

Socioeconomic deprivation and non-suicidal self-injury in New Zealand adolescents: The mediating role of depression and anxiety

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Socioeconomic deprivation has been associated with self-injury, however little is known about the psychological mechanisms underlying this relationship. We assessed how young adolescents' ($N = 797$) experiences of deprivation were associated with Non-Suicidal Self-Injury (NSSI), and tested whether depression and anxiety independently mediated this relationship. Girls reported greater depression, anxiety and NSSI severity than did boys, as well as stronger associations between NSSI and both depression and anxiety. Deprivation was positively associated with NSSI. Among girls, this relationship was fully mediated by both depression and anxiety, whereas for boys depression was the only independent mediator. These findings suggest that psychological distress may be the mechanism by which socioeconomic deprivation predicts NSSI. Moreover, the current study suggests that this process may operate in a different manner among girls and boys.

Keywords: NSSI, Self-Injury, Socioeconomic Deprivation, Depression, Anxiety

Within recent decades, research on Non-Suicidal Self-Injury (NSSI) has been a burgeoning field of study. NSSI includes deliberate behaviours such as cutting and scratching the skin, which occur without suicidal intent and for purposes which are not culturally sanctioned (Nock & Prinstein, 2004), typically as strategies to manage overwhelming emotions or to punish the self (Klonsky, 2007; Nock & Prinstein, 2004). Compared to 6% of community adults (Klonsky, 2011), approximately 17% of adolescents report having deliberately engaged in NSSI (Muehlenkamp, Claes, Havertape, & Plener, 2012; Swannell, Martin, Page, Hasking, & St John, 2014). The high international prevalence of adolescent NSSI is mirrored in Aotearoa New Zealand, where almost 50% of secondary school students report having engaged in NSSI at least once (Garisch & Wilson, 2015). Given the high individual, social, and economic costs associated with NSSI (see for example, Garisch & Wilson, 2015; Guan, Fox, & Prinstein, 2012; O'Dea & Wren, 2010), understanding the complex array of factors which contribute to the development and maintenance of self-injury is critical.

An individual's wellbeing is dynamically created by both psychological factors as well as the socioeconomic environment in which they live (see World Health Organisation, 2012). Prior research has identified a range of psychological characteristics that increase risk of NSSI, such as high levels of emotional dysregulation and in-expressivity (Garisch & Wilson, 2015; Gratz & Chapman, 2007), hopelessness (Wilkinson, Kelvin, Roberts, Dubicka, Goodyer, 2011), identity confusion (Gandhi et al., 2017), and mental illnesses such as depression (Cox et al., 2012; Duggan, Heath & Hu, 2015) and anxiety (Wilkinson et al., 2011). Investigation of environmental factors has mainly focused on poor social supports systems (Andrews, Martin, Hasking & Page, 2014; Hankin & Abela, 2011) and life

stressors (Guerry & Prinstein, 2009; Hankin & Abela, 2011). Although wider health research has demonstrated a robust relationship between socioeconomic deprivation and poorer mental health outcomes (see for example, Braveman & Barclay, 2009; Kuh, Hardy, Langenberg, Richards, & Wadsworth, 2002; Reiss, 2013; Twenge & Campbell, 2016; Wilkinson, 1992), the specific relationship between socioeconomic deprivation and NSSI has received much less investigation.

Socioeconomic deprivation in Aotearoa New Zealand

Socioeconomic deprivation is defined as falling below the adequate standard of living according to the majority of a particular society (Herbert, 1975; Townsend, Phillimore & Beattie, 1988). Those who are identified as 'deprived' experience more hardships than their peers and have insufficient access to resources, such as food, education and health care (Pearce, Witten, Hiscock & Blakely, 2008). Due to the complexity of the construct, previous research has operationalised socioeconomic deprivation in a number of different ways.

Denny and colleagues (2016) measured household deprivation in 2012 within a nationally representative sample of 8,500 Aotearoa New Zealand adolescents by asking about nine non-income indicators, such as family, car, and computer ownership, and if participants' parents ever worry about not having enough money for food. Latent class analysis revealed three groups; 80% of participants were classified as not experiencing deprivation, 15% as experiencing moderate deprivation, and 5% of participants were classified as experiencing high deprivation. Using more recent data from the 2014 New Zealand Economic Survey, the Child Poverty Monitor Technical Report (Perry,

2015) used a relative threshold measure, whereby a child (0-17 years old) was considered to be living in poverty if, taking into account housing costs, their family income fell below 60% of the median income. In 2014, 29% of Aotearoa New Zealand children and adolescents were classified as living in socioeconomic deprivation, an increase from 24% in 2013. Although these studies used different methods of operationalising socioeconomic deprivation, they provide converging evidence that a substantial proportion of young New Zealanders live in moderate to severe deprivation. It is therefore critical to understand the impact of socioeconomic deprivation on psychological wellbeing.

Socioeconomic deprivation and self-injury

Socioeconomic position has robustly been associated with poorer mental health outcomes (see for example, Jacobi et al., 2004; Muntaner, Eaton, Miech, & O'Campo, 2004). Originally the relationship between socioeconomic deprivation and self-injury was assessed using hospital presentation records for deliberate self-harm (a broader class of behaviours that often conflates suicidal with non-suicidal self-injury). Hawton, Harriss, Hodder, Simkin, and Gunnell (2001) assessed 5,899 hospital records of deliberate self-harm presentations and found that the rate of presentations from each electoral ward was positively correlated with the extent of deprivation and social fragmentation within that ward. In particular, this relationship was stronger for males than for females. Focusing on an adolescent sample Ayton, Rasool, and Cotterell (2003) analysed the records of 730 adolescents presenting to a United Kingdom emergency department for deliberate self-harm. Again, the deprivation of each electoral ward was positively associated with presentation rates of deliberate self-harm. Looking beyond geographic variance in self-injury, Jablonska, Lindberg, Lindblad, and Hjern (2009) analysed hospital admissions in a national 1973-1982 birth cohort of young people and found that self-harm was positively related to poorer family socioeconomic status. However, a major limitation of hospital presentation data is that this method captures only the most severe instances of self-harm; in a large-scale sample of university students only 6.5% of young people who self-injure had ever sought medical treatment for their self-inflicted injuries (Whitlock, Eckenrode & Silverman, 2006). Therefore hospital presentation data represents only the tip of the iceberg in regard to total self-injurious behaviour across community samples (Rowe et al., 2014).

At present, evidence for the relationship between socioeconomic deprivation and NSSI within community samples is mixed. Within an adult sample, Klonsky (2011) found household income to be unrelated to NSSI. Among adolescents, low parental income has been found to be both associated with engagement in NSSI (Baetens et al., 2013; Page et al., 2014) and to be unrelated to NSSI (Cox et al., 2012; Liang et al., 2014). When utilising non-income related measures of deprivation, compared to their peers, adolescents were more likely to report engaging in NSSI if their parents received socio-welfare benefits (Mossige, Huang, Straiton, & Roen, 2016), were unemployed (Baetens et al., 2013; Brunner et al., 2014; Zetterqvist, Lundh, Dahlström, & Svedin, 2013, but see Mossige et al., 2016) or had a lower educational level

(Baetens et al., 2013; Giletta, Scholte, Engels, Rutger, Ciairano, & Prinstein, 2012).

Assessing more subjective experiences of deprivation, a number of samples have demonstrated that young people who report that their family experiences financial problems are more likely to self-injure than their peers whose families do not experience financial difficulty (Hurtig, Taanila, Moilanen, Nordström, & Ebeling, 2012; Mossige et al., 2016; Nixon, Cloutier, & Jansson, 2008). Extending to investigate NSSI severity, Zetterqvist and colleagues (2013) found that Swedish adolescents who reported high NSSI severity were more likely to report that their family experienced financial difficulties, compared to their peers reporting no NSSI, or low NSSI severity. Given the mixed evidence for a relationship between socioeconomic deprivation and self-injury, further work with community adolescent samples is necessary.

Personal narratives of young people living in socioeconomic deprivation suggest that deprivation causes subjective distress to the individual in the form of feelings of worthlessness, experiences of bullying, and social exclusion from having to miss out on school trips and seeming different (Egan-Bitrán, 2010). Some young people may then manage this distress using self-injury (Chapman, Gratz, & Brown, 2006). Deprivation may also create the context which prevents an individual from developing resiliencies which buffer against psychological ill health and NSSI. For example, the financial cost of out of school activities may prevent a young person from joining a sports team (see Sutton, Smith, Dearden & Middleton, 2007), consequently potentially impairing the development of close friendships and peer support networks. Financially deprived individuals also have less access to community health and wellbeing support services (Newacheck, Hung, Park, Brindis, & Irwin, 2003), resulting in fewer opportunities for health care. Therefore, it is probable that deprivation contributes to a variety of social experiences and psychological distress that may subsequently increase risk for self-injury. Taken together, this line of research suggests that understanding the role that psychological wellbeing plays in the relationship between deprivation and self-injury is critical.

Depression and anxiety as potential mediators

However at present, the specific psychological mechanisms underlying the relationship between socioeconomic deprivation and NSSI remain unclear. Two potential psychological factors which have been the target of investigation are depression and anxiety. A meta-analysis of 51 studies assessing the prevalence of depression found that participants with low socioeconomic status (that is, experiencing deprivation) were more likely to be depressed (OR: 1.81) and to experience persistent depression (OR: 2.06) than their high socioeconomic status peers (Lorant et al., 2002). Specifically among New Zealand adolescents, students experiencing moderate or high deprivation were disproportionately more likely to report high depressive symptoms (OR: 2.41 and 1.84, respectively) than students not experiencing deprivation (Denny et al., 2016). In a similar manner, a review of the field finds robust evidence for an association between anxiety disorders and low household income or financial difficulties among children and adolescents (Beesdo, Knappe, & Pine, 2009). This association

extends to New Zealand, where research from the Dunedin Longitudinal Study found that adolescents who met the criteria for an anxiety disorder were more likely to live in families with low socioeconomic status (Miech, Caspi, Moffitt, Wright, & Silva, 1999). Taken together, previous research suggests that depression and anxiety are strongly linked with socioeconomic deprivation.

International and local research has also demonstrated robust associations between NSSI and both depression and anxiety (see for example, Garisch & Wilson, 2015; Glenn & Klonsky, 2011; Selby, Bender, Gordon, Nock, & Joiner, 2012; Wilcox et al., 2012). A recent meta-analysis reviewed 56 articles comparing NSSI engagement among people with and without emotional disorders such as depression, anxiety, and post-traumatic stress disorder (Bentley, Cassiello-Robbins, Vittorio, Sauer-Zavala, & Barlow, 2015). People with an emotional disorder were reported to be 1.75 times more likely to also report engaging in NSSI than their peers without an emotional disorder. Additionally, no difference in NSSI engagement rates were found between depression and anxiety diagnoses.

Although previous research has linked depression and anxiety with both NSSI and socioeconomic deprivation, and NSSI with socioeconomic deprivation, to date few studies have simultaneously examined the relationship between NSSI, socioeconomic deprivation, depression and anxiety. Using the Avon Longitudinal Study, Page and colleagues (2014) found that across all socioeconomic deprivation measures (i.e., social class, household income and maternal education), relative risk for self-harm was reduced by 1-9% when adjusting for depressive symptoms during early adolescence. This reduction suggests that depression may partially mediate the association between socioeconomic deprivation as well as self-injury. However, at present this hypothesis has not been directly tested. In addition, it is not clear whether anxiety may also independently mediate the relationship between socioeconomic deprivation and NSSI.

The current study

The present study aims to better establish the relationship between socioeconomic deprivation and NSSI within community samples, and to gain further insight into psychological mechanisms underlying this relationship. Given that onset of NSSI is typically considered to occur around ages 12 to 14 (Jacobson & Gould, 2007; Plener, Schumacher, Munz & Groschwitz, 2015) focusing on early adolescence is particularly appropriate. Using data from the Youth Wellbeing Study, the current study tests whether socioeconomic deprivation creates a situation of psychological distress, which young people then cope with using self-injury. We use multiple mediation models to test whether depression and anxiety independently mediate the relationship between socioeconomic deprivation and NSSI severity in Aotearoa New Zealand adolescents. We test two predictions; first, that NSSI severity is positively associated with socioeconomic deprivation in New Zealand adolescents, and second, that depression and anxiety symptoms independently mediate this relationship for both males and females.

Method

Participants

Participants were 797 students enrolled at 15 high schools in the greater Wellington area of Aotearoa New Zealand. Participants were made up of 304 males, 491 females and 2 who identified as transgender (6 did not report their gender), with an average age of 13.57 ($SD = 0.63$). The majority of participants (71%) identified as Pākehā/New Zealand European, 8% as Māori, 5% as Pasifika, 1% as Chinese, 2% as Indian, 9% as a non-listed ethnicity (e.g. Filipino), and 5% did not choose a primary ethnicity.

Materials

Non-suicidal self-injury

All participants completed a NSSI history screening question. Participants read the following *"Sometimes people have thoughts about hurting themselves on purpose, but do not actually hurt themselves. And sometimes people hurt themselves deliberately (i.e., on purpose) to cause damage to their body but NOT to kill themselves (e.g. cut, burn, scratch, or carve their skin, bang or hit themselves, or prevent wounds from healing)"* and then indicated either *'No, I have never hurt myself on purpose'*, *'Yes, I have hurt myself on purpose'*, or *'I have thought about hurting myself on purpose'*. Participants who indicated that they had engaged in NSSI, or that they thought about doing so, then completed a modified version of the simplified Deliberate Self-Harm Inventory (DSHI-s; Lundh, Karim & Quilisch, 2007), to assess the lifetime frequency and severity of self-injurious behaviours in adolescents. In the current study the DSHI-s was modified to include an additional scale point; such that *"Never"* was differentiated into *"I have never thought about doing this"* and *"I have thought about doing this, but never done it"* in line with theoretical arguments that NSSI thoughts of action and NSSI actions are related, but often distinct (Martin, Bureau, Cloutier, & Lafontaine, 2011; Nock, Prinstein, & Sterba, 2009). The *"any of the above-mentioned behaviours causing hospitalization or injury requiring medical treatment"* item was removed. Additionally, the *"punched oneself"* and *"banged head"* items were combined into one item (modified item *"punched yourself, or banged your head against something, to the extent that caused a bruise to appear"*). The revised DSHI-s consisted of 13-items, and demonstrated good internal consistency within this sample ($\alpha = 0.79$). Participants were asked to indicate the extent to which they had ever thought of or engaged in the DSHI statements on a 5 point scale, ranging from 0 (*"I've never thought about doing this"*) to 4 (*"I've done this many times"*). Items began with *"Have you ever deliberately (but without wanting to kill yourself)"* and then listed 13 different self-injurious behaviours such as *"cut your wrist, arms, or other areas of your body"*, *"burned yourself with a cigarette, lighter or matches"* and *"rubbed glass into your skin"*. A measure of NSSI severity was created by averaging participant's responses to the 13 items, thus taking into account the number of NSSI forms, and the frequency of engagement. In order to capture the complete spectrum of NSSI severity, participants who indicated that they had never thought about or engaged

in NSSI were assigned a score of zero. The revised DSHI-s consisted of 13-items, and demonstrated good internal consistency within this sample ($\alpha = 0.79$).

Socioeconomic deprivation

Participants completed a six-item Socioeconomic Deprivation Scale created for the present study. Participants were presented with items such as "Do you ever go without breakfast because there is not enough food in your household?" to which they responded either "yes" or "no", (coded as 1 and 0 respectively). The item "Do the people who care for you ever worry about money for food, rent, or electricity?" was adapted from the item "Do your parents, or the people who act as your parents, ever worry about not having enough money to buy food?" used in the Youth'12 National Health and Wellbeing Survey of New Zealand Secondary School Students (Adolescent Health Research Group, 2012). An additional item was created to assess whether adolescents themselves worried about money for necessities. The other four items were developed following a review of the literature. See Table 1 for all items, factor loadings and rates of endorsement. A socioeconomic deprivation score was created by averaging participant's responses to the 6 items. In order to establish the factor structure of the Deprivation Scale, an unrotated exploratory factor analysis was conducted with the six items. Inspection of eigenvalues and the scree plot indicated a one-factor solution, which explained 37.5% of the variance. Inspection of the item loadings onto the component revealed that the majority of factors loaded on the factor (ranging .69 to .63), but the item "Do you ever miss school because there is not enough money to get there" loaded at .38, and so this item was removed from subsequent analyses (see Giles, 2013). The five item socioeconomic deprivation scale showed questionable internal reliability $\alpha = 0.64$, although this is likely to be influenced by the few items in the scale.

Table 1.

Items comprising the Socioeconomic Deprivation Scale, factor loadings and rate of endorsement

Item	Factor loading	Endorsement rate
Do your parents, whānau, or other people who look after you ever worry about money for food, rent, or electricity?	.69	24.9%
Do you ever worry about your parents, whānau, or other people who look after you not having enough money to buy food, pay rent, or pay for electricity?	.64	26.1%
Have you ever not had enough money for books or to go on school trips because your parents, whānau, or other people who look after you could not afford it?	.63	7.5%
Do you ever go without breakfast because there's not enough food in your household?	.63	4.4%
Do you ever go without lunch because there's not enough food in your household?	.65	4.2%
Do you ever miss school because there's not enough money for the bus or train, or not enough petrol in the car to get there?	.38	1.4%

Ns range from 783 to 788. Note that the final item was removed to improve the internal reliability of the scale.

Depression and Anxiety

Depression and anxiety symptomatology were measured using the Depression Anxiety Stress Scale (DASS-21; Lovibond & Lovibond, 1995a). Due to timing constraints during data collection, participants completed only the depression and anxiety subscales. Participants completed seven items to index each construct, reporting the degree to which each item applied to them over the past week. Sample items include: "I found it difficult to work up the initiative to do things" (Depression item) and "I felt that I was using a lot of nervous energy" (Anxiety item) to which participants respond on a 4-point scale ranging from '0 – did not apply to me at all' to '3 – applied to me very much or most of the time'. Responses on each item in the subscale were totalled and multiplied by two in order to provide scores comparable to norms of clinically relevant symptoms (consistent with instructions, Lovibond & Lovibond, 1995b). Previous research has validated the use of the DASS in young adolescents (Szabó, 2010). In the present sample, the internal consistency of both the depression and anxiety subscales were satisfactory ($\alpha = .90$, and .83, respectively).

Procedure

Ethical approval for this study was granted by the New Zealand National Health and Disability Ethics Committee. Forty-five secondary schools in the greater in the Wellington region were contacted and invited to take part in the broader Youth Wellbeing Study in 2011 and 2013. After consultation with school management and Board of Trustees, 15 schools participated in the study. Students in Year 9 (US Grade 8) and, at one school Year 10, took home an information pack and consent form for parents. 1451 students returned a completed consent form, 75.5% of these having parental permission to take part in the study. This overall rate of consent is consistent with other high school based NSSI research requiring active parental consent (Andrew, Martin, Hasking & Page, 2014). In order to take part in the study, both parental consent and participant assent were required.

The survey was administered in 2013 in classrooms under the supervision of a research team member(s) during a class period. Participants were first given an information sheet outlining the study and the opportunity to ask researchers any questions. Participants were informed that their participation in the current study was voluntary and that they were able to withdraw at any time without consequence. Participants were also given assurance that their answers would remain confidential, unless researchers were concerned for their safety. The survey consisted of demographic information, the Socioeconomic Deprivation Scale, the depression and anxiety subscales of DASS-21, the modified version of the DSHI-s, and a number other questionnaire measures assessing youth wellbeing not included in the present study. The survey took approximately 40 minutes to complete. Following participation, students were debriefed and given a list of contact details for community services, should they wish to seek support. Students were also able to approach team members following participation if they had any questions or concerns. Students also had the option of leaving their email or postal address to receive a summary of study results.

Analytic plan

In order to maximise the sample size available missing data was computed where possible. Given that the DASS -21 Depression and the DASS-21 Anxiety subscales show adequate internal consistency, when participants had completed 80% or more of the scale the average of the items they had completed was calculated and inserted into the missing cells before a sum score was calculated. In contrast, the DSHI-s is more like a symptoms checklist than a typical scale. Therefore, DSHI-s missing cells were assumed to be the absence of that NSSI behaviour and replaced with zeros (see Lundh, Karim & Qulisch, 2007 for a similar method of addressing missing DSHI-s data). Given that the internal consistency of the Deprivation scale was poor, and the current study is the first to use the scale, missing data was not computed.

Given our use of a community sample, we anticipated that NSSI severity, Depression, Anxiety and Socioeconomic Deprivation would be non-normally distributed, and so we standardised the data prior to mediational analysis. As previous research has found gender differences in NSSI engagement (Plener, Libal, Keller, Fegert, & Muehlenkamp, 2009), depression (Piccinelli & Wilkinson, 2000), and anxiety (McLean & Anderson, 2009), we split our sample by gender in order to establish whether the mechanisms underlying the relationship between socioeconomic deprivation and NSSI differed for boys and girls¹.

We followed the general procedure outlined by Preacher and Hayes (2008) using the programme PROCESS (Hayes, 2012) to test simultaneously for significant mediations by Anxiety and Depression. That is, we simultaneously assessed the indirect effect of Socioeconomic Deprivation (*X*) on NSSI severity (*Y*) through Anxiety (*M1*); the indirect effect of Socioeconomic Deprivation (*X*) on NSSI severity (*Y*) through Depression (*M2*); the indirect effect of Socioeconomic Deprivation (*X*) on NSSI severity (*Y*) through both Anxiety (*M1*) and Depression (*M2*) in parallel; and the direct effect of Socioeconomic Deprivation (*X*) on NSSI severity (*Y*). Bootstrapping with 5000 samples provided a 95% confidence interval around the indirect effects in order to determine if the mediating effects are different from zero (Preacher & Hayes, 2008)².

Results

Descriptive statistics

Within the current sample, 37.8% of participants indicated yes to one or more of the five items of the Socioeconomic Deprivation scale, indicating that a substantial proportion of the sample experience some degree of socioeconomic deprivation. Individual item endorsement is presented in Table 1. Participants were most likely to report that they worried about not having enough money for food, rent, or electricity (26.1%), and were least likely to report ever missing school

¹ As the number of adolescents who identified as transgender in our sample is too small to draw informative statistical conclusions, subsequent gender analyses will compare only participants who identify either as male or female.

² Note that in order to be informative, the 95% confidence intervals reported here were calculated from the unstandardized data.

because there was not enough money to get there (1.4%). Girls (*mean rank* = 399.14) reported greater socioeconomic deprivation than boys (*mean rank* = 367.33), $U = 64703.50$, $p = .026$, $r = .08$.

Consistent with international prevalence rates, the majority (71.5%) of adolescents indicated that they had never thought about, or engaged in, self-injury. Of all participants, 19.1% reported having engaged in at least one form of NSSI, while the remainder (9.4%) reported having thought about hurting themselves, but not engaging in any self-injurious behaviours. The most common NSSI behaviours were cutting (15.5%) and scratching skin (9.8%). Of the participants who reported engaging in NSSI, 15.8% reported that the last time they had self-injured was more than a year ago, 30.1% within the last year, 30.8% within the last month, and 23.3% within the last week. The majority of participants who reported NSSI reported engaging in self-injurious behaviours more than once (66.3%). Girls (*mean rank* = 428.57) reported greater NSSI severity than boys (*mean rank* = 348.62, $U = 59620.00$, $p < .001$, $r = .22$).

As expected in a community sample, anxiety scores were non-normally distributed (*skewness* = 1.51, *kurtosis* = 1.83). Using the cut off scores reported by Lovibond and Lovibond (1995b), the majority of participants (63.4%) reported anxiety symptoms within the normal range, 7.2% in the mild anxiety range, 14.3% in the moderate anxiety range, 4.2% in the severe anxiety range, and 10.8% in the range for extremely severe anxiety. Girls (*mean rank* = 416.17) reported experiencing greater anxiety symptoms than did boys (*mean rank* = 368.66), $U = 65711.50$, $p < .001$, $r = .10$.

In a similar fashion, depression scores were also non-normally distributed (*skewness* = 1.50, *kurtosis* = 1.65). Again, the majority of participants (69.9%) reported depression scores in the normal range, 8.7% in the mild depression range, 10.7% in the moderate depression range, 4.6% in the severe depression range, and 6.1% in the extremely severe depression range. Girls (*mean rank* = 418.69) reported experiencing greater depression symptoms than did boys (*mean rank* = 364.58), $U = 64473.50$, $p < .001$, $r = .12$.

Relationship between socioeconomic deprivation and psychological wellbeing

Table 2 show the zero-order correlations between depression, anxiety, NSSI, and deprivation. Consistent with predictions, socioeconomic deprivation was associated with greater self-injurious ideation and behaviours. Replicating prior local and international research, depression and anxiety were also positively associated with NSSI, as well as strongly correlated with each other. In order to establish if there were differences in the strength of the relationship among boys and girls, we use the Fisher *r*-to-*z* transformation to compare correlations. There was no evidence for a difference in the strength of the relationship between self-injury and deprivation, anxiety and depression, anxiety and deprivation, or depression and deprivation (*ps* range from .653 to .076). However, the relationship between anxiety and self-injury ($Z = 4.20$, $p < .001$) and depression and self-injury ($Z = 3.27$, $p = .001$) was significantly stronger for females than for males, suggesting that the relationship between psychological

wellbeing and self-injury may differ by gender.

Table 2.

Means (and standard deviations), and zero-order correlations between deprivation, DASS-21 depression and anxiety, and DSHI-s scores for the total sample and for males and females separately

	NSSI	DASS Depression	DASS Anxiety	Deprivation
Total <i>M (SD)</i>	.17 (.38)	7.56 (9.27)	7.20 (8.10)	0.13 (.21)
Males <i>M (SD)</i>	.08 (.28)	5.84 (7.65)	5.79 (6.48)	0.11 (.19)
Female <i>M (SD)</i>	.21 (.42)	8.45 (9.86)	8.03 (8.82)	0.14 (.21)
<u>Males:</u>				
Deprivation	.26*	.33*	.33*	-
DASS Anxiety	.36 ^{ab}	.73*	-	
DASS Depression	.50 ^{ab}	-		
NSSI	-			
<u>Females:</u>				
Deprivation	.19*	.26*	.30*	-
DASS Anxiety	.60 ^{ab}	.72*	-	
DASS Depression	.65 ^{ab}	-		
NSSI	-			
<u>Total</u>				
Deprivation	.22*	.28*	.31*	-
DASS Anxiety	.55*	.73*	-	
DASS Depression	.62*	-		
NSSI	-			

Female *N*'s range from 478 to 491; male *N*'s range from 295 to 304; * $p < .01$. ^a indicates that the size of correlation differs between males and females, *ps* range from $< .001$ to $.001$.

Given these significant zero-order relationships, we next assessed whether depression and anxiety mediate the association between deprivation and self-injury. For girls, the combined indirect effect of Depression and Anxiety on the relationship between Deprivation and NSSI was significant, $R^2 = .47$, $F(3, 474) = 141.94$, $p < .001$, indicating that the combined set of mediators partially explained the relationship between Deprivation and NSSI. Both Depression, $t(476) = 9.60$, $p < .001$, unstandardized 95% CI [0.15, 0.36], and Anxiety $t(476) = 5.69$, $p < .001$, unstandardized 95% CI [0.09, 0.28] independently mediated the effect of Deprivation on NSSI. When taking into account both mediating variables, the direct pathway between Deprivation and NSSI became non-significant, $t(476) = 0.27$, $p = .784$, suggesting that for girls the relationship between Deprivation and NSSI is fully mediated by both Depression and Anxiety. See Figure 1A for the standardized parameter estimates for each of the direct and indirect pathways.

For boys, the combined indirect effect of Depression and Anxiety on the relationship between Deprivation and NSSI was significant, $R^2 = .26$, $F(3, 291) = 34.48$, $p < .001$, indicating

that the combined set of mediators partially explained the relationship between Deprivation and NSSI. In contrast to girls, for boys Depression, $t(293) = 6.55$, $p < .001$, unstandardized 95% CI [0.08, 0.50], independently mediated the effect of Deprivation on NSSI, but Anxiety did not $t(293) = -.01$, $p = .992$, unstandardized 95% CI [-0.14, 0.14]. When taking into account both mediating variables, the direct pathway between Deprivation and NSSI became non-significant, $t(293) = 1.94$, $p = .053$, suggesting that for boys the relationship between Deprivation and NSSI is fully mediated by Depression alone. See Figure 1B for the standardized parameter estimates for each of the direct and indirect pathways.

Discussion

Previous international research has provided mixed evidence for a relationship between socioeconomic deprivation and greater engagement in self-injury, with subjective measures of socioeconomic deprivation more consistently demonstrating a relationship with NSSI than objective measures.

In particular, the potential mechanisms underlying this relationship have largely remained unexplored. Drawing from a New Zealand sample of community adolescents, the present study tested the hypotheses that greater socioeconomic deprivation is associated with greater NSSI severity, and that both anxiety and depression independently mediate this relationship. Adolescents who reported greater socioeconomic deprivation were more likely to also report engaging in NSSI, as well as greater depression and anxiety symptoms. However, the strength of the relationship between NSSI and depression, and NSSI anxiety was greater for girls than for boys, leading us to split our mediational analyses by gender. Consistent with our hypothesis, psychological distress fully mediated the relationship between deprivation and NSSI. Among girls, both depression and anxiety independently mediated this relationship, while among boys, only depression independently mediated the relationship.

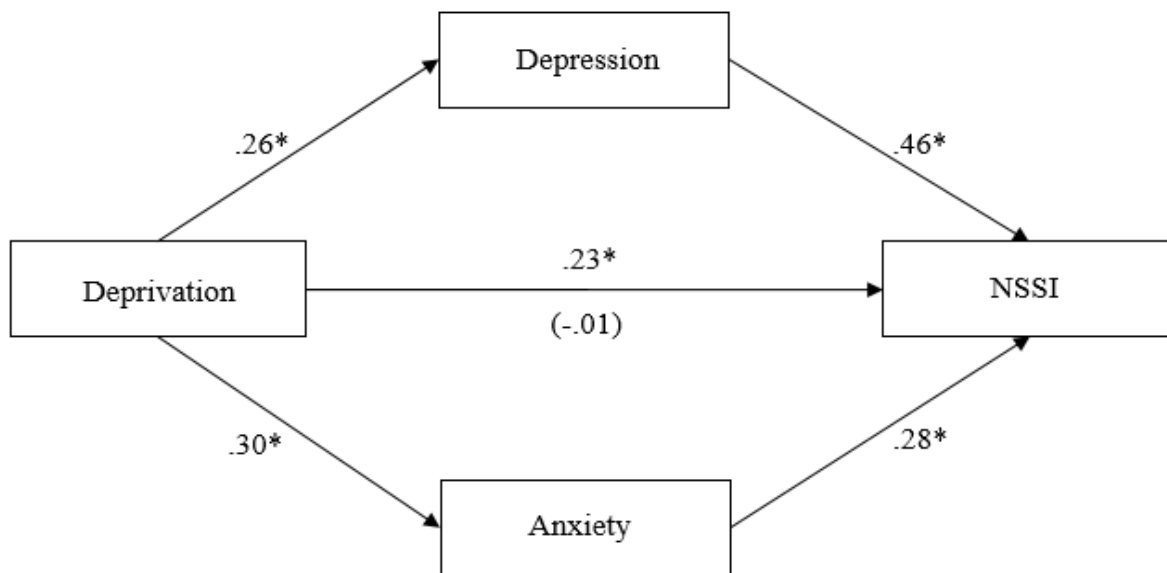
Previous research has consistently found hospital presentation for deliberate self-injury to be associated with geographic variation in deprivation, as was as family socioeconomic status (Ayton et al., 2003; Hawton et al., 2001; Jablonska et al., 2009). However, use of hospital records is problematic in that these samples fail to distinguish between suicidal and non-suicidal self-injury, as well as disproportionately excluding those whose self-injury did not require medical attention and individuals who are unable to access hospital services. Even in contexts with minimal financial costs associated with state-funded medical care, deprived individuals will likely experience difficulties associated with travel to hospital and follow-up care, and will therefore be under-represented in hospital presentation data (Rowe et al., 2014; Whitlock et al., 2006). Overall, the results presented here provide additional evidence that the relationship between deprivation and NSSI extends to community samples of adolescents, which is likely to be more representative of those in the population who self-injure.

However, previous research within community samples find mixed evidence for a relationship between socioeconomic

deprivation and self-injury. Research utilising subjective indices of socioeconomic deprivation (e.g., reported experiences of financial difficulties) consistently find greater socioeconomic deprivation to be associated with NSSI (Hurtig et al., 2012; Mossige et al., 2016; Nixon et al., 2008; Zetterqvist et al., 2013). In contrast, research using more objective measures of socioeconomic deprivation (e.g., parental income, or parental

unemployment) find evidence of a negative relationship or no relationship (see for example, Baetens et al., 2013; Klonsky, 2011; Liang et al., 2014; Mossige et al., 2016; Swannell et al., 2014). The disparity in results between subjective and objective measures of socioeconomic deprivation suggests that subjective socioeconomic deprivation measures variability that objective deprivation does not. Previous research suggests

A



B

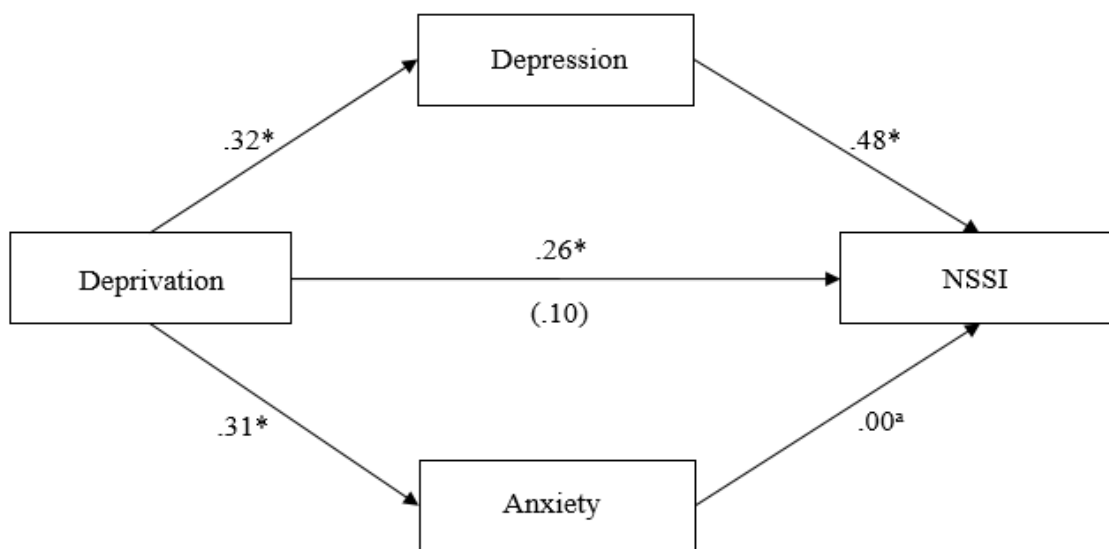


Figure 1. Multiple mediation models of Deprivation and NSSI through Depression and Anxiety for girls (Panel A) and boys (Panel B). Standardised regression coefficients are provided along the paths. $*p < .001$.

that socioeconomic deprivation can be distressing for some young people (Egan-Bitran, 2010), and that the risk of self-injury is reduced when adjusting for depression symptoms (Page et al., 2014). The current study found that psychological distress fully mediated the relationship between deprivation and NSSI. Our data provides a tentative theoretical hypothesis that socioeconomic deprivation indirectly increases risk for NSSI by directly increasing the risk for depression and, among girls only, anxiety. Consistent with theoretical understandings of NSSI as a strategy to avoid overwhelming emotional experiences (Chapman et al., 2006), the current study suggests that deprivation leads to symptoms of psychological distress (or vice versa), and that NSSI is then used to cope with this distress.

Critically, although we we feared similar relationships between deprivation and mental health outcomes, the psychological mechanisms underlying the relationship between socioeconomic deprivation and NSSI appear to differ for boys and girls. For girls, greater depression and anxiety independently mediated the relationship between socioeconomic deprivation and NSSI. However, for boys only depression independently mediated this relationship. This suggests that depressed boys choose to manage their distress with NSSI, whereas anxious boys choose a different coping strategy. Given that conduct problems and substance use are more common in males than females (Chen & Jacobson, 2012; Zahn-Waxler, Shirtcliff, & Marceau, 2008), these behaviours may be fruitful areas for future study.

Consistent with previous adolescent research (Zahn-Waxler et al., 2008), girls reported greater anxiety and depression than did boys. However, we found no evidence of a difference in the strength of the relationship between socioeconomic deprivation and either self-injury, depression or anxiety. This finding adds to the already mixed results of previous research investigating the relationship between mental health outcomes and socioeconomic deprivation in children and adolescents. Specifically, a systematic review of research investigating mental health outcomes and deprivation in children and adolescents (Reiss, 2013) highlighted studies for which there were no gender differences (e.g. Ravens-Sieberer et al., 2008), studies where the association between mental health outcomes and deprivation was stronger for males (e.g. Due et al., 2003) and studies where the association was stronger for females (e.g. Leve et al., 2005). Therefore it is clear that future meta-analytic work is needed to understand the conditions under which socioeconomic deprivation is associated with gender differences in mental health outcomes.

Practically, this study emphasises that adolescents whose families are experiencing socioeconomic deprivation are at greater risk of poor mental health outcomes, including anxiety, depression, and self-injury. Policy and funding should focus on providing low decile schools or comparatively poorer geographical areas with greater resources for mental health and wellbeing support, perhaps in the form of larger school guidance counsellor teams or programmes targeted at prevention or promoting student wellbeing. Given that populations with the greatest socioeconomic deprivation have the highest mental health needs but typically the poorest access to health services (Saxena, Thornicroft, Knapp,

& Whiteford, 2007), school-based interventions are likely to be particularly important for addressing socioeconomic disparities in adolescent mental health. Additionally, assessing socioeconomic deprivation may then be useful for school guidance counsellors, school staff and mental health professionals in helping to identify adolescents who may be at greater risk of poorer mental health allowing for greater monitoring for any initial signs of difficulty or distress. The current study also reiterates the need for mental health services and NSSI intervention programmes to consider the role of environmental stressors such as deprivation in the development of mental health problems.

One strength of this research is that it assesses the mechanisms underlying the relationship between NSSI and socioeconomic deprivation within a large community sample of New Zealand adolescents. Unfortunately the cross-sectional nature of this study limits possible conclusions about causality in the relationships between socioeconomic deprivation, depression, anxiety, and NSSI. Although self-injury is unlikely to cause deprivation, deprivation, depression and anxiety may simply co-occur, or perhaps a depressed young person is both more likely to perceive deprivation and to engage in self-injury. Quasi-experimental studies suggest that socioeconomic deprivation may be causality implemented in poorer mental health, reporting that a decrease in deprivation leads to a decrease or remission of mental health issues (Costello, Comptom, Keeler, & Angold, 2003; Strohschein, 2005). However, it is import to note that Costello and colleagues (2005) found no effect of improved financial circumstances on depression or anxiety symptoms, while Strohschein (2005) found that the effect of household income on depression attenuated as the children aged into adolescence. A second caveat of the current research is the time course captured by the measures. We assessed current experience of socioeconomic deprivation, level of anxiety and depression symptoms in the past week, and lifetime NSSI, effectually assessing whether the relationship between current deprivation and past NSSI is mediated by recent anxiety and depression. Thus, it is clear that further longitudinal analyses are required to better clarify the nature of the relationship between socioeconomic deprivation and mental health outcomes.

Given that we know that in Aotearoa New Zealand, Māori experience greater deprivation than non-Māori (Denny et al., 2016; Perry, 2015), it is somewhat surprising that Māori youth do not appear to be significantly more likely than non-Māori youth to report NSSI (Wilson et al., 2016). Future research could explore whether there are cultural buffers of the relationship between deprivation and NSSI. Alternatively, there is evidence to suggest that the link between deprivation and population health is better accounted for by relative deprivation and social comparisons than it is by objective deprivation (e.g. Kondo, Kawachi, Subramanian, Takeda, & Yamagata, 2008; Wilkinson & Pickett, 2007). In many areas, Māori are concentrated in lower decile schools in which relative deprivation may be less obvious than in higher decile areas. Future research is needed to better understand the casual relationship between socioeconomic deprivation and self-injury, depression, anxiety and mental health more broadly.

Conclusions

Over a third (37.8%) of our young adolescent Aotearoa New Zealand sample reported experiencing some degree of subjective socioeconomic deprivation. Experiencing socioeconomic deprivation was associated with greater depression, anxiety, and engagement in self-injury. Among girls, the relationship between deprivation and NSSI was fully mediated by both depression and anxiety, whereas for boys only depression independently mediated the relationship. These findings suggest that psychological distress may be the mechanism by which socioeconomic deprivation predicts engagement in self-injury, and critically that this process may operate in a different manner among girls and boys. Taken together, these findings reiterate the need for greater mental health and wellbeing support for adolescents and their families experiencing socioeconomic deprivation.

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