Edinburgh Mental Well-Being Scale (SWEMWBS) was the measure used for the mental well-being dimension of the dual-factor model in this thesis. This instrument incorporates aspects of both the *hedonic* and the *eudaimonic* perspective (Tennant et al., 2007). Unlike its predecessor, the 14-item Warwick Edinburgh Mental Well-Being Scale, the 7-item SWEMWBS offers a narrower view of mental well-being focusing more on psychological and *eudaimonic* well-being and less on *hedonia* and affect (Stewart-Brown et al., 2009). Much like how the absence of mental illness does not necessarily indicate the presence of mental well-being, under the dual-factor model, an absence of mental well-being does not necessarily indicate the presence of a mental illness, and likewise, a high degree of mental well-being may be observed in people presenting with mental illnesses. The dual-factor model will be described further in Section 2.3.

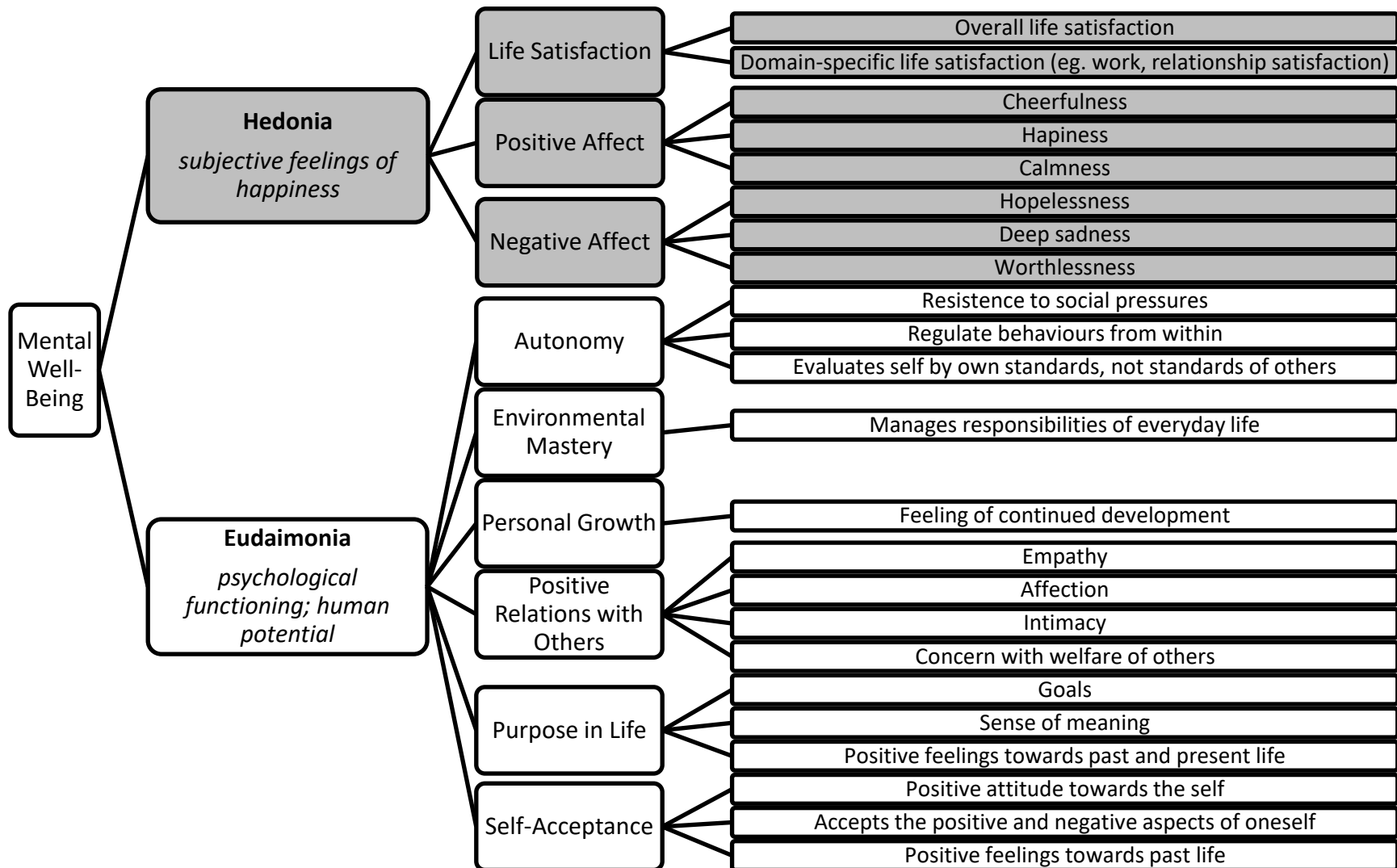


Figure 2.1 Contributors to Positive Mental Health or Mental Well-Being. Adapted from Ryff et al. (2021)

2.3 The Dual-Factor Model of Mental Health

The dual-factor model of mental health views mental health as a *complete state*, where the presence of a high degree of mental well-being together with a low degree of mental illness are prerequisites to a state of complete mental health (Keyes, 2005). Greenspoon and colleagues provided empirical evidence in support of the dual-factor model, isolating groups of elementary school children who simultaneously demonstrated psychopathology and high life satisfaction, and conversely, groups that demonstrated the absence of psychopathology and low life satisfaction (2001, as cited in Suldo & Shaffer, 2008). Suldo and Schafer (2008) provided the following nomenclature for the categories of the dual-factor model, listed here in order from least to most favourable: (1) troubled, characterized by high indicators of psychopathology and a low degree of mental well-being; (2) Symptomatic but content, characterized by high indicators of psychopathology and average-to-high levels of mental well-being); (3) vulnerable, characterized by low indicators of both psychopathology and mental well-being; and (4) Complete mental health, characterized by low indicator of psychopathology and average-to-high levels of mental well-being (Suldo & Shaffer, 2008). These classifications are illustrated in Figure 2.2.

Although Greenspoon and Saklofske (2001) initially developed the dual-factor model classification system in a sample of elementary school students, it has since been applied and validated in a variety of populations, including adolescents (Iasiello et al., 2020). This model forms the theoretical basis for the understanding of mental health and well-being adopted in this thesis. This conceptualization of mental health is especially valuable in the context of understanding the impact of the COVID-19 pandemic on adolescents. Social connectedness, which has been disrupted among adolescents due to limits to in-person interactions, has not only been linked to protecting against mental ill-health (Wickramaratne et al., 2022), but also promoting mental well-being (Jones et al., 2022). It is therefore important to incorporate both constructs in order to fully understand the impact the pandemic has had on adolescents' *complete state* of mental health.

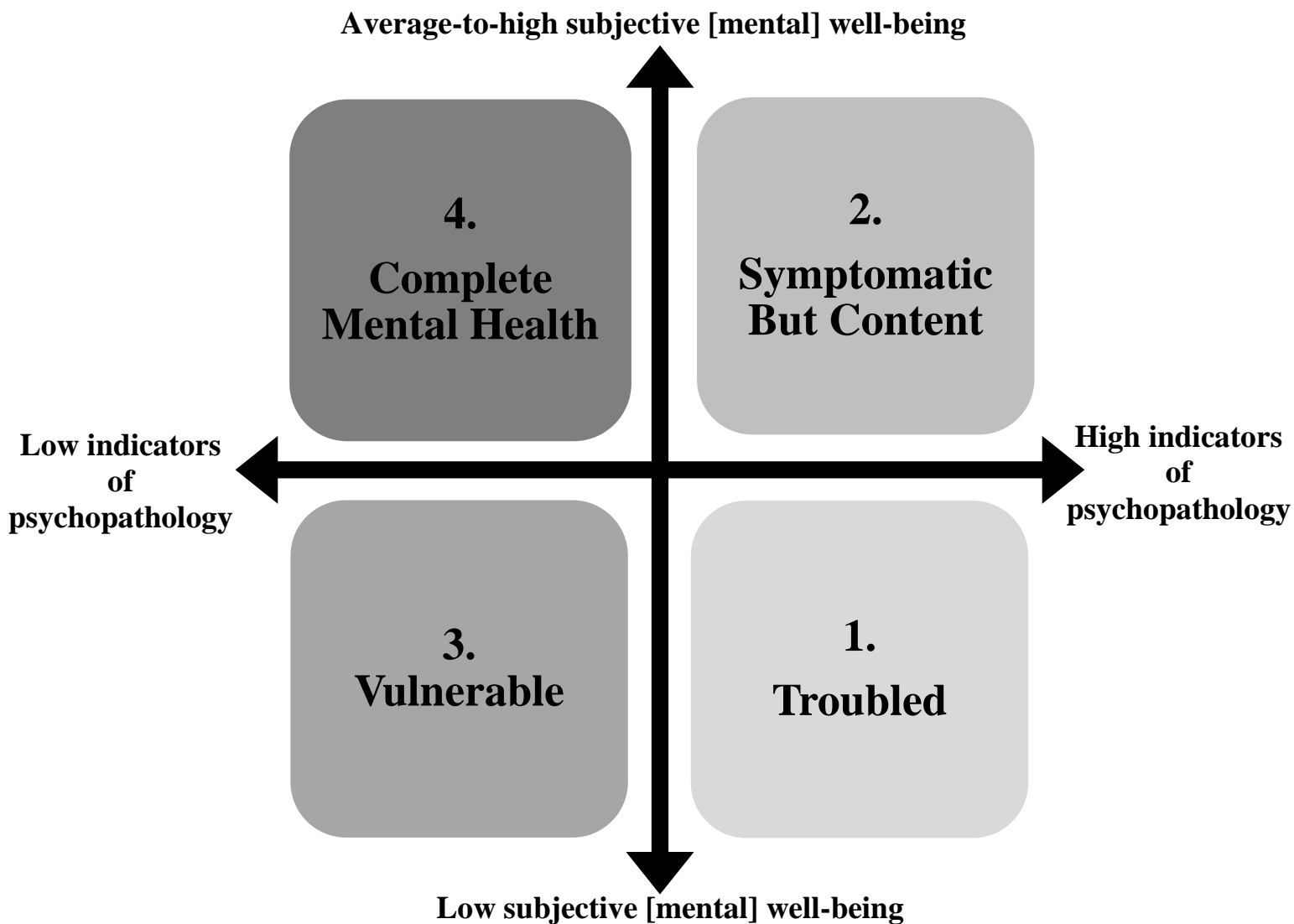


Figure 2.2 The Dual-Factor Model of Mental Health. Adapted from Suldo & Shaffer (2008)

2.4 Belongingness and Social Connectedness

Holt-Lunstad and colleagues (2017) provide a systems framework of social connectedness that is useful for viewing social connectedness as a public health issue. This systems approach also allows for better understanding of the relationship between social connectedness and the social determinants of health, which operate on a systems level as opposed to on an individual level (Raphael, 2016). The framework posits that the extent to which one is socially connected depends on their “connections to others via the existence of relationships and their roles” (structural factors), “a sense of connection that results from actual or perceived support or inclusion” (functional factors), “the sense of

connection to others that is based on positive and negative qualities” (quality factors) (Holt-Lunstad, 2018, p. 440). Structural factors may include social integration, social isolation, and social networks; functional factors include perceived loneliness, received support, and perceived social support; and quality factors include social inclusion and exclusion, and relationship strain (Holt-Lunstad, 2018).

2.4.1 On the Distinction Between Online and Offline Social Connectedness

There are three hypotheses which attempt to explain the ways which digital technologies influence social connectedness: (1) the displacement hypothesis; (2) the interference hypothesis; and (3) the complementarity hypothesis (Kushlev & Leitao, 2020). *The displacement hypothesis* posits that technology influences well-being through the replacement of other activities, especially those that promote mental well-being, such as sleep and in-person interactions (Kushlev & Leitao, 2020). *The interference hypothesis* postulates that digital technologies influence well-being via interference with concurrent activities (Kushlev & Leitao, 2020). For instance, lunch with a friend may be interrupted by brief but frequent phone checks (Kushlev & Leitao, 2020). Lastly, *the complementarity hypothesis* posits that digital technologies influence mental well-being “by affording information and activities not otherwise available” (Kushlev & Leitao, 2020, p. 78). For instance, although adolescents were not able to meet in-person during the pandemic, technologies such as social media, text messaging, and video-chatting apps allowed them to remain in communication with their friends.

Social media may be used in one of two ways, each with differing effects on subjective well-being. *Active usage* refers to “...activities that facilitate direct exchanges with other(s)”, for instance, posting a tweet or sending a private message on Facebook (Verduyn et al., 2017, p. 281). *Passive usage* refers to “...the monitoring of other people’s lives without engaging in direct exchanges with others” (Verduyn et al., 2017). Examples of passive usage include scrolling through an Instagram feed or reading a tweet without communicating with the content creator (Verduyn et al., 2017). Though conflicting findings are available regarding active usage, generally passive usage is associated with poorer subjective well-being, whereas active usage has a positive

relationship with subjective well-being (Verduyn et al., 2017). Given the differing effects that the manner of social media use can have on mental well-being, it is important to differentiate social media *use* from *social connectedness derived from social media*.

Grieve (2013) and colleagues disentangled online and offline social connectedness and identify them as two distinct yet interrelated constructs. By adapting the previously validated Social Connectedness Scale – revised to measure social connectedness in the online setting, particularly via Facebook – Grieve and colleagues (2013) established that not only could social connectedness be derived from an online setting, but that this sense of social connectedness was distinct from in-person social connectedness and was independently associated with positive psychological outcomes, including a moderate positive relationship with subjective well-being and negative relationships with depressive and anxiety symptoms.

In the context of the COVID-19 pandemic, the majority of research concerning the effects of social media on adolescent mental health is centered on social media *use* and not social media *social connectedness*. A previous thesis (Holmes, 2021) has applied an adaption of Grieve and colleagues' Facebook Social Connectedness Scale (2013) and Lee and colleagues' Social Connectedness Scale – Revised (2001) to identify correlates of in-person and online social connectedness among Ontario university students during the pandemic, finding students who reported greater perceptions of connectedness had social media use which “increased greatly” since the start of the pandemic and took the form of active rather than passive engagement (Holmes, 2021). However, that is not to say that passive engagement cannot contribute to a sense of social connectedness derived from social media. Indeed, Liang and colleagues (2023) found some passive users of social media treated their social media as a coping strategy, deriving a sense of support from their social media use. Overall, the effects of social media use on mental health and well-being are highly dependent on the manner of its use. Although it is hypothesized in this thesis that social media may replace or supplement missed in-person interactions among adolescents when such interactions were limited by pandemic restrictions, it is essential that one be specific in studying the manner of its use. This thesis specifically examines the effects of *social connectedness derived from social media* on adolescent

mental health and well-being, as compared to offline (i.e., “in-person”) social connectedness.

2.4.2 Existing Research on Social Connectedness in Adolescents During the COVID-19 Pandemic

This section will summarize existing research on the effects of social connectedness on the mental health and well-being of adolescents during the COVID-19 pandemic organized into five themes: (1) loneliness; (2) school and peer connections; (3) family connections, support, and conflict; (4) friend connections, support, and conflict; and (5) the use of social media and technology to maintain connections during the pandemic.

2.4.2.1 Loneliness

Loneliness has increased in adolescents during the pandemic (S. R. Liu et al., 2022). In a sample of 760 Australian adolescents, over half reported frequently experiencing loneliness during the pandemic, and approximately one-third felt alone some of the time (Li et al., 2021). In the pilot study for the QuaranTEENing project, a qualitative analysis of responses to open-ended survey questions revealed that several respondents described feeling disconnected, isolated, and lonely, and reported missing in-person interactions and social support (Nelson Ferguson et al., 2021). Qualitative results from a mixed-methods study of secondary school students in British Columbia reported that 28% of participants felt socially disconnected during the pandemic, 64% felt connected to others during the pandemic, and 8% felt socially indifferent (Parent et al., 2021). Those feeling socially disconnected reported that the pandemic made it difficult to maintain relationships due to restrictions limiting face-to-face contact, leading to loneliness, social exclusion, anxiety, and difficulty expanding social networks (Parent et al., 2021). A mixed-methods study involving interviews with 229 Italian adolescents found low levels of well-being were associated with more individualistic strategies for coping with the pandemic (i.e., separatedness) and higher levels of well-being were associated with more affiliative strategies (togetherness) (Pepe & Farina, 2023). In a

study of 1753 British Columbia adolescents, feeling depressed was associated with feeling socially disconnected (Parent et al., 2022).

With regard to the mental health correlates of loneliness, an association between higher levels of loneliness and greater depressive symptoms have been observed both prior to (S. R. Liu et al., 2022) and during the pandemic (S. R. Liu et al., 2022; Murata et al., 2020). Experiencing a greater degree of loneliness during the pandemic has also been associated with experiencing lower feelings of happiness (Cauberghe et al., 2020), more negative affect (Rogers et al., 2021), greater anxiety symptoms (Murata et al., 2020), COVID-19 related stress (where greater stress was associated with greater loneliness) (Ellis et al., 2020), PTSD symptoms, and increased suicidal ideation or behaviour since the onset of the pandemic (Murata et al., 2020). Another factor associated with loneliness was prior diagnosis of anxiety or depression, where adolescents with prior conditions reported higher levels of loneliness during the pandemic (Li et al., 2021). A United Kingdom study involving 443 adolescents found that during the pandemic, loneliness was associated with psychological distress and emotional (internalizing) problems (Cooper et al., 2021). In line with the findings of Cooper and colleagues (2021), an Australian study involving 760 adolescents found positive associations between loneliness and psychological distress, and negative associations between loneliness and mental well-being (Li et al., 2021). Cooper and colleagues (2021) found no association between time spent talking with others and emotional problems, psychological distress, and loneliness, suggesting merely the act of talking to others may not be protective against loneliness. However, there is evidence of a link between time spent alone during the pandemic and loneliness. A study involving 3577 Ontario, Quebec, and Alberta adolescents found spending time alone during the early pandemic to be associated with more adverse pre-to-during pandemic changes in mental health outcomes including greater increases in depression and anxiety, more pronounced decreases in psychosocial [mental] well-being, and greater increases in emotional dysregulation (Riazi et al., 2023). Feeling socially disconnected during the pandemic (Parent et al., 2021), experiencing a rise in family conflict, and less time spent with friends (Rogers et al., 2021) were each associated with higher levels of loneliness.

Conflicting findings exist for the association between time spent on social media and loneliness, with some findings suggesting that greater time spent on social media was associated with lower levels of loneliness (Ellis et al., 2020), whereas other findings suggest that greater time spent on social media was associated with higher levels of loneliness (Fumagalli et al., 2021). There is evidence to suggest that high levels of online communication with friends and COVID-19-related stress interact, such that communicating with friends online may protect adolescents against the loneliness they experience associated with COVID-19-related stress (Espinoza & Hernandez, 2022). In a study of 13- to 19-year-old Belgian adolescents, Cauberghe and colleagues (2020) observed that lonely participants were more likely to use social media as a tool to cope with a lack of social contact during the pandemic, and that greater feelings of loneliness were associated with social media use to keep in contact with friends and family.

2.4.2.2 School and Peer Connections

During the pandemic, students reported difficulties with online learning due to a lack of interaction with teachers, peers, and friends ([Esposito et al., 2020; Evans et al., 2020; Fontenelle-Tereshchuk, 2020; Ravens-Sieberer et al., 2020], as cited in Samji et al., 2022). Online learning provided limited opportunities for social interaction (Cockerham et al., 2021). Adolescents who attended school virtually during the pandemic were more likely to report lower levels of school connectedness than those receiving in-person or hybrid instruction (Hertz et al., 2022). School closures and cancelled extracurricular activities were some factors adolescents identified as contributing to feelings of sadness, loneliness, isolation, and boredom during the pandemic (Rimel et al., 2023). In a sample of clinic- and community-recruited participants from Ontario, Tsujimoto and colleagues (2022) found an association between attending school virtually and higher depressive symptoms compared to those attending school in a hybrid format (mix of in-person and virtual instruction). They likewise found an association between greater anxiety symptoms and attending school virtually, compared to adolescents attending school in the hybrid format (Tsujimoto et al., 2022). Similarly, Cingel and colleagues (2022) reported that school context, in particular when comparing in-person to virtual schooling, in-person schooling was associated with stronger feelings of social connection and

inclusion, less problematic social media use, and lowered levels of anxiety and depressive symptoms. Instruction via online platforms where the majority of students had their microphones and cameras off made it difficult for many adolescents to remain engaged (Widnall, Adams, et al., 2022). Several adolescents highlighted the importance of being around others their own age in the school environment, missed being around friends and experienced loneliness when school instruction transitioned to online (Widnall, Adams, et al., 2022). In a sample of 1,708 American adolescents between the ages of 9 and 19 years, social support had a greater effect on reducing loneliness when adolescents were receiving more virtual instruction (Christ & Gray, 2022). However, for some, that transition to online learning was a relief as it allowed them to escape bullying and challenging social dynamics (Widnall, Adams, et al., 2022), and they felt more at ease, with a more laid-back schedule contributing to less stress and pressure (Nelson Ferguson et al., 2021). Likewise, the transition back to in-person learning when pandemic restrictions began to ease was stress- and anxiety-inducing for some as it meant adapting back to a busy social environment (Widnall, Adams, et al., 2022).

In a survey of 7,705 American adolescents, Jones and colleagues (2022) found that adolescents reporting closeness to others at school reported a lower prevalence of: (1) poor mental health during the pandemic; (2) poor mental health in the past 30 days; (3) persistent feelings of sadness or hopelessness in the past 30 days; (4) having seriously considered attempting suicide; (5) and having attempted suicide (Jones et al., 2022). Similar findings regarding a negative association between school connectedness and mental ill-health were observed in a sample of Massachusetts adolescents in grades 6 to 11 (Perkins et al., 2021). A significant negative association was observed between school connectedness and anxiety symptoms, as well as school connectedness and depressive symptoms (Perkins et al., 2021). These associations were present even after adjusting for demographic variables and degree of friend connectedness (Perkins et al., 2021). A study involving 93 Pennsylvania girls between the ages of 12 to 17 years found feelings of peer connectedness were associated with lower odds of reporting suicidal ideation during the pandemic (Hutchinson et al., 2021).

Widnall and colleagues examined patterns of change in the mental health of 603 English adolescents at three time points: (1) Pre-pandemic (October 2019); (2) During the lockdown (May 2020); and (3) After the return to school (October 2019). Their analyses suggested no association between level of school connectedness and peer connectedness (Widnall, Winstone, et al., 2022). They also found that symptoms of anxiety decreased from pre-pandemic levels during the lockdown, but rose again after the return to school, and the decrease in anxiety symptoms was strongest among those who experienced poor connectedness pre-pandemic. (Widnall, Winstone, et al., 2022). The increase in anxiety and depressive symptoms in the lockdown-to-return-to-school period was stronger among those with low pre-pandemic school connectedness compared to those with medium pre-pandemic levels of school connectedness (Widnall, Winstone, et al., 2022). Consistent with the findings of Perkins and colleagues (2021) low school and peer connectedness was consistently associated with poorer mental health and well-being across all three time points (Widnall, Winstone, et al., 2022). For adolescents experiencing low levels of school connectedness, being removed from the school environment due to pandemic restrictions reduced their anxiety (Widnall, Winstone, et al., 2022).

2.4.2.3 Family Connections, Support, and Conflict

Due to pandemic restrictions, adolescents were spending more time at home with their families. In the pilot study for QuaranTEENing, a qualitative analysis of responses to open-ended survey questions suggested that although some adolescents were feeling disconnected, many were spending time connecting with family, and growing closer in these relationships (Nelson Ferguson et al., 2021). There are conflicting results in the literature as to whether this increased time spent with family has a positive or negative effect on adolescent mental health and well-being, which is highly dependent on the familial context.

In a sample of 1,054 Canadian adolescents, more time with friends and less time with family was significantly associated with depressive symptoms, and more time with family and friends was protective against loneliness during the pandemic, suggesting that connecting with family members may be a positive coping strategy (Ellis et al., 2020). However, a UK survey of 1,047 grade nine students found that although family

connectedness did not increase in the sample during the pandemic, increases in anxiety and depressive symptoms were strongest for those with poorer family connections prior to the pandemic (Widnall et al., 2020). In this sample, any improvements in mental health and well-being during the pandemic were greater among those with low pre-pandemic family connectedness compared to those with medium or high pre-pandemic family connectedness (Widnall et al., 2020). A study involving 3,577 Ontario, Quebec, and Alberta adolescents found spending time with family to be associated with lower mean increases in depression scores pre-to-during the pandemic, and smaller declines in psychosocial [mental] well-being] (Riazi et al., 2023). This study also found spending time with family during the early pandemic to be associated with less anxiety and emotional dysregulation (Riazi et al., 2023).

The pandemic appears to have led to increased family intimacy and closeness for some families (McKinlay et al., 2022; Parent et al., 2021; [Evans et al., 2020; Gadermann et al., 2021; Patra et al., 2020; Rogers et al., 2021, as cited in Samji et al., 2022]). Having the opportunity to spend more time together with family contributed to heightened feelings of closeness for some adolescents (Rimel et al., 2023). Some adolescents felt more comfortable reaching out to their family (and peers) for mental health support during the pandemic owing to “an innate understanding among the community of how difficult the pandemic was” (Rimel et al., 2023, p. 9). A daily diary study of 102 Dutch adolescents spanning 20 days between May and June 2020 reported a linear increase in parental support across the duration of the study (Klootwijk et al., 2021). Italian, Romanian, and Croatian adolescents who perceived family support as important had a lower odds of reporting both boredom/emptiness and anxiety during the pandemic (Forte et al., 2021). A survey of 57,948 Chinese high school students between the ages of 11 to 20 years reported that negative family relationships, along with lack of social support, were among the most important factors associated with depressive, anxiety, and PTSD symptoms (Cao et al., 2021). Similarly, Shek and colleagues (2021) reported that stronger parent-child relationships were associated with fewer COVID-19-related PTSD symptoms in Chinese adolescents aged 11 to 20 years. Qualitative results from a study of British Columbia adolescents reported that among those who felt socially connected during the pandemic, some felt closer with a smaller number of friends or family than

prior to the pandemic, and the relationships that they did maintain were strengthened (Parent et al., 2021). These participants reported putting more effort into their closest relationships, making these relationships deeper and more meaningful (Parent et al., 2021). In a United Kingdom sample of 443 adolescents during the pandemic, being closer to parents was associated with fewer emotional symptoms, less psychological distress, and less loneliness (Cooper et al., 2021). Similarly, adolescents who reported being closer with parents at baseline (March 30 to June 1, 2020) demonstrated significantly lower levels of psychological distress 11 weeks later (Cooper et al., 2021). In a sample of 989 Ohio males aged 11 to 16 years, 9.7% reported decreased closeness with family at the time of the survey (June 2020) compared to March 15, 2020, when bars and restaurants closed in Ohio (Tetreault et al., 2021). Those who reported a worsened mood from March 2020 to June 2020 reported a lower prevalence of closeness with family compared to those whose mood did not change or improved (20.7% versus 4.7%) (Tetreault et al., 2021). Similarly, those who perceived an increase in anxiety had a lower prevalence of reporting closeness with family compared to those whose anxiety did not change or decreased (Tetreault et al., 2021).

Several studies have reported that family conflicts have increased for adolescents during the pandemic ([Ademhan Tural et al., 2020; Dong et al., 2020; Jiao et al., 2020; Pinar Senkalfa et al., 2020; Zhang et al., 2020; Ellis et al., 2020, as cited in Theberath et al., 2022]; Ravens-Sieberer et al., 2021; Rogers et al., 2021). This increase in conflict may be due to negative mood, including depression, anxiety, pandemic-related stress (Ademhan Tural et al., 2020; Dong et al., 2020; Jiao et al., 2020; Pinar Senkalfa et al., 2020; Zhang et al., 2020; Ellis et al., 2020, as cited in Theberath et al., 2022), or increased time spent with family (McKinlay et al., 2022; Rogers et al., 2021), especially when living together in small homes and working from home (McKinlay et al., 2022).

Confinement at home, especially under conditions of elevated stress due to the pandemic, may aggravate family conflict and prevent family members from finding respite outside the home (Rosseau & Miconi, 2020, Spinelli et al., 2020, as cited in Craig et al., 2022).

In a sample of 760 Australian adolescents, approximately one-third reported their family relationships were negatively impacted by the pandemic, and most respondents reported a worsening of family stress (Li et al., 2021). Rogers and colleagues (2021) conducted a mixed-methods study consisting of a set of surveys administered prior to the onset of the pandemic (October 2019) and during the pandemic (April 2020) to 407 adolescents between the ages of 14 and 17 years. Responses to an open-ended survey question indicated that 22% of adolescents spent more time with family during the pandemic (Rogers et al., 2021). Some adolescents reported difficulties arising from this increased time spent with family, citing a lack of privacy and personal space, leading to increased conflict and irritation (Rogers et al., 2021). However, more adolescents characterized this increased time spent with family as a positive, stating that more time spent with parents and siblings was enjoyable, a source of social support, and it led to improvements in their relationships, with greater closeness and discovering new things about one another (Rogers et al., 2021). Quantitative results showed that overall, adolescents spent far more time with their families during the pandemic, corresponding to an increase in family support and a slight decrease in family conflict (Rogers et al., 2021). Respondents who reported greater increases in negative affect and family conflict had higher depressive symptoms and loneliness at the pandemic follow-up, above and beyond their measures at baseline (Rogers et al., 2021).

2.4.2.4 Friend Connections, Support, and Conflict

The pandemic presented new challenges to adolescents in making and maintaining friendships. In the pilot study for the QuaranTEENing project, although some adolescents described feeling disconnected with their friends during the pandemic owing to the inability to meet in-person, some adolescents felt more connected with friends and loved ones, adapting to the pandemic situation by visiting outdoors or communicating online (Nelson Ferguson et al., 2021). The literature suggests that maintaining strong connections with friends was an important contributor to the mental health and well-being of adolescents during the pandemic. In addition, some adolescents reported it was difficult to maintain friendships because they felt like they had nothing to talk about with their friends during lockdowns (McKinlay et al., 2022). More virtual time

spent with friends during the pandemic has been linked to less loneliness (Ellis et al., 2020), and friend support during the pandemic was related to lower stress (Espinoza & Hernandez, 2022). Many adolescents missed the support of in-person interaction with friends during this time (Stănicke et al., 2023). Engaging with friends supported mental health, and contact with friends sooner, more often, or in-person was an area adolescents suggested could have improved their mental health throughout the pandemic (Stewart et al., 2023). However, adolescents who were unable to maintain friendships during the pandemic faced negative mental health repercussions.

Many adolescents described feeling less connected with their friends during the pandemic (Li et al., 2021; Nelson Ferguson et al., 2021). Both Rogers and colleagues (2021) and Ezeoke and colleagues (2022) found that adolescents spent far less time with friends during the pandemic, and this corresponded with a slight overall decrease in friend support and decreases in friend conflicts or disagreements. Rogers and colleagues (2021) also found that those who perceived greater decreases in friend support reported higher depressive symptoms during the pandemic (April 2020), above and beyond their baseline measurements (October 2019). For some, differences of opinion concerning the pandemic contributed to this increase in conflict with peers (McKinlay et al., 2022; McKinnon et al., 2023; Rimel et al., 2023).

A qualitative interview and focus group-based study involving United Kingdom adolescents described the changes adolescents perceived to their friend relationships during the pandemic (Widnall, Adams, et al., 2022). Adolescents described losing friends, making new friends, and realizing the value of ‘true’ friendships (Widnall, Adams, et al., 2022). They expressed concern with friends that had gone quiet during the lockdown, checking in with friends they were concerned about, even when this was not reciprocated (Widnall, Adams, et al., 2022). Some of these adolescents expressed appreciation for friends who remained supportive through the pandemic (Widnall, Adams, et al., 2022).

James and colleagues (2023) conducted a daily diary study involving 93 American girls (not including girls with current or past anxiety, depressive, psychotic, or

autism spectrum disorder) recruited from a larger longitudinal study. The participants provided data over a 10 day period in April/May of 2020, followed up 7 months later (James et al., 2023). Participants reported progressively less positive affect, depressive symptoms, and more closeness with peers over the course of the 10 days (James et al., 2023). On days where the girls' feelings of closeness with their peers was higher than their personal average, more daily increases in positive affect as well as lower levels of anxiety and depression were observed compared to their personal average (James et al., 2023). Participants who had reported feeling closer with their peers reported more positive affect in April/May 2020 and fewer depressive symptoms at the seven-month follow-up (James et al., 2023). Those who had reported more depressive symptoms at baseline of the larger longitudinal study from which they were recruited (16 to 52 months prior to April/May) reported less closeness with their peers (James et al., 2023). James and colleagues (2023, p. 7) also found "higher baseline depressive symptoms were associated with less positive affect during lockdown [April/May 2020], and more depressive symptoms longitudinally..., via less closeness with peers".

A repeated cross-sectional study of 208 adolescents in the American was administered in three waves, completed in six-month intervals (Romm et al., 2021). The study found that, compared to those who completed Wave 3 of the survey before the pandemic (March 2019 to March 2020), participants who completed Wave 3 of the survey during the pandemic (April to August 2020) reported greater decreases in friendship and positive affect from survey Wave 2 to Wave 3 (Romm et al., 2021). This corresponded with increases in negative affect, isolation, and depression from Wave 2 to Wave 3 for those who completed Wave 3 during the pandemic compared to those who completed Wave 3 prior to the onset of the pandemic (Romm et al., 2021).

Tetreault and colleagues (2021) examined changes in closeness with friends during the pandemic in a sample of Ohio males aged 11 to 16 years, where 35.7% of respondents reported experiencing decreased closeness with friends during the pandemic (Tetreault et al., 2021). A decreased closeness with friends during the pandemic was observed in a greater percentage of those who perceived worsened mood during the pandemic compared to no change or improvement in mood (52.8% vs 27.3%) (Tetreault

et al., 2021). In addition, those whose perceived increased anxiety increased during the pandemic had a higher prevalence of decreased closeness with friends compared to those whose anxiety decreased or remained the same since the onset of the pandemic (49.7% vs 28.5%) (Tetreault et al., 2021). Analogous findings concerning anxiety were observed by Forte and colleagues (2021), who reported that adolescents who perceived a negative impact of the lockdown on their relationships with friends experienced higher odds of anxiety. These individuals also reported higher odds of experiencing anger, sadness, and boredom/emptiness (Forte et al., 2021).

2.4.2.5 Social Media and Technology Use for Maintaining Social Connections

The onset of the pandemic coincided with an increase in social media use among adolescents (Bailey et al., 2022; Ellis et al., 2020; Forte et al., 2021; [Fumagalli et al., 2021; Vall-Roqué et al., 2021; Rens et al., 2021; Cauberghe et al., 2020; Chen et al., 2021, as cited in Marciano et al., 2022]. There is some evidence to suggest that the magnitude of this increase may be more than double pre-pandemic levels, as Ellis and colleagues (2020) reported a jump in the percentage of Canadian teenagers using social media more than 3 hours per day from 31.9% before the pandemic to 77.2% after the pandemic. Cingel and colleagues (2022) found that adolescents reported high levels of problematic social media use during the pandemic. These findings highlight the shift from in-person to online communication that adolescents underwent in response to the pandemic.

2.4.2.5.1 Barriers to Social Connection Via Social Media and Technology

Although some found technology to facilitate social connections, for others it was a hinderance (Cockerham et al., 2021). Liang and colleagues (2023) found adolescents used social media to stay connected during pandemic-induced school closures, however, paradoxically, social media both hindered and facilitated their ability to connect with others. Several adolescents were maintaining and making new friendships in the online environment, sometimes becoming closer with people they had not known before, but sometimes growing distant from formerly close friends (Liang et al., 2023). For some

adolescents, online communication felt less intimate, more effortful, less beneficial to their mental health and well-being (Parent et al., 2021), and overall perceived it as inferior to face-to-face interaction (Widnall, Adams, et al., 2022). Some adolescents felt overwhelmed by the transition to solely online methods of communication and opted out of this method of contact entirely (McKinlay et al., 2022). Some found online communication “draining” or “exhausting”, facilitating procrastination and loss of sleep, with some describing themselves as “addicted” (Rimel et al., 2023). Text-based communication made it more difficult for some to read their peers’ feelings, tone, and intentions, and a loss of familiarity from lack of in-person contact made this even more difficult (Liang et al., 2023). This group of adolescents found online interactions to lack sincerity overall, especially with a lack of in-person interactions to supplement (Liang et al., 2023). Adolescents cited the following challenges with online communication: (a) difficulty getting in touch with others as online interactions are less immediate than in-person interactions; (b) the ability for one party to drop out mid conversation without explanation; (c) technical difficulties and poor internet connection; and (d) being forced to be more selective of who they stay in touch with (Liang et al., 2023). For many, engaging via technology represented a barrier in maintaining relationships and connecting with others (Rimel et al., 2023). In Italian adults, both offline and online connections protected against psychological distress during the pandemic, however, online connections were not considered to be adequate surrogates for offline connections, as online connections only protected well-being at the most restrictive isolation stages, where offline connections were limited (Marinucci et al., 2022). Mental health support resources typically available through in-person contact at school shifted to the online environment, which some found less conducive to seeking help (Rimel et al., 2023).

Qualitative analyses of open-ended survey questions in a mixed methods study of American adolescents indicated that respondents who reported less in-person interaction during the pandemic felt disconnected and isolated, and that electronic communication was not the same as in-person communication, suggesting the participants found electronic communication during the pandemic to be an inadequate surrogate for in-person communication (Rogers et al., 2021). Indeed, in a study of young adults aged 17 to 25 years, Scott and colleagues (2022) found that for those who primarily interacted

offline with friends prior to the pandemic, the shift away from in-person interactions was associated with a “greater perceived reduction in satisfaction with friendships, which, in turn, was associated with greater loneliness and lower social connectedness” (R. A. Scott et al., 2022, p. 1).

2.4.2.5.2 Social Media and Technology as Facilitators of Social Connection

Among those feeling socially connected during the pandemic, online communication was essential for maintaining relationships during the restrictions, where online communication either supplemented or replaced face-to-face interactions (Parent et al., 2021). Many adolescents used social media as a tool to maintain social connections in a hybrid or virtual learning environment (Cingel et al., 2022).

Some adolescents saw social media as a tool for staying connected with friends despite restrictions from in-person contact due to pandemic precautions (Liang et al., 2023; McKinlay et al., 2022; [Buzzi et al., 2020; Janssen et al., 2020, as cited in Samji et al., 2022]; Widnall, Winstone, et al., 2022). Many cited easier social connectivity (i.e., less intimidating to communicate online than in-person, availability of a broader pool of people to communicate with, and the use of GIFs, emojis and videos to more adequately express emotions, the ability to act like one’s true self without fear of judgement) (Liang et al., 2023). The majority (93.5%) of a sample of Italian adolescents used social media to keep in contact with friends during the pandemic, and some (19.3%) used it to make new acquaintances (Pigaiani et al., 2020). Technology facilitated connections to broader audiences beyond one’s own community, and people they would not encounter in the real world, such as to celebrities and public figures who helped de-stigmatize mental illness by sharing their own struggles and advising how to ask for help (Rimel et al., 2023). It also facilitated involvement in these larger communities, including social justice movements (Rimel et al., 2023). Some adolescents used social media as a medium to provide and receive social support. Among 371 Australian adolescents, 36% had used social media to seek support for themselves, and 50.4% had used it to support others when they expressed thoughts of suicide or self-harm (Bailey et al., 2022).

With regard to the potential effects of social media and technology on loneliness during the pandemic, a study of 760 Australian adolescents found higher amounts of screen time for social connection were associated with less loneliness (Li et al., 2021). Likewise, Ellis and colleagues (2020) found virtual time spent with friends was associated with lower levels of loneliness. Furthermore, a survey of 993 American adolescents conducted during the early stages of the pandemic found that communicating with friends online may be linked to less loneliness associated with negative changes to their daily lives due to the pandemic (Espinoza & Hernandez, 2022). The study found an interaction between online friend communication and negative changes to adolescents' daily lives, such that among adolescents reporting low online friend communication, loneliness was associated with perceived negative changes to their lives due to COVID-19 (Espinoza & Hernandez, 2022). However, among adolescents reporting high levels of online friend communication, no association between negative changes to their daily lives and loneliness was observed (Espinoza & Hernandez, 2022).

Overall, evidence suggests that while online interactions as a replacement for missed in-person interactions during the pandemic may be better than no interaction whatsoever, they do not seem to measure up to in-person interactions.

2.4.2.5.3 Social Media and Technology Use, Mental Health and Well-Being: Benefits and Detriments

The literature shows that social media had both positive and negative effects on the social connectedness, as well as mental health and well-being of adolescents, during the pandemic. A qualitative analysis on a series of interviews with 11 United Kingdom adolescents reported on “the beauty and the beast of social media” in the context of the COVID-19 pandemic – that is, the aspects of social media that adolescents perceived as beneficial or detrimental to their mental health (Keles et al., 2023). The facets adolescents found beneficial were: (a) the capacity for connection and communication; (b) exposure to positive content (e.g., educational or entertaining in nature); (c) positive social comparison (e.g., relating to and feeling motivated by social media content); (d) gaining social support (e.g., by receiving advice or getting compliments from others); and (e) resilience to stress during the pandemic (e.g., allowing them to cope with boredom,

providing a source of entertainment, giving them access to information, allowing them to see lockdown as a shared experience, allowing them to stay connected with loved ones) (Keles et al., 2023). The negative aspects of social media included: (a) exposure to negative content; (b) cyberbullying; (c) negative social comparison; (d) fear (e.g., fear of missing out, associating number of social media followers and likes with self-worth); and (e) addiction/distraction (e.g., dependency on social media interfering with everyday activities) (Keles et al., 2023). Additionally, going on social media was disheartening at times for several adolescents, as they found it frustrating to see peers and celebrities posting about being in violation of pandemic mitigation restrictions and guidelines (Liang et al., 2023; Rimel et al., 2023).

Findings in the literature regarding the relationship between social media use and loneliness are highly dependent on how social media use was measured. With regards to positive associations between social media use and loneliness, Ciacchini and colleagues (2023) found an association between *spending more time online* and feeling lonely, although for the majority (~70%) of respondents, their perceived level of loneliness did not change with the *use of social media*. However, in a United States sample of adolescents Mousavi and colleagues (2023) found that more *social media use during daily activities* was related to more loneliness, but *frequency of checking social media* was unrelated to loneliness (Mousavi et al., 2023). In the same vein, in a United Kingdom study involving 443 adolescents found higher frequency of texting others demonstrated no association with loneliness (Cooper et al., 2021).

Apart from quantity, the quality and nature of adolescent online experiences during the pandemic played an important role in determining whether online experiences had a positive or negative effect on mental health and well-being. In a sample of 735 Peruvian adolescents, positive online experiences, such as feeling valued and receiving advice, were associated with lower levels of loneliness, whereas negative online experiences, such as being cut-off and mistreated, had the opposite effect (Magis-Weinberg et al., 2021). A survey conducted during the early stages of the pandemic found higher friendship quality, rather than amount of online friend communication, was

the factor associated with lower depressive symptoms in the sample (Espinoza & Hernandez, 2022).

In addition to quality of online experiences, the manner of social media use (i.e., *passive* versus *active* engagement) was another determinant of the effects of social media on adolescents' mental health and well-being. In a sample of 523 Icelandic adolescents, there was a positive association between increased passive social media use (in the form of looking at strangers' profiles during the pandemic) with depressive symptoms (Halldorsdottir et al., 2021).

In a qualitative study based on semi-structured interviews with 39 American adolescents, Liang and colleagues (2023) also attempted to disentangle the effects of active versus passive engagement with social media in terms of adolescent emotions (i.e. stress and happiness) during the pandemic. This study identified sources of stress and sources of happiness stemming from active and passive engagement (Liang et al., 2023). With active engagement, sources of stress included negative interactions with others (that may be new or worsening in light of the pandemic), and cyberbullying (Liang et al., 2023). Sources of happiness stemming from active engagement included communicating, playing games, or sharing art with friends, and overall maintaining a sense of social connection (Liang et al., 2023). These adolescents showed an appreciation for the role social media played in keeping them connected during the pandemic (Liang et al., 2023). Sources of stress stemming from passive engagement included passively viewing negative posts (especially negative posts relating to LGBTQ+ or Black Lives Matter issues), witnessing cyberbullying (especially pertaining to racism and homophobia), comparison to others (resulting in poorer self-esteem or jealousy), and being frustrated by seeing peers posting about acting in violation of COVID-19 prevention measures (Liang et al., 2023). Sources of happiness stemming from passive engagement in social media included viewing posts with positive or entertaining content, using social media as a source of support or coping strategy, and being able to customize their social media feeds to only show things that make them happy (Liang et al., 2023).

Overall, the different mental health and well-being effects of various forms of social media use among adolescents amid the pandemic highlight the need for future research to specify the manner of social media use of interest (i.e., *active* or *passive*, or use for generating a sense of social connection). The current thesis is oriented towards the effects of *social connectedness derived from* social media.

2.4.2.5.4 Social Media and Technology as a Coping Tool

Technology was helpful for some adolescents in coping with the “new normal” brought on by the pandemic (Rimel et al., 2023). In a sample of 3,577 Ontario, Alberta, and Quebec adolescents, staying connected with friends online was the most commonly reported coping strategy during the pandemic, reported by 78.8% of respondents (Riazi et al., 2023). Social media-based coping behaviours may vary according to the characteristics of adolescents. A study of 2,165 adolescents in Belgium found anxious adolescents used social media as a tool to adapt to the changes associated with the pandemic, or to maintain contact with family and friends, and lonely adolescents used social media as a coping tool (Cauberghe et al., 2020). A study of 978 American adolescents between the ages of 13 to 17 years asked participants to recall their social media use and depressive symptoms in the month leading up to the initial pandemic-related school closure and a week prior to completing the survey (September to December 2020) (Burke et al., 2021). Results suggested a moderating effect of social media use for coping in the relationship between the change in frequency of social media use and depressive symptoms coinciding with the pandemic (Burke et al., 2021). Compared to adolescents who reported frequent social media use for coping, the strength of the association between increased social media use during the pandemic and higher depressive symptoms was stronger for those reporting infrequent social media use for coping (Burke et al., 2021).

2.4.2.5.5 Associations Between Social Media and Technology Use and Mental Illness

Several studies report a negative effect of social media use on adolescent mental health and well-being during the pandemic (Bailey et al., 2022; Ellis et al., 2020; Forte et

al., 2021; S. R. Liu et al., 2022; Marciano, Viswanath, et al., 2022; Murata et al., 2020; Shah et al., 2021). A meta-analysis by Marciano, Ostroumova and colleagues (2022) concerning adolescents and young adults 10 to 24 years of age found that greater time spent on social media was correlated with higher psychopathological (i.e., mental illness) symptoms, with this association being strengthened by older age and proportion of males included in the sample. A multi-national study of Italian, Romanian, and Croatian secondary school students found that adolescents with a higher use of social media reported a greater likelihood of experiencing all emotional reactions (feelings of anxiety, sadness, anger, and persistent boredom/emptiness), especially boredom/emptiness (Forte et al., 2021). Norcia and colleagues (2022) specified their measurement of social media use to time spent connected with peers, and found that longer time spent connecting with peers online during the pandemic was associated with fewer psychological difficulties (specific parent-observed problem behaviors in adolescents, i.e., difficulty staying still, difficulty concentrating, nervousness and irritability, a tendency to cry for no reason, sleep and eating challenges). Furthermore, in a study of 3,577 Ontario, Alberta, and Quebec adolescents, time with friends online during the early pandemic (May to July 2020) was associated with smaller increases in emotional dysregulation (Riazi et al., 2023). S. Li and colleagues (2021) highlighted the effects of screen time used to connect with friends and family, and found that although overall screen time was associated with greater psychological distress, when screen time was used to connect with friends and family, it was no longer associated with psychological distress. Contradictory results were found in a United Kingdom sample of 443 adolescents, where higher frequency of texting others was associated with greater psychological distress (Cooper et al., 2021).

Generally, the literature has found social media use among adolescents during the pandemic to be associated with depression. An increase in screen time for using social media observed in the pre-to-during pandemic period (Marciano, Viswanath, et al., 2022), and social media use during daily activities during the pandemic have both been associated with depression (Mousavi et al., 2023). Similarly, in a sample of 240 Swiss adolescents, spending more time on social media during the pandemic was associated with elevated odds of experiencing sadness (Dumont et al., 2022). Furthermore, in a sample of 523 Icelandic adolescents, there was an association between communicating

with family over the phone or social media with depressive symptoms (Halldorsdottir et al., 2021).

A daily diary study conducted by James and colleagues (2023) involving 93 American adolescent girls over both a 10-day period in April/May of 2020 and at a follow-up 7 months later examined the relationship between social technology use and adolescent mental health. The participants reported greater feelings of closeness with their peers on days they spent more time texting or video chatting (James et al., 2023). Higher levels of texting with peers compared to the participants' personal average was associated with relatively low same-day levels of depression and anxiety through feelings of closeness with peers (James et al., 2023). More time video chatting with peers compared to the participants' personal average was associated with relatively low same-day levels of depression and anxiety through feelings of closeness with peers (James et al., 2023). Spending more time video chatting overall was associated with more positive affect, more closeness with peers, and fewer depressive symptoms longitudinally (James et al., 2023). Daily social media use was not associated with positive affect, depression, or anxiety, neither at the within- nor between-person level (James et al., 2023).

Among Canadian adolescents, Ellis and colleagues (2020) observed a moderating effect of social media use in the association between COVID-19-related stress and depressive symptoms (Ellis et al., 2020). That is, compared to those reporting "low" or "average" levels of social media use, adolescents reporting "high" social media use had the strongest associations between COVID-19-related stress and depressive symptoms (Ellis et al., 2020). The authors also found that virtual time spent with friends was associated with higher levels of depression (Ellis et al., 2020). Likewise, among a sample of 371 Australian adolescents, depression scores were significantly higher for those using social media more than seven hours per day, compared to those who reported using it zero-to-two or three-to-four hours per day (Bailey et al., 2022).

Shah and colleagues (2021) found higher levels of social media use to be associated with higher prevalence of depressive symptoms, adding that not being able to meet with friends in-person was the primary reason for depressive symptoms. Similar

results were observed in adolescents in the United States, where more time spent on social media corresponded with higher depressive symptoms and suicidal ideation/behaviour (Murata et al., 2020).

Despite an overwhelming number of studies reporting associations between social media use and depressive symptoms among adolescents during the pandemic, there is some evidence suggesting null or even beneficial effects. In a United States study involving 215 adolescents, frequency of checking social media was unrelated to depression (Mousavi et al., 2023). However, a study involving 544 Italian adolescents found a sense of relational closeness to one's friends online served as a buffer in the relationship between loneliness and depression (Boursier et al., 2023).

A majority of studies set among adolescents during the pandemic tended to find relationships between social media use and heightened anxiety. In a United States study involving 215 adolescents, social media use during daily activities was related to elevated anxiety and stress (Mousavi et al., 2023). Likewise, among a sample of 371 Australian adolescents, stress and anxiety scores were significantly higher for those using social media greater than seven hours per day compared to those who reported using it zero-to-two or three-to-four hours per day (Bailey et al., 2022). Shah and colleagues (2021) reported analogous results among Indian adolescents, finding higher levels of social media use to be associated with a higher prevalence of anxiety symptoms, adding that not being able to meet with friends in-person was the primary reason for anxiety symptoms. Some studies have found null or beneficial effects of social media use on anxiety among adolescents during the pandemic. A United States study involving 215 adolescents found that frequency of checking social media was unrelated to anxiety and stress (Mousavi et al., 2023), and a study involving 544 Italian adolescents found a sense of relational closeness to one's friends online served as a buffer in the relationship between loneliness and anxiety (Boursier et al., 2023). Varying aspects and manner of social media use appear to have differential associations with anxiety.

2.4.2.5.6 Associations Between Social Media and Technology Use and Mental Well-Being

Findings regarding the effects of social media use and technology use on mental well-being were generally null or beneficial. However, like mental health, the effects of social media and technology use depend on the type of social media use measured. A meta-analysis found no relationship between social media use and measures of mental well-being (Marciano et al., 2022). Conflicting results were observed for the relationship between social media use and social well-being, as the included studies reported both positive and negative associations (Marciano et al., 2022). A study of 2,165 adolescents in Belgium found social media use did not increase their feelings of happiness (Cauberghe et al., 2020). However, among Ontario, Alberta, and Quebec adolescents, time with friends online during the early pandemic (May to July 2020) was associated with less adverse pre-to-during pandemic changes in mental health outcomes (including smaller decreases in psychosocial [mental] well-being) (Riazi et al., 2023). Similarly, Li and colleagues (2021) found longer duration of screen time for social connection was associated with greater mental well-being.

A longitudinal study of Florida adolescents measured frequency of social media use, importance of social media for meaningful conversations, and gratitude at four time points both prior to and during the pandemic, and found that those who reported more pronounced decreases in the importance they attribute to social media for meaningful conversations had more pronounced decreases in gratitude over time (Maheux et al., 2021). However, no significant difference was observed in frequency of social media use, gratitude, nor importance of social media for meaningful conversations with friends during the pandemic compared to before the pandemic (Maheux et al., 2021). Adolescents reporting higher levels of gratitude at one time point, compared to their average, reported high importance of social media for meaningful conversations with friends at subsequent time points (Maheux et al., 2021). Yet, the within-person change in importance of social media for conversations with friends was not associated with within-person change in gratitude at a subsequent time point (Maheux et al., 2021). Neither prior change in gratitude nor importance of social media for meaningful conversations with

friends were associated with within-person change in frequency of social media use (Maheux et al., 2021). Given the association between gratitude and life satisfaction (Proctor & Linley, 2014), an aspect of mental well-being (Tennant et al., 2007), the study by Maheux and colleagues (2021) may provide additional context on the effects of social media on mental well-being.

2.5 The Social Determinants of Health (SDoH)

This section will introduce the SDoH, followed by a summary of the literature on the potential role of the SDoH in the relationship between social connectedness and adolescent mental health and well-being during the pandemic.

Diderichsen's *Model of the Mechanisms of Health Inequity* attempts to explain how differences in social position contribute to health inequities (Solar & Irwin, 2010). Under this model, social contexts, including the structure of a society or social relations therein, give rise to social stratification, where individuals are ascribed hierarchical social positions (Solar & Irwin, 2010). This social stratification contributes differential exposure to health risk factors, differential vulnerability to health conditions, and differential consequences of ill health in groups experiencing disadvantage (Solar & Irwin, 2010).

The WHO formed the Commission on the SDoH (CSDH) to summarize evidence on how the structures of societies contribute to health inequities (Solar & Irwin, 2010). The CSDH framework (Figure 2.3) is comprised of three elements: socioeconomic and political context, structural determinants and socioeconomic position, and intermediary determinants (Solar & Irwin, 2010). The social, political, and economic conditions (socioeconomic and political context) present in a society produce socioeconomic positions where social stratification occurs based on factors such as income, education, gender, and race (Solar & Irwin, 2010). These underlying structural determinants work through intermediary determinants to shape health inequities (Solar & Irwin, 2010). The CSDH consider three categories of intermediary determinants: (i) material circumstances, encompassing physical environment and access to financial resources; (ii) psychosocial circumstances, including psychological stressors, social support, and coping styles; and (iii) behavioural (eg. nutrition, alcohol and tobacco consumption distributed differently

according to social position) and biological factors (eg. genetic factors) (Solar & Irwin, 2010). The resultant illness brought on by these social determinants can have a feedback effect on the social position of an individual (Figure 2.3 *a*), or, in the case of epidemic diseases, have a feedback effect on the sociopolitical context (Figure 2.3 *b*) (Solar & Irwin, 2010). This is particularly relevant to the COVID-19 pandemic. For example, disproportionate negative consequences of infection faced by members of Indigenous communities led the National Advisory Committee on Immunization (NACI) to issue a recommendation that Indigenous adults be among the first to be prioritized for vaccination in Canada (National Advisory Committee on Immunization (NACI), 2020).

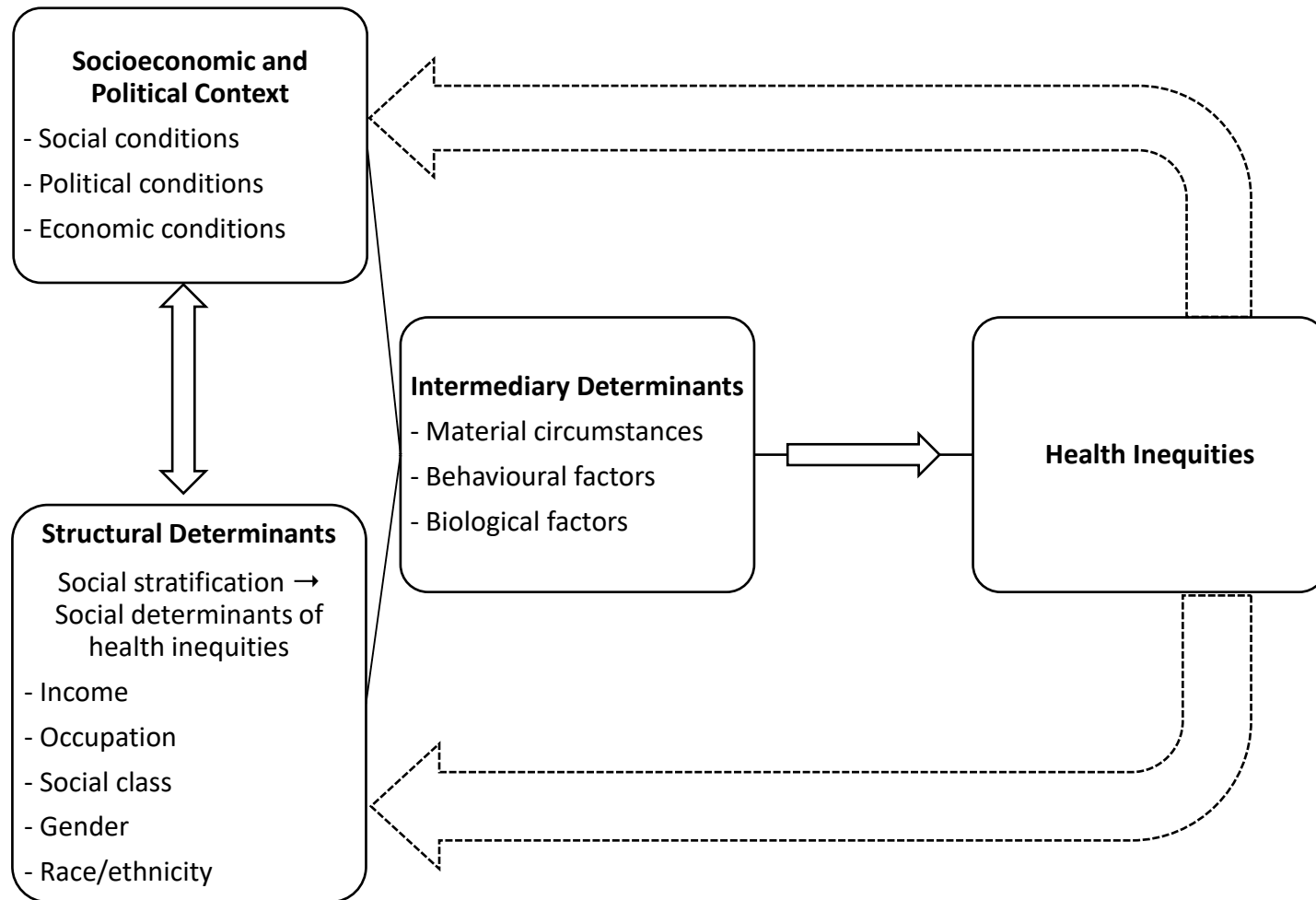


Figure 2.3 The WHO CSDH Framework. Adapted from Solar & Irwin (2010)

Raphael and colleagues (2020) have identified 17 SDoH for the Canadian context: (1) Indigenous ancestry; (2) disability; (3) early child development; (4) education; (5) employment and working conditions; (6) food security; (7) gender; (8) geography; (9) globalization; (10) health care services; (11) housing; (12) immigrant status; (13) income and its distribution; (14) race; (15) social safety net (e.g., employment insurance); (16) social exclusion; and (17) unemployment and job security. The SDoH associated with deterioration in mental health among Canadian adults during the pandemic include income, sexuality, gender, ethnicity, pre-existing mental health conditions, and disability (Jenkins et al., 2021).

Health inequities stemming from disadvantage by the SDoH have been exacerbated during the COVID-19 pandemic in Canada. COVID-19 infection rates in Canada have been disproportionately concentrated in areas with lower average income and educational attainment, and in areas with larger proportions of high-density housing, recent immigrants, visible minorities, and essential workers (Xia et al., 2022). Discrimination rose during the pandemic, with police-reported hate crimes in Canada increasing 80% in 2020 compared to 2019, particularly affecting Black, East or Southeast Asian, Indigenous, and South Asian identities (J. H. Wang & Moreau, 2022). Though unemployment rates in Canada increased overall during the pandemic, gender and educational attainment gaps in employment rates were heightened (Fuller & Qian, 2021).

2.5.1 Existing Research on the Role of the SDoH in the Relationship Between Adolescent Social Connectedness and Mental Health and Well-Being During the COVID-19 Pandemic

This section will summarize current research relating to SDoH that may influence aspects of adolescent social connectedness and mental health and well-being during the COVID-19 pandemic, organized across five SDoH which have been previously studied: (a) age; (2) sex/gender; (3) race; (4) socioeconomic status; and (5) geography. These categories were chosen to align with the SDoH measured in the QuaranTEENing survey used in the present thesis.

2.5.1.1 Age

Research is mixed on the effects of age on adolescent social connectedness as well as mental health and well-being during the pandemic. Multiple studies found null effects of age – for example, in a sample of 215 American adolescents aged 14 to 17 years, age was unrelated to depression, anxiety, stress, fear of missing out (FoMO), nor loneliness (Mousavi et al., 2023). Age did not moderate changes in depressive symptoms or anxiety in the pre-to-during COVID period (Magson et al., 2021). Likewise, in a sample of 694 American adolescents, age was not cross-sectionally associated with higher depression nor anxiety symptoms (Bowen et al., 2022). In a sample of 93 Pennsylvania girls aged 12-to-17 years, age was not associated with the odds of reporting suicidal ideation (Hutchinson et al., 2021). An Australian study in a sample of 248 13-to-16-year-olds, age did not moderate changes in life satisfaction in the pre-to-during COVID period (Magson et al., 2021).

With regard to social connectedness during the pandemic, there is some evidence that younger adolescents fared better than older adolescents. In a study involving 735 Peruvian adolescents aged 11 to 17 years, family support was perceived as lower by older adolescents than younger adolescents (Magis-Weinberg et al., 2021). Likewise, with respect to friend support, in a sample of 1708 American adolescents aged 9-to-19 years, participants in early adolescence reported higher levels of perceived friend support compared to participants in late adolescence (Christ & Gray, 2022). In a sample of 443 United Kingdom adolescents age 11 to 16 years, older age was associated with greater loneliness during the pandemic (Cooper et al., 2021). Some reports suggest that older adolescents may have fared better than younger adolescents in certain areas of social connectedness during the pandemic. In a study involving 735 Peruvian adolescents aged 11 to 17 years, older adolescents perceived more friend social support (Magis-Weinberg et al., 2021). Similarly, in the domain of family support, in a sample of 1708 American participants ages 9 to 19 years, participants in early adolescence reported higher perceived family support compared to those in middle and late adolescence (Christ & Gray, 2022).

With respect to social media use, one report found that older adolescents (aged 17 to 20) demonstrated higher mean hours per day spent on social media than younger adolescents (age 13 to 16 years) (Boursier et al., 2023). Similarly, another report found mobile phone use and social media use were more popular among older students, and both positive and negative experiences on social media were more common for older adolescents (Magis-Weinberg et al., 2021).

With regard to mental health, some evidence suggests that younger adolescents may have fared better than older adolescents during the pandemic. In a sample of 2310 12- to 18-year-old Alberta students, older adolescents reported higher stress indicators than younger adolescents (Schwartz et al., 2021). Likewise, among a sample of Italian adolescents, older adolescents (aged 17-to-20 years) displayed more fear of COVID-19 compared to younger adolescents (aged 13-to-16 years) (Boursier et al., 2023). In a sample of 774 14-to-17-year-olds, older adolescents reported more depressive symptoms (Morales-Vives et al., 2023). Similarly, in a sample of 2996 Italian secondary and high school students, sadness was more frequent among older adolescents (14-to-19-year-olds) than younger adolescents (11-to-14-year-olds) (Esposito et al., 2020). Also, with regard to depressive symptoms, in a longitudinal study involving 694 13-to-19-year-olds, older age was associated with higher depressive symptoms at Time 2 (November 2020) when controlling for depressive symptoms at Time 1 (May 2020) (Bowen et al., 2022). However, in a sample of 761 students from two semi-rural high schools in Georgia, USA, students in younger grades, compared to students in older grades, felt more nervous/anxious, stressed, and depressed/hopeless (Gazmararian et al., 2021).

Research concerning the effects of age on mental well-being among adolescents during the pandemic is rarer than that of mental ill-health. Some of this evidence suggests younger adolescents may have fared better than older adolescents in the area of mental well-being. In a sample of 229 Italian adolescents aged 14 to 19 years, younger participants reported higher levels of subjective [mental] well-being (Pepe & Farina, 2023). Likewise, in a sample of 774 14-to-17-year-olds, older adolescents reported less life satisfaction than younger adolescents (Morales-Vives et al., 2023). However, one report, based on evidence from a sample of 55 Chicago adolescents, found an increase in

wellness scores in the pre-to-during COVID period among high school juniors, but a decrease among Freshmen (Ezeoke et al., 2022).

2.5.1.2 Gender Identity and Sex

There is evidence that experiences of social connectedness and mental health and well-being in adolescents during the pandemic were influenced by gender identity (Bailey et al., 2022; Buzzi et al., 2020; Campione-Barr et al., 2021; Ellis et al., 2020; Magis-Weinberg et al., 2021; Magson et al., 2021; Mitchell et al., 2021; Perkins et al., 2021) and sex (Jones et al., 2022; Rogers et al., 2021). This section will summarize the literature available with respect to how gender acts as an SDoH to influence social connectedness and related mental health and well-being outcomes in adolescents during the pandemic.

Perkins and colleagues (2021) examined levels of overall social connectedness during the pandemic in 320 Massachusetts adolescents and found no gender differences in social connectedness levels. There is evidence to suggest that females and girls reported more loneliness than males and boys during the pandemic (Cooper et al., 2021; Ellis et al., 2020; Espinoza & Hernandez, 2022). Additionally, feelings of closeness to others at school were less prevalent in females than in males (Jones et al., 2022). However, Cingel and colleagues (2022) observed no interaction between gender identity and school context (i.e., in-person, remote, hybrid, etc.) in their association with level of social connectedness, nor was there any moderation by gender in the association between school context and social media use. There was also no moderation by gender in the relationship between school context and loneliness (Cingel et al., 2022). However, they did identify a main effect of gender on social connection, such that transgender and gender non-conforming youth scored significantly lower than those identifying as female and male in terms of their satisfaction with peer connection, and sense of inclusion in a social group (Cingel et al., 2022). Males scored lower than females in terms of satisfaction with peer connection, however this trend was reversed for inclusion in a social group, with males scoring significantly higher than females (Cingel et al., 2022). Social support may be one area where females fared better than males. A study of Turkish adolescents found positive overall relationships between social support and

psychological well-being, however, females demonstrated more social support and psychological well-being than males (Kurudirek et al., 2022).

Experiences of friend connection and support during the pandemic also differed according to gender and sex. Females perceived greater increases in friend conflict during the pandemic than males (Rogers et al., 2021). Gender-minority (e.g., transgender or non-binary) adolescents reported the least challenges with family and friends, yet the most challenges with social connection and community (S. R. Scott et al., 2020). However, compared to boys, girls reported more positive relationship quality with best friends (Campione-Barr et al., 2021). Like friend connections and support, family connections and support during the pandemic appear to differ according to gender and sex. Gender-minority youth reported lower levels of family connectedness compared to cisgender youth (Mitchell et al., 2021). Girls reported larger increases in family conflict than boys (Rogers et al., 2021). A United States survey of 990 youth found gender minority participants had the lowest average scores for family connectedness (Mitchell et al., 2021).

In a study involving 523 Icelandic adolescents, girls (compared to boys) had a higher odds of describing the pandemic as having a positive impact on their family relationships (Halldorsdottir et al., 2021). Compared to boys, girls reported more negative relationship quality with mothers (Campione-Barr et al., 2021), whereas boys reported more familial conflict during the pandemic than girls (Magson et al., 2021). In a study of 4914 Quebec adolescents, gender and sexual diverse adolescents reported greater conflict with their family since the pandemic began compared to their cisgender and heterosexual counterparts (Hébert et al., 2022).

Gender influences not only the frequency of social media use to maintain connections during the pandemic, but also the quality and nature of the connections, and their effects on adolescent mental health and well-being. Among cisgender adolescents, girls tended to spend more time on social media than boys (Bailey et al., 2022; Buzzi et al., 2020; Widnall et al., 2020) (Bailey et al., 2022; Buzzi et al., 2020). This finding was echoed in a sample of Italian adolescents, which found 'being a woman' to be associated

with more time spent on social media and checking social media while performing other activities (Ciacchini et al., 2023). Likewise, in a sample of Icelandic adolescents, girls spent more time than boys communicating over social media with friends (Halldorsdottir et al., 2021). During the pandemic, gender-diverse adolescents used social media more often than cisgender adolescents (Bailey et al., 2022), and cisgender heterosexual girls were more likely than cisgender heterosexual boys to spend more time on social media (Hébert et al., 2022). These results are in line with those reported by Buzzi and colleagues (2020) concerning Italian adolescents, where a smaller percentage of males than females reported more online communication and less in-person communication (62.3% boys, 74.1% girls) during the pandemic.

On social media, there is evidence to suggest gender-diverse adolescents were more likely than cisgender adolescents to provide and seek support (Bailey et al., 2022). Among rural-dwelling sexual and gender minority adolescents in the United States who felt socially isolated during the pandemic, social media was an important source of emotional support, especially on designated LGBTQ+ spaces (Karim et al., 2022). Access to sources of in-person support (such as school-based support and in-person counselling) that LGBTQ+ youth relied on pre-pandemic had been severely limited by public health restrictions (Stehr et al., 2023). Similarly, the pandemic made it difficult, especially for newly out youth, to access support from fellow members of the LGBTQ+ community (Stehr et al., 2023).

With respect to the positive effects of social media use, a study of 523 Icelandic adolescents found girls had a greater odds of reporting using social media as having a positive impact on their mental health than boys (Halldorsdottir et al., 2021). When examining virtual connectedness derived from social media, Jones and colleagues (2022) found no association between sex and being virtually connected to others during the pandemic. However, there is evidence to suggest that social media use had negative impacts on adolescents' mental health and well-being during the pandemic, and that these effects varied across sexes and genders. Increased time engaging with friends over social media during the pandemic was associated with more depressive symptoms among boys in a sample of Icelandic adolescents (Halldorsdottir et al., 2021). Contrary results were

reported in meta-regression conducted by Marciano and colleagues (2022), which found that when studies with a higher percentage of males were included, the positive correlation between time spent on social media and mental ill-being was reduced in strength. One possible reason girls may have been more negatively impacted by social media use than boys may be related to negative online experiences. Girls reported having negative online experiences (i.e., Experiences that evoke feelings such as exclusion or rejection [Kent de Grey et al., as cited in Magis-Weinberg et al., 2021]) more often than boys (Magis-Weinberg et al., 2021). This disparity is especially problematic considering the association between negative online experiences during the pandemic and loneliness (Magis-Weinberg et al., 2021).

Liu and colleagues (2022) examined the role of gender as a moderator in the relationship between aspects of social connectedness and mental health at three points in time: Time 1: an average of 2 years before the California COVID-19 state shutdown, Time 2: approximately eight weeks after the state shutdown, and Time 3: approximately 8.5 months after the state shutdown. This study found that, compared to girls who spent less time on social media, girls with more social media use presented with higher depressive symptoms during the pandemic (Liu et al., 2022). This was true at all time points in the study (Liu et al., 2022). However, this association between social media use and depressive symptoms was not present among boys. Social video game time was also associated with higher depression levels across time for girls, and girls who reported more social video game time had greater acute increases in depressive symptoms (Liu et al., 2022). Like social media use, the association between social video game time and depression was not observed among boys (Liu et al., 2022). Loneliness was associated with more depressive symptoms at all time points in this study, and sex differences observed in levels of depression were attenuated among adolescents with high loneliness (S. R. Liu et al., 2022).

In Canadian adolescents, Ellis and colleagues (2020) found a significant association between social media use during the pandemic and depressive symptoms, and a separate significant association between gender and depressive symptoms, with girls reporting higher depressive symptoms, albeit no interaction was reported between gender and social media use for depressive symptoms.

Gender (Gadassi Polack et al., 2021; Magson et al., 2021; Mitchell et al., 2021) and sex (Espinoza & Hernandez, 2022; S. R. Liu et al., 2022; Peterle et al., 2022) may have also contributed to differential mental ill-health outcomes among adolescents during the pandemic. Compared to cisgender heterosexual males, cisgender heterosexual females reported the pandemic had a greater impact on their mental health (Mitchell et al., 2021). Gender-minority youth perceived significantly greater mental health impacts (Mitchell et al., 2021) and mental health challenges associated with the pandemic (S. R. Scott et al., 2020). In a sample of 886 United Kingdom adolescents, smaller pre-to-during pandemic increase in emotional problems were experienced among boys compared to girls (Hu & Qian, 2021). Females had a higher odds of displaying emotional symptoms than males (Peterle et al., 2022). A study of 4,914 Quebec adolescents revealed cisgender heterosexual boys were less likely to report serious psychological distress levels and gender and sexual diverse adolescents were more likely to report serious psychological distress (Hébert et al., 2022). An Italian study involving 600 high school students found females demonstrated more signs of psychological distress than males during the pandemic (Rega et al., 2022). A Swiss study of 553 adolescents found being a girl was associated with higher depressive and anxiety symptoms at Time 2 (July-to-September of 2021) than being a boy (Foster et al., 2023).

During the pandemic, anxiety symptoms in girls were higher than in boys (Campione-Barr et al., 2021; Magson et al., 2021). Though anxiety symptoms increased during the pandemic for both girls and boys, girls reported greater increases in anxiety symptoms from before the pandemic to during the pandemic (Magson et al., 2021). Likewise, girls reported higher levels of perceived stress during the pandemic (Espinoza & Hernandez, 2022), and higher levels of COVID-19 related stress, relative to boys (Campione-Barr et al., 2021). However, in sample of 1,256 American adolescents, Cingel and colleagues (2022) did not identify any significant interaction between gender and school context in their association with mental health outcomes including anxiety and social anxiety.

During the pandemic, levels of depressive symptoms were generally higher in girls than boys (Campione-Barr et al., 2021; Ellis et al., 2020; Espinoza & Hernandez,

2022; Gadassi Polack et al., 2021; Liu et al., 2022). Though increases in depressive symptoms were observed in adolescents of all genders during the pandemic (Gadassi Polack et al., 2021; Liu et al., 2022), there is evidence to suggest that the magnitude of this increase was more pronounced in girls than in boys (Liu et al., 2022; Magson et al., 2021; Romm et al., 2021). Liu and colleagues (2022) found in a Southern California sample that for females, the increase in depressive symptoms was earlier and more pronounced, whereas for males, a slighter increase was observed in the persistent stage of the pandemic rather than in the acute period immediately following the initial global recognition of the pandemic. Identifying as female has also been associated with greater increases in negative affect with the onset of the pandemic (Romm et al., 2021). Contrary to these findings, Gadassi-Polack and colleagues (2021) observed no gender differences in the increase in depressive symptoms observed in American adolescents during the pandemic.

In a sample of 229 Italian adolescents, girls reported less happiness than boys, and a larger proportion of girls than boys were at risk for developing depressive symptoms and clinical depression (Pepe & Farina, 2023). Similarly, in a sample of 240 Swiss adolescents, being a girl was associated with an elevated odds of feeling sadness compared to boys during the pandemic (Dumont et al., 2022). Likewise, in a sample of clinically and community-recruited Ontario adolescents, females demonstrated greater depression and anxiety than males during the pandemic (Tsujimoto et al., 2022). In a longitudinal study measuring pre-to-during pandemic changes in depressive symptoms, being female was associated with greater depressive symptoms (Marciano, Viswanath, et al., 2022). In a study involving 694 American adolescents, identifying as female, and identifying as a gender other than male or female, was associated with increased odds of reporting negative affect at Time 1 (May 2020) (Bowen et al., 2022). This study also found that after controlling for Time 1 depression and anxiety, identifying as a gender other than male or female was associated with higher depression and anxiety at Time 2 (Bowen et al., 2022).

With regard to mental well-being during the pandemic, boys appeared to have fared better than girls. In a sample of Catalan adolescents, the prevalence of poor overall

mental well-being was higher amongst girls than boys (Folch et al., 2022). Similarly, compared to boys, girls reported a stronger decline in life satisfaction (an aspect of mental well-being) from before the pandemic to during the pandemic (Magson et al., 2021).

2.5.1.3 Race and Ethnicity

Overall, White adolescents tended to fare better than other racial groups with respect to social connectedness during the pandemic (Jones et al., 2022; Rogers et al., 2021). Feeling virtually connected to others was more prevalent among White adolescents compared to Black and Hispanic adolescents (Jones et al., 2022). Black-White biracial adolescents reported the most challenges with mental health, family, social connections, and community (S. R. Scott et al., 2020), and Hispanic/Latinx youth reported experiencing higher levels of loneliness than White youth (Rogers et al., 2021).

Feelings of closeness to persons at school during the pandemic were more prevalent among White students compared to Black, Hispanic, and Asian students (Jones et al., 2022). These feelings were also more prevalent among Hispanic, Asian, Indigenous [USA], and Multi-racial students compared to Black students (Jones et al., 2022). Contrary findings were reported in a sample of 886 United Kingdom adolescents aged 10 to 16 years, where during the pandemic, adolescents belonging to ethnic minority groups reported modestly smaller increases in peer relationship problems in comparison to those belonging to the White ethnic majority group (Hu & Qian, 2021). An aspect of social connectedness in which White adolescents fared worse than other racial groups is in the area of family conflict, where White adolescents reported greater increases in family conflict with the onset of the pandemic than did Latinx adolescents (Rogers et al., 2021). Also, African American adolescents reported experiencing greater family support than White adolescents (Rogers et al., 2021). White adolescents reported greater time spent on social media during the pandemic and were more likely to report moderate-to-severe depressive symptoms (Murata et al., 2020). The prevalence of American secondary school students feeling virtually connected to others during the pandemic was higher among White students, compared to Black and Hispanic students (Jones et al., 2022).

Research focused on racial differences in mental health and well-being outcomes during the pandemic is less clear. In an all-male sample from Ohio, no racial nor ethnic differences were found in perceived worsened mood from before the pandemic onset to after lockdowns had begun (Tetreault et al., 2021). In this same sample, there was no significant association observed between race/ethnicity and increased anxiety once state lockdowns had begun (Tetreault et al., 2021). Similarly, in a sample of clinic and community-recruited Ontario adolescents, Tsujimoto and colleagues (2022) did not observe a significant association between ethnicity and depression nor anxiety. In a sample of 694 American adolescents, race and ethnicity were not associated with depression symptoms, anxiety symptoms, nor negative affect (Bowen et al., 2022). However, adolescents identifying as White or 'Other' reported experiencing more depressive symptoms during the pandemic than did those identifying as Asian American (ethnic background response options were: 'White', 'Asian/Asian American', 'Latinx', 'Black/African American', 'Other') (Espinoza & Hernandez, 2022). Data from 10 United States longitudinal studies has shown that Biracial/multiracial adolescents had a higher likelihood of displaying an increase in depressive symptoms, but Latino/Hispanic adolescents had a higher likelihood of displaying increases in anxiety symptoms in the pre-to-during pandemic period (Barendse et al., 2023). Also relating to change in depressive symptoms, a study of 175 Southern California adolescents collected data at three points in time: Time 1: an average of 2 years before the California COVID-19 state shutdown, Time 2: approximately eight weeks after the state shutdown, and Time 3: approximately 8.5 months after the state shutdown (S. R. Liu et al., 2022). In this study, steeper increases in depressive symptoms at all time points were observed in Black/African American adolescents compared to White, Latinx/Hispanic, and Multiethnic participants (S. R. Liu et al., 2022). However, steeper increases in depressive symptoms between Time 2 and Time 3 of the study were observed among Asian American participants (S. R. Liu et al., 2022).

Relating to well-being, a study of 55 Chicago adolescents, found increases in wellness scores in the pandemic period compared to pre-pandemic among adolescents identifying as Black and Hispanic, and decreases among those identifying as White and Asian (Ezeoke et al., 2022).

When asked what their three biggest challenges were relating to the pandemic: (1) Black/African American and Asian adolescents predominantly identified challenges related to academics and work habits; (2) Black-White adolescents identified challenges related to social connection, family-related challenges, mental health, and adjusting to COVID-19 restrictions; (3) Hispanic/Latinx adolescents identified the most problems related to physical health; (4) Non-White-Multi-Racial-Latinx reported the most challenges pertaining to friends and technology; (5) White-Latinx adolescents had the most challenges related to concern about contracting or being exposed to COVID-19 and changes to their routine; (6) White-Asian adolescents predominantly reported socioeconomic challenges: and finally, (7) White adolescents predominantly reported challenges relating to the future (S. R. Scott et al., 2020).

2.5.1.4 Socioeconomic Status (SES)

Being of a lower socioeconomic status (SES) tended to contribute to poorer social connectedness and mental health and well-being among adolescents during the pandemic (Rogers et al., 2021; Romm et al., 2021; Tetreault et al., 2021). Compared to adolescents from higher-income households, adolescents from low-income households reported greater conflict with parents, and less support from friends (Rogers et al., 2021). In a sample of 443 United Kingdom adolescents, during the pandemic lower income was associated with experiencing more loneliness (Cooper et al., 2021). Additionally in a study of 886 United Kingdom adolescents aged 10 to 16 years, smaller increases in peer relationship problems were observed among adolescents with high earning parents compared to adolescents whose parents fall within the lowest tertile of incomes (Hu & Qian, 2021). Higher SES was associated with more pronounced decreases in negative affect during the pandemic (Romm et al., 2021). In a sample of 240 Swiss adolescents, being in an average-to-poor financial situation was associated with elevated odds of feeling sadness during the pandemic (Dumont et al., 2022). Similarly, among Catalan adolescents, the prevalence of poor overall mental well-being was higher among adolescents from neighbourhoods with a low or medium SES compared to adolescents from neighbourhoods with a high SES (Folch et al., 2022). However, this association between SES and mental health was not observed in all studies. Among Swiss

adolescents, Marciano and colleagues (2022) observed no significant association between subjective SES and pre-to-during pandemic changes in depressive symptoms.

Adolescents reporting a negative financial impact of the pandemic on their family and adolescents reporting a temporary or permanent loss of parental employment during the pandemic had a higher prevalence of overall poor mental well-being (Folch et al., 2022). Similarly, in a sample of 55 Chicago adolescents, those who were the first in their families to attend high school observed significant declines in their wellness in the pandemic period compared to pre-pandemic, where the decline was not significant among those who were not the first in their family to attend high school (Ezeoke et al., 2022). In an all-male sample from urban and Appalachian Ohio, higher SES was associated with an increased risk of perceived worsened mood (Tetreault et al., 2021). There was also a significant association between SES and perceived anxiety, with those of a higher SES having a greater risk of increased anxiety with the onset of the pandemic, compared to unchanged or decreased anxiety (Tetreault et al., 2021). Similarly, in a sample of 215 American adolescents, higher family income was associated with depression, anxiety, and stress (Mousavi et al., 2023). In a sample of clinic and community-recruited Ontario adolescents, Tsujimoto and colleagues (2022) observed greater anxiety symptoms among adolescents from lower-income households. In a study of 407 American adolescents, those from low-income households reported greater increases in negative affect and more pronounced decreases in positive affect with the onset of the pandemic (Rogers et al., 2021). Additionally, those whose mothers had more formal education reported lower depressive symptoms during the pandemic (Rogers et al., 2021).

A study of 128 American adolescents aimed to investigate the moderating role of parental education level on pre-(December to March, 2020) to-during (March to July, 2020) pandemic changes to adolescents' perceived stress and mood (Collier Villaume et al., 2021). This study found pre-to-during pandemic decreases in stress related to school and peers, and significant increases in loneliness were not moderated by parental education level (Collier Villaume et al., 2021). However, the authors found evidence to suggest that compared to adolescents from high education households (i.e. at least one parent with a graduate degree), adolescents from households with low-to-moderate levels

of education fared worse in terms of changes to home/health-related stress and school/social stress (Collier Villaume et al., 2021). With regard to home/health-related stress, adolescents from low-to-moderately educated households had a nearly fourfold increase in this form of stress, and no significant increase was observed among those from highly educated households (Collier Villaume et al., 2021). With respect to the category of mental health-related stress, significant increase in family- and mental health-related stress were present among adolescents from low-to-moderate education households, and no such increases were present among those from highly educated households (Collier Villaume et al., 2021). This study also investigated the role of ethnicity and race in the relationship between parental education and changes to perceived stress and mood (Collier Villaume et al., 2021). The study found perceived school/social stress decreased among White adolescents from high education households, increased for adolescents from low-to-moderate education households, and no change was observed among the other ethnic/racial minority groups, regardless of household education level (Collier Villaume et al., 2021).

2.5.1.5 Geographic Context

Prior to the pandemic, living in a rural community promoted social isolation, due to “lower population densities, long distances to other centres, and lack of transportation and infrastructure that can contribute to isolation” (Kulig, 2012, as cited in Herron et al., 2021, p. 2). However, members of rural communities “develop and rely on a network of family, friends, and neighbours for support to a greater extent than their urban counterparts” (Keating et al., 2011, as cited in Herron et al., 2021, p. 2). On the other hand, urban environments typically contribute to social well-being by enabling social interaction and the formation of social connections ([Mouratidis, 2018, Small and Adler, 2019, Williams and Hipp, 2019], as cited in Mouratidis, 2021). However, during the pandemic, the role the urban environment in promoting social connectedness was disrupted (Mouratidis, 2021). The closure of “third spaces” (e.g., cafes, stores, restaurants, libraries, and cultural spaces) so prevalent in urban areas left open spaces such as public parks and pedestrian zones as the only remaining safe environment for socially distant in-person interaction for urban-based adolescents (Mouratidis, 2021). It

therefore stands to reason that urban adolescents would come to rely upon online means for staying socially connected and supporting their mental health and well-being during this time. Furthermore, rural-dwellers more commonly experienced internet access and connectivity issues (Jabakhanji, 2020, as cited in Whitley et al., 2021), and slow internet speed (CRTC, 2020, as cited in Whitley et al., 2021), which may interfere with their ability to derive a strong enough sense of online social connectedness to have an effect on their mental health and well-being.

Evidence from Canada and similar countries suggest urban and rural-dwelling adolescents had different experiences of social connectedness and mental health and well-being during the pandemic. Though other geographical factors, such as restrictions limiting access to “third spaces” and greenspaces may play a role in mental health and well-being during the pandemic (Mouratidis, 2021), this review narrows its focuses on the different mental health and well-being, as well as social connectedness outcomes among urban and rural-dwelling adolescents. Urban-dwelling US adolescents reported greater increases in time spent with family during the pandemic compared to rural-dwelling adolescents (Rogers et al., 2021). A British Columbia study comparing students from a rural and an urban secondary school found that attending the urban school increased the likelihood of reporting feeling socially disconnected (Parent et al., 2021). Disadvantage for urban adolescents was also seen in their mental health and well-being. A latent class analysis involving 619 Ontario youth between the ages of 14 and 28 years found that the latent class reporting the lowest degree of mood symptoms (e.g., enjoyment, sadness, irritability, and concentration issues, etc.) also had more participants residing in rural areas or small cities than large cities or suburbs (Hawke et al., 2021). Likewise, the latent class reporting the highest degree of mood symptoms also had more participants living in large cities or suburbs (Hawke et al., 2021). A study of 407 American adolescents reported that urban-dwelling adolescents perceived a more pronounced decline in positive affect during the (Rogers et al., 2021) pandemic as well as an increase in time spent with family that was greater for adolescents residing in urban areas compared to those residing in rural areas (Rogers et al., 2021). Conversely, in an all-male study comparing urban and Appalachian Ohio adolescents, the risk of experiencing an increase in anxiety symptoms with the onset of the pandemic was

marginally lower for urban-dwelling adolescents (Tetreault et al., 2021). Among Catalan adolescents, there was no difference in likelihood for reporting poorer overall mental well-being among urban compared to rural-dwelling adolescents (Folch et al., 2022).

2.6 Gaps in the Existing Literature

Although the literature on social connectedness and mental health and well-being of adolescents during the pandemic is vast, there are several notable gaps in the evidence base. Several studies reported issues of data sparsity for some sociodemographic groups (Bailey et al., 2022; Hertz et al., 2022; Jones et al., 2022; Klootwijk et al., 2021; Mitchell et al., 2021; Murata et al., 2020; Shah et al., 2021; Shek et al., 2021; Theberath et al., 2022; Wang et al., 2021). This is especially relevant to those studies that aimed to assess differences according to SDoH because for underrepresented groups, small cell sizes precluded useful comparisons. This is particularly problematic as it limited the amount of studies available to examine the moderating role of SDoH in the relationship between various aspects of social connectedness and mental health. The research presented in this thesis aims to address this gap through an exploratory analysis of the moderating role of several SDoH in the relationship between social connectedness and adolescent mental health and well-being.

A majority of previous studies regarding the effects of social media on adolescent mental health and well-being during the pandemic has focused on frequency or type of social media use, with little examination of the sense of social connectedness derived from social media. As was identified by Grieve and colleagues (2013), online (Facebook) social connectedness is separate construct from offline social connectedness, with different effects on mental health and well-being, and the effects of social media on mental health and well-being may vary according to the manner of use (Verduyn et al., 2017). Therefore, there is a gap in the literature for a study specifying the effects of *social connectedness derived from social media*.

Limited evidence is available to quantitatively compare the different effects of online and offline social connectedness in adolescents during the pandemic. This was studied using qualitative approaches, which found online connections during the

pandemic to be an inadequate surrogate for missed in-person connections (Rogers et al., 2021), and in Italian adults, which found online connections only protected mental well-being at the most restrictive stages of the pandemic, where offline connections were the most limited (Marinucci et al., 2022). However, quantitative analyses among adolescents comparing the effects of these two forms of social connectedness is lacking.

This will also be the only study, to our knowledge, to examine the relationship between social connectedness and adolescent mental health and well-being through a dual-factor framework. The existing literature has largely examined this relationship through a *psychiatric* or *dichotomous* lens, emphasizing negative mental health outcomes with less interest in positive mental health or mental well-being. As a consequence of social connectedness being tied to both protecting against mental ill health (Wickramaratne et al., 2022) and promoting mental well-being (Jose et al., 2012), the integration of both of these constructs under the well-supported dual-factor model is necessary to fully understand and compare the effects of online and offline social connectedness.

Finally, the majority of studies have examined the effect of social connectedness on mental health and well-being of adolescents during the more acute stages of the pandemic, despite concerns in the scientific community about the potential for the pandemic to have lasting effects (Solmi et al., 2022). Restrictions at the later stages of the pandemic may have been more lax, but that does not mean that adolescents were not still feeling the effects of the more restrictive period on their relationships, mental health and well-being. In United Kingdom adolescents, a study found that even as restrictions had begun to ease, some felt lonely even in the presence of peers, as social distancing restrictions got in the way of feeling physically close with others (McKinlay et al., 2022). There is therefore a need for studies examining the relationship between social connectedness and mental health and well-being at the late stages of the pandemic.

In conclusion, there is need for a study set in the late stages of the COVID-19 pandemic that examines the potential moderating effects of SDoH in the relationship between social connectedness and the mental health and well-being of Canadian

adolescents, as well as a study that quantitatively compares the effects of online versus offline social connectedness in this population at the late stages of the pandemic.

Chapter 3

3 Methods

This chapter introduces the research approach, measures, and data analyses used in this thesis. This chapter also includes a description of how missing data were handled, and a rationale for the sensitivity analyses used.

3.1 Research Approach

This study broadly aimed to understand the role of social connectedness in adolescent mental health and well-being during the late stages of the COVID-19 pandemic. A convergent parallel mixed methods design was selected as the approach best to achieve this objective. In this design, qualitative and quantitative data are collected simultaneously, analyzed separately, and the results of the analyses are integrated in the interpretation and discussion (Creswell, 2014). The quantitative analysis, based on responses to closed-ended survey questions, provides insight into the effects of social connectedness on mental health and well-being of Canadian adolescents at the late stages of the COVID-19 pandemic, contrasting the effects of online and offline social connectedness, and exploring how these effects may differ according to the SDoH. The qualitative analysis, based on responses to open-ended survey questions, further characterizes the experiences of social connection and mental health and well-being of respondents, with an emphasis on pandemic-related changes to these experiences, and allows for greater depth of analysis of the comparison between online and offline modes of social connection.

3.2 Sample and Procedure

The present study uses online survey data from the QuaranTEENing project, a national longitudinal study which aims to investigate how the health-related behaviours of Canadian adolescents were impacted by the COVID-19 pandemic, and the coping strategies adolescents used to deal with these changes. The larger QuaranTEENing project incorporates a series of both online surveys and focus groups, however the present study uses data solely collected from the online survey. The survey was developed by a

multi-disciplinary team of researchers experienced in the fields of health sciences, geography, and epidemiology and biostatistics. The survey was then pilot-tested for comprehensibility, usability, and technical functionality by members of the Human Environments Analysis Laboratory Youth Advisory Council (HEALYAC). Study approval was obtained from the Western University Non-Medical Research Ethics Board (#120297). The present study was reported according to the Checklist for Reporting Results of Internet E-Surveys (Eysenbach, 2004). The completed checklist can be found in Appendix A.

Participants were recruited by the market research company, Leger. The Leger Opinion panel consists of approximately 400,000 Canadians (Leger Opinion, 2022). Participants were primarily sourced from the Leger Opinion panel but were supplemented by a partner panel to increase the reach of the survey. Panelists were asked if they had a child/children between 13 and 18 years of age who were available to complete the survey. Additional eligibility criteria included being in high school and living in Canada. The age range was chosen as the latter two waves of the Quaranteening survey would be administered in the subsequent academic year, and participants would need to be secondary school students across all waves of the survey. The present study reports on data from the Time 1 survey of the Quaranteening project, collected between June 21 and July 7 of 2022. Invitations to participate were sent to 19,200 panelists, with 4,989 accessing the survey. In total, 3,695 responses were received from 3,680 unique participants. The survey was administered using Qualtrics software (Qualtrics, Provo, UT) and was offered in both English and French. Participation in the survey was remunerated by the panel companies in the form of points, which may be redeemed for monetary rewards.

3.2.1 Data Cleaning Procedure

To increase the quality of the data, a quality assessment of open-ended responses was conducted in a method similar to that used by Arevalo and colleagues (2022). Two members of the research team independently assessed the responses to all open-ended questions, flagging unintelligible responses, responses that did not make sense within the context of the question being asked, and patterns of repeated responses to open-ended

questions. Participants who progressed to the end of the survey, but left large sections of the questionnaire blank were also flagged as a part of this process. The two team members came to a consensus on which participants should be excluded according to these criteria, and this list was reviewed by an additional two members of the research team. In a further effort to ensure data quality, respondents were also flagged where there was an indication of satisficing by participants with consecutive identical responses (i.e., “straight-lining”) and potential duplicate responses (based on IP address). These responses that were flagged for quality concerns were excluded from the sample in a sensitivity analysis (described in Section 3.4.3).

3.3 Measures

3.3.1 Mental Health and Well-Being

3.3.1.1 Psychological Distress

Psychological distress was measured using the six-item *Kessler Psychological Distress Scale* (K6) (Kessler et al., 2002). The K6 has previously been validated in Canadian adolescents aged 15 to 19 years from the Canadian Community Health Survey–Mental Health ($n = 2010$) (Ferro, 2019). Respondents were asked how often they felt: “Nervous”, “Hopeless”, “Restless or fidgety”, “So depressed (sad) nothing could cheer [them] up”, “[That] everything is an effort”, and “Worthless”. Items were scored on a five-point Likert scale, as follows: 0 = “None of the time”; 1 = “A little of the time”; 2 = “Some of the time”; 3 = “Most of the time”; 4 = “All of the time”. Possible summed scores range from zero to 24, with higher scores corresponding to greater levels of psychological distress (Kessler et al., 2002). Scores greater than or equal to 13 suggest probable mental illness (Kessler et al., 2003). In the initial validation of the K6 as a screening tool for mental illness in the United States general population, this cut point was identified as the point on the scale that equalizes false positive and false negative results in the sample (Kessler et al., 2003). In the initial validation, the K6 identified participants with a mental illness with 36% sensitivity ($SE = 0.36$), 96% specificity ($SE = 0.02$), and a total classification accuracy of 92% ($SE = 0.02$) (Kessler et al., 2003). In the present study, the K6 demonstrated high levels of internal consistency ($\alpha = 0.92$).

3.3.1.2 Mental Well-Being

Mental well-being was measured using the *Short Warwick Edinburgh Mental Wellbeing Scale* (SWEMWBS), a seven-item scale encompassing both *hedonic* and *eudaimonic* aspects of mental well-being (Stewart-Brown et al., 2009). The SWEMWBS has previously been validated for the measurement of mental well-being among adolescents (Melendez-Torres et al., 2019). Participants were asked to select the option that best describes their current thoughts and feelings relating to the following statements: *"I've been feeling optimistic about the future"*, *"I've been feeling useful"*, *"I've been feeling relaxed"*, *"I've been dealing with problems well"*, *"I've been thinking clearly"*, *"I've been feeling close to other people"*, and *"I've been able to make up my own mind"*. These items were scored on a five-point Likert scale, with the following response options: 1 = *"None of the time"*; 2 = *"Rarely"*; 3 = *"Some of the time"*; 4 = *"Often"*; and 5 = *"All of the time"*. Raw scores were calculated as the sum of scores for all items. These raw scores were then transformed using the conversion table provided by Stewart-Brown and colleagues (2009). Possible scores for the SWEMWBS range from 7 to 35, with higher scores reflecting a higher level of mental well-being (Stewart-Brown et al., 2009). SWEMWBS scores were divided into average-to-high and low mental well-being by establishing a cut-point at the mean score minus one standard deviation (Ng Fat et al., 2017). In the current study, the mean score was 23.1 (SD = 4.9) and the cut point was set at: low mental well-being (<18.2), average to high mental well-being (\geq 18.2). In the present sample, the SWEMWBS demonstrated a high level of internal consistency ($\alpha = 0.92$).

3.3.1.3 dual-factor Mental Health Group Classification

Participants were classified into dual-factor Mental Health groups in line with the criteria described by Suldo and Shaffer (Suldo & Shaffer, 2008). Table 3.1 is a visual schematic for the assignment of participants into the four dual-factor Mental Health groups according to their scores on the K6 and SWEMWBS. The categories were labelled such that higher-ordered categories (i.e., IV. complete mental health) represented a more favourable mental health status, and lower-ordered categories (i.e., I. troubled) represented a poorer mental health status.

Table 3.1 Visual Schematic for the Assignment of Participants to a Dual-Factor Mental Health Groups. Adapted from Suldo & Shaffer (2008)

Level of Psychopathology	Level of Subjective Well-Being	
	Low	Average-to-High
Low (probable absence of mental illness)	III. Vulnerable <ul style="list-style-type: none"> • K6 score < 13 • SWEMWBS score < 18.16 	IV. Complete mental health <ul style="list-style-type: none"> • K6 score < 13 • SWEMWBS score \geq18.16
High (probable presence of mental illness)	I. Troubled <ul style="list-style-type: none"> • K6 score \geq 13 • SWEMWBS score < 18.16 	II. Symptomatic but content <ul style="list-style-type: none"> • K6 score \geq 13 • SWEMWBS score \geq 18.16

Note. K6 = Kessler psychological distress scale (6-item); SWEMWBS = Short Warwick Edinburgh Mental Well-Being Scale.

3.3.2 Social Connectedness

3.3.2.1 Online Social Connectedness

Online social connectedness was measured using a nine-item adaptation of the Social Connectedness Scale-Revised (SCS-R; R. M. Lee et al., 2001). The scale was adapted to (a) disentangle social connectedness in the online versus offline setting, and (b) make the scale shorter (reduced from 20 items) in order to keep the total number of items on the final survey to a feasible length. The full version of the scale has been previously validated in a sample of college students, demonstrating a high degree of internal consistency ($\alpha = 0.92$; R. M. Lee et al., 2001). Four of the nine items were positively worded (e.g., “*I am able to connect with other people through social media*”), and five of the nine items were negatively worded (e.g., “*Even among my social media friends/followers, there is no sense of closeness*”). The positively worded items were scored on a six-point Likert scale, ranging from 1 = “*Strongly disagree*” to 6 = “*Strongly agree*”. The negatively worded items were reverse-coded, ranging from: 1 = “*Strongly agree*” to 6 = “*Strongly disagree*”. The full list of items used, as well as their response options and associated item scores, may be found in Appendix B. Item mean scores were calculated for each participant. In line with the cut-points set by Lee and colleagues (2001), item mean scores greater than or equal to 3.5 were defined as “Socially connected”, and item mean scores less than 3.5 were defined as “Socially disconnected”.

In the present study, this scale demonstrated high levels of internal consistency ($\alpha = 0.81$).

3.3.2.2 Offline Social Connectedness

The items used to measure offline social connectedness corresponded to those used to measure online social connectedness, with phrasing of the items reflecting the offline setting rather than online. Like the online social connectedness scale, the offline social connectedness scale included nine items and was comprised of four positively worded (e.g., *"I am able to connect with other people"*) and five negatively worded items (e.g., *"Even among my friends, there is no sense of closeness"*). The positively worded items were scored on a six-point Likert scale, ranging from 1 = *"Strongly disagree"* to 6 = *"Strongly agree"*. The negatively worded items were reverse-coded, ranging from 1 = *"Strongly agree"* to 6 = *"Strongly disagree"*. The full list of items used, as well as their responses options and associated item scores, may be found in Appendix C. Like the online social connectedness scale, item mean scores were collected for each participant, and, in line with the cut-points set by Lee and colleagues (2001), item mean scores ≥ 3.5 were defined as "Socially connected", and item mean scores < 3.5 were defined as "Socially disconnected". In the present study, this scale demonstrated high levels of internal consistency ($\alpha = 0.89$).

3.3.3 The Social Determinants of Health (SDoH)

3.3.3.1 Age

The age of respondents was obtained by asking the question: *"What is your current age (in years)?"* The response options to this question were "13", "14", "15", "16", "17", or "18". For the analysis, these responses were collapsed into the following categories, and treated as a categorical variable: "13-to-14 years" (reference category), "15-to-16 years", and "17-to-18 years". This collapsed variable allowed for sufficient cell sizes for the analysis stratified by age to converge and represent developmentally similar ages.

3.3.3.2 Gender

A two-step approach was applied to avoid the potential misclassification of gender-diverse adolescents who do not self-identify as “transgender” (Scout & Gates, 2014). Adolescents were first asked to identify their sex assigned at birth from the following options: “*Male*”, “*Female*”, “*Intersex*”, and “*I prefer not to answer*”. Adolescents who selected “*I prefer not to answer*” were set to missing for sex. Participants were then asked to select their gender from the following list of options: “*Boy/Man*”, “*Girl/Woman*”, “*Non-binary/Genderfluid*”, “*Trans boy/Trans man*”, “*Trans girl/Trans woman*”, “*Two-Spirit*”, “*I don't identify with any options provided (please specify)*”, and “*I prefer not to answer*”. Those who responded, “*I prefer not to answer*” and those who left no response for gender were classified as missing gender. Two adolescents responded, “*I don't identify with any options provided (please specify)*” and were re-coded into the appropriate classification according to their text responses. No participants selected “*Two-Spirit*”. In line with recommendations set out by the Williams Institute’s Gender Identity in U.S. Surveillance (GenIUSS) group (Scout & Gates, 2014), sex and gender were cross-classified in the method presented in Table 3.2, creating a new nominal variable for gender with the categories: cisgender boy/man, cisgender girl/woman, non-binary/genderfluid, transgender boy/man, and transgender girl/woman. Adolescents identifying as “*Girl/Woman*” who did not provide a sex were classified as “cisgender girl” and adolescents identifying as “*Boy/Man*” who did not provide a sex were classified as “cisgender boy”. One adolescent, who identified their sex assigned at birth as “*Intersex*” selected “*Trans girl/Woman*” so their gender identity remained classified as a “transgender girl/woman” under the new classification scheme.

Table 3.2 Visual Schematic of the Two-Step Cross-Classification Method for Gender in Line with Recommendations from the Williams Institute’s Gender Identity in U.S. Surveillance (GenIUSS) Group. Adapted from Scout & Gates (2014)

Participant-Provided Gender	Participant-Provided Sex Assigned at Birth	
	Male	Female
Boy/Man	Cisgender Boy/Man	Transgender Boy/Man
Girl/Woman	Transgender Girl/Woman	Cisgender Girl/Woman
Non-Binary/Genderfluid	Non-Binary/Genderfluid	Non-Binary/Genderfluid
Trans Boy/Man	Transgender Boy/Man ^a	Transgender Boy/Man
Trans Girl/Woman	Transgender Girl/Woman	Transgender Girl/Woman ^a
<p>Note: ^a Due to the common confusion between sex assigned at birth and gender identity, adolescents who identified as a “<i>Trans boy/Man</i>” with a sex of “<i>Male</i>” and adolescents who identified as a “<i>Trans girl/Woman</i>” with a sex of “<i>Female</i>” were classified as “Transgender Boy/Man” and “Transgender Girl/Woman”, respectively.</p>		

Due to a low frequency of transgender and non-binary adolescents, the gender categories from the two-step approach were collapsed into three categories: “cisgender boy/man” (reference category), “cisgender girl/woman”, and “gender-diverse” (encompasses transgender and non-binary/genderfluid respondents).

3.3.3.3 Ethno-Racial Group

Adolescents were asked to select all ethno-racial groups that apply to them from the following list of options: “*Black (e.g., African, Afro-Caribbean, African Canadian, etc.)*”, “*East Asian (e.g., Chinese, Japanese, Korean, etc.)*”, “*Indigenous (e.g., First Nations, Métis, or Inuit, etc.)*”, “*Latin American (e.g., Mexican, Colombian, Peruvian, etc.)*”, “*South Asian (e.g., East Indian, Pakistani, Sri Lankan, etc.)*”, “*South East Asian (e.g., Filipino, Vietnamese, Cambodian, etc.)*”, “*West Asian or Middle Eastern (e.g., Egyptian, Iranian, Lebanese, Israeli, etc.)*”, “*White (e.g., European ancestry, etc.)*”, and “*If you self-identify further, please specify*”. Participants who selected more than one option (not including “*If you self-identify further, please specify*”) for ethno-racial group were classified as “multi-racial”. Due to data sparsity, collapsed categories were created as illustrated in Table 3.3. Where a text response was provided for those who selected, “*If you self-identify further, please specify*”, participants were classified into the appropriate

collapsed category. If the response was ambiguous, and no other ethno-racial groups were selected, ethno-racial group was set to missing.

Table 3.3 Visual Schematic for the Creation of Collapsed Ethno-Racial Group

Categories

Survey Response Options	Collapsed Ethno-Racial Group Category
Black (e.g., African, Afro-Caribbean, African Canadian, etc.)	Black
South Asian (e.g., East Indian, Pakistani, Sri Lankan, etc.)	South Asian
East Asian (e.g., Chinese, Japanese, Korean, etc.)	East or South East Asian
South East Asian (e.g., Filipino, Vietnamese, Cambodian, etc.)	
White (e.g., European ancestry, etc.)	White
More than one ethno-racial group selected	Multi-racial or Other
Indigenous (e.g., First Nations, Métis, or Inuit, etc.)	
Latin American (e.g., Mexican, Colombian, Peruvian, etc.)	

3.3.3.4 Parent/Guardian Education Level

Adolescents answered the following survey question for up to four of their parents/guardians: *“Please select the highest level of education that parent/guardian [1 to 4] has achieved”*. The response options for this question were as follows: *“Elementary school diploma”, “High school diploma”, “Apprenticeship, or Trade Certificate”, “College Diploma”, “University Degree”, “Postgraduate Degree (e.g., MA, PhD, MD)”, “None of the above”, and “I don't know”*. For parents/guardians which *“None of the above”* or *“I don't know”* were selected, their education level was set to missing. Due to low frequency counts, the education levels were collapsed to the following categories and ranked for each parent/guardian: 1 = “elementary or high school diploma”, 2 = “college diploma, apprenticeship, or trade certificate”, 3 = “university degree”, and 4 = “postgraduate degree”. The highest level of education recorded among all parents/guardians per participant was used in the analyses.

3.3.3.5 Parent/Guardian Employment Status

Adolescents answered the following survey question for up to four of their parents/guardians: *“Please select the employment status of parent/guardian [1 to 4]”*. The response options to these questions were as follows: *“Employed full-time”,*

“Employed part-time”, “Self-employed”, “Unemployed”, and “Other (please specify)”. Based on text responses from those that selected “Other (please specify)”, four additional categories were created: stay-at-home parent, student, retired, and disability. The categories were then collapsed into the following grouping, ranked, and assigned to each parent/guardian: 1 = “employed full-time or self-employed”, 0 = “less than full-time employment” (includes employed part time, unemployed, stay-at-home parent, student, retired, and disability). The highest level of employment recorded among all parents/guardians per participant was used in the analyses.

3.3.3.6 Community Type

To identify the community type in which participants reside, home postal codes provided by survey participants were linked to the Statistics Canada Postal Code Conversion File Plus (PCCF+) Version 7E – November 21 Postal Codes^{OM} (Statistics Canada, 2021). The variable “Community Size Classification (CSize)” was used. This variable is defined in line with the 2016 census population in each Census Metropolitan Area (CMA) or Census Agglomeration (CA) (Statistics Canada, 2021). Urban areas with a population of less than 10,000, plus rural areas are defined by Statistics Canada as “rural and small town Canada” (2021). Definitions for each community size can be found in Table 3.4. Due to small frequencies, a binary variable was created in which 0 = “urban” (reference category), and 1 = “rural”.

Table 3.4 Community Size Definitions and Corresponding Collapsed Category.

Adapted from Statistics Canada (2021)

Community size category	Coverage area	Population	Community Type Collapsed category
1	Toronto, Montreal and Vancouver CMAs	1,500,000 +	Urban
2	Ottawa-Gatineau, Edmonton, Calgary, Québec, Winnipeg, and Hamilton CMAs	500,000 to 1,499,999	
3	All 18 other CMAs and the seven largest CAs	100,000 to 499,999	
4	All 106 of the smaller CAs	10,000 to 99,999	

5	Places not included in a CMA or CA (i.e., urban area population of less than 10,000, plus rural areas). Statistics Canada definition of “rural and small town Canada”	<10,000	Rural
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For participants who provided a postal code that did not match the PCCF+, a manual search was conducted using Google Maps (Google, 2023) to assign them to an urban or rural categorization. For participants who did not provide a valid postal code, the same procedure was conducted using their school postal code in place of their home postal code. School postal codes were obtained by conducting a manual internet search for the school name provided by participants.

3.3.4 Covariates

3.3.4.1 Mode of School Instruction

To control for mode of school instruction as a confounding variable in the analyses, responses to the survey question, “*How are you currently attending school?*” were analysed. Response options were as follows: “*In-person learning at school*”, “*Mixed learning (a combination of in-person and remote)*”, “*Remote learning (e.g., online at home)*”, and “*Other (please specify)*”. For respondents who selected “*Other (please specify)*” text responses were analysed to assign the respondent to the appropriate category. Respondents who indicated they participate in homeschooling (n = X) were analysed in the same category as adolescents engaged in remote learning. Due to the timing of the survey, some respondents indicated that they were on summer holidays from school, and the mode of instruction for such respondents was set to missing (n = X). The final list of categories for this variable was as follows: In-person (reference group); hybrid (mixed learning); and remote.

3.3.4.2 Number of Siblings

To control for whether the participant lived with any siblings, the following survey question was analyzed: “*How many siblings or step-siblings do you currently live with?*”. The following response options were provided: “*I am an only child*”, “*My siblings don't live with me*”, “1”, “2”, “3”, “4”, and “5+”. Responses were collapsed

into a binary variable with the following levels: “lives with at least one sibling” (reference group) and “only child or does not live with sibling(s)”.

3.3.5 Open-Ended Survey Questions

The qualitative analysis was based on responses to two open-ended survey questions: one asking about pandemic-related changes to relationships, and another asking about pandemic-related changes to mental health and well-being. The question about changes to relationships was worded as follows: *“In what ways has the COVID-19 pandemic changed your relationship with friends and family?”*, and was preceded by the following skip logic question: *“Has your relationship with your friends and family been affected by the COVID-19 pandemic?”* Response options to the skip logic question were as follows: *“No change”*, *“Some positive changes”*, *“Some negative changes”*, and *“Both positive and negative changes”*. Participants who selected *“No change”* were re-directed away from the open-ended question and toward the next question of the survey, and the other participants were directed to the open-ended question.

The open-ended question to examine pandemic-related changes to mental health and well-being read as follows: *“In what ways has the COVID-19 pandemic changed your mental health and well-being?”* This was preceded by a skip logic question in the same vein as the social connectedness question, where participants were asked: *“Has your mental health and well-being been affected by the COVID-19 pandemic?”* Response options were *“No change”*, *“Some positive changes”*, *“Some negative changes”*, and *“Both positive and negative changes”*, where those selecting *“No change”* were re-directed away from the open-ended question and toward the next survey question.

3.4 Quantitative Analyses

3.4.1 Statistical Analysis

For the main analyses, we calculated unadjusted estimates of the association between dual-factor mental health with each of the SDoH and social connectedness variables using simple ordinal logistic regression – specifically using proportional odds (also known as cumulative logit) models (Harrell, 2015). The following partially adjusted

analyses were then performed: (1) Adjusted for the SDoH; (2) Adjusted for other covariates (namely mode of school instruction and number of siblings); (3) Adjusted for online social connectedness; (4) Adjusted for offline social connectedness; and (5) Adjusted for both online and offline social connectedness. A fully adjusted analysis was then performed, where all SDoH, social connectedness variables, and other covariates were entered into the model.

An exploratory stratified analysis was then done to assess whether the SDoH served as effect modifiers (moderators) in the relationship between social connectedness and dual-factor mental health group membership. Both unadjusted and adjusted analyses were performed, obtaining stratified odds ratios for (A) the association between online social connectedness and dual-factor mental health group membership; and (B) the association between offline social connectedness and dual-factor mental health group membership. The adjusted stratified models included both online and offline social connectedness as independent variables. To test the significance of the moderation effect, we used the joint test of an interaction term between the SDoH variables and social connectedness variable.

The dependent variable in all models was dual-factor mental health group membership, ordered as follows: (1) troubled; (2) symptomatic but content; (3) vulnerable; and (4) complete mental health. Results are presented as odds ratios (OR) cumulated over the lower-ordered values of dual-factor mental health group, with their corresponding 95% confidence intervals (95% CIs). All statistical analyses were performed using SAS version 9.4 (SAS Institute Inc., Cary, NC). The LOGISTIC procedure was used to estimate odds ratios for the ordinal logistic regression models (SAS Institute Inc., Cary, NC).

An important assumption of ordinal logistic regression (cumulative logit) models is the proportional odds assumption. The proportional odds assumption asserts that the odds ratio of being below any cut-point is the same across all cut points (X. Liu, 2009). For instance, when the dependent variable is dual-factor mental health group membership, the odds of belonging to the vulnerable, symptomatic but content, or

troubled groups compared to complete mental health is equal to the odds of belonging to the symptomatic but content or troubled groups compared to complete mental health or vulnerable groups, and so on. The cumulative logit model is then able to provide a single odds ratio per parameter, representing the odds of belonging to one of the lower ordered categories of dual-factor mental health. The equation below (1) illustrates the proportional odds assumption in the context of dual-factor mental health group membership.

$$\begin{aligned}
 & OR_{(vulnerable\ or\ symptomatic\ but\ content\ or\ troubled)\ vs.\ complete\ mental\ health} \\
 = & OR_{(symptomatic\ but\ content\ or\ troubled)\ vs.\ (complete\ mental\ health\ or\ vulnerable)} \\
 = & OR_{troubled\ vs.\ (complete\ mental\ health\ or\ vulnerable\ or\ symptomatic\ but\ content)}
 \end{aligned}
 \tag{1}$$

The Score Test for the proportional odds assumption provided by the LOGISTIC procedure for each model was used to test the proportional odds assumption. The Score Test for the proportional odds assumption tends to falsely suggest that the assumption is violated ($p < 0.05$) when the assumption holds (Derr, 2013). Therefore, it is expected that a non-significant result on the Score Test can reliably indicate that the assumption is not violated, but a significant test requires further investigation (i.e., graphically) to determine if the assumption is violated (Derr, 2013). The proportional odds assumption was met for all models (non-significant Score Test p -values) unless otherwise indicated. Graphical assessment (not shown) was used to confirm the violation of this assumption (Kelly, 2017). In all instances where the assumption was violated according to the Score Test, graphical assessment confirmed the violation of the assumption, except for the unadjusted model for age, where the Score Test yielded only marginally significant results ($p = 0.04$), and graphical assessment revealed only a minor violation of the assumption. However, given that these violations only occurred in two instances in the exploratory stratified analysis, the ordinal logistic regression approach was still used.

3.4.2 Missing Data

All variables of interest had some degree of missing data, with the proportion of missingness by variable ranging from 0.2% to 2.4%, and 141 (9.0%) of participants missing data for at least one study variable. Data may be missing according to one of three mechanisms: (1) missing completely at random (MCAR); (2) missing at random (MAR); or (3) missing not at random (MNAR) (Austin et al., 2021). Under MCAR, the probability of a subject missing information on a variable does not depend on any observed or unobserved variables (Austin et al., 2021). In such instances, the complete case analysis would be a representative subsample of the full sample, and is not biased (Austin et al., 2021). However, if data is MAR or MNAR, the complete case analysis would result in an exclusion of a substantial portion of the sample missing on at least one study variable and a subsequent loss of power and precision, and could also yield biased estimates (Y. Liu & De, 2015). Under MAR, the probability of missingness depends only on observed variables. Under MNAR, the probability of missingness is dependent on the missing variable itself (Y. Liu & De, 2015). Multiple imputation by fully conditional specification was used to deal with missing values. This method was desirable as it is flexible in the ability to select an appropriate regression method to impute each variable (Y. Liu & De, 2015). The fully conditional specification method assumes that data are at least MAR (Y. Liu & De, 2015). It is not possible to test whether data are MNAR (Austin et al., 2021) which, if true, would violate the assumptions required for the full conditional specification method.

Because missingness on even a single item from the online or offline social connectedness scale would result in the participant being considered “incomplete” on either measure, we imputed online and offline social connectedness at the item-level rather than at the scale score-level. We then calculated scale scores and applied cut points based on the imputed data. Imputing on the item-level rather than the scale level has the added benefit of improvements in scale-level statistical power (Gottschall et al., 2012).

Imputation models should be compatible with the analysis model, accounting for interaction. Failure to account for interaction would result in interaction estimates in the analysis model being biased towards the null (Austin et al., 2021). Typical approaches to

account for interactions include the “transform-then-impute” approach, where a variable is created for the interaction between two independent variables, and this new variable is imputed (von Hippel, 2009). Another approach is the “stratify-then-impute” approach, where imputation is performed after stratification by one of the variables involved in the interaction (von Hippel, 2009). The “transform-then-impute” approach was not possible in this instance, as the interaction term would necessitate imputation of the social connectedness scales on the scale-level rather than the item-level. The “stratify-then-impute” approach was also not possible, as it would require no missingness on at least one variable involved in the interaction (von Hippel, 2009). With both of these approaches unavailable, and acknowledging that the exploratory stratified analysis was otherwise underpowered to test for interaction effects, the decision was made to not account for interaction effects in the imputation model. Instead, the results using imputed data were compared to a complete case sensitivity analysis, in part to assess whether this limitation biased the moderating effects of the SDoH towards the null.

The fully conditional specification method in PROC MI (SAS Institute Inc., 2020) was used to generate 30 complete datasets. While 2- to- 10 imputations are typically viewed as sufficient, a greater number of imputations results in more replicable standard error estimates (von Hippel, 2018). Some have suggested that the number of imputations should be at least as large as the percentage of cases with any missing data (Austin et al., 2021), and 30 imputed datasets are well above this threshold in the present study. Table 3.5 displays the independent variables that were imputed, the number and percent of cases missing those variables, and the method by which those variables were imputed. The discriminant function was used for nominal variables and the logistic function was used for binary and ordinal variables (Y. Liu & De, 2015).

Maximum likelihood estimates were unable to be obtained for the community type variable due to perfect prediction. To address this, we used the LIKELIHOOD=AUGMENT suboption which requests maximum likelihood estimates to be made based on augmented data (SAS Institute Inc., 2015). This procedure, suggested by White, Daniel, and Royston (2010), augments the dataset with a small number of extra observations to avert perfect prediction. The mental well-being and psychological distress

scores were used as covariates for the imputation of the SDoH, social connectedness variables, mode of school instruction, and number of siblings, as failure to do so would result in bias of estimates in the analysis model towards the null (Austin et al., 2021). However, the mental well-being and psychological distress scores were not imputed, as participants missing data on the scales used to create the dual-factor mental health group categorizations were excluded from the analyses. The analyses were performed on the imputed data, and estimates from the imputed dataset were pooled implementing Rubin's combination rules using the MIANALYZE procedure (Ratitch et al., 2013; SAS Institute Inc., Cary, NC). Wald χ^2 joint tests for the interactions between SDoH and social connectedness variables were pooled using the COMBCHI macro (Allison, 2007).

Table 3.5 Imputed Variables and Method of Imputation

Variable	n missing	%	Method of Imputation
Age group	3	0.2	Ordinal logistic regression
Gender	7	0.5	Discriminant function
Ethno-racial group	5	0.3	Discriminant function
Parent/guardian education	26	1.7	Ordinal logistic regression
Parent/guardian employment	9	0.6	Binary logistic regression
Community type	8	0.5	Binary logistic regression
Mode of school instruction	29	1.9	Discriminant function
Number of siblings	3	0.2	Binary logistic regression
Online social connectedness	37	2.4	Ordinal logistic regression for all nine items individually
Offline social connectedness	38	2.4	Ordinal logistic regression for all nine items individually

3.4.3 Sensitivity Analyses

Two sensitivity analyses were conducted: (1) a complete case analysis (CCA); and (2) a sensitivity analysis excluding responses where there were concerns about data quality.

The complete case analysis was conducted to assess the robustness of results to missing data, as well as to verify that not specifying the potential interaction between

SDoH and social connectedness did not bias results of the exploratory stratified analyses. In the complete case sensitivity analysis, we retained only the participants with complete information for all study variables used in the main analysis (Hughes et al., 2019) (i.e., dual-factor Mental Health group membership, age group, gender, ethno-racial group, parent/guardian education, parent/guardian employment, community type, mode of school instruction, number of siblings, online social connectedness, and offline social connectedness). The complete case analysis sample included 1,422 participants.

The second sensitivity analysis was used to explore the potential impact of data quality concerns. When working with online survey data, there are several factors which may threaten the validity of results. One such concern is “survey satisficing” - that is, providing a minimally satisfactory answer without putting forth the cognitive effort required to enter an accurate response to the survey item (Krosnick, 1991). One way to mitigate the effects of satisficing is through the detection of “straight-lining”. Straight-lining occurs when participants select the same response option repeatedly across multiple survey items (for example, selecting “Strongly Disagree” for every item on a scale) (Vriesema & Gehlbach, 2021). Though selecting the same response option across multiple items within a scale measuring the same construct would seem reasonable, in scales where reverse coded items are involved (such as the social connectedness scales used in the present study), the likelihood of a non-satisficing respondent selecting the same response option for all items (reverse-coded and otherwise) would be small. In a method similar to that used by Arevalo and colleagues (2022), we identified straight-liners by flagging consecutive identical selection of response of anchor extremes (i.e., “strongly agree” and “strongly disagree”) in both scales measuring social connectedness. To be identified as a ‘straight-liner’ for either the online or offline social connectedness scales, participants would have needed to complete the scale in its entirety. If a participant was found to be a ‘straight-liner’ on either scale ($n = 32$), they were excluded as part of this sensitivity analysis.

Another common concern with online surveys is that the same person might complete the survey more than once (Eysenbach, 2004). One method commonly used to prevent this is an IP address analysis (Eysenbach, 2004). However, there are some

limitations to this method, namely that multiple legitimate participants might complete the survey from the same IP address, for example in the case of using a Virtual Private Network (VPN; Bernerth et al., 2021). After excluding straight-liners, responses with IP addresses that were shared across multiple participants were identified. Where this was the case, the response from this grouping with the earliest start time was retained. Using this procedure, we identified and excluded 111 additional potential duplicates from the sensitivity analysis. In total, the data quality concerns sensitivity analysis excluded 143 respondents from the main analysis, resulting in a sample size of 1,420.

3.5 Qualitative Analysis

3.5.1 Qualitative Research Approach

The qualitative portion of the analysis described adolescents' experiences of pandemic-related changes to their relationships, as well as mental health and well-being. We used a qualitative descriptive approach to achieve this objective. The qualitative descriptive approach is described as offering "...a comprehensive summary of an event in the everyday terms of those events" (Sandelowski, 2000, p. 336). It allows for a comprehensive description of a phenomenon, while placing an emphasis on describing participants' experiences in their own words (Sandelowski, 2000).

3.5.2 Qualitative Data Analysis

Responses to the two open-ended questions were extracted, and French responses were translated to English. Responses deemed irrelevant (e.g., "Not sure", "Not applicable", or "Don't know") or otherwise uninformative (e.g., "It has changed more positively") were excluded from the analysis. The six phases of thematic analysis as described by Braun and Clarke (2006) were followed. Phase 1 of the analysis involved the immersion of the investigator in the data, identifying any repeating ideas (Silverstein et al., 2006) emerging from the responses. Phase 2 involved the coding process, where a list of initial codes was produced based on the repeating ideas. The data were then entered into NVivo (QSR International Pty Ltd., Burlington, MA), where the codes were applied to text extracts. In Phase 3, common themes and sub-themes were identified, and codes were collated accordingly. In Phase 4, the candidate themes were reviewed and

collapsed with internal and external heterogeneity in mind to ensure clear and identifiable distinctions between themes. At this stage, we further organized themes into broader categories. In the fifth phase, the themes were given informative names that synthesized the ideas captured by each theme. In the sixth and final phase, representative quotes were selected in an attempt to accurately reflect the breadth of ideas represented by each theme. These quotes were then embedded into a description of the themes.

A ‘critical friend’ who was an experienced qualitative researcher was involved in phases three through five of the thematic analysis. The ‘critical friends’ approach, as described by Smith and McGannon (2018), is “a process of critical dialogue between people, with researchers giving voice to their interpretations in relation to other people who listen and offer critical feedback” (p. 13). The goal of the critical friends approach is not to achieve consensus, but to challenge and develop the interpretations made by the investigator (Smith & McGannon, 2018). This approach recognizes that while there can be inter-rater agreement, this agreement may not necessarily have converged on the “truth”, and that many plausible interpretations of the data exist (Smith & McGannon, 2018).

Chapter 4

4 Results

The online survey received 3,695 responses from 3,680 panelists. After excluding participants who did not meet the eligibility criteria or did not agree to participate ($n = 1,863$), participants who did not proceed to the end of the survey ($n = 6$), participants who failed to answer a substantial number of survey questions ($n = 8$), and surveys with repeat low-quality open-ended responses ($n = 200$), the final pool of participants from which the quantitative and qualitative analytic samples were comprised included 1,603 adolescents. After excluding 40 (2.5%) participants who were missing items in at least one of the scales (K6 or SWEMWBS) used to assign participants to a dual-factor mental health group, there were 1,563 responses analyzed in the quantitative analysis. Results of the quantitative analyses are presented in Section 4.1, followed by results of the qualitative analysis in Section 4.2.

4.1 Quantitative Results

Among the final pool of participants, 1,563 (*Mean age* = 15.3, *SD* = 1.2; 50.0% cisgender boys; 66.4% White) were eligible for the quantitative analysis. The sociodemographic characteristics of the quantitative sample, presented according to dual-factor mental health group membership, are reported in Table 4.1. The majority ($n = 1,250$, 80.0%) of participants belonged to the complete mental health group, followed by 121 (7.7%) belonging to the vulnerable group, 115 (7.4%) belonging to the symptomatic but content group, and 77 (4.9%) belonging to the troubled group. Most participants reported feeling socially connected, both in the online ($n = 988$, 63.2%) and offline ($n = 1,159$, 74.2%) setting.

Table 4.1 Characteristics of the Quantitative Sample According to Dual-Factor Mental Health Group Membership (n = 1,563)

Variable	Level	Dual-Factor Mental Health Group Membership								Total Sample (n = 1563)	
		I Troubled (n = 77, 4.9%)		II Symptomatic but Content (n = 115, 7.4%)		III Vulnerable (n = 121, 7.7%)		IV Complete Mental Health (n = 1250, 80.0%)			
		n	%	n	%	n	%	n	%	n	%
<i>Social Determinants of Health (SDoH)</i>											
Age Group	13 to 14	12	15.6	31	27.0	35	28.9	373	29.8	451	28.9
	15 to 16	42	54.6	65	56.5	68	56.2	645	51.6	820	52.5
	17 to 18	23	29.9	19	16.5	18	14.9	229	18.3	289	18.5
	Missing	0	0.0	0	0.0	0	0.0	3	0.2	3	0.2
	Mean, SD	15.7	1.1	15.3	1.2	15.3	1.1	15.2	1.3	15.3	1.2
Gender	Cisgender Boy	26	33.8	49	42.6	55	45.5	652	52.2	782	50.0
	Cisgender Girl	44	57.1	58	50.4	62	51.2	567	45.4	731	46.8
	Gender Diverse	6	7.8	8	7.0	4	3.3	25	2.0	43	2.8
	Missing	1	1.3	0	0.0	0	0.0	6	0.5	7	0.5
Ethno-Racial Group	White	54	70.1	85	73.9	71	58.7	828	66.2	1038	66.4
	Black	2	2.6	4	3.5	4	3.3	50	4.0	60	3.8
	East or South East Asian	7	9.1	9	7.8	16	13.2	151	12.1	183	11.7
	South Asian	2	2.6	7	6.1	11	9.1	74	5.9	94	6.0
	Multi-Racial or Other*	12	15.6	10	8.7	19	15.7	142	11.4	183	11.7
	Missing	0	0.0	0	0.0	0	0.0	5	0.40	5	0.3
Parent/	Postgraduate Degree	9	11.7	24	20.9	24	19.8	229	18.3	286	18.3
	University Degree	31	40.3	44	38.3	42	34.7	493	39.4	610	39.0

Guardian Education	College Diploma, Apprenticeship, or Trade Certificate	24	31.2	27	23.5	41	33.9	400	32.0	492	31.5
	High School or Elementary School Diploma	9	11.7	17	14.8	12	9.9	111	8.9	149	9.5
	Missing	4	5.2	3	2.6	2	1.7	17	1.4	26	1.7
Parent/Guardian Employment	Employed Full Time or Self-Employed	69	89.6	101	87.8	111	91.7	1156	92.5	1437	91.9
	Less than Full Time Employment**	7	9.1	13	11.3	10	8.3	87	7.0	117	7.5
	Missing	1	1.3	1	0.9	0	0.0	7	0.6	9	0.6
Community Type	Urban	69	89.6	102	88.7	106	87.6	1109	88.7	1386	88.7
	Rural	8	10.4	13	11.3	13	10.7	135	10.8	169	10.8
	Missing	0	0.0	0	0.0	2	1.7	6	0.5	8	0.5
<i>Other Covariates</i>											
Mode of School Instruction	In-Person	56	72.7	79	68.7	99	81.8	1073	85.8	1307	83.6
	Hybrid	7	9.1	5	4.4	7	5.8	58	4.6	77	4.9
	Remote	14	18.2	31	27.0	12	9.9	93	7.4	150	9.6
	Missing	0	0.0	0	0.0	3	2.5	26	2.1	29	1.9
Number of Siblings	Lives with at Least One Sibling	52	67.5	78	67.8	79	65.3	921	73.7	1130	72.3
	Only Child or Does Not Live with Sibling(s)	25	32.5	36	31.3	42	34.7	327	26.2	430	27.5
	Missing	0	0.0	1	0.9	0	0.0	2	0.2	3	0.2
<i>Social Connectedness</i>											
Online	Socially Connected	24	31.2	41	35.7	54	44.6	869	69.5	988	63.2
	Socially Disconnected	49	63.6	73	63.5	64	52.9	352	28.2	538	34.4
	Missing	4	5.2	1	0.9	3	2.5	29	2.3	37	2.4
Offline	Socially Connected	28	36.4	44	38.3	59	48.8	1028	82.2	1159	74.2

	Socially Disconnected	47	61.0	67	58.3	59	48.8	193	15.4	366	23.4
	Missing	2	2.6	4	3.5	3	2.5	29	2.3	38	2.4
<p>* "Other" includes Indigenous, Latin American, and West Asian/Middle Eastern</p> <p>** "Less than Full Time Employment" includes Part-Time Employment, Stay-at-Home Parent, Disability, Retired, and Unemployed</p>											

4.1.1 Objective 1: Impact of Social Connectedness on Dual-Factor Mental Health

Results of the ordinal logistic regression of dual-factor mental health group membership on social connectedness are presented in Table 4.2. Odds ratios (OR) for all study variables are presented in Appendix D.

In the unadjusted model, adolescents who were socially disconnected in the online setting experienced a higher odds of belonging to a poorer dual-factor mental health group (OR = 3.94, 95% CI: 3.05 to 5.09). The strength of this association did not change substantially after adjusting for the SDoH (OR = 4.07, 95% CI: 3.13 to 5.29), or mode of school instruction and number of siblings (OR = 3.63, 95% CI: 2.80 to 4.71), but the strength of the association was reduced after adjusting for offline social connectedness (OR = 1.98, 95% CI: 1.47 to 2.66). Similarly, for offline social connectedness, the strength of the association did not differ much between the unadjusted (OR = 6.90, 95% CI: 5.29 to 9.01) and SDoH-adjusted (OR = 7.44, 95% CI: 5.65 to 9.79) or mode of school instruction and number of siblings-adjusted (OR = 6.42, 95% CI: 4.90 to 8.41) models, however the strength of the association was reduced by adjusting for online social connectedness (OR = 4.99, 95% CI: 3.71 to 6.71).

In the fully adjusted model, which included all SDoH and social connectedness variables, adolescents who were socially disconnected in both online (OR = 1.92, 95% CI: 1.42 to 2.59) and offline (OR = 5.14, 95% CI: 3.78 to 6.99) settings had a higher odds of belonging to a poorer dual-factor mental health group, albeit this effect was stronger for offline than online social connectedness. Other factors associated with belonging to a poorer dual-factor mental health group included age group, gender identity, parent/guardian employment status, and mode of school instruction. These effect estimates are presented in Appendix D, with statistically significant effects reported below. In the fully adjusted model, compared to 13- to 14-year-olds, those aged 15- to 16-years (OR = 1.49, 95% CI: 1.08 to 2.06) had a higher odds of belonging to a poorer dual-factor mental health group. Both cisgender girls (OR = 1.68, 95% CI: 1.27 to 2.22) and gender diverse adolescents (OR = 3.49, 95% CI: 1.81 to 6.72) had a higher odds of

belonging to a poorer dual-factor mental health group than cisgender boys. Adolescents attending school remotely had a higher odds of belonging to a poorer dual-factor mental health group than those attending school in-person (OR = 1.70, 95% CI = 1.15 to 2.52). In the fully adjusted model, there was no evidence to suggest that ethno-racial group, parent/guardian education level, parent/guardian employment status, community type, nor number of siblings were associated with dual-factor mental health group membership.

Table 4.2 Results of the Univariable and Multivariable Ordinal Logistic Regression of Dual-Factor Mental Health Group Membership on Social Connectedness (n = 1,563)

Independent Variables	Value	Unadjusted			Partially Adjusted									Fully Adjusted ^d		
					Adjusted for SDoH ^a			Adjusted for Other Covariates ^b			Adjusted for Social Connectedness ^c					
		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI	
Online Social Connectedness	Socially Connected	<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>		
	Socially Disconnected	3.94	3.05	5.09	4.07	3.13	5.29	3.63	2.80	4.71	1.98	1.47	2.66	1.92	1.42	2.59
Offline Social Connectedness	Socially Connected	<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>		
	Socially Disconnected	6.90	5.29	9.01	7.44	5.65	9.79	6.42	4.90	8.41	4.99	3.71	6.71	5.14	3.78	6.99

Odds are cumulated over the lower order categories of dual-factor mental health, with an odds ratio >1 representing a higher odds of belonging to a poorer mental health category (1 = troubled; 2 = symptomatic but content; 3 = vulnerable; 4 = complete mental health). Statistically significant results ($\alpha = 0.05$) are presented in **bold**.

^a SDoH included age group, gender, ethno-racial group, parent/guardian education level, parent/guardian employment status, and community type.

^b Other Covariates: mode of school instruction and number of siblings.

^c Online social connectedness is adjusted for offline social connectedness, and offline social connectedness is adjusted for online social connectedness.

^d The fully adjusted model includes all SDoH and social connectedness variables, as well as mode of school instruction and number of siblings.

SDoH = Social Determinants of Health; *CI* = Confidence Interval; *OR* = Odds Ratio; *Ref.* = Reference Category.

4.1.2 Objective 2: SDoH as Moderators in the Relationship Between Social Connectedness and dual-factor Mental Health

We conducted an exploratory analysis to investigate whether the strength of the association between social connectedness and dual-factor mental health group membership varied according to the SDoH. We performed both unadjusted analyses and analyses adjusted for online and offline social connectedness. The odds ratios presented below are from the adjusted analyses.

4.1.2.1 Online Social Connectedness

There was no statistically significant effect modification of the SDoH in the relationship between online social connectedness and dual-factor mental health. There was some heterogeneity in the odds ratios stratified according to the SDoH, however the joint tests for the interaction terms were not statistically significant. These results are presented in full in Table 4.3. Age was one of these potential moderators, where the association between being socially disconnected in the online setting and belonging to a poorer dual-factor mental health group was stronger among 17- to 18- year-olds (OR = 3.52, 95% CI: 1.76 to 7.02) than 15- to 16- year-olds (OR = 1.96, 95% CI: 1.31 to 2.92), and non-significant among 13- to 14- year-olds (OR = 1.38, 95% CI: 0.76 to 2.47). Gender was another one of these potential moderators, where the association between being socially disconnected in the online setting and belonging to a poorer dual-factor mental health group was strongest among gender diverse participants (OR = 4.81, 95% CI: 1.28 to 18.08), followed by cisgender boys (OR = 2.40, 95% CI: 1.50 to 3.84), then cisgender girls (OR = 1.62, 95% CI: 1.08 to 2.42). Another potential moderator was ethno-racial group, where the association between being socially disconnected in the online setting and belonging to a poorer dual-factor mental health group was strongest among Black adolescents (OR = 6.64, 95% CI: 1.08 to 40.76), followed by adolescents belonging to the Multi-racial or Other category (OR = 3.69, 95% CI: 1.53 to 8.92), White adolescents (OR = 1.81, 95% CI: 1.26 to 2.60), and South Asian adolescents (OR = 1.34, 95% CI: 0.44 to 4.02). In the model adjusted for offline social connectedness, there was no significant effect among East or South East Asian adolescents (OR = 1.68, 95% CI:

0.69 to 4.07). Parent/guardian education was also a potential moderator, where the association between being socially disconnected in the online setting and belonging to a poorer dual-factor mental health group was stronger among those whose parent(s)/guardian(s) had a highest level of education of high school or elementary school diploma (OR = 5.58, 95% CI: 2.16 to 14.39) than those whose parent(s)/guardian(s) had a highest level of education of a postgraduate degree (OR = 2.94, 95% CI: 1.45 to 5.98). There was no significant effect among those whose parent(s)/guardian(s) had a highest level of education of college diploma, apprenticeship, or trade certificate (OR = 1.40, 95% CI: 0.83 to 2.35) or university degree (OR = 1.66, 95% CI: 1.00 to 2.77). There was a significant association between feeling socially disconnected in the online setting and poorer dual-factor mental health group membership among adolescents whose parent(s)/guardian(s) were employed full time or self-employed (OR = 2.06, 95% CI: 1.51 to 2.81), but this association was weakened and no longer statistically significant among those whose parent(s)/guardian(s) had less than full time employment (OR = 1.48, 95% CI: 0.54 to 4.01). A final potential effect modifier in the relationship between feeling socially disconnected in the online setting and poorer dual-factor mental health group membership was community type, where there was a significant association among urban-dwelling adolescents (OR = 2.11, 95% CI: 1.54 to 2.89) but this association was weakened and no longer statistically significant among rural adolescents (OR = 1.28, 95% CI: 0.54 to 3.00).

Table 4.3 Results of the Ordinal Logistic Regression of Dual-Factor Mental Health Group Membership on Online Social Connectedness, Stratified by Social Determinants of Health

SDoH Variables	Value	Unadjusted			Adjusted for Offline Social Connectedness			Interaction <i>p</i> value ^b	
		OR	95% CI		OR	95% CI			
Age Group	13 to 14	2.86	1.74	4.70	0.13	1.38	0.76	2.47	0.05
	15 to 16	4.09	2.90	5.78		1.96	1.31	2.92	
	17 to 18	6.00	3.19	11.30		3.52	1.76	7.02	
Gender	Cisgender Boy	5.03	3.39	7.47	0.16	2.40	1.50	3.84	0.37
	Cisgender Girl	3.07	2.15	4.38		1.62	1.08	2.42	
	Gender Diverse	6.63	1.85	23.83		4.81	1.28	18.08	
Ethno-Racial Group	White	4.81	1.28	18.08	0.20	1.81	1.26	2.60	0.28
	Black	12.58	2.35	67.43		6.64	1.08	40.76	
	East or South East Asian	2.70	1.24	5.86		1.68	0.69	4.07	
	South Asian	2.04	0.74	5.59		1.34	0.44	4.02	
	Multi-Racial or Other *	6.51	3.10	13.68		3.69	1.53	8.92	
Parent/Guardian Education	Postgraduate Degree	5.23	2.76	9.90	0.07	2.94	1.45	5.98	0.22
	University Degree	4.20	2.75	6.42		1.66	1.00	2.77	
	College Diploma, Apprenticeship, or Trade Certificate	2.48	1.57	3.93		1.40	0.83	2.35	
	High School or Elementary School Diploma	7.96	3.40	18.64		5.58	2.16	14.39	
Parent/Guardian Employment	Employed Full Time or Self-Employed	4.09	3.12	5.35	0.51	2.06	1.51	2.81	0.47
	Less than Full Time Employment **	3.06	1.32	7.10		1.48	0.54	4.01	
Community Type	Urban	4.19	3.19	5.51	0.20	2.11	1.54	2.89	0.36
	Rural	2.46	1.15	5.24		1.28	0.54	3.00	

Odds are cumulated over the lower order categories of dual-factor mental health, with an odds ratio >1 representing a higher odds of belonging to a poorer mental health category (1 = troubled; 2 = symptomatic but content; 3 = vulnerable; 4 = complete mental health). Statistically significant results ($\alpha = 0.05$) are presented in **bold**.

Numbers in *italics* indicate that the proportional odds assumption was not met for this model.

^a Results of the joint test for the interaction term between the SDoH variable and online social connectedness in the unadjusted model.

^b Results of the joint test for the interaction term between the SDoH variable and online social connectedness in the model adjusted for offline social connectedness.

* “Other” includes Indigenous, Latin American, and West Asian/Middle Eastern

** “Less than Full Time Employment” includes Part-Time Employment, Stay-at-Home Parent, Disability, Retired, and Unemployed

SDoH = Social Determinants of Health; *CI* = Confidence Interval; *OR* = Odds Ratio.

4.1.2.2 Offline Social Connectedness

No statistically significant interactions existed between any of the SDoH variables and offline social connectedness. However, there were some evidence of effect modification for the relationship between offline social connectedness and dual-factor mental health group membership by the SDoH, albeit not statistically significant. These results are presented in full in Table 4.4. Gender was one of these potential effect modifiers, where the strength of the association was stronger among cisgender girls (OR = 6.03, 95% CI: 4.01 to 9.08) than cisgender boys (OR = 4.29, 95% CI: 2.68 to 6.86), and there was no significant effect among gender diverse adolescents (OR = 2.95, 95% CI: 0.79 to 11.00). Another potential effect modifier was ethno-racial group, where the strongest association was among Black adolescents (OR = 6.61, 95% CI: 1.29 to 33.95), followed by White adolescents (OR = 6.11, 95% CI: 4.23 to 8.81), adolescents belonging to the Multi-racial or Other category (OR = 3.27, 95% CI: 1.35 to 7.93), East or South East Asian adolescents (OR = 3.12, 95% CI: 1.28 to 7.64), and South Asian adolescents (OR = 3.02, 95% CI: 1.00 to 9.06). The strength of the association between offline social connectedness and dual-factor mental health group membership also differed according to parent/guardian education level, where the effect was strongest among those whose parent(s)/guardian(s) had a highest level of education of a university degree (OR = 7.52, 95% CI: 4.51 to 12.52), followed by college diploma, apprenticeship, or trade certificate (OR = 4.91, 95% CI: 2.90 to 8.34), and postgraduate degree (OR = 3.94, 95% CI: 1.99 to 7.77). There was no significant effect among those whose parent(s)/guardian(s) had a highest level of education of a high school or elementary school diploma (OR = 2.03, 95% CI: 0.81 to 5.08). The final potential effect modifier was community type, where the strength of the association between feeling socially disconnected in the offline setting and poorer dual-factor mental health group membership was stronger among rural-dwelling (OR = 6.52, 95% CI: 2.71 to 15.71) than urban-dwelling adolescents (OR = 4.83, 95% CI: 3.52 to 6.62). The strength of the association between offline social connectedness and dual-factor mental health group membership did not differ much across age group (15-to-16-year-olds [OR = 5.73, 95% CI: 3.82 to 8.59]; 13-to-14-year-olds [OR = 4.68, 95% CI: 2.60 to 8.44]; 17-to-18-year-olds [OR = 4.25, 95% CI: 2.17 to 8.30]), nor

parent/guardian employment status (employed full-time or self-employed [OR = 4.95, 95% CI: 3.63 to 6.75]; less than full-time employment [OR = 5.09, 95% CI: 1.84 to 14.03]).

Table 4.4 Results of the Ordinal Logistic Regression of Dual-Factor Mental Health Group Membership on Offline Social Connectedness, Stratified by the Social Determinants of Health

SDoH Variables	Value	Unadjusted			Adjusted for Online Social Connectedness				
		OR	95% CI		Interaction <i>p</i> value ^a	OR	95% CI		Interaction <i>p</i> value ^b
Age Group	13 to 14	5.54	3.33	9.23	0.47	4.68	2.60	8.44	0.42
	15 to 16	7.91	5.49	11.40		5.73	3.82	8.59	
	17 to 18	6.85	3.70	12.71		4.25	2.17	8.30	
Gender	Cisgender Boy	6.93	4.64	10.35	0.81	4.29	2.68	6.86	0.71
	Cisgender Girl	7.36	5.04	10.74		6.03	4.01	9.08	
	Gender Diverse	4.67	1.34	16.33		2.95	0.79	11.00	
Ethno-Racial Group	White	8.13	5.85	11.30	0.20	6.11	4.23	8.81	0.23
	Black	12.83	2.73	60.30		6.61	1.29	33.95	
	East or South East Asian	3.95	1.78	8.77		3.12	1.28	7.64	
	South Asian ^c	3.39	1.22	9.42		3.02	1.00	9.06	
	Multi-Racial or Other *	6.64	3.16	13.96		3.27	1.35	7.93	
Parent/Guardian Education	Postgraduate Degree	6.29	3.39	11.66	0.30	3.94	1.99	7.77	0.33
	University Degree	9.71	6.23	15.15		7.52	4.51	12.52	
	College Diploma, Apprenticeship, or Trade Certificate	5.65	3.47	9.20		4.91	2.90	8.34	
	High School or Elementary School Diploma	5.34	2.38	11.96		2.03	0.81	5.08	

Parent/ Guardian Employment	Employed Full Time or Self-Employed	6.99	5.28	9.23	0.76	4.95	3.63	6.75	0.78
	Less than Full Time Employment **	6.11	2.51	14.87		5.09	1.84	14.03	
Community Type	Urban	6.91	5.21	9.16	0.92	4.83	3.52	6.62	0.83
	Rural	7.23	3.20	16.34		6.52	2.71	15.71	
<p>Odds are cumulated over the lower order categories of dual-factor mental health, with an odds ratio >1 representing a higher odds of belonging to a poorer mental health category (1 = troubled; 2 = symptomatic but content; 3 = vulnerable; 4 = complete mental health). Statistically significant results ($\alpha = 0.05$) are presented in bold.</p> <p>Numbers in <i>italics</i> indicate that the proportional odds assumption was not met for this model.</p> <p>^a Results of the joint test for the interaction term between the SDoH variable and offline social connectedness in the unadjusted model.</p> <p>^b Results of the joint test for the interaction term between the SDoH variable and offline social connectedness in the model adjusted for online social connectedness.</p> <p>* “Other” includes Indigenous, Latin American, and West Asian/Middle Eastern</p> <p>** “Less than Full Time Employment” includes Part-Time Employment, Stay-at-Home Parent, Disability, Retired, and Unemployed</p> <p><i>SDoH</i> = Social Determinants of Health; <i>CI</i> = Confidence Interval; <i>OR</i> = Odds Ratio.</p>									

4.1.3 Sensitivity Analyses

Results of the two sensitivity analyses - specifically, the Complete Case Analysis (CCA; $n = 1,422$) and the analysis removing respondents with data quality concerns ($n = 1,420$) - are presented in Appendices E through J. Overall, conclusions from these analyses did not greatly differ from the main analyses with the full analytic sample.

4.2 Qualitative Findings

From the final pool of participants, there was a total of 776 responses to the question about changes to relationships during the pandemic, and 1,062 responses to the question about changes to mental health and well-being. After screening for irrelevant or uninformative responses (e.g., “Not sure”, “Not applicable”, “Don’t know”, and “It has changed more positively”), 651 responses to the question about changes to relationships and 884 responses to the question about changes to mental health and well-being were analyzed. The final qualitative sample included 1024 participants across the two questions ($Mean_{age} = 15.3$, $SD = 1.2$), of which 479 (46.8%) were cisgender boys, 520 (50.8%) were cisgender girls, and 22 (2.2%) were gender diverse. The ethno-racial background of the qualitative sample included: 702 (68.6%) White, 94 (9.2%) East or South East Asian, 56 (5.5%) South Asian, 38 (3.7%) Black, and 133 (13.0%) Multi-racial or Other.

When adolescents described pandemic-related changes to their relationships, mental health, and well-being, the following six themes emerged: (1) staying connected during the pandemic; (2) contributors to positive mental health and well-being during the pandemic; (3) feeling disconnected during the pandemic; (4) mental health challenges during the pandemic; (5) changes to relationships and social connection at the later stages of the pandemic; and (6) changes to mental well-being at the later stages of the pandemic. These themes are organized in three categories: (1) positive changes to relationships, mental health, and well-being; (2) negative changes to relationships, mental health, and well-being; and (3) other changes to relationships, mental health and well-being at the later stages of the pandemic. Table 4.5 presents a list of the emergent themes, sub-themes, and the categories to which they belong.

Table 4.5 Categories and Themes for Responses About Pandemic-Related Changes to Relationships and Mental Health and Well-Being

Categories	Themes	Sub-Themes
Positive changes to relationships, mental health, and well-being during the pandemic	Staying connected during the pandemic	Becoming closer and strengthening relationships
		Making an effort, adapting, and using technology to maintain relationships
		Adopting a new outlook on relationships
	Contributors to positive mental health and well-being during the pandemic	Advantages to the lockdown
		Adopting a positive outlook, undergoing introspection and self-growth
Negative changes to relationships, mental health, and well-being during the pandemic	Feeling disconnected during the pandemic	Loss of closeness, relationships, and support
		Barriers to staying connected and limitations of connecting via technology
	Mental health challenges during the pandemic	Feeling anxious, stressed, or uncertain
		Frustration towards the lockdowns and staying at home
		Missing out on daily routines, opportunities, and the typical adolescent experience
		Low mood and poor self-esteem
	Other mental illnesses	
Changes to Relationships, Mental Health and Well-Being at the Later Stages of the Pandemic	Changes to relationships and social connection at the later stages of the pandemic	Relationships recovering and improving
		Difficulty adapting to the return to in-person interactions
	Changes to mental well-being at the later stages of the pandemic	Mental health and well-being recovering and improving
		Difficulty adapting to the change in routine

4.2.1 Positive Changes to Relationships, Mental Health, and Well-Being

Adolescents described the positive ways in which their relationships, as well as mental health and well-being, have changed during the pandemic. This category consists of the following two themes: (1) staying connected during the pandemic; and (2) contributors to positive mental health and well-being during the pandemic. These themes are described below.

4.2.1.1 Staying Connected During the Pandemic

Adolescents reflected on how their experience of social connection was positively affected by the pandemic. The following three sub-themes emerged from the main theme of staying connected during the pandemic: (1) becoming closer and strengthening relationships; (2) making an effort, adapting, and using technology to maintain relationships; and (3) adopting a new outlook on relationships. These sub-themes are described below and illustrated with representative quotes.

4.2.1.1.1 Becoming Closer and Strengthening Relationships

Many adolescents described becoming closer in their relationships with their family during the pandemic as lockdowns allowed for more time to be spent together. They were having conversations with loved ones during the pandemic that were more profound, honest, and meaningful. Contributors to increased time spent with family included online learning, parents working from home, and pandemic restrictions or safety concerns. Although this trend of becoming closer to loved ones was primarily restricted to residential family members (i.e., parents and siblings), many respondents felt the pandemic also brought them closer in their relationships with friends and non-residential family members.

“I’ve become much closer with my friend, we understand each other on a deeper level”

Cisgender girl, 14

“... we’re talking about things that are important in life like my grandpa who passed away all the memories...”

Cisgender boy, 15

“I’ve gotten closer to my older sister. I found out that she is [sic] a great person to talk and confide in. She has helped me with boredom through the pandemic and we get a long [sic] now”

Cisgender girl, 16

“my dad had a lot more time to do things with me, and he works at home now which ended up meaning he has more energy – he is not travelling into downtown and back every day so he’s able to do things or talk to me like 1 minute after he finishes work. and [sic] for a long time i [sic] did online school and he did work from home, so we get to see what each other was doing all day. i [sic] understand more about what my mom and dad work at now... i [sic] feel closer to my family after the pandemic”

Cisgender boy, 16

A few made new friends during the pandemic, and for those who did, these new friendships were formed in response to having lost friends they had prior to the pandemic. Similarly, many of these adolescents described changing friend groups. The pandemic coincided with the transition into high school for many, and some were successful making new friends during this transition.

“On one hand, I lost connections with many old friends, and I regret losing them. On the other hand, I gained many new ones, and I usually feel comfortable around them”

Cisgender girl, 14

“I changed friend groups because I had difficulty keeping in touch”

Cisgender girl, 17, Translated

“I made new friends in high school”

Cisgender girl, 15

The challenges of the pandemic led several respondents to lean on their family and loved ones for support. This support was particularly important for adolescents struggling with their mental health. Some recognized the pandemic as a challenging time not just for themselves, but also for their loved ones, where it was necessary that they supported one another to make it through.

“...[my family has] been with me and I know I can depend on them”

Cisgender boy, 16

“...[being with family is] a safe place to be and it helps my anxiety”

Cisgender boy, 17

“...because [sic] of my eating disorder and how much my parents cared for me, I am much closer to my mom and dad”

Cisgender girl, 15

“...[we] stayed strong during the pandemic helping one another”

Cisgender boy, 16

“The ones I am closest to I tell them how I feel about them and let them know I care and love them and that I am always here for them”

Cisgender girl, 14

4.2.1.1.2 Making an Effort, Adapting, and Using Technology to Maintain Relationships

Several respondents felt that the unique challenges associated with the pandemic meant that maintaining their relationships with friends and loved ones required additional effort.

“We have made more efforts to b [sic] together”

“... everybody’s making more of an effort...”
Cisgender boy, 14

Cisgender boy, 15

The pandemic created a need to be more flexible in maintaining relationships. One way adolescents demonstrated their flexibility in maintaining their relationships during the pandemic was by shifting the location of their social interactions to outdoor settings.

“We learned to find things in common and compromise in order to be able to all hang out [sic]”

Cisgender boy, 15

“More tolerant because most of the stuff that upset me isn’t that important after all”

Cisgender girl, 15

“We hang out more outside after school...”

Cisgender boy, 15

The inability to meet in person during the pandemic drove many respondents to use technology as a tool to stay connected, supplementing or replacing these missed in-person interactions. Commonly mentioned modes of communication via technology included social media (including online messaging apps), video conferencing software, phone calls, and online video games. Some found that communicating via technology during the pandemic made them feel more connected to their friends than they did prior to the pandemic. Likewise, for adolescents whose mental well-being suffered from being unable to see their friends in person, technology was a way to cope with the loss of those interactions.

“[I spent] more time on the phone connecting with my friends plus i [sic] used social media to keep in touch. We were not allowed to be around each other”

Cisgender boy, 15

“...whenever there’s a hockey game on we’re all on zoom watching it and it’s really cool”

Cisgender boy, 15

“We are more closer as we play more online”

Cisgender boy, 16

“[There were] periods when I saw friends less, I found it more difficult but I spoke to them on FaceTime...”

Cisgender girl, 14, Translated

“I cannot see my friends as before in-person, but we talk over phone and got zoom meetings with all friends together”

Cisgender girl, 14

4.2.1.1.3 Adopting a New Outlook on Relationships

The onset of the pandemic resulted in experiencing a greater sense of appreciation for their relationships with friends and family, positively changing their perceptions of these relationships or giving them a greater appreciation for family time. This increase in time spent with residential family members also coincided with decreased in time spent with non-residential loved ones. However, many adolescents found that the separation from friends and non-residential family members gave them a greater appreciation for these relationships.

“I thing [sic] I aprecite [sic] them more and feel I am lucky with my family and friends”

Cisgender girl, 14

“it gave me a better outlook on my parents and the things they do to keep us educated and do everything they can to help us”

Cisgender boy, 17

“Made me appreciate family time”

Cisgender girl, 15

“...better [sense of] appreciation [for] the people we have in our lives especially grandma and grandpa and my mother that I don't live with and my uncles and aunties...”

Cisgender boy, 15

Similarly, limited in-person interactions with non-residential loved ones resulted in some gaining a greater appreciation for these in-person interactions. Some described feeling the need to make the most of limited in-person time spent with loved ones, viewing limited in-person time spent together as something to look forward to and savour.

“Social contacts are rarer therefore more appreciated”

Cisgender girl, 16

“I realize how I depend on other peoples' company”

Cisgender boy, 16

“It has made me appreciate time spend [sic] with friends and freedom. I do not like feeling locked up”

Cisgender girl, 14

“I appreciate the company of my friends more”

Cisgender girl, 17

“I can't see them as much but when I do, I value it more”

Cisgender boy, 15

“Interaction is key to making relationships grow... i [sic] try to make every interaction count”

Cisgender girl, 17

For some respondents, the challenges during the pandemic revealed who in their lives they can truly depend on, and who they felt most connected to, thereby encouraging them to become more selective of their relationships. For some, this meant narrowing down their friend group to only their closest friends. For others, the pandemic gave them the opportunity to cut out relationships that they perceived as negative. The pandemic portrayed their friends in a new light, either by exacerbating the negative qualities of existing relationships, or by differences in their reactions to the pandemic. This cleansing of negative relationships that occurred for some during the pandemic has had a positive impact on the lives of these adolescents.

“COVID show [sic] which friends you can count in [sic] or cannot”

Cisgender girl, 17

“Got to see who really matters and who i [sic] really matter to as well”

Cisgender boy, 17

“there was one person who was an ass but he was a friend of a friend, COVID gave me an excuse not to have to see him”

Cisgender girl, 16

“Lost a few friends who did not take COVID19 seriously. Got stronger friendships with others who were of like minds”

Cisgender girl, 16

“I realized who my actual friends were so that made me happy cause I got rid of the negative people in my life”

Cisgender girl, 16

4.2.1.2 Contributors to Positive Mental Health and Well-Being During the Pandemic

Adolescents described the positive changes they experienced with respect to their mental health and well-being as a result of the pandemic. From this theme emerged the following two sub-themes: (1) advantages to the lockdown; and (2) adopting a positive outlook, undergoing introspection and self-growth. These sub-themes are described below and illustrated with representative quotes.

4.2.1.2.1 Advantages to the Lockdown

Some adolescents experienced the pandemic and lockdowns as a break from their daily routines, allowing them the opportunity to decompress. Many of these adolescents found life prior to the pandemic stressful, and the lockdowns provided them respite from this stress, or a chance to clear their minds.

"[the pandemic] provided a break in life. More relaxed life during lockdown"

Cisgender boy, 15, Translated

"it has given me a break from society, thus easing my anxieties a bit"

Cisgender girl, 16

"Since we stayed at home for two years, it has given me the time to think about things clearly"

Cisgender girl 16

A primary contributing factor to this more relaxed lifestyle was the transition to online learning. For many, their experience with online learning was less stressful than their prior experience with in-person learning. For some, this lowered stress was the result of lower expectations and reduced pressures in the online learning environment. The flexibility of online learning allowed adolescents to take responsibility for their own education, and engage in self-paced learning, which many appreciated. Other adolescents pointed to their improved academic performance as the reason for their preference for online learning. For some, this improved academic performance seems to have made a positive contribution to their mental health and well-being.

"At first, when schools were closed, online learning was very chill & relaxed. Marks couldn't decrease and I could sleep in because classes were asynchronous (not live)"

Cisgender girl, 17

"It was great getting a break from in-person learning and there was less to do online"

Cisgender boy, 15

"I haven't been forced to learn or socialize in ways adults think I SHOULD. I learn and socialize in ways that are right for ME and I am so much happier because of it"

Cisgender boy, 14

"I learn more online and can take my time"

Cisgender boy, 17

"... the peak [of the pandemic] was my best year at school mentally and academically"

Cisgender girl, 16

Some adolescents emphasized that they enjoyed being away from social stressors, and not having to interact with others. For adolescents experiencing a negative social environment at school prior to the pandemic, school closures allowed them the opportunity to escape, which contributed to positive changes in their mental health and well-being.

“I am no longer forced to go to school where I don’t fit in or belong. I’m getting a better education now”

Cisgender boy, 14

“People in my class get on my nerves so I was fine with not seeing them”

Cisgender girl, 16

“My thoughts are better about myself since I don't need to put up with kids and there [sic] building [sic]”

Cisgender boy, 17

Some adolescents emphasized that they enjoyed the opportunity the pandemic provided for them to stay at home, and the additional alone time that they gained. For some, the ability to spend their days at home was a key advantage to online learning, as they were not required to wake up early for class, and parents were available to help with school tasks. Staying at home meant these adolescents had more time for activities they enjoy.

“I prefer to stay at home. I am a loner, the pandemic was good for me”

Cisgender girl, 16, Translated

“It was a positive thing to do remote learning for a while and get to stay home”

Cisgender boy, 15

“I have always been able to study online with my parents [sic] assistance something that was not possible before the virus”

Cisgender boy, 14

“...I did things just for me like running, reading for pleasure, cooking...”

Cisgender girl, 16

4.2.1.2.2 Adopting a Positive Outlook, Undergoing Introspection and Self-Growth

Some adolescents responded to the pandemic by adopting a more positive outlook on their lives. One way they demonstrated this was by becoming more resilient, taking up coping strategies such as exercise, or receiving support from others. Several reported finding themselves experiencing greater feelings of appreciation towards aspects of their lives they may have taken for granted before the pandemic. Specific aspects of life prior

to lockdown that adolescents grew a greater appreciation for included extracurricular activities and in-person learning.

“I understood that I had good mental strength... good morale”

Cisgender girl, 17, Translated

“...I took up running. I run 5km before school most mornings and I love how it makes me feel”

Cisgender girl, 16

“The positive, I now have help from a counselor to manage my anxiety”

Cisgender boy, 14

“...through the pandemic I think I’ve been more optimistic when approaching tasks I don’t enjoy”

Cisgender girl, 16

“Has made me appreciate being able to do my extra-curricular activities”

Cisgender boy, 14

Many adolescents were looking inward and gaining a better understanding of themselves during the pandemic. Some applied their deepened self-knowledge to improve themselves, while others who had observed a decline in their mental health and well-being used their deepened self-knowledge to take an active role in improving their mental health. A few respondents specified the lifestyle changes they were making to do so. Other ways in which adolescents demonstrated self-improvement was by maturing, becoming more independent, and caring more for others.

“It’s made me more aware of myself and helped me to take charge of my own life”

Cisgender girl, 16

“[My mental health] initially went down hill but as of late 2021 I made an [sic] active decisions to make lifestyle changes to help improve it”

Cisgender girl, 17

“I learned to study better and build better habits. I wake up early and eat breakfast. I play more sports outside with friends”

Cisgender boy, 17

“It made me grow up faster, I think, be more mature”

Cisgender girl, 14

“I have become more independent and have learned new things in life”

Cisgender girl, 15

“...I take care more about [sic] myself and others”

Cisgender boy, 17

4.2.2 Negative Changes to Relationships, Mental Health, and Well-Being

Adolescents also described the negative ways in which their relationships, as well as mental health and well-being have changed during the pandemic. This second category consists of the following two themes: (1) feeling disconnected during the pandemic; and (2) mental health challenges during the pandemic. These themes are described below and illustrated with representative quotes.

4.2.2.1 Feeling Disconnected During the Pandemic

Three sub-themes emerged from the primary theme of feeling disconnected during the pandemic: (1) loss of closeness, relationships, and support; (2) rise in conflict, tensions, and division; and (3) barriers to staying connected and limitations of connecting via technology. These sub-themes are described below and illustrated with representative quotes.

4.2.2.1.1 Loss of Closeness, Relationships, and Support

Several adolescents described losing their support system during the pandemic. Many lost the support of their friends whom they no longer saw in-person, while others lost the support of mental health and professional psychological support services.

“I feel like I am all on my own to deal with school, personal issues, and family stress”

Cisgender boy, 16

“No friends and peers to support is difficult [sic] too”

Cisgender boy, 15

“Isolation was hard. Unable to access mental health service’s [sic]”

Cisgender boy, 17

“I lost my psychological resources (psychologist, etc.)”

Cisgender girl, 17, Translated

For some, a loss of connection during the pandemic manifested as losing a sense of closeness with their friends and loved ones, sensing their bonds and relationships with others becoming weaker. The primary reason for experiencing such a loss of closeness as reported by the adolescents was being unable to meet in person with their friends and loved ones. The transition to online learning during the early stage of the pandemic contributed to this loss of friendship for some. School was an important environment for

adolescents to interact with their peers, and the virtual learning environment failed to recreate the immediacy of social interactions experienced in person at school, leading some to feel a lowered sense of support and school community.

“it's hard to get together with friends and do things, for more than 2 years now, so friendships kind of weaken”

Cisgender boy, 16

“...I lost friends that I saw only [at school]”

Cisgender boy, 15

“Being out of school during COVID-19 was a little confusing because you never saw your friends, compared school marks and other little things that we took for granted like always having your friends around in and out of class”

Cisgender girl, 13

“I definitely feel more burnt out after the pandemic. I was on virtual learning for I and a half years.... I stopped talking with my friends because we weren't [sic] the type to chat online, moreso the ones who talk only when we see each other at school. When I was going through struggles with school, I didn't have anyone to talk to about it; I felt that I lost connection with my school community...”

Cisgender girl, 16

For some adolescents, the pandemic meant losing touch with and growing apart from friends and loved ones. Several respondents attributed this loss of touch to not seeing each other as much during the lockdowns. For some, this loss of touch went further, with friends pulling away. The pandemic added additional strain to maintaining already struggling friendships, enough to push them to the point of a loss of friendship.

“some i grew apart from, not seeing each other in person”

Cisgender girl, 15

“i have no friends they've moved on. the ones i thought were friends i dsicovered [sic] really weren't my friends”

Cisgender girl, 16

“Everyone just pulled away. Lost a lot of friends. I started highschool [sic] when covid started. It was a hard enough transition”

Cisgender boy, 15

“I feel like I have lost what [we had] growing up together, going to school together [that] has now all changed because of two years of isolation. Now I don't feel like I belong or understand my friends anymore”

Cisgender girl, 14

Many adolescents experienced elevated feelings of isolation and loneliness during the pandemic. These adolescents felt cut off from the social world during lockdowns, losing their sense of connection with others and limiting their in person social interactions to residential family members. While some isolated themselves, others

reported feelings of social exclusion. This sense of isolation weighed heavily on the mental health and well-being of these adolescents.

“I felt isolated, alone, I no longer had a social life...”

Cisgender girl, 17, Translated

“At the beginning when everything was shut/locked down, I felt isolated with my family and missed my friends”

Cisgender girl, 17

“I don’t feel connected anymore”

Cisgender boy, 15

“I don't feel like anyone understands me”

Cisgender boy, 15

“Isolation from my family and friends was hard to deal with at times. I felt alone when i couldnt [sic] meet up with my friends”

Cisgender boy, 15

“I am very reticent towards others due to everything that has happened over the past two years...”

Cisgender girl, 15, Translated

“...I don’t spend tume [sic] with my family. I don’t want to talk to anyone”

Cisgender girl, 16

“I felt ...abandoned by my friends...”

Cisgender girl, 15, Translated

4.2.2.1.2 Rise in Conflict, Tensions, and Division

The pandemic was a time of heightened conflict, tension, and division in relationships. Some adolescents reported that the source of this increased tension was higher levels of stress, often attributed to financial concerns and the transition to online learning.

“[We] got on each others [sic] nerves, stressed”

Cisgender boy, 16

“They just have more stress because of less money and all the food costs more in the grocery stores”

Cisgender girl, 15

“My mom and I fought a lot when we had to do home school”

Cisgender boy, 15

Too much time spent with family contributed to an increased amount of tension between family members. For many, this rise in tension in the family environment manifested as an increase in irritability and family conflict. For several, forced time with family took a toll on their privacy, further contributing to tensions in the family environment and leaving them longing for more space.

“My mother drove me crazy at home”

Cisgender girl, 15

“Being around my family all the time has caused arguments, because I was out with m [sic] friend pre pandemic [sic]. And now I'm stuck at home most of the time”

Cisgender boy, 17

“the lack of personal space and privacy has negatively impacted my relationship with my father who now works from home 5 days a week”

Transgender boy, 17

“I felt invaded by my brother and sister’s spouses because they were always at home”

Cisgender girl, 16, Translated

“With family we are way [too] close and need space from time to time...”

Cisgender boy, 14

For several respondents, the subject of their conflict was differing views on the pandemic. However, for others, differing views on the pandemic were more of a source of division than a source of conflict. For some, division over pandemic views was specifically related to opinions on the COVID-19 vaccination, often extending to the social alienation of themselves or others over their vaccination status. This alienation based on vaccination status has made some adolescents feel left out, with unvaccinated respondents missing out on important events due to their vaccination status.

“Some people in our family were brain washed [sic] by the news station and went crazy with Covid restrictions. We don’t talk to them anymore. My parents said maybe soon they will get back to normal”

Cisgender boy, 15

“I lost friends because I was not vaccinated their parents did not want them to hang out with me anymore”

Cisgender boy, 15

“One of my best friends is not vaccinated and my parents don't want us to see each other inside so I haven't been able to invite her over since the beginning of the pandemic”

Non-binary/genderfluid respondent, 15

“...I've faced some bullying at school (from a teacher, and some students) and online about my choosing not to get vaccinated. I've lost friends over it and it's bullshit”

Cisgender girl, 16

“At times, I have had to deal with being upset and left out because of [vaccination] mandates”

Cisgender boy, 15

“ive [sic] been prevented from seeing my granparents [sic] they died and I could not even attend the funeral because I would not bend over and get vaccinated”

Cisgender girl, 15

4.2.2.1.3 Barriers to Staying Connected and Limitations of Connecting Via Technology

Many adolescents referenced the barriers to in-person contact that they experienced during the pandemic. Parental rules were a prominent barrier, with some specifying that it was the rules of their own parents or their friends' parents limiting this in person contact. For several, fear of contracting COVID-19 prevented them from making in-person contact, while others mentioned public health restrictions as a barrier.

"everyones [sic] parents have differnt [sic] rules so made it hard to stay in touch with friends..."

Cisgender girl, 15

"Less time spent together for fear of [the] pandemic"

Cisgender boy, 14

"Couldn't see them in person for too long due to stupid rules by the governmentb [sic]"

Cisgender girl, 17

For some respondents, the pandemic made it difficult to get in touch and remain in contact with their friends and loved ones. A primary driver of this difficulty remaining in contact with others was the need to stay at home during lockdowns. Some reported experiencing challenges in staying connected with others during the pandemic due to feeling more socially awkward or a loss of social skills. Several of these adolescents reported that the pandemic compounded existing challenges in making new friendships, namely the transition to a new school for high school. Pandemic restrictions at school, and the switch to online learning were among the factors that made making new friends during the pandemic particularly difficult.

"Sometimes it was hard to keep in touch with my friends when we were always at home"

Cisgender girl, 14

"I lost my social skills"

Cisgender girl, 16

"it [sic] was hard to get to know people at the begining [sic] of highschool [sic] with all the restrictions"

Cisgender boy, 15

"I started a new school, high school, by myself and was starting to make friends when covid started. They didnt [sic] remain during covid and after they didnt [sic] start again"

Cisgender girl, 16

"...you don't make any new friends while online learning, thats [sic] impossible"

Cisgender boy, 16

Few respondents commented on the ways in which technology was an inadequate substitute for missed in person social interactions during the pandemic. These respondents found online communication to be less effective, fostering feelings of disconnection rather than protecting against those feelings. For adolescents unaccustomed to using social media for this purpose, replacing in person interactions with online interactions was not an option.

“It's hard to understand each other using only social media”

Cisgender girl, 17, Translated

“I find a lot of my friends prefer to do things online and there a sense of loneliness”

Cisgender boy, 17

“...[I] have no friends since covid, plus i [sic] do not do SM [social media] at all!!!”

Cisgender boy, 16

Many participants reported that their sense of disconnection during the pandemic stemmed from missing in person social interactions. These respondents spent less time with others living outside their household, including friends and non-residential family members, taking a steep toll on these relationships. For many, being away from their friends and loved ones was challenging, and they missed the physical presence of these important people in their lives. This was particularly challenging for adolescents who do not live with their parents. Some relationships, such as those with certain school friends, appeared to be relationships of convenience that could not survive once the adolescents were no longer spending time together in the same physical environment. However, for some of these adolescents, their sense of missing in person interactions was broader, feeling a general sense of missing being around others, which weighed heavily on their mental health.

“We all do our own things and there is a lack of sense of being together all the time”

Cisgender boy, 16

“[We] just sort of grew apart when we should have been enjoying experiences together”

Cisgender boy, 14

“We did not see each other, we were far, not able to visit, outside of school, we were not really friends...”

Cisgender girl, 17, Translated

- “Isolation caused a lot of stress because I couldn’t see friends and family”*
Cisgender girl, 18
- “...not being able to see people sort of felt draining”*
Cisgender girl, 17

4.2.2.2 Mental Health Challenges During the Pandemic

Within the broader theme of mental health challenges during the pandemic, five sub-themes emerged: (1) feeling anxious, stressed, or uncertain; (2) frustration towards the lockdowns and staying at home; (3) missing out on daily routines, opportunities, and the typical adolescent experience; (4) low mood and poor self-esteem; and (5) other mental illnesses. These sub-themes are described below with the support of representative quotes.

4.2.2.2.1 Feeling Anxious, Stressed, or Uncertain

Many adolescents felt anxious, stressed, or worried during the pandemic. For some, these preexisting feelings of anxiety were exacerbated by the pandemic, while others described their anxiety as emerging from the pandemic. Several experienced high levels of stress during the pandemic, with some finding themselves overthinking more often, citing an absence of positive distractions. Though most responses in this theme broadly reference feelings of anxiety, a few adolescents mentioned seeking mental health treatment for anxiety during the pandemic.

- “Already had anxiety and [the pandemic] made me even worse and agoraphobia now rules my life...”*
Cisgender girl, 13
- “i never had anxiety before covid and now i have it from spending so much time alone at the beginning of the pandemic”*
Cisgender boy, 16
- “...I think too far ahead and I didn't do this before the pandemic”*
Cisgender girl, 14, Translated
- “It has affected me by making my anxiety way worse than it was before because i had been with myself for too long and couldnt [sic] disract [sic] myself from the anxiety”*
Cisgender girl, 15
- “The pandemic created anxiety in me. I have lived with generalized anxiety since the onset of covid 19. I am now medicated and I work hard on my mental health”*
Cisgender girl, 18, Translated

For many adolescents, the pandemic evoked feelings of uncertainty. While some had difficulty navigating rapid changes in pandemic mitigation rules and restrictions, many described the pandemic as bringing about feelings of uncertainty for their own future and, more broadly, the future of the world. Financial stressors played a role, as the economic effects of the pandemic were felt by adolescents. Several adolescents expressed that not being able to see an end to the pandemic caused stress in them. Similarly, some expressed concern that the world had fundamentally changed due to the pandemic, and that their lives would never return to normal.

“Too many restrictions.. Government always changes their decisions.. They makes us sick with stress..”

Cisgender boy, 15, Translated

“I feel much more stressed, sometimes I don't see the end and it depresses me I lose a little hope for the future”

Cisgender girl, 16, Translated

“because of the lockdown i have not been abke [sic] to work so i havn't [sic] been able to save money for my trip to Europr [sic] when i graduate so i'm kinda stressed”

Cisgender girl, 16

“It has made me a lot more uncertain about the future and society in general”

Cisgender boy, 15

“The thought that we were ‘locked up’ until who [...] knows when worries me”

Cisgender girl, 17

“feeling [sic] the world is not the world anymore after the pandemic”

Cisgender girl, 16

“It is stressful because i don't know if things will get better”

Cisgender girl, 13

Several respondents referenced growing concerns for their own health and safety as well as the health and safety of their loved ones during the pandemic. Many experienced fear of contracting COVID-19, with some specifying heightened feelings of this worry when around others. For some, their fear was extended to fear of infecting loved ones or their loved ones otherwise falling ill, and was heightened for those with elderly or immunocompromised family members. Adolescents concerned about their own health and that of others took caution during the pandemic, limiting their contact with others. The threat of the pandemic encouraged them to reflect on how fragile and important their health and the health of loved ones can be.

“Can't relax, worry [about] getting the COVID and got very sick like last time, takes me three weeks to get better!”

Cisgender girl, 16
"I'm scared to spread Covid to my parents and grandparents. I don't want to be sick either"

Cisgender girl, 14
"It has made me very worried and scared someone close to me or me could catch it and die"

Cisgender boy, 16
"... afraid of losing my mother who is immunocompromised"

Cisgender girl, 14, Translated
"I am more cautious of being around other people and more worried about my own health"

Cisgender boy, 15
"It made me aware of life. How easily you can get sick and even have complications. It has made me more careful now"

Cisgender girl, 17

4.2.2.2.2 Frustration Towards Lockdowns and Staying at Home

Many respondents described feelings of frustration and anger towards the pandemic, masking, and restrictions, with some directing this frustration toward the government for implementing pandemic restrictions. Many respondents felt trapped, locked up, or stuck at home, which weighed heavily on their mental health, with some describing that the restrictions made them feel like they no longer had control over their lives.

"...makes me angry, sad, and wish that COVID-19-19 [sic] had never happened because of the damage it has done"

Cisgender girl, 13

"A little stressed and fatigued with masks"

Cisgender boy, 14, Translated

"...restrictions making life unlivable"

Cisgender boy, 16, Translated

"it has been hard to see the world go crazy and people lose things important to them because leaders cointue [sic] to make really bad choices about covid"

Cisgender girl, 16

"Being stuck inside the house for the past 2 years made me feel suffocated..."

Cisgender girl, 15

"I felt the government had too much power over lives and told us what we could and couldn't do. I felt powerless during the time of the lock down"

Cisgender boy, 15

Several respondents felt bored during the pandemic and lockdowns. Some cited a lack of activities, being unable to spend time with friends, and being unable to leave the house as sources of their boredom, with some referencing the perceived effect of this

boredom on their mental health. Adolescents filled their time at home on devices, with some describing their usage reaching problematic levels.

“during quarantine, life got so boring so it had a negative impact on my mental health”

Cisgender boy, 16

“Being inside for so long and not being able to go any where [sic] or do anything wasn’t cool”

Cisgender boy, 14

“Not being able to get out makes me feel very depressed”

Cisgender boy, 16

“I have been by myself lots of time and bored. Doing lots of social media surfing”

Cisgender girl, 13

“I bacame [sic] more attached to the electronics. I spent many hours in front of my phone, tablet, computer...”

Cisgender girl, 16

Online learning was a source of frustration for many adolescents who experienced academic challenges, such as challenges with the adaptation in learning style, feeling overwhelmed with the workload, achieving poorer grades, and concern about falling behind in their education. Several respondents reported struggling with a lack of focus and motivation to do schoolwork. Adolescents who reported academic challenges with the online learning found these challenges to be highly distressing. Some struggled with the technological aspect of this transition, expressing concern over their increase in screen time and struggling with the use of video conferencing platforms for instruction. These challenges led some to feel left behind, believing that teachers and administrators did not understand the challenges they faced in the online learning environment.

“...hard to study and [have] discussions to reenforce [a] lesson”

Cisgender girl, 13

“...I constantly felt that there were so many assignments to complete and I wasnt [sic] taking breaks at all”

Cisgender girl, 16

“It’s been harder to focus on school. New ways of learning”

Cisgender girl, 13

“On line [sic] school was negative, lack of motivation to get work done...”

Cisgender boy, 15

“anxiety of dealing with school has been devastating to my mental health. I could see myself fail more each day simply because I could see my grade every day, and it kept going lower and lower”

Cisgender boy, 17

“...when we had school at home I felt more tired of always being on my Chromebook”

Cisgender girl, 14, Translated

“Having to go to zoom meetings everyday was really annoying...”

Cisgender girl, 16

“...it is a bit stressful doing virtual learning when the teacher forgets about me and doesn't understand the problems with virtual learning”

Cisgender girl, 15

“BEING STUCK AT HOME IN THE COUNTRY WITH HORRIBLE INTERNET WAS TERRIBLE FOR 1.5 YEARS. OUR SCHOOL BOARD AND THE MINISTRY OF EDUCATION DID LITTLE TO ADDRESS ISSUES THAT RURAL STUDENTS FACE. I WAS VIRTUALLY CUT-OFF FROM PARTICIPATING IN CLASS DISCUSSIONS”

Cisgender boy, 16

4.2.2.2.3 Missing Out on Daily Routines, Opportunities, and the Typical Adolescent Experience

Many adolescents described missing daily routines and extra-curricular which were halted due to pandemic restrictions. For some, there was a sense of missing out on their normal routines, while others mentioned specific aspects of their day-to-day routines that they missed. The most common missed activity was sports, especially team sports, leaving some concerned with the lasting impact of missing sports during this time.

“MY NORMAL HABITS AND ROUTINE ARE UP-SIDE-DOWN RIGHT NOW”

Cisgender boy, 17

“...it was a big thing to take in that you couldn't go to your school, friends [sic] homes or anywhere to do things like shopping, going to the movies, athletically [sic] games were out too!”

Cisgender girl, 13

“...I need to play sports to help me manage my stress and for my health, but it's boring to do individual sports like during the pandemic”

Cisgender girl, 16, Translated

“I'm an athlete and missed 2 years of sports and I feel sad about all the sports and events I missed. Now that sports are back, most girls have quit and there aren't enough athletes to form teams so I won't get to go back to it. It makes me sad and kind of mad about it..”

Cisgender girl, 17

While some reported missing out on specific milestones, such as vacations and graduations, many of these adolescents described a broader sense of missing out on the typical adolescent experience. Some felt like they had nothing to look forward to with these opportunities having been taken away and felt that their life was not lived to the fullest during this time. Others were concerned with the way missing opportunities due to the pandemic would prevent them from achieving their goals.

“it left some experiences unknown like graduating grade eight and not being able to travel or go anywhere for summer and winter holidays for the past two years”
Cisgender boy, 15

“...sometimes it prevents me from living a typical and normal adolescence...”
Cisgender girl, 17, Translated

“...there was nothing to look forward to like a holiday...”
Cisgender girl, 14

“I was not able to accomplish some of the things I was focused on like getting my life guarding award I couldn't get it because everything was closed and I want it to get a job”
Cisgender girl, 17

4.2.2.2.4 Low Mood and Poor Self-Esteem

Changes to the lives of adolescents during the pandemic left many feeling broken down. The pandemic weighed heavily on the minds of these adolescents, manifesting as feeling more distracted, losing the ability to focus, and struggling with a loss of motivation. Many described their mood during the pandemic as “depressed” or “sad.” Commonly cited reasons for feeling this way included missed social interactions and loss of daily routines. For those dealing with existing depression, the pandemic compounded these feelings. A few respondents mentioned seeking mental health treatment for depression during the pandemic.

“There was a hopeless feeling that Covid 19 brought into my life...”
Cisgender boy, 14

“Tire [sic] and draining”
Cisgender girl, 14

“...my focus is not always there”
Cisgender girl, 16

“At first I didn't want to do anything”
Cisgender boy, 15, Translated

“When we were stuck inside at home i [sic] got depressed and sad all the time. I missed seeing people”
Cisgender boy, 15

“DURING [sic] THE PANDEMIC I FELT DOWN AND DEPRESSED ALL THE TIME WITH NOT BEING ABLE TO SEE MY FRIENDS, GO TO SCHOOL OR DO MY REGULAR ACTIVITIES...”
Cisgender boy, 17

“i was dealig [sic] with depreeession [sic]... beforre [sic] covid, when covid came it confined me to the house, my mental issues became much worse”
Cisgender girl, 16

“I became really depressed during the height of the pandemic. I had a hard time getting up in the morning... My parnts [sic] helped me and got me some help...”
Cisgender girl, 15

A few adolescents described struggling with negative self-image during the pandemic. Some reported negative self-image in relation to body changes and challenges with remaining physically active amid pandemic restrictions. Others respondents reported feeling more self-critical, with one attributing their rise in self-criticism during the pandemic to an absence of other distractions.

“Gained weight. Lost self confidence”

Cisgender girl, 14

“...not getting gym time made me self conscious”

Cisgender girl, 16

“...I’ve also become a lot more critical of myself...”

Cisgender girl, 17

“...it has given me too much time to sit and think about how much i really don't like myself”

Cisgender girl, 16

4.2.2.2.5 Other Mental Illnesses

Few respondents referred to mental illnesses that they experienced during the pandemic aside from anxiety and depression. Some reported developing an eating disorder during the pandemic – namely, anorexia and bulimia. One respondent commented that while the beginnings of their eating disorder may have been present in them before the pandemic, they felt that the pandemic may have been the aggravating factor in bringing this illness upon them. Few respondents shared that they had experienced thoughts of suicide or attempted suicide during the pandemic.

“I was struggling with eating before Covid. But during Covid I developed full blown anorexia and had to be hospitalized for 7 weeks. I am doing better now and am in good recovery but I will deal with this illness for the rest of my life in some way. Being out of school with nothing to do led me to overexercise and diet. But I also know that eating disorders are genetic so maybe this would have happened anyway”

Cisgender girl, 15

“For more than a year I lived in a suicidal crisis and I had [to](#) see a psychiatrist twice for a total of three weeks, plus a follow-up of several months outpatient at the hospital and other therapies, etc”

Cisgender girl, 15, Translated

4.2.3 Changes to Relationships, Mental Health, and Well-Being at the Later Stages of the Pandemic

The third and final category of responses details the other changes to relationships as well as mental health and well-being that adolescents reported experiencing at the later stage of the pandemic, as more severe lockdown restrictions (e.g., online learning, closing of non-essential businesses) were lifted. This category includes the following two themes: (1) changes to relationships and social connection at the later stages of the pandemic; and (2) changes to mental well-being at the later stages of the pandemic. These themes are described in the section below and illustrated with representative quotes.

4.2.3.1 Changes to Relationships and Social Connection at the Later Stages of the Pandemic

Two sub-themes were identified within the main theme of changes to relationships and social connection at the later stages of the pandemic: (1) relationships recovering and improving; and (2) difficulty adapting to the return to in-person interactions. These themes are described below and are presented with illustrative quotes.

4.2.3.1.1 Relationships Recovering and Improving

Despite the challenges to relationships faced by adolescents during the earlier stages of the pandemic, as restrictions were lifted and in-person social interactions with friends and loved ones become more frequent, adolescents were spending more time together, reconnecting, and becoming close again.

"...it was so good [to come] back together!"

Cisgender girl, 15

"There has been positive changes with my friends and family because now that we are able to see each other again we are spending more time together"

Cisgender girl, 15

"At first with [sic] my friends it distanced us, but now we are closer than ever"

Cisgender girl, 16

4.2.3.1.2 Difficulty Adapting to the Return to In-Person Interactions

Many struggled with the return to in-person interactions after the lifting of severe pandemic restrictions. Adolescents frequently reported feeling more anxious or hesitant to be in crowds or in public spaces after having been out of public settings for so long due to pandemic restrictions. Some felt more introverted, reserved, or shy, finding it challenging to socialize with others in-person. Furthermore, some experienced new or worsening social anxiety.

“I'm a lot more nervous to be around crowds. Going to the mall isn't as enjoyable as it used to be. I went to watch a movie in the theatre and was very uncomfortable”

Cisgender girl, 14

“Due to the pandemic, I've been rather, more closed off with others. I started disliking going out in public (ex.: restaurants, shopping in person, the beach), and I like to stay in my house doing my own things”

Cisgender girl, 14

“I have become a little more reclusive from others (distancing), I have a lot of trouble with the return to normal life”

Cisgender girl, 15, Translated

“Its [sic] hard to connect with people after not seeing them for 2 years”

Cisgender girl, 16

“...afterwards I had issues with social anxiety for a couple months”

Cisgender girl, 17

4.2.3.2 Changes to Mental Health and Well-Being at the Later Stages of the Pandemic

Within the final theme of changes to mental health and well-being at the later stages of the pandemic emerged the following two sub-themes: (1) Mental health and well-being recovering and improving; and (2) Difficulty adapting to the change in routine, activities, and setting. These sub-themes are described below with the support of representative quotes.

4.2.3.2.1 Mental Health and Well-Being Recovering and Improving

Many adolescents reported that, although their mental health and well-being were negatively impacted by the pandemic, they have seen some improvement after the lifting of severe restrictions. While some attributed this improvement in their mental health and

well-being to the transition back to in person learning, others attributed it to being able to interact with others in person again.

“[The pandemic] caused a short term effect on the mental health but it has improved because of the pandemic situation is getting better”

Cisgender boy, 15

“My mental health deteriorated with online learning. Its [sic] improving now that i am back in the classroom”

Cisgender girl, 17

“Being kept from family and friends was a huge drain. I'm glad that's over (knock on wood)”

Cisgender boy, 17

“At first I fell into depression (diagnosed) but now I am happier than EVER”

Cisgender girl, 16, Translated

“I am happier being able to be around people again”

Cisgender boy, 14

For some, fear of contracting COVID-19 and other stressors were having less of an impact on their mental health and contributing less strain to their relationships at the later stages of the pandemic. Some of these adolescents are transitioning out of the restrictions with a greater sense of appreciation for simple pleasures they missed during the lockdowns.

“...we were a little afraid of catching the Covid. But now it's okay and with the vaccine I'm not afraid to have it...”

Cisgender boy, 15

“Given me stress that ended eventually”

Cisgender boy, 15

“There were tensions in the home. Now its [sic] better, I can escape more”

Cisgender boy, 17

“i am able to appreciate a lot of things that i took for granted before. Just being able to go outside and get fresh air is a blessing after the long months of covid lockdown”

Cisgender boy, 16

4.2.3.2.2 Difficulty Adapting to the Change in Routine, Activities, and Setting

A few adolescents highlighted the challenges they experienced in the transition back to routines, activities, and settings that had been disrupted due to pandemic restrictions, finding this transition overwhelming and anxiety-inducing.

“I find it difficult to get into routines and to manage my time with all of the activities now available to me”

Cisgender girl, 17

“I am nervous about going back into the world”

Cisgender girl, 17

A major concern for those struggling with the change in routine after the lifting of restrictions was the return to in person learning. Some found that the change in routine was what made this transition difficult, while others cited a preference for online learning. The return to in-person instruction highlighted for some how much they missed during online learning, with pandemic-related changes to in-person instruction compounding the difficulty of catching up. While some adolescents struggled with the return to in person instruction because it meant being in close proximity with others, others struggled with the presence of COVID-19 restrictions at their school.

“Found [it] harder to get back into the swing of school”

Cisgender boy, 16

“I started to do well being isolated at home so the return to face-to-face was difficult. I could concentrate more at homeschool”

Non-binary/genderfluid respondent, 14, Translated

“...when schools reopened, they made these modified schedules with double periods (2.5 hours) and half the school in-person and the other half joining online. I realized how behind I was in my learning and the alternating/hybrid model they created wasn't helping”

Cisgender girl, 17

“Don't want to go to school and be around people”

Cisgender girl, 13

“Going back to school with mask mandates and distance protocols was mean”

Cisgender girl, 15

“I have to be very careful for not getting COVID from the school. Teachers and students don't wear masks. No evidence shows without masks is safe. Mislaeding [sic] by the provincial government”

Cisgender boy, 14

Chapter 5

5 Discussion

The overarching goal of this study was to examine the relationship between social connectedness and mental health and well-being among Canadian adolescents during the late stages of the COVID-19 pandemic. This goal was addressed through the investigation of three objectives: (1) to compare the effects of online and offline social connectedness on dual-factor mental health; (2) to explore the potential moderating role of the SDoH in this relationship; and (3) to describe the pandemic-related changes to adolescents' relationships as well as mental health and well-being. This chapter discusses and integrates the findings of both the quantitative and qualitative analyses investigating the role of social connectedness on adolescent mental health and well-being during the late stages of the COVID-19 pandemic. This chapter concludes by highlighting the strengths and limitations of the present thesis, as well as its implications and opportunities for future investigation.

5.1 Summary and Integration of Results

5.1.1 Impact of Social Connectedness on Dual-Factor Mental Health

Most adolescents in the study sample reported feeling socially connected, both in the online (63.2%) and offline (74.2%) setting. By way of comparison, the initial validation of the Social Connectedness Scale – Revised in College students found 85% of the sample reported feeling socially connected (R. M. Lee et al., 2001). However, this distribution was based on the full scale, without disentangling online and offline social connectedness. A prior thesis (Holmes, 2021) studying Ontario university students which used an adaptation of the Facebook Social Connectedness scale (Grieve et al., 2013) for online social connectedness, and the Social Connectedness Scale – Revised (R. M. Lee et al., 2001) for offline social connectedness, found a high degree of social connectedness in the sample, with social connectedness higher in the offline than online setting, (Holmes, 2021) which is consistent with the findings of the present thesis.

Most adolescents in the present study belonged to the complete mental health (80.0%) group, followed by the vulnerable (7.7%), symptomatic but content (7.4%), and troubled (4.9%) groups. The distribution across the four dual-factor mental health groups are difficult to compare between studies, as such distributions rely not only on the characteristics of the sample, but the scales and cut-points used to define the categories (Iasiello et al., 2020). Despite the heterogeneity between studies in the manner in which group membership was defined, the general trend is that the complete mental health group is the largest, typically comprising ~60% of the sample in other studies, ranging from 57% to 65% (Furlong et al., 2017; Lyons et al., 2012; McMahan, 2012; Suldo et al., 2016; Xiong et al., 2017). Distributions in the other groups are also variable: vulnerable (7% to 20%), symptomatic but content (7.8% to 13%), troubled (10% to 20%) (Furlong et al., 2017; Lyons et al., 2012; McMahan, 2012; Suldo et al., 2016; Xiong et al., 2017). However, as was the case in the present thesis, the vulnerable and symptomatic but content groups often have similar frequencies (Lyons et al., 2012; McMahan, 2012; Suldo et al., 2016; Suldo & Shaffer, 2008). The relatively large proportion of study participants belonging to the complete mental health group in the present study may be explained by the choice of scale for measuring psychopathology, which has a cut-off score of 13 for screening of probable mental illness, which included approximately 12.3% of the sample. Previous validation studies in United States general population of adults found this cut-off to represent 6% of the population (Kessler et al., 1996), and a previous validation involving Canadian adolescents reported that 95% of females and 99% of males would score below this cut-off, with the non-gender stratified distribution putting the 95th percentile at a score of 11, and the 99th percentile at a score of 16 (Ferro, 2019). The cut-off of 6-13% of the population meeting the criteria for the presence of psychopathology is in stark contrast to the manner in which Suldo & Schaffer, defined psychopathology in their seminal paper on the dual-factor model, which used a t-score of 60 on scales measuring internalizing and externalizing symptoms (2008). Suldo & Schaffer also used cut-offs for their subjective well-being scale set at the 30th percentile which placed 30% of the sample in the low mental well-being groups, and 70% in the average-to-high mental well-being groups (2008). This is in contrast to the cut-offs applied to the SWEMWBS in the current study, which places the low mental well-being

group at below the mean minus one standard deviation (~15% according to the Central Limit Theorem) and the remainder of participants (~85%) in the average-to-high mental well-being groups (Ng Fat et al., 2017). The present thesis' finding that most of our sample were in the complete mental health group aligns with findings from the qualitative analysis, which suggested that many adolescents were experiencing improved mental health and well-being at the later stages of the pandemic as restrictions were being lifted.

This thesis found that feeling socially disconnected was associated with poorer mental health and well-being among Canadian adolescents at the late stages of the COVID-19 pandemic. The effects of feeling socially disconnected offline were stronger than the effects of feeling socially disconnected online. These results suggest that while both facets of social connectedness were important contributors to adolescent mental health and well-being at the late stages of the COVID-19 pandemic, offline social connectedness was more impactful. These findings are unsurprising considering the qualitative analysis, where adolescents reported that staying connected with and becoming closer to loved ones had a positive effect on their mental health and well-being. Missed in-person interactions were a primary contributor to poor mental health and well-being, and some adolescents pointed to the ways in which online connections were a poor surrogate for missed in-person interactions, fostering feelings of disconnection rather than protecting against those feelings. Previous qualitative research has highlighted the inadequacy of online interactions in replacing missed in-person interactions (Parent et al., 2021) and emphasized the importance of in-person interactions for maintaining a sense of social connection during the pandemic (Nelson Ferguson et al., 2021).

The present thesis found that older age was associated with dual-factor mental health status, where 15-to-16-year-olds demonstrated poorer mental health and well-being than 13-to-14-year-olds. These results suggest that older adolescents struggled the most with respect to mental health during the pandemic, and are in line with previous research which has suggested that older adolescents reported higher stress indicators, more signs of negative affect (Schwartz et al., 2021), depressive symptoms, and lower life satisfaction (Morales-Vives et al., 2023). This decline in mental health and well-being with age is a typical developmental pattern, as the onset of adult mental disorders

typically begins during the early neurodevelopmental phases of life and peak in mid-to-late adolescence (Solmi et al., 2022).

Another factor associated with dual-factor mental health was gender, where cisgender girls and gender-diverse adolescents each demonstrated poorer dual-factor mental health than cisgender boys. These results are unsurprising, as prior COVID-19-era research has indicated that girls (Campione-Barr et al., 2021; Espinoza & Hernandez, 2022; Liu et al., 2022; Magson et al., 2021; Mitchell et al., 2021; Peterle et al., 2022; Romm et al., 2021) and gender minority (Mitchell et al., 2021; S. R. Scott et al., 2020) adolescents demonstrated poorer mental health and well-being than boys.

The final correlate was mode of school instruction, where adolescents learning in the hybrid setting were at a higher odds of belonging to a poorer dual-factor mental health group than those learning in-person at school. It is surprising that adolescents who were remote learning were not at significantly greater odds of belonging to a poorer dual-factor mental health group than those attending school in-person. Prior reports have indicated that adolescents attending school in the virtual format tend to have poorer mental health and social connectedness than those attending school in-person. Indeed, in one report, attending school in-person was associated with lower levels of anxiety and depressive symptoms, as well as stronger levels of social connection and inclusion and less problematic social media use compared to those who attended school online (Cingel et al., 2022). Tsujimoto and colleagues (2022) reported analogous findings comparing the hybrid to virtual format, where adolescents who attended school virtually displayed more depressive and anxiety symptoms than those who attended school in the hybrid format. Taken together, these findings suggest one may expect students attending school in person to fare the best with regard to their mental health, followed by those attending school in the hybrid format, then those attending school virtually. However, it is important to note that at the later stages of the pandemic, many school boards across Canada were offering students the choice of attending school in-person or virtually, suggesting adolescents who continued to attend school virtually may have done so by choice (Slugoski, 2021). Indeed, in the qualitative section of the present thesis, many participants indicated a preference for virtual learning. This may explain why attending

school virtually was not significantly associated with poorer dual-factor mental health than attending school in-person.

5.1.2 SDoH as Moderators in the Relationship Between Social Connectedness and Mental Health

The exploratory analyses examining the potential moderating role of the SDoH in the relationship between social connectedness and dual-factor mental health were largely underpowered. However, there was some evidence to suggest that the SDoH may moderate this relationship.

The association between online social connectedness and dual-factor mental health group membership was stronger among 17-to-18-year-olds than 15-to-16-year-olds, and non-significant among 13-to-14-year-olds. Effects of offline social connectedness did not vary across age groups. These findings suggest that online social connectedness was most impactful on the mental health and well-being of older adolescents, but offline connectedness remains an equally important factor for all age groups. Prior evidence suggests that, compared to younger adolescents, older adolescents spent more time on social media during the pandemic (Boursier et al., 2023) which may explain why social connectedness via social media was such an important factor for older adolescents, and less important to younger adolescents. Further research is needed to compare the effects of online and offline social connectedness on mental health and well-being across age groups of adolescents during the pandemic.

The strength of the association between online social connectedness and dual-factor mental health was strongest among gender-diverse adolescents, followed by cisgender boys, then cisgender girls. This trend was somewhat reversed for offline social connectedness, where the association was stronger among cisgender girls than cisgender boys, and became non-significant among gender-diverse adolescents. These results suggest that online social connectedness may be more impactful among gender-diverse adolescents and cisgender boys, whereas offline connections appear more impactful to cisgender girls. Prior research suggests that social connectedness in the online setting may be of particular importance to gender-diverse adolescents, as this group is more likely to provide and seek social support over social media compared to cisgender

adolescents (Bailey et al., 2022). There has been little prior investigation into gender differences in the effects of social connectedness on adolescent mental health and well-being. Despite girls using social media during the pandemic more than boys (Bailey et al., 2022; Buzzi et al., 2020; Halldorsdottir et al., 2021), girls have reported more negative online experiences than boys (Magis-Weinberg et al., 2021). This may explain the findings of the present thesis that suggests the mental health and well-being of cisgender girls is more dependent on offline connections compared to other genders.

Another potential moderator was ethno-racial group. The association between online social connectedness and dual-factor mental health was strongest among adolescents belonging to the Black group, followed by Multi-Racial/Other, White, and South Asian groups. For offline social connectedness, the strongest association was among Black groups followed by White adolescents, those belonging to the Multi-Racial/Other group, East or South East Asian adolescents, and weakest among South Asian adolescents. In the literature, White adolescents tended to fare better than adolescents of other races in terms of their social connectedness (Jones et al., 2022; Rogers et al., 2021) including feeling virtually connected to others (Jones et al., 2022). Research regarding racial/ethnic differences in mental health and well-being is less consistent, with conflicting reports indicating no effect of race/ethnicity on perceived worsened mood or increased anxiety since the onset of the pandemic (Tetreault et al., 2021), and other reports suggesting White adolescents had decreases in wellness scores with the onset of the pandemic (Ezeoke et al., 2022) and more depressive symptoms (compared to Asian Americans) (Espinoza & Hernandez, 2022). Furthermore, other studies have indicated that Black/African American adolescents had steeper increases in depression symptoms than other races with the onset of and through the pandemic, (Liu et al., 2022) but increases in wellness with the onset of the pandemic (Ezeoke et al., 2022). Further research is needed to comment on the potential moderating role of race/ethnicity in the relationship between social connectedness and mental health and well-being.

Another potential moderator was parent/guardian education level, although the findings do not generate a clear trend in the strength of association according to parent/guardian education. However, it appears that among the adolescents whose

parent(s)/guardian(s)'s education level was the lowest, the association between online social connectedness and dual-factor mental health was the strongest. However, there was somewhat of a reversal in the trend for offline social connectedness, where the strongest effect was observed among adolescents with university-educated parent(s)/guardian(s). One potential explanation for this trend is that, compared to adolescents from socioeconomically privileged backgrounds, parents from working class backgrounds tend to be less involved in regulating their teens' internet use (Micheli, 2015). As a result, adolescents from privileged backgrounds make sense of the internet "vertically" characterized by a high level of parental involvement in their internet use, and adolescents from less advantaged backgrounds engage more "horizontally" characterized by greater influence by their peers than their parents in the way they engage with the internet (Micheli, 2015). These less advantaged adolescents thereby see the internet as an "adult-free" world, organized by peers and not dictated by adults (Lareau, 2003, as cited in Micheli, 2015), therefore having more opportunities to experiment with social media (Micheli, 2015). Hence they may have become more reliant on it as a means of staying socially connected and maintaining a sense of mental health and well-being. Some have theorized that time spent online may displace in-person social interaction (Kushlev & Leitao, 2020). A potential explanation for the reversal of trend for offline social connectedness is that because socioeconomically advantaged adolescents have less opportunities to experiment with social media than their disadvantaged peers, and their internet use is more structured and closely regulated by their parents (Micheli, 2015) they place less importance on online interactions on their mental health and well-being, and their in-person interactions are not displaced by time spent online. This theory is somewhat contradicted when considering parent/guardian employment status as a surrogate SES measure, as the association between online social connectedness and dual-factor mental health was only significant for adolescents whose parent(s)/guardian(s)'s highest level of employment was full-time or self-employed, and the ORs were homogenous for offline social connectedness. Further investigation is needed into the potential role of socioeconomic status as a moderator in the relationship between social connectedness and adolescent mental health and well-being.

The final potential moderator identified in this thesis was community type, where the association between online social connectedness and dual-factor mental health was significant among urban-dwelling adolescents and non-significant among rural-dwelling adolescents. This trend was reversed for offline social connectedness, where the strength of the association was greater among rural- than urban-dwelling adolescents. These findings suggest that offline connections were more impactful for rural-dwelling adolescents than urban dwelling adolescents, but online social connections were more impactful among urban- than rural-dwelling adolescents. Prior literature indicates that urban-dwelling adolescents experienced greater likelihood of feeling socially disconnected (Parent et al., 2021) and a more pronounced decline in positive affect with the onset of the pandemic (Rogers et al., 2021). This is consistent with the pandemic-disrupted role described by Mouratidis (2021) of the urban environment in promoting social connectedness. However, the moderating role of community type in the relationship between social connectedness and adolescent mental health and well-being during the COVID-19 pandemic merits future investigation.

5.1.3 Qualitative Description of Canadian Adolescents' Experiences with COVID-19 Pandemic-Related Changes to Relationships as Well as Mental Health and Well-Being

This thesis aimed to understand the effects of the COVID-19 pandemic on the relationships as well as mental health and well-being of adolescents through a qualitative exploration of responses to two open-ended survey questions. Respondents described the pandemic-related negative and positive changes they observed in these domains.

In this thesis, many adolescents reported becoming closer in their relationships, as lockdowns allowed for more time to be spent together. They described putting more effort into their relationships, having more meaningful conversations, and providing or receiving support, which facilitated a sense of closeness, even with non-residential loved ones. Prior literature supports this finding (Nelson Ferguson et al., 2021), especially with regard to relationships with family (Parent et al., 2021; [Evans et al., 2020; Gadermann et al., 2021; Patra et al., 2020; Rogers et al., 2021, as cited in Samji et al., 2022]). Parent and colleagues (2021) described similar findings to the present thesis relating to making an effort to maintain relationships and having more meaningful interactions during the

pandemic, stating participants “described putting more effort (e.g., initiating conversations, consistently checking in with friends) into their closest relationships, which translated into deeper, more meaningful interactions” (p. 755).

The inability to meet in-person drove many adolescents in the present thesis to use technology to stay connected, allowing some to feel more connected than they had prior to the pandemic. This finding is in agreement with previous reports which have suggested that technology facilitated social connectivity among some adolescents during the pandemic (Liang et al., 2023; Nelson Ferguson et al., 2021; Parent et al., 2021). An interview-based qualitative study of American adolescents found approximately one quarter of participants described technology as facilitating communication during the pandemic, citing it made it less intimidating to approach people, easier to connect with others around the world, and that their emotions could “be more accurately represented through GIFs, videos, and emojis than words”, and could allow them “to act more like their true selves without fear of judgement from others” (Liang et al., 2023, p. 5).

Some adolescents in this study gained a renewed appreciation for their relationships and in-person interactions, while for others, the pandemic revealed who their true friends were and encouraged them to become more selective of their relationships. Adolescents gaining a greater sense of appreciation for their relationships and in-person interactions is a finding in alignment with those of an interview-based qualitative research study by Goldstein and Flicker (2022). This finding of reflection on friendships, realizing who one’s true friendships and becoming more selective of them is also supported by prior qualitative research (Goldstein & Flicker, 2022; Liang et al., 2023; Montreuil et al., 2022). In this thesis, the shift to online learning allowed some to escape challenging social environments and bullying at school. This finding is corroborated by the findings of qualitative study from the United Kingdom reported that some adolescents were relieved to be away from bullying and challenging social dynamics at school during the shift to online learning (Widnall et al., 2022).

For some, the pandemic and transition to online learning provided a break from daily routines, allowing them to decompress. Staying at home meant these adolescents had more time for activities they enjoy. Some responded by adopting a more positive outlook on their lives, becoming more resilient, or undergoing introspection and self-

improvement. These positive changes echo findings of the prior QuaranTEENing pilot study, where adolescents reported feeling more at ease with less stress and pressure, described self-reflection, growth and care, identified that the pandemic allowed adolescents more time for themselves, and that leisure and health-promoting activities such as physical activity, being outside, video games, cooking or baking, arts, reading, and television as positive coping strategies (Nelson Ferguson et al., 2021).

The loss of connection observed in the findings of the present thesis manifested as losing touch or closeness with loved ones, missing being around others, leaving many feeling isolated or lonely. This finding is consistent with previous reports which have indicated that loneliness was on the rise among adolescents during the pandemic (Liu et al., 2022), with adolescents feeling disconnected from their loved ones (Nelson Ferguson et al., 2021), and mourning the loss of in-person interactions (Rogers et al., 2021). This is concerning, as loneliness has been associated with higher depressive symptoms among adolescents both prior to (Liu et al., 2022) and during the pandemic (Liu et al., 2022; Murata et al., 2020), along with suicidal ideation during the pandemic (Murata et al., 2020).

Several participants experienced a rise in tension and division, as time spent with family took a toll on their privacy and personal space. Prior reports have indicated that changes in family relationships are highly dependent on the familial context. While for some more time spent together fostered a greater sense of connection to family members (Ellis et al., 2020; Parent et al., 2021; [Evans et al., 2020; Gadermann et al., 2021; Patra et al., 2020; Rogers et al., 2021, as cited in Samji et al., 2022]), others saw increased conflict among family members during the pandemic (Ravens-Sieberer et al., 2021; Rogers et al., 2021; [Ademhan Tural et al., 2020; Dong et al., 2020; Jiao et al., 2020; Pinar Senkalfa et al., 2020; Zhang et al., 2020; Ellis et al., 2020, as cited in Theberath et al., 2022]), with some citing an increase in time spent with family as a source of conflict (Rogers et al., 2021).

For others in this study, conflicting views on the pandemic were a source of division. Few studies have reported on how adolescent peer relationships were impacted by differing views on the pandemic (Rimel et al., 2023). An interview-based qualitative study of United Kingdom adolescents reported different views on the pandemic

“...between friends led to arguments over what was acceptable or not when following the social distancing rules” (McKinlay et al., 2022, p. 6). The findings of this thesis, along with those of McKinlay (2022), suggest that studying the ways in which adolescent relationships were impacted by differing views on the pandemic, especially lasting impacts at the later stages, is an interesting avenue for future research, especially in light of the presence of anti-vax sentiment, conspiracies, and misinformation among some adolescents during the pandemic (McKinnon et al., 2023).

In addition, for some of the adolescents in this thesis, the pandemic compounded existing challenges in making new friendships, namely the transition to high school. This transition coincides with the transition from the juvenile phase (i.e., before puberty) to the adolescent phase (i.e., post-puberty), where peer relationships gain greater importance (Nelson et al., 2016), making such challenges particularly concerning.

For some adolescents in this study, technology was an inadequate substitute for missed in-person social interactions, with online communication fostering disconnection, rather than protecting against it. Several reports have also described the ways in which adolescents found technology to be an inadequate surrogate for missed in-person interactions during the pandemic. In the literature, adolescents found online interactions to be lacking in intimacy (Liang et al., 2023; Parent et al., 2021). An interview-based qualitative study of American adolescents reported that participants described that being unable to see one's peers made it harder to interpret their peers' feelings, tone and intentions through text message (Liang et al., 2023). Similarly, a sample of British Columbia adolescents found online interactions to be more effortful and less beneficial to their mental health and well-being (Parent et al., 2021).

For many adolescents in this thesis, the pandemic evoked feelings of anxiety, stress, and uncertainty. This finding is consistent with prior studies which have found a rise in anxiety symptoms among adolescents during the pandemic (Samji et al., 2022). Some adolescents in this study had fears of contracting or spreading the virus to loved ones, whereas others were concerned about the implications of the pandemic on their future and the state of the world. The sentiment of being fearful of contracting or spreading the virus to loved ones (Hébert et al., 2022; Nelson Ferguson et al., 2021; S. R. Scott et al., 2020) and being concerned about the implications of the pandemic on their

future (Li et al., 2021; McKinlay et al., 2022; Nelson Ferguson et al., 2021; S. R. Scott et al., 2020) is corroborated by findings of prior qualitative research. Restrictions caused some participants to feel “locked up” and like they no longer had control over their lives. This sense of feeling “trapped” was a common finding among adolescents in the COVID-19 literature (McKinlay et al., 2022; Nelson Ferguson et al., 2021). Many adolescents in the current study felt bored during the pandemic, being unable to spend time with their friends or get out of the house, with this having a negative impact on their mental health. Feeling bored and needing to get out was a commonly reported challenge among adolescents during the pandemic (McKinlay et al., 2022; Rogers et al., 2021; S. Scott et al., 2021). Some adolescents in this study experienced feelings of anger and frustration with the pandemic and the way restrictions were impacting their lives. This sentiment has been echoed by United Kingdom adolescents (S. Scott et al., 2021). Online learning was frustrating for many participants, who experienced academic challenges and felt left behind. Academic challenges, struggling with the workload (Luthar et al., 2021; McKinlay et al., 2022; Nandlall et al., 2022; S. R. Scott et al., 2020), time management and difficulty staying motivated (McKinlay et al., 2022; Nandlall et al., 2022; S. R. Scott et al., 2020) were all challenges frequently reported in the literature. Several adolescents from the current sample missed their daily routines, extra-curricular activities, milestones, and more broadly, the “typical” adolescent experience. Missing out on such experiences was commonly cited in the qualitative literature as contributing to poor adolescent mental health (McKinlay et al., 2022; Nelson Ferguson et al., 2021; Rogers et al., 2021; S. Scott et al., 2021). The pandemic weighed heavily on the minds of the participants in the current study, manifesting as feeling more distracted, a loss of motivation, and feeling depressed or sad. For those with pre-existing depression, the pandemic compounded these feelings. This is consistent with prior reports that the pandemic led to an increase in depressive symptoms among adolescents (Samji et al., 2022).

Several adolescents in this thesis mentioned that while their relationships, mental health, and well-being struggled during the early pandemic, they saw an improvement as restrictions were lifted and in-person interactions became more frequent. This finding highlights the way in which the adolescents saw the pandemic and restrictions as

responsible for negative changes to their relationships as well as mental health and well-being, as when restrictions were lifted, they noticed improvements in these areas. Fear of contracting COVID-19 and other stressors had less of an impact at the later stages. However, many struggled with the return to in-person interactions, feeling more introverted or experiencing social anxiety. A few highlighted the challenges they experienced in transitioning back to routines, activities, and settings that were disrupted by pandemic restrictions. This hesitancy to re-integrate into the social world after the easing of restrictions echo results from a qualitative analysis of interviews by McKinlay and colleagues of United Kingdom adolescents and young adults, where “[adolescents] said they felt apprehensive about future social situations from not having been exposed to ‘real life’ and becoming accustomed to life in lockdown” (2022, p. 7).

5.2 Strengths

This thesis has several strengths. The primary strength is the convergent parallel mixed methods approach, which integrated open-ended survey question responses with the quantitative analysis. This allowed a greater detail of investigation than either the quantitative or qualitative analyses would have allowed for on their own.

The majority of primary studies on the relationship between social connectedness and mental health and well-being among adolescents are set during the acute period of the pandemic. This study is one of few that is able to point to both the effects of the pandemic at the late stages (through the quantitative analyses) and describe change over time (in the qualitative analysis). The setting of this study at the late stages of the pandemic is important, as there exists concerns in the scientific community regarding the potential lasting effects of the pandemic (Solmi et al., 2022). Indeed, the qualitative analysis pointed to improvement and recovery of relationships, mental health, and well-being for some adolescents. However, this study also found that some adolescents were struggling with the return to in-person social interaction and to adapt to a “new normal” in terms of their daily routines.

In contrast to studies done during the acute stages of the pandemic, where mode of school instruction was uniformly remote, at the later stages of the pandemic, the mode of school instruction was more varied. The sample of the present study represents

adolescents who attended school remotely, used hybrid instruction, or attended school virtually. This was in part due to the heterogeneity of restrictions across provinces, but also points to the unique setting of the late stage of the pandemic, where adolescents were attending school in a variety of ways. The model in the main analysis controlled for mode of school instruction, which represented an important confounding variable in the relationship between social connectedness and mental health and well-being.

Although many previous studies focused on frequency or type of social media use, there has been little examination of the sense of social connectedness generated from social media. As Grieve and colleagues (2013) identified, online (Facebook) social connectedness is a separate construct from offline social connectedness, and effects of social media on mental health and well-being may vary according to the manner of use (Verduyn et al., 2017). This necessitates the specification for social connectedness *derived from* social media when studying the effects of social media use on mental health, and is a key strength of this thesis' approach.

The incorporation of the dual-factor model of mental health is another important strength of this study. The existing literature has focused predominantly on the effects of the pandemic on adolescent mental ill health (i.e., psychopathology, psychological distress), and less attention has been paid to positive mental health outcomes, let alone combining these two constructs to capture a complete picture of the mental health impacts of the COVID-19 pandemic. Because social connectedness has been tied to both protecting against mental ill health (Wickramaratne et al., 2022) and promoting mental well-being (Jose et al., 2012), it was important to incorporate both of these constructs under the well-supported dual-factor model (Iasiello et al., 2020) to be able to fully compare the effects of online and offline social connectedness at the late stages of the pandemic.

Finally, the exploratory analysis of the moderating role of the SDoH in the relationship between social connectedness and adolescent mental health and well-being during the pandemic was unique. Though there exists a sizeable body of evidence on the effects of these determinants on both social connectedness and mental health and mental well-being, data sparsity has often precluded moderation analyses. Though the analysis presented in this thesis was underpowered to detect significant moderation effects, the

results of this hypothesis-generating analysis will hopefully encourage future investigation in adequately powered samples.

5.3 Limitations

There are several limitations to this study which must be considered when interpreting the findings. The primary limitation is that this study was based on cross-sectional data. Like all cross-sectional studies, temporality cannot be established. The findings of this thesis are therefore unable to determine whether feeling socially disconnected led to poorer mental health and well-being, or if poorer mental health and well-being led the adolescent to become socially disconnected. However, prior research supports the assumption that social connectedness predicts mental well-being, coming first in the causal pathway, and not vice versa (Jose et al., 2012). The cross-sectional nature of the study also limits one from commenting on pandemic-related changes in either social connectedness or mental health and well-being in the quantitative analysis, however the qualitative section was able to provide insight into this.

The second set of limitations to be addressed pertain to the nature of online survey data. Firstly, participants were recruited as a convenience sample, which results in a sample that does not necessarily reflect the characteristics of the general population of Canadian adolescents. Further complicating this was the fact that the survey was sent to parents of adolescents rather than the adolescents themselves, meaning certain demographic groups could not be targeted during recruitment to ensure a representative sample. Furthermore, because the survey is sent to adults, the investigator must assume that they have children and allowed the children to fill out the survey independently, without the adults influencing the child's choices, or the adult filling out the survey on behalf of the child. Those who agreed to participate may have stronger reactions to the COVID pandemic compared to those that did not complete the survey. Likewise, adolescents on the extreme end of mental suffering may not be represented due to inability to make it through the survey due to their mental ill-health. Finally, despite recruiting participants from a reputable panel-polling company, the data cleaning procedure, and the data quality concerns sensitivity analysis, it is possible some

fraudulent or duplicate responses may have remained in the final data set by evading these checks.

There are also several limitations relating to the measurement of social connectedness. First, the survey did not include a question asking whether the adolescent used social media prior to administering the online social connectedness scale. However, in 2018, 92% of Canadian adolescents aged 15-to-19-years reported regularly using social media (Schimmele et al., 2021). Though the vast majority of adolescents do use social media, it is possible that some adolescents may have skipped this scale or answered hypothetically if they did not use social media. Because there was no way to identify why a participant may have skipped items, or if a participant answered hypothetically, all participants were analyzed as if they used social media. The survey also did not formally distinguish between *active* and *passive* use of social media, which are known to have differential impacts on mental health and well-being (Verduyn et al., 2017). Though the full (20-item) Social Connectedness Scale – Revised was validated in college students (R. M. Lee et al., 2001), it has not been formally validated for use with adolescents. Similar concerns are present for the scale measuring online social connectedness, which was adapted from the Facebook Social Connectedness scale (Grieve et al., 2013). As presented on the survey, both the online and offline social connectedness scales initially had 10 items. However, the item “*I don’t feel I participate with anyone or any group*” was erroneously repeated in the offline social connectedness scale, as item 3 and item 10. The first response to the item was retained, and the additional item from the online social connectedness scale which was inconsistent with the offline scale (item 6: “*I lose a sense of connectedness with society when I am on social media sites/apps*”) was removed. The adaptation of the scale has not been formally validated, however it has been used in its full version in a sample of university students (Holmes, 2021).

Cut-points used to determine dual-factor group membership are heterogeneous across studies because many studies use different scales to define the groups, with different cut-offs sometimes based on the distribution of scale scores within the sample. For example, the well-being scale puts approximately 15% of a sample into the low group by setting the cut-off at the mean minus one standard deviation (Ng Fat et al.,

2017). Likewise, the psychological distress score cut-off of 13 or higher is quite conservative, in some contexts indicative of serious mental illness (Kessler et al., 2003), which may not be consistent with other scales which define the presence of psychopathology as scoring below the 30th percentile (e.g., Suldo & Shaffer, 2008). This makes the distribution of group memberships difficult to compare between studies (Iasiello et al., 2020).

The proportional odds assumption was violated for a select few models, however, the primary model of interest in the main analysis was unaffected by this violation, and the assumption was only violated for two stratified analyses. Instances where this violation occurred are marked and should be interpreted with caution, but this does not undermine the main conclusions of the present thesis.

The moderation analysis was underpowered to detect statistically significant differences in the strength of the association between social connectedness and mental health and well-being between groups as defined by the SDoH. This is owing to the fact that the sample size was relatively small to allow for this magnitude of comparisons, and there were a relatively small number of participants belonging to some groups (e.g., gender-diverse adolescents). The sample was predominantly in a state of complete mental health, socially connected, White, urban-dwelling, with highly educated and employed parents, and mostly consisted of those in the 15-to-16-year-old age group. Sparsity of data necessitated the process of collapsing many categories, particularly for ethno-racial group, which hinders both the interpretation and comparability of results. For instance, the Multi-Racial/Other category is very broad, consisting of adolescents who selected more than one ethno-racial group, West Asian/Middle Eastern, Latin American, and Indigenous adolescents. These categorizations vary greatly between studies (often due to the necessity to collapse categories) making it difficult to compare results. Issues of representation undercutting comparisons according to the SDoH are quite commonly reported in the existing literature (Bailey et al., 2022; Hertz et al., 2022; Jones et al., 2022; Klootwijk et al., 2021; Mitchell et al., 2021; Murata et al., 2020; Shah et al., 2021; Theberath et al., 2022), and future investigation should make a concerted effort to ensure adequate sample sizes and representation to allow for these comparisons. The results of the moderation analysis may have also been affected by the fact that any potential

interaction between social connectedness and the SDoH in the relationship between social connectedness and Dual-Factor group membership was not accounted for in the imputation model.

The incorporation of responses to open-ended questions asking about pandemic-related changes to relationships as well as mental health and well-being was a strength of the study as it allowed deeper investigation of study objectives. Although this approach allows one to hear from a greater number of participants than other approaches, such as interviews and focus groups which are typically limited to much smaller sample sizes, responses are often short and do not provide as rich data (LaDonna et al., 2018). Most typed responses were very short, and unlike an interview or focus group the researcher was not able to probe deeper into a participant's response, generate follow-up questions or ask for clarification. In addition, unlike a focus group, this style of inquiry does not allow for participants to feed off one another. While this can have disadvantages (e.g., group think) (MacDougall & Baum, 1997) there are some key advantages to this approach, namely that group discussion may bring up nodes which would not otherwise have been elucidated. The larger QuarantEENing project did involve the use of virtual focus groups, both at Time 1 (June-to-July 2022) and Time 3 (February-to-March 2023) which will allow this question to be investigated in further detail in the future.

5.4 Implications

This is the first study to quantitatively compare the effects of online and offline social connectedness on the mental health and well-being of adolescents during the COVID-19 pandemic. This thesis' findings suggest that, while feeling socially disconnected resulted in poorer mental health and well-being, offline social connectedness has more of an impact than online social connectedness. The qualitative analysis found that while some adolescents observed their relationships and mental health and well-being recovering and improving at the later stages of the pandemic, many were still struggling in both domains. Therefore, efforts to support adolescent mental health coming out of the COVID-19 pandemic should emphasize facilitating social connections. In the event of future lockdowns, encouraging the maintenance of social connections among adolescents, especially in the offline environment, should be a priority. However,

because online connections do have some impact on adolescent mental health and well-being, this is a promising area to promote social connections in a safe, socially distant manner.

The findings of the exploratory stratified analyses suggest that the effects of offline and online social connectedness are not homogenous across SDoH. Notably, results suggest that older, gender-diverse, and White adolescents, along with those whose parent(s)/guardian(s) have a low level of education and are employed full-time or self-employed, and urban-dwelling adolescents have the most potential to benefit from social media social connectedness to maintain a sense of mental health and well-being.

5.5 Areas for Future Research

Future research is needed using validated scales to quantitatively compare the effects of online and offline social connectedness. The scales used in present thesis, though based on adapted and shortened versions of validated scales, were not validated in the form presented in the survey. Future investigation should use validated scales, such as the full Facebook Social Connectedness Scale (Grieve et al., 2013) and full Social Connectedness Scale – Revised (R. M. Lee et al., 2001) to further investigate these differences.

Few studies involving adolescent social connectedness and mental health during the pandemic took a dual-factor approach, more commonly opting for a *psychiatric* or *dichotomous* understanding of mental illness (i.e., measuring the presence or absence of psychopathology) and excluding measures of mental well-being. The dual-factor model has the distinct advantage of capturing adolescents' state of mental illness and mental well-being to form an understanding of their complete mental health (Suldo & Shaffer, 2008). Given the protective effects of social connectedness against mental ill-health (Wickramaratne et al., 2022) and its promotion of mental well-being (Jose et al., 2012), taken together with strong evidence for the dual-factor model (Iasiello et al., 2020), future research should incorporate the dual-factor model when investigating the effects of social connectedness on adolescent mental health.

The qualitative analysis revealed that differing views on the pandemic was a source of conflict. Given the presence of anti-vax sentiment, conspiracies and

misinformation among some (McKinnon et al., 2023), understanding the ways in which adolescents' relationships have been impacted and continue to be impacted by this division would be an interesting avenue for future research.

Finally, data sparsity has often precluded analyses examining the moderating role of the SDoH in the relationship between aspects of social connectedness and mental health and well-being. Though the present thesis was underpowered to detect significant moderation effects, the results of these hypothesis-generating analyses suggest a potential moderating role of some SDoH. Future investigation with more adequately powered samples is warranted.

5.6 Conclusion

Feeling socially disconnected was associated with poorer dual-factor mental health among Canadian adolescents at the later stages of the COVID-19 pandemic, although offline social connectedness had a greater effect than online social connectedness. SDoH such as age and ethno-racial groups, gender, parent/guardian education and employment, and community type may moderate the relationship between social connectedness and dual-factor mental health, but future investigation in larger sample sizes is needed. Adolescents described staying socially connected through the pandemic by becoming closer, using technology, and gaining a greater sense of appreciation for their relationships and in person interactions. Some described having the opportunity to decompress and enjoy more time at home, adopt a positive mindset, and undergo introspection and self-growth. However, many described experiencing a loss of connection, missing in person interactions, and the inadequacy of online interactions in replacing them. Mental health challenges included feelings of anxiety, frustration, missing out on the typical adolescent experience, low mood, and poor self-esteem. At the later stages of the pandemic, some adolescents reported relationships and mental health recovering, whereas others had difficulty adapting to the return to routines. In summary, social connectedness is an important contributor to adolescent mental health and well-being during the late stages of the COVID-19 pandemic. As the increasing dependency of adolescents on online social connections to keep in touch with society was catalyzed by the COVID-19 pandemic, there is a heightened need for future investigations to

disentangle the effects of online and offline social connectedness on mental health and well-being.

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Appendices

Appendix A: Checklist for Reporting Results of Internet E-Surveys (CHERRIES)

Item Category	Checklist Item	Description
Design	Describe survey design	The target population was Canadian adolescents between the ages of 13 to 18. This was a convenience sample, drawn from the Leger opinion panel supplemented by panelists from a partner company. The Leger panel consists of over 400,000 active members.
IRB (Institutional Review Board) approval and informed consent process	IRB approval	Study approval was obtained from the Western University non-medical research ethics board (#120297).
	Informed consent	<p>Participants were recruited through their parents. Consent from parents was obtained prior to the adolescent being able to proceed with the survey.</p> <p>Upon opening the survey invitation, participants were provided a Letter of Information (LOI) containing study details, (e.g., Expected length of time to complete the study [20 to 30 mins], where and for how long the data would be stored [Qualtrics, followed by Western University's server, 7 years], the names of the investigators, and the purpose of the study ["There is an urgent need to improve our understanding of how the COVID-19 pandemic has impacted, and continues to impact, the mental well-being and health-related behaviours of teens."])</p> <p>After submitting parental consent, parents were directed to pass the survey to their child, who also consented and answered the eligibility questions (ensuring the child was between 13 to 18 years of age, living in Canada, and currently in high school).</p>
	Data protection	The survey platform used (Qualtrics) uses encryption and restricted access authorization to prevent unauthorized access. Access to the password-protected Qualtrics platform was only available to members of the research team. Once data was retrieved from Qualtrics for analysis, datasets were stored on Microsoft Teams, with access limited to members of the research team. The survey was anonymous, but sensitive information collected included postal codes and IP addresses.

Development and pre-testing	Development and testing	The online survey was developed by researchers with experience in a variety of disciplines including health sciences, health geography, and epidemiology and biostatistics. The survey was pilot tested for usability, comprehensibility, and technical functionality by members of the research team and the HEAL Youth Advisory Council
Recruitment process and description of the sample having access to the questionnaire	Open survey vs. closed survey	Closed. The survey was sent to survey panel members from Leger and a Partner company.
	Contact mode	Leger and Partner company panelists were invited to complete the survey via email and their panel company online portal.
	Advertising the survey	Participants were recruited via email invitation to members of the Leger opinion and partner company survey panels.
Survey administration	Web/E-mail	This online survey was administered via Qualtrics.
	Context	The survey was available only to Leger and partner company panelists. The unique link directed users to a site containing no other content aside from the survey.
	Mandatory/voluntary	The survey was voluntary.
	Incentives	Participants were compensated by Leger and the partner company with panel points, which can be collected and redeemed for monetary rewards.
	Time/Date	Responses were received from June 21 to July 7, 2022.
	Randomization of items or questionnaires	Not done.
	Adaptive questioning	Skip logic was used at several points throughout the survey. Variables included here which used skip logic were the questions about parent/guardian education and employment status (where adolescents could skip the questions about second, third, and fourth parents/guardians if this did not apply to them), and both open-ended questions used in the qualitative analysis were preceded by a skip-logic question (where adolescents reporting "no change" to their relationships or mental health and well-being pertaining to the pandemic were re-directed past the open-ended question).
	Number of items	The number of items per page ranged from one to 10. The pages with greater numbers of items were a result of the inclusion of multi-item scales.

	Number of screens (pages)	The survey was 84 pages in length, with three pages dedicated to LOI and consent. However, not every page was accessed by all participants as a result of the implementation of skip-logic questions.
	Completeness check	Aside from the consent questions, no items were deemed mandatory. If a participant selected a response for a consent question that would make them ineligible to participate (e.g., responded “No” to the question: “I am between the ages of 13 and 18 years”) they were automatically redirected out of the survey. Participants who did not progress to the end of the survey were excluded from the analyses.
	Review step	Participants were able to use a back button to change their responses. The survey did not include a review step.
Response rates	Unique site visitor	Unique site visitors were not counted. Survey invitations were sent to 19,200 panelists from Leger and the partner company. 4,989 accessed the survey.
	View rate (Ratio unique site visitors/unique survey visitors)	Not calculated, participants were invited through Leger and a partner panel company (see below).
	Participation rate (Ratio unique survey page visitors/agreed to participate)	The survey was sent to 19,200 panelists from Leger and the partner company. 4,989 accessed the survey. 3,680 filled (at least in part) the first page of the survey, which contained eligibility questions. Entering a response which would render the participant ineligible directed them away from the remainder of the survey. 2,307 unique IDs agreed to participate, and 1,817 endorsed all eligibility questions.
	Completion rate (Ratio agreed to participate/finished survey)	We received 3,695 responses from 3,680 unique IDs: 2,307 unique IDs agreed to participate and 1,817 endorsed the subsequent eligibility questions. 1,811 completed survey, and 6 were incomplete. Of the 1,811 completed surveys, 8 were removed for not answering a large portion of survey questions, and 200 were removed in the quality assessment for open-ended responses.
	Cookies used	Not used.
Preventing multiple entries	IP check	Through Qualtrics, we collected the public IP address of all survey respondents. Since there are scenarios where different adolescent may share the same public IP address

from the same individual		(e.g., by using a VPN), we did not use IP address as a measure to identify potential duplicate entries from the same user in the main analysis. If respondents had both identical IP addresses, responses other than the first entry (n = 111) were flagged and removed in the data quality sensitivity analysis (described in Section 3.5.4).
	Log file analysis	Not used.
	Registration	This survey was only accessible to the panelists contacted by Leger and the partner company. In instances where more than one response was received per participant ID, we retained the complete version. If both versions were complete, we retained the response with the earliest start date and time.
Analysis	Handling of incomplete questionnaires	Only completed questionnaires were analyzed.
	Questionnaires submitted with an atypical timestamp	No responses were excluded for completing the items too quickly. A sensitivity analysis where "straight-liners" (n = 32) were excluded did not yield different results from the primary analysis.
	Statistical correction	Not applicable.

Appendix B: Scale Items Measuring Online Social Connectedness. Adapted from R. M. Lee et al. (2001)

Please rate the degree to which you agree or disagree with each statement below:						
Item	Strongly agree	Agree	Slightly agree	Slightly disagree	Disagree	Strongly disagree
Even among my social media friends/followers, there is no sense of closeness.	1	2	3	4	5	6
Even around social media friends/followers I know, I don't feel that I really belong	1	2	3	4	5	6
I feel understood by the people I know when I'm on social media sites/apps.	6	5	4	3	2	1
I feel distant from social media friends/followers.	1	2	3	4	5	6
I am able to relate to my social media friends/followers.	6	5	4	3	2	1
I am able to connect with other people through social media.	6	5	4	3	2	1
I see myself as a loner when I am on social media.	1	2	3	4	5	6
My social media friends/followers feel like family.	6	5	4	3	2	1
I don't feel I participate with any one or any group on social media sites/apps.	1	2	3	4	5	6

Appendix C: Scale Items Measuring Offline Social Connectedness. Adapted from R. M. Lee et al. (2001)

When I am not online...						
Item	Strongly agree	Agree	Slightly agree	Slightly disagree	Disagree	Strongly disagree
I feel distant from people.	1	2	3	4	5	6
I see myself as a loner.	1	2	3	4	5	6
I don't feel I participate with anyone or any group.	1	2	3	4	5	6
Even around people I know, I don't feel I really belong.	1	2	3	4	5	6
I am able to relate to my peers.	6	5	4	3	2	1
I am able to connect with other people.	6	5	4	3	2	1
I feel understood by the people I know.	6	5	4	3	2	1
My friends feel like family.	6	5	4	3	2	1
Even among my friends, there is no sense of closeness.	1	2	3	4	5	6

Appendix D: Full Results of the Univariable and Multivariable Ordinal Logistic Regression of Dual-Factor Mental Health Group Membership on Social Connectedness (n = 1,563)

Independent variables	Value	Unadjusted			Partially Adjusted												Fully Adjusted					
					Adjusted for SDoH			Adjusted for Other Covariates ^a			Adjusted for Online Social Connectedness			Adjusted for Offline Social Connectedness					Adjusted for Social Connectedness			
		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI				
<i>Social Determinants of Health</i>																						
Age Group	13 to 14	<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>		
	15 to 16	1.32	0.98	1.77	1.33	0.99	1.79	1.31	0.97	1.77	1.42	1.05	1.93	1.45	1.06	1.98	1.49	1.08	2.04	1.49	1.08	2.06
	17 to 18	1.33	0.92	1.92	1.29	0.88	1.87	1.24	0.85	1.80	1.31	0.89	1.91	1.27	0.86	1.88	1.28	0.86	1.90	1.22	0.81	1.82
Gender	Cisgender Boy	<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>		
	Cisgender Girl	1.47	1.14	1.90	1.53	1.18	1.99	1.56	1.21	2.02	1.38	1.06	1.80	1.60	1.22	2.10	1.57	1.20	2.07	1.68	1.27	2.22
	Gender Diverse	3.86	2.10	7.07	3.65	1.97	6.76	3.45	1.86	6.40	4.06	2.17	7.59	3.80	1.99	7.24	3.97	2.08	7.58	3.49	1.81	6.72
Ethno-Racial Group	White	<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>		
	Black	0.78	0.39	1.55	0.75	0.37	1.50	0.70	0.34	1.41	0.77	0.38	1.56	0.73	0.35	1.53	0.73	0.35	1.54	0.70	0.33	1.49
	East or South East Asian	0.81	0.54	1.22	0.83	0.55	1.27	0.79	0.52	1.20	0.74	0.48	1.12	0.71	0.46	1.11	0.70	0.45	1.09	0.72	0.46	1.14
	South Asian	0.99	0.59	1.67	1.07	0.63	1.82	0.83	0.49	1.42	0.84	0.49	1.43	0.80	0.46	1.40	0.77	0.44	1.35	0.84	0.47	1.49
	Multi-Racial or Other	1.11	0.76	1.62	1.11	0.76	1.63	0.96	0.66	1.42	1.20	0.81	1.76	1.19	0.80	1.77	1.21	0.81	1.80	1.15	0.77	1.74
Parent/ Guardian Education	Postgraduate Degree	<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>		
	University Degree	0.98	0.69	1.40	0.99	0.69	1.42	0.93	0.65	1.33	1.06	0.73	1.52	1.09	0.75	1.60	1.11	0.76	1.62	1.09	0.74	1.61

	Socially Disconnected	6.90	5.29	9.01	7.44	5.65	9.79	6.42	4.90	8.41	4.99	3.71	6.71	-	-	-	-	-	-	5.14	3.78	6.99
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Odds are cumulated over the lower order categories of dual-factor mental health, with an odds ratio > 1 representing a higher odds of belonging to a poorer mental health category (1 = troubled; 2 = symptomatic but content; 3 = vulnerable; 4 = complete mental health).
 Statistically significant results ($\alpha = 0.05$) are presented in **bold**.
 Numbers in *italics* indicate that the proportional odds assumption was not met for this model.
^a Other Covariates include mode of school instruction and number of siblings.
 * “Other” includes Indigenous, Latin American, and West Asian/Middle Eastern
 ** “Less than Full Time Employment” includes Part-Time Employment, Stay-at-Home Parent, Disability, Retired, and Unemployed
 CI = Confidence Interval; OR = Odds Ratio; Ref. = Reference Category.

Appendix E: Complete Case Analysis (CCA) Full Results of the Univariable and Multivariable Ordinal Logistic Regression of Dual-Factor Mental Health Group Membership on Social Connectedness (n = 1,422)

Independent variables	Value	Unadjusted		Partially Adjusted															Fully Adjusted			
				Adjusted for SDoH			Adjusted for Other Covariates			Adjusted for Online Social Connectedness			Adjusted for Offline Social Connectedness			Adjusted for Social Connectedness						
		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI	
<i>Social Determinants of Health</i>																						
Age Group	13 to 14	<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>		
	15 to 16	1.31	0.96	1.77	1.31	0.96	1.78	1.30	0.96	1.78	1.42	1.03	1.95	1.38	1.00	1.91	1.43	1.03	1.98	1.42	1.01	1.98
	17 to 18	1.28	0.86	1.89	1.24	0.83	1.85	1.21	0.81	1.80	1.28	0.85	1.92	1.18	0.78	1.79	1.21	0.80	1.84	1.17	0.76	1.79
Gender	Cisgender Boy	<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>		
	Cisgender Girl	1.42	1.09	1.85	1.46	1.11	1.91	1.51	1.15	1.98	1.34	1.01	1.76	1.54	1.16	2.05	1.51	1.13	2.01	1.59	1.19	2.12
	Gender Diverse	3.99	2.16	7.35	3.77	2.03	7.02	3.65	1.97	6.80	4.19	2.23	7.89	3.88	2.03	7.41	4.07	2.13	7.80	3.67	1.90	7.07
Ethno-Racial Group	White	<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>		
	Black	0.83	0.41	1.67	0.80	0.40	1.62	0.74	0.36	1.51	0.79	0.39	1.62	0.77	0.36	1.62	0.76	0.36	1.61	0.73	0.34	1.57
	East or South East Asian	0.83	0.54	1.26	0.85	0.55	1.32	0.79	0.52	1.22	0.73	0.47	1.13	0.75	0.48	1.17	0.71	0.45	1.13	0.73	0.46	1.18
	South Asian	1.09	0.63	1.86	1.17	0.67	2.03	0.91	0.52	1.57	0.90	0.52	1.57	0.88	0.49	1.56	0.85	0.48	1.51	0.93	0.51	1.68
	Multi-Racial or Other	1.05	0.71	1.56	1.05	0.70	1.58	0.92	0.62	1.38	1.13	0.75	1.69	1.14	0.75	1.72	1.15	0.75	1.75	1.10	0.72	1.69
Parent/Guardian Education	Postgraduate Degree	<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>		
	University Degree	0.94	0.65	1.36	0.97	0.67	1.41	0.90	0.62	1.30	1.03	0.70	1.50	1.05	0.71	1.55	1.06	0.72	1.58	1.06	0.70	1.58

	Socially Disconnected	6.77	5.13	8.93	7.19	5.41	9.56	6.34	4.78	8.40	4.66	3.43	6.35	-	-	-	-	-	-	4.76	3.46	6.55
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Odds are cumulated over the lower order categories of dual-factor mental health, with an odds ratio >1 representing a higher odds of belonging to a poorer mental health category (1 = troubled; 2 = symptomatic but content; 3 = vulnerable; 4 = complete mental health).

Statistically significant results ($\alpha = 0.05$) are presented in bold.

* "Other" includes Indigenous, Latin American, and West Asian/Middle Eastern

** "Less than Full Time Employment" includes Part-Time Employment, Stay-at-Home Parent, Disability, Retired, and Unemployed

CI = Confidence Interval; OR = Odds Ratio; Ref. = Reference Category.

Appendix F: CCA Results of the Ordinal Logistic Regression of Dual-Factor Mental Health Group Membership on Online Social Connectedness, Stratified by the Social Determinants of Health

Independent Variables	Value	Unadjusted			Adjusted for Offline Social Connectedness				
		OR	95% CI		Interaction <i>p</i> Value ^a	OR	95% CI		Interaction <i>p</i> Value ^b
Age Group	13 to 14	3.03	1.81	5.09	0.15	1.60	0.87	2.92	0.09
	15 to 16	4.44	3.10	6.37		2.11	1.40	3.20	
	17 to 18	6.49	3.29	12.78		3.90	1.87	8.11	
Gender	Cisgender Boy	5.20	3.46	7.83	0.29	2.49	1.54	4.04	0.48
	Cisgender Girl	3.40	2.33	4.96		1.83	1.20	2.80	
	Gender Diverse	6.36	1.77	22.90		4.68	1.25	17.58	
Ethno-Racial Group	White	4.34	3.12	6.05	0.27	2.05	1.40	3.00	0.40
	Black	11.69	2.17	62.90		6.37	1.04	39.02	
	East or South East Asian	3.12	1.38	7.05		1.92	0.76	4.83	
	South Asian	1.93	0.69	5.38		1.32	0.44	3.97	
	Multi-Racial or Other *	6.23	2.88	13.46		3.76	1.48	9.55	
Parent/Guardian Education	Postgraduate Degree	5.75	2.93	11.26	0.07	3.57	1.71	7.43	0.18
	University Degree	4.44	2.86	6.89		1.70	1.01	2.88	
	College Diploma, Apprenticeship, or Trade Certificate	2.66	1.65	4.29		1.52	0.89	2.60	

	High School or Elementary School Diploma	9.05	3.82	21.44		6.57	2.53	17.06	
Parent/ Guardian Employment	Employed Full Time or Self-Employed	4.37	3.30	5.80	0.44	2.23	1.62	3.08	0.43
	Less than Full Time Employment **	<i>3.12</i>	<i>1.24</i>	<i>7.85</i>		1.75	0.60	5.08	
Community Type	Urban	4.57	3.43	6.09	0.11	2.35	1.69	3.27	0.25
	Rural	2.26	1.01	5.07		1.22	0.49	3.00	
<p>Odds are cumulated over the lower order categories of dual-factor mental health, with an odds ratio > 1 representing a higher odds of belonging to a poorer mental health category (1 = troubled; 2 = symptomatic but content; 3 = vulnerable; 4 = complete mental health). Statistically significant results ($\alpha = 0.05$) are presented in bold.</p> <p>Numbers in <i>italics</i> indicate that the proportional odds assumption was not met for this model.</p> <p>^a Results of the joint test for the interaction term between the SDoH variable and online social connectedness in the unadjusted model.</p> <p>^b Results of the joint test for the interaction term between the SDoH variable and online social connectedness in the model adjusted for offline social connectedness.</p> <p>* “Other” includes Indigenous, Latin American, and West Asian/Middle Eastern.</p> <p>** “Less than Full Time Employment” includes Part-Time Employment, Stay-at-Home Parent, Disability, Retired, and Unemployed.</p> <p><i>CI</i> = Confidence Interval; <i>OR</i> = Odds Ratio.</p>									

Appendix G: CCA Results of the Ordinal Logistic Regression of Dual-Factor Mental Health Group Membership on Online Social Connectedness, Stratified by the Social Determinants of Health

Independent Variables	Value	Unadjusted			Adjusted for Online Social Connectedness			Interaction <i>p</i> Value ^b	
		OR	95% CI		OR	95% CI			
Age Group	13 to 14	5.21	3.07	8.86	0.42	4.10	2.23	7.53	0.40
	15 to 16	7.93	5.43	11.59		5.49	3.60	8.37	
	17 to 18	6.50	3.39	12.46		3.84	1.90	7.76	
Gender	Cisgender Boy	7.06	4.67	10.66	0.84	4.30	2.66	6.94	0.83
	Cisgender Girl	6.95	4.66	10.36		5.38	3.49	8.29	
	Gender Diverse	4.48	1.28	15.67		2.88	0.77	10.72	
Ethno-Racial Group	White	8.00	5.66	11.30	0.26	5.66	3.86	8.29	0.30
	Black	11.87	2.52	55.86		6.36	1.25	32.46	
	East or South East Asian	4.33	1.90	9.82		3.21	1.29	8.02	
	South Asian	3.21	1.13	9.09		2.89	0.96	8.70	
	Multi-Racial or Other *	5.85	2.71	12.63		2.71	1.05	6.96	
Parent/ Guardian Education	Postgraduate Degree	5.38	2.85	10.15	0.18	3.11	1.55	6.25	0.21
	University Degree	10.27	6.46	16.31		7.82	4.61	13.24	
	College Diploma, Apprenticeship, or Trade Certificate	5.45	3.29	9.02		4.58	2.65	7.91	
	High School or Elementary School Diploma	5.38	2.36	12.30		1.93	0.76	4.90	

Parent/ Guardian Employment	Employed Full Time or Self-Employed	6.97	5.21	9.31	0.43	4.75	3.44	6.55	0.43
	Less than Full Time Employment **	4.91	1.89	12.76		3.77	1.28	11.07	
Community Type	Urban	6.79	5.07	9.11	0.97	4.49	3.23	6.23	0.84
	Rural	7.06	2.95	16.88		6.50	2.57	16.44	

Odds are cumulated over the lower order categories of dual-factor mental health, with an odds ratio >1 representing a higher odds of belonging to a poorer mental health category (1 = troubled; 2 = symptomatic but content; 3 = vulnerable; 4 = complete mental health). Statistically significant results ($\alpha = 0.05$) are presented in **bold**.

Numbers in *italics* indicate that the proportional odds assumption was not met for this model.

^a Results of the joint test for the interaction term between the SDoH variable and offline social connectedness in the unadjusted model.

^b Results of the joint test for the interaction term between the SDoH variable and offline social connectedness in the model adjusted for online social connectedness.

* “Other” includes Indigenous, Latin American, and West Asian/Middle Eastern

** “Less than Full Time Employment” includes Part-Time Employment, Stay-at-Home Parent, Disability, Retired, and Unemployed
CI = Confidence Interval; *OR* = Odds Ratio.

Appendix H: Data Quality Sensitivity Analysis Full Results of the Univariable and Multivariable Ordinal Logistic Regression of Dual-Factor Mental Health Group Membership on Social Connectedness (n = 1,420)

Independent variables	Value	Unadjusted			Partially Adjusted										Fully Adjusted							
					Adjusted for SDoH			Adjusted for Other Covariates			Adjusted for Online Social Connectedness		Adjusted for Offline Social Connectedness				Adjusted for Social Connectedness					
		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI				
<i>Social Determinants of Health</i>																						
Age Group	13 to 14	<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>					
	15 to 16	1.34	0.97	1.84	1.33	0.97	1.84	1.32	0.96	1.82	1.42	1.03	1.98	1.46	1.04	2.04	1.49	1.06	2.09	1.46	1.03	2.07
	17 to 18	1.52	1.03	2.25	1.45	0.97	2.16	1.42	0.95	2.11	1.49	1.00	2.23	1.47	0.97	2.22	1.48	0.98	2.23	1.41	0.92	2.15
Gender	Cisgender Boy	<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>					
	Cisgender Girl	1.71	1.30	2.26	1.76	1.33	2.33	1.80	1.36	2.38	1.59	1.20	2.11	1.80	1.34	2.41	1.48	0.98	2.23	1.83	1.36	2.46
	Gender Diverse	4.40	2.35	8.26	3.94	2.08	7.49	4.15	2.20	7.83	4.54	2.38	8.65	4.25	2.19	8.24	4.42	2.28	8.57	3.82	1.95	7.48
Ethno-Racial Group	White	<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>					
	Black	0.89	0.44	1.78	0.85	0.42	1.72	0.81	0.40	1.64	0.85	0.42	1.74	0.81	0.38	1.69	0.80	0.38	1.68	0.77	0.36	1.65
	East or South East Asian	0.98	0.64	1.51	1.07	0.68	1.66	0.94	0.61	1.45	0.90	0.58	1.40	0.88	0.55	1.38	0.86	0.54	1.36	0.91	0.56	1.45
	South Asian	1.00	0.56	1.78	1.10	0.61	2.00	0.88	0.49	1.59	0.86	0.48	1.56	0.79	0.43	1.46	0.77	0.41	1.42	1.19	0.77	1.83
	Multi-Racial or Other	1.19	0.80	1.77	1.20	0.80	1.80	1.04	0.69	1.56	1.28	0.85	1.92	1.23	0.81	1.85	1.25	0.82	1.90	0.84	0.45	1.60
Parent/Guardian Education	Postgraduate Degree	<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>			<i>Ref.</i>					
	University Degree	0.92	0.63	1.35	0.92	0.62	1.36	0.89	0.60	1.31	1.00	0.67	1.48	1.04	0.69	1.56	1.06	0.71	1.59	1.03	0.68	1.56

	Socially Disconnected	5.99	4.52	7.94	6.33	4.73	8.47	5.70	4.29	7.58	4.38	3.21	5.99	-	-	-	-	-	-	4.59	3.32	6.33
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Odds are cumulated over the lower order categories of dual-factor mental health, with an odds ratio > 1 representing a higher odds of belonging to a poorer mental health category (1 = troubled; 2 = symptomatic but content; 3 = vulnerable; 4 = complete mental health).

Statistically significant results ($\alpha = 0.05$) are presented in bold.

* "Other" includes Indigenous, Latin American, and West Asian/Middle Eastern

** "Less than Full Time Employment" includes Part-Time Employment, Stay-at-Home Parent, Disability, Retired, and Unemployed

CI = Confidence Interval; OR = Odds Ratio; Ref. = Reference Category.

Appendix I: Data Quality Sensitivity Analysis Results of the Ordinal Logistic Regression of Dual-Factor Mental Health Group Membership on Online Social Connectedness, Stratified by the Social Determinants of Health

Independent Variables	Value	Unadjusted			Adjusted for Offline Social Connectedness				
		OR	95% CI		Interact ion <i>p</i> Value ^a	OR	95% CI		Interact ion <i>p</i> Value ^b
Age Group	13 to 14	2.26	1.32	3.84	0.03	1.20	0.64	2.23	0.01
	15 to 16	3.73	2.58	5.40		1.96	1.28	2.98	
	17 to 18	6.53	3.38	12.62		4.10	2.02	8.33	
Gender	Cisgender Boy	4.53	2.93	7.02	0.23	2.61	1.57	4.34	0.38
	Cisgender Girl	2.88	2.00	4.16		1.56	1.03	2.36	
	Gender Diverse	5.92	1.62	21.66		4.55	1.20	17.29	
Ethno-Racial Group	White	4.55	1.20	17.29	0.21	1.83	1.25	2.68	0.30
	Black	11.92	2.22	64.05		6.43	1.05	39.41	
	East or South East Asian	2.50	1.12	5.58		1.71	0.70	4.16	

	South Asian	1.94	0.64	5.92		<i>1.18</i>	<i>0.34</i>	<i>4.13</i>	
	Multi-Racial or Other *	6.42	2.95	13.98		3.68	1.46	9.29	
Parent/ Guardian Education	Postgraduate Degree	4.76	2.43	9.31	0.07	3.57	1.75	7.30	0.14
	University Degree	7.49	4.65	12.06		5.77	3.37	9.87	
	College Diploma, Apprenticeship, or Trade Certificate	5.47	3.29	9.08		1.28	0.74	2.20	
	High School or Elementary School Diploma	8.41	3.51	20.20		5.94	2.28	15.45	
Parent/ Guardian Employment	Employed Full Time or Self- Employed	3.74	2.81	4.99	0.62	2.08	1.50	2.88	0.54
	Less than Full Time Employment **	3.01	1.23	7.38		1.47	0.51	4.22	
Community Type	Urban	4.00	3.00	5.35	0.04	2.21	1.59	3.07	0.09
	Rural	1.57	0.67	3.65		0.88	0.34	2.28	

Odds are cumulated over the lower order categories of dual-factor mental health, with an odds ratio >1 representing a higher odds of belonging to a poorer mental health category (1 = troubled; 2 = symptomatic but content; 3 = vulnerable; 4 = complete mental health).

Statistically significant results ($\alpha = 0.05$) are presented in **bold**.

Numbers in *italics* indicate that the proportional odds assumption was not met for this model.

^a Results of the joint test for the interaction term between the SDoH variable and online social connectedness in the unadjusted model.

^b Results of the joint test for the interaction term between the SDoH variable and online social connectedness in the model adjusted for offline social connectedness.

* “Other” includes Indigenous, Latin American, and West Asian/Middle Eastern.

** “Less than Full Time Employment” includes Part-Time Employment, Stay-at-Home Parent, Disability, Retired, and Unemployed.

CI = Confidence Interval; OR = Odds Ratio.

Appendix J: Data Quality Sensitivity Analysis Results of the Ordinal Logistic Regression of Dual-Factor Mental Health Group Membership on Offline Social Connectedness, Stratified by the Social Determinants of Health

Independent Variables	Value	Unadjusted			Adjusted for Online Social Connectedness				
		OR	95% CI		Interaction <i>p</i> Value ^a	OR	95% CI		Interaction <i>p</i> Value ^b
Age Group	13 to 14	4.35	2.52	7.50	0.32	3.97	2.12	7.44	0.27
	15 to 16	6.87	4.65	10.14		5.06	3.29	7.77	
	17 to 18	6.47	3.41	12.25		3.94	1.98	7.84	
Gender	Cisgender Boy	5.21	3.35	8.10	0.54	3.15	1.88	5.26	0.39
	Cisgender Girl	7.01	4.73	10.38		5.87	3.85	8.96	
	Gender Diverse	4.14	1.16	14.82		2.83	0.75	10.75	
Ethno-Racial Group	White	6.67	4.70	9.47	0.39	5.07	3.45	7.46	0.44
	Black	12.23	2.60	57.53		6.49	1.27	33.21	
	East or South East Asian	3.51	1.53	8.07		2.82	1.14	7.03	
	South Asian	3.63	1.16	11.32		3.38	0.96	11.90	
	Multi-Racial or Other *	6.38	2.94	13.87		3.15	1.24	7.99	
Parent/ Guardian Education	Postgraduate Degree	5.52	2.87	10.62	0.72	2.87	1.38	6.00	0.73
	University Degree	1.75	1.02	3.01		2.30	1.42	3.71	
	College Diploma, Apprenticeship, or Trade Certificate	5.47	3.29	9.08		4.93	2.84	8.58	
	High School or Elementary School Diploma	5.58	2.36	13.18		2.13	0.81	5.57	
	Employed Full Time or Self-Employed	5.97	4.44	8.03	0.90	4.29	3.09	5.95	0.90

Parent/ Guardian Employment	Less than Full Time Employment **	6.16	2.39	15.89		5.17	1.77	15.15	
Community Type	Urban	6.03	4.47	8.12	0.93	4.19	3.01	5.83	0.86
	Rural	5.76	2.35	14.09		6.04	2.31	15.83	
<p>Odds are cumulated over the lower order categories of dual-factor mental health, with an odds ratio >1 representing a higher odds of belonging to a poorer mental health category (1 = troubled; 2 = symptomatic but content; 3 = vulnerable; 4 = complete mental health). Statistically significant results ($\alpha = 0.05$) are presented in bold.</p> <p>Numbers in <i>italics</i> indicate that the proportional odds assumption was not met for this model.</p> <p>^a Results of the joint test for the interaction term between the SDoH variable and offline social connectedness in the unadjusted model.</p> <p>^b Results of the joint test for the interaction term between the SDoH variable and offline social connectedness in the model adjusted for online social connectedness.</p> <p>* “Other” includes Indigenous, Latin American, and West Asian/Middle Eastern</p> <p>** “Less than Full Time Employment” includes Part-Time Employment, Stay-at-Home Parent, Disability, Retired, and Unemployed</p> <p><i>CI</i> = Confidence Interval; <i>OR</i> = Odds Ratio.</p>									

Curriculum Vitae

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Brock University Dean's Honour List
2017-2018, 2018-2019, 2019-2020, 2020-2021

Brock University Entrance Scholarship
2017-2018, 2018-2019, 2019-2020, 2020-2021

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Oral Presentations:
Abdunnabi S, Nelson Ferguson K, Seabrook, JA, Anderson KK, Gilliland JA. A Mixed Methods Exploration of the Impact of Social Connectedness on Adolescent Mental Health and Well-Being in the Late Stages of the COVID-19 Pandemic. Child Health Symposium. May 2023. London, Ontario.

Poster Presentations:
Abdunnabi S, Nelson Ferguson K, Seabrook, JA, Anderson KK, Gilliland JA. Social Connectedness and Adolescent Mental Health and Well-Being in the Late Stages of the COVID-19 Pandemic: A Mixed Methods Exploration. Western University Department of Epidemiology and Biostatistics EpiBio Research Day. April 2023. London, Ontario.

Abdunnabi S, Nelson Ferguson K, Seabrook, JA, Anderson KK, Gilliland JA. Social Connectedness and Adolescent Mental Health and Well-Being in the Late Stages of the COVID-19 Pandemic: A Mixed Methods Exploration. Child Health Research Day. May 2023. London, Ontario.

Abdunnabi S, Nelson Ferguson K, Seabrook, JA, Anderson KK, Gilliland JA. Social Connectedness and Adolescent Mental Health and Well-Being in the Late Stages of the COVID-19 Pandemic: A Mixed Methods Exploration. London Health Research Day. June 2023. London, Ontario.