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Sibling and Family Impact on British Young Adult Mental Wellbeing During Covid-19

LISA WADDELL



A dissertation submitted to the University of Bristol in accordance with the requirements of the degree of **MASTER OF SCIENCE** by advanced study in Policy Research in the **FACULTY OF SOCIAL SCIENCES AND LAW**.

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ABSTRACT

The objective of this dissertation was to provide policy evidence for the protective nature of families, especially siblings, on British young adult positive mental health during the Covid-19 pandemic. Based off assessment of existing literature and theoretical frameworks, siblings were hypothesised to have mixed effects on young adult mental wellbeing changes during the first Coronavirus lockdown, which are moderated by gender. Using longitudinal data from the Millennium Cohort Study and the Warwick-Edinburgh Mental Wellbeing Scale as a means of measuring positive mental health, these hypotheses were tested with lagged dependent variable multiple regression analyses. Mixed effects were confirmed, with family cohabitation and number of siblings generally positively associated, but fully-related siblings negatively associated, with mental wellbeing during Covid-19. Almost all effects were fully moderated by gender, supporting the notion that men's wellbeing is more deeply affected, and protected, by family factors than women's. Implications for policy include incorporating family networks into young adult male wellbeing resilience interventions, as well as supporting families housing young adult children.

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I would like to dedicate this work to the inspirational women in my life for sharing ideas, providing mentorship, and committing hours of time to connecting virtually. This research story is for you.

AUTHOR DECLARATION

I declare that the work in this dissertation was carried out in accordance with the requirements of the UNIVERSITY'S REGULATIONS AND CODE OF PRACTICE FOR TAUGHT PROGRAMMES and that it has not been submitted for any other academic award. Except where indicated by specific reference in the text, this work is my own work. Work done in collaboration with, or with the assistance of others, is indicated as such. I have identified all material in this dissertation which is not my own work through appropriate referencing and acknowledgement. Where I have quoted or otherwise incorporated material which is the work of others, I have included the source in the references. Any views expressed in the dissertation, other than referenced material, are those of the author.

SIGNED: ..  DATE: 13-09-2021

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INTRODUCTION

The British young adult population is arguably one least acknowledged in Covid-19 policy, but also one deeply affected by national health measures, with the recognition that peoples 18-24 have experienced some of the most significant academic, economic, and social interruptions due to the pandemic (Etheridge and Spantig, 2020; Prime, Wade and Browne, 2020; Evandrou *et al.*, 2021; Kwong *et al.*, 2021; O'Connor *et al.*, 2021). Previous research has established that interruptions to early adulthood milestones related to living independently from family (Shanahan, 2000) are associated with lower mental health outcomes, both before and during the pandemic (Copp *et al.*, 2017; Evandrou *et al.*, 2021). However, within the widespread context of Covid-19 lockdown, much is still unknown about how family related to young adult mental health. While family structures and relationship effects on wellbeing have been widely considered in relation to parent-child relationships (e.g., Aquilino and Supple, 2001; Hango, 2007; Francesconi and Heckman, 2016; Finan, Ohannessian and Gordon, 2018; Bayrakdar *et al.*, 2019), much less has been said about sibling impacts (Feinberg, Solmeyer and McHale, 2012; McHale, Updegraff and Whiteman, 2012; White and Hughes, 2017; Waid *et al.*, 2020). The context of Covid-19 provides a unique opportunity to examine how siblings and family impact young adult mental wellbeing (MW) during pandemic-related loss of social interaction and personal capability (Research Aim 1).

The Foresight Report on Mental Capital and Wellbeing (Beddington *et al.*, 2008) and the World Health Organisation Report on Promoting Mental Health (WHO, 2004) brought British policy focus to the promotion of young adult MW (e.g., Public Health England, 2020), also known as positive mental health, on the grounds that MW provides resilience to the necessary stresses of life and is protective of future health and economic stability (Cohen and Pressman, 2006; Chida and Steptoe, 2008; Johnson *et al.*, 2017; Rose *et al.*, 2017; Stewart-Brown, 2017). Capturing the level of optimal functioning in “psychological and social domains” (Kazdin, 1993, p. 128) MW conceptually subsets the larger construct of subjective wellbeing with focus on emotional resilience and social capacity (e.g., Rose *et al.*, 2017; Stewart-Brown, 2017; Thomas, Liu and Umberson, 2017). Therefore, poor young adult MW during Covid-19 implies future health problems and later socio-economic issues (e.g., Chida and Steptoe, 2008; Collins *et al.*, 2012; Shannon *et al.*, 2020).

Given that the average British family has more than one child (Corps, 2020), and there are well-documented associations between mental health and family structures (e.g., Deater-

Deckard and Dunn, 2002; Malmberg and Flouri, 2011; Feinberg, Solmeyer and McHale, 2012; Barclay and Myrskylä, 2016; Patalay and Fitzsimons, 2018; Cheng and Furnham, 2020), sibling effects could be a powerful factor in protecting against negative effects of social isolation and loneliness (Campion *et al.*, 2020; Pieh, Budimir and Probst, 2020). This dissertation aims to provide primary level policy support toward mental disorder prevention (Campion *et al.*, 2020) through examining risk and protective factors of positive mental health during the first Covid-19 British lockdown (Research Aim 2). Another aim of this study is to contribute to the academic literature relating childhood sibling environment to adulthood wellbeing (e.g., Waldinger, Vaillant and Orav, 2007; Barclay and Kolk, 2018; Finan, Ohannessian and Gordon, 2018; Chang and Chen, 2021) (Research Aim 3).

Research evidence for informing health policy must be able to separate correlation from causation (Duncan, Magnuson and Ludwig, 2004). However, many studies that looked at the factors driving MW used cross-sectional study designs on observational data (e.g., Wiklund *et al.*, 2012; Fink *et al.*, 2015; Evandrou *et al.*, 2021; Koenig *et al.*, 2021), which limits their ability to control for omitted variable bias, and diminished their capacity for causal inference (e.g., Pearl, 2010; Wooldridge, 2010; Angrist and Pischke, 2015; Bryman, 2016). It is important for both policy and research to evidence the size and nature of factors that impact wellbeing in a way that accurately depicts real trends in the general population, such as utilising experimental statistics and longitudinal study designs (e.g., Schaie and Hertzog, 1982; Keele and Kelly, 2006; Pearl, 2010; Angrist and Pischke, 2015; Bryman, 2016; Bellemare, Masaki and Pepinsky, 2017; Wilkins, 2018; Savage *et al.*, 2020). To inform public policy focused on promoting positive mental health through incorporation of social networks, this dissertation aimed to establish a causal relationship between siblings and young adult MW during Covid-19 by using a longitudinal research design (Research Aim 4).

The Warwick Edinburgh Mental Wellbeing Scale (WEMWS) (Tennant *et al.*, 2007) is considered a powerful tool for measuring MW. Previous research shows the WEMWS is both unidimensional (i.e., all questions relate to state of positive mental health) and valid in British young adult populations (Tennant *et al.*, 2007; McKay and Andretta, 2017; Shah *et al.*, 2018). Although relatively new, this scale is popularly used in mental health research related to social isolation and emotional resilience (e.g., Collins *et al.*, 2012; Ng Fat *et al.*, 2017a; Rose *et al.*, 2017; Shannon *et al.*, 2020; O'Connor *et al.*, 2021) as well as policy work on mental illness and positive functioning (e.g., Shah *et al.*, 2018; Public Health England, 2020; Parkin, 2021). Moreover, for the general young adult population, the WEMWS is a preferred mental health measure due to its popular disconnect from stigmatised disorders (Shah *et al.*, 2018) as well as sensitivity to MW shifts due to social and psychological stresses (Collins *et al.*, 2012). Thus,

low WEMWS scores are understood as an early signal for mental ill-health (Collins *et al.*, 2012; Rose *et al.*, 2017; Shannon *et al.*, 2020), and signal a need for policy attention. To this end, preliminary work indicates that Covid-19 decreased MW across the British population, with particular effect on women (Etheridge and Spantig, 2020; Bazarkulova and Compton, 2021). Therefore, mental health disparities of vulnerable groups, such as women and young adults, are highlighted for public health policy by evidencing how much family-related factors protected or risked young men and women's MW during a period of national stress and social isolation (Research Aim 5).

Especially in young adult populations, MW is intrinsic to promotion of good health and positive social functioning (Johnson *et al.*, 2017; Rose *et al.*, 2017; Stewart-Brown, 2017; O'Connor *et al.*, 2021). Even before the pandemic, young adults in Britain faced a multitude of wellbeing threats such as lack job security (Holford, 2020), wages stagnation (Collins and Mayer, 2010), decreased home ownership (Bayrakdar *et al.*, 2019), and delayed partnering behaviour (Zhou and Kan, 2019). There is a need to incorporate complex family relationships into the health policy used to address young adult mental health. Although clearly important, the effect of sibling factors on MW changes during the pandemic has not yet been investigated. Therefore, the following research questions, designed to investigate how sibling factors are associated with young adult MW changes, are important to both policy and social science.

- I. In Great Britain, how much did having siblings protect or risk young adult positive mental health during the first Covid-19 lockdown?
 - i. Was young adult MW during lockdown impacted by number of siblings?
 - ii. How much did the relatedness of siblings impact MW during this period?
 - iii. Did sibling gender composition impact young adult MW during lockdown?
 - iv. Was living with family during Covid-19 lockdown associated with young adult MW protection or risk?
 - v. How did young adult gender moderate the impact of family on positive mental health during Covid-19?

The core objective of this dissertation is to provide policy support through evidencing the role of family in young adult mental health during lockdown. The following chapters provide the rationale, construction, implementation, and policy implications of this secondary quantitative research project. In Chapter 1, a literature review of the relevant theoretical and empirical research work relating family and siblings to young adult MW is outlined to show how family and sibling factors may be protective or detrimental to young adult mental health during Covid-19. Each section of this first chapter concludes with a hypothesised answer to the research questions, based on the reviewed evidence. Following, Chapter 2 considers the

methodological challenges related to understanding family factors on young adult MW during Covid-19, and how these challenges were addressed in the current study. Specifically, considerations about the reliability and validity of longitudinal quantitative observational approaches are positioned as rationale for the current methods used to analyse Millennium Cohort Study young adult mental health during Covid-19. In Chapter 3, the findings of lagged dependent variable ordinary least squares regression models are presented in relation to how family factors of interest protected or risked young adult mental health, and how these effects were conditional upon participant sex. Finally, Chapter 4 discusses the findings in relation to the larger body of work on family impacts on young adult MW. With the pandemic restrictions lifted, but cases still surging in many areas across the UK, this research report concludes by tying these findings back to policy by outlining how current mental disorder prevention, and overall young adult mental health policy, can benefit by incorporating sibling relationships, especially for young men, into larger conversation of how to promote resilience during periods of stress.

LITERATURE REVIEW

According to the growing body of research highlighting how social relationships promote MW (e.g., Aquilino and Supple, 2001; e.g., Branje *et al.*, 2004; Feinberg, Solmeyer and McHale, 2012; Harcourt *et al.*, 2015; White and Hughes, 2017; Waid *et al.*, 2020; Jensen *et al.*, 2021), how “current thoughts, feelings, and behavior [*sic*] might have been shaped by interpersonal events that took place much earlier in life” can aid predictions about current and future population wellbeing (Simpson and Campbell, 2013, p. 8). While parent-child associations with MW have been widely considered in research and policy contexts (e.g., Aquilino and Supple, 2001; Hango, 2007; Francesconi and Heckman, 2016; Finan, Ohannessian and Gordon, 2018; Bayrakdar *et al.*, 2019), much less is known about how siblings may protect against threats to MW (Feinberg, Solmeyer and McHale, 2012; McHale, Updegraff and Whiteman, 2012; White and Hughes, 2017; Waid *et al.*, 2020). Fortunately, research over the past two decades, albeit with focus on children and adolescents, aids in directing predictions about how siblings may be associated with MW changes during Covid-19. This work has revealed a range of sibling complexities in terms of similarities to, and differences from, other important relationships during development (i.e., peer, teacher, parent) (Dunn *et al.*, 1999; Conger and Little, 2010; Whiteman, McHale and Soli, 2011; Feinberg, Solmeyer and McHale, 2012; McHale, Updegraff and Whiteman, 2012; Finan, Ohannessian and Gordon, 2018; Szymańska, 2020; Feinberg *et al.*, 2021).

YOUNG ADULT WELLBEING DURING COVID-19

The Coronavirus public health crisis resulted in a national lockdown. This policy directly contributed to a secondary public health crisis: mental ill-health (Campion *et al.*, 2020). Social isolation measures caused workplaces across the nation to close their doors, threatening the positions most often filled by the emerging adult populations (Ellison, 2017; Evandrou *et al.*, 2021). Young adults who enrolled in higher education or training programmes experienced unexpected cuts or changes (Tinsley, 2020). Previously affordable and reasonable housing choices become unaffordable and unjustifiable when working from home, or unemployed, and many young adults moved residences during lockdown (Evandrou *et al.*, 2021).

Traditionally, British people in their twenties are generally expected to be forging individual identities outside of their childhood environment (Shanahan, 2000; Elder, 2001; Jensen, Whiteman and Fingerman, 2018), such as moving out of the family home, starting higher education, and securing employment. Life Course posits that these changes can be attributed as social achievements linked to young adult positive MW (Shanahan, 2000; Hutchison, 2010; Jensen, Whiteman and Fingerman, 2018). Thus, key milestones for young adults are threatened by Coronavirus lockdown, increasing social stress and lowering young adult MW. Life Course posits that young adult response to Covid-19 related “social stress” (Pearlin, 1999, p. 161), should be understood with reference to the social, historical, and political contexts. Therefore, while living with parents or childhood carers during young adulthood may, under normal circumstances, be against the usual social norm of progression, thus negatively impacting wellbeing, Covid-19 lockdown presents a particular situation where social norms shifted: young adults across Great Britain were moving home (Evandrou *et al.*, 2021). It is possible that this shift changed the mentality and stigma around moving home (Cialdini and Trost, 1998; Bicchieri, 2005; Bicchieri and Mercier, 2014). Thus, young adults may not have experienced normal MW deficits due to moving home. Instead, family may have provided emotional support for young adults during the pandemic (Hypothesis 1).

Preliminary research into the mental health effects of the Covid-19 pandemic has blossomed (e.g., Champion *et al.*, 2020; Etheridge and Spantig, 2020; Henderson *et al.*, 2020; Smith *et al.*, 2020; Evandrou *et al.*, 2021). Cross-sectional studies in Britain have indicated that young adults may be uniquely vulnerable to the effects of the Covid-19 lockdown compared to other generations (Etheridge and Spantig, 2020; Henderson *et al.*, 2020; Evandrou *et al.*, 2021). However, these studies are assessing variables collected at one point in time, thus cannot rule out reverse causation (Angrist and Pischke, 2015; Shipley, 2016; Pieters, 2017). Therefore, the current evidence about young adult mental health during the pandemic, while informative on correlational relationships between Covid-19 related MW vulnerabilities in UK

populations, cannot provide basis for causal inference. The current study aims to address this gap by utilising a longitudinal design. Through positioning predictive variables that are collected before the outcome measure, the causal timeline of sibling factors preceding MW outcomes is ensured (Bryman, 2016). This dissertation improves upon current understanding of how Covid-19 affects young adult populations by utilising a longitudinal, rather than cross-section research design in order to produce robust estimates for causal inference and policy evidence.

SINGLETONS VERSUS SIBLINGS

Characterised by contact and companionship, emotional intensity, and family role structure, sibling relationships are distinct from other close relationships in a person's youth, and are widely considered to produce distinct childhood environments from single children (singletons) (Updegraff et al., 2011; Whiteman, McHale and Soli, 2011; Feinberg, Solmeyer and McHale, 2012; McHale, Updegraff and Whiteman, 2012). However, a majority of the work has looked at siblings effects in childhood or early adolescence (for review see McHale, Updegraff and Whiteman, 2012; and updated review Gilligan, Stocker and Conger, 2020). This dissertation addresses the gap in sibling effect literature by focusing on how childhood sibling environment can protect or risk young adult MW during the Covid-19 pandemic.

A variety of theories focused on sibling impacts (e.g., Attachment Theory, Bowlby, 1969; Ainsworth, 1989; and Social Learning Theory, Bandura, 1977; Patterson, 1984), indicate that siblings protect against Covid-19 MW changes through a variety of complex social and emotional mechanisms throughout life. Moreover, the effects of having siblings versus not having siblings are noted in a variety of observational studies (Downey and Condrón, 2004; Cameron *et al.*, 2013; Downey, Condrón and Yucel, 2015; Fletcher and Kim, 2019) highlighting both non-cognitive and interpersonal skills, which are directly linked to later wellbeing (Bedford, Volling and Avioli, 2000; Jambon *et al.*, 2019; Waid *et al.*, 2020). Analysis of this work implies that sibling environment during childhood may foster the development of enhanced socio-emotional skills, with implications for mental health during periods of stress like the Covid-19 lockdown. However, most key studies connecting siblings to social or emotional outcomes are related to children, not young adults (for reviews see McHale, Updegraff and Whiteman, 2012; Gilligan, Stocker and Conger, 2020). Therefore, this dissertation will use theory from the childhood sibling literature to connect young adult MW outcomes to childhood sibling environment.

MORE THAN A PEER: ATTACHMENT AND SOCIAL LEARNING

Although the vast majority of sibling literature relates to children (for review see McHale, Updegraff and Whiteman, 2012), the arguments presented in this body of work outlines potential mechanisms through which siblings can impact a person's life and wellbeing into adulthood. Moreover, the little literature on sibling impacts into adulthood indicate that emotional and social skills developed through childhood and adolescence relate to emerging adult wellbeing (e.g., Stocker and Lanthier, 1997; Conger and Little, 2010; Milevsky and Heerwagen, 2013; Finan, Ohannessian and Gordon, 2018; Stocker *et al.*, 2020). Thus, childhood sibling environment dictates long-term socio-emotional outcomes.

Attachment Theory (originally Bowlby, 1969; Ainsworth, 1989) indicates that the quality of bond created between children and their close family members will impact the nature and security of future social relationships (Stewart, 1983; Teti and Ablard, 1989; Caspers *et al.*, 2007; Whiteman, McHale and Soli, 2011; McHale, Updegraff and Whiteman, 2012; Manning, 2017). Patterns of relating to one's social environment are founded in bond any familiar individual that can act as a "secure base from which children can explore the world around them but return to in stressful circumstances for comfort and security" (Whiteman, McHale and Soli, 2011, p. 125). Although attachment does not necessarily mean a positive relationship, a secure attachment to a sibling can provide a healthy foundation for future social relationships, and protect against negative responses to stress (e.g., Stewart, 1983; Teti and Ablard, 1989; Cooper, Shaver and Collins, 1998; Caspers *et al.*, 2007). More recent work developing Attachment Theory has indicated that attachments to family members outside of parents, such as siblings, can foster future positive mental health and life satisfaction by extending the network of family giving consistent social support and protection for the child during their development (Finan, Ohannessian and Gordon, 2018; Lagerstrom, 2018; Umemura *et al.*, 2018). In other words, only children have smaller family networks with whom to form attachments, thus are less protected from the social stresses buffered by secure attachments.

Complementarily, Social Learning Theory postulates that people learn from each other through observation and copying behaviour (originally Bandura, 1977). Work developing Social Learning Theory emphasises how having a sibling (compared to not) encourages the development and refinement of prosocial and conflict resolution skills (Bedford, Volling and Avioli, 2000; Branje *et al.*, 2004; Howe *et al.*, 2012; White *et al.*, 2014). Social exchanges between siblings (e.g., helping a younger sibling with homework; trusting a sibling with an issue when worried; resolving conflict between siblings) are associated with greater social and emotional proficiency throughout life (e.g., Kitzmann, Cohen and Lockwood, 2002; White *et al.*, 2014; Downey, Condrón and Yucel, 2015; Cyron, Schwerdt and Viarengo, 2017; Sang

and Nelson, 2017). In this way, recent empirical work indicates that children with siblings have more developed empathy and social skills than only children of the same age (Lam, Solmeyer and McHale, 2012; Jambon *et al.*, 2019). The positive mental health and life satisfaction levels captured by the WEMWS, then, are expected to be more protected from negative MW for participants from families with multiple children in comparison to families with only-children (Hypothesis 2).

WHO'S COMPETING? SIBLING NUMBER

Within the literature on sibling impacts on MW, broadly speaking, there are two conflicting narratives: siblings are rivals or siblings are support systems (Whiteman, McHale and Soli, 2011). Through investigating the literature on these branches of understanding, many authors have come to the conclusion that sibling relationships are best described as complex and 'ambivalent' (Deater-Deckard and Dunn, 2002, p. 572), being coloured by conflictual and supportive elements, often in quick procession or even simultaneously (Feinberg, Solmeyer and McHale, 2012; McHale, Updegraff and Whiteman, 2012). Research indicates that the existence of sibling rivalry and support during development may be important to the continued sibling effects on MW into early adulthood (Conger and Little, 2010; McHale, Updegraff and Whiteman, 2012; Jensen, Whiteman and Fingerman, 2018; Feinberg *et al.*, 2021).

Decades of work on sibling rivalry has put forward variations of Resource Dilution Theory: the number of children in a family reduces the amount of resources available; thus negatively impacting child physical, educational, and emotional outcomes (e.g., Blake, 1981; Downey, 1995; Black, Devereux and Salvanes, 2010; Erola *et al.*, 2018; Riswick, 2018). Evidence for this theory comes from both economic and psychological research (for review see Whiteman, McHale and Soli, 2011). It is argued that sibling competition is an adaptive social mechanism to ensure children have access enough of the shared resources. Thus, sibling rivalry is an evolved family dynamic, and should increase with the number of children. While rivalry may have been (pre)historically adaptive (Riswick, 2018; Rebar *et al.*, 2020), it is well noted that high sibling rivalry has negative effects on a person's self-esteem and overall mental wellbeing (for reviews see Feinberg, Solmeyer and McHale, 2012; McHale, Updegraff and Whiteman, 2012), as well as a range of behaviours related to mental ill-health (see Waid *et al.*, 2020 for a recent scoping review). By the rationale of Resource Dilution Theory, single children will be more protected from threats to MW than children with any number of siblings, due to the inherent competition of sibships. Connecting with Attachment Theory, sibling groups with high levels of rivalry during early childhood would not form secure attachment bonds, thus would lack the potential benefit of an expanded attachment network. Therefore, MW would not be protected by large sibling groups, as rivalry increases with the number of siblings. Indeed,

according to Resource Dilution Theory, large groups of siblings may even increase negative MW changes, especially during a period of stress like Covid-19.

While, Resource Dilution Theory, though limited, is substantiated with valid and generalisable quantitative research designs (e.g., Barker *et al.*, 2008; Wolke *et al.*, 2013; Liu *et al.*, 2020); key recent work highlights how household resource distribution is perhaps too simplistic to explain of how siblings may impact mental health (McHale, Updegraff and Whiteman, 2012). First, resource dilution effects do appear to be compensated in families with a larger number of adults (Tanskanen, Erola and Kallio, 2016; Erola *et al.*, 2018). Second, dilution is argued to directly impact someone's mental health through mechanisms of social conflict and comparison (Feinberg *et al.*, 2000; Feinberg, Solmeyer and McHale, 2012), rather than simply sibling competition for resources. As will be shown in the following sections, the argument that number of siblings predicts worse MW is weakened when considering arguments of siblings as a social support resource.

In the midst of conversations around sibling rivalry is the growing body of work investigating the benefits of having siblings (e.g., Branje *et al.*, 2004; Whiteman, McHale and Soli, 2011; McHale, Updegraff and Whiteman, 2012; White and Hughes, 2017; Jensen, Whiteman and Fingerman, 2018). To this end, some authors have argued in favour of the Social Support Theory (Cohen and Wills, 1985; Pearlin, 1999; Bedford, Volling and Avioli, 2000), instead of sibling rivalry. This theory posits that number of siblings increases the extent of one's personal support system, thus improving one's overall mental wellbeing (Chang and Chen, 2021). In terms of close social relationships, siblings are poised to be 'built in' support systems for a person's wellbeing. From the perspective of social support, periods of stress like the pandemic will bring siblings together, and enhance overall wellbeing (Sharer *et al.*, 2016).

While seemingly in direct conflict, Social Support Theory and Resource Dilution Theory may be reconciled with the work of Bedford, Volling and Avioli (2000). Bedford and her colleagues posited that sibling conflict can actually result in individuals being better equipped to handle social stressors later in life (see also Bedford, 1998), and thus better off than others with nonconflictual sibling relationships during the transition to adulthood. These authors used qualitative research evidence to construct and support a model where conflict and competition advantages siblings, in comparison to only children, by introducing social learning in how to handle disagreements, disappointment, and uncomfortable social situations. Bedford underlines the importance of sibling conflict in the development of the sense of self, coping mechanisms, and social and emotional confidence. However, Bedford's arguments have only been supported with qualitative evidence, which is neither reliable nor generalisable. However, qualitative work such as Bedford's benefits the theoretical construction of the longer term

wellbeing outcomes from different sibling environments. Therefore, sibling number is expected to be positively related to WEMWS during Covid-19 (Hypothesis 3).

WHO COUNTS? SIBLING TYPE

Fitting with Life Course Theory, contextualisation within historical, as well as individual, time is important. Increases in divorce, cohabitation, and remarriage have led to greater complexity of sibling compositions in families, with different family types becoming more common through the UK (Bryson, Purdon and Skipp, 2017; Harkness and Salgado, 2018; Amorim and Tach, 2019). Full siblings (children who genetically share the same mother and father) are no longer the norm they used to be. Half siblings (share the same mother or father) and stepsiblings (only related to by parental romantic partnering) are becoming more common, and it is important to understand similarities and differences of the effect of sibling type. However, the main corpus of sibling work still give overwhelming focus to exclusively to full siblings in nuclear families (for review see McHale, Updegraff and Whiteman, 2012).

While the effects of full siblings has been documented above, much of the work on non-full siblings comes from a deficit-comparative approach that assumes, due to family transitions, half or step siblings had worse off MW than full siblings or only children (for review see Sanner et al., 2018). This work developed Resource Dilution theorising that less genetic relatedness within a family leads to greater competition and conflict (e.g., Brown, Manning and Stykes, 2015; Tanskanen, Danielsbacka and Rotkirch, 2015; Fomby, Goode and Mollborn, 2016; Tanskanen, Erola and Kallio, 2016). These studies generally used large-scale cross sectional quantitative analyses to test differences between full siblings and mixed siblings, with a range of mixed results, including that into early adulthood, mixed siblings are connected with possibly less conflict than full siblings, while full siblings show more closeness.

Moreover, other work on complex family structures aligns with Social Support Theory by considering half and step siblings to be supportive resources (Gatins, Kinlaw and Dunlap, 2014; Halligan, Chang and Knox, 2014). In this work, the addition of mixed sibling types, and stresses to family structures, results in closer relationships between full and non-full siblings. Importantly, a recent review (Gilligan, Stocker and Conger, 2020) highlights how, as family structures become more complex, sibling connections become more socially determined, and this social support becomes more important to wellbeing as a person enters adulthood (see also work on family as a social construct e.g., Dermott and Fowler, 2020). Therefore, it is expected that WEMWS score changes, after taking into account number of siblings, will show no difference between full siblings and mixed sex siblings (Hypothesis 4).

GIRLS CARE, BOYS FIGHT – OR DO THEY?

Similar to sibling number effects, two unrelated and contradictory branches of work come together to support the notion that sibling gender composition influences young adult mental health. First, psychology work argues that siblings are motivated to differentiate their personalities, identities, and roles within a household (originally Turner, 1982; see also Feinberg and Hetherington, 2000; David, Grace and Ryan, 2004). By filling different social niches within the family, siblings are able to figuratively increase their value as family members (see review Whiteman, McHale and Soli, 2011). Support for sibling differentiation arguments is seen in work related to gender identity, social norm adherence, and activity choice (for review see Endendijk, Groeneveld and Mesman, 2018). Mixed-sex siblings tend to use naturally occurring sex categories to differentiate from each other, and thus naturally experience less conflict than same sex siblings (Feinberg and Hetherington, 2000; Whiteman, McHale and Soli, 2011; McHale, Updegraff and Whiteman, 2012).

Following differentiation theory, mixed-sex siblings are expected to show less negative effects on MW than same-sex siblings. This predicted sibling gender composition pattern is evidenced in some empirical work relating to various life decisions, such as job choice and family formation patterns (e.g., McHale *et al.*, 2001; Rao and Chatterjee, 2017; Cools and Patacchini, 2019; Brenøe, 2021). However the outcome of interest and timing within the life course seems to contribute to variation in observed impact (Anelli and Peri, 2015). On the other hand, the work in Social Support Theory argues that similarity between siblings encourages more interactions between siblings, thus more benefits via social learning and attachment pathways (Conger and Little, 2010; McHale, Updegraff and Whiteman, 2012; White and Hughes, 2017; Stocker *et al.*, 2020). Given the contradicting theoretical and empirical findings explaining sibling gender composition impacts on MW, it is challenging to determine how sibling gender composition effects on young adult MW. It is hypothesised, then, that mixed-sex siblings will be ambiguously related to MW (Hypothesis 5).

FAMILY IMPACT ON MENTAL HEALTH AND THE ROLE OF GENDER

It is well known that gender-related biological and social mechanisms play a role in the experience of positive mental health (Bor *et al.*, 2014; Erazo, 2020; Etheridge and Spantig, 2020; Campbell, Bann and Patalay, 2021). Recent work into the protective role of family on mental health, though not considering sibling factors specifically, has shown that men in particular may be protected by family (Cable *et al.*, 2013; Szymańska, 2020). Therefore family effects on mental wellbeing are expected to be moderated by participant sex: young men are expected to show significant effects related to family, while women are expected to show non-

significant or negative effects related to family (Hypothesis 6). However, Cable et al.'s study failed to take into account family structure during childhood, used retrospective MW indicators to control for existing MW levels, and only investigated number of family members. Moreover, Szymańska's study used a small number of participants (N = 276) in a cross sectional design, limiting ability for robust or causal inferences. Therefore, the current dissertation looks to improve on this previous work investigating the moderating role of gender on MW family effects by looking at MW collected over time, before and after the pandemic, as well as conditioning MW on childhood sibling environment.

SUMMARY AND OVERVIEW

This overview of the literature aimed to review of relevant theoretical work on sibling mental health impacts, while assessing current gaps in empirical knowledge on young adult mental health during Covid-19. The given Attachment, Social Learning, Life Course, Social Support, and Resource Dilution theories explain the complex interplay of sibling factors on young adult MW outcomes. The following chapters show how the hypotheses formed through this consideration of the literature were tested. After, the findings of this analysis and the limitations of the chosen longitudinal research design are considered with reference to this foundational literature. Given the probable important impact of siblings on young adult MW, policy is supported with evidence on family networks protect lockdown-related impacts to mental health.

METHODOLOGY

Does having a sibling at age 10 account for any variation in young adult MW during the Covid-19 pandemic? If so, what kind of sibling characteristics are associated with these changes? How does gender moderate these effects? Are families protective to mental health during the Covid-19 pandemic. Secondary data analysis of the Millennium Cohort Study (MCS, University College of London [UCL]) allowed these associations between young adult WEMWS scores (dependent variable), as well as sibling characteristics and family dwelling (independent variables) to be quantified using ordinary least squares (OLS) parameter estimation (Chatterjee and Simonoff, 2013), controlling for individual pre-existing levels of wellbeing by including a lag of the dependent variable (LDV) as a control. Therefore, the LDV OLS regression analysis allows for the researcher to investigate how much, given an individual's MW levels before the pandemic, did siblings protect mental health during the Covid-19 pandemic. In this section, the validity and reliability of causal inference on observational data is considered in relation to the research design, dataset, measures, and analyses. The intention of this section is to discuss the appropriate methodology required to quantify how much the shock of Covid-19 impacted young men and women's mental health given family factors.

DESIGNING FOR CAUSAL INFERENCE

Research questions about family factor protection to young adult MW given lockdown were answered with a quantitative longitudinal research design as statistical modelling on observational data from the MCS surveys that followed participants from birth into early

adulthood. Inferential statistical models, like OLS, can produce reliable estimates from observational data of the amount of causal association between predictive and outcome factors within a population (Mackinnon *et al.*, 2003; McGue, Osler and Christensen, 2010; Listl, Jürges and Watt, 2016). However, the validity and reliability of the research design is centred around two alternatives to causation: reverse causation (Hertzog, Hultsch and Dixon, 1999; Salthouse, 2006; McGue, Osler and Christensen, 2010; Hartanto *et al.*, 2021) and confounding (Pearl, 2000, 2010; McNamee, 2003; McGue, Osler and Christensen, 2010). While a secondary analysis of MCS data may yield estimates of true causation between variables of interest, the path between family factors and MW may arise by reverse causation, whereby positive child mental health may encourage parents to have more children. In principle, resolution of reverse causation is achieved through using longitudinal research designs that allows for predictive variables to be temporally sequenced before outcome variables (i.e., measuring sibling factors in 2011, and outcome factors in 2020). Therefore a strength of the longitudinal design of the current dissertation was that independent variables of interest were observed before outcome variables, increasing inference validity (Angrist and Pischke, 2015; Bryman, 2016). On the other hand, the validity threat of confounders, or variables that predict outcome measures but are unrelated to the variables of interest and statistically unaccounted, requires close attention to the dataset, variables, and theoretical connections between interest factors and outcomes. Ultimately, the longitudinal research design was operationalised using MCS data with consideration to both validity and reliability.

DATA AND PARTICIPANTS

MCS participants have had important social, demographic, and health related data collected across their life course. MCS data collection began when participants were only 9 months old, and continues presently. The most recent data available are from special Covid-19 web surveys, which were sent to a subsample of the now 19-20 year old participants during the Covid-19 lockdown of 2020-2021. The main MCS waves, study design, and question selection are well documented in Hansen (2014). The Covid-19 waves, being unique of data collection strategy and sample selection, are outlined in Brown and colleague's (2021). As such, MCS data allowed the researcher to assess effects of siblings on wellbeing within the cohort of UK people experiencing Covid-19 lockdown in the beginning of their adulthood. The MCS participants are from a nationally representative probability sample of children born across the UK between the years 2000 – 2001. Joshi and Fitzsimons (2016) give in-depth detail about the construction of the MCS sample, which is both stratified and clustered. Of the specified representative sample of families, all children born into these families during the years 2000-2002 were included as primary cohort members. Because of the complex sampling strategy,

it is advised to use sample weights when discussing and analysing the data (Ketende and Jones, 2011; Hansen, 2014; Joshi and Fitzsimons, 2016), so that results can be generalised to the population of focus; therefore, all results reported here are weighted with the advisable longitudinal weights (i.e., the combined population and attrition weight of the last round of data collection included in the analysis).

While most families had only one child as the cohort member (i.e., one child born in 2000), MCS collected information on up to three primary cohort members (i.e., twins, triples born in the target year). Key information was collected at each wave from a main parent (usually mother) about family structure and size, as well as information about the cohort member, until the cohort member was old enough to answer alone (i.e., age 7). The current study focused on childhood predictors and emerging adulthood outcomes of MW over time, to investigate MW during the shock of Covid-19 lockdown. Therefore, the data analysis was narrowed to three points of data collection: Wave 5 (MCS5; CLS, 2021), Wave 7 (MCS7; CLS, 2020), and the first wave of the Covid-19 survey (MCSCov; CLS, 2021), conducted just after the commencement of lockdown. The data were collected when cohort members were ages 10-11 (2011/2012), 17 (2018-2019) and 19-20 (2020), respectively. Through structuring the dataset in this manner, main predictive variables of interest precede the outcome variable of interest, aiding in the validity of the causal inferences by reducing reverse causality.

The current study sample was limited to primary cohort members who participated in MCS5, MCS6, MCS7, and MCSCov. Secondary/tertiary cohort members (twins and triplets) were excluded as sample members and included as part of sibling demographics. The sample was further reduced by only keeping sample members who gave valid responses for all relevant questions, with cases being deleted listwise to aid in comparison across analytical models. The final sample, with these deductions, was $N = 2,127$.

In consideration of ethics, because data was already collected and anonymised upon access, major ethical concerns of participant anonymity and consent (Creswell and Poth, 2015) were not relevant to the current secondary analysis. However, MCS data is socially sensitive in nature and must be accessed, stored, and used with care. To access the data, projects must be created within a verified UK Data Service account. In this case, University of Bristol provided this verification, and log-in required only use of valid university user details. Data was then assigned to a project and accessed following dataset specific conditions. The datasets used for the current study were “safeguarded” by the UK Data Service. Access required agreement to the End User License terms and conditions, as well as agreement to additional conditions of use that enforce/ensure confidentiality. After accessing the data, all files were stored with the secure The University of Bristol Research Data Storage Facility (RDSF).

Ethical approval for this study was obtained from the School of Policy Studies Ethics committee through the MPR Dissertation Unit Convenor prior to commencing any data work (Annex A).

MEASURES

To determine whether siblings were protective to MW during the Covid-19 pandemic, key hypothesised relationships between MW and sibling structure, participant sex, and family cohabitation needed to be operationalised as observable measures within the MCS dataset. Through attention to the empirical basis for operationalised measures, as well as the theoretical relationships between variables, the following measures were used to answer questions around how family protected young adult MW during Covid-19.

MENTAL WELLBEING

The dependent variable used to assess MW changes was constructed from 7 positively worded questions included on the MCS Covid-19 survey (May 2020) as well as during the previous survey round (2018-2019). Known as the Shortened Warwick-Edinburgh Mental Wellbeing Scale (SWEMWS), these questions were answered on a scale of one to five, with one being 'none of the time' and five being 'all of the time' (further detailed in Table 1). Thus, higher scores from these Likert-type items indicated positive mental health. The SWEMWS has been validated in the UK young adult populations (McKay and Andretta, 2017), and is sensitive enough to assess clinical wellbeing over time (Collins *et al.*, 2012). As reported in the technical reports (Brown *et al.*, 2021), this scale had high internal reliability, as verified by Cronbach's alpha at both before and during the pandemic (MCS7: $\alpha = 0.83$; MCSCov: $\alpha = 0.86$). All questions were averaged into a derived MW measure for each participant, allowing unanswered questions to be collapsed into overall wellbeing score, thus minimising missing MW scores to only those where no questions were answered. Finally, to simplify the interpretation of analysis, SWEMWS scores were scaled by demeaning and dividing by standard deviation. Therefore, all reporting of coefficients should be interpreted as standard deviations from the mean. Histograms of SWEMWS scores from MCS7 and MCSCov showed that their distributions were relatively normal, with some positive skew (Annex B), but not enough, given sample size, to warrant non-parametric analyses (Harpe, 2015; Piovesana and Senior, 2018). In sum, MW was a continuous, interval level variable with a normal distribution, thus facilitating the use of parametric analyses for hypothesis testing (Chatterjee and Simonoff, 2013; Field, 2018).

SIBLING STRUCTURE, LIVING WITH FAMILY, AND PARTICIPANT SEX

Independent variables were selected based on sibling factors theoretically and empirically connected to MW. Therefore, the main predictive variable of interest pertained to number of siblings, sibling gender composition, and type of siblings. In accordance with study aims, through incorporating childhood sibling structure as a predictor to MW, the protective and risk factors of family size on young adults during Covid-19 were sequenced before outcomes. Thus, the causal effect of sibling factors on MW during Covid-19 can be assessed. Secondary effects of interest included participant sex and whether the participant was living with family during the first Covid-19 lockdown.

Structural sibling characteristics were gathered at Wave 5 (MCS5), from the household file. Only children were retained in the sample to compare against larger families (Pollet and Nettle, 2009). Siblings were operationalised as any MCS5 family members with a relationship to the primary cohort member indicated as sibling (including full, half, step, adopted, and foster siblings). Sibship size was calculated for each family by counting the number of siblings in each household, from which participants were categorised: no siblings, one sibling, two sibling, and three or more siblings. Additionally, the MCS5 household data also allowed for information to be collected regarding sibling type. Sibling type was categorised as only those with only full siblings and those who have mixed sibling families (e.g., White and Riedmann, 1992; Harcourt *et al.*, 2015; Yucel and Yuan, 2015). Next, family member sex, as indicated on the same household file, allowed for sibling gender composition to be operationalised. In combination with participant sex information from the MCS5 family file, participants were categorised, where relevant, as part of same-sex or mixed-sex sibling groups (Rao and Chatterjee, 2017; Brenøe, 2018). Finally, participant sex, which was operationalised as male or female (1 = male; 0 = female), was also included as an independent variable as well as a moderator to determine how family factors impacted young men and women's MW differently during Covid-19.

Separately, family cohabitation were also included as independent variables and collected from the MCSCov survey. This variable is considered separate because it was collected at the same point in time as the outcome variable, thus does not possess the same inferential validity as independent variables collected at an earlier point (i.e., through reverse causation). However, young adult cohabitation with family was considered an important piece to the puzzle of understanding how young adult MW during Covid-19 was impacted by family factors, and empirically relevant specifically to young adult populations in GB (Copp *et al.*, 2017; Evandrou *et al.*, 2021). Young adult cohabitation with family was captured by participants who indicated they were living with a parent or carer (Evandrou *et al.*, 2021). Therefore, through

using sibling factors as well as sex and family measures as independent variables (Table 1), the protective nature of family to MW during Covid-19 could be assessed.

CONTROL VARIABLES

Control variables were crucial to this study, because differences between sibling characteristics and relationships and mental wellbeing during Covid-19 may be jointly determined by other factors, thus confounded. Ideally, this confounding is addressed through randomisation between treatment and control groups (i.e., randomised control trials); however random allocation of participants into family groups is far from realistic. Therefore a study design using number of siblings to predict MW outcomes must consider these sources of error in model estimation through including control measures, which reduces potential for confounding from omitted variable bias (Bryman, 2016). Additionally, to isolate the effects of siblings on MW, Covid-19 stressors, previously identified as associated with wellbeing during the pandemic, were also controlled, including changed financial conditions, experience of Coronavirus symptoms, moving houses, and changes to education (Wright, Steptoe and Fancourt, 2020; Evandrou *et al.*, 2021). Thus the issue of confounds to any observed relationship between sibling effects and wellbeing are somewhat addressed through including control variables into the model (Table 1).

ANALYTICAL STRATEGY

To investigate variations in young adult MW conditioned on the shock of Covid-19 lockdown, and how these variations were impacted by sibling and family factors, MW observed before Covid-19 was used as a control variable within traditional OLS regression estimation (see equations 1 – 4 below). Given that Covid-19 MW was expected to be significantly correlated to existing positive mental health, lagging MW by one period ($t-1$), and including the LDV on the right hand side of the equation, allowed the researcher to account for the dynamic processes of positive mental health over a fixed period, as well as control for pre-existing mental health levels that contribute to omitted variable bias (Keele and Kelly, 2006).

Analysis was conducted in four steps. First, to assess the influence of siblings on MW outcomes, young adult MW are written as a function of only siblings and participant and family characteristics. The intention was to establish a difference between only children and siblings. Shown by equation (1), MW_{it} measures participant i 's positive mental health during the Covid-19 pandemic. The effect of interest, β_1 represents that of being an only child; of secondary importance, β_2 represents the controlled effect of living with family during Covid-19; and β_3 represents the controlled effect of participant sex (with male equal to one and female as the reference category). Previous MW for individual i is represented by $MW_{i(t-1)}$, where β_4 represents

the effect. Finally, X_i is a matrix of individual control variables, and ε_{it} represents the unobserved error during observation at time t .

$$MW_{it} = \beta_0 + \beta_1 OnlyChild_i + \beta_2 Family_i + \beta_3 Male_i + \beta_4 MW_{i(t-1)} + X_i \delta + \varepsilon_{it} \quad (1)$$

The second model (Model 2) was intended to further break down sibling number to test sibling support hypotheses, and to determine if effects on SWEMWS scores during Covid-19 improved, or became stronger with increased sibling number. Model 2 is indicated by equation (2), showing similarly represented effects as equation (1), however now β_1 represents the effect of number of siblings for participant i .

$$MW_{it} = \beta_0 + \beta_1 SiblingNumber_i + \beta_2 Family_i + \beta_3 Male_i + \beta_4 MW_{i(t-1)} + X_i \delta + \varepsilon_{it} \quad (2)$$

Model 3 added the next set of sibling variables into the equation to compare sibling compositions, to determine how sibling relatedness and gender composition, conditioned on sibling number, affected Covid-19. Shown by equation (3), $FullSibling_i$ represents whether a participant has only full siblings, as opposed to mixed siblings; while $MSSibling_i$ represents whether the participant has mixed-sex siblings (as opposed to same-sex).

$$MW_{it} = \beta_0 + \beta_1 SiblingNumber_i + \beta_2 Family_i + \beta_3 Male_i + \beta_5 FullSibling_i + \beta_6 MSSibling_i + \beta_4 MW_{i(t-1)} + X_i \delta + \varepsilon_{it} \quad (3)$$

Model 4 was used to break down how a participant's sex moderates the effects of sibling and family variables on MW scores during Covid-19. Shown by equation (4), this final LDV OLS model includes three interaction effects, represented by β_7 , β_8 , and β_9 , which indicate, given the participant is male, the effect sibling number, having only fully related sibling and living with family, respectively. Therefore Model 4 was used to determine how siblings and family factors protected or risked MW in young men and young women differently.

$$MW_{it} = \beta_0 + \beta_1 SiblingNumber_i + \beta_2 Family_i + \beta_3 Male_i + \beta_5 FullSibling_i + \beta_6 MSSibling_i + \beta_7 (SiblingNumber_i \times Male_i) + \beta_8 (FullSibling_i \times Male_i) + \beta_9 (Family_i \times Male_i) + \beta_4 MW_{i(t-1)} + X_i \delta + \varepsilon_{it} \quad (4)$$

The main criticism of LDV OLS regression is that LDV's can suppress the explanatory power of other independent variables and negatively bias estimates (originally Achen, 2001; see also Tanizaki, Hamori and Matsubayashi, 2006; Wilkins, 2018). However, when disturbance terms (ε_{it}) are independently identically distributed (i.e., uncorrelated and normally distributed,) and Y_{t-1} is observed, OLS estimation is generally deemed an appropriate choice due to its consistency within large samples (Maeshiro, 1996). Moreover the independence of explanatory variables (a core assumption of multiple regression; Chatterjee and Simonoff,

2013) is often not the case when using LDVs (Achen, 2001). However, without the context of the pandemic, MW scores before Covid-19 are not expected to be significantly predicted by sibling factors (White, 2001; Finan, Ohannessian and Gordon, 2018). Moreover, under Weak Dependence Assumptions with a large sample, like the one used in this dissertation, the bias introduced by a LDV on an OLS estimate approaches zero (Wilkins, 2018). Finally, LDV OLS regression was chosen over the commonly preferred alternative of fixed effect modelling (Achen, 2001; Allison, 2009; Wilkins, 2018), due to key predictive factors (siblings) being time invariant, and research focus on the MW within the specific window of Covid-19 lockdown rather than as a change over time.

In summary, four regression models were constructed to test whether MW during Covid-19 was protected by different sibling factors (Table 1). All data and analyses work was done using R Studio software. Additionally, all analyses were weighted using longitudinal survey weights that account for response attrition across waves as well as sample construction. Finally, the researcher used a significance level of $p < 0.01$ to reduce rate of false positives and increase analysis power (Field, 2018). In the next section, after a description of the sample characteristics and model assumption checks, results of the four LDV OLS regression analyses are presented.

TABLE 1 : VARIABLE SUMMARY TABLE

A variable Summary table Containing central tendency (Variance) and prevalence of study measures for N = 2,127 participants. Here, SWEMWS are reported as actual means, rather than scaled means, to indicate MW response Tendencies.

Variables	Mean or % *	SD	Metric	Description
Dependent Variable				
Covid-19 MW	3.32	0.71	1 – 5	<p>To measure mental wellbeing, the researcher took the mean SWEMWS scores across 7 indicators to create a composite wellbeing score for Covid-19 (this was also for SWEMWS at MCS7). The questions asked of participants were as follows: (1 = None of the time; 5 = All of the time)</p> <p>Over the past two weeks have you been:</p> <ol style="list-style-type: none"> 1) feeling optimistic about the future 2) feeling useful 3) feeling relaxed 4) dealing with problems well 5) thinking clearly 6) feeling close to other people 7) able to make up my own mind about things <p>Responses to these indicators were averaged across participants. Then, to facilitate interpretation the scores were scaled so that the mean was 0 and standard deviation 1.</p>

Independent Variables

Family Size

No siblings (reference)	16.57	0 – 1	Having no siblings living in the household (0 = No; 1 = Yes)
One sibling	46.17	0 – 1	Having one sibling living in the household (0 = No; 1 = Yes)
Two siblings	25.91	0 – 1	Having two siblings living in the household (0 = No; 1 = Yes)
Three + siblings	11.35	0 – 1	Having three or more siblings living in the household (0 = No; 1 = Yes)

Dimensions of Sibship (only children excluded)

Mixed siblings (reference)	12.82	0 – 1	Are there siblings in the household that are half, step, adopted or foster (0 = No; 1 = Yes)
Only full siblings	87.18	0 – 1	Are the siblings in the household all fully related (0 = No; 1 = Yes)
Same-sex siblings (reference)	61.61	0 – 1	Are the siblings in the household same-sex (0 = No; 1 = Yes)
Mixed-sex siblings	38.39	0 – 1	Are the siblings in the household mixed-sex (0 = No; 1 = Yes)

Participant Sex

Female (reference)	50.63	0 – 1	Respondent sex is classified as female (0 = No; 1 = Yes)
Male	49.37	0 – 1	Respondent sex is classified as male (0 = No; 1 = Yes)
Living with family	90.97	0 – 1	Respondent is living with parents or grandparents (0 = No; 1 = Yes)

Control Variables

Ethnicity

Non-white (reference)	15.99	0 – 1	Respondent ethnicity is classified as Non-white (from derived variable categorising participants six UK Census ethnic categories) (0 = No; 1 = Yes)
White	84.01	0 – 1	Respondent ethnicity is classified as White (from derived variable categorising participants six UK Census ethnic categories) (0 = No; 1 = Yes)

Number of carers	1.82	0.38	1 – 2	Number of primary carers indicated in the household during childhood (1 = one carers; 2 = two carers)
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Covid Living

Experience of Covid-19 symptoms	59.69	0 – 1	Respondent has experienced any Covid-19 symptoms since the pandemic began (0 = No; 1 = Yes)
Changes to learning	49.91	0 – 1	Respondent indicated experiencing changes to learning due to Covid-19 (0 = No; 1 = Yes)
Moving due to Covid-19	24.53	0 – 1	Respondent indicated moving since Covid-19 began (0 = No; 1 = Yes)
Financial experience since Covid-19 began	26.09	0 – 1	Respondent indicated that their financial situation since Covid-19 began is either 'much worse' or 'somewhat worse', responses to survey scale binarized (0 = No; 1 = Yes)

Region

No Information (reference)	9.25		0 – 1	Region variable derived from post code response as indicated in MCSCov, if this response is left empty, there is no information (0 = No; 1 = Yes)
Wales	3.63		0 – 1	Region variable derived from post code response as indicated in MCSCov: post code indicates habitation in Wales (0 = No; 1 = Yes)
Scotland	6.83		0 – 1	Region variable derived from post code response as indicated in MCSCov: post code indicates habitation in Scotland (0 = No; 1 = Yes)
England	80.29		0 – 1	Region variable derived from post code response as indicated in MCSCov: post code indicates habitation in England (0 = No; 1 = Yes)
(lagged) MW **	3.47	0.68	1 – 5	

* Percentages rather than means are presented for the nominal (or categorical) variables. All means and percentages here are weighted according the manuals using longitudinal weights accounting for survey attrition.

** Lagged MW was collected at time $t - 1$ (MCS7), indicating pre-Covid MW levels (when participants were aged 17 in 2018/2019), and is used as a control covariate predicting Covid-19 MW

RESULTS

MODEL ASSUMPTIONS

While linear modelling is a powerful causal tool, the data and models under investigation were required to meet certain specifications to produce reliable and valid estimates (Chatterjee and Simonoff, 2013; Cohen *et al.*, 2013; Field, 2018): linearity, normality, homoscedasticity, independence of observations, and randomly distributed errors (or residuals) (Chatterjee and Simonoff, 2013; Cohen *et al.*, 2013; Wilkins, 2018). Moreover, LDV OLS required that MW pre-Covid-19 be correlated with MW post-Covid-19. When data fit within these parameters, parametric analysis (like OLS) can facilitate causal inference. However, if any of these assumptions are violated, estimates are considered unreliable and invalid (Maeshiro, 1996; Achen, 2001; Cohen *et al.*, 2013; Field, 2018; Wilkins, 2018).

Some assumptions were confirmed before analysing models. First, given that main independent variables are all categorical, linearity could be assumed between family factors and mental wellbeing (0-1 has only one path, which is linear in nature). Second, histograms showed that the frequency of wellbeing scores before and after the pandemic approximated a normal distribution (Annex B: Figure 3 and Figure 4). Third, Pearson's correlation showed that pre- and post-pandemic SWEMWS scores were significantly positively correlated in a test ($r = 0.50, p < 0.01$), and a basic linear model indicated that preceding MW predicted pandemic MW ($\beta = 0.50, S.E. = 0.02, p < 0.01$).

Further model assumptions were checked after running each model, before interpretation. All model assumption plots can be found in Annex B: Figure 3 –

Figure 8. Residuals were checked with Q-Q plots, or probability plots comparing standardised residuals against their theoretical quantiles, showing the difference between the observed value and predicted value (Chatterjee and Simonoff, 2013). The models' Q-Q plots showed consistent variance across the predicted line, as is expected of homoscedastic residuals. Residual scatterplots, indicated no visible trend, thus errors were randomly distributed. Finally, independence of explanatory variables was confirmed using generalized variance inflation factor (GVIF) analysis (Fox and Monette, 1992) with a cut-off of four (O'Brien, 2007). None of the models generated GVIF values above 2.18, thus quantitative threshold for independence of explanatory variables was met theoretically and quantitatively. Further, the association between MW and its lag was also fairly consisted across the regression models summarised in Table 2, ($\beta = 0.45 - 0.46$, S.E. = 0.02, $p < 0.01$). Thus, the analyses in this section can be interpreted under the assumption that estimations are both valid and reliable.

SAMPLE DESCRIPTION

Table 1 provides descriptive information on the study sample. About 51 percent versus 49 percent of the population were female or male, respectively. At MCS5, about 17 percent of the sample were only children, 46 percent had one sibling, 26 percent had two siblings, and 11 percent had three or more siblings. Looking at sibling types, 87 percent of the sample had only full siblings, while almost 13 percent had mixed families. Sibling gender composition was split 60 percent with same sex-siblings and 40 percent with mixed-sex siblings. Almost 90 percent of participants were living with family during MCSCov data collection. Further details on sample characteristics (e.g., region, ethnicity, number of carers in childhood, and Covid-19 stressors) are provided in Table 1.

As shown in Figure 1, SWEMWS scores during Covid-19 averaged 3.32 points (SD = 0.71) on a scale ranging from 1.00 to 5.00. Pre-Coronavirus SWEMWS scores averaged 3.47 points (SD = 0.68). Average change between the two time periods per participant was 0.16 points (SD = 0.70) worse MW during Covid-19 than before (Figure 2). Considering these distributions binarily, with SWEMWS scores less than three indicating low MW scores, 21 percent of the population experienced low MW before the pandemic, which increased to almost 30 percent of the sample during the first lockdown. Scaled SWEMWS scores indicated the lowest MW score during lockdown was 3.31 standard deviations lower than the mean, and the highest MW score was 2.45 standard deviations higher than the mean. A similar distribution was observed in pre-pandemic MW (Min: - 3.68; Max: 2.26).

Comparing SWEMWS score descriptions by gender (Figure 1 and Figure 2), male participants appeared to experience higher MW than their female counterparts both before and during the

pandemic (Figure 1). Conversely, both male and female participants with siblings appear to have reported better MW during Covid-19 than their only child counterparts. From Figure 1, it appears that male participants without siblings experienced lower drops in SWEMWS score between MCS7 and MCSCov. Figure 2 further shows that only child males seem to have experienced some of the most drastic wellbeing declines compared to other gender and sibling groupings.

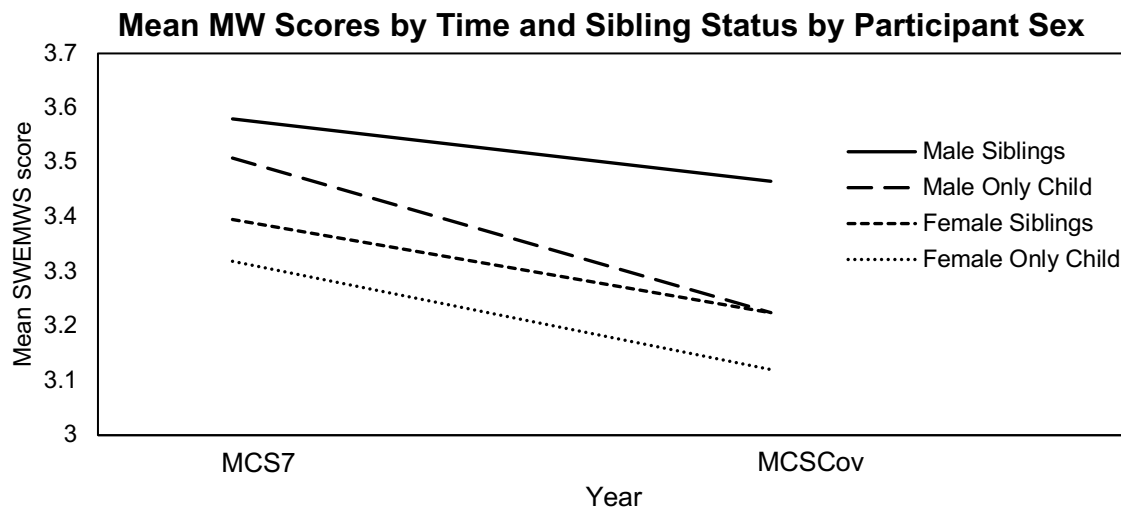


FIGURE 1: MEAN MENTAL WELLBEING BEFORE AND AFTER COVID-19, BY SEX AND SIBLING

A Line graph showing weighted mean SWEMWS scores at time $t-1$ (MCS7) and t (MCSCov). Mean SWEMWS Scores are Broken down here by sibling status and participant Sex. In this figure, larger SWEMWS scores indicate better overall MW.

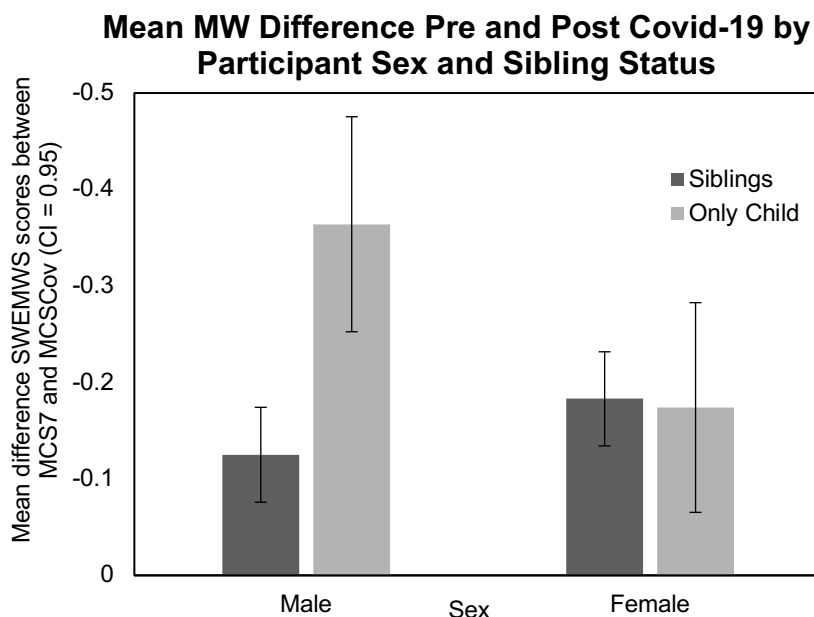


FIGURE 2: DIFFERENCE IN MENTAL WELLBEING BEFORE AND AFTER COVID-19, BY SEX AND SIBLING

A bar graph depicting the mean difference of SWEMWS scores between times $t-1$ (MCS7) and t (MCSCov), as broken down by sex and sibling status. In this table, larger negative scores indicate larger negative MW changes between MCS7 and MCSCov.

Table 2, Figure 1, and Figure 2 indicate that there are statistically relevant associations between family structure, participant sex, and positive mental health during the first Covid-19 lockdown. Because SWEMWS scores were scaled for analysis, all reported OLS standardised coefficients in Table 2, Beta (β), can be understood as deviations from a mean mental health score of zero. Finally, all four regression models contained control variables, which are also reported in Table 2, though not discussed in depth here. A null model containing only controls (Annex C: Table 3), including the LDV, significantly predicted 28 percent of the total observed variation in SWEMWS scores ($R^2 = 0.28$, $F(12, 2114) = 70.45$, $p < 0.01$).

TABLE 2: MAIN REGRESSION MODEL (1 – 4) SUMMARY TABLE

Results of a lagged dependent variable regression models on the mean SWEMWS scores collected during may 2020 according to sibling characteristics and family living

	Model 1		Model 2		Model 3		Model 4	
	Beta	S.E.	Beta	S.E.	Beta	S.E.	Beta	S.E.
(Intercept)	-0.09	(0.14)	-0.25	(0.14)	-0.27	(0.14)	-0.11	(0.14)
Only Child	-0.20 ***	(0.05)	–	–	–	–	–	–
One Sibling			0.18 **	(0.06)	0.31 ***	(0.08)	0.08	(0.10)
Two Siblings			0.30 ***	(0.06)	0.42 ***	(0.09)	0.24*	(0.11)
Three+ Siblings			0.04	(0.08)	0.15	(0.10)	0.18	(0.10)
Full Siblings					-0.14 *	(0.06)	0.00	(0.08)
Mixed Sex					-0.02	(0.04)	-0.01	(0.04)
One Sibling × Sex							0.47 ***	(0.12)
Two Siblings × Sex							0.38 **	(0.12)
Full Siblings × Sex							-0.29 **	(0.11)
Living with Family × Sex							0.31 *	(0.13)
Living with Family	0.30 ***	(0.07)	0.29 ***	(0.07)	0.30 ***	(0.07)	0.15	(0.09)
Male	0.17 ***	(0.04)	0.18 ***	(0.04)	0.18 ***	(0.04)	0.06	(0.08)
Lagged MW	0.46 ***	(0.02)	0.45 ***	(0.02)	0.46 ***	(0.02)	0.46 ***	(0.02)
Adjusted R ²	0.29		0.29		0.29		0.30	
F-Statistic	66.43		58.96		52.37		43.82	
DF	12, 2113		15, 2111		17, 2109		21, 2105	
N Participants	2,127		2,127		2,127		2,127	
overall model sig	p < 0.01		p < 0.01		p < 0.01		p < 0.01	

Significance codes: 0 '***' 0.001 '**' 0.01 '*'

Controls were included in each model, and the following listing indicates significant controls throughout all models (significance levels of controls did not vary depending on model): financial experience since Covid-19 ***; experience of academic interruption; experience of Covid-19 symptoms***; moving due to Covid-19 ***; number of carers during childhood; region of survey; and ethnicity

FAMILY AND MENTAL HEALTH DURING COVID-19

Models 1, 2 and 3, show that sibling variables account for about 1 percent of MW variation during Covid-19. In Model 1, the variation in SWEMWS scores was significantly negatively related to being an only child during MCS5, in comparison to having a sibling ($\beta = -0.20$, S.E. = 0.05, $p < 0.01$). This means that only children experienced a fifth of a deviation worse MW than their sibling peers during Covid-19. Breaking down further, Model 2 shows that, controlling all else, participants who had one sibling ($\beta = 0.18$, S.E. = 0.06, $p < 0.01$) or two siblings ($\beta = 0.30$, S.E. = 0.06, $p < 0.01$) were associated with significantly more positive SWEMWS scores during Covid-19, in comparison to only siblings. Meanwhile, no difference was found in Covid-19 SWEMWS scores between only children and those with three or more siblings.

Model 3 all considered sibling factors. The effect on SWEMWS scores of having one sibling ($\beta = 0.31$, S.E. = 0.08, $p < 0.01$) and having two siblings ($\beta = 0.42$, S.E. = 0.09, $p < 0.01$) increased when considering sibling composition factors, absent from Model 2. However, the standard error for these estimates also increased, therefore interpretation should be cautious. Controlling for only children, participants who had only full siblings were associated with significantly lower SWEMWS scores than mixed-sibling families ($\beta = -0.14$, S.E. = 0.06, $p < 0.01$). No such significant differences were found comparing mixed-sex and same-sex siblings. In other words, the results of Model 3 indicate having only full siblings was associated with negative Covid-19 MW changes, but sibling gender composition did not mirror this effect.

The first three models succeed in establishing that sibling factors predicted MW during Covid-19. In harmony, these models also indicate that participants who were living with family were associated with almost a third of a deviation better MW than those who were not ($\beta = 0.29 - 0.30$, S.E. = 0.07, $p < 0.01$). Combining the findings of Models 1 – 3, these results indicate that young adults in this sample were protected from negative MW if they had one or two siblings, and if they were living with their families.

DIFFERENCES BY SEX

Participant sex was consistently significant across the first three models ($\beta = 0.17 - 0.18$, S.E. = 0.04, $p < 0.01$) and indicated that male participants experienced higher MW during Covid-19 than female participants. To investigate how sex moderates the relationship between siblings and MW, as indicated by the previously outlined theory and Figure 1 and Figure 2, interaction terms were added to Model 4, based on a factor's significance in preceding Models 1 – 3 (Cohen *et al.*, 2013; Field, 2018). Product terms interacting sex with having only full siblings, having one sibling, and having two siblings were included in the Model 4. Including

these three interaction terms in Model 4 explained one percent more overall variation in SWEMWS scores ($R^2 = 0.30$, $F(15, 2111) = 43.82$, $p < 0.01$) than previous Models 1 – 3. This may seem like a small amount. Though, looking at the descriptive Figures Figure 1 and Figure 2, the inclusion of Model 4 into the analysis allows the investigator to disaggregate effects of participant sex from family effects, to see a more clear picture of how family structures may be protecting or risking MW for young men and women. Because the moderators of sibling is a categorical dummy variable (0 = female; 1 = male), the interpretation of estimates is: interaction effects are the specific effects on men, while main effects reflect effects on women.

Model 4 shows how sibling effects changed given a person's sex. Young men's MW benefitted from having both one sibling ($\beta = 0.47$, S.E. = 0.12, $p < 0.01$) and, to a lesser extent, two siblings ($\beta = 0.38$, S.E. = 0.12, $p < 0.01$), compared to only child males, while young women's MW only significantly benefitted from having two siblings ($\beta = 0.24$, S.E. = 0.11, $p < 0.01$), compared to no siblings. Having only full siblings negatively affected male ($\beta = 0.29$, S.E. = 0.11, $p < 0.01$) but not female participants. Similarly, female participants did show any different variation in SWEMWS scores when living with family, or living without family. However, males did show a strong positive effect on SWEMWS scores from living with family during Covid-19 ($\beta = 0.31$, S.E. = 0.13, $p < 0.01$). Overall, when looking at protective and risk factors for mental wellbeing, male MW seems to be more affected by family factors than female MW during Covid-19, with young women experiencing some protection from having two siblings.

DISCUSSION

Promoting good mental health, and reducing negative MW in young adults is important not only for policy, but for larger society as well (WHO, 2004; Beddington *et al.*, 2008; Johnson *et al.*, 2017; Stewart-Brown, 2017; Public Health England, 2020; Parkin, 2021). Despite considerable research and policy attention on the role of family structure in mental health (e.g., Aquilino and Supple, 2001; Kiernan and Huerta, 2008; Malmberg and Flouri, 2011; Feinberg, Solmeyer and McHale, 2012; Finan, Ohannessian and Gordon, 2018; Harkness and Salgado, 2018), important gaps remain regarding how siblings impact mental health outcomes. Evidence suggests that positive mental health is differentiated by gender and family structure (Finan, Ohannessian and Gordon, 2018; Campbell, Bann and Patalay, 2021; O'Connor *et al.*, 2021). However, the existing research on MW has been limited first by cross-sectional designs, second through focusing on childhood and adolescent developmental periods, and third by neglecting to consider important sibling influences all together. Therefore, the main study objective was to use a longitudinal quantitative design to investigate how much sibling number, type, and gender composition, as well as living with family, protected young men and women's MW in Britain during Covid-19, using MCS observational data. To this end, LDV regression analyses found that young men, and young women to a lesser extent, experienced MW benefits during the Coronavirus UK lockdown from having one or two siblings as well as living with family.

Comparing the current findings with existing research using the WEMWS, the observed trends in the outcome variable mirror previous work. For example, previous research using the same scale has found that women generally reported lower SMEMWS scores than men (e.g., Powell

et al., 2013; Stewart-Brown *et al.*, 2015; Ng Fat *et al.*, 2017b; O'Connor *et al.*, 2021). Further aligning with previous research, no differences in ethnicity were found (O'Connor *et al.*, 2021). Moreover, the observed descriptive trend of general MW decline in young adult MW during the Covid-19 pandemic is also supported by previous empirical work (Etheridge and Spantig, 2020; Pieh, Budimir and Probst, 2020; O'Connor *et al.*, 2021). The alignment of observed trends with previous WEMWS work, and larger MW investigation, speaks not only to the reliability of the SWEMWS, but also to the validity of inferences made from the current dissertation's findings.

MORE SIBLINGS, BETTER MENTAL HEALTH

Answering the primary research question, being a singleton young adult was associated with 0.2 standard deviations less MW than having a sibling was. Supporting hypotheses and previous work, not having siblings in childhood was associated with lower positive mental health during a period of stress, compared to young adults who had a sibling. Thus, Social Attachment (e.g., Bowlby, 1969; Stocker and Lanthier, 1997; Lagerstrom, 2018) and Social Learning (e.g., Bandura, 1977; Bedford, Volling and Avioli, 2000; Kitzmann, Cohen and Lockwood, 2002; Sang and Nelson, 2017) theories are supported. Similarly, the finding that sibling young adults do better than singletons indicates support for the social support hypothesis (e.g., Pearlin, 1999).

Merry and colleagues' (2020) found similar results when investigating the social domain of MW by looking at early adulthood relationship quality as predicted by earlier sibling environment. Similar to the current dissertation, Merry and his team collected data from participants at one point in time and followed up with young adult outcomes at a later wave of data collection. They found relatively strong significant negative association between only children and romantic relationship quality. However, Merry used an outcome variable only collected at one point in time. Therefore they were unable to take into account existing levels of social functioning. A strength of the current dissertation is that it looked at outcome variable controlling for previous levels, while controlling for existing mental health levels before the pandemic. Through utilizing a longitudinal design looking at MW isolated within the period of Covid-19 isolation, the current study provided support for the causal path between siblings and protection against MW stressors.

This dissertation's and Merry *et al.*'s (2020) empirical findings that siblings provide social support, thus are protective of mental health are not alone (e.g., Berg *et al.*, 2017; Finan, Ohannessian and Gordon, 2018; Krejcová, Chýlová and Michálek, 2019; Fry, Telzer and Rogers, 2021). However, similar to other work on siblings, when sibling factors are included,

the relationship between siblings and positive mental health is far from simple (Feinberg, Solmeyer and McHale, 2012; McHale, Updegraff and Whiteman, 2012; Feinberg *et al.*, 2021). The findings in this dissertation imply that, unlike Merry's findings, the relationship between sibling number and MW is U-Shaped. The lack of significant difference in MW effect between singletons and participants with three or more siblings indicate the possibility that too many siblings may cause the same negative mental health changes during Covid-19 lockdown as being an only child, similar to more traditional work on resource dilution theory (Downey, 1995; Evenhouse and Reilly, 2004; Black, Devereux and Salvanes, 2010). On the other hand, the differences between MW changes of participants with three or more siblings, and the changes in MW of participants with no siblings, do indicate a positive association, albeit nonsignificant (+0). This positive association between large number of siblings and MW changes during lockdown could be considered further indication that siblings, of any quantity, are protective of mental health. Moreover, in comparison to having no siblings, having two siblings had a larger effect on mental wellbeing changes than having one sibling, which also differed from singletons. Therefore, theory of siblings as social support is partially accepted here.

The finding that Covid-19 MW of participants with three or more siblings is not significantly different from that of singletons may be an artifact of study design. Other research, which uses sibling number groups rather than an interval or linear measure of sibling number, failed to find any significant differences on emotional or social domains for larger sibling groups (Lawson and Mace, 2010). Contrastingly, Merry and colleagues (2020) constructed number of siblings as a linear, interval level variable, starting at zero, and found strong associations with social wellbeing and increased sibling size. Further, the lack of association between only children and three plus groups could be an artifact of the sample, as only about 15 and 10 percent of the population, respectively, fit into these groups. Given that too small of sample size can reduce power of a regression model to detect differences (Chatterjee and Simonoff, 2013; Bryman, 2016; Piovesana and Senior, 2018), the lack of protective effect observed in three or more sibling groups could be due to limitations of the sample. Future research would need to look at the differences between categorical and interval types of sibling number variables, across a large sample of singletons and participants from large families, to reconcile whether sibling number increases has a linear or U-relationship with MW.

RELATED SIBLINGS ARE NOT NECESSARILY BETTER

Adding to the complexity of siblings as support, while confirming hypotheses and supporting research (Deater-Deckard and Dunn, 2002; Evenhouse and Reilly, 2004), those with only full siblings were found to have worse 0.14 standard deviations worse MW than those with mixed siblings. The finding that having only full siblings risks mental health sheds light on two

relatively separate empirical findings. First, full siblings pairs have been found to be associated with higher levels of conflict than half or step siblings (Deater-Deckard and Dunn, 2002). Second, that adding siblings to a household, especially half siblings, results in higher overall social cohesion for a family, thus better wellbeing (Harcourt *et al.*, 2015). It is important to note that the evidence around the protective or risk factors of mixed sibling families is highly varied (for review see Sanner *et al.*, 2018). For example, much literature comparing full and mixed siblings has found negative physical (Tanskanen, Danielsbacka and Rotkirch, 2015), and emotional behavioural outcomes (Evenhouse and Reilly, 2004) associated with having a mixed-sibling family. The incongruence of these findings and those of the current dissertation is explained through both differences of outcome measure, as well as differences in life stage. To the latter of these points, the studies indicating a negative effect of partially or non-related siblings here focused on wellbeing effects during childhood and adolescence. Following life course predictions, increased conflict in childhood, as is observed with full siblings, would inform the support found in having siblings later. Notably, this explanation goes against Bedford's conflict hypothesis work (2000). Future research would need to better investigate the mechanism of sibling conflict within the causal path of sibling type and mental health, perhaps through mediation analysis. Additionally, future research should account for family structure changes overtime, which could confound the effect of having only full siblings during childhood on MW in early adulthood (i.e., to mechanisms of emotional distress over family structure change during adolescence). Thus, a clear limitation of the current dissertation is that it failed to account for family size and structure across a life course (Amorim and Tach, 2019), something future work would need to remedy to reliably estimate effects of sibling relatedness on MW.

On the other hand, sibling gender composition was shown to be non-significant, thus the hypothesis that same-sex siblings would be associated with better MW during Covid-19 was rejected. This lack of significant effect due to sibling gender composition could be an artifact of the model and categories. Like sibling type, sibling gender composition could have changed between MCS5 and MCSCov. Moreover, the nonsignificant relationship was negative (-0), as predicted. To reconcile the contrasting perspectives used to build the sibling gender composition hypothesis and to explain the current findings would be best reconciled with subsequent studies looking at sibling gender composition effects on MW over time, across adolescence and into adulthood.

FAMILY IS PROTECTIVE OF MALE MENTAL HEALTH

Looking at the first three models, the answer to research sub question four is strong support for a protective effect of about 0.3 deviations better mental wellbeing when living with family

than when not, thus the hypothesis that living with family is protective of young adult MW during the pandemic is accepted. While it is already known that family buffers young adults from negative economic outcomes of adulthood (Billari and Liefbroer, 2007; Tosi and Grundy, 2018), the current dissertation's findings notably add how family also buffers against threats to positive mental health during the first lockdown.

However, the full picture of family effect on mental wellbeing is drawn with the final interaction model showing that the main effects used to answer the research questions all discuss the relationship between young men and their families. When gender is included as a moderating variable, the effects of mental wellbeing on women disappear (with the exception of young women with two sisters). Supporting the final hypothesis and previous work, gender moderated the relationship between MW and family factors (Cable *et al.*, 2013; Finan, Ohannessian and Gordon, 2018; Szymańska, 2020). Importantly though, sibling factor interaction with gender did not change the direction of sibling effect. Therefore the aforementioned directional association of family factors with MW still hold true for women, just no longer significantly. Cable and his colleagues (2013) found strikingly similar wellbeing results to the current study, in that, WEMWBS indicated that number of family relationships was important to men's MW over time but not women's. Importantly, Cable observed these differences in a sample of British adults between the ages of 45-60, indicating that the pattern observed between young men's MW and family may progress into later adulthood. Their study, which included peer relationships, indicated that, women's MW was better predicted by number of friendships than number of relatives. Given the similarity of Cable's work to the current dissertation's study design (longitudinal, using WEMWS scores as the outcome variable), future research should look at the impact of family and friends on MW throughout adulthood to better understand how to protect positive mental health.

Overall, the findings underscore the importance of family in protecting MW during a period of stress. While there are several strengths in this study, there are also notable limitations to the study's validity and reliability. First, given the nature of the MCS sample, the current findings may be impacted by cohort bias (Bryman, 2016), or the systematic differencing of responses due to particular, unaccounted traits within the cohort, unshared by the larger population. MCS participants may be different from the rest of the population, especially those who are participating in current waves, 20 years into the study. To correct for this limitation, future work would need to compare across different cohorts of young adults. Second, while the majority of family factors are collected prior to MW variables, family cohabitation was collected at the same time as MW, weakening the validity of causal inference by introducing the possibility of reverse causation (e.g., Angrist and Pischke, 2015; Bryman, 2016). Therefore, future work looking into Covid-19 mental health impacts, or wider protective nature of family against poor

mental health, the potential that poor MW may predict whether a young adult lives at home. Finally, as previously mentioned, sibling factors were time invariant in the current model. However, this eliminated the researcher's ability to look at how family factor change across adolescence is related to young adult MW. Therefore, future work needs to look at how family factors predict young adult mental health, with consideration toward family variation. Additional future work needs to also consider the impact of sibling conflict on emerging adult MW (e.g., Bedford, Volling and Avioli, 2000; Wolke *et al.*, 2013) to better understand the complexity that colours sibling relationship to positive mental health in early adulthood.

FUTURE RESEARCH AND POLICY IMPLICATIONS

Despite the aforementioned limitations, this dissertation provides important contributions to academic and policy research through examining associations between family structures and mental health. First, through looking at MW in the specific context of Covid-19, the direct impact of policy decisions on British young adult mental health was analysed. Second, through investigating how family protects against MW threats using representative data with a robust statistical model, policy evidence is provided that addresses mental health inequalities. When directed through the appropriate institutions, interventions aimed at improving emotional resilience and MW in young adults (WHO, 2004; Public Health England, 2020; Parkin, 2021) can be improved with these findings in the following ways:

1. Mental health services available to young adults, such as those at universities and through the NHS, do not often incorporate family support systems. Moving forward, these services should make more targeted approaches by incorporating family networks into wellbeing plans for young men with siblings.
2. To reduce mental health inequalities, British policy related to reducing loneliness and social isolation (e.g., Parkin, 2021) needs to direct funding for support services directed toward young women and emerging adults without siblings and living without family.
3. Family support policy, such as the generous furlough and supplemental universal credit payments seen during 2020-2021, needs to extend support to families with adult children living at home, and to encourage young adults to use built-in familial support systems.

CONCLUSION

Through examining family-related risk and protective factors, the current study aimed to inform debates about how British young adult mental health was directly affected by the first national Coronavirus lockdown. This dissertation extended past work by using a short-term longitudinal design to explore the effect of sibling factors on MW conditioned on the Covid-19 context. Results from this study suggest young men, in particular, may benefit from the social support provided by siblings and families during a period of stress. Any future lockdown measures need to be considered in relation to how the mental health of the young adult population is affected by social isolation and life-stage interruptions.

ANNEX A: SCHOOL OF POLICY STUDIES RESEARCH ETHICS APPROVAL

University of
BRISTOL

School for Policy Studies

SPS RESEARCH ETHICS APPLICATION FORM: U/G and TAUGHT POSTGRADUATE STUDENTS

This form must be completed for each piece of research carried out by all undergraduate and taught post-graduate students in the School for Policy Studies.

Students should discuss their proposed research with their supervisors who will then approve and sign this form before forwarding to the relevant dissertation convenor (or in some cases unit convenor or programme director) who will approve the form on behalf of the SPS REC when they are happy with the contents.

Failure to get approval prior to conducting any fieldwork (virtual for 2020/21 only) may result in the University taking action for research misconduct – the outcome of such action may be that you are unable to submit your fieldwork findings for assessment and your **degree may not be awarded**.

Once your study is approved, you must follow the plan described in this form. You should remember that ethics is an on-going process, ie your ethical thinking is not 'done' when your form is signed. It is about how you act as a researcher. You should remain reflexive throughout the research process and think about how the research is impacting on your participants and yourself. You should refer to this completed form throughout your research process to make sure you are remaining within your ethical approval. If you wish to change your research plan, then you must discuss this with your supervisor. If the change is very small your supervisor can approve the change. However, if the change is more significant, you will need to ask for an amendment to your ethical approval. Your supervisor and dissertation convenor must approve this change in writing. If you do not get approval for changes, then you won't have ethical approval for the change, and it may result in the University taking action for research misconduct.

This signed form or a copy **must** be submitted as an appendix to your dissertation. If appropriate, a copy of approval from the SPS Research Ethics Committee (REC) or other REC committee should also be in the appendix to your dissertation.

Who needs to provide Ethics approval for your project?

Annex A: University of Bristol SPS REC Approval

The School will only consider those projects which do not require ethical approval from elsewhere. As such, you should make sure that your proposed research does not fall within the jurisdiction of HMPPS (Her Majesty's Prison and Probation Service) or the NRES system. e.g. does it involve staff or offenders – see <https://www.gov.uk/government/organisations/her-majestys-prison-and-probation-service/about/research> or does it involve NHS patients, staff or facilities – see <http://www.hra-decisiontools.org.uk/ethics/>.

Social care research projects which involve NHS patients, people who use services or people who lack capacity as research participants need to be reviewed by a Social Care Research Ethics Committee (see <https://www.hra.nhs.uk/planning-and-improving-research/policies-standards-legislation/social-care-research/>). Similarly, research which accesses unanonymised patient records (without informed consent) must be reviewed by a REC and the National Information Governance Board for Health and Social Care (NIGB).

Any application to an external body should be discussed with your supervisor.

Terminology used in this form:

Primary research includes any research that collects new data such as interviews, focus groups, observations, online surveys, new data collected via a social media post etc. **Due to the COVID 19 situation, fieldwork (collection of data in person) is not permitted. All primary research must take place online, over the telephone or using methods that allow sharing of information without meeting in person.**

Secondary analysis relates to the re-analysis of data that already exists such as analysis of publicly available documents or tv programmes, analysis of existing social media posts, reviews systematic or otherwise, or statistical analysis of analysis of publicly available datasets etc.

Which sections of the form do I complete?

All students must complete **section 1**.

If your research includes **primary research**, please go to **section 4** and complete **all** of the following questions and sections of the form. You should also read **section 2** if your research involves **children or vulnerable adults**.

If your research only involves **secondary analysis** of data, please go to **section 3** and then **complete section 5**.

All students must also complete the section on Data Management (**section 5**). When your supervisor is happy with your form, complete **part A of Section 6** and send it to this final version of your form to your supervisor.

SECTION ONE: STUDENT, ADVISOR/SUPERVISOR

Please complete:

Requested information	Details
Student's name:	LISA WADDELL
Student's email:	PA20319@BRISTOL.AC.UK
Programme:	MSc POLICY RESEARCH
Project advisor/supervisor:	Professor Susan Harkness
Date dissertation is to be submitted:	13 SEPTEMBER, 2021
Project working title:	The 'brother penalty': an investigation of how sibling sex effects gender conformity

SECTION TWO: WORKING WITH CHILDREN AND VULNERABLE PEOPLE

We have removed the information regarding the DISCLOSURE AND BARRING SERVICE CHECK from this form as no face to face fieldwork is permitted this academic year (20/21). (This is the check that you need if you are going to meet with children or vulnerable adults).

However, any research which includes children or vulnerable adults is considered 'sensitive' and your research plans should be extremely well thought through and all of the potential ethical issues on considered on this form. You must discuss your plans in detail with your supervisor.

When engaging with young children (under 13), you must contact them through their parents/carers/teachers. The responsible adults should be given an information sheet providing full details about the research. Children and young people should also be given appropriately written information about the project. Young children under 13 should be asked for their 'informed assent' to take part - ie that understand at an age appropriate level about the project and they are happy to be involved. Children between 13 and 17 should be asked for their informed consent to take part. In some cases, it will be appropriate to only seek the 13-17 year old's, ie not their parent's, consent to take part in the research. This should be discussed with your supervisor and approved on a case by case basis. When researching with children/young people face to face online, you should ensure that parents/carers/ teachers are nearby and able to support children's participation and wellbeing.

If you are engaging with children/young people (under 18) face to face online, then no more than 2 contacts are allowed. If you wish to do longer term work with children/young people, please discuss this with your supervisor.

You should only use your University email address and never give out your personal phone number. You must keep a record of all email contacts to and from young people or vulnerable adults.

For further guidance see:

<https://learning.nspcc.org.uk/research-resources/briefings/research-with-children-ethics-safety-avoiding-harm#article-top>

SECTION 3: SECONDARY RESEARCH**For those intending to carry out secondary analysis of data:**

Please provide details of where you are getting your data set from and how you will use. Data sets must be stored on the University of Bristol server.

Questions	Details
What sources / secondary datasets you will use?	Millennium Cohort Study: Seventh Survey, 2018 (8682) Millennium Cohort Study: Longitudinal Family File, 2001-2018 (8172)
Where will you get these data from (e.g. ESRC Data Archive, systematic literature review, document archive). Please describe your selection criteria and how you will locate/access the data?	UK Data Service: Projects must be created within a verified account in the UK Data Service. Data can be then be assigned to the project and accessed following dataset specific conditions. Links to Datasets: https://beta.ukdataservice.ac.uk/datacatalogue/studies/study?id=8682 https://beta.ukdataservice.ac.uk/datacatalogue/studies/study?id=8172
If necessary, how will you obtain permission to use these data? This would apply to data sets where it is usual for the researcher to sign an end user licence.	Datasets 8172 and 8682 are safeguarded. Therefore, the data can be accessed after agreement to the End User License for the UK Data Service as well as the additional condition of agreement for SN8172 and SN8682, which includes a verification of storing the data securely.
How will you analyse the data?	RStudio Software and SPSS (data arrives in SPSS and tab delineated format)
What ethical issues will you consider? i.e. will you consider the quality of the papers/programmes etc reviewed?	Data is anonymised during collection, thus does not raise concerns about personally identifying information. However, the information is socially sensitive in nature and must be stored on a secure server. The University of Bristol Research Data Storage Facility (RDSF) ensures this data security.

If you are only using secondary data, please go to Section 5.

If you are using 'mixed methods' (i.e. collecting primary data as well), complete the rest of this form.

SECTION FIVE – DATA MANAGEMENT

To be completed by all students whether you are doing primary research including fieldwork or secondary analysis.

1) How will you manage your data?

All identifiable electronic data should be stored on the university password protected server.

Data should be anonymised as soon as possible and identifying files kept securely away from anonymised data.

Unanonymised data must **never** be stored on a memory stick or digital recorder (other than on your return journey from an interview) unless it is a highly secure password protected and encrypted device (e.g. FIPS 140-2 Level 3 security). Any paper document, such as consent forms, should be locked away in a secure draw or cabinet until they can be scanned and saved on the University of Bristol server. The documents should be scanned as soon as possible. Paper documents should be disposed of securely by shredding or in the confidential waste bins in SPS.

In accordance with the Data Protection Act, **the data collected must not be kept any longer than necessary than for the purpose it was collected for.** Therefore, you must delete your data from the University server when you are awarded your degree.

If you plan to publish (write a paper about your findings) or plan to do a further degree and use the data as the starting point for your Masters Dissertation, you must discuss your plans with your supervisor. This is because the data must remain stored at the University of Bristol – usually in your supervisor’s account on the University Data storage facility. You are not permitted to store data outside of the University.

If it is agreed that your supervisor will hold your data for you, then you would need to explain that you want to keep the data and describe how it will be used in your information sheet. You must also ask for specific consent to keep the data for the specified purpose.

Declaration	Yes
I confirm that that data collected/used will be stored on the University of Bristol server.	X
I confirm that paper documents will be stored in a secure draw or cabinet until they can be scanned and stored on the university server	X
I confirm that I will dispose of any paper documents securely	X
I confirm that I will keep my data until after I have been awarded my degree: I will then destroy all data collected, including electronic audio and document files and shred hard copy transcripts.	X

SECTION SIX – YOUR EMOTIONAL WELL-BEING

To be completed by all students whether you are doing primary research including fieldwork or secondary analysis.

Dissertation topics are often selected due to personal interest/experience and you will be working on your chosen subject for a number of months. This may have an emotional impact. If you are investigating a topic that is sensitive for you, you need to have a plan regarding ensuring your emotional wellbeing, to be self-aware and ask for support if you need it. You should discuss your well-being plan with your supervisor. You can access support from:

<https://www.bristol.ac.uk/students/wellbeing/services/wellbeing-access/>

The Big White Wall is a digital support service you can use to help you deal with everything from everyday stresses to major life events.

<https://www.bristol.ac.uk/students/wellbeing/services/big-white-wall/>

Risk	How you will address this risk.
<p><i>I feel upset after learning about sibling dynamics and mental health outcomes due to personal family dynamics and personal struggles.</i></p>	<p><i>I will take some time to myself and do something that helps me feel better such as exercise or watching television. If I still feel upset, I will use my social support system such as my mother, my partner, and my friends to talk through my feelings.</i></p> <p>I would only talk about how the information made me feel and not share any details about specific datapoints</p>

SECTION SEVEN: CONFIRMATIONS AND SIGNATURES**A) Student:**

Declaration	Yes
I certify that the statements made in this request are accurate and complete, and if I receive approval for this project from my supervisor/unit convener I will conduct my research as stated.	X
I agree to inform my advisor/supervisor/unit convener in writing of any emergent problems or proposed procedural changes and that I will not proceed with the research until any proposed changes have been reviewed and approved.	X
I have attached all the relevant documentation necessary to carry out this research.	X
I am aware that this form and, if necessary, REC approval from the SPS REC must be included in an appendix in my dissertation.	X

Signature:	[REDACTED]
Date:	25 May 2021

Please indicate with an X in the following box that you are submitting this form by email with an electronic signature	X
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B) Student advisor/supervisor: Please tick the first box and one of the subsequent boxes:

Declaration	Yes
I have reviewed this form.	X
I approve the information in this form and do not think higher level approval is necessary.	X
I have sought advice from the SPS REC, this advice has been headed and approval has been given.	
This form should be examined by the SPS REC or an application made to a NHS REC.	


Signature	Susan Harkness
Date	25 May 2021

Please indicate with an X in the following box that you are submitting this form by email with an electronic signature	
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C) The dissertation convenor, unit convenor or programme director, on behalf of SPS Research Ethics Committee:

Please tick the appropriate box:

Declaration	Yes
Approval is granted to this project	x
This form is being referred to the appropriate SPS REC or an application should be made to a NHS REC.*	

Signature:	
Date:	27-May-2021

Please indicate with an X in the following box that you are submitting this form by email with an electronic signature	x
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*It is the student's responsibility to submit this form to the SPS REC or a NHS REC. Students should discuss this application with their supervisor and ensure that the dissertation convenor is kept informed regarding this application and when ethical approval is received.

SECTION 3: SECONDARY RESEARCH (Supplemental data/information)**For those wishing to include more datasets than previously reviewed to carry out secondary analysis of data:**

Please provide details of where you are getting your additional data set from and how you will use. Data sets must be stored on the University of Bristol server.

Questions	Details
What additional sources / secondary datasets you will use?	<p>Millennium Cohort Study: Fifth Wave, 2012 (SN 7464)</p> <p>Millennium Cohort Study: Sixth Wave, 2012 (SN 8156)</p> <p>COVID-19 Survey in Five National Longitudinal Cohort Studies: Millennium Cohort Study, Next Steps, 1970 British Cohort Study and 1958 National Child Development Study, 2020-2021 (SN 8658)</p>
Where will you get these data from (e.g. ESRC Data Archive, systematic literature review, document archive). Please describe your selection criteria and how you will locate/access the data?	<p>UK Data Service:</p> <p>Dataset selection based off requirements for longitudinal study design and for access to variables on siblings (age 10), background variables (age 10), sibling relationship (age 14) and Covid-19 stressors and mental health outcomes (age 20).</p> <p>Links to Datasets:</p> <p>https://beta.ukdataservice.ac.uk/datacatalogue/studies/study?id=7464</p> <p>https://beta.ukdataservice.ac.uk/datacatalogue/studies/study?id=8156</p> <p>https://beta.ukdataservice.ac.uk/datacatalogue/studies/study?id=8658</p>
If necessary, how will you obtain permission to use these extra data? This would apply to data sets where it is usual for the researcher to sign an end user licence.	<p>Projects must be created within a verified UK Data Service account. In this case University of Bristol provides this verification, and log-in requires only use of my Bristol log-in. Data can be then be assigned to the project and accessed following dataset specific conditions.</p> <p>The datasets used for the current study have conditions labelled "safeguarded" by the UK Data Service. Access requires agreement to the End User License terms and conditions as well as agreement to additional conditions of use that enforce/ensure confidentiality.</p>
How will you analyse the data?	RStudio Software and SPSS (data arrives in SPSS and tab delineated format)
What ethical issues will you consider? i.e. will you consider the quality of the papers/programmes etc reviewed?	<p>The previously approved datasets will that no longer be used for analysis will be purged from secure servers.</p> <p>All data are anonymised during collection, thus does not raise concerns about personally identifying information.</p> <p>Per the additional conditions in place for dataset use, specific ID pairing between research identifiers supplied by the UK Data Service [MCSID] and any other identifiers previously issued.</p> <p>Moreover, the information is socially sensitive in nature and must be stored on a secure server. The University of Bristol Research Data Storage Facility (RDSF) ensures this data security.</p>

SECTION SEVEN: CONFIRMATIONS AND SIGNATURES (Supplemental data/information)**A) Student:**

Declaration	Yes
I certify that the statements made in this amendment are accurate and complete, and if I receive approval for this amendment from my supervisor/unit convener I will conduct my research as stated.	X
I agree to inform my advisor/supervisor/unit convener in writing of any further emergent problems or proposed procedural changes and that I will not proceed with the research until any proposed changes have been reviewed and approved.	X
I have attached all the relevant documentation necessary to carry out this research.	X
I am aware that this form and, if necessary, REC approval from the SPS REC must be included in an appendix in my dissertation.	X

Signature:	[REDACTED]
Date:	19-July-2021

Please indicate with an X in the following box that you are submitting this form by email with an electronic signature	X
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B) Student advisor/supervisor:

Please tick the first box and one of the subsequent boxes

Declaration	Yes
I have reviewed this amendment.	x
I approve the information in this amendment and do not think higher level approval is necessary.	x
This amendment is a large enough change to be considered by the dissertation convenor.	
This amendment should be examined by the SPS REC.	

Signature	Susan Harkness
Date	19 July 2021

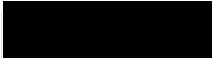
Please indicate with an X in the following box that you are submitting this form by email with an electronic signature	x
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Annex A: University of Bristol SPS REC Approval

C) (Only if considered necessary) The dissertation convenor, unit convenor or programme director, on behalf of SPS Research Ethics Committee:

Please tick the appropriate box:

Declaration	Yes
Approval is granted to this project	x
This form is being referred to the appropriate SPS REC or an application should be made to a NHS REC.*	

Signature:	
Date:	19-July-2021 [Section 3 Supplemental data/information on Secondary Research]
Date:	19-Aug-2021 [Section Six supplement on SDA & Wellbeing]

Please indicate with an X in the following box that you are submitting this form by email with an electronic signature	x
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ANNEX B: DATA ASSUMPTION CHECKS

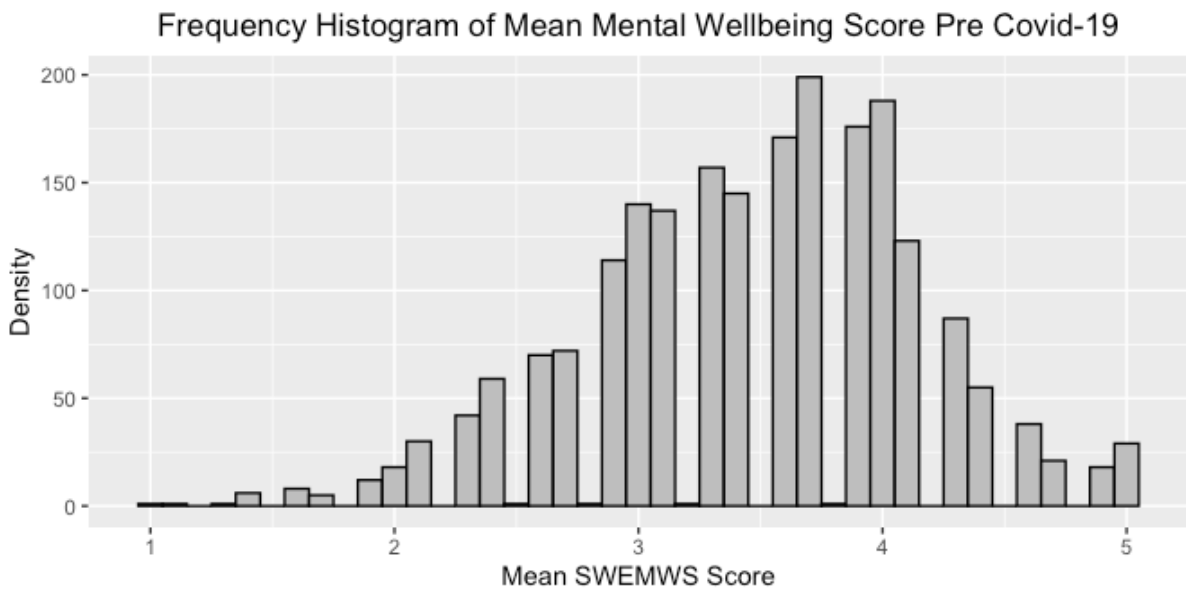


FIGURE 3: FREQUENCY HISTOGRAM PRE-COVID-19 MENTAL WELLBEING

Frequency Histogram of mean MW Score before Covid-19 as captured in 2018 and 2019, showing a somewhat normal distribution, left skew. The deviations from a normal distribution were deemed acceptable given the large sample size.

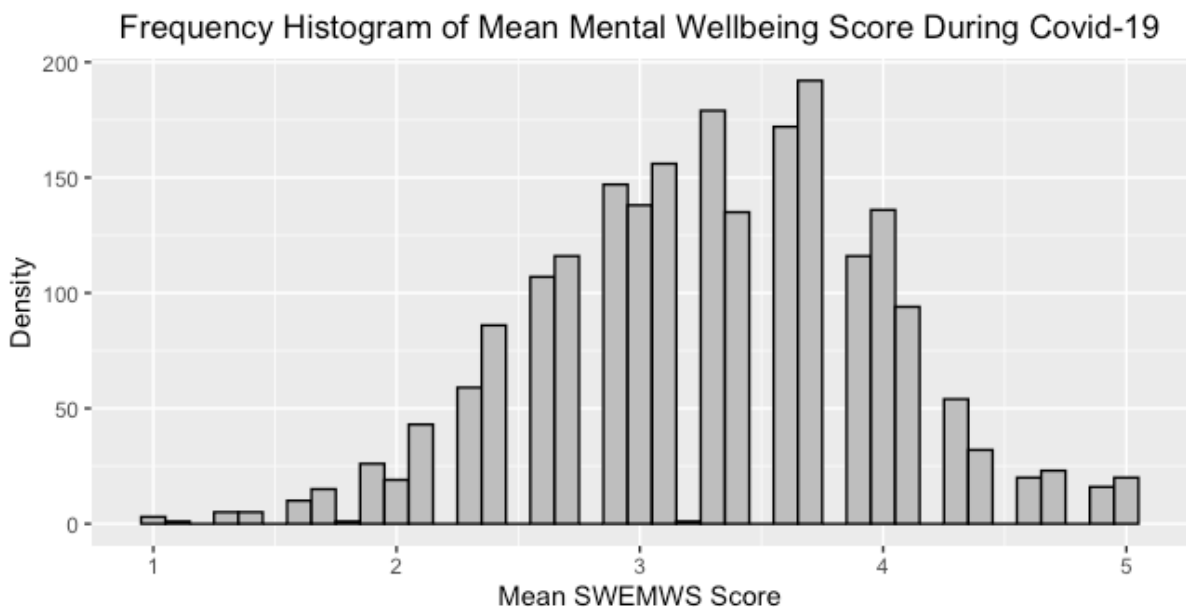


FIGURE 4: FREQUENCY HISTOGRAM OF POST-COVID-19 MENTAL WELLBEING

Frequency Histogram of mean MW Score During Covid-19 as captured in May 2020, showing a normal distribution, slight skew to the left. The deviations from a normal distribution were deemed acceptable given the large sample size.

Annex B: Data Assumption Checks

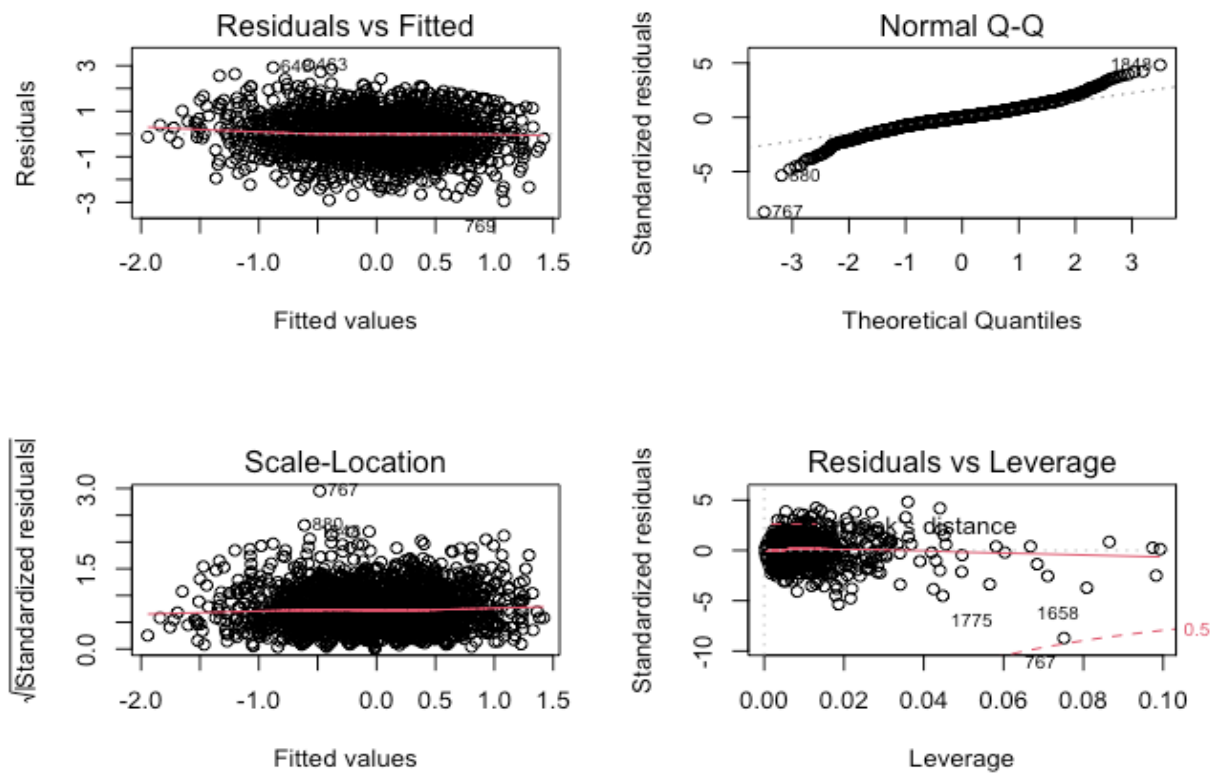


FIGURE 5: REGRESSION DIAGNOSTIC PLOTS – MODEL 1

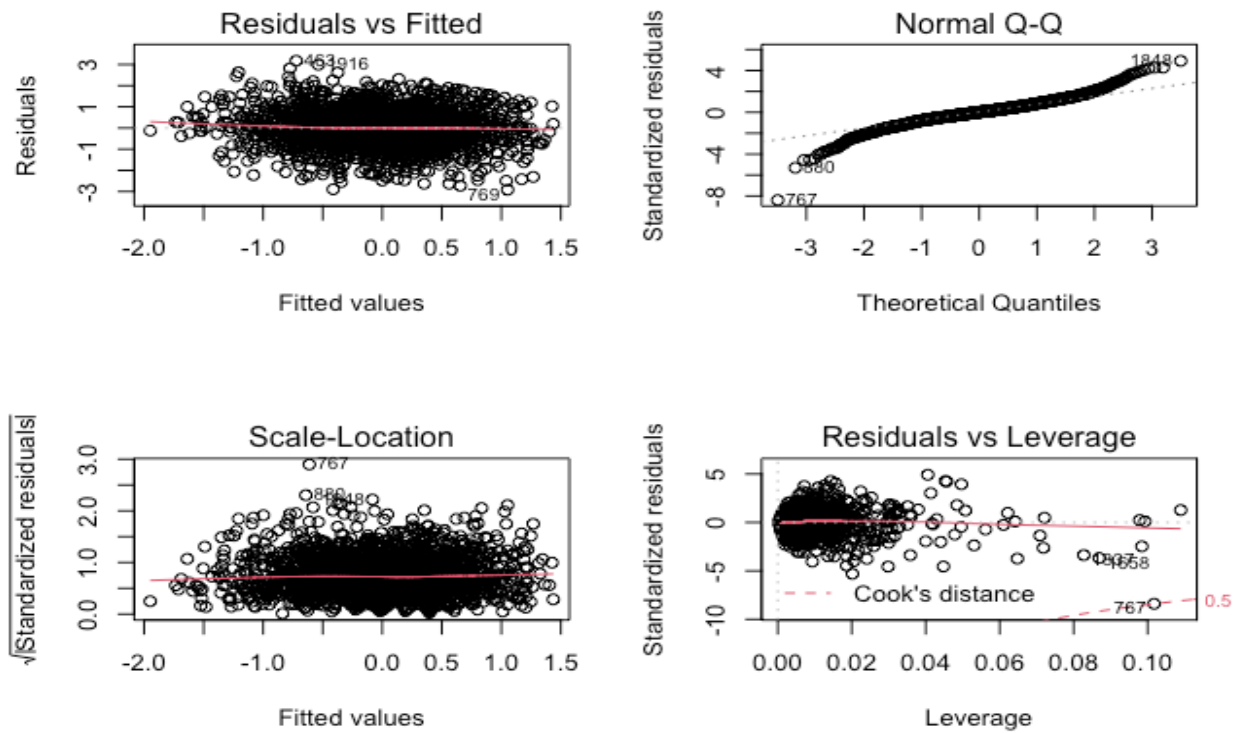


FIGURE 6: REGRESSION DIAGNOSTICS PLOTS – MODEL 2

Annex B: Data Assumption Checks

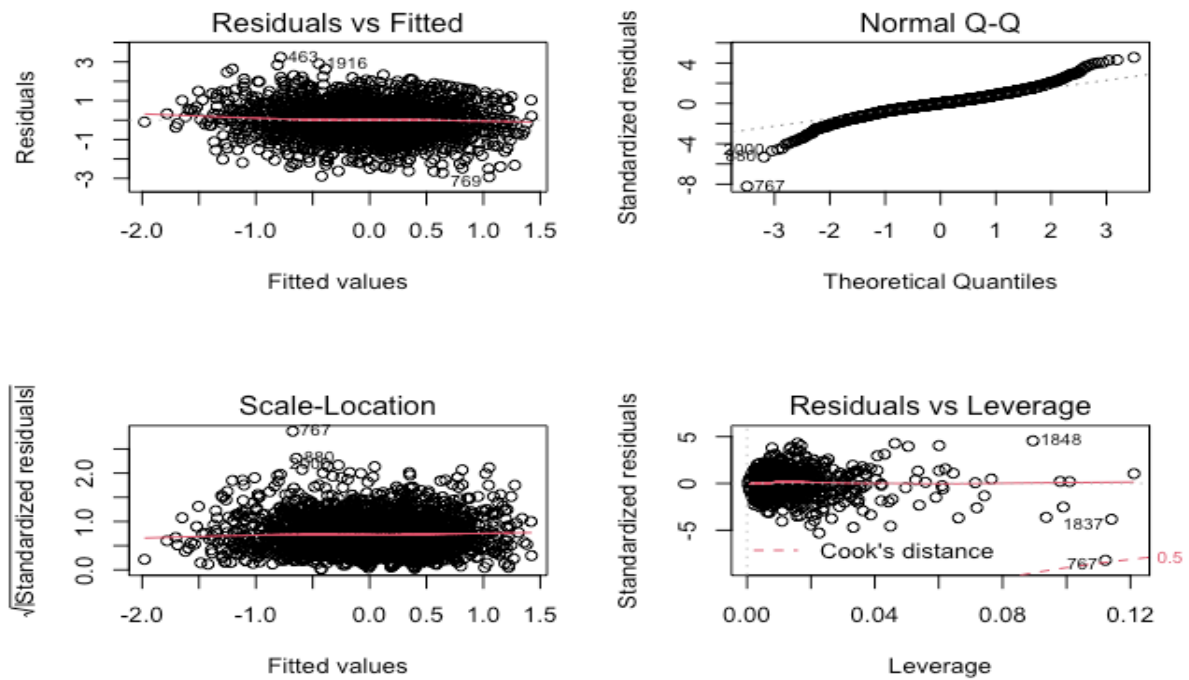


FIGURE 7: REGRESSION DIAGNOSTICS PLOTS – MODEL 3

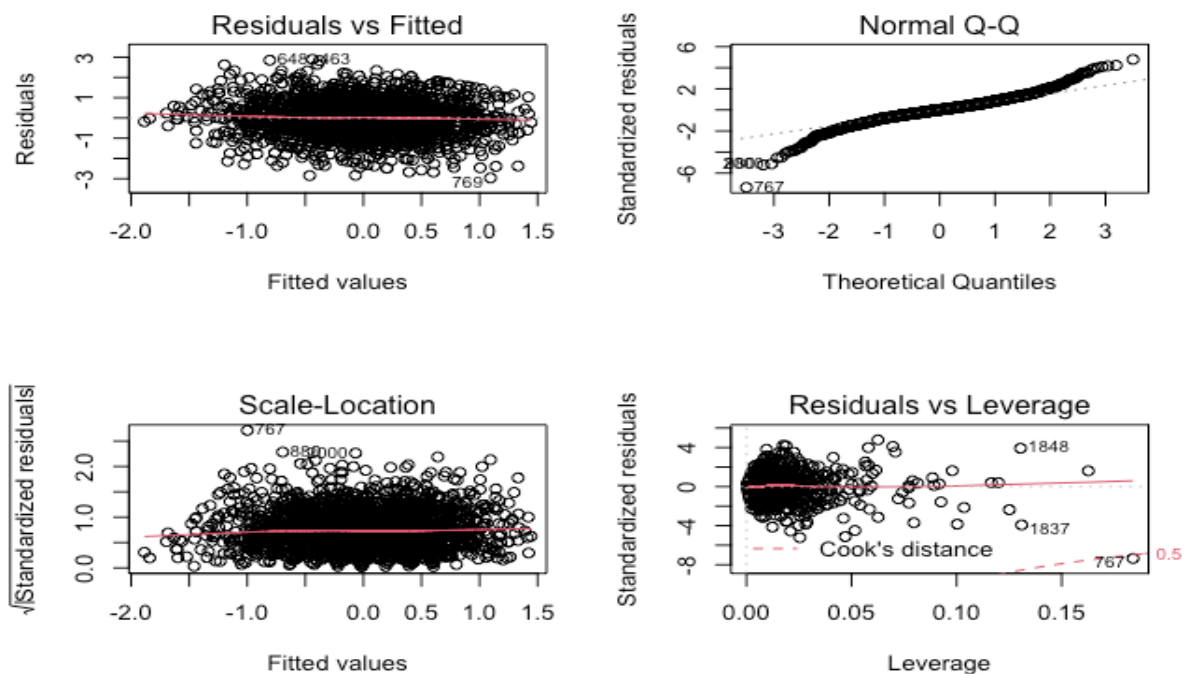


FIGURE 8: REGRESSION DIAGNOSTICS PLOTS – MODEL 4

The Residual versus Fitted plot for Figures 1 - 8, as well as the Scale-Location plots show that residuals are randomly distributed and uncorrelated. The normal q-q plot at the top left shows that the data have some measure of kurtosis. The Residual versus leverage plot indicate that a observations were influential to means. Analyses were repeated without these observations and similar significant relationships were found.

ANNEX C: NULL MODEL

TABLE 3: NULL REGRESSION MODEL SUMMARY

A table showing a the results of a LDV OLS regression ran with only controls on young adult MW.

	Model 0	
	Beta	S.E.
(Intercept)	-0.09	0.14
Covid Finances	-0.20 ***	0.43
Covid Interruptions to Learning	0.04	0.04
Experience of Covid Symptoms	-0.15 ***	0.39
Moving Due to Covid	-0.22 ***	0.04
Ethnicity White	0.00	0.05
Number of Carers	0.05	0.05
England	-0.08	0.07
Scotland	-0.10	0.10
Wales	-0.13	0.12
Living with Family	0.30***	0.07
Male	0.17***	0.04
Lagged MW	0.46***	0.02
Adjusted R ²	0.28	
F-Statistic	70.45	
DF	12, 2113	
N Participants	2,127	
overall model sig	p < 0.01	
Signif. codes: 0 '***' 0.001 '**' 0.01 '*'		

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