

**THE SELF-REPORTED HOLISTIC MENTAL HEALTH AND WELLBEING OF
ADOLESCENTS LIVING IN A POST-EARTHQUAKE COMMUNITY**

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Abstract

Background: There has been a psychopathology focus in disaster research examining adolescent mental health and wellbeing, but recently studies have begun to also examine wellbeing-related constructs. Although an increased risk of posttraumatic stress disorder has been established in disaster-exposed adolescents, comparatively little is known about how disasters impact adolescent wellbeing, nor how factors within the post-disaster environment interact to influence holistic adolescent mental health and wellbeing.

Objective: The objective of this study was to describe the holistic mental health and wellbeing of adolescents living in an earthquake-struck city by considering a range of mental health and wellbeing indicators, as well as risk and protective factors hypothesised to influence mental health and wellbeing. The dual-factor model of mental health was used as a framework to guide this study.

Method: A survey of Christchurch secondary school students was used to gather data about their subjective wellbeing, risk of low wellbeing, psychological distress, quality of life, exposure to Adverse Childhood Experiences, social support from friends and family, school connectedness, and expectations about future quality of life.

Results: A slim majority of students reported good subjective wellbeing (52.3%) and high current quality of life (56.4%), whereas a larger majority reported low risk of psychological distress (79%). An equal proportion of students reported high and low risk of low wellbeing. There were no statistically significant differences in any of the variables measured between adolescents who did and did not live through the Christchurch earthquakes. Regression analyses identified that school connectedness, social support from friends and family, and future expectations of quality of life significantly predicted subjective wellbeing, risk of low wellbeing, risk of psychological distress, and current quality of life. The

number of Adverse Childhood Experiences significantly predicted only risk of psychological distress when the effects of other variables were controlled for.

Conclusion: The findings of this study indicate that there is a low mean level of wellbeing and quality of life in this sample of adolescents living in a severely earthquake-affected community. School connectedness, social support from family and friends, and expectations about future quality of life were shown to significantly predict variance in subjective wellbeing, quality of life, and psychological distress. This suggests that there are social and environmental factors that can be targeted to improve holistic mental health and wellbeing in disaster-affected adolescents who have experienced high levels of trauma. Conclusions in this study are limited by the representativeness of the sample, the cross-sectional nature of the study, and potential sampling bias.

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Table of Contents

Abstract	ii
Acknowledgements	iv
Table of Contents	v
List of Tables	viii
List of Figures.....	x
Abbreviations	xi
Chapter 1: Introduction.....	1
Adolescent Mental Health and Wellbeing.....	3
Risk and Protective Factors for Adolescent Mental Health and Wellbeing.....	5
Adverse Childhood Experiences and Adolescent Mental Health and Wellbeing.....	7
Natural Disasters, Earthquakes and Adolescent Mental Health and Wellbeing	13
The Recovery Environment and Adolescent Mental Health and Wellbeing	16
The Christchurch Context	17
Chapter 2: Literature Review.....	26
Meta-analyses and Systematic Reviews of the Mental Health and Wellbeing of Disaster-affected Adolescents	26
The Dual-factor Model of Mental Health	40
Recent Studies of Mental Health and Wellbeing in Earthquake-affected Adolescents .	49
Summary.....	73
Study Aim.....	76

Chapter 3: Method	77
Design	77
Ethics.....	77
Recruitment.....	80
Participants.....	81
Instrumentation.....	81
Measures	81
Approach to Data.....	97
Data Analysis.....	98
Chapter 4: Results	105
Data Preparation.....	105
Participants.....	108
Adolescents' Subjective Wellbeing (WHO-5)	109
Adolescents' Psychological Wellbeing and Distress (PWDS)	112
Adolescents' Adverse Childhood Experiences (ACEs)	115
Adolescents' Quality of Life (Cantril Ladder)	116
Adolescents' Social Support	118
Summary of Dichotomised Variables	119
Relationships Between Survey Variables.....	120
Predictors of Adolescent Mental Health and Wellbeing	123

Dual-factor Model of Mental Health.....	130
Chapter 5: Discussion.....	132
Key Findings.....	132
Limitations.....	142
Implications for Future Research.....	146
Implications for Practice.....	147
Conclusion.....	148
References.....	150
Appendices.....	171
Appendix A: Paper Version of the Secondary Students Wellbeing Survey.....	171
Appendix B. Number of Items Completed within the Survey, WHO-5, PWS and PDS by Respondents.....	175
Appendix C. Response Rates and Types per Survey Item.....	177

List of Tables

Table 1. Summary of the Methodology and Aim, Mental Health and Wellbeing Outcomes, and Risk and Protective Factors in Meta-Analyses and Literature Reviews Identified for Analysis	28
Table 2. Summary of Recent Studies Examining the Application of the Dual-Factor Model of Mental Health in Adolescents.....	44
Table 3. Summary of Characteristics and Findings Related to Psychopathology and Subjective Wellbeing of Recent Studies of Earthquake-affected Adolescents Included in Literature Review.....	51
Table 4. Psychopathological and Subjective Wellbeing-related Outcomes Measured in Studies of Earthquake-affected Adolescents	55
Table 5. Self-reported Age, Year Level, and Earthquake Exposure of Adolescents who Responded to the Secondary Students' Wellbeing Survey, and Mean (Standard Deviation) for Each Characteristic.....	108
Table 6. Proportion of Likert Scale Responses by Adolescents to WHO-5 Items, Mean (SD) per item.....	111
Table 7. Proportion of Likert Scale Responses by Adolescents to Psychological Wellbeing Scale items, Mean (SD) per item.....	113
Table 8. Proportion of Likert Scale Responses by Adolescents to Psychological Distress Scale items, Mean (SD) per item.....	114
Table 9. The Proportion of Adolescents Reporting the Number of ACEs Experienced Prior to the Survey.....	115
Table 10. The Proportion of Adolescents Reporting Ratings on the Cantril Ladder (Current QOL).	116

Table 11. The Proportion of Adolescents Reporting Ratings on the Cantril Ladder (future expectations of QOL).....	117
Table 12. Spearman Rank Order Correlations Between Survey Variables.....	122
Table 13. Summary of Multiple Regression Analysis of Variables Predicting Adolescents' SWB (WHO-5 Mean Item Score).....	124
Table 14. Summary of Multiple Regression Analysis of Variables Predicting Adolescents' Wellbeing (PWS Mean Item Score).	124
Table 15. Summary of Multiple Regression Analysis of Variables Predicting Adolescents' Psychological Distress (PDS Mean Item Score).	125
Table 16. Summary of Multiple Regression Analysis of Variables Predicting Adolescents' Current QOL (Cantril Ladder Current).....	126
Table 17. Second approach to categorisation for the Dual-Factor Model of Mental Health: Scoring Cut-offs on the Psychological Wellbeing Scale and Psychological Distress Scale Using Mean and Standard Deviation Scoring Protocol.....	130
Table 18. Proportion of Respondents Falling within the Four Dual-Factor Mental Health Categories defined by Bolognino (2015) Cut-off Scores and Cut-off Scores based on Mean and Standard Deviations for the Psychological Wellbeing Scale and Psychological Distress.	131
Table 19. Comparison of Distributions Across Dual-Factor Model of Mental Health Categories Between Present Study and Previous Studies	141

List of Figures

Figure 1. Map of Christchurch Showing the Red Zone, Location of Flockton Basin, Avon River from South Brighton to the City Centre, and the Port Hills Area Affected by Bushfire.	18
Figure 2. Map of Christchurch Showing Proportion of Residents Over the Age of 18 Years who Report Low Wellbeing. (Source: CERA 2015, Canterbury Wellbeing Index June 2015, Christchurch: CERA, p6)	21
Figure 3. Differences in Proportions of Adolescents Living in Different Areas of New Zealand with Poor Mental Health and Risk Factors for Poor Mental Health. (Source: Superu, 2016, p32)	24
Figure 4. Mental Health Terminology, Conceptual Categories, and Prevalence Range Associated with the Dual-Factor Model of Mental Health (adapted from: Antaramian et al., 2010; Bolognino, 2015; Lyons et al., 2012; Suldo et al., 2016; Suldo & Shaffer, 2008)	42
Figure 5. Percentages of Adolescents with Indicators of Positive Mental Health and Wellbeing Scores.....	127

Abbreviations

ACEs	Adverse Childhood Experiences
ANOVA	Analysis of Variance
BOT	Board of Trustees
CDHB	Canterbury District Health Board
CERA	Canterbury Earthquake Recovery Agency
CI	Confidence Interval
CYW	Centre for Youth Wellness
CYW ACES-Q	Centre for Youth Wellness ACES-Questionnaire
ERIC	Ethical Research Involving Children
HBSC	Health Behaviour in School Children
HrQOL	Health-related Quality of Life
MCAR	Missing Completely at Random
NLEs	Negative Life Events
NCEA	National Certificate of Educational Achievement
NSCH	National Survey of Children's Health
NZ	New Zealand
OECD	Organisation for Economic Co-operation and Development
PDS	Psychological Distress Scale
PTG	Posttraumatic Growth
PTGI	Posttraumatic Growth Inventory
PTSD	Posttraumatic Stress Disorder
PTSS	Posttraumatic Stress Symptoms

PWDS	Psychological Wellbeing and Distress Screener
PWS	Psychological Wellbeing Scale
QOL	Quality of Life
RTLB	Resource Teacher: Learning and Behaviour
SAMHSA	Substance Abuse and Mental Health Services Administration
SES	Socioeconomic Status
SSWQ	Student Subjective Wellbeing Questionnaire
Superu	Social Policy Research and Evaluation Unit
SWB	Subjective Wellbeing
USA	United States of America

Chapter 1: Introduction

The mental health and wellbeing of adolescents is an area of critical concern. The adolescents of today represent the largest generation of 10- to 18-year-olds in history (Patton et al., 2016; Sawyer et al., 2012) and mental health problems have become the dominant health burden in this age group (Bor, Dean, Najman, & Hayatbakhsh, 2014; Collishaw, 2015; Kieling et al., 2011; Patton et al., 2016). Mental health problems can have a wide range of damaging effects on the individual lives of adolescents including diminished educational achievement, poor wellbeing and physical health, early mortality, reduced productivity and independence and compromised interpersonal relationships (Choi, 2018; Collishaw, 2015; Hawkins et al., 2016; Kieling et al., 2011; Patel, Boyce, Collins, Saxena, & Horton, 2011). There is strong evidence to suggest that poor adolescent mental health can persist into adulthood and become a lifelong problem (Choi, 2018; Collishaw, 2015; Currie et al., 2012; Kieling et al., 2011; Patel et al., 2011; Patton et al., 2016; Pitchforth et al., 2018; World Health Organization, 2014), and therefore there is also a societal cost associated with poor adolescent mental health. Taking action to improve adolescent mental health is a priority, both as an ethical responsibility to reduce individual suffering and to promote self-actualisation (Balvin & Banati, 2017; Kieling et al., 2011), and second, to reduce the societal costs of poor health (Choi, 2018; Collishaw, 2015; Kieling et al., 2011; Patton et al., 2016). There is agreement among health experts that addressing adolescent mental health problems has ripple effects beyond the immediate benefits of healthy, happy and flourishing young people who are reaching their potential; it is also key to generating the greatest improvements in societal health and wellbeing (Choi, 2018; Clark et al., 2013; Hawkins et al., 2016; Kieling et al., 2011; Patton et al., 2016; Pitchforth et al., 2018; World Health

Organization, 2014). Despite this, some research suggests that adolescent mental health and wellbeing is an overlooked and neglected area of health research (Kieling et al., 2011; Patel et al., 2011; Patton et al., 2016). A key to improving mental health and wellbeing in adolescents is developing greater knowledge, particularly better estimates of the prevalence of different mental health and wellbeing outcomes (Bor et al., 2014; Collishaw, 2015; Kieling et al., 2011), as well as a greater understanding of the social and environmental influences on these outcomes (Allen, Balfour, Bell, & Marmot, 2014; Balvin & Banati, 2017; Currie et al., 2012).

Mental health is a multi-dimensional construct comprising emotional, cognitive, behavioural and social components that is an essential part of complete health (Keyes, 2002; World Health Organization, 2018). It is defined by the World Health Organization (2014) as:

A state of well-being in which every individual realizes his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to her or his community.

Mental health has been conceptualised as existing on a continuum (Huppert & So, 2013; Keyes, 2002; Rose et al., 2017). At one end, negative mental health, also referred to as psychopathology (Suldo & Shaffer, 2008), is characterised by maladaptive thoughts, feelings and behaviours that cause an individual distress and impair their functioning (Keyes, 2002; Rose et al., 2017). Positive mental health, on the other hand, is characterised by lasting experiences of positive affect along with positive psychological functioning (Keyes, 2002; Rose et al., 2017), which is associated with concepts such as self-acceptance, personal growth, positive relationships with others, social acceptance and social contribution (Huppert & So, 2013; Keyes, 2002). Established conceptualisations are clear that positive mental health is more than a simple absence of psychopathology; it is also defined by the

existence of positive emotional, cognitive, behavioural and social indicators related to the construct of wellbeing (Keyes, 2002; Rose et al., 2017; World Health Organization, 2005).

The construct of wellbeing, like mental health, is also multi-dimensional (Diener et al., 2017; Huppert & So, 2013; Olympia et al., 2014). It has been conceptualised as having both eudaimonic and hedonic properties across emotional, cognitive, behavioural and social dimensions (Huppert & So, 2013; Olympia et al., 2014). Eudaimonic wellbeing relates to the realisation of potential, meaning, and fulfilment in life (Huppert & So, 2013; Ryan & Deci, 2001). Ryan and Deci (2001) suggest that there are six key indicators of eudaimonic wellbeing: personal growth, life purpose, self-acceptance, autonomy, positive relatedness and mastery; these engender states of vitality, authenticity and self-actualisation. Hedonic wellbeing is most commonly associated with the construct of subjective wellbeing (SWB) (Huppert & So, 2013; Keyes, 2002). SWB is defined along three dimensions: the experience of positive and pleasant affect, such as happiness, enjoyment and contentment; comparative experiences of negative or unpleasant affect, such as sadness and anger; and, the subjective and positive evaluation of overall quality of life (QOL) (Diener et al., 2017; Olympia et al., 2014). Subjective QOL relates to personal evaluations of need fulfilment, accessibility of resources, and engagement in rewarding, meaningful, and enjoyable activities in major life settings (Diener et al., 2017; Olympia et al., 2014). Fundamentally, wellbeing and good mental health are about feeling satisfied and happy, and functioning well and thriving (Diener et al., 2017; Huppert & So, 2013; Keyes, 2002; Rose et al., 2017).

Adolescent Mental Health and Wellbeing

Adolescent mental health and wellbeing needs to be understood within the context of the extensive and rapid psychological, physical, neurological, and social development that takes place at this stage of life (Carr, 2016; Gowers, 2005; Papalia, Olds, & Feldman, 2006).

Adolescence represents a time of increased emotional awareness and more complex emotional regulation strategies, increased capacities for relativistic, abstract and hypothetical thought, rapid physical growth, reproductive maturation, drastic changes in brain structure and neural connectivity through synaptic pruning, increasing importance and influence of peers, greater autonomy and less reliance on family and the development of an independent identity (Carr, 2016; Currie et al., 2012; Gowers, 2005; Papalia et al., 2006; Suldo, Thalji-Raitano, Kiefer, & Ferron, 2016). As these changes occur, adolescents are faced with growing academic expectations and increased responsibility for keeping themselves well as they move into young adulthood (Currie et al., 2012; Gowers, 2005; Papalia et al., 2006). This complex array of rapid cognitive, social, neurological and physical change with different systems maturing at different times can increase the susceptibility and vulnerability of adolescents to poor mental health and wellbeing (Suldo et al., 2016).

According to international and local research, approximately one fifth of adolescents report low levels of wellbeing (Currie et al., 2012; Lambert et al., 2014). A large cross-national survey of 43 nations measured the wellbeing of approximately 200,000 adolescents using the construct of perceived QOL as a proxy for wellbeing. The study found that 12% of 11-year-olds, 15% of 13-year-olds, and 17% of 15-year-olds reported poor QOL (Currie et al., 2012). In New Zealand (NZ), a recent cross-sectional survey of NZ secondary school students found a similar proportion of adolescents with poor wellbeing. Perceived wellbeing was measured in the survey, with 21% of the sample reporting poor wellbeing (Lambert et al., 2014). The Prime Minister's Youth Mental Health Project in NZ has also reported that a significant proportion of NZ adolescents have low levels of wellbeing, particularly adolescents residing in Eastern Christchurch (Social Policy Research and Evaluation Unit (Superu), 2016).

Adolescents are also vulnerable to clinically significant psychopathology (Gore et al., 2011; Patton et al., 2012). Depressive disorders, schizophrenia, and bipolar disorder are some of the leading causes of disability and premature mortality in 10- to 18-year-olds globally (Gore 2011). In NZ, the rate of psychopathological symptoms in adolescents is high compared to other countries (Patton et al., 2012; Superu, 2016). Around 13% of NZ adolescents report clinical symptoms of depression and anxiety, and 24% report engaging in deliberate self-harm (Superu, 2016). In Eastern Christchurch these rates of psychopathology have been found to be even higher, with 36% of adolescents reporting high levels of depression or anxiety and 28% engaging in deliberate self-harm (Superu, 2016). NZ also has the highest rate of adolescent suicide of any country in the Organisation for Economic Co-operation and Development (OECD) with a rate of 23 suicides per 100,000 15- to 19-year-olds in comparison to the mean OECD rate of 7.4 per 100,000 (OECD, 2017). These statistics show that poor mental health in adolescents is not only a global issue, but also a leading issue of concern within NZ.

Risk and Protective Factors for Adolescent Mental Health and Wellbeing

Research into the risk and protective factors that influence the wellbeing and mental health of adolescents is of critical importance in helping service providers and secondary schools understand students' needs. Risk factors are antecedent conditions that increase the likelihood of poor mental health and wellbeing, whereas protective factors are antecedent conditions that decrease the likelihood of poor mental health and wellbeing, or that increase the likelihood of positive mental health and wellbeing (Kazdin, Kraemer, Kessler, Kupfer, & Offord, 1997). Risk and protective factors exist within different ecological levels and therefore may be something about the adolescent themselves, such as their age or developmental maturity; something about their family, such as the emotional support

available to adolescents from their parents; or, something about the environments they spend a substantial amount of time in, such as the school environment or an adolescent's sense of belonging there (Clark et al., 2013; Currie et al., 2012; Morgan et al., 2015; Olympia et al., 2014; Shortt & Spence, 2006). Understanding the interactions, and balance, of risk and protective factors is critical to promoting mental health and wellbeing in adolescents.

Social support, connectedness within the family, school, and neighbourhood contexts have been highlighted as potentially important protective factors that increase the likelihood of positive mental health and wellbeing in adolescents (Chu, Saucier, & Hafner, 2010; Clark et al., 2013; Currie et al., 2012; Morgan et al., 2015; Rueger, Malecki, Pyun, Aycock, & Coyle, 2016; Superu, 2016). A moderate but significant relationship ($r = .201$) between positive wellbeing in adolescents and greater levels of perceived social support (i.e. the amount of support available to them if required) was established in a recent meta-analysis of 246 studies published prior to 2009 (Chu et al., 2010). Perceived support as opposed to the reported size of social networks or actual support received was shown to have the largest effect on adolescent wellbeing. Perceived social support in the school environment from teachers and school staff had the largest significant relationship with wellbeing outcomes ($r = .209$), followed by family support ($r = .192$) and then support from friends ($r = .100$). The strength of these relationships was shown to increase with age, suggesting that social support becomes increasingly important to adolescent wellbeing the older they become. In NZ, the role of supportive family and a sense of belonging within the school environment have been highlighted as protective against poor mental health in a sample of 3,170 adolescents from 24 secondary schools who responded to a nationwide survey examining mental health, wellbeing and social support (Superu, 2016). Adolescents who reported higher levels of family support and family interest in their wellbeing at school were

significantly less likely to report indicators of poor mental health and wellbeing compared to those who reported low levels of support (Superu, 2016). Adolescents indicated their most likely sources of support in times of need were friends and family. This study and meta-analysis are examples of research that highlight the protective nature of social support against poor mental health and wellbeing in adolescents.

Other research highlights the need to also consider risk factors in the study of adolescent mental health and wellbeing. Research in this area has traditionally focused on the examination of fixed risk factors such as age, gender, and socio-economic status to identify groups of adolescents most at risk of poor mental health and wellbeing outcomes (Diener et al., 2017). One common finding is that the risk of poor outcomes increases with age. For example, a large multi-national survey of over 200,000 children and adolescents from 38 European and North American countries found that although 88% of 11-year-olds reported high life satisfaction, only 85% of 13-year-olds and 79% of 15-year-olds reported the same (Currie et al., 2012). A significant increase in the amount of psychological health complaints, such as irritability, feeling low, and feeling nervous, over the previous six months was also found with age (Currie et al., 2012). While findings such as these help to identify groups at higher risk of poor outcomes, this focus on fixed risk factors has limited utility in terms of planning to address the mental health and wellbeing needs of adolescents as they cannot be targeted through intervention. Another approach is to identify dynamic risk factors that interact with protective factors to influence mental health and wellbeing in adolescents that can be targeted through intervention.

Adverse Childhood Experiences and Adolescent Mental Health and Wellbeing

One set of dynamic risk factors associated with poor mental health and wellbeing outcomes is a group of potentially traumatic childhood experiences referred to collectively

as Adverse Childhood Experiences (ACEs). Ten ACEs were first identified and examined in the seminal studies of approximately 30,000 American adults conducted by Felitti, Anda, Dube, and colleagues; they included childhood experiences of: (1) psychological abuse, (2) physical abuse, (3) sexual abuse (4) emotional neglect, (5) physical neglect, (6) parental separation or divorce, (7) having a mother or stepmother who had been treated violently, (8) living with household members who were alcohol or substance abusers, (9) living with household members who were mentally ill or suicidal, and (10) living with household members who had been imprisoned (Dube et al., 2001; Felitti et al., 1998). This research demonstrated that accumulated experiences of ACEs up until the age of 18 years significantly increased the risk of poor mental health and wellbeing in adulthood, a finding that has been consistently replicated in other studies of adults (Kalmakis & Chandler, 2015).

These findings have been replicated in a growing body of research examining the effects of ACEs on adolescent mental health and wellbeing (e.g. Balistreri & Alvira-Hammond, 2016; Flouri & Mavroveli, 2013; Perfect, Turley, Carlson, Yohanna, & Saint Gilles, 2016; Suliman et al., 2009). In the last ten years there have been a number of cross-sectional and prospective studies, and one systematic review that provide evidence of the relationship between cumulative exposure to ACEs and indicators of poor mental health and wellbeing in adolescents. Two cross-sectional studies in particular have shown that there is a relationship between cumulative exposure to ACEs and symptoms of emotional and psychological distress in adolescents, including symptoms of depression and posttraumatic stress disorder (PTSD). In the first study, Suliman et al. (2009) established a significant relationship between ACEs exposure and the risk of depression and PTSD in a cross-sectional survey of 922 South African adolescents aged 14 – 18 years old. Findings of this survey indicated that there were significant correlations between measures of ACEs and measures of depression ($r = .23$

to .34, $p < .01$), anxiety ($r = .13$ to $.17$, $p < .01$) and PTSD ($r = .34$ to $.37$, $p < .01$). Those adolescents who reported multiple ACEs were more likely to also report more symptoms of depression and PTSD.

Another cross-sectional study has shown a similar dose response relationship between ACEs exposure and poor emotional wellbeing (Balistreri & Alvira-Hammond, 2016). In a survey of over 33,000 American adolescents aged 12- to 17-years-old, adolescents with more ACEs were significantly more likely to have a diagnosis of depression or anxiety, or report frequent feelings of unhappiness, sadness, or depression than those with fewer ACEs. Of the 9.4% of the sample that reported four or more ACEs, 32.9% also reported poor emotional wellbeing. In comparison, only 6.2% of those adolescents with no ACEs also reported poor emotional wellbeing. The odds of reporting poor emotional wellbeing increased by 32% with each additional ACE reported, $OR = 1.38$; 95% CI [1.3, 1.4], $p < .001$.

A significant relationship between cumulative ACEs and poor adolescent wellbeing has also recently been supported in a systematic review of 83 studies with adolescents aged 18-years or younger (Perfect et al., 2016). Perfect et al. (2016) found that adolescents with more ACEs were more likely to have impaired cognitive functioning, poorer academic achievement and progress, and more school-related disciplinary action than adolescents without ACEs. The literature reviewed also found that cumulative ACEs significantly increased the risk of negative affect, poor self-esteem, and social withdrawal associated with poor adolescent wellbeing.

These two recent cross-sectional studies, and the systematic review of cross-sectional research, all consistently illustrate that cumulative exposure to ACEs is associated with an increased risk of poor mental health and wellbeing in adolescents. This relationship appears to be consistent across different populations in different settings. Two pieces of

prospective research have added weight to these findings by supporting the idea that there is a causal relationship between exposure to cumulative ACEs, and poor mental health and wellbeing in adolescents.

In the first prospective study, cumulative ACEs predicted emotional and behavioural problems in adolescents. Flouri and Mavroveli (2013) surveyed ACEs and emotional and behavioural problems in a sample of British adolescents aged 11- to 16-years. One year later they repeated their measures with the same adolescents. At follow-up, the more ACEs an adolescent had at baseline, the more likely they were to experience emotional and behavioural problems one year later.

In a similar prospective study, this time of Australian adolescents aged 12- to 18-years, Boyes, Hasking, and Martin (2016) found a significant positive correlation between ACEs and psychological distress measured one year later ($r = .28, p < .001$). The number of self-reported ACEs at baseline accounted for 20.5% of the variance in psychological distress measured one year later ($B = .16, p < .001$). This study, and that of Flouri and Mavroveli (2013), show that cumulative ACEs are a significant risk factor for the subsequent development of negative mental health outcomes in adolescents.

Not all adolescents who are exposed to ACEs go on to develop poor mental health. Literature is beginning to emerge that shows there are protective factors that can buffer the impact of ACEs on adolescent mental health (e.g. Balistreri & Alvira-Hammond, 2016; Moore & Ramirez, 2016; Soleimanpour, Geierstanger, & Brindis, 2017). Two recent studies drawing on a large national dataset ($n = 34,512$) of 12- to 17-year-old USA adolescents in particular have demonstrated that protective factors partially mediate the relationship between cumulative ACEs and adolescent mental health, reducing the risk of poor mental health outcomes. In the first study, Balistreri and Alvira-Hammond (2016) examined the moderating

effect of family functioning on the relationship between ACEs and wellbeing in adolescents. For adolescents with four or more ACEs, better family functioning, such as eating together, parenting capacity and quality, and lower levels of family stress, significantly reduced the odds of depression, anxiety, and frequent feelings of unhappiness or sadness.

In the second study, Moore and Ramirez (2016) investigated the influence of a number of protective factors including family social support, and perceptions of safety and support within school and the local neighbourhood on the strength of the relationship between ACEs and poor adolescent wellbeing. They found that although cumulative ACEs were significantly and negatively related to positive wellbeing ($r = -.193, p < .001$), the accumulation of protective factors partially mediated the negative effects of ACEs on adolescent wellbeing.

These studies illustrate that the risk to adolescent wellbeing posed by exposure to ACEs can be mitigated by protective factors. They also highlight the value of considering the interplay between risk and protective factors in any exploration of adolescent mental health and wellbeing.

Prevalence of exposure to ACEs. Between half and two thirds of American adolescents are exposed to one or more ACEs by the time they are 17-years old (Bethell, Newacheck, Hawes, & Halfon, 2014; McLaughlin et al., 2013; Perfect et al., 2016). Perfect and colleagues' (2016) systematic review suggested that most studies reported prevalence rates in this range, which is also congruent with the adult prevalence rates found in foundational ACEs studies (Dube et al., 2001; Felitti et al., 1998). There is some variation in the proportion of adolescents who have experienced four or more ACEs by the age of 17-years, with reported ranges varying from 7% to 12% (Brown et al., 2017; Burke, Hellman, Scott, Weems, & Carrion, 2011). Nonetheless, there appears to be a substantive minority of

adolescents with high levels of cumulative exposure to ACEs that is likely to seriously compromise their mental health and wellbeing.

No NZ studies specifically examining cumulative exposure to ACEs in adolescents were able to be identified although Danese et al. (2009) did examine childhood exposure to maltreatment, social isolation and low socio-economic status in a sample of NZ adults. They found that 30.3% of the sample had experienced one of these ACEs and 11.9% had experienced two or more. Other NZ studies have found high levels of exposure to individual ACEs, such as childhood sexual abuse, and childhood maltreatment (e.g. Breslau et al., 2014; Fergusson, McLeod, & Horwood, 2013). These studies highlight that exposure to ACEs is common.

New ACEs. The dose response relationship between ACEs and poor mental health and wellbeing in adolescents is not constrained to the ten core ACEs originally studied in the late 1990s. Subsequent research has demonstrated that there are a wider range of other potentially traumatic childhood experiences that act in the same way as the ten original ACEs (e.g. Bethell et al., 2014; Finkelhor, Shattuck, Turner, & Hamby, 2015; Kalmakis & Chandler, 2014). For example, Bethell et al. (2014) found that changes to ACEs wording and the addition of other ACEs did not affect the dose response relationship between cumulative ACEs and negative mental health in adolescents. New ACEs highlighted in research include, parental death (Burke et al., 2011), peer victimisation (Finkelhor et al., 2015), exposure to community violence (Bethell et al., 2014; Finkelhor et al., 2015), and the experience of natural disasters (Kalmakis & Chandler, 2014). These studies demonstrate that the

accumulation of a wide range of potentially traumatic childhood experiences may contribute to poor mental health in adolescents.

Natural Disasters, Earthquakes and Adolescent Mental Health and Wellbeing

Childhood exposure to the conditions associated with natural disasters and their aftermath are potentially traumatic experiences that can also be considered an ACE. Natural disasters are acts of nature that produce sudden, unpredictable and severe disruption that overwhelms community resources and exceeds the coping capacity of those affected (Shaw, Espinel, & Shultz, 2012). Goldmann and Galea (2014) suggest that natural disasters can be defined by four characteristics: 1) they threaten harm or death to a substantial number of people; 2) they disturb social processes and networks at individual, family and community levels; 3) they disrupt services and cause loss of resources; and, 4) they have both acute stressors resulting from direct disaster exposure and secondary stressors such as job loss, school closure and physical and psychological health outcomes resulting from disaster disruption. The level of threat posed by natural disasters, along with extent of disruption that accompanies them, means that they often constitute traumatic events with the potential for many negative consequences.

Children and adolescents exposed to natural disasters are particularly vulnerable to poor mental health outcomes (Goldmann & Galea, 2014; Kronenberg et al., 2010; Masten & Narayan, 2012; Shaw et al., 2012). It has been suggested that following a disaster, young people are at greater risk of poor mental health than adults (Bonanno, Brewin, Kaniasty, & La Greca, 2010; Grelotti et al., 2018; Substance Abuse and Mental Health Services Administration (SAMHSA), 2018). Cognitive, emotional, and behavioural capacities are built as an individual develops during childhood and adolescence; these capacities affect psychological responses to natural disaster. Children typically do not have the adaptive

coping and self-regulation skills nor the capacities to accurately attribute causality, understand the concept of chance, and evaluate the potential threat of a disaster in order to respond to natural disasters on their own in a completely adaptive way (Kronenberg et al., 2010; Shaw et al., 2012). The limited cognitive and emotional capacity of children makes them particularly reliant on parents and other adults to make decisions for them that will protect their safety and wellbeing (Kronenberg et al., 2010; Liberty, 2017; Shaw et al., 2012). This level of reliance means that the psychological responses of children and adolescents to natural disasters are partially dependent on the functional capabilities of their parents and other adults providing them with care in the wake of natural disasters (SAMHSA, 2018). In addition, children are particularly vulnerable to the timing of natural disasters. It is possible that the occurrence of a natural disaster during a sensitive period of development will negatively influence the organisation of an experience-dependent system, resulting in long-term maladaptation (Masten & Narayan, 2012). Highlighting the role of age, Kronenberg et al. (2010) found that children aged 9- to 11-years-old were more likely than older children and adolescents to score higher on self-report measures of depression, PTSD, hyperarousal and avoidance two- and three-years following exposure to Hurricane Katrina. These points highlight the vulnerability of children and adolescents who are exposed to natural disasters, suggesting that they may be particularly susceptible to negative psychological outcomes.

Research has shown that exposure to natural disaster increases the risk of psychopathology in adolescents (Furr, Comer, Edmunds, & Kendall, 2010; Lai, Auslander, Fitzpatrick, & Podkowirow, 2014; Rubens, Felix, & Hambrick, 2018; Terasaka, Tachibana, Okuyama, & Igarashi, 2015), however there is considerable variance in prevalence rates (Grelotti et al., 2018; Lai et al., 2014; Trickey, Siddaway, Meiser-Stedman, Serpell, & Field, 2012; Wang, Chan, & Ho, 2013). For example, the prevalence of posttraumatic stress

symptoms (PTSS) ranged between 1% and 95% in disaster-affected adolescents considered in one meta-analysis (Wang et al., 2013). This variance is thought to be accounted for by the characteristics of the disaster and its aftermath (Bonanno et al., 2010; Pine, Tarrant, Lyons, & Leathem, 2015; Shaw et al., 2012), the affected community (Bonanno et al., 2010; Rubens et al., 2018), the affected individual and their proximal environment (Bonanno et al., 2010; Fergusson, Boden, Horwood, & Mulder, 2015; Shaw et al., 2012), and the timing of the disaster exposure (Rubens et al., 2018; Terasaka et al., 2015). Other studies have demonstrated that many adolescents do not go on to develop serious mental health issues following disaster exposure (Bonanno et al., 2010; SAMHSA, 2018). A review of disaster literature found that the rate of chronic and clinically significant psychiatric symptoms associated with psychiatric disorder seldom exceeds 30% in adolescent research samples (Bonanno et al., 2010). These findings highlight that there are a number of possible trajectories of mental health following disaster exposure.

Recent studies show that different individuals follow unique mental health and wellbeing paths following natural disaster exposure, and that the passage of time does not necessarily produce an improvement in mental health and wellbeing following disaster exposure (Fan, Long, Zhou, Zheng, & Liu, 2015; Masten & Narayan, 2012; Terasaka et al., 2015). Bonanno et al. (2010) asserts that it is the combination and accumulation of many factors following a disaster that affects mental health and wellbeing outcomes rather than the direct effect of one or two factors. This highlights the importance of considering the roles of multiple risk and protective factors in the exploration of adolescent mental health and wellbeing following disaster exposure.

The Recovery Environment and Adolescent Mental Health and Wellbeing

Some researchers suggest post-disaster stressors pose some of the greatest risks to mental health and wellbeing following a natural disaster (Cadichon, Lignier, Cénat, & Derivois, 2017; Canterbury Earthquake Recovery Authority (CERA), 2013; Liberty, 2017; Shaw et al., 2012; Trickey et al., 2012). The recovery environment is characterised by stressors directly and indirectly linked to a natural disaster (Grelotti et al., 2018; Lock et al., 2012; Morgan et al., 2015; Pine et al., 2015; Shaw et al., 2012). Shaw et al. (2012) characterise these stressors as “prolonged, chronic and, debilitating” (p. 26) in many post-disaster communities. Post-disaster stressors can be considered to constitute circumstances, events, and policies consequential to the natural disaster that create problems for those living in the recovery environment (Lock et al., 2012). They often include damage and destruction of infrastructure, which restricts access to basic necessities, such as clean water and sewerage systems (McColl & Burkle, 2012; Morgan et al., 2015; Platt, Brown, & Hughes, 2016; Potter, Becker, Johnston, & Rossiter, 2015; Shaw et al., 2012); economic difficulties with compensation or insurance claims, which can increase household stress and impact access to material resources (Morgan et al., 2015; Potter et al., 2015; Shaw et al., 2012); lack of access to appropriate healthcare (Platt et al., 2016); school closures, relocations and mergers that can result in peer isolation and disrupted social support (McColl & Burkle, 2012; Potter et al., 2015; Shaw et al., 2012); and loss of shelter, and possessions which may result in displacement and transience, and disrupt supportive community networks (Grelotti et al., 2018; Lock et al., 2012; Platt et al., 2016). In the case of earthquakes, aftershocks can be a constant and ongoing source of stress that provide reminders of the initial impact and represent the possibility of further destruction (Cadichon et al., 2017; Liberty, 2017; Shaw et al., 2012). Broken buildings, damaged roads and demolition sites also provide constant visual

reminders of the earthquake experience (Goenjian et al., 2011; Liberty, 2017). These stressors not only increase the risk of poor mental health and wellbeing outcomes in adolescents in and of themselves, they also increase the risk of parental mental health problems, homelessness and extreme economic hardship that can all be considered to constitute ACEs. The combined stress of living in a post-disaster community along with the potential for cumulative exposure to ACEs represent strong risks to the mental health and wellbeing in disaster-affected adolescents.

The Christchurch Context

Research is clear that each natural disaster has its own unique signature of risks and stressors owing to idiosyncrasies such as the disaster type, disaster magnitude, affected population, and community resources (Wang et al., 2013). Since 2010, Christchurch has experienced a series of unique natural disasters that have had serious and wide-ranging consequences. Starting with a M7.1 earthquake on 4 September 2010, followed by many large aftershocks, Christchurch then experienced a shallow M6.2 earthquake with an epicentre close to the central business district with strong upward ground velocities and lateral spreading on 22 February 2011 (Liberty, 2017; Marquis, Kim, Elwood, & Chang, 2017; Morgan et al., 2015). The February earthquake resulted in significant loss of life (185 deaths), injury (6600 injuries), and destruction of property (7,500 houses deemed too difficult, dangerous or impractical to repair and over 100,000 homes damaged) in a population of approximately 440,000 (Clope & Conradson, 2018; Ferris & Petz, 2012; Liberty, 2017; Morgan et al., 2015). A national state of emergency was invoked for the first time in NZ history (Ferris & Petz, 2012), resulting in the deployment of defence personnel and machinery to the city centre to assist with recovery and security, restriction of movement into the city including restricted access to homes, workplaces, and schools within the city

cordon, and requisition of land, buildings and vehicles where necessary (Ministry of Civil Defence & Emergency Management, 2019). Between September 2010 and December 2018, Christchurch has experienced an unprecedented 83 earthquakes of M5.0 or greater and over 22,000 aftershocks (Crowe, 2018). The most recent mapping of seismic activity shows that earthquakes and aftershocks have been concentrated in central and eastern Christchurch (GNS Science, 2019). This sustained and repetitive series of earthquakes, has been compounded by significant and repeated flooding in the Flockton Basin area, and areas surrounding the Avon River east of the city centre, along with bushfires in the Port Hills in February 2017 (Figure 1). Together these events have resulted in widespread disruption and destruction within the Canterbury region over the last eight years.

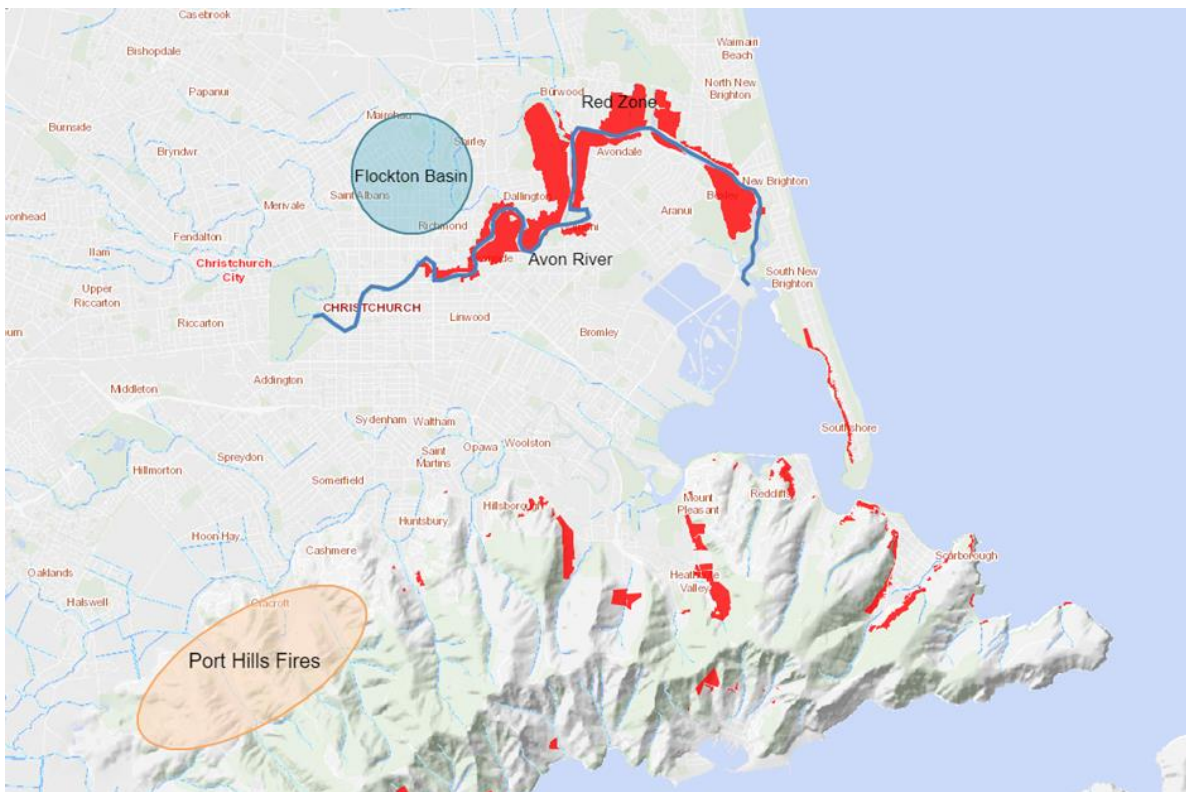


Figure 1. Map of Christchurch Showing the Red Zone, Location of Flockton Basin, Avon River from South Brighton to the City Centre, and the Port Hills Area Affected by Bushfire.

During this eight-year period, Christchurch residents have had to contend with many significant stressors. There has been extensive and repeated liquefaction across the city, whereby seismic forces cause cracks in the ground that allow a mix of silt and water to “flow like a liquid” (McColl & Burkle, 2012, p. 35); over 400,000 tonnes of silt were estimated to have been forced up from the ground in Christchurch (UC Quake Centre, 2018). The pure force, uncontrollability, and repeated cycle of earthquake and liquefaction eroded hope for many residents that recovery of their damaged houses and land would ever be possible (McColl & Burkle, 2012). Subsequent earthquakes, ongoing aftershocks, and liquefaction caused such damage that in June 2011, CERA deemed a 630-hectare area of Christchurch unliveable (Blundell, 2014). CERA declared approximately 7,800 homes unfit for purpose; homeowners were offered compensation for their properties at non-negotiable rates based on previous land valuations, and had to re-locate. All housing was slowly demolished and cleared from the area known as the *red-zone* (Figure 1) over several years (Blundell, 2014). Many residents lived in derelict communities during this demolition period; families, including children, lived in fear of prowlers, and watched bulldozers tear down their neighbours’ houses (Blundell, 2014). Many of the red-zoned families were displaced to other locations outside Christchurch where they had to rebuild not only their homes, but also new community and social networks (CERA, 2015). As at June 2017, slightly fewer than half of all Christchurch residents reported that their sense of community had dissipated since the September 2010 earthquake (Canterbury District Health Board (CDHB), 2017). Many schools were also impacted by the earthquakes, with a large number of school closures and mergers (CERA, 2015). Following the February 2011 earthquake, 18 schools were relocated, 55% of secondary school students were site sharing with another school, and over 12,000 students were forced to change schools due to earthquake damage or school mergers (CERA, 2015).

One year after the February 2011 earthquake, the NZ government announced the permanent merger of 11 schools and the closure of a further 11 schools (CERA, 2015). This created huge disruption and stress to school families, given the central role school plays in communities and social activities (Cloke & Conradson, 2018; Ferris & Petz, 2012; McColl & Burkle, 2012).

The cumulative effect of these stresses, and other potentially traumatic events and experiences, has had a significantly negative effect on the mental health of Christchurch residents. Repeated surveys of wellbeing conducted by CERA and the CDHB of adult residents aged 18 years or older living in Christchurch since 2012 show these negative mental health impacts. Many adults have reported difficulties arising as a result of the earthquakes that could have a specific impact on children and adolescents, including: loss or relocation of their General Practitioner, school or preschool (26% of respondents), distress or anxiety from ongoing aftershocks (42%), additional financial burdens (45%), and having to move house permanently or temporarily (26%) (CERA, 2013). Many respondents reported dealing with “frightened, upset or unsettled children as a result of the earthquakes” (32% of respondents) (CERA, 2013). Since 2013, the SWB of Christchurch adults has been measured using the WHO-5. In the initial April 2013 survey using the WHO-5, 38.6% of adults over the age of 18 years reported low SWB (CERA, 2013). Since then, the proportion of respondents reporting low SWB has decreased over time; however, in June 2017, 30% of respondents still reported low SWB (CDHB, 2017). The adults reporting the lowest SWB have tended to reside in the most severely earthquake-affected areas in the Eastern suburbs of Christchurch (Figure 2) (CERA, 2015). Approximately 40% of respondents who took part in these wellbeing surveys between 2012 and 2017 reported having children living in their homes (CDHB, 2017). This shows that many Christchurch children and adolescents have been living with

parents or other adults who have been significantly and negatively impacted by the earthquakes, and/or who report poor SWB.

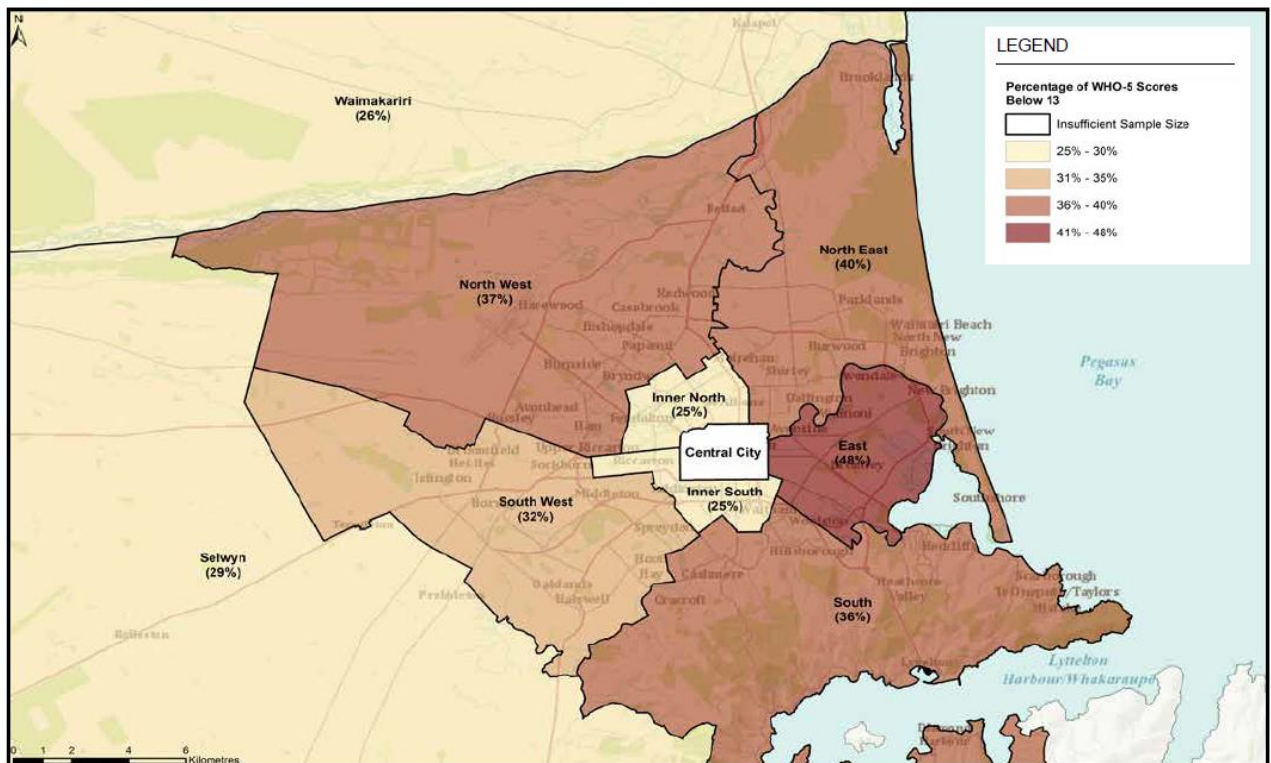


Figure 2. Map of Christchurch Showing Proportion of Residents Over the Age of 18 Years who Report Low Wellbeing. (Source: CERA 2015, Canterbury Wellbeing Index June 2015, Christchurch: CERA, p6)

Previous surveys of mental health and wellbeing in Christchurch adolescents. High rates of negative mental health and wellbeing in Christchurch adolescents have been found in two large scale surveys conducted in 2013 and 2015.

A 2013 survey of 3,341 young people living in greater Christchurch aged 12- to 24-years-old found that a large proportion of respondents were experiencing poor emotional health and wellbeing (CERA, 2014). Approximately 35% of young people reported low SWB as measured by the WHO-5. Those living in Christchurch city were more likely to have a score below the mean than adolescents in the less earthquake-affected neighbouring

districts of Selwyn (to the west of the city) and Waimakariri (to the north of the city). Those aged 12- to 15-years were more likely to rate their SWB higher than those aged 15- to 24-years. In addition to poor SWB, many adolescents also reported that their everyday lives were negatively impacted by stressors associated with the Christchurch earthquakes; 70% reported worries about aftershocks, 61% reported having to deal with family members who were angry and upset about insurance claims, 49% reported having been separated from friends due to relocation, 46% reported closure or relocation of their General Practitioner or school, 44% reported family relationship problems, 34% reported relationship problems with friends or romantic partners, and 19% reported that they had no one to talk to about these problems (CERA, 2014). Despite these reports of poor SWB and significant stress, 81% of these adolescents rated their overall QOL as good or extremely good, with no significant differences in QOL ratings across more- and less-affected areas of Christchurch. On the whole the findings of this survey showed that the SWB of many adolescents living in Christchurch in 2013 was compromised, they were exposed to ongoing and significant stress and adversity, some with little social support; however, many still perceived their QOL to be good.

The low levels of wellbeing following the earthquakes in Christchurch adolescents was also shown in a 2015 nationwide survey of the wellbeing and mental health of 3,170 adolescents. It highlighted that adolescents living in Eastern Christchurch had comparatively higher rates of poor mental health and wellbeing, and significantly more risk factors for poor mental health and wellbeing, than adolescents living in other areas of NZ including Northland, West Auckland, Hawke's Bay, Lower Hutt, and Invercargill (Superu, 2016). While 30% of all NZ adolescents reported moderate to high levels of symptoms of anxiety and depression, 35% of Eastern Christchurch adolescents reported the same (Figure 3). A

similarly higher proportion of Eastern Christchurch adolescents reported self-harming (28%) compared to all adolescents (20%) who took part in the survey. Adolescents from Eastern Christchurch were also significantly more likely to report risk factors found to correlate with poor mental health than adolescents from other localities across NZ. While 36% of Eastern Christchurch adolescents lacked a sense of belonging, only 26% of all adolescents reported the same; 43% of Eastern Christchurch adolescents reported feeling unsafe at school compared to 32% of all adolescents who took part in the survey; fewer Eastern Christchurch adolescents (62%) reported that they would ask family for support than adolescents living elsewhere in NZ (74% to 84%). These findings highlight both the comparatively poor mental health and wellbeing of adolescents living in an area of Christchurch severely affected by the earthquakes along with the higher prevalence of risk factors for poor mental health. The disparity shown in this survey was such that addressing the mental health needs of Eastern Christchurch adolescents was noted as a key priority in government initiatives designed to promote adolescent mental health and wellbeing throughout NZ (Superu, 2016).

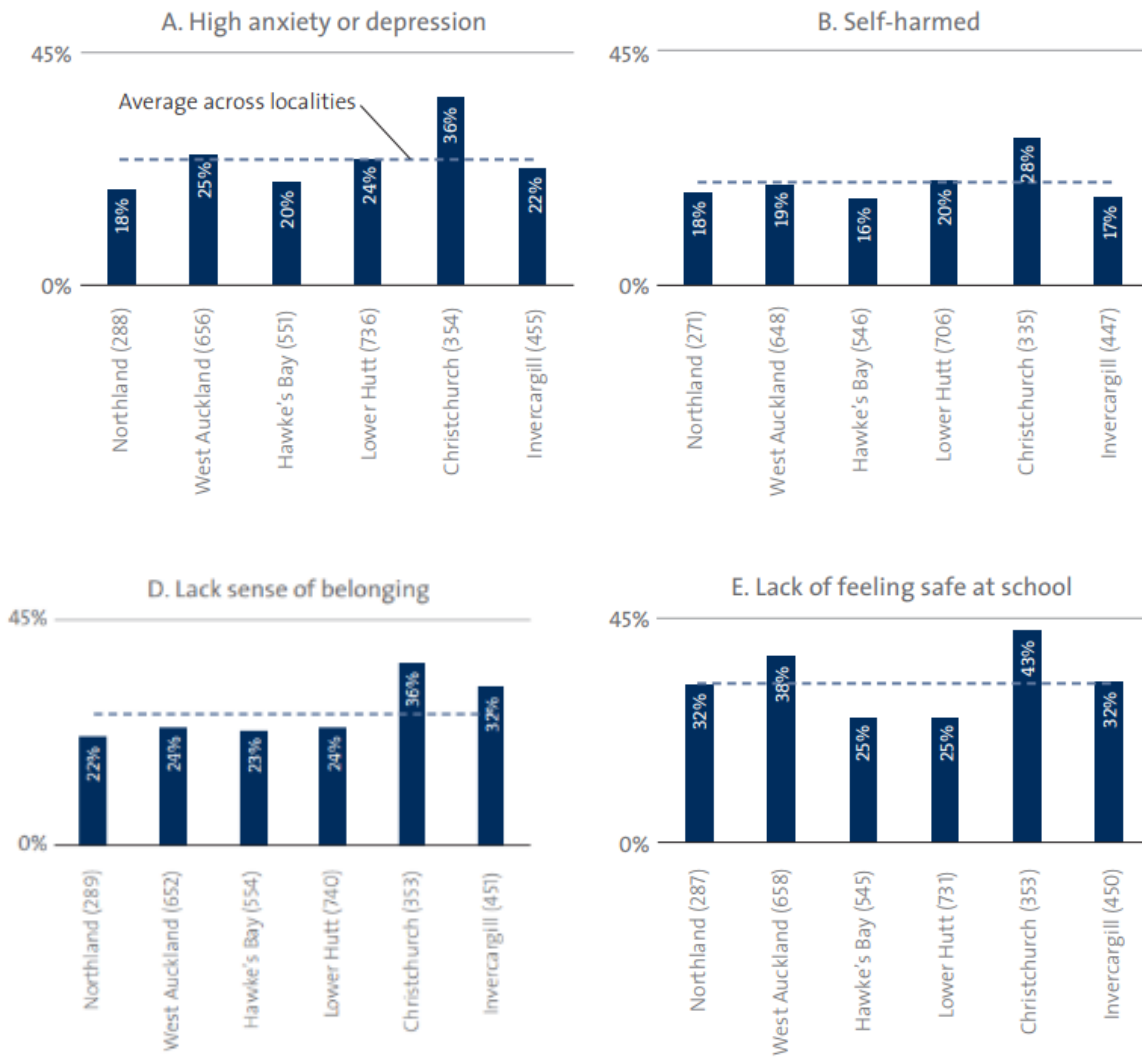


Figure 3. Differences in Proportions of Adolescents Living in Different Areas of New Zealand with Poor Mental Health and Risk Factors for Poor Mental Health. (Source: Superu, 2016, p32)

These studies highlight the negative and sustained effects of the adversities and stresses related to the Canterbury earthquakes on the mental health and wellbeing of Christchurch adolescents. Despite the passage of time, many adolescents continue to experience poor mental health that is significantly worse than adolescents residing in other areas of NZ (Superu, 2016). Conclusions about the holistic mental health and wellbeing of Christchurch adolescents, along with the combined impact of risk and protective factors on

these outcomes, have been limited by choices regarding how to publish these survey results and an inability to detail the survey content in the 2015 study due to intellectual property rights (Superu, 2016). Published findings show that many adolescents are experiencing poor wellbeing, many are experiencing poor mental health, some have good social support, and many have contended with chronic stress and adversity in the last eight years. However, one of the surveys did not detail the items used to measure wellbeing and mental health, and neither survey systematically reported the magnitude of the relationships between these variables. A particular limitation of both surveys was a failure to identify and conceptualise profiles of mental health and wellbeing in adolescents affected by the Christchurch earthquakes that are congruent with established definitions of mental health as a construct defined by both the absence of psychopathology and presence of indicators of positive cognitive, behavioural and social functioning related to wellbeing. A significant implication of this is the potentially inaccurate quantification of mental health and wellbeing problems in Christchurch adolescents; it is difficult to determine from published findings whether adolescents have the cognitive, behavioural, and social resources, or the positive outlook on life associated with good wellbeing, such that they are able to cope well with symptoms of psychopathology and their day-to-day functioning is less impaired.

Chapter 2: Literature Review

The purpose of this literature review is threefold. First, recent meta-analyses and systematic reviews examining the mental health and wellbeing of adolescents who live in a post-disaster community were analysed in order to: gain an overview of findings related to mental health and wellbeing in disaster-affected adolescents, as well as risk and protective factors that influence these outcomes; to identify strengths and limitations in the literature; and, to consider the approaches taken to the study of mental health and wellbeing in natural-disaster affected adolescents. Second, literature was reviewed to explore the potential utility of the dual-factor model of mental health for describing mental health and wellbeing of adolescents living in a post-earthquake community, including likely functional impairment associated with different categories of mental health and wellbeing. Specific attention was given to whether this model could address some of the limitations identified in the meta-analyses reviewed. Third, recent studies specifically focused on the mental health and wellbeing of earthquake-exposed adolescents were reviewed using the dual-factor model of mental health as a guiding framework. This was done in order to provide a detailed analysis of mental health and wellbeing in earthquake-exposed adolescents, risk and protective factors that contribute to these outcomes, and the strengths and limitations of this literature.

Meta-analyses and Systematic Reviews of the Mental Health and Wellbeing of Disaster-affected Adolescents

Inclusion criteria. To identify recent, relevant meta-analyses and systematic reviews, peer-reviewed journals were searched. Meta-analyses and systematic reviews were considered relevant if they: (1) focused on mental health and wellbeing in disaster-affected

adolescents; (2) considered the effects of exposure to natural disaster or traumatic experiences on mental health and wellbeing; and, (3) were published in the last ten years. Efforts were made to source literature that focused only on earthquake-affected adolescents, however no meta-analyses or systematic analyses were able to be identified with this sole focus.

Three relevant meta-analyses (Furr et al., 2010; Rubens et al., 2018; Trickey et al., 2012) and four literature reviews (Lai et al., 2014; Self-Brown, Lai, Patterson, & Glasheen, 2017; Terasaka et al., 2015; Wang et al., 2013) were identified that were published between 2010 and 2018 (Table 1). Three of these specifically examined mental health outcomes associated with natural disaster exposure (Rubens et al., 2018; Self-Brown et al., 2017; Terasaka et al., 2015), three with disaster (natural and man-made) exposure (Furr et al., 2010; Lai et al., 2014; Wang et al., 2013) and one with trauma exposure (Trickey et al., 2012). All seven reviews evaluated experimental studies of mental health and wellbeing of earthquake-affected adolescents.

Table 1. Summary of the Methodology and Aim, Mental Health and Wellbeing Outcomes, and Risk and Protective Factors in Meta-Analyses and Literature Reviews Identified for Analysis

Authors (year)	Methodology / Aim	Number of Studies (EQ Focused Studies)	Mental Health and Wellbeing Outcomes	Risk and Protective Factors
Furr et al. (2010)	To meta-analyse the association between disaster (natural and man-made) exposure and youth PTSD, and associated risk factors.	96 (23)	PTSD	<ul style="list-style-type: none"> • Demographic factors • Disaster characteristics • Disaster exposure • Subjective experiences of disaster
Trickey et al. (2012)	To meta-analyse the risk factors associated with development of PTSD in children and adolescents who have been exposed to trauma.	64 (9)	PTSD	<ul style="list-style-type: none"> • Subjective experience of trauma • Pre-trauma variables • Objective measures of trauma exposure • Demographic variables
Wang et al. (2013)	To conduct a systematic review of the prevalence of psychopathology in children and adolescents exposed to disaster (natural and manmade).	85 (35)	PTSD Depression Anxiety	No examination of risk and protective factors
Lai et al. (2014)	To conduct a systematic review of the relationship between disaster (natural and manmade) exposure and depression in children and adolescents.	72 (26)	Depression	<ul style="list-style-type: none"> • Age and gender • Disaster exposure variables • PTS symptoms

Authors (year)	Methodology / Aim	Number of Studies (EQ Focused Studies)	Mental Health and Wellbeing Outcomes	Risk and Protective Factors
Terasaka et al. (2015)	To conduct a systematic review of the long-term (3+ years) relationship between natural disaster exposure and PTSD in children and adolescents.	10 (3)	PTSD	<ul style="list-style-type: none"> • Age and gender • Disaster experiences and loss • Other traumatic experiences • Recovery environment • Social support
Self-Brown et al. (2017)	To conduct a narrative review of emerging literature focused on externalising problems and posttraumatic growth in youth following exposure to natural disaster.	10 (4)	Externalising symptoms Posttraumatic Growth	<ul style="list-style-type: none"> • Objective measures of disaster exposure (e.g. death of family members, injury, school disruption) • Pre-disaster trauma exposure • Post-disaster adversity • Subjective experience of disaster • Coping styles • Age and gender
Rubens et al. (2018)	To meta-analyse the relationship between natural disaster exposure and non-PTSS internalising and externalising symptoms in youth.	62 (24)	Non-PTSS internalising symptoms Externalising symptoms	<ul style="list-style-type: none"> • Age • Time since disaster • Financial resources of community

Analysis and critique of meta-analysis and literature review findings. Furr and colleagues (2010) sought to determine the effect of exposure to natural and man-made disasters on PTSD in adolescents in a meta-analysis of 96 studies published in peer-reviewed journals prior to 2009. They also reviewed the influence of risk factors on PTSD. A total of 74,154 children and adolescents under the age of 18 years, with a mean age of 12.54 ($SD = 3.19$) were studied; 23 of the included studies were of earthquake-affected adolescents. The meta-analysis showed that exposure to disasters related to small-to-medium sized increases in the likelihood of meeting the criteria for PTSD ($r = .19$, $k = 42$). Age was not found to be significantly related to PTSD, but disaster-exposure variables were. Closer physical proximity to the disaster ($r = .33$), higher levels of peri-traumatic stress ($r = .38$) and greater perceived threat to self ($r = .24$) were shown to significantly relate to increased likelihood of adolescents meeting the criteria for PTSD. Furr et al. (2010) concluded overall that disaster-exposed adolescents were at increased risk of meeting the criteria for PTSD. In addition, they reported that the relationship between disaster exposure and other mental health and wellbeing outcomes was poorly understood due to the focus on PTSD in the research analysed.

Furr et al. (2010) suggested that in order to better understand the effects of disaster exposure on adolescent mental health and wellbeing, future research needed to consider the influence of risk and protective factors. They pointed out that protective factors shown to influence the mental health and wellbeing of adolescents in the general population, such as social support, prior trauma exposure, and parental psychopathology, were under-researched in disaster-affected adolescents, therefore preventing their inclusion in the meta-analysis. Furr et al. (2010) suggest that these protective factors needed to be systematically

incorporated into future research in order to gain greater insight into the mental health and wellbeing of disaster-affected adolescents.

In a subsequent meta-analysis, Trickey and colleagues (2012) aimed to identify the most important risk factors for PTSD in trauma-exposed children and adolescents aged 6- to 18-years-old. They analysed 64 peer-reviewed, quantitative studies with 32,238 participants published between 1980 and 2009; nine of the studies examined earthquake exposure. Of the 25 risk factors analysed, previous experiences of psychopathology and a prior diagnosis of PTS were shown to most strongly predict PTSD (*population effect sizes* = .69 and .64). Other strong risk factors included, poor family functioning (*population effect size* = .46), social withdrawal (*population effect size* = .39), the subjective experience of trauma (*population effect size* = .36), low social support (*population effect size* = .33), trauma severity (*population effect size* = .29), post-trauma parental psychopathology (*population effect size* = .29), and negative life events pre- and post-trauma (*population effect size* = .21). Age was not found to affect whether or not an adolescent was diagnosed with PTSD. Other than prior psychopathology, Trickey et al. (2012) concluded that the strongest risk factors for PTSD in adolescents were the subjective experiences of trauma and post-trauma factors. They pointed out however that the influence of low social support and social withdrawal were under-researched factors, and therefore their influence on PTSD was not as well understood. Risk factors for mental health outcomes other than PTSD in trauma-exposed children and adolescents were not examined by Trickey et al. (2012).

The prevalence and course of PTSD and depression in disaster-exposed adolescents was the focus of a systematic review of 60 cross-sectional and 25 longitudinal studies conducted by Wang, Chan, and Ho (2013). The studies reviewed were published between 1987 and 2011; 35 of them examined psychopathology in earthquake-affected adolescents.

Wang et al. (2013) found that between 2.5% and 95% of earthquake-affected adolescents reported PTSS and between 2.5% and 60% met the diagnostic criteria for PTSD. Between 11.3% and 39.4% of earthquake-affected adolescents reported symptoms congruent with depression. The review indicated that the prevalence of PTSD in disaster-affected adolescents generally declines over time, however this is not always the case. Younger disaster-affected adolescents aged 14-years or younger were at greater risk of chronic PTSD over time. Wang et al. (2013) concluded that although there appears to be an escalation in symptoms of PTSD and depression in adolescents following disaster-exposure, there is also significant variation in the prevalence of these symptoms. One shortcoming of this systematic review acknowledged by Wang et al. (2013) was a failure to consider the influence of risk and protective factors on trajectories of PTSD and depression in disaster-affected adolescents.

Risk factors for depression in disaster-affected adolescents were examined in a narrative review of 72 quantitative, peer-reviewed studies conducted by Lai and colleagues (2014). They reviewed studies of children and adolescents under the age of 18-years who had been exposed to both natural and man-made disasters; 26 of the studies were of earthquake-exposed children and adolescents. Lai et al. (2014) also sought to describe the prevalence of depression and the use of theory in studies of disaster-affected children and adolescents. They found that between 4% and 69% of natural-disaster exposed children and adolescents reported symptoms of depression. Age and gender did not consistently relate to depression, however greater disaster-exposure, and co-morbid PTSS were significantly associated with an increased risk of reporting symptoms of depression. Post-disaster adversity, such as exposure to community violence and the experience of high levels of secondary stress were also strongly related to increased risk of depression. Lai et al. (2014)

found that there was not a single risk profile for depression in disaster-affected children and adolescents, suggesting that multiple factors play a role in whether or not a young person experiences depression following disaster exposure. They reported that a weakness in around two-thirds of the studies reviewed was the absence of a strong theoretical foundation to guide the examination of depression in disaster-affected adolescents. Lai et al. (2014) suggest that this impedes the development of knowledge by limiting systematic and considered examination of a range of possible mental health outcomes in disaster-affected children and adolescents.

Terasaka and colleagues (2015) systematically reviewed 10 studies published between 2005 and 2013 in peer-reviewed journals to examine the long-term effects of natural-disaster exposure on PTSD in children who would have been aged between 3- and 16-years at the time of disaster exposure. The examination of PTSD in the studies reviewed by Terasaka et al. (2015) occurred between 3- and 20-years post-natural disaster; three of the studies were of earthquake-affected children and adolescents. They found that the prevalence of PTSD varied significantly between the 10 studies reviewed, with rates between 2.7% and 22.4%. A clear relationship between time since disaster and prevalence of PTSD was not found, supporting the idea that there are different trajectories of mental health and wellbeing following natural disaster-exposure. There were mixed findings regarding the effect of gender, other traumatic experiences, and social support and relationship on PTSD. Age was not significantly related to PTSD outcomes. In contrast, the effect of disaster experience and loss was consistently related to PTSD outcomes, as were co-morbid symptoms of depression and anxiety. Those youth that lived closest to the natural disaster, those who experienced disaster-related injury, death of family members or loss, those whose subjective experience of the natural disaster was poorer, and those who also had

symptoms of depression or anxiety were more likely to experience chronic PTSD symptoms. Terasaka and colleagues (2015) reported that their conclusions about the long-term effects of natural disaster on youth PTSD were limited not only by a lack of research in general, but also a lack of multivariate research that examined the multiple and interconnected risk and protective factors that influence mental health outcomes in disaster-affected youth.

Self-Brown, Lai, Patterson, and Glasheen (2017) conducted a brief narrative review of approximately 10 studies that examined the impact of natural disasters on externalising symptoms and posttraumatic growth (PTG) in youth. PTG is defined as positive psychological change that comes about as a result of struggle with challenging and traumatic situations or events (Jieling & Xinchun, 2017; Self-Brown et al., 2017; Tedeschi & Calhoun, 2004). It is associated with greater appreciation of life and re-prioritisation of what is important in life, improved social and intimate relationships, greater personal strength, optimistic future-focus, and spiritual development following exposure to trauma (Tedeschi & Calhoun, 2004). Although clear inclusion criteria for this review were not published, the authors stated that their aim was to highlight both emerging research that focussed on these understudied outcomes in youth, and innovative approaches to the study of mental health and wellbeing in natural disaster-affected youth. They found that children and adolescents affected by natural disaster are more likely to experience externalising symptoms, such as aggression and behaviour problems, and negative physical health outcomes, such as headaches, fatigue and respiratory problems. They highlighted the close interplay between these outcomes and PTSS, anxiety, and dysregulation of the stress response system in children and adolescents living in post-disaster environments, with study findings suggesting important links between mental health, stress, and physical health in post-disaster environments.

They also reviewed three studies that found that some children and adolescents exposed to natural disaster experience PTG if they possess, and are able to employ, positive coping strategies, such as positive meaning-making. Very emergent research reviewed by Self-Brown et al. (2017) suggests that different trajectories of PTG can co-exist alongside different levels of PTSS, and that these different trajectories are influenced by a range of risk and protective factors. They point out that this innovative research has facilitated greater insight into the multitude of mental health and wellbeing trajectories possible in disaster-affected youth by recognising the interplay between psychopathology, wellbeing, risk factors and protective factors. In their discussion of this emerging research, Self-Brown et al. (2017) highlight the need for more research that examines outcomes beyond PTSD and that takes a bio-ecological approach incorporating and considering both neurological and environmental influences on mental health and wellbeing in disaster-affected youth. They suggest this is necessary in order to understand the holistic mental health and wellbeing of children and adolescents.

In a very recent meta-analysis, Rubens and colleagues (2018) sought to describe the relationship between non-PTSS internalising and externalising problems, and exposure to natural disaster in children and adolescents under the age of 18 years. The meta-analysis examined 62 studies of internalising problems ($n = 376,990$) and 26 studies of externalising problems ($n = 27,496$) in natural disaster-affected youth, all of which contained the quantitative data necessary to calculate population effect sizes. A small but significant relationship between exposure to natural disasters and non-PTSS internalising problems ($r = .18$) was found and a significant but very small relationship between natural disaster exposure and externalising problems was found ($r = .08$). Neither age nor time since disaster were found to have significant effects on the relationship between natural-disaster exposure

and internalising or externalising problems. In contrast, the relationship between natural-disaster exposure and internalising and externalising symptoms was significantly influenced by the financial resources of the affected communities. The relationship between disaster exposure and internalising and externalising problems was much weaker in children and adolescents living in communities with more financial resources compared to children and adolescents living in communities with fewer resources. This finding highlights the importance of context and community in mental health and wellbeing outcomes in disaster-affected adolescents. In their discussion of findings, Rubens et al. (2018) were particularly critical of the overwhelming focus on the study of PTSD as an outcome in disaster-affected youth suggesting that this focus makes it difficult to understand how natural disaster affects the holistic mental health and wellbeing of children and adolescents, including pathways to post-disaster adaptation and growth.

In summary, the seven meta-analyses and literature reviews consistently demonstrated that exposure to natural disaster increases the risk of psychopathology in adolescents, particularly PTSD, depression, non-PTSD internalising symptoms, and externalising symptoms. However, considerable variance in the prevalence of psychopathology in natural disaster-exposed adolescents living in different communities has been found, which is partially dependent on the level of resources in the community pre- and post-disaster; the type, duration, and intensity of natural disaster; and, individual risk and protective factors (Bonanno et al., 2010; Lai et al., 2014; Terasaka et al., 2015; Trickey et al., 2012; Wang et al., 2013). While these findings demonstrate the risk natural disaster-exposure plays to the development of symptoms of psychopathology, they do not advance our understanding of the impact of disasters on holistic mental health and wellbeing in adolescents.

Scholars have acknowledged that the predominantly psychopathology-focused approach to mental health research is a limitation in the child and adolescent natural-disaster literature (Furr et al., 2010; Rubens et al., 2018; Self-Brown et al., 2017). While six of the identified reviews adopted a deficit approach to mental health focused on psychopathology, five of these also acknowledged the importance of incorporating positive psychological constructs in future child and adolescent disaster research in order to better understand mental health and wellbeing outcomes in disaster-affected youth (Furr et al., 2010; Lai et al., 2014; Rubens et al., 2018; Terasaka et al., 2015; Trickey et al., 2012). Scholars have in particular stated a need to move beyond the study of PTSD as an outcome of disasters in children and adolescents to address gaps in knowledge related to a broader set of mental health outcomes, such as resilience, PTG, and holistic mental health and wellbeing beyond specific psychopathological diagnoses (Furr et al., 2010; Rubens et al., 2018; Self-Brown et al., 2017). Rubens et al. (2018) and Self-Brown et al. (2017) both suggest developing knowledge in these areas is a priority in order to inform the development and planning of comprehensive intervention designed to promote good mental health in children and adolescents affected by natural disasters. Analysis of these meta-analyses and reviews makes it clear that there is a need for a broader conceptualisation of mental health in disaster-research in order to develop a comprehensive and holistic understanding of the effects of disaster-exposure on the mental health and wellbeing of adolescents.

Analysis of the seven meta-analyses and literature reviews also showed that adolescent mental health outcomes are affected by a wide range of risk and protective factors that respectively can aggravate or mitigate the development of poor mental health and wellbeing. The most researched of these factors are demographic characteristics, including age and gender, and disaster-exposure variables, such as proximity to the natural

disaster, level of distress during the disaster, and personal loss and injury. While these findings are helpful for response planning in the immediate aftermath of a natural disaster and can be used to identify high-risk groups, they provide little in the way of information about factors that can be targeted via intervention to improve mental health outcomes. This limitation has been acknowledged in the literature, with scholars suggesting that there needs to be a greater focus on risk and protective factors that can be targeted to improve mental health and wellbeing in adolescents following a disaster (Furr et al., 2010; Rubens et al., 2018; Terasaka et al., 2015; Trickey et al., 2012).

Pre- and post-disaster exposure to other adverse experiences is one such risk factor identified in these meta-analyses and literature reviews. The reviews of Trickey et al. (2012) and Lai et al. (2014) found that pre- and post-disaster adverse life events, such as living with a parent who is experiencing mental illness or suicidality, the experience of community violence, and family dysfunction, can significantly increase the likelihood of poor mental health and wellbeing in adolescents. In contrast, Terasaka et al. (2015) reported mixed findings on the effects of adverse life events, however they also suggested that the lack of uniformity in the measurement of these factors may account for some of the mixed findings. One approach that could overcome these issues would be to consider the cumulative impact of pre- and post-disaster adverse events on adolescent mental health and wellbeing rather than looking at the effects of specific events. Such an approach would align with ACEs research.

Social support has been identified in these meta-analyses and literature reviews as a potentially important protective factor for positive mental health and wellbeing in disaster-affected adolescents. While there is a growing body of research that shows a strong link between social support and mental health in adolescents in the general population (Chu et

al., 2010), research has only recently emerged regarding the effects of social support on disaster-affected adolescents (Trickey et al., 2012). Trickey et al. (2012) cited only four studies out of the 64 they reviewed that considered social support as a protective factor for good mental health and wellbeing in disaster-affected youth, however all four suggested social support is likely to play an important role. Five of the reviews analysed suggest that in order to gain greater understanding of adaptation and good mental health in disaster-affected adolescents, protective factors, such as social support, must be studied as well as risk factors (Furr et al., 2010; Lai et al., 2014; Rubens et al., 2018; Self-Brown et al., 2017; Trickey et al., 2012).

Some authors suggest that a number of the identified limitations in this body of research may relate to its largely atheoretical nature (Alisic, Jongmans, Van Wesel, & Kleber, 2011; Lai et al., 2014; Wang et al., 2013). Lai et al. (2014) found that less than one third of the disaster-research they reviewed presented explicitly-stated theories. Similar findings were reported in a meta-analysis of the use of theoretical frameworks in child trauma research (Alisic et al., 2011). Without strong grounding in theory, disaster research seems to have predominantly defaulted to a deficit approach to mental health that focuses on psychopathology, groups most at risk of psychopathology, and factors that increase the risk of psychopathology. While there is acknowledgement that research in post-disaster environments is often fraught and complicated (Masten & Osofsky, 2010), Wang et al. (2013) suggest that this default position may result in inaccurate estimation of the psychological impacts of disasters on children and adolescents. In addition, Rubens et al. (2018) suggest the focus on psychopathology has resulted in over-looking other mental health and wellbeing outcomes as well as factors that may promote adaptation, growth, and wellbeing in disaster-affected adolescents. The use of a well-considered theoretical framework in disaster-research

may promote the consideration of mental health and wellbeing in a way that is congruent with established conceptualisations of mental health as more than the absence of disease. It may also provide a framework that permits the systematic incorporation and consideration of multiple risk and protective factors. One theoretical framework that could be useful for examining disaster-affected adolescent mental health and wellbeing in a holistic way is the dual-factor model of mental health (Greenspoon & Saklofske, 2001; Suldo & Shaffer, 2008).

The Dual-factor Model of Mental Health

The dual-factor model of mental health provides an alternative theoretical framework for considering mental health in adolescents affected by ACEs, earthquake trauma, and/or post-disaster events. Two factors are considered to define mental health within this model; these are psychopathology and SWB (Antaramian, Huebner, Hills, & Valois, 2010; Lyons, Huebner, Hills, & Shinkareva, 2012; Renshaw & Cohen, 2014; Suldo & Shaffer, 2008; Suldo et al., 2016). Psychopathology (within the dual-factor model of mental health) refers to the negative symptoms associated with internalising and externalising psychological disorders, which are defined by clinical criteria (Suldo & Shaffer, 2008; Suldo et al., 2016). SWB is described as “the way in which and the reasons why individuals experience their lives positively” (Antaramian et al., 2010, p. 462); the experience of positive affect, an absence of negative affect and good life satisfaction are the three key components of SWB cited within the literature (Antaramian et al., 2010; Diener et al., 2017; Keyes, 2002; Suldo & Shaffer, 2008). Through this dual focus on both psychopathology and SWB, the dual-factor model of mental health dismisses the notion that the absence of psychopathology is the only requirement for positive mental health. Instead, a key part of the framework is that moderate to high levels of SWB are also necessary for positive mental health.

To operationalise this theory, the dual-factor model of mental health defines four categories of mental health by intersecting different degrees of psychopathology and SWB across two planes (Antaramian et al., 2010; Renshaw & Arslan, 2018; Suldo & Shaffer, 2008; Suldo et al., 2016) (Figure 4). The first category defined by the dual-factor model of mental health is *mentally healthy* (also referred to as *complete mental health*), which is defined by low-to-average levels of psychopathology with concurrent average-to-high levels of SWB (Antaramian et al., 2010; Renshaw & Arslan, 2018; Suldo & Shaffer, 2008; Suldo et al., 2016). The second category is termed *symptomatic but content*, which is defined by high levels of psychopathology with concurrent average-to-high levels of SWB (Antaramian et al., 2010; Renshaw & Arslan, 2018; Suldo & Shaffer, 2008; Suldo et al., 2016). Individuals within this category appraise the quality of their lives positively and experience more positive affect than negative in spite of clinical levels of psychopathology (Antaramian et al., 2010; Suldo & Shaffer, 2008). The third category within the dual-factor model of mental health is *asymptomatic but discontent* (also referred to as *vulnerable*), this category is defined by average-to-low levels of psychopathology and concurrent low levels of SWB (Antaramian et al., 2010; Renshaw & Arslan, 2018; Suldo & Shaffer, 2008; Suldo et al., 2016). Individuals within this category experience more negative affect than positive affect and have low levels of perceived QOL, however they do not have clinical levels of psychopathology. The final category within the dual-factor model of mental health is *mentally unhealthy* (also known as *troubled*), which is defined by a high degree of psychopathology and low levels of SWB comprising more negative affect than positive affect, and poor QOL (Antaramian et al., 2010; Renshaw & Arslan, 2018; Suldo & Shaffer, 2008; Suldo et al., 2016).

Level of Subjective Wellbeing		
	High-to-average SWB	Average-to-low SWB
Level of Psychopathology	Mentally Healthy (Complete Mental Health) <i>Prevalence range: 57.0 – 71.2%</i>	Asymptomatic but Discontent (Vulnerable) <i>Prevalence range: 7.3 – 13%</i>
	Symptomatic but Content <i>Prevalence range: 8.8 – 17.3%</i>	Mentally Unhealthy (Troubled) <i>Prevalence range: 5.1 – 19.9%</i>

Figure 4. Mental Health Terminology, Conceptual Categories, and Prevalence Range Associated with the Dual-Factor Model of Mental Health (adapted from: Antaramian et al., 2010; Bolognino, 2015; Lyons et al., 2012; Suldo et al., 2016; Suldo & Shaffer, 2008)

Application of the dual-factor model of mental health to the study of adolescent mental health and wellbeing.

A growing body of research provides empirical support for the validity and utility of the dual-factor model of mental health in the study of adolescent mental health. Foundational research focused on confirming the two-factor structure of mental health within adolescents through factor analysis (Wilkinson & Walford, 1998), and confirming the existence of the new mental health categories of symptomatic but content and asymptomatic but discontent (Greenspoon & Saklofske, 2001). More recently research has continued to focus on showing that psychopathology and SWB are related but distinct constructs that contribute to mental health rather than existing along a single continuum as per the deficit model of mental health (Antaramian et al., 2010; Lyons et al., 2012; Suldo & Shaffer, 2008; Suldo et al., 2016).

Five recent cross-sectional studies of adolescents (Table 2) in particular have shown that the dual-factor model of mental health reliably differentiates four mental health groups (Antaramian et al., 2010; Bolognino, 2015; Lyons et al., 2012; Suldo & Shaffer, 2008; Suldo

et al., 2016). These studies all used representative adolescent samples drawn from middle- and high-schools in the USA to self-report their SWB ($n = 349$ to $5,948$). All studies also used self-report measures of psychopathology, and two also used teacher-report measures (Suldo & Shaffer, 2008; Suldo et al., 2016). Although the findings of these five studies show some variation in the proportion of adolescents who fit within each of the four mental health categories defined by the dual-factor model of mental health, they consistently showed that most adolescents fit within the mentally healthy category (between 57.0% and 71.2% of adolescents). There are less consistent patterns in the relative proportions of adolescents fitting into each of the other three categories, however significant proportions of adolescents have been found to fit within each one. Between 7.3% and 13.0% of adolescents were found to be asymptomatic but discontent; in all five studies this was the category with either the lowest proportion of adolescents or second lowest proportion. Between 8.8% and 17.3% of adolescents were found to be symptomatic but discontent. In two of the studies, there were exactly the same proportion of adolescents in the symptomatic but discontent category as there were in the asymptomatic but discontent category (Suldo & Shaffer, 2008; Suldo et al., 2016); in these two studies, these categories contained the lowest relative proportion of adolescents. Between 5.1% and 19.9% of adolescents were found to be mentally unhealthy in these studies. While there is variation in the proportion of adolescents fitting into each of the four dual-factor categories, there were no clear demographic correlates that could explain the variations in prevalence nor obvious methodological explanations. One study however found that social and environmental factors were associated with different dual-factor mental health in adolescents (Lyons et al., 2012).

Table 2. Summary of Recent Studies Examining the Application of the Dual-Factor Model of Mental Health in Adolescents

	Suldo & Shaffer (2008)	Antaramian et al. (2010)	Lyons et al. (2012)	Suldo et al. (2016)	Bolognino (2015)
<i>Participant Characteristics</i>					
Number of participants	349	764	990	500	5,948
Age range (Mean, SD)	10 – 16 years (12.96, .97)	Not reported (Grade 7 & 8 students)	(14.62, 2.06)	14 – 18 years (15.27, 1.0)	Grade 5 - 10
Characteristics	Middle school sample	Middle school sample	Middle & High school sample	High school sample	Middle & High school sample
Location	Florida	South East USA	South East USA	South East USA	USA
<i>Proportion of Participants in Each Mental Health Category</i>					
Mentally Healthy	57%	66.9%	64%	62.2%	71.2%
Asymptomatic but Discontent	13%	8.1%	7.3%	11.4%	10.6%
Symptomatic but Content	13%	17.3%	8.8%	11.4%	13.2%
Mentally Unhealthy	17%	7.7%	19.9%	15%	5.1%

Lyons et al. (2012) found that the experiences of uncontrollable stressful events and social support influenced the likelihood of falling within different dual-factor mental health categories. As well as self-reporting their SWB and symptoms of psychopathology, adolescents in this study were also asked to report the number of uncontrollable stressful life events they had experienced in the previous 12 months from a list of 18 potential events. Two of these items were ACEs, namely parental divorce and death of a close friend (Suldo & Huebner, 2004). Lyons et al. (2012) found that adolescents who reported more uncontrollable stressful events were at increased odds of belonging to either the symptomatic but content ($OR = 1.09, p < .10$) or mentally unhealthy ($OR = 1.21, p < .05$) category than they were of belonging to the mentally healthy category. However, there was no significant effect on belonging to the asymptomatic but discontent group. The common factor in symptomatic but content and mentally unhealthy adolescents is moderate-to-high levels of psychopathology, whereas the common factor between mentally healthy and asymptomatic but discontent adolescents is low levels of psychopathology. These findings suggest that the experience of more uncontrollable stressful events can increase the likelihood of moderate-to high levels of psychopathology, and therefore being either mentally unhealthy or symptomatic but content.

Lyons et al. (2012) also asked adolescents in their study to report perceived social support from parents, close friends, and teachers. Social support from parents was found to significantly predict membership in the four dual-factor mental health categories. Adolescents who reported greater levels of parental social support were at decreased odds of belonging to the asymptomatic but discontent group ($OR = .72, p < .05$), symptomatic but content group ($OR = .82, p < .10$), or mentally unhealthy ($OR = .56, p < .05$) than they were of belonging to the mentally healthy group. Perceived social support from other sources did

not significantly predict category membership. The results of this study show that social factors, such as having good levels of social support, and environmental factors, such as experiencing ACES or other uncontrollable stressful events, do influence mental health when considered under the dual-factor model of mental health; these factors may explain some of the variation in the proportions of adolescents found to fit within the four categories. This provides support for the idea that it is important to consider social and environmental factors in future studies examining dual-factor mental health in adolescents.

The utility of the dual-factor model of mental health for describing differences in mental health-related functioning and impairment in critical social, emotional, and physical domains has been shown in three of these recent studies (Antaramian et al., 2010; Suldo & Shaffer, 2008; Suldo et al., 2016). In the earliest study, Suldo and Shaffer (2008) reported significant group differences in social functioning and physical health. Mentally healthy adolescents were shown to have the highest levels of functioning compared to other adolescents, including asymptomatic but discontent adolescents with similarly low levels of psychopathology. Mentally healthy adolescents had better social relationships, and the highest levels of physical health. Significant differences between symptomatic but content and mentally unhealthy adolescents were also found, showing the protective effect of moderate-to-high levels of SWB. Symptomatic but content adolescents had better social functioning and better physical health than mentally unhealthy adolescents. In this study, mentally unhealthy adolescents were shown to routinely experience the poorest emotional, behavioural, and physical outcomes (Suldo & Shaffer, 2008).

In a subsequent study, group differences based on the dual-factor model of mental health were identified in adolescent functioning and social relationships within the school environment. Like Suldo and Shaffer (2008), Antaramian et al. (2010) found that mentally

healthy adolescents had higher levels of functioning, such as greater academic achievement and school engagement, and stronger social relationships than asymptomatic but discontent adolescents; reinforcing the important role of SWB to these outcomes. The reported quality of relationships between adolescents and teachers was also significantly lower in asymptomatic but discontent and mentally unhealthy adolescents compared to mentally healthy adolescents. These findings, like those of Suldo and Shaffer (2008), highlight the relationship between SWB and social functioning within the school setting. They also support the utility of the dual-factor model of mental health for providing an estimation of mental health-related functional impairment within a school population than is achieved by measuring psychopathology alone.

In the most recent study examining the validity and utility of the dual-factor model of mental health with adolescents, Suldo et al. (2016) found significant differences in adolescents' social adjustment and identity development depending on their mental health category. Mentally healthy and symptomatic but content adolescents were found to have significantly higher levels of social adjustment and positive identity development than mentally unhealthy and asymptomatic but discontent adolescents. These findings indicated that irrespective of symptoms of psychopathology, adolescents with moderate-to-high levels of SWB also: had better perceived social support, more satisfying social relationships, and better self-concept clarity; experienced greater social inclusion than exclusion; and, engaged in activities that were more meaningful than adolescents with low SWB. These findings echo those of Suldo and Shaffer (2008) and Antaramian et al. (2010) by showing the value of considering both psychopathology and SWB in any estimation of holistic adolescent mental health.

These three studies show the potential utility of the dual-factor model of mental health for differentiating the contributions of SWB and psychopathology to specific areas of adolescent mental health and functioning. The differences found between groups of adolescents with similar levels of psychopathology but different levels of SWB demonstrate the additive value of measuring SWB. Adolescents who are mentally healthy with high levels of SWB and low levels of psychopathology have been consistently shown to be more successful in life, have better physical health, enjoy satisfying social relationships and thrive emotionally (Suldo et al., 2016). In comparison those adolescents with similarly low levels of psychopathology who fall within the asymptomatic but discontent mental health group have been shown to experience more difficulties with physical health, social relationships, and emotional experiences (Antaramian et al., 2010). The additive value of measuring SWB in conjunction with psychopathology is also demonstrated in findings related to symptomatic but content adolescents. Compared to other adolescents who have clinical levels of psychopathology, these adolescents have been shown to cope better with their symptoms and demonstrate more positive attributes such as better social relationships, greater self-worth and gratitude such that they are unlikely to require the same support as mentally unhealthy adolescents (Antaramian et al., 2010). These findings highlight the utility of the dual-factor model of mental health for meaningfully describing adolescent mental health. It is therefore possible that this model provides the foundation necessary for examining and describing mental health in earthquake-affected adolescents in a theoretically driven way that aligns with established conceptualisations of mental health as more than the absence of psychopathology. Use of the dual-factor model of mental health may also facilitate a more accurate estimation of the psychological and functional impact of earthquakes on adolescents.

Recent Studies of Mental Health and Wellbeing in Earthquake-affected Adolescents

In order to add depth to the review conducted of meta-analyses and literature reviews focused on the effects of disaster and trauma exposure on mental health and wellbeing in adolescents, a review of recent studies focussed specifically on the mental health and wellbeing of earthquake-affected adolescents was conducted using the dual-factor model of mental health as a framework for analysis. The primary aims of this review were to: (1) examine psychopathology and SWB outcomes in earthquake-affected adolescents, and (2) examine the influences of social support and cumulative exposure to ACEs or other traumatic events on the mental health and wellbeing of earthquake-affected adolescents. The goal was to address knowledge gaps already identified in the earlier analysis of mental health and wellbeing in disaster-affected adolescents, and examine the extent to which studies had considered the dual influence of psychopathology and SWB on the holistic wellbeing and functioning of earthquake-affected adolescents.

Studies identified and their characteristics. Eighteen studies published in peer-reviewed journals since 2010 were identified for review (Table 3). Most of the studies were cross-sectional (13 studies), with the rest adopting longitudinal designs; 17 employed within-groups designs and one employed between-groups design comparing earthquake-affected participants against non-affected participants. The most studied earthquakes were the 2008 M8.0 Wenchuan Earthquake in China (nine studies) and 2013 M7.0 Ya'an Earthquake in China (three studies). Other earthquakes studied included the 2011 M7.1 Christchurch Earthquake in NZ, 2011 M9.0 Great Eastern Japan Earthquake, 2011 M7.2 Van Earthquake in Turkey, 2010 M7.0 Haiti Earthquake, and the 1999 M6.0 Parintha Earthquake in Greece. The length of time elapsed between the earthquake and the study ranged from six months to eight years; six studies were conducted within two years of the earthquake,

seven studies were conducted between two and six years following the earthquake, and four studies were conducted more than six years following the earthquake. Participants ranged in age from 3- to 19- years-old at the time they were exposed to an earthquake.

Table 3. Summary of Characteristics and Findings Related to Psychopathology and Subjective Wellbeing of Recent Studies of Earthquake-affected Adolescents Included in Literature Review

Authors (year)	Design (n)	Earthquake (magnitude)	Time	Participant Age		Summary of Findings	
				Study	Earthquake	Psychopathology	SWB
Heetkamp and De Terte (2015)	CS (525)	2010/11 Christchurch (M7.1)	6 mths	13 - 20 years	12:6 – 19:6 years	24.0% PTSD 5.0% extremely severe PTSD 40.0% low/no PTSD symptoms 42.0% impaired daily functioning.	-
Zheng, Fan, Liu, and Mo (2012)	CS (2250)	2008 Wenchuan, China (M8.0)	6 mths	11 – 18 years	10:6 – 17:6 years	Mean PTSD score 39.2(15.1 SD) for older adolescents (15-18 years). Mean PTSD score 34.6(11.4 SD) for younger adolescents (11-14 years). <i>(a score of 50 or more indicates PTSD).</i>	-
Mashiko et al. (2017)	CS (15,274)	2011 Great East Japan (M9.0)	1 yr	4 – 15 years	3 – 14 years	22.0% 7- to 12-year-olds clinically significant psychological distress 16.3% 13- to 15-year-olds clinically significant psychological distress	-

Authors (year)	Design (n)	Earthquake (magnitude)	Time	Participant Age		Summary of Findings	
				Study	Earthquake	Psychopathology	SWB
Jia et al. (2010)	CS (596)	2008 Wenchuan, China (M8.0)	1 yr 3 mths	8 – 16 years	6:9 – 14:9 years	12.4% PTSD 13.9% Depression	Mean HRQOL score 82.2 (SD 12.2)(<i>maximum score possible is 100</i>)
Zhang, Liu, Jiang, Wu, and Tian (2014)	L (1420)	2008 Wenchuan, China (M8.0)	1 yr 5 mths	12 – 20 years	10:7 – 18:7 years	12.1% PTSD 39.1% re-experiencing symptoms 16.4% avoidance symptoms 32.5% hyperarousal symptoms	-
Fan et al. (2015)	L (1573)	2008 Wenchuan, China (M8.0)	2 yrs	14:6 years (mean)	12:6 years (mean)	7.2% chronic PTSD 65.3% on resistance trajectory (no PTSD symptoms)	-
Zhou, Wu, and Zhen (2018)	CS (397)	2013 Ya'an, China (M7.0)	2 yrs 6 mths	13 – 20 years	10:6 – 17:6 years	PTSD – mean score 14.9 (8.9 SD) (<i>maximum score possible is 80</i>)	PTG – mean score 62.7 (20.9 SD) (<i>maximum score possible is 132</i>)
Tang et al. (2017)	L (153)	2013 Ya'an, China (M7.0)	2 yrs 6 mths	8 – 18 years	5:6 – 15:6 years	15.7% PTSD 21.6% Depression 8.5% co-morbid PTSD and Depression	-

Authors (year)	Design (n)	Earthquake (magnitude)	Time	Participant Age		Summary of Findings	
				Study	Earthquake	Psychopathology	SWB
Cénat and Derivois (2015)	CS (872)	2010 Haiti (M7.0)	2 yrs 6 mths	7 – 17 years	4:6 – 14:6 years	36.9% PTSD 46.2% Depression 22.3% Comorbid PTSD and Depression	-
Goenjian et al. (2011)	L (511)	1999 Parintha, Greece (M6.0)	2 yrs 8 mths	13 – 18 years	10:4 – 15:4 years	8.8% PTSD 3.6% Depression	Mean QOL score 77.4 (SD 11.5)
Jia et al. (2013)	L (596)	2008 Wenchuan, China (M8.0)	3 yrs	8 – 16 years	5 – 13 years	10.7% PTSD 13.5% Depression 4.7% co-morbid PTSD and Depression	-
Hu, Xu, and Liu (2018)	CS (1,031)	2008 Wenchuan, China (M8.0)	3 yrs	16 - 22 years	13 – 19 years	-	16 – 18 year-olds had significantly lower QOL than 19 – 22 year-olds.
Tian, Wong, Li, and Jiang (2014)	CS (4,604)	2008 Wenchuan, China (M8.0)	3 yrs	15:1 years (mean)	12:1 years (mean)	5.7% PTSD	-

Authors (year)	Design (n)	Earthquake (magnitude)	Time	Participant Age		Summary of Findings	
				Study	Earthquake	Psychopathology	SWB
Eray, Uçar, and Murat (2017)	CS/CC (434)	2010 Van, Turkey (M 7.2)	6 yrs	14:9 years (mean)	8:9 years (mean)	21.8% PTSD Additional 66.1% mild to moderate PTSD symptoms.	-
Tanaka et al. (2016)	CS (2,641)	2008 Wenchuan, China (M8.0)	6 yrs	11 - 18 years	5 – 12 years	Multiple EQ-related traumatic experiences increase the risk of suicidality and psychopathology	-
Cadichon et al. (2017)	CS (723)	2010 Haiti (M7.0)	6 yrs 4 mths	14 - 24 years	7:8 – 17:8 years	35.8% severe PTSD symptoms 49.2% moderate PTSD symptoms	-
Du et al. (2018)	CS (4,118)	2008 Wenchuan, China (M 8.0)	8 yrs	14 – 20 years	6 – 12 years	2.7% PTSD 22.0% re-experiencing symptoms 9.3% avoidance symptoms 34.3% hyperarousal symptoms	PTG mean scale score = 54.1

Note: Time - time elapsed between earthquake and study, SWB - subjective wellbeing, CS - cross-sectional, PTSD - Posttraumatic Stress Disorder, HRQOL - Health-related Quality of Life, L - longitudinal, PTG - Posttraumatic Growth, QOL - Quality of Life, CC - case-control

Mental health and subjective wellbeing-related outcomes studied. A deficit approach to mental health with a focus on psychopathology dominated the mental health outcomes examined in the studies identified. Despite concerted efforts to locate studies examining SWB and positive mental health constructs, PTSD was still the most studied adolescent mental health outcome (Table 4). Other psychopathology-focused outcomes studied included depression, suicidality, fear, difficulties at home and school, and general symptoms of psychopathology. In total there were 28 psychopathological outcomes studied across the 18 studies.

In comparison, there were only six SWB-related outcomes studied across the 18 studies. Two studies examined QOL, whereas one looked at Health-related QOL (HrQOL). Three studies examined PTG as an outcome of primary concern. PTG is distinct from SWB in that it applies only to trauma-exposed individuals and refers to growth or personal improvement following trauma-exposure (Tedeschi & Calhoun, 2004). In earthquake-affected adolescents PTG could be considered an indicator of wellbeing, particularly eudaimonic aspects of wellbeing related to personal growth, life purpose, and positive relatedness. In turn, experiencing growth in these areas is also likely to improve QOL and therefore can also be related to SWB in earthquake-affected adolescents.

Table 4. Psychopathological and Subjective Wellbeing-related Outcomes Measured in Studies of Earthquake-affected Adolescents

Outcome	n	Studied by:
<i>Psychopathological Outcomes</i>		
Posttraumatic Stress Symptoms and Posttraumatic Stress Disorder	16	Jia et al. (2010), Goenjian et al. (2011), Zheng et al. (2012), Jia et al. (2013), Tian et al. (2014), Zhang et al. (2014), Cénat and Derivois (2015), Fan et al. (2015), Heetkamp and De Terte (2015), Cadichon et al. (2017), Eray et al. (2017), Jieling and Xinchun (2017),

Outcome	n	Studied by:
		Tang et al. (2017), Du et al. (2018), Hu et al. (2018), Zhou et al. (2018)
General symptoms of psychopathology	5	Tanaka et al. (2016), Eray et al. (2017), Mashiko et al. (2017), Tang et al. (2017), Hu et al. (2018)
Depression	4	Jia et al. (2010), Goenjian et al. (2011), Jia et al. (2013), Cénat and Derivois (2015)
Suicidality	1	Tanaka et al. (2016)
Difficulties at home and school	1	Tang et al. (2017)
Total psychopathology outcomes	27	
<i>SWB-related Outcomes</i>		
Posttraumatic Growth	3	Jieling and Xinchun (2017), Du et al. (2018), Zhou et al. (2018)
Quality of Life	2	Goenjian et al. (2011), Hu et al. (2018)
Health-related Quality of Life	1	Jia et al. (2010)
	6	

Psychopathological outcomes in earthquake-affected adolescents. Findings from the individual studies analysed confirmed that there is a high prevalence of psychopathology in some earthquake-exposed adolescents. In the studies analysed, prevalence rates of PTSD ranged from 2.7% - 43.9% (Cadichon et al., 2017; Cénat & Derivois, 2015; Du et al., 2018; Eray et al., 2017; Fan et al., 2015; Goenjian et al., 2011; Heetkamp & De Terte, 2015; Jia et al., 2013; Jia et al., 2010; Tang et al., 2017; Tian et al., 2014; Zhang et al., 2014); of Depression from 13.5% - 46.21% (Cénat & Derivois, 2015; Goenjian et al., 2011; Jia et al., 2013; Jia et al., 2010; Tang et al., 2017); and were 21.6% in the single study that measuring general psychological distress (Mashiko et al., 2017). A number of studies also found high

rates of PTSD/Depression co-morbidity in their samples, with prevalence ranging between 4.7% and 22.5% of participants (Cénat & Derivois, 2015; Jia et al., 2013; Tang et al., 2017). These findings align with those established in previous meta-analyses and literature reviews, showing that there are elevated rates of psychiatric disorders in earthquake-exposed adolescents.

Although these study findings point to high rates of psychopathology in earthquake-exposed adolescents, significant variance in these rates was also found. No study specifically examined the reasons for the varying prevalence rates reported, however a number of possible explanations were put forward. Explanations included the differing lengths of time since participants had been exposed to the earthquakes and their age at exposure (Cadichon et al., 2017; Eray et al., 2017); the extent of damage and loss associated with each earthquake (Cénat & Derivois, 2015; Du et al., 2018; Fan et al., 2015; Heetkamp & De Terte, 2015; Jia et al., 2013; Jia et al., 2010; Tang et al., 2017); the characteristics of the locations where the earthquakes happened (Cadichon et al., 2017; Tang et al., 2017); the influence of protective factors such as social support (Du et al., 2018, Eray et al., 2017; Fan et al., 2015; Tian et al., 2014); and the experience of post-disaster adversity (Cénat & Derivois, 2015; Fan et al., 2015; Jia et al., 2013; Tang et al., 2017). The same degree of variation in psychopathology was found in the review of meta-analyses and literature reviews of disaster-affected adolescents. This finding lends further support to the idea that there is not a single trajectory of psychopathology in adolescents following earthquake exposure.

A recent case-control study has reported significantly higher rates of psychopathology in earthquake-exposed adolescents than in adolescents who had not lived through an earthquake (Eray et al., 2017). Eray and colleagues (2017) used a cross-sectional survey measuring PTSD and general psychological symptoms to study group differences

between 230 adolescents who had lived through the 2010 Van Earthquake in Turkey six years earlier and 204 adolescents who had never experienced an earthquake; the groups were matched for gender and age. Significant differences in both PTSD and a number of general psychological symptoms were found between the two groups. Earthquake-exposed adolescents were significantly more likely to report symptoms of PTSD ($t = -1.966, p < .05$), greater interpersonal sensitivity ($t = -2.257, p < .05$), anxiety ($t = -2.259, p < .05$), and phobic anxiety ($t = -2.270, p < .05$) than non-exposed adolescents. The use of the case-control design in this study supports the proposition that adolescents who have lived through an earthquake, even six years earlier, are at significantly higher risk of PTSD and depression than adolescents who have not lived through the same experience. From a dual-factor model of mental health perspective, this suggests that earthquake-exposed adolescents would be more likely to fit within the mentally unhealthy and symptomatic but content mental health categories than non-exposed adolescents.

Subjective wellbeing-related outcomes in earthquake-affected adolescents. Six studies were identified that specifically examined SWB-related outcomes in earthquake-affected adolescents (Du et al., 2018; Goenjian et al., 2011; Hu et al., 2018; Jia et al., 2010; Jieliang & Xinchun, 2017; Zhou et al., 2018). Two studies examined QOL, one study examined HrQoL, and three studies examined PTG in earthquake-affected adolescents.

Quality of life. Three studies have shown that earthquake-affected adolescents who have symptoms of psychopathology in the aftermath of an earthquake are also more likely to experience lower QOL.

In the earliest study, a cross-sectional survey was used to examine whether HRQoL was related to psychopathology in 596 children and adolescents who had experienced the M8.0 Wenchuan earthquake 15 months earlier (Jia et al., 2010). The children were aged 8-

to 16-years old at the time of the study. HrQoL relates primarily to one's physical health status but also incorporates perceived physical, emotional, social, and day-to-day functioning (Varni, Burwinkle, Seid, & Skarr, 2003). Those children and adolescents who met the criteria for PTSD or depression were found to be significantly more likely to also experience poor HrQOL ($p < .001$). Measures of PTSD and depression symptoms accounted for 40% of the variation in measures of HrQOL in the children and adolescents studied. These findings suggest that earthquake exposed adolescents are at significant risk of being categorised as mentally unhealthy rather than symptomatic but content under the dual-factor model of mental health given the large relationship between psychopathology and HrQOL (an indicator of SWB).

In a subsequent longitudinal study, the relationships between psychopathology, earthquake-related losses, stressors since the earthquake, and QOL were examined (Goenjian et al., 2011). Adolescents ($n=511$) in this study were exposed to the M6.0 Parintha earthquake when they were aged between 10- and 15-years old. Measures of depression, PTSD, earthquake-related loss and difficulties since the earthquake were taken at 3 months, and again at 32 months post-earthquake; QOL was also measured at this time. Goenjian et al. (2011) found that those adolescents reporting higher levels of PTSD symptoms and depression three months post-earthquake were more likely to report lower levels of QOL 29 months later. Depression was the biggest predictor of QOL, accounting for 16% of the variance in adolescents' self-reported QOL. The study also showed that stressors experienced by the adolescents in the three months following the earthquake played a larger role in predicting their long-term QOL than did earthquake-related losses. For example, financial difficulties and job loss within the family three months after the earthquake accounted for 6% of the variance in QOL scores (the second biggest predictor of

QOL), whereas the death of a close friend or family member during the earthquake accounted for only 0.8% of the variance. These findings show that short-term negative impacts of earthquake exposure, particularly psychopathology and life stressors, may influence adolescent QOL, long after initial earthquake exposure.

In the most recent study of QOL in earthquake-exposed adolescents, the relationships between psychopathology, degree of earthquake exposure, and QOL were examined (Hu et al., 2018). Hu et al. (2018) surveyed 1,031 adolescents who had been exposed to the M8.0 Wenchuan earthquake between two and three years earlier when they were aged between 13- and 19-years old. Like the two earlier studies of QOL described, Hu et al. (2018) also found that having PTSD symptoms was significantly related to reduced perceived QOL in earthquake-affected adolescents. The extent of earthquake exposure reported by the adolescents was found to relate significantly and positively to PTSD; the greater the exposure the more severe the PTSD symptoms. Although a negative relationship was established between extent of earthquake exposure and QOL, this was not significant until PTSD was introduced as a mediating factor. This suggests that the extent of earthquake exposure experienced by adolescents can indirectly influence their long-term QOL.

The findings reported in these three studies suggest that earthquake exposure is related to negative long-term QOL in adolescents with PTSD or depression and therefore, within a dual-factor model of mental health, they would be more likely to be categorised as mentally unhealthy. All three studies found that adolescents with symptoms of PTSD or depression were more likely to report lower ratings of QOL than those adolescents without. A limitation of these studies is that published results did not allow conclusions about the prevalence of good or poor QOL in earthquake-affected adolescents to be made, nor were descriptive statistics published that would have allowed comparison with other adolescent

populations. These limitations constrain understandings of QOL in earthquake-affected adolescents, and in turn limit the conclusions that can be made about potential differences in QOL and dual-factor mental health between earthquake-exposed adolescents and adolescents in the general population.

Posttraumatic growth. Three very recent cross-sectional studies examined PTG in adolescents affected by earthquakes in China. All used the self-report Posttraumatic Growth Inventory (PTGI) to measure PTG. The PTGI measures perceived positive changes in self, relationships with others, and life philosophies following exposure to traumatic events; these are constructs that relate closely to eudaimonic wellbeing. Higher scores on the PTGI are indicative of positive change following trauma exposure and greater PTG, with a maximum total score of 132 (Jieling & Xinchun, 2017).

In the first study, Jieling and Xinchun (2017) surveyed 928 adolescents with a mean age of 13.13 who had been exposed to the M7.0 Ya'an earthquake eight months earlier; the age range of these participants was not reported. The mean PTGI score for this sample was 63.43 ($SD = 19.79$). In the second study, Zhou et al. (2018) surveyed 397 adolescents aged 13- to 20-years-old two and a half years after the M7.0 Ya'an earthquake. All participants had experienced, and lived in areas severely affected by, the earthquake. The mean PTGI score in this sample was 62.69 ($SD = 20.9$). In the final study, Du et al. (2018) surveyed two groups of adolescents aged 14- to 20-years-old who had been exposed to the M8.0 Wenchuan earthquake eight years earlier. The first group lived in an area severely affected by the earthquake ($n = 2,120$), whereas the second group lived in a generally affected area ($n = 1,998$). The mean PTGI score for the severely affected adolescents was 54.09 ($SD = 19.29$) and for the generally affected adolescents it was 39.93 ($SD = 24.85$).

The findings of these three studies collectively show that there are moderate mean levels of PTG in earthquake-affected adolescents, and therefore show that some adolescents experience improvements in their wellbeing following exposure to earthquakes. The levels of PTG following earthquake exposure may lessen with time; adolescents exposed eight months earlier to an earthquake had higher mean PTGI scores than those adolescents exposed eight years earlier. PTG is also likely to be affected by the severity of earthquake exposure experience; adolescents with severe exposure had a higher mean PTGI score than adolescents who were less severely impacted by an earthquake. One limitation of these studies that constrains meaningful conclusions about PTG in earthquake-exposed adolescents is the absence of frequency data in the published material; this precludes conclusions about the prevalence of different levels of PTG in the samples studied. Epidemiologists are clear that prevalence data is essential for improving the understanding of mental health and wellbeing in adolescents (Bor et al., 2014; Collishaw, 2015; Kieling et al., 2011).

Co-existence of psychopathology and subjective wellbeing in earthquake-affected adolescents. Four of the 18 identified recent studies of mental health and wellbeing in earthquake-affected adolescents examined the co-existence of psychopathology and SWB (Goenjian et al., 2011; Hu et al., 2018; Jia et al., 2010; Jieling & Xinchun, 2017). Three of these studies adopted a unidimensional approach to the study of these co-existing indicators of mental health by assuming a linear relationship between psychopathology and SWB whereby SWB was hypothesised to decrease as psychopathology increased that is incongruent with the dual-factor model of mental health (Goenjian et al., 2011; Hu et al., 2018; Jia et al., 2010). While the findings of these studies did show significant linear relationships whereby the experience of more severe symptoms of PTSD and depression

related to lower level of QOL, they did not show the proportion of adolescents with symptoms of PTSD or depression who also reported good QOL, and who therefore may be symptomatic but content within the dual-factor model of mental health. In addition, findings did not allow conclusions to be made about the prevalence of poor QOL in adolescents without PTSD or depression, limiting identification of adolescents who may be asymptomatic but discontent.

One study that did adopt an approach congruent with the dual-factor model of mental health was the study conducted by Jieling and Xinchun (2017). In this study, the authors sought to identify all possible patterns of PTSD and PTG in their sample using a person-centred approach to statistical analysis. They were able to identify three distinct patterns of mental health, which they called *thriving*, *resilient* and *stressed and growing*. Thriving adolescents made up 76.2% of the sample and were characterised by mild levels of PTSD and moderate levels of PTG. Smaller proportions of adolescents fell within both the resilient group (9.1%) who were characterised by mild levels of both PTSD and PTG, and the stressed and growing group (14.7%) who were characterised by clinical levels of PTSD and moderate levels of PTG. These findings show that earthquake-affected adolescents can and do experience high levels of psychopathology with concurrent moderate-to-high levels of PTG. Similarly, they show that some adolescents can also experience lower levels of psychopathology in combination with low levels of PTG. While the groups identified by Jieling and Xinchun (2017) don't neatly approximate the groups defined by the dual-factor model of mental health, they do show that there are distinct profiles of mental health that exist in earthquake-affected adolescents that are not able to be identified using a unidimensional approach to analysis. These findings highlight that although it is important to consider the correlations between negative and positive psychological outcomes, this

approach needs to also be supplemented by approaches that are person-centred and can identify the full range of mental health outcomes made possible by considering both psychopathology and SWB in earthquake-affected adolescents.

The influence of social support on mental health and wellbeing in earthquake-affected adolescents. Social support has been conceptualised as the psychological and material resources offered to an individual by others; for adolescents the sources of support come primarily from family, friends, and school (Chu et al., 2010; Reuman, Mitamura, & Tugade, 2014). Reuman et al. (2014) suggest there are two types of social support: 1) functional support, which consists of the provision of emotional, tangible or emotional resources to an individual by other individuals; and 2) structural support, which relates more to the ties an individual has with others including the stability of their place, and degree of establishment, within a social network. Social support is posited to contribute to SWB by providing experiences of positive affect, consistency, and a sense of dependability in life; it can also act to protect against stress by strengthening and supporting perceptions of self-esteem and -efficacy (Chu et al., 2010). Those adolescents with good social support are therefore more likely to be conceptualised as mentally healthy or symptomatic but content within the dual-factor model of mental health.

Social support was shown to protect against poor mental health and promote wellbeing in earthquake-affected adolescents in six of the recent studies identified for this literature review (Du et al., 2018; Eray et al., 2017; Fan et al., 2015; Jia et al., 2013; Tian et al., 2014; Zhou et al., 2018). The influence of social support on PTSD in earthquake-affected adolescents was examined in all of these studies, on depression in one of the studies (Jia et al., 2013), and on PTG in two of the studies (Du et al., 2018; Zhou et al., 2018).

Social support and PTSD. A negative relationship between social support and PTSD was found in the six studies that examined this relationship (Du et al., 2018; Eray et al., 2017; Fan et al., 2015; Jia et al., 2013; Tian et al., 2014; Zhou et al., 2018). Higher levels of social support were consistently found to relate to lower levels of PTSD symptom severity. Two studies found however that the size of decreases in PTSD scores associated with increases in social support, although significant were quite small.

In the first study, Tian et al. (2014) conducted a cross-sectional survey of 4,604 adolescents who had a mean age of 12.1 years when they were exposed to the M8.0 Wenchuan earthquake three years earlier. They found that higher levels of self-reported perceived social support significantly reduced the odds of reporting high levels of PTSD symptoms, however this was only by a small amount ($OR = .977, p < .001$). In the study of Du et al. (2018) (described earlier), higher levels of self-reported perceived social support also predicted small but significant reductions in PTSD symptoms for earthquake-affected adolescents ($B = -.067, p < .05$).

In another cross-sectional study, a similarly small negative relationship between social support and PTSD was found however this was only significant when self-esteem was introduced as a mediating factor (Zhou et al., 2018). Zhou et al. (2018) assessed PTSD, social support, self-esteem and hope in the 397 adolescents aged 13- to 20-years-old they surveyed two and a half years after the M7.0 Ya'an earthquake. Building on existing research that demonstrated the protective effects of social support on adolescent mental health, they sought to examine the mechanisms by which social support related to PTSD in earthquake-affected adolescents. They found that social support in and of itself was not a significant predictor of PTSD scores when included in regression analysis ($\beta = .01, p > .05$). However, further analysis showed that when self-esteem was introduced as a mediating factor, social

support became a significant predictor of reductions in PTSD scores ($\beta = -.08, p < .01$). The same was not found when hope was introduced as a mediating factor. These findings suggest therefore that social support may promote self-esteem through feelings of belonging and acceptance in earthquake-affected adolescents; in turn, these feelings can bolster an adolescent's ability to cope with the negative symptoms associated with PTSD. In this way social support significantly predicts less severe PTSD symptoms.

In another survey social support was however not found to be a significant predictor of PTSD. Jia et al. (2013) surveyed 596 adolescents who had experienced the M8.0 Wenchuan earthquake three years earlier when they were aged between 6- and 14-years-old. They found that there was a significant but small negative correlation between self-reported perceived social support and PTSD scores ($r = -.010, p = .04$), however when social support was entered as a predictor in regression analysis along with demographic factors, objective and subjective measures of earthquake exposure, earthquake-related losses, and symptoms of depression, it was not found to be a significant predictor of PTSD ($\beta = .062, p = .15$). In a unidimensional model of mental health, this indicates that when these other factors are taken into account, the effect of social support on PTSD scores is no longer significant.

In contrast to findings that social support is associated with only small decreases in PTSD or is not a significant predictor of PTSD at all, Eray et al. (2017) found that social support from family was a significant and large predictor of PTSD in adolescents affected by the M7.2 Van earthquake six years earlier. Adolescents reported their PTSD symptoms and perceived social support from family, friends, and teachers via a survey. In a series of hierarchical regression analyses, Eray et al. (2017) found that perceived social support explained 10.8% of the variance in the PTSD scores when the effects of age, gender,

earthquake exposure, including the witness of death or severe injury, displacement, and relocation variables were controlled for. However, they also found that perceived family support was the only source of social support that significantly predicted changes in PTSD scores ($\beta = -.660, p < .001$); neither social support from friends nor from teachers were significant predictors of reduced PTSD symptoms. These findings highlight that the source of social support may be an important factor in protecting against severe PTSD symptoms; the authors suggest that the support of parents may help children cope with the traumatic effects of earthquake exposure.

Social support may also protect against chronic trajectories of PTSD over time. In a longitudinal survey of 596 children and adolescents conducted between 6- and 24-months following exposure to the M8.0 Wenchuan earthquake, Fan et al. (2015) sought to determine the influence of social support on change in PTSD symptoms over time. The participants had a mean age of 11-and-a-half-years at the time they were exposed to the earthquake (age range was not reported). Fan et al. (2015) found that increasing levels of self-perceived social support significantly reduced the odds of experiencing continual moderate-to-severe PTSD symptoms over the 24-month period following the earthquake ($OR = .34, p < .05$). Social support was also found to significantly reduce the odds of experiencing relapse to clinical levels of PTSD following periods of recovery during the 24-month period ($OR = .27, p < .01$). These findings again highlight the potentially protective influence of social support on PTSD in earthquake-affected adolescents.

Social support and depression. A significant and negative relationship between social support and depression in earthquake-exposed adolescents has been established in one study ($r = -.42, p < .001$) (Jia et al., 2013). In this cross-sectional survey of adolescents affected by the M8.0 Wenchuan earthquake conducted by Jia et al. (2013) (described

earlier), social support was also found to be a negative predictor of depression symptoms in regression analyses conducted ($\beta = -.364, p < .001$) when demographic factors, objective and subjective measures of earthquake exposure, earthquake-related losses and symptoms of PTSD were controlled for. These findings show the protective influence of social support from the experience of depressive symptoms.

Social support and Posttraumatic Growth. Findings from two studies suggest that social support promotes PTG in earthquake-affected adolescents. In their study of adolescents aged 13- to 20-years old conducted two-and-a-half years after the M7.0 Ya'an earthquake, Zhou et al. (2018) found that social support was a significant predictor of PTG ($\beta = .17, p < .01$). The size and significance of this predictive relationship increased when hope was introduced as a mediating factor ($\beta = .21, p < .001$). These findings suggest that social support can enhance an adolescent's level of hope for the future helping them to think positively about traumatic experiences they may have experienced during or after the earthquake, which could then lead to PTG.

In their survey of adolescents aged 14- to 20-years old conducted eight years after the M8.0 Wenchuan earthquake, Du et al. (2018) also found that social support was a significant predictor of PTG. Social support was more predictive of PTG in adolescents who lived in areas severely affected by the earthquake ($B = .334, p < .001$) than it was in adolescents more generally affected by the earthquake ($B = .156, p < .001$). Results suggested that the sense of security obtained through social support promoted PTG in the adolescents studied; this sense of security may be more important to adolescents living in highly disrupted communities that have been severely earthquake-affected than those living in less disrupted communities.

Overall, the findings of these recent studies indicated that it is possible that social support may protect against the experience of symptoms of psychopathology, particularly PTSD, in earthquake-affected adolescents. Social support may also protect against the persistence of PTSD over extended periods of time following earthquake exposure. It appears that the source of social support may be an important factor in determining the influence on PTSD, with support from family members more influential than the support from friends or teachers. The findings of one study indicate that social support may act to improve children and adolescent's self-esteem, which improves their ability to cope with potentially traumatic experiences associated with earthquake exposure and lessens the potential for experiencing severe PTSD symptoms. The results of this study help to understand how and why social support may be a protective factor against psychopathology in earthquake-affected adolescents. Three studies showed that social support also positively predicts PTG. Findings suggest that social support may promote PTG through the mechanisms of hope and security. Social support may help adolescents to feel more secure and more hopeful about their future, which in turn may promote positive thoughts about themselves and the experiences they have been through resulting in PTG.

While these findings support the ideas that social support might promote good wellbeing in earthquake-affected adolescents and protect against psychopathology, therefore increasing the likelihood of adolescents being conceptualised as mentally healthy within the dual-factor model of mental health, firm conclusions are limited by two factors. First, emergent research has focused on PTSD and PTG as indicators of mental health and wellbeing. In order to further develop understanding of the role of social support in the promotion of wellbeing and protection against poor mental health there is a need to consider the influence of social support on other indicators of mental health and wellbeing,

such as QOL and positive affect. Second, only one study looked at the influence on mental health and wellbeing of different sources of support, finding that meaningful differences existed depending on the source of support. In order to further develop and support this idea, research that considers the contribution to mental health and wellbeing from different sources of support may be useful.

The influence of cumulative exposure to secondary stressors and ACEs on mental health and wellbeing in earthquake-affected adolescents. Four recent studies have shown the negative impact that post-earthquake stressors and traumatic experiences, such as ACEs, can have on adolescent mental health (Cénat & Derivois, 2015; Fan et al., 2015; Tang et al., 2017; Zheng et al., 2012).

An increased risk of PTSD was found in adolescents with a mean age of 14-years exposed to secondary stressors six months after the M8.0 Wenchuan earthquake (Zheng et al., 2012). A cross-sectional survey was used to measure self-reported PTSD symptoms and exposure to negative life events (NLEs); NLEs were stressful experiences that had a negative impact on the respondent's life such as interpersonal conflict, personal loss, academic pressure, being punished, and physical health problems. A moderate-to-large sized correlation was found between NLEs and PTSD, ($r = .48, p < .001$), suggesting those adolescents that reported more NLEs were at significantly more risk of experiencing PTSD symptoms than those who did not report these experiences. Zheng et al. (2012) found that NLEs accounted for 18.7% of the variance in PTSD symptoms after controlling for the effects of gender, age, earthquake-related losses, damage, and trauma. These findings show that adolescents with more NLEs in the aftermath of an earthquake are at increased risk of experiencing PTSD.

Increased levels of stress have also been associated with more chronic experiences of PTSD in the 24-month period following earthquake exposure (Fan et al., 2015). In their longitudinal study of adolescents exposed to the Wenchuan earthquake, Fan et al. (2015) measured adolescents' exposure to NLEs six months after the earthquake and again 24-months after the earthquake using the same instrument employed by Zheng et al. (2012). Adolescents who reported experiencing more NLEs six months after the earthquake had significantly increased odds of then experiencing clinical PTSD symptoms than they were of experiencing no PTSD symptoms any time in the following 18 months ($OR = 4.04, p < .001$). They also had even greater odds of experiencing these PTSD symptoms continuously over the following 18 months rather than recovering from them ($OR = 9.09, p < .05$). Continuing to experience high levels of NLEs 24 months after initial exposure to the earthquake was also related to an increased risk of PTSD symptoms ($OR = 5.13, p < .001$). Respondents were also far more likely to develop delayed onset PTSD after initial resistance to experiencing PTSD symptoms if they had high NLEs 24 months post-earthquake ($OR = 14.30, p < .001$). These findings illustrate the negative effect of high levels of stress in the post-earthquake environment on adolescent mental health.

Poor adolescent mental health has also been shown to be associated with the cumulative experience of post-earthquake ACEs. In a longitudinal study of 153 earthquake-exposed adolescents, Tang et al. (2017) showed that cumulative exposure to ACEs following the earthquake increased the risk of PTSD and depression. Participants in this study were aged between 6-years and 15-and-a-half-years old when they were exposed to the M7.0 Ya'an earthquake two-and-a-half years earlier; some participants were also exposed to the M8.0 Wenchuan earthquake seven years earlier. Tang et al. (2017) found that those adolescents exposed to both earthquakes were at significantly higher risk of both PTSD (OR

= 67.54, $p < .001$) and depression ($OR = 4.92$, $p = .008$) than those who had been exposed only to the Ya'an earthquake. Those adolescents who accumulated further ACEs in the 30 months following the earthquake were also much more likely to report clinically significant symptoms of PTSD or depression. Adolescents were at increased odds of clinical levels of PTSD and depression if they reported being neglected (PTSD, $OR = 5.386$, $p = .009$; depression, $OR = 4.68$, $p = .002$), if their family was experiencing poverty (PTSD, $OR = 6.15$, $p = .005$; depression, $OR = 9.03$, $p < .001$), they had witnessed death (PTSD, $OR = 6.91$, $p = .005$), or lost a family member (depression, $OR = 13.25$, $p = .002$) in the 30 months following the earthquake. These findings highlight the increased likelihood of PTSD and depression in adolescents exposed to previous earthquakes, and the negative influence further ACEs during the post-disaster period can have on adolescent mental health.

The negative influence of exposure to ACEs on adolescent mental health was also highlighted in a cross-sectional survey study conducted by Cénat and Derivois (2015). In this study, the authors found that cumulative exposure to ACEs during both the pre- and post-earthquake periods significantly increased the risk of poor mental health in 872 children and adolescents who lived through the M7.0 Haiti earthquake. ACEs reported included exposure to other natural disasters, physical violence, kidnapping, and sexual assault. Participants in this study had experienced staggeringly high levels of ACEs before the earthquake; 96.45% had at least one ACE and 29.47% had experienced six or more ACEs pre-earthquake. Within 30 months post-earthquake, all participants had experienced the earthquake, 87.04% had experienced at least one additional ACE and 20.98% had six or more ACEs in addition to those that they had experienced pre-earthquake. A positive and significant moderate-sized correlation was found between the number of ACEs and both PTSD ($r = .27$, $p < .01$) and depression ($r = .29$, $p < .01$); the more ACEs a respondent accumulated, the greater the risk

of PTSD and/or depression. The extreme level of ACEs in this sample is congruent with the extremely high levels of psychopathology found in this study; 85.66% of participants were found to be experiencing moderate-to-severe symptoms of PTSD and/or depression. The extreme level of ACEs in this study also highlights the importance of socioenvironmental context when interpreting results. Nevertheless, these findings suggest that cumulative exposure to ACEs pre- and post-earthquake can have a profound negative influence on adolescent mental health by increasing the likelihood of psychopathology.

While these four studies highlight the relationship between significant life stressors, ACEs, and psychopathology in earthquake-affected adolescents, none examined the relationship between significant life stressors, ACEs, and wellbeing. It therefore remains unclear how such cumulative experiences contribute to earthquake-affected adolescents' holistic mental health as per the dual-factor model of mental health. Further study of the relationship between ACEs and wellbeing in earthquake-affected adolescents would also help to clarify the predictive power of ACEs in this population.

Summary

Research indicates that adolescents have increased vulnerability to negative mental health outcomes (Carr, 2016; Suldo et al., 2016). Adolescents who are exposed to natural disasters and who live in disaster-affected communities have been shown to be at even greater risk of poor mental health compared to adolescents who have not had these experiences (Goldmann & Galea, 2014; Kronenberg et al., 2010; Masten & Narayan, 2012; Shaw et al., 2012). Poor adolescent mental health is one of the leading causes of health-related disability during adolescence (Gore et al., 2011), however it remains an understudied area (Kieling et al., 2011) particularly in disaster-affected communities (Rubens et al., 2018; Self-Brown et al., 2017; Tang et al., 2017; Wang et al., 2013).

Many recent studies have focused on psychopathology as a primary indicator of mental health in earthquake-affected adolescents, continuing the trend identified in the meta-analyses and literature reviews identified and analysed in this chapter. Recent research findings continue to indicate that there is a significant variation in the prevalence of PTSD and depression in earthquake-affected adolescents (refer Table 3). Between 2.7% (Du et al., 2018) and 43.9% (Cadichon et al., 2017) of earthquake-affected adolescents are reported to experience PTSD symptoms, and between 13.5% (Jia et al., 2013) and 46.21% (Cénat & Derivois, 2015) are reported to have depression. Symptoms of PTSD and depression may persist for many years post-disaster (e.g. Cadichon et al., 2017; Du et al., 2018; Eray et al., 2017; Tanaka et al., 2016).

What is unclear from this research, however, is the proportion of adolescents who learn to cope with their symptoms thus mitigating the severity of the functional impacts associated with PTSD and depression. While a number of recent studies have examined SWB-related constructs within earthquake-affected adolescents, findings are limited. Recent studies have focused on QOL and PTG as indicators of wellbeing, however none have reported the prevalence of wellbeing nor have they considered wellbeing holistically by including all key indicators of wellbeing (i.e., QOL, presence of positive affect, and absence of negative affect). The largely unidimensional approach to the consideration of mental health in disaster-affected adolescents in this research is at odds with established conceptualisations of mental health. These conceptualisations are clear that the absence of psychopathology is a necessary but not sufficient indicator of mental health; wellbeing must also be considered in order to gain a true picture of mental health.

A number of recent studies of mental health in the general adolescent population have adopted the dual-factor model of mental health that incorporates consideration of

both psychopathology and SWB. These studies have shown that the dual-factor approach can provide a more detailed and accurate understanding of adolescent mental health than is achieved through consideration of psychopathology alone (Antaramian et al., 2010; Lyons et al., 2012; Suldo & Shaffer, 2008). The presence or absence of high levels of SWB in combination with the presence or absence of psychopathological symptoms has been associated with different levels of day-to-day functioning (Antaramian et al., 2010; Suldo & Shaffer, 2008).

One study was identified in this literature review that adopted a dual-factor approach to the consideration of mental health in earthquake-affected adolescents (Jieling & Xinchun, 2017). Jieling and Xinchun (2017) found that, within their sample, psychological distress could co-occur with positive psychological changes; three distinct patterns of mental health were identified based on different levels of PTSD and PTG. This emergent research shows that the adoption of a dual-factor model of mental health to the study of earthquake-affected adolescents may be a useful way of gaining a more comprehensive overview of their holistic mental health.

The combined findings of recent research also suggest that it is important to consider both risk and protective factors in order to gain a holistic overview of mental health in earthquake-affected adolescents. Findings show that cumulative exposure to stress and ACEs, both during an earthquake and in the post-earthquake environment, can contribute to poorer mental health in adolescents (Cénat & Derivois, 2015; Fan et al., 2015; Tang et al., 2017; Zheng et al., 2012). These findings align with research demonstrating the negative effect of cumulative ACEs on mental health in adolescents within the general population. On the other hand, social support from trusted others can reduce the likelihood of poor mental health outcomes and promote positive mental health (Du et al., 2018; Eray et al., 2017; Fan

et al., 2015; Jia et al., 2013; Tian et al., 2014; Zhou et al., 2018). To date, research has not examined the interactive and simultaneous influences of psychopathology, wellbeing, risk factors, and protective factors on the holistic mental health of earthquake-affected adolescents. In order to provide a more complete picture of mental health in adolescents living in an earthquake-affected community these combined findings suggest such an approach may be useful.

Study Aim

This study aims to add to the knowledge base regarding the mental health and wellbeing of adolescents in earthquake-affected communities by using a dual-factor model of mental health that incorporates measurement of both psychopathology and SWB. This is a novel approach that may facilitate a more holistic picture of mental health and wellbeing in earthquake-affected adolescents than has been achieved to date. Concurrent measurement of ACEs, social support, school connectedness, and future expectations of QOL will also be used to examine the synergistic effects on adolescent mental health of risk and protective factors within the post-earthquake environment. This may help to identify the factors that have the greatest influence on adolescent holistic mental health in the post-earthquake environment and the relationships between these factors. In turn, this may have important implications for the planning and development of supports designed to improve mental health and wellbeing in adolescents living in a disaster-struck community over an extended period of time.

Chapter 3: Method

Design

An anonymous cross-sectional survey comprised of multiple indicators was used to provide data about the holistic mental health and wellbeing of adolescents attending secondary school in East Christchurch. Cross-sectional surveys provide a cost- and time-effective means of collecting data that permits analysis of group differences and relationships between outcome variables (Barker, Pistrang, & Elliott, 2016; Price, 2012).

Ethics

A number of ethical factors were identified in relation to this research project. To address these, considerations were made in accordance with the guidelines provided within the Ethical Research Involving Children (ERIC) compendium (Graham, Powell, Taylor, Anderson, & Fitzgerald, 2013) prior to application for institutional approval to conduct the research. Ethical approval for the Secondary Students' Wellbeing Survey (SSWS) was sought and obtained from the University of Canterbury Educational Research Human Ethics Committee prior to approaching the principals and Boards of Trustees (BOTs) of any schools. The approval reference number was 2018/35/ERHEC.

Key ethical issues that applied to this research project included consideration of the need to carry out research, potential harm to participants, informed consent, and privacy and confidentiality.

Need for research. Ethical guidelines advise that research with adolescents should only be undertaken in cases where knowledge that benefits adolescents can be extended (Graham et al., 2013). Existing information suggested that many Christchurch adolescents

were experiencing poor mental health and/or low levels of wellbeing (Adolescent Health Research Group, 2013; CERA, 2014; Superu, 2016), however it was not known what proportion of these adolescents were using effective coping strategies such that they were free from problems in their day-to-day functioning. Determining the proportion of adolescents who were coping effectively would help to inform planning of supports by providing an estimate of service needs. Prior to conducting the present study, there were no sources that provided this information.

Avoidance of harm. ERIC principles state that researchers must seek to mitigate or eliminate potential harm to adolescents who participate in research (Graham et al., 2013). Three potential sources of harm to adolescent participants were identified as relevant to this research project, including: (1) potential harm from an imbalance in power dynamics between researchers and adolescents, (2) placing an unfair burden on an over-researched population, and (3) exposure to sensitive or distressing content. To mitigate these risks, a number of steps were taken. Principals who consented to their school's participation were able to remove any survey items they wished to and, based on their knowledge of their pupils, could select those to whom survey invitations would be sent. Particular emphasis was placed on the voluntary nature of the SSWS in all messages and requests forwarded to students from principals and other school staff who invited students to participate. To address the potential for distress following exposure to sensitive items within the SSWS, information about sources of support were presented at the bottom of every page including a hyperlink to information about local specialist mental health services provided by the CDHB. Additional sources of support were also included on the final page of the survey. Adolescents could reach the final page of the survey by exiting or completing the survey. A further step to mitigate harm included providing contact information to principals and BOTs

for clinical staff at the 298 Youth Health Centre who were available to support school staff where necessary.

Informed consent. Guidelines suggest that best ethical practice with any research involving children and younger adolescents is to obtain informed consent from a parent or guardian along with the informed consent or assent of adolescent participants (Graham et al., 2013). It is imperative that informed consent or assent is provided freely and explicitly, and that this is renegotiable (Graham et al., 2013). Prior to commencing the SSWS, informed consent to participate was provided by principals and BOTs in their legislated roles to provide duty of care "*in loco parentis*" (Human Rights in Education (*Mana Tika Tangata*), 2018). To gain informed consent, principals and BOTS were approached about the SSWS and provided with the following items to consider in order to determine if they wished to participate: (1) an information sheet outlining the aim of the survey, potential involvement of the school, content of the survey, option to remove any questions from the survey if they wished to, potential effects on students, benefits of participation, right to withdraw consent, confidentiality, and background information about the survey; (2) the proposed survey questions; and (3) a consent form explicitly outlining their understanding of the SSWS, the requirements placed on them, the voluntary nature of their involvement and right to withdraw participation at any time, the steps taken to ensure confidentiality and anonymity, and who to contact for further information or complaints. They were advised of their responsibility for communicating with parents and caregivers of students about the survey if they agreed to participate. For those principals and BOTs who did agree to participate after reviewing the information provided, explicit informed consent was provided via the signing of an approved consent form.

To obtain informed assent from adolescents in participating schools, an email template was provided to principals and BOTs to distribute to students inviting them to participate in the SSWS. This template provided information about the anonymous nature of the survey, the right to skip questions or exit the survey, the aim of the survey, publication of results, what to do if they were distressed by the content, who to contact for further information, and confidentiality and storage of information. The template also explicitly stated that clicking through to the survey on the link provided or answering any questions would be understood to constitute their consent to participate. Anonymity, confidentiality, the voluntary nature of participation, and rights to exit the survey or skip any questions were reiterated on the landing page of the SSWS reached by clicking the link provided in the email template. Adolescents who chose to participate in the survey were provided with clear skip or exit options on every page to reiterate their rights to withdraw participation.

Privacy and confidentiality. Maintaining participant school and individual adolescent privacy and confidentiality was a key ethical concern in this research project. The SSWS data gathered used randomly generated codes to identify participating schools, which were known only by the research team conducting the SSWS. The anonymous nature of the survey and limits on demographic data collection protected the privacy of individual adolescents who chose to participate in the survey. All survey data was stored on a password protected computer and backed up on the secure University of Canterbury server accessible only by the researchers on a password protected computer. Data will be securely stored for ten years and then deleted from the computer and University server.

Recruitment

Secondary schools in East Christchurch were emailed an invitation to participate in the SSWS; those that were interested were provided with detailed information and consent

forms about involvement in the study. If the BOTs and the principal provided informed consent to participate, the principal was forwarded an email template to send to their pupils. The email template, approved by the Ethics Committee, contained information about the study and a link to the SSWS.

Participants

Adolescents in Years 9 to 13 attending the participating schools were eligible to take part in the SSWS. The principal of each participating school determined which students within their school would be invited to participate, as described above.

Instrumentation

The SSWS was conducted using Qualtrics © software (www.qualtrics.com). Qualtrics is the only online survey tool that is approved for use within the University of Canterbury by the Human Ethics Committee. The SSWS created in Qualtrics was accessible only to those provided with a hyperlink to the survey; Qualtrics collected responses in real time and controlled for respondents taking the survey more than once from the same computer. Survey results were accessible only to the survey owners who had to log-in to the Qualtrics website using a username and password to view them. Once logged-in, survey owners could access summary information about the number of complete and incomplete surveys taken, could view more detailed break-downs of survey responses by respondent or survey item, and could export data to statistical analysis software for data analysis.

Measures

The SSWS was composed of well-known, freely available instruments that were selected to measure variables relevant to the holistic mental health and wellbeing of adolescents. The survey was designed to be brief with fixed choice answers to ensure

integrity of data. In total the survey contained 21 questions, 18 of which were derived from the measures described below. Two survey questions were also included about the age and year level of the respondent. In order to determine whether respondents had been exposed to the Christchurch earthquakes, the SSWS also contained the following stem and question: “The Christchurch earthquakes affected many people. Did you live in Christchurch at the time of the earthquakes?”. Respondents were provided with yes or no response options. This item wording had previously been used with parents of children living in Christchurch who had participated in recent research (Liberty, 2017).

WHO-5. The WHO-5 was included within the SSWS to provide an indicator of adolescents’ SWB. The WHO-5 is a well-validated and extensively-used measure of SWB both internationally (Topp, Østergaard, Søndergaard, & Bech, 2015) and in NZ, where it is notably incorporated within the now-annual Christchurch Wellbeing Surveys conducted with adult residents since the occurrence of the Christchurch earthquakes (CDHB, 2018) as well as the *Youth 2000* surveys of the health and wellbeing of NZ youth conducted in 2007 and 2012 (Adolescent Health Research Group, 2013). The incorporation of the WHO-5 within the SSWS permitted direct comparison of participant SWB with national SWB findings for NZ adolescents and earthquake-affected Canterbury adults.

The WHO-5 is a brief measure of SWB first published by WHO in 1998 (McDowell, 2010; Topp et al., 2015) and is freely available (<https://www.psykiatri-regionh.dk/who-5/who-5-questionnaires/Pages/default.aspx>). Adolescents self-report on positively-worded items about their cheerfulness and “good spirits”, frequency of being “calm and relaxed” and “active and vigorous”, “waking up fresh and rested” and having things in their daily life that they are interested in over the past two weeks (De Wit, Pouwer, Gemke, Delemarre-van De Waal, & Snoek, 2007, p. 2003). Respondents rate each of the five items on a six-point

Likert scale from 0 (*at no time*) to 5 (*all of the time*); a total raw score between 0 and 25 is obtained by summing the items (Adolescent Health Research Group, 2013; Topp et al., 2015). Higher scores are indicative of better levels of SWB (Adolescent Health Research Group, 2013; De Wit et al., 2007), scores of 13 or more suggest the respondent has good SWB (Adolescent Health Research Group, 2013).

The validity and reliability of the WHO-5 for use in adolescent populations was first established in a study of Dutch adolescents conducted by De Wit et al. (2007). Prior to this study, there had been little research using the WHO-5 with adolescent populations and none that reported validation data. In the validation and reliability study, De Wit and colleagues (2007) surveyed 91 adolescents aged 13- to 17-years old who had Type I diabetes. Participants were administered a questionnaire containing the WHO-5, questions about self-esteem, mental health, and family conflict, and a measure of depression. A number of analyses were undertaken to determine the validity and reliability of the WHO-5 in this adolescent sample. Firstly, the WHO-5 was found to have a good level of readability for typically-developing adolescents. Structural validity of the WHO-5 in this adolescent sample was analysed through confirmatory factor analysis and exploratory factor analysis. These analyses confirmed the single-factor structure of the WHO-5 as a unidimensional measure of SWB in adolescents. Internal consistency of the WHO-5 was also established by calculating Cronbach's α , which was .82 in this study indicating a high level of consistency. Finally, concurrent validity was established through significant correlation between the WHO-5 and measures of depression, family conflict, mental health, and self-esteem. Overall, the findings of De Wit and colleagues (2007) indicated that the WHO-5 was a valid and reliable instrument to use to measure adolescent SWB.

In NZ, the WHO-5 has been used in two large scale surveys of adolescent health, called the *Youth 2000* series. These nationwide surveys of adolescents from 91 different secondary schools were undertaken in 2007 and 2012, with total respondents numbering 9,107 and 8,497 respectively (Adolescent Health Research Group, 2013). Within these surveys, a cut-off score of 13 or more was used to define those respondents considered to have good SWB (Adolescent Health Research Group, 2013). One particular study published using the *Youth 2000* data from 2007 reported on the reliability and validity of the WHO-5 for use in NZ adolescents (Lambert et al., 2014). This study sought to determine correlates of happiness in adolescents as measured by the WHO-5. Respondents also provided responses to a general life satisfaction item, a general mood item, and a measure of depression, which were used to determine the convergent validity of the WHO-5 in this sample. Results showed that the WHO-5 scores correlated significantly and positively with general mood and life satisfaction, and correlated significantly and negatively with depression (Lambert et al., 2014). These findings support the convergent validity of the WHO-5 in NZ adolescents.

Psychological Wellbeing and Distress Screener (PWDS). The PWDS was included within the SSWS to facilitate assessment of dual-factor mental health. The PWDS is the only identified dual-factor measure designed specifically for use with adolescents (Renshaw & Arslan, 2018). In addition, it has well-defined and psychometrically sound scoring cut-offs that allow for identification of the four different mental health categories defined by the dual-factor model of mental health.

Recently developed by Renshaw and Bolognino (2017) as a universal mental health screening tool, and freely available (https://digitalcommons.lsu.edu/cgi/viewcontent.cgi?article=3050&context=gradschool_theses), the PWDS taps adolescents' perceptions of affective and adaptive wellbeing on one

hand and perceptions of affective distress and emotional problems on the other. The PWDS contains two subscales, the Psychological Wellbeing Scale (PWS) and the Psychological Distress Scale (PDS). The PWDS has a total of 10 items extracted from the WHO-sponsored Health Behaviour in School-Aged Children (HBSC) Survey, which is conducted four-yearly across 40 different countries. The first five PWDS items measure psychological wellbeing and focus on self-perceived affective and adaptive wellbeing; the items include self-report ratings about getting on well at school, paying attention, feeling full of energy, feeling fit and well, and having fun with friends. The remaining five PWDS items measure psychological distress and focus on self-perceived affective distress; the items include self-report ratings about feeling sad, lonely, low, nervous, and irritable or in a bad temper. Respondents rate each item on a five-point Likert scale from 1 (*never*) to 5 (*always*) for the first seven items, which relate to wellbeing (items 1-5) and distress (items 6 and 7) in the previous two weeks. The remaining three items relate to feelings of distress in the previous six months and are rated on a scale from 1 (*rarely or never*) to 5 (*about every day*). Scores for the two subscales are obtained by summing the ratings on the first five items for the PWS and the final five items for the PDS. Scores less than 16 on the PWS are indicative of high risk for low wellbeing, whereas scores of more than 17 on the PDS are indicative of high risk for psychological distress (Bolognino, 2015).

Two large validation studies have demonstrated the psychometric properties of the PWDS. The first study, conducted by Renshaw and Bolognino (2017), was based on survey data from 12,642 USA adolescents aged 11- 16 years old. This study established the construct validity of the PWDS through both exploratory and confirmatory factor analysis, which confirmed the presence of two related yet distinct factors namely psychological wellbeing and psychological distress. Exploratory factor analysis produced a two-factor

solution with acceptable eigenvalues, factor loadings, and moderate inverse correlations between the two-factors, suggesting they were related yet distinct constructs. The two factors identified statistically mapped on to the conceptualised factors of psychological wellbeing and psychological distress. Confirmatory factor analysis corroborated the two-factor structure of the PWDS evidencing strong inverse correlations between the two factors as well as robust factor loadings, and good internal consistency ($\alpha > .75$). Convergent validity was also established in this study by conducting a latent variable path analysis that was predictive of adolescent's ratings on a single item measure of life satisfaction. Measures obtained from the PWDS were not found to vary across a number of demographic factors including ethnicity, school year level, and residence classification. Divergent validity was not tested. While these analyses were considered indicative of psychometric defensibility of the PWDS, Renshaw and Bolognino (2017) suggested that further testing of the concurrent and predictive validity of the PWDS was necessary as well as replication studies using other samples.

A subsequent study of a Turkish version of the tool, the PWDS-T, on a sample of 399 Turkish adolescents aged 11 – 18 years established similar psychometric defensibility, generalisability, and adaptability of the instrument (Renshaw & Arslan, 2018). Renshaw and Arslan (2018) administered the PWDS, three subscales from the Social and Emotional Health Survey to measure school, peer and family support, and two subscales of the Positive and Negative Experience Scale to measure respondents' positive and negative affect, which would allow for analysis of concurrent validity. Confirmatory factor analysis was used to confirm the two-factor structure of the PWDS and latent variable path analyses confirmed the relationship between the two factors and concurrent measures. Each factor correlated significantly in the expected direction with family support, positive affect, and negative

affect, with moderate to large relationships found. Renshaw and Arslan (2018) reported that the two-factor model predicted large variations in the concurrent variables measured, suggesting a good level of concurrent validity. On the whole, in addition to demonstrating the acceptability of the PWDS in other cultures, this study provided further evidence of the reliability and validity of the PWDS as a screening tool for dual-factor mental health in adolescents.

To date, the only known published studies to have previously employed the PWDS are the two studies used to determine its psychometric properties (i.e., Renshaw & Arslan, 2018; Renshaw & Bolognino, 2017) and a study of psychological wellbeing, social support, and social exclusion within the school setting (Arslan, 2018). Arslan (2018) used the PWDS to assess psychological wellbeing in a study of 407 adolescents aged 11 – 18 years old from Turkey. A good level of internal consistency was found ($\alpha = .85$) and scores on the PWDS correlated significantly and positively with family, peer and school support, and significantly and negatively with social exclusion. The findings of this study reinforce the convergent validity and reliability of the PWDS.

To ensure best fit within the SSWS in the NZ context, a number of small modifications were made to the PWDS. First, to reduce duplication within the survey, two of the PWDS questions were either combined or replaced by questions from the WHO-5. The PWDS question, “Thinking about last week, have you felt full of energy?” (Renshaw & Bolognino, 2017, p. 162) was combined with the WHO-5 question, “Over the last two weeks, I have felt active and vigorous” (De Wit et al., 2007, p. 2,003) to form the following question: “Over the last two weeks, I have felt active and vigorous / full of energy...”. The PWDS question, “Thinking about last week, have you felt fit and well?” (Renshaw & Bolognino, 2017, p. 162) was excluded from the survey as it was determined to be similar to the WHO-5 question,

“Over the last two weeks, I woke up feeling fresh and rested...” (De Wit et al., 2007, p. 2003). Secondly, to ensure comprehension of the response items on the Likert scale for the PWDS, one addition was made to the scale. After piloting the SSWS with an eleven-year old volunteer, the word “seldom” was identified as potentially difficult to comprehend for some NZ adolescents. As such, this option on the Likert scale was presented as, *seldom/hardly ever* to make it easier to comprehend. Finally, in the online SSWS, small amendments to the layout and presentation of the PWDS were made to ensure usability, formatting consistency, and flow in an online environment. In previous studies the PWDS has been presented to adolescents as a pen and paper form.

Exposure to ACEs. In order to measure the number of adverse experiences adolescents have been exposed to, the SSWS incorporated an item measuring ACEs. As no self-report screening measure for exposure to ACEs in adolescents designed for research use currently exists (Bethell et al., 2017), the SSWS drew on two ACEs screening tools. These screening tools were the Centre for Youth Wellness ACEs-Questionnaire Teen Self-report (CYW ACEs-Q Teen SR) (Burke Harris & Renschler, 2015) and the National Survey of Children’s Health ACEs Measure (NSCH-ACES) (Bethell et al., 2014).

The CYW ACEs-Q Teen SR is a self-report instrument developed to screen for cumulative exposure to ACEs in adolescents aged 13- to 19-years old in primary care settings (Bucci et al., 2015). The CYW ACEs-Q Teen is a tool that asks respondents to indicate the number of ACEs they have been exposed to rather than to identify which ACEs, this is called a *de-identified* tool (Bucci et al., 2015; Purewal et al., 2016). Developers found that primary care providers, families, and adolescents preferred this de-identified tool as it allowed for a brief risk assessment within the constraints of a clinic visit (Purewal et al., 2016). Nineteen ACEs are assessed within two sections of the CYW ACEs-Q Teen (Bucci et al., 2015). The first

section contains the 10 core ACEs studied in the work of Felitti et al. (1998), namely: “physical, emotional, and sexual abuse; physical and emotional neglect; mental illness of caregiver; incarceration of a relative; violence toward the mother; substance abuse in the home; and parental divorce or separation” (Purewal et al., 2016, p10). The second section contains a further nine ACEs identified through consultation with CYW advisory boards, local youth, and health, clinical and research staff as relevant to adolescents living in the San Francisco area (Purewal et al., 2016), namely: foster care, bullying or harassment at school, parental death, separation from parents through deportation or immigration, serious illness or medical procedure, neighbourhood violence, youth arrest or incarceration, discrimination, and youth intimate partner violence. Respondents read the ACE items in each section and then write down the number of ACEs they have experienced within each section in two boxes provided. The total CYW ACES-Q Teen SR score is obtained by summing the two numbers written down by the respondent. Total scores of four or more indicate a need for follow-up, and include referral for further assessment within primary care (Bucci et al., 2015). Purewal et al. (2016) report that reliability and validity testing of the CYW ACES-Q Teen SR is planned.

The NSCH-ACES is a parent-report tool designed to measure the cumulative exposure to ACEs of children and adolescents aged 0- to 17-years within a research context (Bethell et al., 2017; Bethell et al., 2014). It was first embedded within the larger NSCH in 2011-12 (Bethell et al., 2014); the NSCH is now an annual survey designed to provide a broad representation of child and adolescent health within the USA conducted with a sample of approximately 20,000 USA parents (Bethell et al., 2017; The Child and Adolescent Health Measurement Initiative, 2018). The NSCH-ACES measures exposure to nine ACEs, these are derived from the ten core ACEs studied by Felitti et al. (1998) and items identified through

an extensive literature review (Bethell et al., 2017). The nine ACES measured include: living in a family where it is hard to get by on the family's income, parental divorce/separation, parental death, parental incarceration, domestic violence, physical violence or witnessing neighbourhood violence, mental illness or suicidality of a household member, alcohol or substance abuse by a household member, and racial or ethnic discrimination (Bethell et al., 2017).

Respondents are asked to indicate via closed yes/no options whether their child has been exposed to each of the nine ACEs. Each ACE within the NSCH-ACES is assigned a score of one for an affirmative response, a total score is obtained by summing the affirmative responses (Bethell et al., 2017). Like the CYW ACES-Q Teen SR and other measures of ACEs, a score of four or more is indicative of high risk for poor mental and physical health outcomes (Bethell et al., 2017). A recent study sought to determine the acceptability, psychometric properties, and validity of the NSCH-ACES for use within research contexts (Bethell et al., 2017). Acceptability was measured via an analysis of drop-off in responses following the introduction of the NSCH-ACES within the larger NSCH survey; no significant drop-off was found signalling that parents found the questions acceptable. Statistical analyses confirmed that a single-factor model best fit the NSCH-ACES items commensurate with the concept that the ACES survey items measure a single construct. Predictive validity was established using structural equation modelling, which evidenced strong odds ratios for the latent adversity construct measured by the NSCH-ACES and associated physical and mental health outcomes; as NSCH ACES scores increased, the odds of poor health outcomes also increased.

Neither the CYW ACES-Q Teen SR nor the NSCH-ACES were considered to be appropriate measures of ACES for use in the SSWS without modification. While the CYW ACES-Q Teen SR provides for adolescent self-report and uses a de-identified scoring

procedure that is less intrusive and more acceptable to adolescents, its reliability and validity has not yet been established and it was designed for use within a clinical context where it is more appropriate and ethical to ask about potentially upsetting and sensitive experiences such as sexual abuse and neglect. While the NSCH-ACES appears to be a psychometrically sound tool with ACE items that are less intrusive and sensitive and therefore more appropriate for use within survey/research contexts, it is a parent-report tool that was not designed specifically for adolescent self-report. In the absence of any other ACEs screening tool designed for adolescent self-report within a research context, the SSWS includes a hybrid measure incorporating the de-identified scoring protocol adopted within the CYW ACES-Q Teen R and some of the less intrusive ACE items within the NSCH-ACES. Research has shown that it is the cumulative exposure to ACEs that is key to understanding risk of poor mental health outcomes rather than the particular ACEs a child or adolescent is exposed to (Bethell et al., 2014). This supports the use of the de-identified scoring protocol and also suggests that it is not necessary to include sensitive and more intrusive ACEs items related to sexual abuse and neglect, which may be upsetting to respondents within the context of an anonymous survey where there is limited recourse to provide immediate support to respondents as they complete the survey.

Within the SSWS, background information about ACEs is provided within the introduction to the item to provide context to respondents about the question, instructions are provided to count the number of statements applicable to the respondent from the list of eight ACEs provided, and fixed response options from 0 to 8 are provided in order to ensure a de-identified response is provided. The eight ACEs included within the survey were: parental death, parental divorce/separation, parental incarceration, domestic violence,

household alcohol or drug abuse, household mental illness or suicidality, physical abuse/neighbourhood violence and family economic hardship.

The Cantril Self-Anchoring Ladder of Life Satisfaction (Cantril Ladder). The Cantril Ladder was included in the SSWS in order to measure adolescents' current QOL and future expectations of QOL five years on. QOL is the cognitive domain of SWB. While both the PWDS and WHO-5 measure SWB, these measures focus on the affective domains of SWB. The addition of the Cantril Ladder added to the robustness of the assessment of SWB within the SSWS by ensuring that both affective and cognitive aspects of SWB were measured.

The Cantril Ladder has been widely used to measure subjective judgements of QOL (Gallup Inc, 2018; Mazur, Szkulstecka-Dębek, Dzielska, Drozd, & Małkowska-Szcutnik, 2018). The original version published by Cantril in 1965 uses a stem sentence to prompt respondents to stop and consider their life in both the best possible light along with their future hopes and wishes and also in the worst possible light along with their fears and worries (Gallup Inc, 2018). Respondents were then presented with an image of a ladder with rungs numbered 0 to 10 and the following stem and question: "Here is a picture of a ladder. Suppose the top of the ladder represents the best possible life for you and the bottom of the ladder the worst possible life. Where on the ladder do you feel you stand at the present time?" (Levin & Currie, 2014, p. 1,049). In this version respondents were also asked to provide ratings of where they pictured their life five years earlier as well as where their life will be in five years' time (Levin & Currie, 2014). A number of iterations of this scale have since been used to measure QOL in diverse populations (Levin & Currie, 2014; McDowell, 2010). Its widest use in adolescents has been as part of the four-yearly HBSC survey since 2002 (Levin & Currie, 2014).

The Cantril Ladder used in the HBSC survey does not include the lengthy stem sentences outlined in Cantril's original version and asks only about current QOL (Levin & Currie, 2014). The Cantril Ladder is scored within the HBSC survey using a binary cut off, whereby ratings of six or higher on the ladder are considered to represent high QOL and ratings less than six are considered to represent low QOL (Levin & Currie, 2014). Levin and Currie (2014) point out that it is also possible to obtain a continuous score between zero and ten, from *worst possible life* (0) to *best possible life* (10). Despite the extensive use of this adapted version of the Cantril Ladder in the HBSC survey, it has only recently been validated for use with adolescents aged 11 to 15 years.

The reliability and convergent validity of an adapted version of the Cantril Ladder was established in a survey of 7,679 Scottish adolescents aged 11 – and 15-years old (Levin & Currie, 2014). Over a period of three years, seven cohorts of respondents completed a survey that incorporated the adapted version of the Cantril Ladder along with six previously validated instruments measuring wellbeing including, the Student Life Satisfaction Survey, Strengths and Difficulties Questionnaire, KIDSCREEN-10, General Health Questionnaire and two questions from the HBSC survey asking about happiness and feeling left out. The survey also incorporated measures of constructs associated with QOL including health risk behaviours and number of health complaints. Four of the cohorts also re-took the survey between two and four weeks after initially responding to it. Levin and Currie (2014) tested the reliability and validity of the continuous scores produced by the Cantril Ladder as well as the binary categories of high and low QOL established using previously published cut-off scores.

Test-retest reliability of the adapted Cantril Ladder was established using Pearson's correlation coefficient for continuous scores and Cohen's Kappa for binary categories

obtained by respondents who were surveyed twice between two and four weeks apart. Analysis of continuous scores revealed there was an acceptable level of correlation between responses for 11- and 13-year olds ($r = .66$ and $.70$) and correlation approached an acceptable level for 15-year olds ($r = .58$). For binary categories of low and high QOL there was moderate agreement across all samples ($Kappa = .44 - .54$). Levin and Currie (2014) suggested that the lower test-retest correlation obtained for the continuous scores of 15-year olds, compared to 11- and 13-year olds, was attributable to developmental factors rather than reduced reliability of the measure. Drawing on previous literature they posited that QOL may be less stable over time in older adolescents due to puberty and possible associated mood swings.

Convergent validity of the adapted Cantril Ladder was established by calculating both Pearson's and Spearman's correlation coefficients for scores on the Cantril Ladder and those obtained via the other measures of wellbeing and associated constructs embedded within the survey taken by respondents. Significant negative correlations of moderate to large size were found between continuous scores on the Cantril Ladder and measures of poor mental health ($r = -.33$ to $-.50$), and significant and positive correlations with measures of life satisfaction ($r = .42$ to $.56$), happiness ($r = .36$ to $.62$), and social functioning ($r = .32$ to $.40$) indicating moderate to large relationships. Moderately sized negative relationships between life satisfaction measured by the Cantril Ladder and subjective health complaints were found ($r = -.25$ to $-.42$), moderate positive relationships with perceived health ($r = .33$ to $.42$), and small relationships if any with indicators of health risk (fighting, alcohol use and smoking). These findings suggest that the Cantril Ladder has a good level of convergent validity overall with other measures of SWB and is somewhat convergent with constructs

previously found to be related to SWB. Analysis of divergent and face validity was not carried out, but noted as a limitation of the study.

One other recent study has confirmed the convergent validity of the adapted version of the Cantril Ladder used in the HBSC survey of adolescents. Mazur and colleagues (2018) surveyed 1,423 Polish adolescents aged 10- to 17-years old using the adapted Cantril Ladder and the KIDSCREEN-10 questionnaire, which is a validated measure of subjective health and wellbeing in child and adolescent populations (Mazur et al., 2018). Statistical analysis using Pearson's correlation coefficient of the survey data found significant relationships between the Cantril Ladder ratings and all of the KIDSCREEN-10 domains, including physical wellbeing ($r = .36$), psychological wellbeing ($r = .54$), moods and emotions ($r = .54$), self-perception ($r = .54$), autonomy ($r = .37$), parent relations and home life ($r = .56$), peers and social support ($r = .35$), school environment ($r = .47$), social acceptance ($r = .23$), and financial resources ($r = .30$). The findings of Mazur et al. (2018) therefore indicate a good level of convergent validity between the Cantril Ladder and a measure of SWB adding weight to the earlier findings of Levin and Currie (2014). The combined findings indicate that the Cantril Ladder is a brief but effective means for assessing adolescent QOL.

Like the adapted version of the Cantril Ladder used in the HBSC survey and validation studies (i.e. Levin & Currie, 2014; Mazur et al., 2018) the short stem explaining the concept of the ladder was used in the SSWS. Rather than the single item used in these studies, the Cantril Ladder used in the SSWS asks respondents about both current QOL and future expectations of QOL.

Social Support. In order to determine social support experienced by adolescents, two questions were included in the SSWS about this.

Social support from family and friends. The first question focused on support from trusted peers and family in hard times, a measure of social support that has been shown to strengthen an adolescent's ability to cope with stressors (Chu et al., 2010). Research has shown that social support from trusted friends and family are two of the strongest sources of social support in adolescence (Helsen, Vollebergh, & Meeus, 2000), particularly for adolescents who have been exposed to earthquakes (CERA, 2014; Eray et al., 2017). The availability of a trusted friend or family member has also been shown to protect against poor mental health outcomes associated with ACEs exposure (Balistreri & Alvira-Hammond, 2016; Moore & Ramirez, 2016; Soleimanpour et al., 2017).

The wording for the social support item used in the SSWS was derived from the CERA Youth Wellbeing Survey, and the *Youth '12* Survey. These items asked respondents, "If you needed help or support during a difficult time, is there anyone you could turn to?" (CERA, 2014), and whether they "have an adult who they would feel okay talking to about a serious problem" (Adolescent Health Research Group, 2013). Findings from the CERA Youth Wellbeing Survey indicated that the top sources of support for adolescents were family and friends (CERA, 2014). Given the importance of both friends and family as sources of social support during adolescence, and in keeping with trying to maintain the brevity of the SSWS, a single item was used to measure the level of functional social support respondents perceived themselves to have. This item within the SSWS asks respondents to select an option that best describes their feeling in relation to the statement, "I have a trusted friend or family member who can help me through hard times"; a five-point Likert scale is provided with five options: *strongly agree*, *agree*, *neutral*, *disagree*, and *strongly disagree*.

School connectedness. The second question focused on social support within the school context, and asked students about their sense of connectedness at school. School connectedness is conceptualised as relating well with others and feeling cared for within the school context (Renshaw, Long, & Cook, 2015). The school connectedness survey item came from the Student Subjective Wellbeing Questionnaire (SSWQ) developed by Renshaw et al. (2015). The SSWQ has been subject to extensive psychometric analyses to ensure structural validity, external validity, concurrent validity and internal consistency (Renshaw et al., 2015). Importantly, it has also been shown that item wording within the SSWQ is developmentally appropriate for inclusion within an adolescent self-report measure (Renshaw et al., 2015). The SSWQ item incorporated into the SSWS asks respondents to select an option that best describes their feeling in relation to the statement “I feel people at this school care about me”; a five-point frequency-based Likert scale is provided with five options: *always, very often, quite often, seldom/hardly ever, and never*.

Approach to Data

The data collection period began on 15 October 2018 and ended on 18 December 2018. A number of steps were taken to prepare the data for analysis. First, the raw survey data, variables, and value labels stored in Qualtrics were saved to an SPSS sav data file for use in the IBM SPSS Statistics 25 (IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp) statistical analysis software. The SPSS sav data file is a spreadsheet that contains rows for each respondent and columns for the response date, time, level of completion and answers entered or choice text selected for each question. A data dictionary was prepared and each variable labelled in accordance with this dictionary. The raw data for all surveys completed on paper was entered into this SPSS sav data file. Six-digit identification number were then assigned to each response; these were based on the

three-digit school code entered and the order in which the responses were submitted (numbered 001, 002, 003, etc). Columns were inserted into the spreadsheet to record the total scores for the WHO-5, and the two subscales of the PWDS (PWS, PDS) for each respondent. These scores were calculated using the scoring protocols for each measure and entered manually for each respondent.

Data Analysis

All data analysis was undertaken using the IBM SPSS Statistics 25 statistical analysis software (IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp).

Demographic characteristics. Summarising the respondent characteristics was the first step taken in data analysis. The mean, standard deviation and frequency distribution for respondent age, year level, and earthquake exposure were calculated and summarised in a table. To determine the proportion of respondents who were exposed to the Christchurch earthquakes by year level, responses to these items were cross tabulated and proportions recorded.

Missing data. Next, missing data was analysed to determine the proportion of missing data for each survey item and survey scale, and to determine if there were any significant patterns in the missing data. The proportion of missing data for each survey variable and the completion rates for each of the three scales embedded in the survey were summarised and recorded in a table. To determine if there were any common patterns in missing data by respondent characteristics, chi-square tests of independence were undertaken to determine if there were significant group differences by year level or respondent earthquake exposure. One of the assumptions of the chi-square analysis is that no more than 20% of the cell counts should be less than five (Field, 2013). When this

assumption was not met, Fisher's exact tests were used as recommended by Field (2013) to determine if there were any significant differences by year level or respondent earthquake exposure. A significance level of $p < .05$ was used to determine significance. Year level was chosen to be the most representative variable to describe participant maturity rather than age as there was a much higher proportion of missing data for age (23.3%) compared to year level (6.8%).

To determine if there were any patterns in missing data for the three scales embedded within the SSWS, two sets of analyses were undertaken. First, Little's missing completely at random (MCAR) test was used to determine if data were missing completely at random for each of the scales. Data is MCAR when the missing data are a random subset of the data, and there are no relationships between missing data points and any of the other data values. Data can be assumed to be MCAR when this test is non-significant (Little & Rubin, 1987). Second, Chi-square tests of independence of missing data for the total scale scores for the WHO-5, PWS and PDS were also used to determine if there were any significant patterns by year level or earthquake exposure.

Imputation of the mean item score was used for missing scale data. Imputation is considered to be a favourable approach when missing data are MCAR in order to preserve statistical power and provide the best estimates of population parameters (Graham, Cumsille and, Shevock, 2012). To calculate the mean item score for each scale, the following steps were taken. First, for each respondent the number of items they answered for the scale was recorded. Then, the total score was calculated for the scale for each respondent based on the responses they had provided and the scoring protocols for that particular scale. Finally, the total score for the scale for each respondent was divided by the number of items they had answered to produce a mean item score for the scale for each respondent.

All analyses of scale data were based on this mean item score calculated for each respondent for each scale.

Descriptive statistics. Descriptive statistics were prepared for the eight study variables, namely SWB measured by the WHO-5, risk of low wellbeing measured by the PWS, school connectedness, risk of psychological distress measured by the PDS, exposure to ACEs, social support from family and friends, current QOL measured by the first Cantril Ladder question, and future expectations of QOL measured by the second Cantril Ladder question. The mean and standard deviation for each survey item, and each survey scale, was calculated along with frequency tables outlining the distribution of responses to each survey item. Each of the eight study variables was summarised by year level and earthquake exposure using cross-tabulations, and then Analysis of Variance (ANOVA) and independent t-tests were used to determine if there were any significant differences in responses by year level or earthquake exposure. The reliability of each of the survey scales was determined by calculating Cronbach's α .

Dichotomisation of responses. To gain an overview of the adolescents' mental health and wellbeing, including risk and protective factors, transformations were then made using published cut-off scores to dichotomise the eight study variables into sixteen variables representing positive and negative mental health and wellbeing. As all analyses of scale data were based on respondents' mean item scores, published full scale cut-off scores were divided by the number of scale items to obtain mean item cut-off scores that could be used to dichotomise responses. The 16 variables were then sorted into one of four groups: (1) *indicators of positive mental health and wellbeing*; (2) *indicators of negative mental health*

and wellbeing; (3) hypothesised protective factors for positive mental health and wellbeing'; and, (4) hypothesised risk factors for negative mental health and wellbeing.

Using this approach, the group indicators of positive mental health and wellbeing was defined by the following four variables: (1) good SWB, categorised by a mean item score of 2.6 or more on the WHO-5; (2) low risk of low wellbeing, categorised by a mean item score of 3.2 or more on the PWS; (3) low risk of psychological distress, categorised by a mean item score of 3.4 or less on the PDS; and (4) high current QOL, categorised by a score of 6 or more on the Cantril Ladder (current QOL). The group indicators of negative mental health and wellbeing was defined by the following four variables: (1) poor SWB, categorised by a mean item score of less than 2.6 on the WHO-5; (2) high risk of low wellbeing, categorised by a mean item score of less than 3.2 on the PWS; (3) high risk of psychological distress, categorised by a mean item score of more than 3.4 on the PDS; and (4) low current QOL, categorised by a score of less than 6 on the Cantril Ladder (current QOL). The group hypothesised protective factors for positive mental health and wellbeing was defined by the following four variables: (1) less than four ACEs, categorised by a score of less than 4 on the ACEs survey item; (2) high expectations about future QOL, categorised by a score of 6 or more on the Cantril Ladder (future expectations of QOL); (3) good support from family and friends, categorised by a score of more than 3 on the social support survey item; and, (4) good school connectedness, categorised by a score of 3 or more on the school connectedness survey item. The group hypothesised risk factors for negative mental health and wellbeing was defined by the following four variables: (1) four or more ACEs, categorised by a score of 4 or more on the ACEs survey item; (2) low expectations about future QOL, categorised by a score of 5 or less on the Cantril Ladder (future expectations of QOL); (3) little or no support from family and friends, categorised by a score of 3 or less on

the social support survey item; and, (4) little or no school connectedness, categorised by a score of 2 or less on the social support survey item.

Analysis of dual-factor mental health. The proportion of respondents falling within each of the four dual-factor mental health categories was first determined using the cut-off scores provided by Bolognino (2015) and then using an alternative approach using mean scores and standard deviations on the PWS and PDS to define cut-off scores. Scores less than one standard deviation below the sample's mean on the PWS were used to define high risk of poor wellbeing, whereas scores greater than one standard deviation above the sample's mean on the PDS were used to define high risk of psychological distress. This alternative approach is common in the establishment of cut-off scores in psychological screening tools (Antaramian et al., 2010) and was recommended as an alternative scoring protocol by the developer of the PWDS (Bolognino, 2015).

Analyses of relationships between variables. The relationships between the variables measured in the survey were analysed for three reasons: (1) to calculate the size of the relationship between the four different indicators of mental health and wellbeing, namely SWB (measured by the WHO-5), risk of low wellbeing (measured by the PWS), risk of psychological distress (measured by the PDS) and current QOL (measured by the Cantril Ladder – current QOL); (2) to determine which of the risk (i.e., four or more ACEs, low future expectations of QOL, little or no social support, and little or no school connectedness) and protective (i.e., fewer than four ACEs, high future expectations of QOL, good social support, and good school connectedness) factors should be included as predictor variables for SWB, risk of low wellbeing, risk of psychological distress and current QOL in multivariate analysis; and (3) to assess multicollinearity between predictor variables. Spearman's rank order correlation co-efficient was used to assess the relationship between each of the variables

within the study, which is indicated for calculating correlations between variables that are not interval variables (Coolican, 2017). Cohen's (1988) guidelines for determining the relative strength of the Spearman's correlation co-efficient (r_s) have been used to interpret these findings. Correlation coefficients between .10 and .29 have been taken to indicate a small correlation, between .30 and .49 as a medium correlation, and .50 or over as a large correlation (Cohen, 1988).

A series of multiple linear regressions were then used to examine the factors that best predicted SWB (as measured by the WHO-5), risk of low wellbeing (as measured by the PWS), risk of psychological distress (as measured by the PDS), and current QOL (as measured by the Cantril Ladder – current QOL). Only those factors shown to have a significant relationship with each of these outcomes (identified either in the ANOVA of year level, independent t-tests of earthquake exposure, or Spearman's correlations) were included in the regression analyses.

Finally, case analyses of the response patterns of individual respondents were carried out. These tested and confirmed the relationships between mental health, wellbeing, and risk and protective factors identified through cross-sectional regression analyses. To carry out case analyses a new variable representing total mental health and wellbeing was created for each respondent and a score was created based on the indicators of positive mental health and wellbeing each particular case had. To create the score, each adolescent was given one point for every indicator of positive mental health and wellbeing they had. Indicators of positive mental health and wellbeing were: (1) good SWB, defined by a WHO-5 mean item score of 2.6 or more; (2) low risk of poor wellbeing, indicated by a PWS mean item score of 3.2 or more; (3) low risk of psychological distress, indicated by a PDS mean

item score of 3.4 or less; and (4) high current QOL, indicated by a rating of 6 or more on the Cantril Ladder (current QOL). Therefore, possible scores ranged from 0 to 4.

To examine the risk and protective factors associated with different scores on the positive indicators of mental health and wellbeing variable, individual cases with the same scores were selected and responses to the survey items measuring risk and protective factors were systematically examined. For each score, the percentage of adolescents with predictors of positive mental health was determined and then the percentage of adolescents with predictors of negative mental health, both defined by the dichotomised variables described earlier. Next, the mean ratings for each predictor were calculated for each group of adolescents with the same indicator scores. ANOVAs were used to compare the mean scores between the groups.

Chapter 4: Results

Data Preparation

Recruitment. Recruitment of respondents by principals and school personnel commenced following distribution of the online survey and email template to schools in early October 2018. By late October, no responses had been recorded so recruitment assistance was offered to participating schools and procedures clarified regarding the distribution of the email invitation and use of school codes. For one school, difficulties were experienced with recruitment due to the online nature of the survey invitation and survey. To overcome these difficulties a paper version of the survey was prepared (Appendix A) and forwarded to the school for distribution to students. Respondents began answering the survey on 5 November 2018; final responses were received on 12 December 2018 and the survey was officially closed to respondents on 21 December 2018.

Response Rates. Adolescents attended one of four secondary schools in Christchurch, with a maximum possible number of adolescents eligible to be invited to participate in the survey of approximately 1,600 (Ministry of Education, 2019). However, in one school only 50 adolescents were invited to participate using the paper version of the survey, and, in another school, only Year 9 and 10 adolescents were emailed a link to the survey. Therefore, of the 1,600 adolescents eligible for participation, approximately 950 adolescents were invited to take part in the survey via email and a further 50 via personal invitation (for those adolescents completing the paper form of the SSWS). It is unknown how many of the approximately 950 email invitations were opened by adolescents.

A total of 367 adolescents followed the email link to the SSWS and entered the school code provided to them in the invitation email sent by their school principal. A total of 28 adolescents completed the paper form of the SSWS out of the approximately 50

adolescents invited to do so. As such, a total of 395 adolescents started the survey, which is approximately 40% of those invited to do so.

Not all of the 395 adolescents who started the SSWS completed it. The completion rates for the SSWS are described in Appendix B, including the completion rates for each of the three scales embedded within the SSWS; namely, the WHO-5, PWS and PDS. Of the 395 adolescents who started the SSWS, 234 (60%) responded to all questions. As such, approximately 23% of all adolescents invited to participate in the survey completed all items within the survey.

The response rates per survey item are presented in Appendix C, including information about the number of respondents who chose to skip the item or exit the survey per item. Visual analysis of the response rates shows that there was a downward trend in response rates per survey item as the SSWS progressed, however this was not completely consistent. All respondents were required to answer the first item, provision of their school code; as such, the response rate for this item was 100%. After this, the second survey item (school year) had the next highest response rate of 93.2%. The final survey item (age) had a response rate of 76.7%, which was higher than three earlier survey items; namely, item number 17 – ACEs with a response rate of 74%, item number 20 – Cantril Ladder (current QOL) with a response rate of 74.9%, and item number 21 – Cantril Ladder (future expectations of QOL) with the lowest response rate of 73.7%.

Missing Data.

Individual survey items. Chi-square analyses and Fisher's exact tests showed that there were no significant differences in missing responses for any of the survey items by year level. Visual analyses of missing data suggested that overall Year 10 adolescents had proportionately more missing responses than respondents from other year levels. Further

Chi-square analyses and Fisher's exact tests showed that there were no significant differences in missing responses for 21 of the 22 survey items by earthquake exposure. There was however a significant difference in missing responses between adolescents who lived in Christchurch during the Christchurch earthquakes and those who did not for the final item of the PDS scale, "how often have you felt irritable or in a bad temper?". A Fisher's exact test showed that respondents who did not live in Christchurch during the earthquake were significantly less likely to respond to this item ($p = .007$). Visual analyses of missing data by earthquake exposure did not reveal any consistent pattern of missing data.

As no common patterns in missing data by respondent characteristics were identified, all primary analyses were conducted using available data for survey items that were not otherwise part of one of the three scales embedded within the SSWS. This approach was adopted in order to avoid making any assumptions about the possible values for missing responses. Graham, Cumsille, and Shevock (2012) suggest that this is an acceptable approach, highlighting that the risk of bias is very small.

Scale data. The completion rates for each of the three scales embedded within the survey, namely the WHO-5, the PWS subscale of the PWDS, and the PDS subscale of the PWDS, are outlined in Appendix B. Of the 395 adolescents who started the survey, 83% completed all items for the WHO-5, 80% completed all items for the PWS, and 74.4% completed all items for the PDS.

No significant patterns in the missing data for the three scales were identified using Little's MCAR test and chi-square tests of independence. Little's MCAR test was not significant for the WHO-5, $\chi^2(24) = 24.539$, $p = .431$; nor for the PWS, $\chi^2(24) = 20.452$, $p = .671$; nor the PDS, $\chi^2(33) = 38.173$, $p = .246$. Therefore, it was concluded that the missing data pattern for each of the WHO-5, the PWS and the PDS was MCAR. The chi-square tests

of independence of the missing data for the total scale scores for the WHO-5, PWS, and PDS did not show any significant patterns by year level or earthquake exposure. As there were no significant patterns identified and the missing data were MCAR, mean item score imputation was used for missing scale data.

Reliability. Reliability of responses to the three scales embedded within the survey was examined using Cronbach's α prior to undertaking substitution of mean item scores for missing data. Analysis showed that all scales were highly reliable; WHO-5 $\alpha = .904$, PWS $\alpha = .817$, and PDS $\alpha = .855$.

Participants

The age, year level, and reported exposure to the Christchurch earthquakes is provided in Table 5. The mean age of respondents was 15.15 years ($SD = 1.57$) and their mean year level was 10.61 ($SD = 1.37$). The majority of adolescents were either Year 9 (26.3%) or Year 10 (21.8%). Of the adolescents who responded to the question, "Did you live in Christchurch during the earthquakes?", 71.0% responded yes. The proportion of adolescents exposed to the Christchurch earthquakes by year level was as follows: 69.0% of Year 9s, 60.9% of Year 10s, 78.3% of Year 11s, 66.0% of Year 12s, and 86.8% of Year 13s.

Table 5. Self-reported Age, Year Level, and Earthquake Exposure of Adolescents who Responded to the Secondary Students' Wellbeing Survey, and Mean (Standard Deviation) for Each Characteristic

Characteristic		
Mean (<i>SD</i>) Age (years)	15.15	(1.57)
Age Distribution <i>n</i> (%)		
11 years	2	(0.5%)
12 years	6	(1.5%)
13 years	33	(8.4%)

Characteristic		
14 years	79	(20.0%)
15 years	61	(15.4%)
16 years	53	(13.4%)
17 years	46	(11.6%)
18 years	21	(5.3%)
19 years	2	(0.5%)
Unknown	92	(23.3%)
Mean (<i>SD</i>) Year Level	10.61	(1.37)
Year Level Distribution <i>n</i> (%)		
Year 9	104	(26.3%)
Year 10	86	(21.8%)
Year 11	73	(18.5%)
Year 12	59	(14.9%)
Year 13	46	(11.6%)
Unknown	27	(6.8%)
Christchurch Earthquake Exposure <i>n</i> (%)		
Earthquake exposed	217	(54.9%)
Not earthquake exposed	88	(22.3%)
Unknown	90	(22.8%)

Adolescents' Subjective Wellbeing (WHO-5)

The WHO-5 was used to measure adolescent SWB. Using the criteria for wellbeing established for this measure, 52.3% of adolescents reported good subjective wellbeing.

Item 1, feeling “cheerful and in good spirits” over the previous two weeks was the WHO-5 item with the highest mean rating ($M = 2.88$) (Table 6). Of the adolescents who responded to this item, 42.1% reported feeling “cheerful and in good spirits” in the last two weeks “most of the time” or “all of the time”; only 2.5% reported that this had not occurred

at all. Item 4, waking up feeling “fresh and rested” in the last two weeks was the WHO-5 item with the lowest mean rating ($M = 2.00$). Of the adolescents who responded to this item, 19.8% reported waking up “feeling fresh and rested” in the last two weeks “some of the time”, with 24.5% reporting that this occurred “at no time” in the previous two weeks.

The mean item score for the total WHO-5 scale was 2.52 ($SD = 1.28$). There was a statistically significant difference by year level for the total WHO-5 mean item score, $F(4,349) = 4.403, p = 0.002$. The total mean item scores for each year level were as follows: Year 9 $M = 2.97$ ($SD = 1.27$), Year 10 $M = 2.61$ ($SD = 1.23$), Year 11 $M = 2.18$ ($SD = 1.23$), Year 12 $M = 2.34$ ($SD = 1.32$), and Year 13 $M = 2.18$ ($SD = 1.25$). There was no statistically significant difference in total mean item score for the WHO-5 scale by earthquake exposure, $t(303) = -1.760, p = .079$. The total mean item score for those exposed to the Christchurch earthquakes was 2.35 ($SD = 1.29$), compared to 2.63 ($SD = 1.21$) for those adolescents who did not live in Christchurch during the earthquakes.

Table 6. Proportion of Likert Scale Responses by Adolescents to WHO-5 Items, Mean (SD) per item.

Item	Response Frequency (%)						Mean (SD) rating
	All of the time (5) (4)	Most of the time (4)	More than half the time (3)	Less than half the time (2)	Some of the time (1)	At no time (0)	
<i>Over the last two weeks...</i>							
1 – I have felt cheerful and in good spirits (<i>n</i> =363)	36 (9.9%)	117 (32.2%)	76 (20.9%)	44 (12.1%)	81 (22.3%)	9 (2.5%)	2.88 (1.40)
2 – I have felt calm & relaxed (<i>n</i> =352)	31 (8.8%)	79 (22.4%)	69 (19.6%)	70 (19.9%)	72 (20.5%)	31 (8.8%)	2.53 (1.47)
3 – I have felt active & vigorous (<i>n</i> =337)	37 (11.0%)	66 (19.6%)	58 (17.2%)	71 (21.1%)	73 (21.7%)	32 (9.5%)	2.49 (1.52)
4 – I woke up feeling fresh & rested (<i>n</i> =339)	23 (6.8%)	54 (15.9%)	55 (16.2%)	57 (16.8%)	67 (19.8%)	83 (24.5%)	2.00 (1.61)
5 – my daily life has been filled with things that interest me (<i>n</i> =335)	34 (10.1%)	75 (22.4%)	59 (17.6%)	64 (19.1%)	73 (21.8%)	30 (9.0%)	2.53 (1.51)

Adolescents' Psychological Wellbeing and Distress (PWDS)

The PWDS was used to measure adolescent wellbeing and distress. Using the criteria provided for the PWDS by Bolognino (2015), responses showed that 50% of the adolescents reported low risk of low wellbeing, and 21% of the adolescents reported high risk of psychological distress.

Psychological Wellbeing Scale (PWS). Item 5, having “fun with your friends” in the last week was the PWS item with the highest mean rating ($M = 3.89$, $SD = 1.16$) (Table 7). Of the adolescents who responded to this item, 41% reported *always* having fun with their friends in the last week; only 3.6% reported that this had *never* occurred.

The mean item score for the total PWS scale was 3.20 ($SD = .88$). There was a statistically significant difference by year level for the PWS mean item score, $F(4,330) = 4.205$, $p = 0.002$. The total mean item scores for each year level were as follows: Year 9 $M = 3.46$ ($SD = .90$), Year 10 $M = 3.22$ ($SD = .84$), Year 11 $M = 3.04$ ($SD = .71$), Year 12 $M = 2.99$ ($SD = .94$), and Year 13 $M = 2.98$ ($SD = .88$). There was a statistically significant difference in total mean item score for the PWS scale by earthquake exposure, $t(303) = -2.125$, $p = .034$. The total mean item score for those exposed to the Christchurch earthquakes was 3.12 ($SD = .88$), compared to 3.35 ($SD = .84$) for those adolescents who did not live in Christchurch during the earthquakes.

Table 7. Proportion of Likert Scale Responses by Adolescents to Psychological Wellbeing Scale items, Mean (SD) per item

Item	Response Frequency (%)					Mean (SD) score
	Always (5)	Very often (4)	Quite often (3)	Seldom /hardly ever (2)	Never (1)	
<i>Thinking about last week, have you...</i>						
1 – got on well at school? (n=326)	71 (21.8%)	88 (27.0%)	108 (33.1%)	53 (16.3%)	6 (1.8%)	3.51 (1.06)
2 – been able to pay attention? (n=332)	62 (18.7%)	100 (30.1%)	108 (32.5%)	48 (14.5%)	14 (4.2%)	3.45 (1.08)
3 – felt full of energy? (based on WHO-5 item 3) (n=337)	37 (11.0%)	66 (19.6%)	58 (17.2%)	144 (36.5%)	32 (8.1%)	2.80 (1.19)
4 – felt fit and well? (based on WHO-5 item 4) (n=339)	23 (6.8%)	54 (15.9%)	55 (16.2%)	124 (36.6%)	83 (24.5%)	2.44 (1.21)
5 – had fun with your friends? (n=334)	137 (41.0%)	81 (24.3%)	70 (21.0%)	34 (10.2%)	12 (3.6%)	3.89 (1.16)

Psychological Distress Scale (PDS). Item 2, “feeling lonely” in the last week was the PDS item with the lowest mean rating ($M = 2.45$, $SD = 1.25$) (Table 8). Most adolescents reported that they *seldom or hardly ever* felt lonely (32.3%), and 26.3% of adolescents reported that they *never* felt lonely in the last week. Item 1, “feeling sad” in the last week was the PDS item with the highest mean rating ($M = 2.70$, $SD = 1.19$). Although the highest proportion of adolescents (38.9%) reported that they *seldom or hardly ever* felt sad in the last week, 9.3% of adolescents reported that they *always* felt sad in the last week.

The mean item score for the total PDS scale was 2.55 ($SD = 1.02$). There was a statistically significant difference by year level for the PDS mean item score, $F(4,314) = 5.314$, $p < .001$. The total mean item scores for each year level were as follows: Year 9 $M = 2.31$ (SD

= .99), Year 10 $M = 2.35$ ($SD = .94$), Year 11 $M = 2.93$ ($SD = .98$), Year 12 $M = 2.76$ ($SD = 1.17$), and Year 13 $M = 2.77$ ($SD = .86$). There was not a statistically significant difference in total mean item score for the PDS scale by earthquake exposure, $t(203.4) = 1.403$, $p = .162$. The total mean item score for those exposed to the Christchurch earthquakes was 2.63 ($SD = 1.10$), compared to 2.46 ($SD = .86$) for those adolescents who did not live in Christchurch during the earthquakes.

Table 8. Proportion of Likert Scale Responses by Adolescents to Psychological Distress Scale items, Mean (SD) per item.

Item	Response Frequency (%)					Mean (SD) score
	Always (5)	Very often (4)	Quite often (3)	Seldom /hardly ever (2)	Never (1)	
<i>Thinking about last week, have you...</i>						
1 – felt sad? ($n=324$)	30 (9.3%)	58 (17.9%)	65 (20.1%)	126 (38.9%)	45 (13.9%)	2.70 (1.19)
2 – felt lonely? ($n=319$)	27 (8.5%)	43 (13.5%)	62 (19.4%)	103 (32.3%)	84 (26.3%)	2.45 (1.25)
	About every day (5)	More than once per week (4)	About every week (3)	About every month (2)	Rarely or never (1)	
<i>In the last 6 months, how often have you had the following...</i>						
3 – feeling low? ($n=306$)	31 (10.1%)	58 (19%)	62 (20.3%)	66 (21.6%)	89 (29.1%)	2.59 (1.35)
4 – feeling nervous? ($n=306$)	35 (11.4%)	57 (18.6%)	55 (18.0%)	76 (24.8%)	83 (27.1%)	2.62 (1.36)
5 – irritability or bad temper? ($n=309$)	31 (10%)	48 (15.5%)	59 (19.1%)	73 (23.6%)	98 (31.7%)	2.49 (1.34)

Adolescents' Adverse Childhood Experiences (ACEs)

Most adolescents (66.9%) reported experiencing at least one ACE, however, 33.1% reported they had experienced no ACEs (Table 9).

The mean number of ACEs reported by adolescents was 2.10 ($SD = 2.27$). The difference in mean number of ACEs by year level was not significant, $F(4,280) = 1.209$, $p = 0.307$. The mean number of ACEs reported by year level were as follows: Year 9 $M = 2.06$ ($SD = 2.35$), Year 10 $M = 2.16$ ($SD = 2.33$), Year 11 $M = 2.16$ ($SD = 2.18$), Year 12 $M = 1.55$ ($SD = 2.13$), and Year 13 $M = 2.59$ ($SD = 2.09$). There was also no statistically significant difference in number of ACEs reported by earthquake exposure, $t(296) = -1.26$, $p = .208$. The mean number of ACEs for those exposed to the Christchurch earthquakes was 2.21 ($SD = 2.25$), compared to 1.75 ($SD = 2.20$) for those adolescents who did not live in Christchurch during the earthquakes.

Table 9. The Proportion of Adolescents Reporting the Number of ACEs Experienced Prior to the Survey.

Number of ACEs	<i>n</i>	(%)
0	97	(33.1%)
1	62	(21.2%)
2	34	(11.6%)
3	24	(8.2%)
4	24	(8.2%)
5	17	(5.8%)
6	19	(6.5%)
7	9	(3.1%)
8	7	(2.4%)

Adolescents' Quality of Life (Cantril Ladder)

The Cantril Ladder was used to measure adolescents' QOL. A slim majority of adolescents (56.4%) reported high current QOL, whereas 88.7% reported high expectations for future QOL.

Current QOL. The mean rating on the Cantril Ladder (current QOL) item for the sample was 6.00 ($SD = 2.24$). There was no significant difference in mean ratings by year level, $F(4,282) = .488, p = .745$. The mean ratings by year level were as follows: Year 9 $M = 6.23$ ($SD = 2.48$), Year 10 $M = 5.98$ ($SD = 2.08$), Year 11 $M = 5.80$ ($SD = 2.01$), Year 12 $M = 5.80$ ($SD = 2.48$), and Year 13 $M = 5.78$ ($SD = 1.93$). There was also no significant difference in mean ratings by earthquake exposure, $t(168.7) = -1.57, p = 0.118$. The mean rating for those exposed to the Christchurch earthquakes was 5.89 ($SD = 2.32$), compared to 6.32 ($SD = 2.01$) for those adolescents who did not live in Christchurch during the earthquakes.

A rating of 5 was the most frequent rating given by adolescents responding to the Cantril Ladder (current QOL) (17.6%) (Table 10). A rating of 0 was the least frequent rating given by adolescents (.3%).

Table 10. The Proportion of Adolescents Reporting Ratings on the Cantril Ladder (Current QOL).

Rating	<i>n</i>	(%)
0	1	(0.3%)
1	7	(2.4%)
2	10	(3.4%)
3	22	(7.4%)
4	37	(12.5%)
5	52	(17.6%)

Rating	<i>n</i>	(%)
6	34	(11.5%)
7	51	(12.9%)
8	43	(10.9%)
9	20	(6.8%)
10	19	(6.4%)

Future expectations of QOL. The mean rating on the Cantril Ladder (future expectations of QOL) item for the sample was 7.98 ($SD = 2.04$). There was no significant difference in mean ratings by year level, $F(4,277) = .259$, $p = .904$. The mean ratings by year level were as follows: Year 9 $M = 8.09$ ($SD = 2.20$), Year 10 $M = 7.89$ ($SD = 2.08$), Year 11 $M = 7.75$ ($SD = 1.94$), Year 12 $M = 7.96$ ($SD = 2.26$), and Year 13 $M = 8.03$ ($SD = 1.67$). There was also no significant difference in mean ratings by earthquake exposure, $t(173.03) = -1.025$, $p = .307$. The mean rating for those exposed to the Christchurch earthquakes was 7.92 ($SD = 2.14$), compared to 8.17 ($SD = 1.79$) for those adolescents who did not live in Christchurch during the earthquakes.

A rating of 9 was the most frequent rating given by adolescents responding to the Cantril Ladder (future expectations of QOL) (24.7%) (Table 11). A rating of 0 was the least frequent rating given by adolescents (.7%).

Table 11. The Proportion of Adolescents Reporting Ratings on the Cantril Ladder (future expectations of QOL).

Rating	<i>n</i>	(%)
0	2	(0.7%)
1	3	(1%)

Rating	<i>n</i>	(%)
2	5	(1.7%)
3	4	(1.4%)
4	4	(1.4%)
5	15	(5.2%)
6	20	(6.9%)
7	28	(9.6%)
8	69	(23.7%)
9	72	(24.7%)
10	69	(17.5%)

Adolescents' Social Support

Overall, 69.5% of adolescents reported having good support from family and friends, and 72.5% feel that people at their school care about them.

Social support from family and friends. The mean rating on the Likert-scale for friend and family support for the sample was 3.95 ($SD = 1.14$). There was no significant difference in mean ratings by year level, $F(4,292) = 1.199$, $p = .31$. The mean ratings by year level were as follows: Year 9 $M = 4.06$ ($SD = 1.00$), Year 10 $M = 4.00$ ($SD = 1.12$), Year 11 $M = 3.95$ ($SD = 1.21$), Year 12 $M = 3.64$ ($SD = 1.40$), and Year 13 $M = 3.84$ ($SD = .97$). There was also no significant difference in mean rating by earthquake exposure, $t(299) = -.531$, $p = .596$. The mean rating for those exposed to the Christchurch earthquakes was 3.93 ($SD = 1.18$), compared to 4.01 ($SD = 1.06$) for those adolescents who did not live in Christchurch during the earthquakes.

The highest proportion of adolescents (41.6%) reported that they *strongly agreed* that they had a trusted friend or family member who could help them through hard times. The proportion of adolescents providing a rating of *agree* was 27.9%, of *neutral* was 20%, of *disagree* was 5.2%, and of *strongly disagree* was also 5.2%.

School connectedness. The mean rating on the Likert-scale for school connectedness for the sample was 3.22 ($SD = 1.18$). There was no significant difference in mean ratings by year level, $F(4,309) = .903$, $p = .46$. The mean ratings by year level were as follows: Year 9 $M = 3.36$ ($SD = 1.02$), Year 10 $M = 3.26$ ($SD = 1.16$), Year 11 $M = 3.05$ ($SD = 1.30$), Year 12 $M = 3.06$ ($SD = 1.34$), and Year 13 $M = 3.24$ ($SD = 1.08$). There was also no significant difference in mean rating by earthquake exposure, $t(296) = -1.26$, $p = .208$. The mean rating for those exposed to the Christchurch earthquakes was 3.13 ($SD = 1.19$), compared to 3.32 ($SD = 1.17$) for those adolescents who did not live in Christchurch during the earthquakes.

The highest proportion of adolescents (30.7%) reported that they *often* felt that people at their school cared about them. The proportion of adolescents providing a rating of *always* was 16.1%, of *very often* was 25.7%, of *seldom/hardly ever* was 19.2% and of *never* was 8.4%.

Summary of Dichotomised Variables

Survey measures were dichotomised (see Methods) to provide a summary of the four groups of variables defined in the study, namely indicators of positive mental health and wellbeing, indicators of negative mental health and wellbeing, hypothesised protective factors for positive mental health and wellbeing, and hypothesised risk factors for negative mental health and wellbeing. These categories provide a summary of the survey results.

Adolescents' responses to the survey variables used to define indicators of positive mental health and wellbeing showed that: 79% of adolescents were at low risk of

psychological distress, 56.4% had high current QOL, 52.3% had good SWB, and 50% were at low risk of low wellbeing. Responses to the survey variables used to define indicators of negative mental health and wellbeing showed that: 50% of adolescents had high risk of low wellbeing, 47.7% of adolescents had poor SWB, 43.6% of adolescents had low current QOL, and 21% of adolescents had high risk of psychological distress. Responses to the survey variables used to define hypothesised protective factors for positive mental health and wellbeing showed that: 88.7% of adolescents had high expectations about their future QOL, 74.1% of adolescents had fewer than four ACEs, 72.4% of adolescents had good school connectedness, and 69.5% of adolescents had good support from family and friends. Responses to the survey variables used to define hypothesised risk factors for negative mental health and wellbeing showed that: 30.5% of adolescents had little or no support from family and friends, 27.6% had little or no school connectedness, 25.9% had four or more ACEs, and 11.3% had low expectations about their future QOL.

Relationships Between Survey Variables

Large significant Spearman's rank order correlations were found between all measures of mental health and wellbeing ($r_s = .531$ to $.891$) (Table 12). The largest correlation was found between the WHO-5 mean item score and the PWS mean item score ($r_s = .891$). Correlations between the WHO-5, PWS, and Cantril Ladder (current QOL) were all positive, whereas correlations between the PDS and the WHO-5, PWS and Cantril Ladder (current QOL) were negative.

Significant correlations were found between risk and protective factors and each of the four measures of mental health and wellbeing, suggesting that all factors should be included in multivariate analysis. The largest correlations were found between school

connectedness and the WHO-5 ($r_s = .667$) and the PWS ($r_s = .663$) (Table 12). The smallest correlations were between ACEs and the PWS ($r_s = -.252$) and WHO-5 ($r_s = -.256$).

None of the correlation coefficients between ACEs, Cantril Ladder (future expectations of QOL), support of family and friends, and school connectedness exceeded .80, suggesting that there was no multicollinearity between them and they could be included together in multivariate analysis. All correlations were small to medium in size ($r_s = -.142$ to $.370$) (Table 12).

Table 12. Spearman Rank Order Correlations Between Survey Variables.

Variable	1	2	3	4	5	6	7	8
1. WHO-5	-	.891***	-.726***	.553***	-.256***	.400***	.395***	.667***
2. PWS	.891***	-	-.662***	.531***	-.252***	.404***	.390***	.663***
3. PDS	-.726***	-.662***	-	-.543***	.281***	-.387***	-.424***	-.544***
4. Cantril Ladder (Current QOL)	.553***	.531***	-.543***	-	-.307***	.611***	.441***	.416***
5. ACEs	-.256***	-.252***	.281***	-.307***	-	-.216***	-.235***	-.142*
6. Cantril Ladder (Future QOL)	.400***	.404***	-.543***	.611***	-.216***	-	.340***	.319***
7. Support of Family & Friends	.395***	.390***	-.424***	.441***	-.235***	.340***	-	.370***
8. School Connectedness	.667***	.663***	-.544***	.416***	-.142*	.319***	.370***	-

Note. * $p < .05$, *** $p < .001$ (two-tailed); PWS = Psychological Wellbeing Scale; PDS = Psychological Distress Scale; ACEs = Adverse Childhood Experiences

Predictors of Adolescent Mental Health and Wellbeing

Multivariate analysis. The best predictors of SWB, risk of low wellbeing, risk of psychological distress, and current QOL were calculated using a series of multiple linear regressions. The risk and protective factors examined in the multiple regressions were number of ACEs, school connectedness, support from family and friends, and expectations about future QOL. Earthquake exposure was not included as a predictor given that it was not found to have a significant effect on three of the four mental health and wellbeing outcomes used as dependent variables in the regression analyses. As year level was found to have a significant effect on three of these outcomes, it was included in the multiple regression equations in order to control for its effect.

Subjective Wellbeing. A multiple linear regression was carried out to see how well school connectedness, expectations about future QOL, social support, and number of ACEs predicted SWB as measured by the WHO-5 mean item score. The results of the regression indicated that the model could explain 49.9% of the variance in SWB, and that the model was a significant predictor of SWB, ($F(5, 255) = 50.775, p < .001$). School connectedness made a statistically significant contribution to the regression model (Table 13), as did expectations about future QOL, social support from friends and family, and year level. However, the number of ACEs reported did not make a statistically significant contribution to the model.

Table 13. Summary of Multiple Regression Analysis of Variables Predicting Adolescents' SWB (WHO-5 Mean Item Score).

Variable	<i>B</i>	<i>SE</i>	<i>t</i>	<i>p</i>
School connectedness	.597	.052	11.563	.000***
Future expectations about QOL	.077	.029	2.647	.009**
Social support	.118	.054	2.162	.032*
ACEs	-.048	.026	-1.818	.070
Year level	-.104	.040	-2.593	.010**

Risk of low wellbeing. A multiple linear regression was carried out to see how well school connectedness, expectations about future QOL, social support, and number of ACEs predicted risk of low wellbeing as measured by the PWS mean item score. The results of the regression indicated that the model could explain 50.7% of the variance in low wellbeing, and that the model was a significant predictor of risk of low wellbeing, ($F(5, 255) = 52.345, p < .000$). School connectedness made a statistically significant contribution to the regression model (Table 14) as did expectations about future QOL, social support, and year level. The number of ACEs reported did not make a statistically significant contribution to the model.

Table 14. Summary of Multiple Regression Analysis of Variables Predicting Adolescents' Wellbeing (PWS Mean Item Score).

Variable	<i>B</i>	<i>SE</i>	<i>t</i>	<i>p</i>
School connectedness	.402	.035	11.511	.000***
Future expectations about QOL	.056	.020	2.877	.004**
Social support	.073	.037	1.993	.047*
ACEs	-.032	.018	-1.804	.072
Year level	-.099	.027	-3.657	.000***

Risk of psychological distress. A multiple linear regression was carried out to see how well school connectedness, expectations about future QOL, social support, and number of ACEs predicted risk of psychological distress as measured by the PDS mean item score. The results of the regression indicated that the model could explain 44.7% of the variance in psychological distress, and that the model was a significant predictor of risk of psychological distress, ($F(5, 255) = 41.194, p < .000$). School connectedness made a statistically significant contribution to the regression model (Table 15), as did social support, the number of ACEs reported, expectations about future QOL, and year level.

Table 15. Summary of Multiple Regression Analysis of Variables Predicting Adolescents' Psychological Distress (PDS Mean Item Score).

Variable	<i>B</i>	<i>SE</i>	<i>t</i>	<i>p</i>
School connectedness	-.396	.045	-8.763	.000***
Social support	-.165	.048	-3.466	.001***
ACEs	.066	.023	2.876	.004**
Future expectations about QOL	-.055	.025	-2.178	.030*
Year level	.103	.035	2.928	.004**

Current QOL. A multiple linear regression was carried out to see how well school connectedness, expectations about future QOL, social support, and number of ACEs predicted current QOL as measured by the rating on the Cantril Ladder (current QOL). The results of the regression indicated that the model could explain 46.7% of the variance in current QOL ratings and that the model was a significant predictor of current QOL, ($F(5, 253) = 44.379, p < .000$). Expectations about future QOL made a statistically significant contribution to the regression model (Table 16), as did social support, and school

connectedness. Neither the number of ACEs reported nor year level made a statistically significant contribution to the model.

Table 16. Summary of Multiple Regression Analysis of Variables Predicting Adolescents' Current QOL (Cantril Ladder Current).

Variable	<i>B</i>	<i>SE</i>	<i>t</i>	<i>p</i>
Future expectations about QOL	.453	.052	8.650	.000***
Social support	.426	.098	4.343	.000***
School connectedness	.391	.093	4.186	.000***
ACEs	-.069	.047	-1.463	.145
Year level	-.028	.073	-.387	.699

In summary, the results of regression analyses indicated that school connectedness, social support from friends and family, and future expectations about QOL consistently predicted mental health and wellbeing outcomes represented by SWB, risk of low wellbeing, risk of psychological distress, and current QOL. Increases in the levels of school connectedness, social support from family and friends, and future expectations about QOL predicted increases in SWB and current QOL, and decreases in both the risk of low wellbeing and risk of psychological distress. The number of ACEs reported by adolescents was only a significant predictor of risk of psychological distress; increases in the number of ACEs reported by adolescents predicted increases in the risk of psychological distress. Year level was related to all outcomes except for current QOL. An increase in year level was predictive of lower levels of SWB, higher risk of low wellbeing, and higher risk of psychological distress.

Case analyses. Case analyses were carried out for 296 adolescents who had answered all the survey items used to inform the new variable 'total mental health and wellbeing'. Scores on this variable ranged from 0 to 4, with each adolescent given one point

per indicator of positive mental health and wellbeing they reported (refer to Methods chapter for more detail).

Adolescents with a score of 4 were the most common, 33.4% of adolescents scored 4 indicating an optimal level of mental health and wellbeing (Figure 5). Adolescents with a score of zero, indicating the poorest levels of mental health and wellbeing, represented 18.9% of the 296 adolescents included in the case analysis.

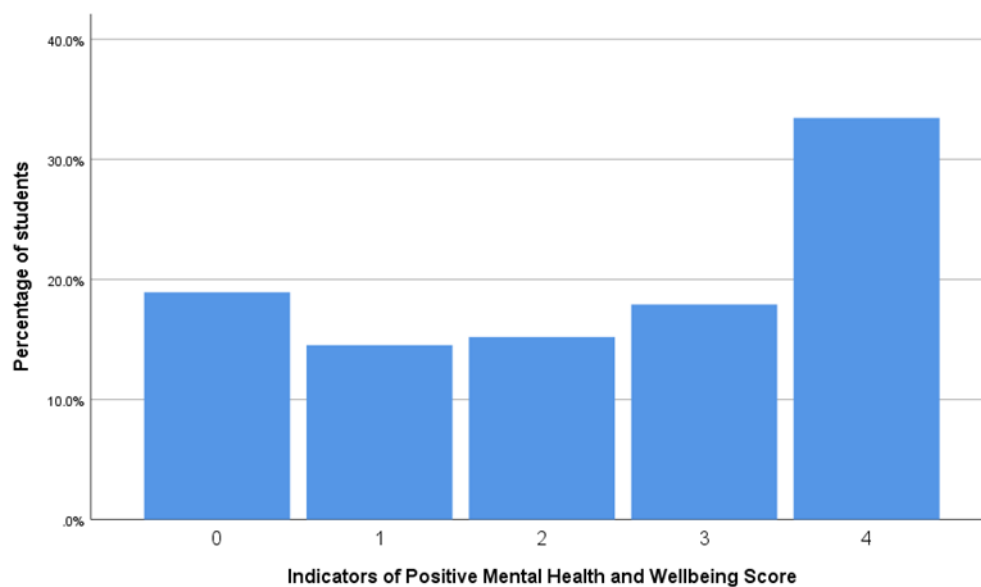


Figure 5. Percentages of Adolescents with Indicators of Positive Mental Health and Wellbeing Scores.

For the school connectedness item, 100% of adolescents with four indicators of positive mental health and wellbeing also reported high levels of school connectedness. Specifically, 32.3% of these adolescents reported that they *always* felt that people at their school cared about them and 67.7% reported that they *very often* felt this way. In comparison, 74.5% of those adolescents with zero indicators of positive mental health and wellbeing also reported low levels of school connectedness. Specifically, 52.7% reported that

they *seldom/hardly ever* felt that people at their school cared about them and 21.8% reported that they *never* felt this way. There was a statistically significant difference in mean ratings for school connectedness between the five different groups of adolescents, $F(4,284) = 45.521, p < .000$. Those with more indicators of positive mental health and wellbeing had significantly higher ratings of school connectedness than those with fewer indicators. The mean school connectedness ratings for each group were as follows: four indicators $M = 4.05$ ($SD = .77$), three indicators $M = 3.38$ ($SD = .95$), two indicators $M = 2.93$ ($SD = 1.12$), one indicator $M = 2.52$ ($SD = .97$) and zero indicators $M = 2.15$ ($SD = .93$).

For the ACEs survey item, 88.4% of adolescents with four indicators of positive mental health and wellbeing also reported experiencing less than four ACEs. In comparison, 49.1% of adolescents with zero indicators reported experiencing four or more ACEs. There was a statistically significant difference in mean responses for number of ACEs experienced between the five different groups of adolescents, $F(4,276) = 9.824, p < .000$. Those with more indicators of positive mental health and wellbeing reported significantly fewer ACEs than those with fewer indicators. The mean number of ACEs reported for each group was as follows: four indicators $M = 1.29$ ($SD = 1.95$), three indicators $M = 1.94$ ($SD = 2.12$), two indicators $M = 2.24$ ($SD = 1.94$), one indicator $M = 2.12$ ($SD = 2.24$), and zero indicators $M = 3.51$ ($SD = 2.32$).

For the support from friends and family item, 87.7% of adolescents with four indicators of positive mental health and wellbeing also reported high levels of social support. Specifically, 62.2% *strongly agreed* that they had a trusted friend or family member who could help them through hard times and 25.5% *agreed* with this statement. In comparison, 66.1% of those adolescents with zero indicators of positive mental health and wellbeing also reported low levels of social support. Specifically, 33.9% reported that they were *neutral*

about whether they had a trusted friend or family member who could help them through hard times, 17.9% *strongly disagreed* and 14.3% *disagreed* that they had this support. There was a statistically significant difference in mean ratings for social support between the five different groups of adolescents, $F(4,289) = 19.837, p < .000$. Those with more indicators of positive mental health and wellbeing had significantly higher ratings for social support than those with fewer indicators. The mean social support ratings for each group were as follows: four indicators $M = 4.48 (SD = .78)$, three indicators $M = 4.21 (SD = 1.01)$, two indicators $M = 3.91 (SD = 1.03)$, one indicator $M = 3.72 (SD = 1.14)$, and zero indicators $M = 3.00 (SD = 1.31)$.

For the Cantril Ladder (future expectations of QOL) item, 98% of adolescents with four indicators of positive mental health and wellbeing also reported high expectations about their future QOL. In comparison, 31.5% of adolescents with zero indicators of positive mental health and wellbeing also reported low expectations about their future QOL. There was a statistically significant difference in mean ratings for future expectations about QOL between the five different groups of adolescents, $F(4,284) = 24.126, p < .000$. Those with more indicators of positive mental health and wellbeing had significantly higher expectations about future QOL than those with fewer indicators. The mean ratings for future expectations about QOL for each group were as follows: four indicators $M = 9.09 (SD = .943)$, three indicators $M = 7.73 (SD = 2.16)$, two indicators $M = 8.66 (SD = 1.63)$, one indicator $M = 6.90 (SD = 2.01)$, and zero indicators $M = 6.56 (SD = 2.35)$.

The results of these case analyses confirmed the models examined through regression analysis. Specifically, adolescents with the highest number of indicators of positive mental health and wellbeing were also significantly more likely to report lower numbers of ACEs, higher expectations for future QOL, higher levels of school connectedness, and higher levels of social support from friends and family. Conversely, adolescents with the

lowest number of positive mental health and wellbeing were significantly more likely to report higher numbers of ACEs, lower expectations for future QOL, lower levels of school connectedness, and lower levels of social support from family and friends.

Dual-factor Model of Mental Health.

The proportion of adolescents within each of the four mental health categories defined by the dual-factor model of mental health was examined in two ways. In the first approach, the scoring guidelines provided by Bolognino (2015) for the PWDS were used to define the four categories of mental health. In the second approach, new cut-off scores were determined from the means and standard deviations on the PWS and PDS for this particular sample, but again following the Bolognino (2015) methods to establish their cut-offs (Table 17). The PWS cut-off score used to inform category membership was 2.32, determined by subtracting one standard deviation from the mean PWS score for the sample. The PDS cut-off score used to inform category membership was 3.57, determined by adding one standard deviation to the mean PDS score for the sample. Each of the categories were defined by scores greater or less than each of these cut-off scores.

Table 17. Second approach to categorisation for the Dual-Factor Model of Mental Health: Scoring Cut-offs on the Psychological Wellbeing Scale and Psychological Distress Scale Using Mean and Standard Deviation Scoring Protocol.

	Dual-Factor Mental Health Category			
	Mentally Healthy	Symptomatic but Content	Asymptomatic but Discontent	Mentally Unhealthy
PWS Mean Item Score	≥ 2.32	≥ 2.32	< 2.32	< 2.32
PDS Mean Item Score	< 3.57	≥ 3.57	< 3.57	≥ 3.57

The results of both approaches to categorisation in the dual-factor model of mental health show that most responses fell within the mentally healthy category (Table 18). Under the first approach to categorisation only, significant proportions also fell within the asymptomatic but discontent category (26.5%) and the mentally unhealthy category (22.9%).

Table 18. Proportion of Respondents Falling within the Four Dual-Factor Mental Health Categories defined by Bolognino (2015) Cut-off Scores and Cut-off Scores based on Mean and Standard Deviations for the Psychological Wellbeing Scale and Psychological Distress.

Category	Bolognino scoring protocol		Mean and SD scoring protocol*	
	%	(<i>n</i>)	%	(<i>n</i>)
Mentally Healthy	48.8%	(160)	72.0%	(236)
Asymptomatic but Discontent	26.5%	(87)	6.7%	(22)
Symptomatic but Content	1.5%	(6)	11.3%	(37)
Mentally Unhealthy	22.9%	(75)	10.1%	(33)

* See text and Table 17 for cut-offs used.

Chapter 5: Discussion

The overall aim of this study was to examine the holistic mental health and wellbeing of adolescents living in an earthquake-affected community using a dual-factor model of mental health that incorporated measures of both psychopathology and SWB. To achieve this the prevalence of self-reported good SWB, risk of poor wellbeing, risk of psychological distress, good QOL, good school connectedness, good social support from friends and family, and high expectations of future QOL was calculated, along with variations by age/school year, and earthquake exposure in this sample. Relationships between the mental health and wellbeing outcomes measured, and ACEs, school connectedness, social support, and future expectations about QOL were also analysed to examine the synergistic effects of risk and protective factors on the mental health and wellbeing of adolescents living in a post-earthquake community. Further analysis was undertaken to determine the proportion of adolescents that fit into each of the four categories of mental health defined by the dual-factor model of mental health. A discussion of the key findings of this survey, limitations, and implications for practice and future research is presented in this chapter.

Key Findings

Earthquake exposure and adolescent mental health. The adolescents in the present study who reported living in Christchurch during the 2010 and 2011 earthquakes did not provide significantly different ratings on any of the survey variables examined in the SSWS to those adolescents who reported that they did not live in Christchurch during the earthquakes. This is a finding that contrasts with previous studies. Meta-analyses have reported significant positive relationships between disaster exposure and psychopathology (e.g., Furr et al., 2010; Lai et al., 2014; Rubens et al., 2018; Terasaka et al., 2015). The case

control study of Eray et al. (2017) showed that earthquake-exposed adolescents were significantly more likely to experience poor mental health and wellbeing outcomes than adolescents who had not lived in an earthquake-exposed community.

The stress and adversity of living in a post-earthquake community over a long period of time may explain the lack of difference between adolescents who did and did not live in Christchurch during the earthquakes. A number of studies have shown that post-disaster stressors and adversities can account for a large amount of the variation in adolescent mental health and wellbeing (e.g., Cadichon et al., 2017; Shaw et al., 2012; Trickey et al., 2012). In the meta-analysis of risk factors for the development of PTSD in trauma-affected adolescents, Trickey et al. (2012) found that the variables with some of the largest effects on mental health related to post-disaster variables such as, family functioning, social support, parental psychopathology, and post-trauma negative life events. There have been high levels of chronic stress and adversity reported in Christchurch since the September 2010 and February 2011 earthquakes (e.g., Blundell, 2014; CDHB, 2017; CERA, 2013, 2015; McColl & Burkle, 2012). This has been associated with the experience of 83 earthquakes of M5.0 or greater, over 22,000 aftershocks, extensive liquefaction, destruction of property and community resources, disruption to essential services and utilities, insurance problems, re-location following destruction or demolition of homes, the closure and merger of schools, and subsequent disasters including a large forest fire and flooding. These significant stressors have had negative community-wide effects for many years, which in turn affect residents whether or not they lived in Christchurch during the September 2010 and February 2011 earthquakes. It is possible that it is these stressors that are having the greatest impact on adolescent mental health at the present time. This assertion fits with ACEs research (e.g., e.g. Balistreri & Alvira-Hammond, 2016; Flouri & Mavroveli, 2013; Perfect et al., 2016;

Suliman et al., 2009) that it is the cumulative effect of chronic stress and adversity that is the strongest predictor of adolescent mental health rather than specific traumatic events.

Prevalence of poor SWB, wellbeing, and QOL. Close to half of the adolescents surveyed for the present study reported poor SWB, and wellbeing; slightly less than half reported low levels of current QOL. The prevalence of poor SWB is markedly higher than prevalence rates reported for NZ adolescents living outside of Christchurch (e.g. CERA, 2014; Lambert et al., 2014). More than three times as many of the adolescents in the present study were at high risk of poor wellbeing compared to USA adolescents from the general population studied by Bolognino (2015). Bolognino (2015) found that only 15.7% of the USA adolescents she studied were at high risk of poor wellbeing, whereas 50% of the adolescents in the present study reported the same. In addition, more than twice as many adolescents in the present study rated their current QOL as poor compared to earthquake-affected Christchurch adolescents surveyed in 2013 (CERA, 2014).

These findings are likely to reflect the deleterious effects of living in a post-disaster environment over a long period of time. The adolescents who took part in the present study were aged between 3- and 11-years at the time of the Christchurch earthquakes in 2010 and 2011. Some have lived in a stressful post-disaster environment throughout their entire childhood; others have had to contend with this through their adolescence. Exposure to this ongoing stress throughout childhood and adolescence, and the potential trauma associated with living in a severely earthquake-affected community, has been shown to negatively affect the development of self-regulation and executive functioning skills in children and adolescents who are not well supported by responsive and well-regulated adults who are coping well themselves (Kronenberg et al., 2010; Shaw et al., 2012). The neuro-physiological impact of living in this environment has also been associated with long-term maladaptation

of emotional and behavioural regulation, and cognitive abilities (Masten & Narayan, 2012). Together these may result in low levels of positive affect associated with poor SWB. In addition, they may increase the likelihood of negative evaluations of need fulfilment, or a lessening of ability to engage in meaningful or enjoyable activities, both of which are associated with low levels of QOL. Dysregulation associated with exposure to cumulative trauma and stress is also likely to negatively affect an adolescent's capacity to build positive social relationships, which can leave them more vulnerable to poor SWB and QOL.

The proportion of adolescents reporting poor SWB and QOL in this sample compared to Christchurch adolescents surveyed in 2013 may also be partly attributable to differences in the extent to which the communities within which they live have been affected by the Christchurch earthquakes. Adolescents living in both severely affected and less affected communities took part in the 2013 survey, whereas the adolescents who took part in the present study were most likely to be living in some of the most severely-affected communities of Christchurch. Research has shown that adolescents living in communities more severely affected by earthquakes report lower levels of QOL than adolescents living in less-affected areas (Hu et al., 2018). This point is congruent with the relative prevalence of good SWB in Christchurch adults reported in a 2015 survey (CERA, 2015). While 75% of adults residing in less severely affected areas of Christchurch reported good SWB, only 52% of adults residing in the most-severely affected suburbs of Christchurch reported the same (CERA, 2015). It is therefore possible that the mean level of SWB and QOL of this sample was lower than the adolescents surveyed in 2013 simply because they have had to manage and adapt to the wide range of chronic social and environmental stresses associated with living in communities that have been severely affected by the Christchurch earthquakes.

Prevalence of psychological distress. The proportion of adolescents reporting high risk of psychological distress in the present study is comparable to psychopathology findings from international studies of earthquake-affected adolescents (e.g., Eray et al., 2017; Terasaka et al., 2015) and lower than the prevalence rates found in a previous study of the mental health of Christchurch adolescents conducted in 2015 (Superu, 2016). Analysis of the differences and similarities in the prevalence of psychopathology between the present study and other research is limited however by the measurement of psychological distress in this study compared to the focus on PTSS in other studies. The risk of psychological distress in this study was determined solely by the measurement of negative affect symptoms, including feeling sad, lonely, low, nervous or irritable/bad tempered; this is quite different to clinical measures of PTSS and depression that cover a much broader range of negative symptoms.

Prevalence of ACEs and relationship with adolescent mental health and wellbeing.

The prevalence of ACEs within the sample of adolescents surveyed in the present study was high. Approximately one quarter of the adolescents in the present study reported experiencing four or more ACEs; 71% of the adolescents also lived in Christchurch during the 2010 and 2011 earthquakes, which constitutes exposure to another ACE. In comparison, other studies have found that between 7% and 12% of adolescents report exposure to four or more ACEs by the time they are 17-years of age (Brown et al., 2017; Burke et al., 2011). This high level of exposure may be partly reflective of the chronic stress and adversity associated with living in a severely earthquake-affected community over a long period of time.

The experience of four or more ACEs has been consistently found to increase the risk of poor mental health outcomes in adolescents (e.g. Balistreri & Alvira-Hammond, 2016;

Flouri & Mavroveli, 2013; Perfect et al., 2016; Suliman et al., 2009). In the present study, there were significant relationships between the number of ACEs adolescents reported and poor SWB, poor wellbeing, psychological distress, and low current QOL. The sizes of these relationships were similar to those found in ACEs research by Suliman et al. (2009) and Moore and Ramirez (2016) of adolescents in the general population. They were also similar in size to relationships found between poor mental health and wellbeing, and parental neglect, personal loss, poverty, community violence, and parental mental health problems in adolescents living in earthquake-affected communities (Fan et al., 2015; Tang et al., 2017; Zheng et al., 2012).

Within the present study the relationship between ACEs and poor mental health and wellbeing was no longer significant when the effects of protective factors were taken into account. Adolescents with high levels of school connectedness and social support, and high expectations about their future QOL were less likely to also report poor SWB, wellbeing, and QOL, or psychological distress even if they had also experienced a number of ACEs. This contrasts with Moore and Ramirez's (2016) finding that cumulative ACEs continued to significantly predict small decreases in adolescent wellbeing even if adolescents also reported living in a supportive and safe neighbourhood, had social support from an adult, and felt that their school environment was safe. Their results showed that these protective factors partially mediated the relationship between ACEs and wellbeing, whereas the present study shows that protective factors completely mitigated the role of ACEs in the prediction of SWB, QOL, and psychological distress.

This finding may be related to concerted efforts during the post-earthquake period to strengthen and bolster social connectedness, social support, and positive coping through public health campaigns in Christchurch. There has been a very widely publicised campaign

called 'All right?' that has emphasised family relationships, community connectedness and communication, checking in with neighbours, classmates, and workmates, and showing kindness and empathy to others (Healthy Christchurch, 2019). Within schools, significant efforts have been taken to build closer relationships between the school and local communities, and teachers have strived to support children and improve communication with adolescents' families in the post-earthquake period (Education Review Office, 2013). In populations where such campaigns and efforts are not undertaken to bolster protective factors, connectedness, hope, and social support that encourage positive affect and coping may not be so strong as to fully mitigate the negative effects of ACEs.

Relationships between school connectedness, social support, and high expectations about future QOL, and adolescent mental health and wellbeing. School connectedness was shown to be the largest and most consistent predictor of SWB, wellbeing, and psychological distress in this study. It accounted for significant variance in these outcomes and current QOL even when the effects of social support from family and friends, ACEs, future expectations about QOL, and year level were controlled for.

Adolescents who indicated that they felt like there were people at their school that cared for them more often than not, were significantly more likely to report the highest levels of SWB, wellbeing, and QOL, and the lowest levels of psychological distress. In comparison, those adolescents with the lowest levels of SWB, wellbeing, and QOL, and the highest levels of psychological distress were significantly more likely to report that they seldom or never felt that people at their school cared for them. These findings suggest a strong relationship between school connectedness, and mental health and wellbeing in these adolescents.

Mixed findings regarding the effect of social support and connectedness within the school environment have however been found in other studies. In the only identified study

to consider the relationship between school-based support and mental health in earthquake-affected adolescents, Eray et al. (2017) reported that support from teachers was not a significant predictor of variations in PTSD while support from family was. In contrast, a meta-analysis of adolescents in the general population found that social support within the school context had a larger effect on adolescent wellbeing than social support from friends and family (Chu et al., 2010). One possible explanation for these mixed findings are the dependent outcomes used in the studies. Eray et al. (2017) examined PTSD as an outcome; of the four mental health and wellbeing outcomes studied in the present study, school connectedness accounted for the least amount of variation in psychological distress, which most closely approximates PTSD. Furthermore, the large effect of school support found by Chu et al. (2010) related to positive wellbeing rather than poor mental health. It is therefore plausible to suggest that school connectedness acts more so to promote positive wellbeing than it does to protect against psychopathology. Certainly, the results of the current study taken together with previous findings suggest that it is important to explore the nature and directionality of the relationship between social support within the school context, and adolescent mental health and wellbeing.

Adolescents' expectations about their future QOL were shown to be the largest predictor of current QOL in the present study. It also accounted for significant variance in SWB, wellbeing, and psychological distress when the effects of other factors were controlled for. Having high expectations about future QOL can be considered as a proxy for hope and optimism as it entails thinking positively about the future and perceiving that desirable goals, such as good QOL, are attainable.

One study of earthquake-affected adolescents found that hope is likely to play a role in promoting wellbeing (Zhou et al., 2018). Zhou et al. (2018) found that having hope helped

adolescents to think more positively about their future and cope with traumatic earthquake-related experiences. In turn, this was found to promote the likelihood of adolescents experiencing PTG. In Zhou et al.'s (2018) study social support was found to increase the likelihood of adolescents having hope. Equally, in the present study, the presence of good social support and future expectations of QOL were significantly and positively correlated. These collective findings highlight the potentially synergistic effects of social support and expectations about future QOL in contributing to different experiences of mental health and wellbeing in earthquake-affected adolescents.

Dual-Factor Mental Health. The proportions of adolescents fitting into the categories defined by the dual-factor model of mental health was examined in two ways to explore how best to apply the model to a sample of earthquake-affected adolescents. Each approach produced quite different findings.

In the first approach, the scoring cut-offs based on mean levels of psychopathology and wellbeing in a large sample of USA adolescents provided by Bolognino (2015) was used. This approach showed that the distribution across the four mental health categories in the current study was markedly different to that found in previous studies (Table 19). There were considerably more adolescents categorised as mentally unhealthy and asymptomatic but discontent in the present study; these findings highlight the low mean levels of SWB in this sample of adolescents.

Table 19. Comparison of Distributions Across Dual-Factor Model of Mental Health Categories Between Present Study and Previous Studies

Category	Prevalence range in previous studies*	Prevalence in present study using Bolognino cut-offs	Prevalence in present study using sample mean and SD
Mentally Healthy	57 – 71.2%	48.8%	72%
Asymptomatic but Discontent	7.3 – 13%	26.5%	6.7%
Symptomatic but Content	8.8 – 17.3%	1.5%	11.3%
Mentally Unhealthy	5.1 – 19.9%	22.9%	10.1%

* previous studies: Antaramian et al., 2010; Bolognino, 2015; Lyons et al., 2012; Suldo et al., 2016; Suldo & Shaffer, 2008.

These findings also highlight the risk involved in a unidimensional approach that relies solely on the consideration of psychopathology as an indicator of adolescent mental health. A large majority (80%) of adolescents in the present study reported low risk of psychological distress. From a unidimensional approach, this would suggest that most of the adolescents in the present study are likely to have good mental health because they don't report frequent experiences of psychological distress. This is incongruent with the finding that 50% of the sample also reported poor wellbeing, suggesting they are not functioning optimally in their day-to-day lives. In the first approach to applying the dual-factor model of mental health to the study sample, just over a quarter of the sample (26.5%) were identified as asymptomatic but discontent. Research has consistently shown that asymptomatic but discontent adolescents are at risk of poor outcomes in many facets of life, such as academic achievement, social adjustment, school engagement, and positive identity development, compared to mentally healthy adolescents who also experience similarly low levels of psychopathology (Antaramian et al., 2010; Suldo & Shaffer, 2008; Suldo et al., 2016). These

findings show the potential utility of the dual-factor model of mental health for screening adolescent mental health and wellbeing and identifying at risk adolescents who would not otherwise be identified when screening only for symptoms of psychopathology.

In the second approach to applying the dual-factor model of mental health to the adolescents, the sample mean and standard deviation were used to define the scoring cut-offs for the four mental health categories. Using this approach, the majority of adolescents (72%) were identified as mentally healthy, and the distribution across the mental health categories more closely resembled that found in other studies. This finding is completely incongruent with the results of each of the individual scales used in the SSWS, which consistently show that the mean levels of SWB, wellbeing, and QOL in the sample are low. These contrasting findings shows that adopting this approach to defining dual-factor model of mental health cut-offs in an earthquake-affected community is not appropriate as it essentially skews the distribution and does not accurately reflect mental health and wellbeing.

Limitations

The findings of this study need to be considered in light of several methodological limitations that confine the conclusions/generalisations that can be drawn from the study results.

Potential bias. Two key sources of potential bias in this study that may influence the reliability of the results have been identified; these include sampling bias and selection bias.

The generalisability of the study findings is limited by the representativeness of the sample of adolescents who took part in this survey. Within the study sample, Year 9 and 10 adolescents were proportionately over-represented, whereas Year 11, 12, and 13 adolescents were proportionately under-represented. This is a potential issue because

significant year level effects were identified in statistical analyses for some of the survey variables measured. Year 9 and 10 adolescents were significantly more likely to report positive SWB, lower risk of poor wellbeing, and lower levels of psychological distress than Year 11, 12, and 13 adolescents. This is likely to have skewed mean scores for these variables, resulting in an under-estimate of poor mental health in this sample. This reduces the generalisability of findings to the wider secondary adolescent population within both the participating secondary schools and other Christchurch secondary schools. Had the sample been larger and more representative of the year level distribution within secondary schools it is possible that the mean SWB and risk of poor wellbeing scores would have been lower, and the mean score on risk of psychological distress higher.

Conclusions about the representativeness of the sample and therefore the generalisability of the results are also compromised by the limited measurement of demographic variables in the survey. Gender, ethnicity, and socio-economic status (SES) were not measured in the survey in order to protect the anonymity of the respondents. Furthermore, one of the aims during the study development was to keep the survey as brief as possible to maintain adolescent's interest and encourage successful completion of all questions. Additionally, the measurement of these demographic factors was not considered especially salient to the key research objectives of the study; namely, to gain an overview of the holistic mental health and wellbeing of adolescents attending the participating schools, as well as information about social and environmental risk factors rather than to identify potentially at-risk groups based on gender, ethnicity, or SES. One pitfall of this approach however are the limitations it places on the use of comparative analysis to establish the representativeness of the sample. Only year level and age could be used to assess the representativeness of the sample to other samples studied, and to the demographic

characteristics of the secondary adolescent population in both the participating schools and Christchurch secondary schools more widely. Gender, ethnicity, and SES differences have been reported to be associated with mental health in some previous studies of earthquake-affected adolescents (e.g. Cadichon et al., 2017; Rubens et al., 2018; Wang et al., 2013); there is some risk therefore of bias in the survey findings related to over- or under-representation of individuals of different genders, ethnicity and/or SES, and therefore over- or under-estimation of poor mental health.

Another source of possible bias arises from the convenience sampling used to acquire survey respondents. The survey was voluntary and adolescents self-selected whether or not to participate. Those who did choose to respond had to have a certain level of motivation to do so, particularly as there was no overt incentive for responding. It is possible that the wellbeing, mental health, and protective and risk factors of those adolescents motivated to complete the survey differed from those who did not complete the survey. Convenience sampling is a well-recognised source of potential bias in psychological research (Barker et al., 2016; Coolican, 2017); however, concerns about potential bias have to be balanced against the ethical requirement to protect the privacy of respondents in an anonymous survey, particularly in exploratory epidemiological research such as this where in-depth intervention is not offered as part of the study.

Reliance on self-report. The sole reliance on self-report without triangulation from other sources is a potential threat to the reliability of the survey results. While self-report is acknowledged as one of the most suitable methods for capturing subjective thoughts, feelings, and evaluations (Barker et al., 2016), there is a risk that the responses provided are not accurate or reliable. It is noted however that in the present study the internal reliability of the three scales included within the survey was very high (WHO-5 $\alpha = .904$, PWS $\alpha = .817$,

PDS $\alpha = .855$). This suggests that adolescents responded consistently to the 15 items used to inform these scales. In order to strengthen the self-report findings of this study, and further examine reliability, collateral information from different sources, such as interviews, focus groups, teacher reports, or parent reports, could be gathered in future research.

Survey timing. The survey was forwarded to adolescents during a potentially elevated time of stress associated with National Certificate of Educational Achievement (NCEA) examinations. During late-October to November, Year 11, 12, and 13 adolescents in the participating schools were preparing for and sitting final NCEA examinations. The elevated stress and pressure often associated with final examinations may have reduced positive feelings of associated with SWB and therefore negatively influenced ratings on some survey items, such as “getting on well at school”, “being able to pay attention”, “feeling nervous”, “feeling fresh and rested” or “full of energy”. The survey timing may also be one explanation for the under-representation of Year 11, 12, and 13 adolescents within the study sample; it is probable that NCEA examinations were a higher priority for these adolescents than responding to a voluntary survey.

Cross-sectional design. Cross-sectional research limits the conclusions that can be made about the stability of findings over time, causality, and direction of relationships between variables (Barker et al., 2016). While significant correlations were found between the survey variables measured, the results do not show whether one variable caused changes in another or vice versa. For example, the available data and analyses do not show whether good levels of school connectedness promote good wellbeing, QOL and low risk of psychopathology; or, whether adolescents who report being happy, positive and able to function well attract more care and support in the school environment, which bolsters their sense of school connectedness. These limitations could be overcome with repeated

administration of the survey throughout the academic year to track changes in mental health and wellbeing, however the anonymous nature permits only the measurement of trends rather than tracking of unique variable relationships particular to specific individuals. Some of the limitations associated with cross-sectional research are difficult to overcome in anonymous surveys where repeated measures of individual adolescents cannot be undertaken.

Implications for Future Research

The key findings and limitations of this current study highlight the need for repeated-measure longitudinal research to further investigate issues of causation, directionality, and stability across time. The risk and protective factors measured are significantly related to the mental health and wellbeing outcomes measured, however the data collected do not allow conclusions to be made about whether these factors precede different outcomes. Attempts to better understand these relationships through repeated measures over time will help to clarify the role of these risk and protective factors, and the potential mechanisms through which they influence mental health and wellbeing.

School connectedness, social support, and future expectations about QOL appear to be key protective factors that related to good mental health and wellbeing in earthquake-affected adolescents. Further research examining how and why some adolescents have better levels of school connectedness and social support, and higher expectations for future QOL are key to better understanding how to bolster these protective factors in adolescents that are not doing so well. Improved understandings will be helpful in the planning and delivery of programmes aimed at improving adolescent mental health and wellbeing. Efforts must be made to consider how best to bolster a sense of connectedness and support in the school setting and with family and friends, as well as a hope for the future in trauma-

affected adolescents. Particular attention needs to be given about how to do this in an environment of ongoing adversity and stress where adolescents are potentially exposed to further trauma. Promotion of hope for the future is a particular challenge that needs to be addressed as local practitioners and researchers may be weary, stressed, and traumatised by continuing to live in earthquake-affected communities. Future research must therefore consider how to incorporate aspects of selfcare and support for practitioners and researchers carrying out their work in challenging environments.

The findings of this study highlight the inter-relatedness of psychopathology and wellbeing; however, the fit of the dual-factor model of mental health was not typical due to the low mean wellbeing in the sample. It appears that measurement of psychopathology and wellbeing is critical to understanding the holistic mental health of earthquake-affected adolescents and future research efforts may be usefully directed towards more advanced statistical analysis of these variables, such as latent profile analysis. Jieling and Xinchun (2017) have demonstrated the benefits of such an approach in their research examining the co-existence of PTSD and PTG in earthquake-affected adolescents where specific groups of adolescents were able to be described, each with different levels of functioning.

Implications for Practice

The results of this study highlight the capacity of some earthquake-affected adolescents who have experienced ACEs to enjoy high levels of mental health and wellbeing. This is particularly so for adolescents who feel cared for by people at their school, who have trusted friends or family they can turn to during hard times, and who can think positively about their future. In practice this suggests that there are modifiable social and environmental factors that can be targeted to improve the mental health and wellbeing of adolescents who are currently doing poorly, even if they have been exposed to many ACEs

and stress in the post-earthquake period. This provides hope for those working in education, social services, and specialist mental health services that even severely traumatised adolescents can experience positive outcomes with the right social and environmental conditions. School connectedness, social support, and positive thinking about the future related significantly to mental health and wellbeing outcomes, suggesting that they can buffer the negative effects associated with high numbers of ACEs. This has implications for school-wide and individual approaches to ameliorating poor levels of holistic mental health and wellbeing in earthquake-affected adolescents with high mean levels of ACEs living in stressful, damaged, and changing environments. It appears crucial that a sense of connectedness and social support are promoted.

The findings of this study also identified that there is value in screening for symptoms of psychopathology and wellbeing when assessing adolescent mental health and functioning in the school setting. There were a large number of adolescents at risk of poor functioning and long-term outcomes because their mean levels of wellbeing were extremely poor despite not reporting symptoms of psychopathology. Dual-factor research has consistently shown that these asymptomatic but discontent adolescents function more poorly than mentally healthy adolescents with similar levels of psychopathology (Antaramian et al., 2010; Lyons et al., 2012; Suldo & Shaffer, 2008; Suldo et al., 2016). Taking a dual-factor approach to screening and assessment of adolescents in the school setting may help to better identify those adolescents requiring support to protect their wellbeing and mental health, allowing them to meet their potential by functioning well and flourishing.

Conclusion

The objective of this study was to describe the holistic mental health and wellbeing of earthquake-affected adolescents using a dual-factor theoretical framework that

incorporates considerations of both psychopathology and SWB. To date, academic research in this subject area has predominantly focused on describing psychopathology in earthquake-affected adolescents, and risk factors that increase the likelihood of poor mental health. The present study therefore provides a preliminary contribution towards describing and examining mental health in earthquake-affected adolescents in a way that is more congruent with established conceptualisations of mental health as constituting both the absence of psychopathology and the presence of positive wellbeing.

The present study also makes a small contribution to understandings of the synergistic effects of risk and protective factors on holistic mental health and wellbeing in earthquake-affected adolescents. Results of the study show that many of the adolescents living within severely earthquake-affected communities report low levels of wellbeing and QOL seven and a half years post-earthquake. From a dual-factor perspective, there is an over-representation of asymptomatic but discontent and mentally unhealthy adolescents compared to the general population, suggesting that there are many adolescents living in post-earthquake communities that are not reaching their potential and that therefore require support. Results do also show however that those adolescents who report high levels of school connectedness, social support, and high expectations of future QOL are more likely to report positive wellbeing and QOL, and less likely to report psychological distress even when they have experienced ACEs.

These findings provide some initial ideas about the personal, social, and environmental factors worth harnessing and building on to support future efforts to improve the mental health and wellbeing of Christchurch adolescents living in post-earthquake communities.

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Appendices

Appendix A: Paper Version of the Secondary Students Wellbeing Survey

Secondary Students Wellbeing Survey



We are interested in understanding more about the wellbeing of secondary school students in Christchurch – we want to hear from as many students as possible so that we can be sure we have a good idea of how things are going for Christchurch secondary students at the moment. Your participation in this survey is voluntary – all responses will be kept completely anonymous and confidential. You can skip any questions you don't want to answer.

1. What is your current year level?

Please circle your answer from the following options.

Year 9

Year 10

Year 11

Year 12

Year 13

2. Our wellbeing and mood over the last two weeks can affect how we see our life and how we experience our health and learning. Your answers to these questions will assist us to understand your recent feelings.

For each statement, please tick the box that is closest to how you have been feeling over the last two weeks.

Over the last two weeks...	All of the time	Most of the time	More than half the time	Less than half the time	Some of the time	At no time
I have felt cheerful and in good spirits...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I have felt calm and relaxed...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I have felt active and vigorous/full of energy...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I woke up feeling fresh and rested...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
My daily life has been filled with things that interest me...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3. The following questions are about your emotional health

For each statement, please tick the box that is closest to how you have been feeling over the last two weeks.

Over the last week...	Always	Very Often	Quite often	Seldom/hardly ever	Never
have you got on well at school?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

have you been able to pay attention at school?

have you had fun with your friends?

4. Do you feel like people at this school care about you?

Please circle the option that best describes how you feel.

Always Very often Quite often Seldom/hardly ever Never

5. Sometimes we naturally have other types of feelings. These questions are about those feelings.

For each question, please tick the box that best describes your answer.

	Never	Seldom/ hardly ever	Quite often	Very often	Always
Over the last week...					
have you felt sad?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
have you felt lonely?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	Rarely or never	About every month	About every week	More than once a week	About every day
Over the last six months...					
how often have you felt low?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
how often have you felt nervous?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
how often have you felt irritable or in a bad temper?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6. Many secondary students have experienced life events that are stressful. These events can affect health and learning. Please read the following statements and keep count of the total number that apply to you.

Have you ever:

- Lived with a parent or caregiver who was divorced or separated?
- Lived with a parent or caregiver who died?
- Lived with a parent or caregiver who served time in prison?
- Lived with anyone who was mentally ill or suicidal or severely depressed for more than a couple of weeks?
- Lived with anyone who had a problem with alcohol or drugs?
- Witnessed a parent, caregiver or other adult in the household behaving violently toward another (for example slapping, hitting, kicking, punching or beating each other up)?
- Been the victim of violence or witnessed any violence in your neighbourhood?
- Experienced economic hardship somewhat often or very often (i.e., your family found it hard to cover the costs of food and housing)?

How many of the above statements apply to you?

Please circle your answer from the options below.

1 2 3 4 5 6 7 8 9 10

7. The Christchurch earthquakes affected many people. Did you live in Christchurch during the earthquakes?

Please circle your answer from the options below.

Yes

No

8. People may support and help each other through difficult times. This question is about your feelings about your supports.

Please tick the box that best describes how you feel about the following statement.

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
I have a trusted friend or family member who can help me through hard times.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

10
9
8
7
6
5
4
3
2
1
0

9. Assume the ladder to the left is a way of picturing your life. The top of the ladder represents the best possible life for you. The bottom rung of the ladder represents the worst possible life for you.

At which rung-number on the ladder do you feel you personally stand right now?

Please circle the rung number from the options below. Remember 0 represents the worst possible life for you and 10 represents the best possible life for you.

0 1 2 3 4 5 6 7 8 9 10

Where do you expect to be five years from now?

Please circle the rung number from the options below. Remember 0 represents the worst possible life for you and 10 represents the best possible life for you.

0 1 2 3 4 5 6 7 8 9 10

10. How old are you now?

Please circle how many years old you are.

11 12 13 14 15 16 17 18 19

Thank you so much for taking our survey!!

If you are upset or have concerns about some of the things you have been asked in the survey please talk to your parents or your school counsellor. Or, if you require urgent support, you can free phone CAF-Emergency on (0800) 218 219 (press option 2).

Appendix B. Number of Items Completed within the Survey, WHO-5, PWS and PDS by Respondents

Measure	Number of items completed	Frequency (%) of Respondents	
		n	(%)
Secondary Students Wellbeing Survey	22	234	(59.2%)
	21	45	(11.4%)
	20	13	(3.3%)
	19	9	(2.3%)
	18	6	(1.5%)
	17	1	(0.3%)
	16	4	(1%)
	15	4	(1%)
	14	3	(0.8%)
	13	4	(1%)
	12	3	(0.8%)
	11	5	(1.3%)
	10	2	(0.5%)
	9	1	(0.3%)
	8	1	(0.3%)
	7	2	(0.5%)
	6	3	(0.8%)
	5	4	(1%)
	4	9	(2.3%)
	3	10	(2.5%)

Measure	Number of items completed	Frequency (%) of Respondents	
		n	(%)
	2	16	(4%)
Secondary Students Wellbeing Survey	1	16	(4%)
WHO-5	5	328	(83%)
	4	8	(2%)
	3	7	(1.8%)
	2	10	(2.5%)
	1	11	(2.8%)
	0	31	(7.8%)
Psychological Wellbeing Scale	5	317	(80%)
	4	16	(4%)
	3	1	(0.3%)
	2	6	(1.5%)
	1	4	(1%)
	0	51	(12.9%)
Psychological Distress Scale	5	294	(74.4%)
	4	12	(3%)
	3	8	(2%)
	2	8	(2%)
	1	6	(1.5%)
	0	67	(17%)

Appendix C. Response Rates and Types per Survey Item

Item #	Description	Frequency and Percentage of Response Type		
		Responded	Skipped Item	Exited Survey
1	School Code	395 (100%)	0	0
2	Year Level	368 (93.2%)	25 (6.3%)	2 (0.5%)
3	WHO-5 Q1	363 (91.9%)	29 (7.3%)	3 (0.8%)
4	WHO-5 Q2	352 (89.1%)	42 (10.6%)	1 (0.3%)
5	WHO-5 Q3	337 (85.3%)	57 (14.4%)	1 (0.3%)
6	WHO-5 Q4	339 (85.8%)	56 (14.2%)	0
7	WHO-5 Q5	335 (84.8%)	59 (14.9%)	1 (0.3%)
8	School Support	323 (81.8%)	72 (18.2%)	0
9	PWS Q1	326 (82.5%)	69 (17.5%)	0
10	PWS Q2	332 (84.1%)	63 (15.9%)	0
11	PWS Q5	334 (84.6%)	61 (15.4%)	0
12	PDS Q1	324 (82%)	70 (17.7%)	1 (0.3%)
13	PDS Q2	319 (80.8%)	76 (19.2%)	0
14	PDS Q3	306 (77.5%)	89 (22.5%)	0
15	PDS Q4	306 (77.5%)	88 (22.3%)	1 (0.3%)
16	PDS Q5	309 (78.2%)	86 (21.8%)	0
17	ACES	293 (74%)	101 (25.6%)	1 (0.1%)
18	EQ Exposure	305 (77.2%)	90 (22.8%)	0
19	Social Support	305 (77.2%)	90 (22.8%)	0
20	QOL-Current	296 (74.9%)	99 (25.1%)	0
21	QOL-Future	291 (73.7%)	104 (26.3%)	0
22	Age (years)	303 (76.7%)	92 (23.3%)	0