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SEARCH

Psychosocial factors associated with the mental health of Indigenous children living in high income countries

A systematic review

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A C K N O W L E D G E M E N T S

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Background

Indigenous children living in high income countries such as Australia, New Zealand, Canada and the United States of America (USA) are disproportionately affected by mental health problems when compared to their non-Indigenous counterparts.[1-5] Childhood mental health disorders such as anxiety, depression and externalising behaviours are associated with a range of negative outcomes that are overrepresented in Indigenous communities. These include high rates of suicidal ideation and completion.[6,7] The long-term sequelae of poor childhood mental health is believed to significantly contribute to the many health and social 'gaps' between Indigenous and non-Indigenous populations that occur throughout the lifespan.[8]

While the aetiology of childhood mental health disorders is likely to involve multiple determinants, the impact of European colonisation constitutes an additional, pervasive risk factor for Indigenous children living in Australia, New Zealand, Canada and the USA. For these children, colonisation and subsequent cultural marginalisation are believed to be the "cause of causes",[9] impacting negatively on children's mental health through low socio-economic families and communities, experiences of discrimination, and exposure to the psychological effects of intergenerational trauma and inequality.[10]

However, despite the presence of these factors many Indigenous children are 'resilient' and show positive adaption even in the presence of considerable adversity.[11] Resilience is argued to be manifested through a combination of protective factors broadly including, individual traits, positive familial relationships, and the influence of community and culture.[12-14] Resilience is an area that is receiving increasing interest from Indigenous groups and researchers given the adversities Indigenous populations face and the potential of resilience research to inform initiatives to improve long-term mental health outcomes.[11,15]

The aim of this systematic review was to identify modifiable psychosocial risk and protective factors, common to Indigenous children living in Australia, New Zealand, Canada and the USA that are associated with mental health outcomes typically associated with school-aged children. The results may aid the design of initiatives to improve the mental health of Indigenous children and identify areas for further research.

Methods

ELIGIBILITY CRITERIA

Peer-reviewed, English language studies that reported quantified relationships between psychosocial variables and mental health outcomes in Indigenous children were eligible. School-aged samples (mean ages between 5 and 18 years) from the four 'CANZUS' (Canada, Australia, New Zealand, USA) countries were included, with studies including participants over 21 years excluded. Given differences in the environmental and social challenges Indigenous populations living within the Arctic Circle experience[16] compared to other Indigenous communities, studies involving these populations were also excluded. Studies investigating multiple ethnic groups were included if a separate quantitative analysis was provided for the Indigenous sample.

Given the potential of evolving social and political landscapes to effect changes in the health of Indigenous minority groups, only papers published in the last 20 years (1996 to January 2016) were included. In keeping with this review's focus of modifiable factors associated with mental health, studies measuring congenital disorders or mental disability were excluded. Due to current controversies surrounding the diagnosis of Attention Deficit Hyperactivity Disorder (ADHD),[17] associations between psychosocial variables and an ADHD diagnosis were not included. Delinquent behaviour, eating disorders and suicidal ideation were also not included. Studies that used recruitment strategies leading to over-sampling high risk populations were not included (e.g. clinical or incarcerated samples).

LITERATURE SEARCH

We conducted a literature search using MEDLINE, PsychINFO, Embase, and Scopus databases. Details of the literature search are available online (Appendix A). The first author screened papers for eligibility by reading abstracts and, where necessary, the full text. A second reviewer (C.H) independently read 25% of the papers and compared with the first author. Disagreements were resolved by discussion. Reference lists were examined from included papers to identify potentially eligible studies.

ANALYSIS PLAN SUMMARY

The aim was to determine the associations between independent psychosocial variables and common childhood mental health outcomes. Due to the considerable heterogeneity in how these variables were conceptualised and measured, and in the statistical methods employed to assess relationships, calculation of summary estimators (meta-analysis) was neither possible nor appropriate. Instead, a two-stage process was used to assess the strength of association between psychosocial variables and mental health.

To begin, independent variables that measured commonly occurring and thematically similar psychosocial constructs were grouped into 'domains' (e.g. psychosocial variables measuring 'family income' and 'caregiver's education' were both considered to be variables that measured the domain: 'socioeconomic status'). The first stage involved making an overall judgement whether each individual study provided evidence for an association between a domain and: good mental health, poor mental health, or showed a negligible or inconsistent association. The second stage involved assessing the quality of evidence associating each domain with mental health, as measured by multiple studies, using the Grades of Recommendation, Assessment, Development, and Evaluation (GRADE)[18] guidelines. For example, associations between the domain 'scholastic ability' and mental health were measured in eight studies. Four studies provided evidence for an association between

children's scholastic ability and good mental health outcomes, one study showed an association with poor mental health, and three studies showed negligible associations. Using the GRADE guidelines this evidence was rated as being 'very low'.

A more detailed description of the independent and dependent variables, domains, methods of data extraction and applying the GRADE guidelines are given below.

Psychosocial variables

Psychosocial variables were defined as any quantifiable measure of children's psychological traits, abilities, and family or community environments. The first author grouped psychosocial variables into commonly occurring domains. Domains that were measured in fewer than four studies were not included in this analysis.

Mental health outcomes

Childhood and adolescent mental health is often defined by the presence or absence of symptoms of internalising and/or externalising disorders.[19,20] Internalising disorders describe adverse mental health states that are inner-directed, including depression, anxiety, and withdrawal. In contrast, externalising disorders are outer-directed and manifest as maladaptive behavioural problems including antisocial, oppositional and aggressive behaviour. We defined mental health as any quantitative measure of internalising, externalising symptoms and/or measures of positive mental health (e.g. self-esteem) typically associated with school-aged children.

Resilience is described as positive adaption despite the presence of adversity.[21] Studies that measured associations between psychosocial variables and mental health outcomes in conjunction with elevated levels of adversity were also deemed to measure 'resilient' mental health outcomes.

DATA EXTRACTION

Bivariate and multivariable analyses of a domain variable's association with mental health were extracted from each study, including the statistic used, the magnitude and direction of the association, the p-value and the confidence interval (where given). When path analysis was employed, only associations from the best fitting model were included. Similarly, when multiple statistical models progressively introduced confounders, only statistics from the final modal were included. Longitudinal and cross-sectional data were both included. Interactions were not recorded; however, because the construct of resilience is often defined as an interaction between differing levels of adversity and independent variables, interactions that were deemed to measure resilience were included. When multiple papers reported results from the same data set, variables measuring the same domain were treated as belonging to a single study.

Stage one: Individual studies

Each study was independently assessed by two authors (CY, CH) to ascertain whether it provided evidence for an association between a psychosocial domain and: good mental health, poor mental health, or a negligible or inconsistent association. When only one association between a psychosocial variable and a mental health outcome was reported in a single study, statistical significance was used to determine evidence for an association. When domains were measured by more than one psychosocial variable and/or multiple mental health outcomes were used within a single study; the number of statistically significant associations, the magnitude and direction of effects and the number of comparisons were all considered before making a judgement regarding an association. Measures of both positive (e.g. self-esteem) and negative (e.g. depression) mental health

were considered together in order to determine the overall association between domain variables and mental health. Disagreements were resolved via discussion.

Stage two: Evidence appraisal

We used the Grades of Recommendation, Assessment, Development, and Evaluation (GRADE)18 guidelines to rate the quality of evidence within each domain. The GRADE guidelines rate evidence as being 'very low', 'low', 'moderate' or 'high' depending on four categories of investigation: risk of bias, inconsistency, indirectness, and if reasons to rate up the strength of evidence exist ('imprecision' was not assessed given the relatively small number of studies that reported confidence intervals). Observational studies start at 'low' quality and could be rated up or down depending on the quality of evidence. In accordance with the GRADE recommendations, domains that had been rated down for any reason were not eligible to be rated up. Two authors (CY, CH) independently assessed all elements of the GRADE evidence profile, discrepancies were resolved by discussion.

Risk of Bias: Risk of bias was first assessed in individual studies using the Newcastle-Ottawa Scale (NOS) adapted for cross-sectional studies.[22] This scale measures potential sources of bias on a 10 point scale. Risk of bias is deemed to be present if the sample size is not justified or unsatisfactory,[23] if the sample is unrepresentative of the target population, if inappropriate or un-validated measurement tools have been used, if theoretically important variables were not controlled for (SES, and age and gender), and if inappropriate or unclear statistical tests were employed. We set the following criteria for judging risk of bias: 9-10 points = low risk; 7-8 points = medium risk; ≤6 points = high risk. Domains that included a majority of high risk studies were considered to be at serious risk of bias and were rated down.

Inconsistency: Inconsistency was deemed to be present when large differences between point estimates and/or confidence interval ranges were observed among studies that measured the same psychosocial domain. Domains were always rated as inconsistent if different studies measuring the same domain produced significant but conflicting associations with mental health outcomes (note: this did not include negligible associations).

Indirectness: Indirectness was deemed to be present if study populations were not representative of all the geographical regions (i.e. data was available for less than three of the five study regions). A body of evidence rated down this way did not necessarily mean that the quality of evidence was low per se, but instead should be interpreted that the evidence was not representative of the majority of geographical regions.

Rating up the quality of evidence: Provided that there were no reasons to rate evidence down, the quality of evidence for each domain could be rated up if: the majority of studies reported medium or large effect sizes, if a dose-gradient effect was observed, or if the majority of studies controlled for confounding variables that could plausibly reduce the magnitude of the effect. We followed conventional rules of thumb for effect sizes[24] and deemed medium effect sizes as: Cohen's d = 0.5, zero-order correlation coefficient r = |0.3|, and odds ratios = 2 or 0.5; large effect sizes were defined as Cohen's d = 0.8, zero-order correlation coefficient r = |0.5|, and odds ratios = 5 or 0.2. All other statistics were interpreted within the context of the study.

Using the above heuristics two researchers (C.Y, C.H) independently appraised the effect sizes reported in each study. Effect sizes were rated as being 'small', 'medium', 'large', 'negligible' or 'inconsistent'. When more than one statistic was reported, the range of effect sizes was recorded. Using the same method, a qualitative summary of the range of effect sizes, per domain, was made by the researchers.

For example, a study by Whitbeck et al.[25] investigated substance abuse among American Indian children. In this case the domain, 'substance use' is indicated by three variables: "alcohol problems", "alcohol abuse" and "number of substances used in the past month". Mental health was indicated by measures of withdrawal, somatic complaints and

anxiety/depression (all symptoms of internalising). This study provided three independent variables and three dependent variables, yielding nine associations between the domain ‘substance use’ and mental health. The variable “number of substances used in the past month” was found to be significantly correlated with mental health variables: “somatic symptoms” and “anxiety/depression” (r’s = 0.16 and 0.27, respectively). All other correlations were positive but non-significant. Given the absence of conflicting evidence, and the two significant correlations, this paper is deemed to have provided evidence of an association between the domain ‘substance use’ and poor mental health.

After appraising all other studies measuring the domain ‘substance abuse’, 8/9 studies measuring this domain were deemed to provide evidence for an association with poor mental health. Using the GRADE guidelines the quality of evidence was rated up from ‘low’ to ‘moderate’ due to the majority of studies adjusting for confounding factors, and the absence of any reason to rate down.

Results

SEARCH RESULTS

The results of the literature search are presented in Appendix A. Of the 159/492 studies independently assessed by the first and second author, four discrepancies were detected; however on closer inspection all of these studies met exclusion criteria and no further studies were assessed by the second author. Forty-seven studies were included in the review.

Study characteristics

The majority of studies were conducted in mainland USA (30, 64%) with Native American samples, 8 studies (17%) involved Indigenous Canadian samples (two studies assessed both American and Canadian Indigenous samples), 7 studies (15%) involved Australian Indigenous samples, and 4 (9%) studies involved Indigenous Hawaiian samples. No studies from New Zealand met inclusion criteria. All studies were observational; 39 studies (83%) used a cross-sectional design, 8 (17%) used a longitudinal analysis or a mixture of longitudinal and cross-sectional designs. Participants' ages ranged from 4-20 years. Most studies included children aged between 11-18 years (i.e. middle and/or high school-aged children). Sample sizes ranged from 65 to 13,454 participants. Measures of negative mental health outcomes were the most commonly assessed, measured in 41 (87%) studies. Internalising symptoms were measured in 27 studies (57%), externalising symptoms were measured in 14 studies (30%), global measures of mental health were measured in 14 studies (30%), and positive mental health was measured in 13 studies (28%). A summary of the included studies is provided in Appendix B.

Risk of bias

The results of the Newcastle-Ottawa scale assessment are presented in Appendix C. Scores ranged from 4 to 10 (median: 7). 12 papers (26%) were judged to have low risk of bias, 21 papers (45%) were judged to have medium risk of bias, and 14 papers (30%) were judged to have high risk of bias. 23 papers (49%) failed to report information regarding non-respondents or reported a response rate that was less than 75%, 37 papers (79%), failed to control for age and gender, and/or any socioeconomic variables, though most papers (36, 77%) controlled for at least one other variable, 14 papers (30%) used measures of mental health that were not culturally validated.

OVERALL OUTCOMES

Tables 1, 2 and 3 presents the GRADE evidence profile for individual, family and community level domains. Individual-level domain variables were reported in 40 studies (85%), family-level domain variables were measured in 25 studies (53%) and community-level domain variables were measured in 22 studies (47%). The median number of associations between a single psychosocial domain and mental health per paper was two (interquartile range: three). Figures 1, 2, and 3 show the number of studies that measured each individual, family, and community-level domain's association with mental health, respectively, and the proportion of studies, within each domain, associated with good mental health, poor mental health, or those that showed a negligible/ inconsistent association. Five papers from Australia used data from same large-scale study, (Western Australian Aboriginal Child Health Survey).[61,63,64,66,67] These papers were treated as a single study when they measured the same domain.

Individual-level domains

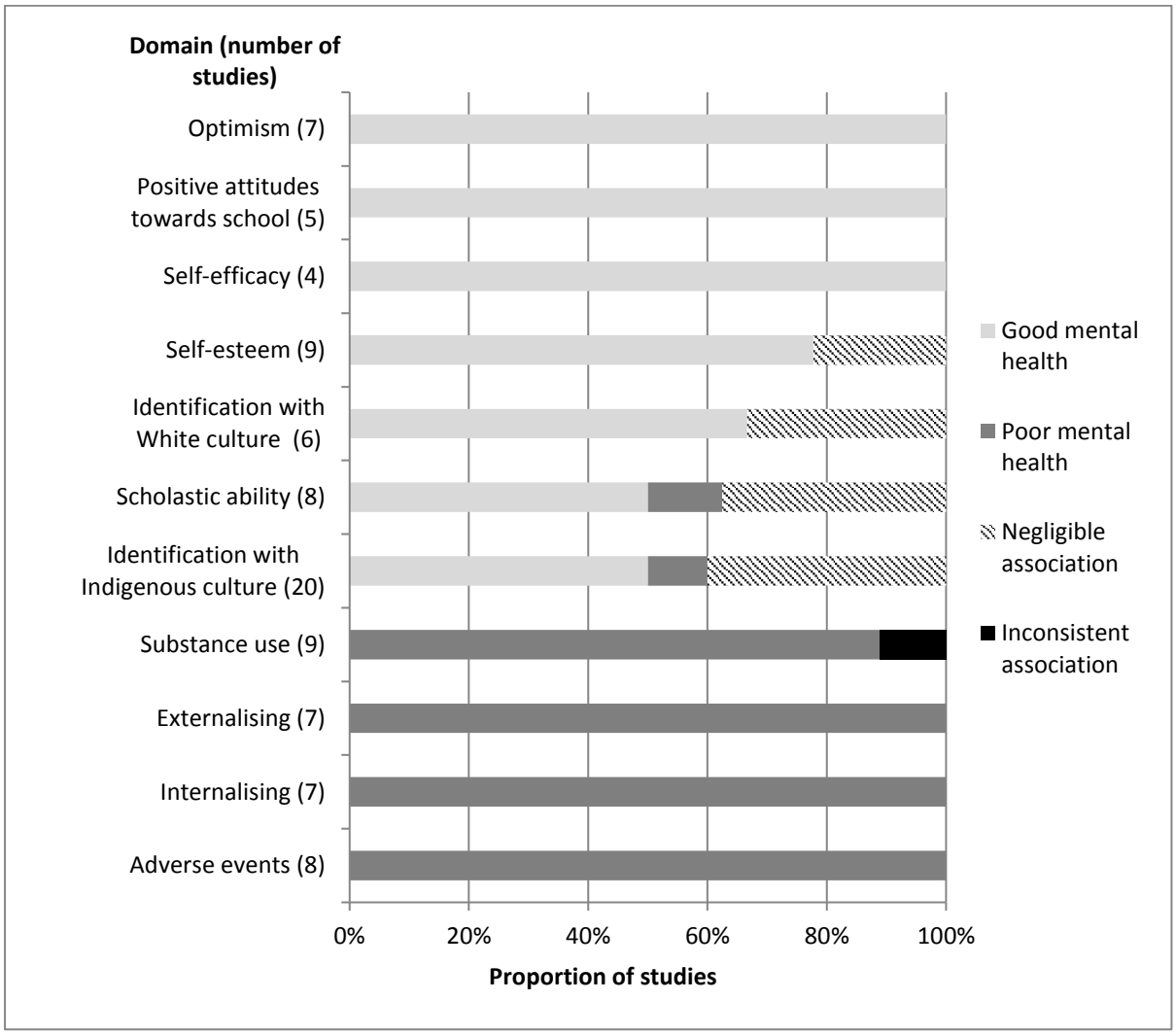
The Grade evidence profile for Individual level domains is summarised in Table 1, and illustrated at Figure 1.

Table 1. GRADE evidence profile for Individual level domains

Domain	Number of studies	Risk of bias	Inconsistency	Indirectness	Effect size summary	Quality	Comments
Optimism	7	No serious risk	No serious inconsistency	No serious indirectness	Small-medium	High	Rated up due to medium effects sizes and control of confounding factors
Attitudes towards school	5	No serious risk	No serious inconsistency	Serious indirectness	Small-medium	Very low	Rated down due to studies from the USA (mainland) only
Self-efficacy	4	No serious risk	No serious inconsistency	Serious indirectness	Small-Medium	Very low	Rated down due to studies from USA (mainland) only
Self-esteem	9	No serious risk	No serious inconsistency	No serious indirectness	Negligible-medium	Moderate	Rated up due to evidence of a dose-gradient effect
Identification with White culture	6	No serious risk	No serious inconsistency	Serious indirectness	Negligible-Small	Very low	Rated down due to studies from the USA (mainland) only
Scholastic ability	8	No serious risk	Serious inconsistency	No serious indirectness	Inconsistent	Very low	Rated down due to inconsistent findings.
Identification with Indigenous culture	20	No serious risk	Serious inconsistency	Serious indirectness	Inconsistent	Very low	Rated down due to inconsistent findings and the majority of significant results (9/10) being from the USA (mainland)
Adverse events	8	No serious risk	No serious inconsistency	No serious indirectness	Medium-Large	High	Rated up due to large effect sizes, a dose-gradient effect, and satisfactory control of confounding factors

Domain	Number of studies	Risk of bias	Inconsistency	Indirectness	Effect size summary	Quality	Comments
Externalising	7	Serious risk of bias	No serious inconsist	No serious indirectness	Medium	Very low	Rated down due to serious risk of bias
Internalising	7	No serious risk	No serious inconsist	No serious indirectness	Medium-Large	High	Rated up due to large effect sizes
Substance Abuse	9	No serious risk	No serious inconsistency	No serious indirectness	Small-Large	Moderate	Rated up due to control of confounding factors

Figure 1. Associations between individual-level domains and mental health



Optimism

Measured children's optimistic view of their future, positive affect and optimistic explanatory styles. Optimism was associated with better mental health outcomes in all studies (7/7) that

measured this domain.[31,32,47,48,51,59,70] Internalising symptoms were negatively associated with optimism in six studies.

Positive attitudes towards school

Measured children's positive view of school including feelings of school membership. Positive attitudes towards school were consistently associated with better mental health outcomes in all studies (5/5) that assessed this domain.[28,32,37,39,46] This domain was only measured in studies conducted in the USA (mainland).

Self-efficacy

Measured children's belief in their ability to achieve specific goals. Self-efficacy was associated with good mental health in all studies (4/4) that measured this domain.[40,45,49,51] Using a cross-sequential longitudinal design one study found increases in self-efficacy predicted decreases in depressive symptoms over a three year period.[45] This domain was only measured in studies conducted in the USA (mainland).

Self-esteem

Measured children's concept of their own self-worth. High self-esteem was associated with better mental health outcomes in 7/9 (78%) of the studies that measured this domain.[28,33,37,48,57,59,67] One study of Aboriginal Australian children showed a dose-gradient effect linking higher levels of self-esteem to greater odds of positive psychosocial functioning.67 Medium to high negative correlations between self-esteem and depressive symptoms were reported (correlation coefficients ranged from -0.26 to -0.71).

Identification with White culture

Measured the extent that Indigenous children saw themselves adopting or adapting to White cultural practices. Greater identification with White culture was significantly associated with better mental health outcomes in 4/6 (66.6%) studies.[37,42-44] This domain was only measured in studies conducted in the USA (mainland).

Scholastic ability

Measured children's academic achievement or general cognitive ability, Grade Point Average (GPA) scores were the most commonly used measure. Greater scholastic ability was significantly associated with better mental health outcomes in 4/8 (50%) studies,[46,51,55,70] however this domain's relationship with mental health was inconsistent with one study showing that higher GPA was significantly associated with increased depressive symptoms.[41] The highest quality study, a cohort-sequential design, provided evidence that depression negatively affects scholastic ability, not the other way around.[71]

Identification with Indigenous culture

Measured children's identification with their own Indigenous culture (e.g. participating in cultural activities, speaking an Indigenous language). This domain was found to be significantly associated with better mental health outcomes in 10/20 (50%) studies.[31,33,34,37,43,44,46,48,51,56] Conversely, 2/10 (20%) studies conducted in the USA (mainland) and Hawaii found this domain to be associated with poor mental health.[39,70] Identification with Indigenous culture appeared more strongly associated with measures of positive mental health (i.e. self-esteem, positive affect; significantly associated in 6/9 (67%) studies) than measures of negative mental health (significantly negatively associated in 5/14 (36%) studies).

Substance use

Measured children's use of illegal drugs and alcohol (tobacco use was not included). Substance use was associated with poorer mental health in 8/9 (88.9%)

studies.[25,27,32,37,38,49,62,68] Substance abuse was consistently associated with externalising and global measures of poor mental health (5/5 studies)[27,32,38,49,62], but was less consistently associated with depressive symptoms (4/8 studies).[25,37,62,68]

Externalising

Measured antisocial, aggressive and oppositional behaviours. All studies (7/7) that measured externalising symptoms found a positive association between this domain and other negative mental health outcomes.[25,33,37,49,53,56,68] Externalising symptoms were comorbid with symptoms of depression in 5/5 studies.[25,33,37,49,68] The evidence for externalising was rated down due to 4/7 (57%) studies being rated high risk of bias.[33,49,56,68]

Internalising

Measured internalising symptoms including anxiety, depression, withdrawn behaviour and suicidal ideation. All studies (7/7) that measured internalising symptoms found a positive association between this domain and other negative mental health outcomes.[25,28,32,38,49,59,68]

Adverse events

Measured children's exposure to events likely to cause substantial stress/psychological trauma (e.g. abuse, neglect). Children's experience of adverse events was associated with poorer mental health in all studies that measured adversity (8/8).[29,35,38,47,52,57,61,65] The evidence linking adverse events and negative mental health included large effect sizes (maximum odds ratio: 8.85; Cohen's d: 1.55) and two studies that reported a dose-gradient response between number of adversities and prevalence of poor mental health.[52,61]

Family-level domains

Family cohesion (positive)

Measured the quality of relationships children experienced within their immediate family including measures of family support and positive parenting styles. This domain was significantly associated with better mental health outcomes in 12/13 (92%) studies.[28,29,32,34-36,38,46,57,60,69,70]

Low family SES

Measured indices of socio-economic status including family income, caregiver's education and occupation, and housing quality/tenure. Low family SES was significantly associated with poor mental health in 3/9 (33%) studies.[53,64,69] Conversely, a Canadian study found that children of caregivers who had some postsecondary education were more likely to have a diagnosed psychological or nervous condition than those who did not have any post-secondary education.[60] An Australian study found an inconsistent relationship between SES variables 'household occupancy level' and 'number of homes lived in': the former being associated with less behavioural or emotional problems, but the latter being associated with more.[61] The remaining 3/9 (33%) studies showed negligible associations.

Atypical family structure

Measured whether children were raised by single caregivers or by family members other than the children's parents (e.g. aunts, uncles). Atypical family structure was associated with poor mental health in 3/7 (43%) studies.[61,63,69]

Caregiver's mental health/ behaviour (negative)

Included measures of caregiver's mental health problems, criminal activity, domestic violence and substance abuse. This domain was associated with poor mental health outcomes in 7/8 studies (88%).[26,30,32,52,54,61,69] Violence between caregivers, and parent's

anti-social behaviour produced the largest effects (bivariate odds ratios: 5.6 and 7.1, respectively).32,[52]

Family cohesion (negative)

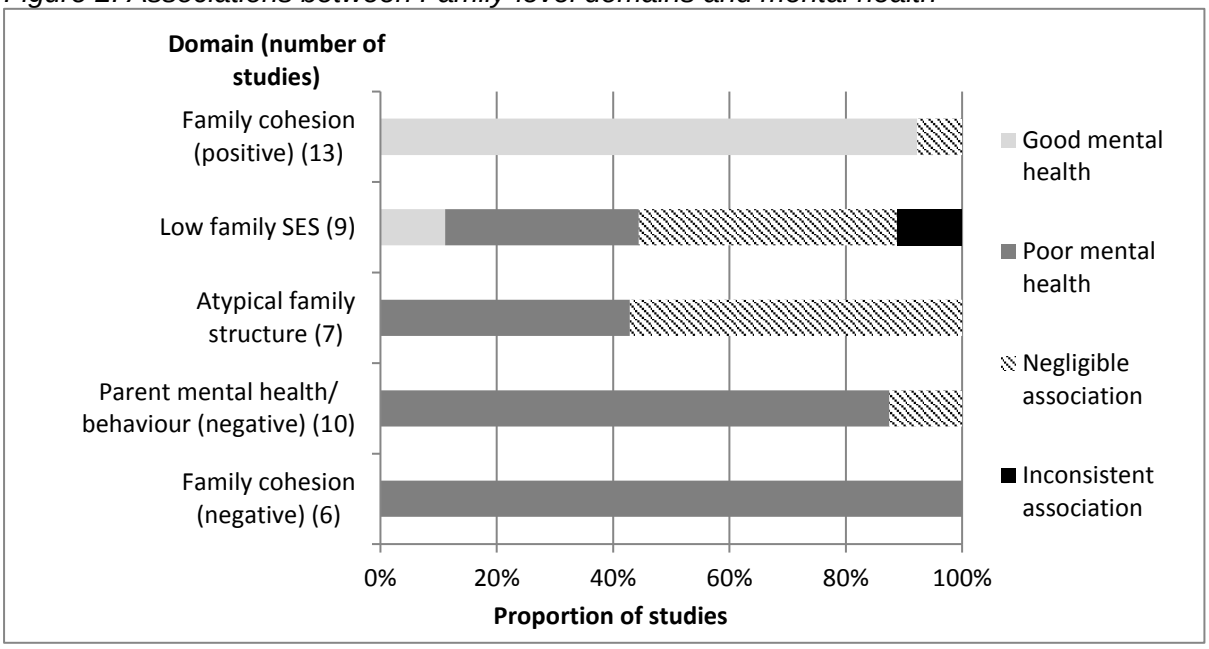
Measured poor relationships children had with their family, and harsh parenting practices. All studies (6/6) that looked at negative family cohesion found that this domain was associated with poor mental health.[33,35,38,52,57,61] Effect sizes were medium to large in all studies that reported them (one study did not report effect sizes).[35] Children who stated that they rarely had someone who showed them love and affection[57] or who reported more family conflict[33] showed the largest associations with poor mental health (odds ratio: 4.82, correlation coefficient: .55, respectively).

The Grade evidence profile for Family level variables is summarised in Table 2, and illustrated at Figure 2.

Table 2: GRADE evidence profile for family-level variables

Domain	**Number of studies**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Effect size summary**	**Quality**	**Comments**
Family Cohesion (negative)	6	No serious risk	No serious inconsistency	No serious indirectness	Medium-Large	High	Rated up due to large effect sizes and a dose-gradient effect
Family Cohesion (positive)	13	No serious risk	No serious inconsistency	No serious indirectness	Small-Large	High	Rated up due to medium/large effect sizes and a dose-gradient effect
Family SES	9	No serious risk	Serious inconsistency	No serious indirectness	Inconsistent	Very low	Rated down due to inconsistent findings
Atypical family Structure	7	No serious risk	No serious inconsistency	No serious indirectness	Negligible-Small	Moderate	Rated up due to control of confounding factors
Negative caregiver mental health, behaviour	8	No serious risk	No serious inconsistency	No serious indirectness	Small-large	High	Rated up due to medium effect sizes and the control of confounding factors

Figure 2. Associations between Family-level domains and mental health



Community level domains

Peer support (positive)

Measured the presence, and quality of prosocial relationships children had with their peers. All studies (5/5) that investigated positive peer support found an association between this domain and better mental health outcomes.[32,33,46,60,67]

Community cohesion (negative)

Measured negative elements of Indigenous children's community including violent or criminal activity in neighbourhood or school environments. Negative community cohesion was associated with poor mental health in 2/4 (50%) studies.[35,38] Only studies from USA (mainland) and Canada reported results relevant to this domain.

Discrimination

Measured children's experiences of racial discrimination. Discrimination was seen to be associated with poor mental health in 7/8 studies (88%).[25,34,35,44,52,53,62] Using an auto-regressive cross-lagged path design, a study of Native American and Canadian Indigenous groups concluded that discrimination caused subsequent aggression and not the other way around.[53]

Bullying

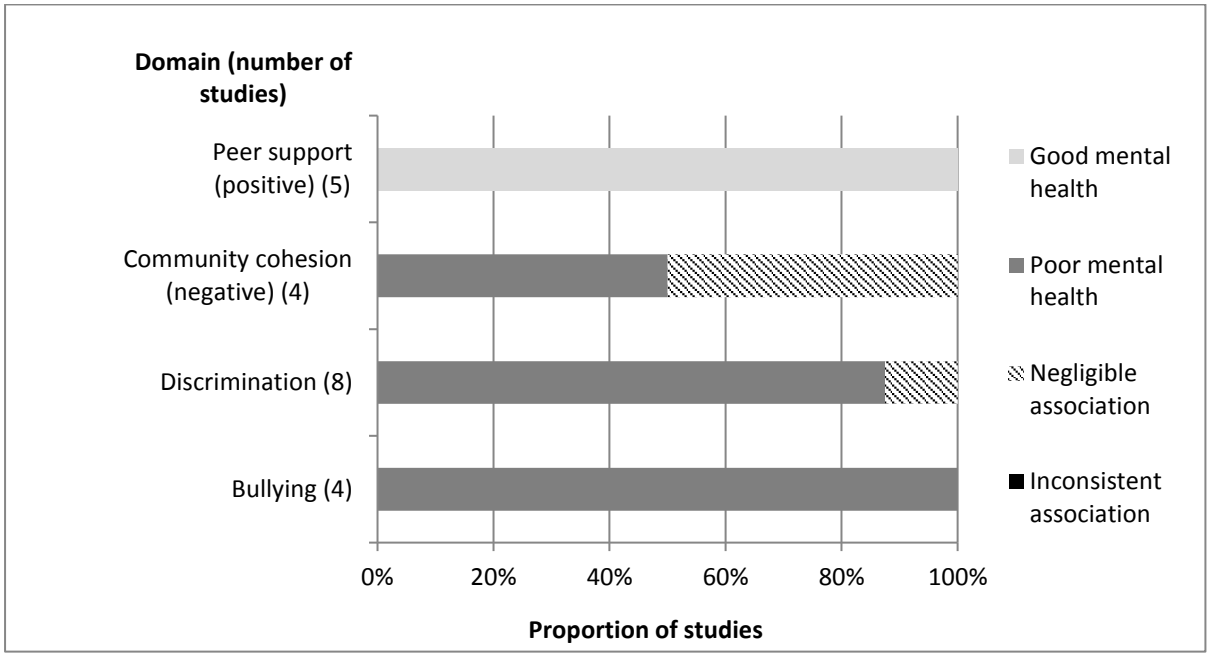
Measured whether the child experienced bullying. All studies (4/4) that measured this domain showed a significant association with poor mental health.[33,50,57,58] Only studies from USA (mainland) and Canada reported results relevant to this domain including one study that reported a dose-gradient response associating the amount of bullying to prevalence of depressed mood.[57]

The Grade evidence profile for Community level variables is summarised in Table 3, and illustrated at Figure 3.

Table 3. GRADE evidence profile for community-level variables

Domain	Number of studies	Risk of bias	Inconsistency	Indirectness	Effect size summary	Quality	Comments
Peer support (positive)	5	No serious risk	No serious inconsistency	No serious indirectness	Small-Medium	Moderate	Rated up due to medium effect sizes
Community cohesion (negative)	4	No serious risk	Serious inconsistency	Serious indirectness	Negligible-Large	Very low	Rated down due to studies from USA/Canada only and inconsistent findings
Discrimination	8	No serious risk	No serious inconsistency	No serious indirectness	Small-Medium	High	Rated up due to medium effect sizes and control of confounding variables
Bullying	4	No serious risk	No serious inconsistency	Serious indirectness	Small-Large	Very low	Rated down due studies from USA (mainland) and Canada only

Figure 3. Proportion and type of associations between Community-level domains and mental health



Resilience

Five studies provided a quantitative measure of adversity and mental health, fitting the inclusion criteria for 'resilience'. These included one Australian, one Hawaiian, and three

studies from the USA (Mainland). Of these, three studies specifically aimed to measure resilience,[34,67,69] two studies presented interactions that fit the resilience paradigm.[44,47]

Of the three studies conducted with Native American youths, resilient mental health was significantly associated with identification with Indigenous culture, maternal warmth, not experiencing discrimination,[34] optimistic explanatory styles[47] and identification with White culture (females only).[44] One Australian study found resilient Aboriginal youths were more likely to have higher self-esteem, be less likely to be involved in fights, have a prosocial friend, and be less likely to live in the top 50% of neighbourhoods, as rated by an index of neighbourhood SES.[67] A study of Hawaiian youths found that family support lessoned the likelihood of internalising symptoms in children experiencing multiple family adversities.[69]

Discussion

Any discussion of Indigenous disadvantage must first acknowledge the longstanding inequalities many Indigenous people continue to face, and the subsequent influence this is likely to have on all aspects of their lives.[72] Within this context, psychosocial risk factors may also be considered as outcomes of historical trauma.

This review found moderate to high level evidence for associations between a number of psychosocial domains and the mental health of Indigenous children living in high income countries. Of these, domains associated with better mental health outcomes included: children's positive cohesion with their family, higher self-esteem and optimism, and increased peer support. Domains associated with poorer mental health outcomes included: negative family cohesion, caregiver's negative mental health/behaviour, exposure to adverse events, discrimination, co-morbid internalising symptoms, and substance abuse. Children's negative family cohesion, experiences of adversity and comorbid internalising symptoms consistently produced medium to large effect sizes, predicting poorer mental health outcomes in all cases. Studies focused on adolescents, and predominantly measured symptoms of poor mental health. Given well documented disparities between Indigenous and non-Indigenous mental health, the relatively small amount of research that investigates the aetiology of Indigenous children's mental health is concerning.

Stable relationships between individual-level psychological factors and mental health outcomes indicate the importance of fostering optimistic attitudes, self-esteem and self-efficacy in Indigenous young people. Consistent with previous literature involving non-Indigenous samples, children who displayed internalising or externalising symptoms were considerably more likely to also exhibit other negative mental health symptoms.[73]

The association between children's identification with their Indigenous culture and mental health was the most commonly assessed relationship, reflecting the importance that community-led research and Indigenous mental health initiatives place on this connection.[74-76] This domain generally predicted better mental health outcomes however evidence for this association was inconsistent. Our review suggests that, in American Indian samples, identification with Indigenous culture more consistently predicted greater levels of positive mental health, than less negative mental health outcomes. This domain was also seen to be a factor that promoted resilient mental health in a sample of American Indian children,[34] indicating that cultural identification may be a protective factor when adversity is present; however this finding was not replicated in Australian Aboriginal children. Differences in the way cultural constructs are operationalized, and difficulties measuring this construct have been previously reported and may account for the heterogeneous findings.[77,78] Research that can identify the specific processes that allow Indigenous children's identification with their culture to protect against poor mental health is suggested as an area for further investigation.

Our results are consistent with findings from non-Indigenous research that show the important influence the familial environment has on children's mental health.[79-82] Of the 19 studies that measured family cohesion, 18 were judged to provide evidence for an association with mental health, including medium to large effect sizes reported in studies from all regions. Moreover, our results illustrate the clear correlation family cohesion has with mental health outcomes: positive cohesion predicted better mental health, whereas negative cohesion predicted worse mental health. Negative caregiver behaviour, such as criminal activity or the presence of domestic violence and poor mental health was also robustly associated with poorer mental health outcomes in children, as was the domain 'adverse events', which often included adversities that were directly related to parent's behaviour (e.g. neglect). Taken together, these results provide strong evidence that the quality of familial relationships and stable, supportive family environments are crucial to the mental health of Indigenous children. By contrast, low family SES and atypical family structures appeared less consistently associated with mental health. There is a large body

of evidence that shows SES is linked to children's mental health in non-Indigenous populations.[83-85] While, overall, this review supports these findings, socioeconomic and family structure factors do not appear to be as reliable predictors of mental health as the types of relationships and stability caregivers are able to provide for Indigenous children. It is possible that limited variation in Indigenous family's SES, due to ongoing disadvantage, reduced the strength of associations with mental health, resulting in negligible or weak associations.

At the community-level, discrimination and unhealthy peer relationships consistently predicted poorer mental health outcomes. Experiences of discrimination were associated with poor mental health, including evidence for a causal relationship with aggressive behaviour; however effect sizes were small to medium. This magnitude of effect is consistent with a recent meta-analysis that found an overall zero-order correlation of -0.20 (95% CI: -0.22 to -0.17) between perceived discrimination and mental health in minority groups.[86] We note that these effect sizes refer only to explicit discrimination and should be distinguished from implicit discriminatory attitudes/behaviours, as well as the historical effects of systemic racism.[87] The correlation between the quality of children's peer relationships and mental health outcomes provides further support for initiatives that encourage opportunities for healthy relationships to form, and seek to reduce the incidence of bullying within community and school environments.

Despite the growing call from Indigenous groups for more strengths-based research,[88,89] we found that a comparatively small amount of studies measured positive mental health outcomes, including only three studies that were specifically designed to assess resilience. Of these, significant associations were identified at the individual, family and community-level, supporting common theoretical frameworks that define resilience as a combination of proximal and distal influences.[13] 'Positive family cohesion' was the only domain significantly associated with resilience in more than one study.

This review highlights several important implications for policy makers, clinicians and Indigenous health researchers. Indigenous children's family environment appears a strong universal risk or protective factor for mental health outcomes, depending on the quality of relationships. Indigenous parents face a number of well-documented stressors that can lead to poor family environments.[90,91] Further, they face significant cultural and socioeconomic barriers that can prevent them from seeking and receiving adequate health services.[92,93] While there are programs in place to support caregivers of Indigenous children, given the high rates of mental illness, more needs to be done to enable caregiver's provision of positive, stable parenting for their children in safe, supportive family environments. This review also supports initiatives that seek to foster positive psychological attributes such as children's self-esteem, and aim to reduce the incidence of bullying, substance use and experiences of discrimination.

We identified only three studies that employed research methodologies specifically designed to assess the direction of causality.[45,53,71] While this type of research often requires greater resources to conduct, more research designed to assess causality can provide a richer understanding of the aetiology of Indigenous mental health that, in turn, can aid the construction of effective mental health initiatives.

This review contains a number of limitations. The heterogeneous manner in which both independent and dependent variables were conceptualised and measured prevented a more fine-grained analysis from being performed, and meant qualitative judgements of quantitative data were employed, potentially introducing bias. This review is vulnerable to publication bias that may result in an overestimate of the number of studies that show significant associations between psychosocial variables and mental health. Using statistical significance as a primary indicator of an association is problematic as studies that use large samples or employed multiple comparisons are more likely to report significant results. It is therefore likely that this method increased the chance of making a type I error and potentially contributed to a 'best case' scenario for detecting associations. Further, we

acknowledge that the reliance on arbitrary p value thresholds has been widely criticised.[94,95] We believe the inclusion of the GRADE evidence table and reporting effect sizes help provide a fuller picture of associations that are not based on p values alone. Most studies were conducted in the USA (mainland) restricting the generalizability of some domains to other Indigenous groups; similarly some domains were only measured in a small number of studies. Finally, it is possible that Western ideas and measures of psychopathology do not adequately map onto Indigenous concepts of mental health.[96] Given that the majority of studies used culturally validated measurement tools (measuring risk/protective factors and mental health outcomes) we are confident that the Indigenous concepts of mental health, for the most part, were adequately measured.

Large disparities between Indigenous and non-Indigenous health are unacceptable in high income countries that have both the resources and the responsibility to address this inequality. The results of this review emphasise important individual, family and community-level factors that comprise potential targets for health interventions. In particular, the strong evidence linking positive familial relationships and environments to better mental health outcomes support the design and implementation of more initiatives to strengthen Indigenous families. However, the lack of Indigenous mental health research, including the small number of longitudinal designs and strength-based research does not appear commensurate with the research and health needs of Indigenous communities. Given the disproportionately high rates of Indigenous mental health disorders and youth suicide, there is an urgent need to address this research gap and develop more evidence-based strategies to reduce the burden of poor mental health for Indigenous children and their communities.

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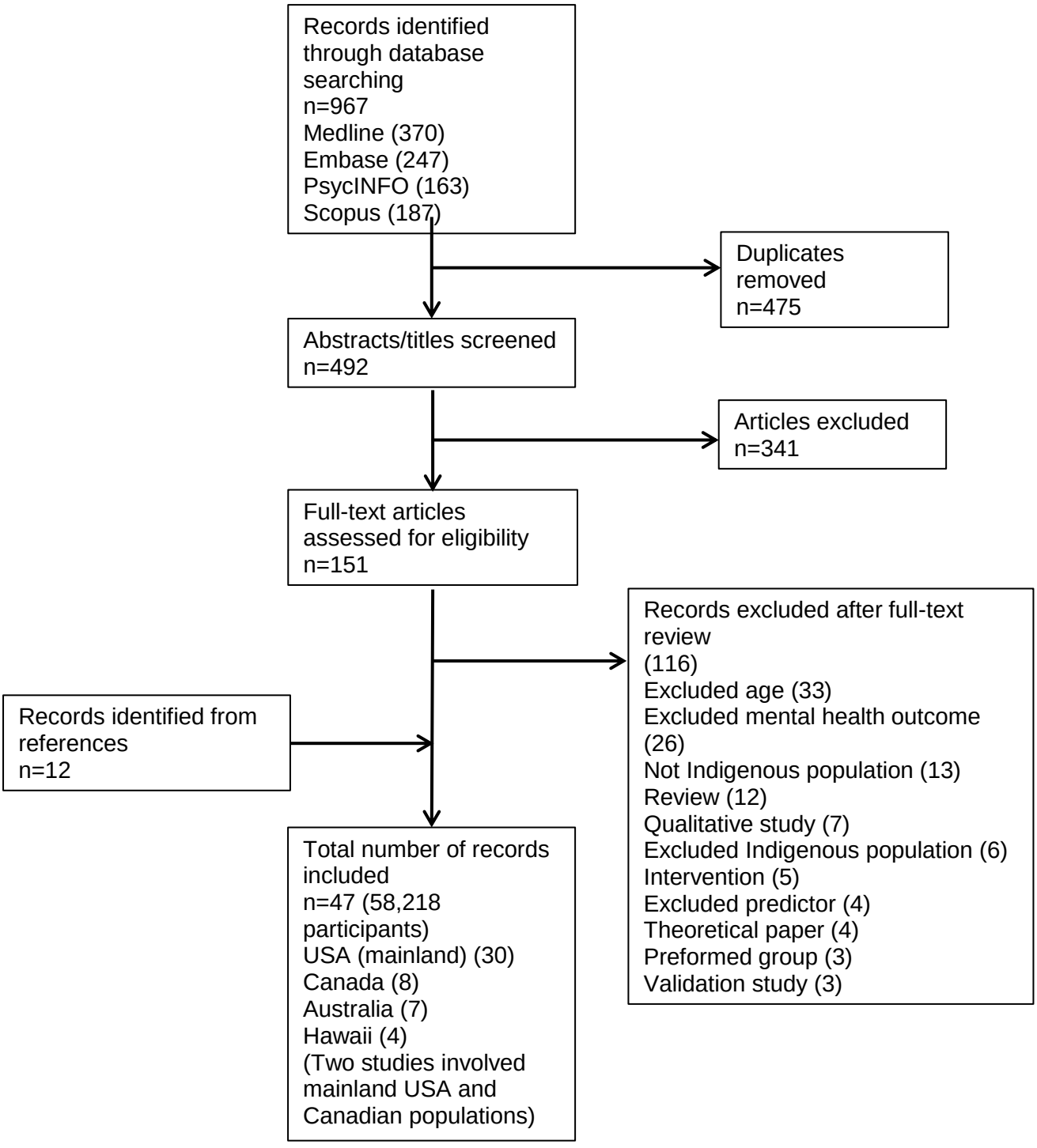
Appendix A: Search Results



Appendix B: Study characteristics

Study	Sample size	Male (%)	Age (range or mean) or school grade	Mental health outcome	Mental health measure
USA (mainland)					
Costello,24 1997	323	53.2	9-13	Symptoms of child/adolescent psychiatric	CAPA
Federman25 1997	431	nr	9-15	Symptoms of child/adolescent psychiatric	CAPA
Cummins,26 1999	13454	49.3	14.5	Positive mental health	Emotional Health
Fisher,27 1999	112	46.4	14.82	Psychopathological behaviour	CBCL
Wall,28 2000	96	52	8-13	Internalising and externalising symptoms	CBCL
Whitbeck,18 2001	195	54	9-16	Internalising symptoms	YSR
Rieckmann, 29 2004	332	40.7	14-20	Depression	CDI, DSM-IV,
Bearinger,30 2005	569	48.3	9-15	Violence	Bespoke measure
Newman,31 2005	96	47	12-15	Internalising symptoms, positive mental health	SAS, SMFQ,
La Fromboise,3	212	54.2	10-15	Positive mental health (resilience)	Bespoke measure
Silmere,33 2006	401	44.9	15.6	Positive mental health	DIS-IV, YSR, CIS
Whitsell,34 2006	1252	47.9	14-17	Self-esteem	RSES
Jones,35 2007	137	47	14-19	Self-esteem, depression	RSES, CES-D
Stiffman,36 2007	385	Not report	12-19	Behaviour and emotional problems	YSR
Stiffman,37 2007	401	Not report	12-19	Depression, conduct disorder	YSR, CIS
Scott,38 2008	112	53	13-19	Depressive symptoms	IDD
Hamill,39 2009	151	54.3	7-12th grade	Depressive symptoms	CDI
Albright,40 2010	114	47	11-15	Hopelessness	HSC
La Fromboise,4	438	46.2	Adolescents	Hopelessness	BHS
Galliher,42 2011	137	48.9	14-19	Self-esteem, social functioning	CASAFS, RSES
Scott,43 2012	198	46.3	5-8th grade	Depressive symptoms	CDI
Stumblingbear-Riddle,44	196	41.8	14-18	Self esteem	TECSES

Mileviciute,45 2013	93	50.5	Grades 5-8	Depressive symptoms	CDI
Mileviciute,47 2014	146	36.3	13-18	Depressive symptoms, externalising problems	CDI, YSR
Smokowski, 46 2014	1,358	48.6	13.4	Internalising and externalising symptoms,	SSP, YSR, RES
Bell,48 2014	79	40.5	11-18	Depressive symptoms, self-esteem	CES-DC, RSES
Tyser,49 2014	164	47	Grades 5-12	Depressive symptoms	CDI
Brokie,50 2015	132	49	15-19	Depression and PTSD symptoms	BDI-IA, Short
USA (mainland) and Canada					
Sittner Hartshorn,5	692	50	10-12 at first wave	Aggression	DSM-IV
Whitbeck,52 2006	656	50	9-13	Childhood mental disorders	DISC-R
Canada					
Mykota,53 2006	480	51	6-18	Psychosocial functioning	BRP-2
Flanagan,54 2011	65	58.1	11-19	Internalising and externalising symptoms	T-CRS, CDI,
Lemstra,55 2011	204	44	5-8 grade	Depressed mood	CES-D
Lemstra,56 2011	204	44.1	10-16	Depressed mood	CES-D
Ames,57 2013	283	48.1	12	Depressive symptoms, self-esteem	CES-D, SDQ-2
Kaspar,23 2013	12,366	51	6-14	Psychological or nervous difficulties	Clinical diagnosis
Australia					
Silburn,58 2007	1073	Not report	12-17	Clinically significant emotional and behavioural	SDQ
Priest,59 2011	345	47	16-20	Social and Emotional wellbeing	Strong souls
Zubrick,60 2011	5,289	nr	0-17	Clinically significant emotional and behavioural	SDQ
Shepherd,61 2012	3,993	51.2	4-17	Clinically significant emotional and behavioural	SDQ
Askew,62 2013	344	52	7.3	Child's behaviour	Parent report
Hopkins,63 2013	674	50	12-17	Clinically significant emotional and behavioural	SDQ
Hopkins,64 2014	1021	50	12-17	Resilience	SDQ
Hawaii					
Makini,65 1996	1819	45.2	Grades 9 to 12	Internalising and externalising symptoms	CES-D, STAI,
Goebert,66 2000	2634	Not report	Grades 9 to 12	Internalising and externalising symptoms	CES-D, STAI,

Carlton,67 2006	1173	45.6	Grades 9-12	Internalising and externalising symptoms	CES-D, STAI,
Hishinuma,68 2012	3,189	45.7	Grades 9-12	Depression	CES-D

BADS=Braver Aggression Detection Scale, BHS=Beck Hopelessness Scale, BRP-2=Behaviour Rating Profile-2nd Edition, CAPA=Child and Adolescent Psychiatric Assessment, CASAFS=Child and Adolescent Social and Adaptive Functioning Scale, CBCL=Child Behaviour Checklist, CDI=Children's Depression Inventory, CES-D=Centre for Epidemiology Studies-Depression, CIS=Columbia Impairment Scale, DBD=Disruptive Behaviour Disorders Rating Scale, DIS-IV=National Institute for Mental Health's Diagnostic Interview Schedule, DISC-R=Diagnostic Interview Schedule for Children-Revised, DSM-IV=Diagnostic and Statistical Manual of Mental Disorders-Fourth Edition, FES=Family Environment Scale, HSC=The Hopelessness Scale for Children, IDD=Inventory to Diagnose Depression, MMPI=Minnesota Multiphasic Personality Inventory, PANAS-X=Positive and Negative Affect Schedule, RCMAS-2=Revised Children's Manifest Anxiety Scale, SAS-A=Social Anxiety Scale for Adolescents, SDQ=Strengths and Difficulties Questionnaire, SDQ-2=Marsh's Self-Description Questionnaire, SEQ=Social Experiences Questionnaire, SMFQ=Short Mood and Feelings Questionnaire, SSP=School Success Profile, STAI=Spielberger State-Trait Anxiety Inventory, T-CRS=Teacher-Child Rating Scale, TECSES=Tri-Ethnic Center's Self Esteem Scale, YSR=Youth Self-report

Appendix C: Risk of Bias