

Canada's residential school system: measuring the intergenerational impact of familial attendance on health and mental health outcomes

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ABSTRACT

Background We estimate the intergenerational relationship between the residential school (RS) attendance of an older generation family member and the physical and mental health of a younger generation.

Methods Data from the 2012 Aboriginal Peoples Survey (APS) is used to examine the relationship between previous generational family RS attendance and the current physical and mental health of off-reserve First Nations, Métis and Inuit Canadians. Five outcomes are considered (self-perceived health, mental health, distress, suicidal ideation and suicide attempt). Direct (univariate) and indirect (multivariate) effects of family RS attendance are examined for each dependent variable. We draw from the general and indigenous-specific social determinants of health literature to inform the construction of our models.

Results Familial RS attendance is shown to affect directly all five health and mental health outcomes, and is associated with lower self-perceived health and mental health, and a higher risk for distress and suicidal behaviours. Background, mediating and structural-level variables influence the strength of association. Odds of being in lower self-perceived health remain statistically significantly higher with the presence of familial attendance of RS when controlling for all covariates. The odds of having had a suicide attempt within the past 12 months remain twice as high for those with familial attendance of RS.

Conclusions Health disparities exist between indigenous and non-indigenous Canadians, an important source of which is a family history of RS attendance. This has implications for clinical practice and Canadian public health, as well as countries with similar historical legacies.

INTRODUCTION

Indigenous peoples of Canada

Indigenous identity in Canada comprises three distinct groups: First Nations, Inuit and Métis peoples, as legally recognised by the Constitution Act of 1982. The 2011 Census reports that there are currently 1 400 685 indigenous peoples living in Canada of whom 851 560 (60.8%) solely identify as First Nations, 451 795 (32.2%) are Métis and 59 445 (4.2%) are Inuit¹—the remainder identify as having mixed indigenous heritage. Indigenous Canadians make up 4.3% of the total Canadian population and are growing at a rate of ~20% annually, as opposed to 5% for the non-indigenous population.¹ The median age of the indigenous Canadian population is 27.7 years, considerably younger than the 40.6-year median for

non-indigenous Canadians.¹ First Nations, Inuit and Métis peoples may or may not hold registered Indian status, and it is estimated that over a quarter of First Nations peoples are not registered.¹ Half of the registered First Nations peoples live on reserve, while fewer than 5% of Métis peoples live on reserve.¹ Inuit peoples have had different arrangements with the federal government historically and have never lived on reserve; however, a high proportion (76%) live in Inuit Nunangat, or Inuit self-governed lands in northern Canada.¹

Residential schools: a social determinant of indigenous health

Since the launch of the Royal Commission on Aboriginal Peoples (RCAP) in the 1990s, health disparities between indigenous and non-indigenous Canadians' health outcomes have been documented and investigated.² The RCAP was the first comprehensive public recording and recognition of the historical, social, economic and political systems, views and policies that had contributed importantly to the inequities observed as being faced by indigenous Canadians.² The RCAP report prompted the initiative to collect data regarding indigenous peoples' health and well-being across health outcomes as well as the social determinants of health (SDH).

An expansive array of policy legacies potentially contributed to the above-mentioned disparities in health. In this paper, we focus on the residential school (RS) system in Canada. The primary policy goal of RSs was to assimilate indigenous Canadians into European colonial culture.² The earliest RSs began in Québec in the early 17th century; the widespread system administered by the Catholic, Anglican and United churches and federal government began in the mid-19th century and lasted until the last school was closed in 1996.³

By the end of the 19th century, RS attendance became mandatory and children as young as 3 years were forced by law to leave home and live at the schools.^{2,3} After the last RS closed in 1996, survivors began to come forward with reports of chronic sexual and physical abuse and neglect.⁴ Those who attended RSs were exposed to discrimination, colonialism, implied racial inferiority, cultural dispossession, widespread family fracturing and oppression.⁴

While many have explored the impact of the RSs on the health of those who attended and their communities, there are relatively few that estimate empirically the association between RS attendance and the health and mental health outcomes of



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subsequent generations. We use the 2012 cycle of the Aboriginal Peoples Survey (APS)[†] to evaluate quantitatively if and how parental, aunt, uncle and grandparental RS attendance influences a continuum of self-perceived health and mental health outcomes in subsequent generations of off-reserve indigenous Canadians.

RSs and potential intergenerational impacts on health

How can a distal exposure of trauma influence the subsequent generations' health outcomes? Brave Heart *et al*^{5, 6} have pioneered the framing of trauma with respect to indigenous peoples and cumulative effects of traumatic historical events on present-day functioning. Brave Heart and DeBruyn⁵ coined the term historical trauma in their study of the 1890 Wounded Knee Massacre of the Lakota people in the USA. This temporally distal event was found to have impacts on the mental health and grief processing of present-day Lakota peoples over one century later. The development and application of scholarship addressing historical trauma^{5, 7–9} includes several terms and concepts including historical trauma responses,⁸ collective trauma, race-based trauma and intergenerational trauma. Brave Heart and DeBruyn⁵ note that trauma experienced by indigenous Americans continues to be felt by their descendants, manifesting itself in unresolved grief and depression.

Possible mechanisms

The impact of RS attendance on attendees' self-perceived health status is important and well documented, in that RS exposure is significantly and negatively associated with self-perceived health, when controlling for a variety of confounding, mediating and community-level factors.¹⁰ The impact of RS attendance of an older generation family member was found to be associated with higher odds of reporting a history of abuse, and for those individuals with abuse history, higher odds of suicidality in a sample of First Nations individuals living on reserve.¹¹ It is therefore reasonable to ask whether these important intergenerational effects exist for First Nations, Inuit and Métis Canadians living off reserve. We investigate if RS attendance of a parent, aunt, uncle or grandparent is associated with lower health and mental health status in subsequent generations without direct RS attendance, when compared with individuals with no family history of RS attendance, controlling for SDH.

Our model is informed by literature exploring SDH,^{12, 13} indigenous-specific SDH^{14–17} and literature discussing historical trauma transmission and how this impacts on health. There are several dimensions to the mechanisms by which distal exposure to policy directed at a specific cultural group can influence the health outcomes of subsequent generations of said population. These dimensions include direct influence of parents' and grandparents' ill health and mental health resulting from RS attendance, possible biological transfer of adaptations to trauma, as well as relational interactions such as behaviours towards and in the presence of younger generations.

Biological

Research in the area of epigenetics has shed light on potential mechanisms of intergenerational transfer of parental experience on the health and well-being of children. The effect of experience of a parent on a child or grandchild may be linked through epigenetic inheritance. Epigenetic inheritance refers to modifications in gene expression in parental cells in response to

challenges presented by the environment, which can be transmitted to a child (F1) and at least another generation or two (F2 and F3) in the absence of the original exposure.^{18–20}

Studies have shown that early-life experience has the potential to alter DNA methylation states without changing the DNA sequence.²¹ Epigenetic modification can lead to lifelong changes in the hypothalamic–pituitary–adrenal (HPA) response to stress in children, based on the experiences of parents or grandparents. Traumatic stressors have been shown to alter HPA axis functioning²² such that coping biologically and behaviourally to subsequent stressful events becomes exaggerated.²³ Epigenetic modifications have been shown to have long-lasting, stable behavioural responses that can exceed the length of the stimulus and, when maladaptive, can result in psychiatric disorders.²⁴ Epigenetic transmission of parent experience and coping skills can explain how even before conception, environmental exposure of parents is a determinant of risk and coping in the following generations.²⁵

Psychosocial

Biological mechanisms also potentially inform the psychosocial coping abilities in the environment of individuals as they move through the life course. Yehuda, Halligman and Grossman observed HPA dysregulation in the children of Holocaust survivors when compared with controls.²⁶ Similarly, children of survivors of traumatic experiences who themselves experience trauma were shown to be significantly more likely than controls to develop post-traumatic stress disorder (PTSD).^{26, 27} Even traumatic stressors experienced early in childhood of a parent may influence their children's well-being.²⁸

Attachment theory^{29, 30} provides a theoretical construct in psychology that can explain the transmission of health and pathology from parent to child via role modelling and relational type, respectively. Attachment theory suggests that the parent–child bond is biologically based and essential for survival of the child—this bond develops into an attachment style that is shaped in early childhood and is apparent throughout the life course.³⁰ Insecure attachment between parent and child as symptomatised by parentification, rejection, fear and unresolved trauma has been found to be highly prevalent (83%) in children whose parents were subjected to childhood trauma.^{31, 32} Maternal experience of childhood trauma, mediated by maternal mental health, has been shown to be a significant predictor of child health and mental health outcomes, and maternal experience of high betrayal trauma, in addition to the level of perceived intervention by her own parents, was shown to be the only significant predictor of her own parent attachment style with her infant child.^{33, 34} A mother's exposure to abuse in childhood is significantly associated with poorer mental health outcomes, which influences parenting style and is associated with children internalising depressive symptoms in early childhood.³⁵

Parent experience of trauma in childhood and its impact on children's broader access to social and community supports can be understood through a phenomenon of silencing, or 'the conspiracy of silence' in Holocaust survivors and their children, whereby children were verbally or non-verbally taught not to trust anyone, and not to communicate about their experiences.³⁶ Conversely, compulsive retelling of traumatic experiences by parents to their children may cause vicarious trauma of children, as well as subject children to parentification or other non-child-like roles within the family that cause undue stress.³⁷

The abduction of indigenous Canadian children from their homes potentially impacted on parenting skills and styles.^{38, 39}

[†]The APS is a Statistics Canada-administered survey and data set.

In addition to being separated from their families of origin, RS survivors' exposure to abuse and neglect in the RS environment has manifested in the transmission of abusive and neglectful parenting patterns into indigenous communities.^{17 38} Across all cultures, when an individual is abused or neglected in childhood, that person's propensity to abuse or neglect their children is significantly higher.³³

Coping with traumatic experiences has been shown to include the use of harmful substances such as alcohol and drugs in indigenous populations⁴⁰ and in populations suffering from PTSD more broadly.⁴¹ Health behaviours, which have a more direct impact on health outcomes, are shaped by biological, psychological and social factors. The First Nations Information Governance Centre (FNIGC) provides descriptive statistics derived from the Regional Health Survey (RHS) regarding on-reserve First Nations peoples and a variety of SDH outcomes, including health behaviours. Statistics from the RHS describe poorer health outcomes in survivors and children of survivors of the RSs (see FNIGC at <http://data.fnigc.ca/online>).

Community

Structural resources within a given community may be impacted by the prevalence and severity of RS attendance. Gee and Payne-Sturges⁴² cite segregation, perceived aggression and oppression as potential mechanisms of place and environment on health and mental health in populations impacted by historical trauma. Neighbourhood resources or lack thereof can act to mediate the impacts of stressors and environmental hazards.⁴³ The interplay between an individual's ancestor having attended RS and existing stressors within their community, may be mediated by the quality of housing, food security and health behaviours. In addition, community responses to historical

trauma may influence how individuals are impacted by familial ancestral attendance of RS.⁸

For individuals with ancestral RS attendance, separation from family, stress from traumatic events (in the past) and current community stressors both mediate and are indicators of the pathways and impacts of a distal trauma on current generations' health and mental health. Those directly exposed to one or multiple policies impacting cultural loss (RS, geographic relocation, child removal) cope as individuals, as well as in the context of their community settings. Indirect effects on individuals who attended RS may be influenced by how others in their setting cope, and the prevalence of prior generational exposure to RS attendance. The first generation following attendees may experience direct biological and social transmission of parental coping and experience, as well as indirect effects determined by environmental exposures and coping. Grandchildren of attendees experience indirect biological and social exposures, as well as direct social exposure to family dynamics and relationships that may be impacted by grandparent attendance.

Selection of independent variables

Our hypothesis is that younger generation non-attendees with exposure to ancestral attendance of RS will report poorer mental and physical health outcomes than those without this exposure through, and mediated by the mechanisms stated above. Our conceptual framework informs our variable selection. We begin by controlling for exogenous variables to understand how age, gender and variation in exposure to RS across First Nations, Inuit and Métis peoples may be associated with the health and mental health outcomes. We then introduce potentially partially endogenous covariates (eg, marital status, educational attainment, income, etc) to control for the influence of SDH that may mediate the exposure of ancestral RS

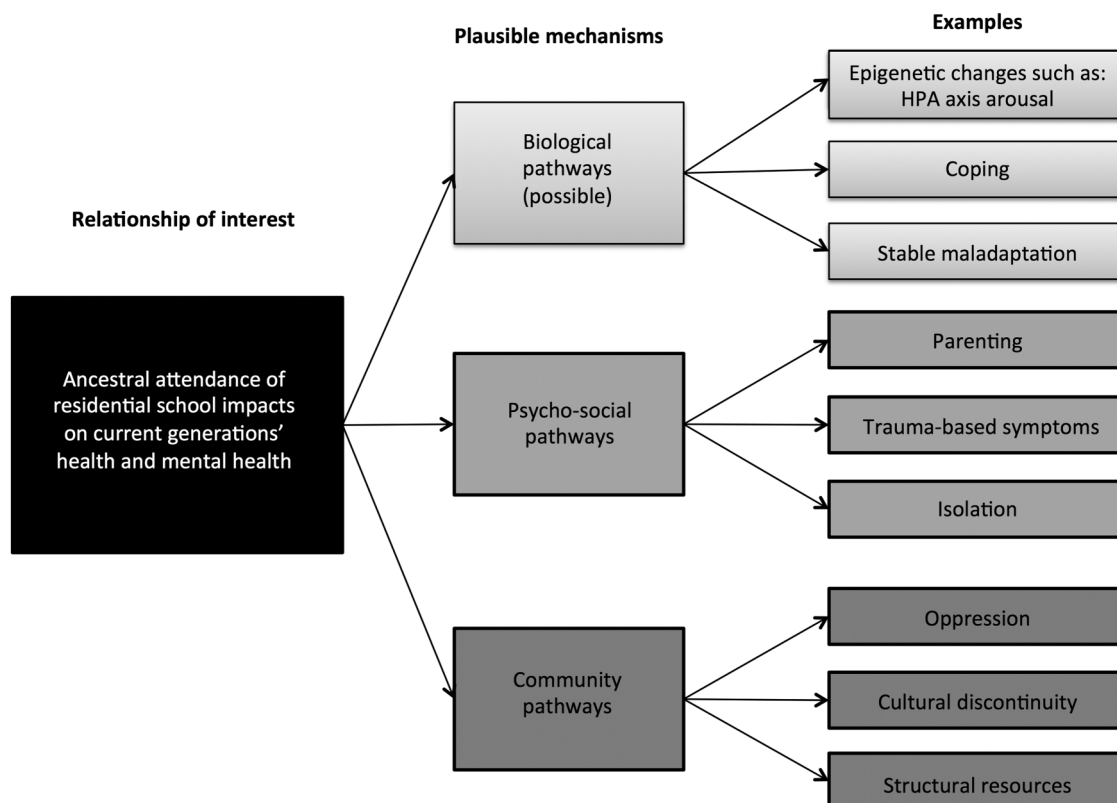


Figure 1 Possible mechanisms for the intergenerational transfer of trauma.

attendance on current individuals' health and mental health status. These covariates draw upon the intergenerational trauma and SDH literature cited above, including those that identify indigenous-specific SDH. We conceptualise RS attendance as a distal SDH and proxy for colonialism.^{12 14 17 44} We then add a series of potentially partially endogenous structural-level variables such as household food security, housing repair status and individual health behaviours to control for factors identified in the literature as being particularly pertinent at the individual and community level in the population of interest.^{17 44 45}

The covariates chosen outline the confounders and potential mediators for the pathway of this exposure across the life course of the children and grandchildren of RS survivors. Owing to the cross-sectional nature of the data, although we are unable to explore pathways across the lifespan, or model cohort effects, we argue that RSs signify an important potential source of trauma for indigenous Canadians, one which could have lasting effects through more proximal determinants of health (our covariates).

METHODS

Our framework for analysis (figure 1) guided our independent variable selection and groupings. The 2012 APS represents respondents self-identifying as 'Aboriginal' in the 2011 National Household Survey (NHS) and represents First Nations, Métis and Inuit peoples living off reserve. There were 28 410 respondents self-identified as indigenous in the 2012 cycle. Statistics Canada reports a 76% response rate.⁴⁶ Reliable data were collected for all provinces and territories including the northern Inuit self-governed regions of Inuvialuit, Nunavik, Nunatsiavut and Nunavut. Data selected for analyses focuses on education, employment and health including the social determinants thereof.

Statistical analysis

Dependent variables

Dependent variables were chosen to represent a continuum of health and well-being from being healthy to being in poor overall or mental health. The five dependent variables are self-perceived health (SPH), self-perceived mental health (SPMH), the 10-item Kessler Psychological Distress Scale (K10), suicide attempt in the past 12 months and suicidal ideation in the past 12 months. SPH and SPMH are modelled as ordinal outcome variables. Respondents were asked: 'In general, would you say your (mental) health is excellent, very good, good, fair or poor?' Responses were coded with 'excellent' as the highest (5) and 'poor' the lowest (1) for both ordinal measures. The K10 is a 10-item scale that measures overall psychological distress. Each question is a Likert-type scale ranging from 1 to 5 (1=not at all, 5=very much). Two measures of suicidality were used—the presence of reported suicidal ideation in the past 12 months, and the presence of any reported suicide attempts within the past 12 months. Online supplementary appendices A and B describe the dependent (outcome) and independent variables.

Self-perceived or rated health status has been shown to be an independent predictor of mortality^{47 48} and morbidity⁴⁹ across a wide variety of populations. Self-perceived mental health status has been shown to be an important predictor of overall physical health, and a valid measure of general mental health in a Canadian sample.^{50 51} The K10 has been evaluated as a measure of non-specific psychological distress and psychiatric morbidity in population health surveys in Canada, the USA and Australia, and has been found to be psychometrically sound in measuring the overall psychological distress for First Nations, Inuit and Métis peoples living off reserve in Canada.^{52–55}

Suicidal ideation and attempt in the past 12 months are included as proxies for severe psychological distress as well as likelihood of completing suicide. As suicide rates in certain indigenous communities can be much higher (up to 20 times higher than in other communities), we included these measures as dependent variables.¹ Clinical measures to estimate suicidal ideation attempt to provide guidelines for the prevention of suicidal behaviours, and ultimately death by suicide.^{56–58} Suicidal ideation has been shown to be a predictor of suicide attempt within a year of reported ideation.⁵⁹ Attempted suicide is the strongest known predictor of completed suicide.⁶⁰

Our sample includes adults aged 18 and over who either reported having or not having at least one of their parents, aunts, uncles, grandparents or both parent(s) and grandparent(s) who attended a RS. Respondents who reported having attended a RS, or who reported having a spouse, siblings, cousins or

Table 1 Variable means or proportion of distribution by family attendance of residential school

Variable	Mean or proportion by family attendance of RS		P<0.001 Unless specified
	Presence of family attendance of RS	Absence of family attendance of RS	
Self-perceived health			
Poor	6.53	5.37	
Fair	14.55	13.38	
Good	29.63	27.99	
Very good	29.54	31.42	
Excellent	19.76	21.85	
Self-perceived mental health			
Poor	2.55	1.86	
Fair	10.13	8.12	
Good	28.14	23.11	
Very good	30.52	34.35	
Excellent	28.65	32.56	
K10	6.583	5.344	
Suicidal ideation	0.061	0.038	
Suicide attempt	0.017	0.005	
Age			
Younger (18–34)	0.484	0.335	
Middle (35–64)	0.442	0.475	
Older (65+)	0.074	0.191	
Sex			
Indigenous identity			
First Nations	0.627	0.395	
Métis	0.324	0.586	
Inuit	0.057	0.026	
Urban	0.462	0.419	
Marital status	0.458	0.545	
Educational attainment	0.765	0.798	<0.01
Low-income cut-off (after tax)	0.203	0.135	
Employment status	0.629	0.636	
Number of minors in the household	1.043	0.658	
Home repair status	0.123	0.098	
Food security	0.123	0.068	
Alcohol use	0.575	0.609	<0.05
Tobacco use	0.338	0.261	

RS, residential school.

Table 2 Results of models predicting self-perceived health and mental health, conditional on familial attendance of a residential school

	Model 1 OR (95% CI)		Model 2 OR (95% CI)		Model 3 OR (95% CI)		Model 4* OR (95% CI)	
	SPH	SPMH	SPH	SPMH	SPH	SPMH	SPH	SPMH
FA of RS	0.861* (0.761 to 0.974)	0.770*** (0.671 to 0.883)	0.758*** (0.662 to 0.869)	0.801*** (0.690 to 0.931)	.799** (0.696 to 0.919)	0.0858 (0.735 to 1.003)	0.828** (0.711 to 0.964)	0.901 (0.772 to 1.053)
Male			1.230*** (1.090 to 1.387)	1.332*** (1.177 to 1.508)	1.174* (1.038 to 1.329)	1.277*** (1.122 to 1.452)	1.118 (0.977 to 1.281)	1.223** (1.070 to 1.398)
Younger age (reference)								
Middle age			0.622*** (0.550 to 0.704)	0.944 (0.830 to 1.073)	0.516*** (0.449 to 0.592)	0.804** (0.697 to 0.927)	0.527*** (0.451 to 0.613)	0.865* (0.749 to 0.999)
Older age			0.303*** (0.243 to 0.377)	0.974 (0.793 to 1.197)	0.440*** (0.346 to 0.560)	1.379** (1.088 to 1.747)	0.393*** (0.308 to 0.502)	1.317* (1.038 to 1.671)
First Nations			0.945 (0.822 to 1.085)	0.906 (0.788 to 1.043)	1.020 (0.889 to 1.169)	0.991 (0.860 to 1.142)	0.975 (0.838 to 1.134)	0.981 (0.853 to 1.128)
Inuit			0.867 (0.741 to 1.015)	0.799** (0.668 to 0.954)	1.075 (0.869 to 1.330)	0.896 (0.695 to 1.155)	1.208 (0.930 to 1.570)	0.946 (0.718 to 1.246)
Métis (reference)								
Marital status (married)					1.161** (1.014 to 1.329)	1.270*** (1.102 to 1.464)	1.155 (0.994 to 1.343)	1.161 (1.006 to 1.339)
Living in an urban area					0.924 (0.810 to 1.054)	0.924 (0.808 to 1.056)	0.867* (0.753 to 0.999)	0.908 (0.794 to 1.038)
Educational attainment					1.800*** (1.538 to 2.107)	1.732*** (1.479 to 2.028)	1.569*** (1.322 to 1.862)	1.559*** (1.329 to 1.829)
Income (below LICO-AT)					0.557*** (0.454 to 0.683)	0.599*** (0.488 to 0.734)	0.670** (0.561 to 0.872)	0.744** (0.605 to 0.915)
Labour force status (employed)					2.177*** (1.883 to 2.516)	1.898*** (1.629 to 2.212)	1.980*** (1.702 to 2.300)	1.635 (1.405 to 1.902)
Presence of minors in home					1.073** (1.021 to 1.128)	1.029 (0.976 to 1.085)	1.112*** (1.055 to 1.187)	1.043 (0.988 to 1.101)
Major repairs needed to home							0.606*** (0.486 to 0.756)	0.524*** (0.419 to 0.656)
Food insecurity							0.463*** (0.359 to 0.597)	0.289*** (0.218 to 0.383)
Regular alcohol use							1.643*** (1.422 to 1.899)	1.181* (1.031 to 1.352)
Daily tobacco use							0.529*** (0.453 to 0.619)	0.709*** (0.607 to 0.828)

*p<0.05; **p<0.01; ***p<0.001.

FA, family attendance; LICO-AT, low-income after-tax cut-offs; RS, residential school; SPH, self-perceived health; SPMH, self-perceived mental health.

another family member (not specifically defined) who attended a RS, were excluded in order to focus on potential intergenerational impacts of RS attendance on outcomes versus proximal temporal impacts. The final data set comprises 14 280 observations representing ~609 480 indigenous Canadians living off reserve after using rounding specifications, and frequency and bootstrapped weights as delineated by Statistics Canada guidelines.⁴⁶ Bootstrap weights were used on all final models and probability weights applied to all descriptive statistics.

Independent variables

The key explanatory variable in the models described above is whether the survey respondents had at least one family member

of an older generation who attended RS (family attendance (FA)). This variable was derived from a series of questions asking respondents about their own RS attendance, as well as that of their family members. Respondents who stated they did not know about family member attendance or who skipped the question were excluded. Within the data set, 43% of respondents reported having a parent, uncle, aunt, grandparent or 'both' who attended RS, while 57% stated they did not. We conducted sensitivity tests to determine whether parent, aunt, uncle or grandparent, RS attendance differed significantly with respect to each outcome and found that as an explanatory variable, there was no significant difference between the effects of including all relatives into a total FA variable versus separate

groups on any of the models (data not shown). Thus, these groups were combined.

Statistical models

For each of the five dependent variables, there are four nested models: (1) a univariate model that describes the direct impact of FA of RS on outcomes; (2) exogenous background variables are introduced into the first of three multivariate nested models, which include age, sex and indigenous identity; (3) we introduce potentially partially endogenous mediating variables including marital status, and whether respondents live in a rural or urban area; educational attainment, income level, labour force status, and the number of minors in the household; (4) we add potentially partially endogenous variables including the state of housing repair needed, food security and health behaviour variables that may act as structural-level mediators of the impact of FA on the five delineated outcomes. Covariates included in models 3 and 4 may be partially endogenous, particularly health behaviours.

Missing data

Those with missing observations are excluded from the analysis. We used logistic regression to test whether or not there exists an important association between missing data and our outcomes of interest (see online supplementary appendix B). We did not find any significant association between FA of RS for any of our outcomes of interest. We did find associations between certain covariates and our outcome variables (data not shown)—these will be discussed in the Limitations section.

RESULTS

Descriptive statistics

Variable means or proportions by familial attendance of RS are shown in table 1, and the differences in means or proportions were calculated using t tests or χ^2 tests. Fewer individuals with FA of RS reported being in excellent and very good self-perceived health and mental health than those with no FA, and a great proportion of those with FA reported being in poor and

fair self-perceived health and mental health status. Those with a history of FA of RS had higher scores on the K10, and higher proportions of individuals with suicidal ideation and attempts in the past year when compared with those with no FA.

Model outputs

Self-perceived health and mental health

We modelled two ordinal outcomes: SPH and SPMH, as seen in table 2. We conducted likelihood ratio tests to ensure the proportional odds assumption for the ordered logistic regression models (SPH and SPMH) held (data not shown). In all SPH models, the estimated cut-points for fitted values were significantly different from each other. In the final SPMH model, there is no statistically significant difference between the fitted values of those reporting being in 'excellent', 'very good' and good mental health. Results show that the odds of being in self-reported 'excellent' health are significantly and negatively related to having a FA of a RS ($p<0.000$). This association holds when mediating and structural-level variables, including health behaviours, are controlled for in the model. SPMH is shown to be negatively and significantly associated with FA of a RS when background factors are controlled for; however, the effect loses statistical significance when mediating and structural covariates are included in the model.

Kessler-10-Item Distress Scale

The K10 was modelled as a binary outcome variable at the 'moderate' distress threshold level reported in the literature.⁶¹ FA of RS is positively and significantly associated with the presence of moderate psychological distress—this effect is attenuated in the multivariate models (table 3).

Suicidality

The association between FA of RS and suicidal ideation is attenuated below statistically significant levels ($p<0.05$) once background, mediating and structural covariates are introduced (table 4). The association between FA of RS and having attempted suicide in the past 12 months remains positively and

Table 3 Results of models predicting Kessler-10 Distress Scale scores, conditional on familial attendance of a residential school

Kessler-10 Distress Scale	Model 1 B (95% CI)	Model 2 B (95% CI)	Model 3 B (95% CI)	Model 4 B (95% CI)
FA of RS	1.242* (1.041 to 1.483)	0.933** (0.392 to 1.474)	1.073 (0.867 to 1.328)	1.002 (0.792 to 1.267)
Male		−1.314*** (−1.770 to −0.857)	1.114 (0.919 to 1.352)	1.253* (1.023 to 1.535)
Younger age (reference)				
Middle age		−0.561,* (−1.064 to −0.057)	0.872 (0.704 to 1.082)	0.646*** (0.509 to 0.820)
Older age		−1.724*** (−2.452 to −0.997)	0.513*** (0.362 to 0.726)	0.387*** (0.268 to 0.559)
First Nations		0.197 (−0.359 to 0.752)	1.090 (0.867 to 1.370)	1.129 (0.879 to 1.451)
Inuit		−0.686 (−1.452 to 0.079)	0.932 (0.664 to 1.309)	0.857 (0.552 to 1.332)
Métis (reference)				
Marital status (married)			0.619*** (0.509 to 0.754)	0.653*** (0.527 to 0.808)
Living in an urban area			0.860 (0.705 to 1.048)	0.854 (0.684 to 1.066)
Educational attainment			0.624*** (0.507 to 0.769)	0.738*** (0.592 to 0.923)
Income (below LICO-AT)			1.524** (1.196 to 1.942)	1.143 (0.866 to 1.509)
Labour force status (employed)			0.533*** (0.430 to 0.661)	0.643*** (0.504 to 0.820)
Presence of minors in home			0.885** (0.807 to 0.970)	0.885* (0.798 to 0.981)
Major repairs needed to home				2.122*** (1.586 to 2.840)
Food insecurity				3.114*** (2.321 to 4.178)
Regular alcohol use				0.871 (0.704 to 1.078)
Daily tobacco use				1.375** (1.104 to 1.711)

* $p<0.05$; ** $p<0.01$; *** $p<0.001$.

FA, family attendance; LICO-AT, low-income after-tax cut-offs; RS, residential school.

Table 4 Results of models predicting suicidal ideation in the past 12 months, conditional on familial attendance of a residential school

	Model 1 OR (95% CI)		Model 2 OR (95% CI)		Model 3 OR (95% CI)		Model 4 OR (95% CI)	
	SI	SA	SI	SA	SI	SA	SI	SA
FA of RS	1.661* (1.123 to 2.458)	3.352*** (1.894 to 5.931)	1.352 (−2.452 to −0.997)	2.572** (1.354 to 4.886)	1.346 (0.855 to 2.121)	2.358* (1.206 to 4.610)	1.181 (0.741 to 1.882)	2.000* (1.023 to 3.908)
Male			0.953 (0.691 to 1.314)	0.535 (0.269 to 1.065)	0.994 (0.714 to 1.383)	0.554 (0.272 to 1.130)	0.997 (0.710 to 1.399)	0.500 (0.249 to 1.005)
Younger age (reference)					1.266 (0.825 to 1.942)	1.655 (0.825 to 3.318)	1.486 (0.940 to 2.348)	1.991* (1.093 to 3.625)
Middle age			0.688 (0.459 to 1.030)	0.473* (0.251 to 0.891)				
Older age			0.311* (0.124 to 0.782)	0.090* (0.014 to 0.566)	0.252** (0.091 to 0.697)	0.073** (0.010 to 0.518)	0.322* (0.109 to 0.957)	0.134* (0.019 to 0.959)
First Nations			1.410 (0.900 to 2.209)	1.061 (0.532 to 2.115)	1.236 (0.778 to 1.963)	0.947 (0.476 to 1.886)	1.242 (0.770 to 2.002)	0.823 (0.423 to 1.599)
Inuit			1.260 (0.815 to 1.947)	1.946 (0.965 to 0.018)	1.041 (0.563 to 1.928)	1.502 (0.530 to 4.263)	0.763 (0.368 to 1.584)	0.942 (0.335 to 2.650)
Metis (reference)								
Marital status (married)					0.672* (0.454 to 0.995)	0.405** (0.207 to 0.790)	0.791 (0.542 to 1.154)	0.540 (0.284 to 1.026)
Living in an urban area					0.927 (0.589 to 1.460)	0.628 (0.316 to 1.248)	0.950 (0.597 to 1.515)	0.611 (0.309 to 1.206)
Educational attainment					0.810 (0.502 to 1.308)	0.457* (0.238 to 0.876)	0.985 (0.624 to 1.557)	0.577 (0.293 to 1.134)
Income (below LICO-AT)					2.715*** (1.875 to 3.932)	0.887 (0.440 to 1.788)	2.153*** (1.455 to 3.186)	0.769 (0.354 to 1.672)
Labour force status (employed)					0.434*** (0.301 to 0.627)	0.268*** (0.138 to 0.519)	0.520** (0.359 to 0.753)	0.304*** (0.160 to 0.577)
Presence of minors in home					0.701*** (0.587 to 0.837)	0.857 (0.684 to 1.074)	0.700*** (0.581 to 0.843)	0.864 (0.689 to 1.086)
Major repairs needed to home							1.570 (0.958 to 2.572)	0.586 (0.233 to 1.475)
Food insecurity							3.966*** (2.464 to 6.384)	4.800*** (2.233 to 10.319)
Regular alcohol use							1.151 (0.811 to 1.632)	2.027* (1.018 to 4.033)
Daily tobacco use							1.887** (1.308 to 2.722)	3.011*** (1.683 to 5.385)

Note: *p<0.05; **p<0.01; ***p<0.001.

FA, family attendance; LICO-AT, low-income after-tax cut-offs; RS, residential school; SA, suicide attempt; SI, suicidal ideation.

statistically significantly related in all model outputs (table 4). When all covariates are introduced and controlled for, the odds of having attempted suicide are twice the odds of those with no FA of RS.

DISCUSSION

The likelihood of being in worse self-perceived health and mental health, as well as experiencing self-reported mental distress, suicidal ideation and having a suicide attempt in the past 12 months, increases conditional on familial attendance of RS. Conceptual constructs developed in the intergenerational trauma literature have been used to estimate the impact of familial RS attendance on health and empirically evaluate the presence of intergenerational trauma.^{8 23} RS family member attendance acts as a mediator for various present-day stress experiences, especially in frequency of exposure to stress and the appraisal thereof.²³ This lends support to the mediating mechanism of survivor stress impacting the stress responses of children of survivors to current stress responses.

We find that controlling for a variety of structural and SDH, the effect of RS attendance on subsequent generations remains important and statistically significantly associated with lower self-perceived health and higher odds of suicide attempt within the past year.

RS: a distal determinant of health and mental health

Our results indicate that when controlling for background, mediating and structural-level variables, including health behaviours, the impact of FA of RS on the likelihood of being in excellent self-perceived health is negative and significant, and that of having attempted suicide in the past year is positive and significant. Model outputs for SPMH, the K10 and suicidal ideation indicate that FA of RS is directly associated with current functioning of subsequent generations of RS survivors. The variation in attenuation of the effects in these models could be due to a variety of unobserved factors, including responder biases in answering sensitive mental health-related questions that may still be stigmatising.

Health behaviours

Coping with traumatic experiences has been shown to include the use of harmful substances such as alcohol and drugs in indigenous populations and in populations suffering from PTSD more broadly.^{40 41} Health behaviours which have a more direct association with health outcomes are shaped by biological, psychological and social factors. Results from the RHS, a data set capturing health and SDH indicators for on-reserve First Nations peoples, reveal poorer health outcomes in survivors and children of survivors of RSs (see <http://data.fnigc.ca/online>).

It is striking that even when controlling for structural covariates—health behaviours, food security issues and whether shelter is adequate or in need of major repair—individuals whose ancestors attended RSs report lower likelihoods of being in excellent SPH and are more likely to have attempted suicide in the past year. As noted above, suicide attempt is the strongest predictor of death by suicide.

Limitations

First, the APS relies on self-report and is a cross-sectional survey, making causal inference difficult. Second, as mentioned above, intergenerational transfer of trauma is difficult to show through quantitative analysis, as data are not conducive to differentiating between cohort effects and omitted variables or considerations. Data limitations make analyses beyond

correlational or associational difficult. Further, we lack a longitudinal data set.

In our analysis of missing data, we found that being male was significantly and positively associated with missingness in all mental health outcomes (SPMH, the K-10 and suicidal ideation and attempt). It is possible that in terms of mental health outcomes modelled, the effect of FA of RS was underestimated, due to response bias in the sample. In online supplementary appendix B we report on the degree of missingness, which is substantial and related to covariates which are typically associated with lower levels of self-perceived health and mental health.

Our analysis only considers the effects for indigenous Canadians living off reserve. Although this population represents a large proportion of indigenous Canadians, it is not the full picture of indigenous Canadians' experience and cannot be generalised beyond the limits of the survey.

Practice and policy implications

Practice implications

The associations found are striking and signal the need for a widespread recognition and understanding of the effects of past collective trauma on the current health states. Most health service delivery to indigenous peoples is not centred on indigenous health principles or conceptualisations of health and well-being. At the practice level, it is important that non-indigenous practitioners are aware that present health symptoms may reflect mechanisms of pathology not immediately observable. Consulting with indigenous groups to develop a culturally sensitive means of inquiring as to the RS attendance of family members including of any ancestors, could improve holistic, person-centred and culturally appropriate understanding and framing of health issues for indigenous peoples.

Policy implications

There have been initiatives by the Canadian government to recognise and address the negative and lasting impacts of the RS system on indigenous Canadians. Policy remedies in terms of health require a deeper understanding and awareness within and outside of health systems of the policy legacies of RSs on current indigenous Canadians' health and well-being. Improving the health and well-being of indigenous Canadians is an obvious public health policy goal in terms of equity and sustainability of health systems. We asked if the RS attendance of any older generation family member was associated with the current health and mental health status of offspring—however, many generations removed. Further research is warranted in exploring the nature of the intergenerational effect—it may be interesting to see if there are differential effects across parents and generations or by gender. Further exploration into the risk and protective factors associated with physical and mental health outcomes at the population level should focus on evaluating empirically the similarities and differences in SDH for indigenous Canadians compared with other Canadians.

What is already known on this subject?

- ▶ Indigenous attendees of the residential school system in Canada report lower self-perceived and mental health than indigenous peoples who did not attend residential schools.
- ▶ Disparities exist between indigenous and non-indigenous Canadians in terms of health status and the social determinants of health.

What this study adds?

- This is the first study to examine quantitatively the association between ancestral attendance of Canadian residential schools and subsequent generations of off-reserve indigenous Canadians' health and mental health using a nationally representative survey.
- Knowing that ancestral residential school attendance affects current generations' health and mental health outcomes can better inform culturally appropriate programmes to improve the health of indigenous Canadians.

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REFERENCES

- 1 Statistics Canada. *Aboriginal Peoples in Canada: First Nations People, Métis and Inuit*. Minister of Canada, Ottawa, 2011.
- 2 Royal Commission on Aboriginal Peoples (RCAP). *Report of the Royal Commission on Aboriginal Peoples Volume 1—Looking Forward Looking Back*. Ottawa, Canada: Canada Communication Group, 1996.
- 3 Aboriginal Healing Foundation. *From truth to reconciliation*. 2nd edn. Ottawa, ON: Aboriginal Healing Foundation, 2008.
- 4 Truth and Reconciliation Commission of Canada. *Honouring the truth, reconciling for the future*. Ottawa, Canada: Lorimer, 2015. http://www.trc.ca/websites/trcinstitution/File/2015/Honouring_the_Truth_Reconciling_for_the_Future_July_23_2015.pdf
- 5 Brave Heart MYH, DeBruyn LM. The American Indian Holocaust: healing historical unresolved grief. *Am Indian Alsk Native Ment Health Res* 1998;8:56–78.
- 6 Brave Heart MYH, Chase J, Elkins J, et al. Historical trauma among indigenous peoples of the Americas: concepts, research, and clinical considerations. *J Psychoactive Drugs* 2011;43:282–90.
- 7 Denham AR. Rethinking historical trauma: narratives of resilience. *Transcult Psychiatry* 2008;45:391–414.
- 8 Evans-Campbell T. Historical trauma in American Indian/Native Alaska communities: a multilevel framework for exploring impacts on individuals, families, and communities. *J Interpers Violence* 2008;23:316–38.
- 9 Whitbeck LB, Adams GW, Hoyt DR, et al. Conceptualizing and measuring historical trauma among American Indian people. *Am J Community Psychol* 2004;33:119–30.
- 10 Kaspar V. The lifetime effect of residential school attendance on indigenous health status. *Am J Public Health* 2013;104:2184–90.
- 11 Elias B, Mignone J, Hall M, et al. Trauma and suicide behaviour histories among a Canadian indigenous population: an empirical exploration of the potential role of Canada's residential school system. *Soc Sci Med* 2012;74:1560–9.
- 12 Hertzman C, Wiens M. Child development and long-term outcomes: a population health perspective and summary of successful interventions. *Soc Sci Med* 1996;43:1083–95.
- 13 Marmot M. Public Health Social determinants of health inequalities. *Lancet* 2005;365:1099–104.
- 14 Czyzewski K. Colonialism as a broader social determinant of health. *Int Indigenous Policy J* 2011;2:1–14. <http://ir.lib.uwo.ca/ijip/vol2/iss1/5>.
- 15 Dyck M. *Social determinants of Métis Health*. National Aboriginal Health Organization: Métis Center, Ottawa, Canada, 2009.
- 16 Inuit Tapirit Kanatami. *Social determinants of Inuit health*. Inuit Tapirit Kanatami: Ottawa, Canada, 2014.
- 17 Reading CL, Wein F. *Health Inequalities and Social Determinants of Aboriginal Peoples' Health*. 2009:1–47. http://www.nccah-cnca.ca/docs/socialdeterminates/nccah-loppie-wien_report.pdf
- 18 Babenko O, Kovalchuk I, Metz GAS. Stress-induced perinatal and transgenerational epigenetic programming of brain development and mental health. *Neurosci Biobehav Rev* 2015;48:70–91.
- 19 Harper L V. Epigenetic inheritance and the intergenerational transfer of experience. *Psychol Bull* 2005;131:340–60.
- 20 Szyf M. The early life social environment and DNA methylation. *Epigenetics* 2011;6:971–8.
- 21 Szyf M. How do environments talk to genes? *Nat Neurosci* 2013;16:2–4.
- 22 Adler NE, Stewart J. Health disparities across the lifespan: meaning, methods, and mechanisms. *Ann N Y Acad Sci* 2010;1186:5–23.
- 23 Bombay A, Matheson K, Anisman H. Appraisals of discriminatory events among adult offspring of Indian residential school survivors: the influences of identity centrality and past perceptions of discrimination. *Cultur Divers Ethnic Minor Psychol* 2014;20:75–86.
- 24 Tsankova N, Renthal W, Kumar A, et al. Epigenetic regulation in psychiatric disorders. *Nat Neurosci* 2007;8:355–67.
- 25 Lane M, Robker RL, Robertson SA. Parenting from before conception. *Science* 2014;345:756–60.
- 26 Yehuda R, Halligan SL, Grossman R. Childhood trauma and risk for PTSD: relationship to intergenerational effects of trauma, parental PTSD, and cortisol excretion. *Dev Psychopathol* 2001;13:733–53.
- 27 Solomon Z, Kotler M, Mikulincer M. Combat-related posttraumatic stress disorder among second-generation holocaust survivors: preliminary findings. *Am J Psychiatry* 1988;147:865–8.
- 28 Yehuda R, Bierer LM. Transgenerational transmission of cortisol and PTSD risk. *Prog Brain Res* 2008;167:121–35.
- 29 Bowlby J. *Attachment and loss*. 2nd edn. New York, NY: Basic Books, 1982. <http://www.loc.gov/catdir/enhancements/fy0831/00266879-b.html><http://scholar.google.com/scholar?hl=en&btnG=Search&q=intitle:Attachment+and+loss#1>
- 30 Bowlby J. *A secure base: parent-child attachment and healthy human development*. London, UK: Routledge, 1988.
- 31 Alexander PC. Application of attachment theory to the study of sexual abuse. *J Consult Clin Psychol* 1992;60:185–95.
- 32 Berthelot N, Ensink K, Bernazzani O, et al. Intergenerational transmission of attachment in abused and neglected mothers: the role of trauma-specific reflective functioning. *Infant Ment Health J* 2015;36:200–12.
- 33 Banyard VL, Williams LM, Siegel JA. The impact of complex trauma and depression on parenting: an exploration of mediating risk and protective factors. *Child Maltreat* 2003;8:334–49.
- 34 Bernstein RE, Laurent HK, Musser ED, et al. In an idealized world: can discrepancies across self-reported parental care and high betrayal trauma during childhood predict infant attachment avoidance in the next generation? *J Trauma Dissociation* 2013;14:529–45.
- 35 Madigan S, Wade M, Plamondon A, et al. Maternal abuse history, postpartum depression, and parenting: links with preschoolers' internalizing problems. *Infant Ment Health J* 2015;36:146–55.
- 36 Danieli Y. *International handbook of multigenerational legacies of trauma*. Danieli Y, ed. Boston, MA: Springer US, 1998.
- 37 Bar-On D, Eland J, Kleber RJ, et al. Multigenerational perspectives on coping with the holocaust experience: an attachment perspective for understanding the developmental sequelae of trauma across generations. *Int J Behav Dev* 1998;22:315–38.
- 38 Kirmayer LJ, Brass GM, Holton T, et al. *Suicide among aboriginal people in Canada*. Ottawa, ON, 2007.
- 39 Kirmayer L, Simpson C, Cargo M. Healing traditions: culture, community and mental health promotion with Canadian Aboriginal peoples. *Australas Psychiatry* 2003;11: S15–23.
- 40 Sochting I, Corrado R, Cohen IM, et al. Traumatic pasts in Canadian Aboriginal people: further support for a complex trauma conceptualization? *BC Med J* 2007;49:320–6.
- 41 McFarlane AC. Epidemiological evidence about the relationship between PTSD and alcohol abuse: the nature of the association. *Addict Behav* 1998;23:813–25.
- 42 Gee GC, Payne-Sturges DC. Environmental health disparities: a framework integrating psychosocial and environmental concepts. *Environ Health Perspect* 2004;112:1645–53.
- 43 Macintyre S, Ellaway A, Cummins S. Place effects on health: how can we conceptualise, operationalise and measure them? *Soc Sci Med* 2002;55:125–39.
- 44 King M, Smith A, Gracey M. Indigenous health part 2: the underlying causes of the health gap. *Lancet* 2009;374:76–85.
- 45 Chandler MJ, Lalonde CE. Cultural continuity as a protective factor against suicide in first Nations Youth. *Horizons* 2008;10:68–72.
- 46 Budinski R, Langlet E. *Aboriginal peoples survey 2012: user's guide to the analytical file*. Ottawa, Canada: Statistics Canada, 2014.
- 47 Idler EL, Benyamini Y. Self-rated health and mortality: a review of twenty-seven community studies. *J Health Soc Behav* 1997;38:21–37.
- 48 Miilunpalo S, Vuori I, Oja P, et al. Self-rated health status as a health measure: the predictive value of self-reported health status on the use of physician services and on mortality in the working-age population. *J Clin Epidemiol* 1997;50:517–28.
- 49 Benjamins MR, Hummer RA, Eberstein IW, et al. Self-reported health and adult mortality risk: an analysis of cause-specific mortality. *Soc Sci Med* 2004;59:1297–306.
- 50 Levinson D, Kaplan G. What does self rated mental health represent. *J Public Health Res* 2014;3:122–7.

- 51 Mawani FN, Gilmour H. Validation of self-rated mental health. *Health Rep* 2010;21:61–75. http://www.statcan.gc.ca/access_acces/archive.action?loc=/pub/82-003-x/2010003/article/11288-eng.pdf&archive=1
- 52 Bougie E, Arim RG, Kohen DE, *et al.* Validation of the 10-item Kessler Psychological Distress Scale (K10) in the 2012 Aboriginal Peoples Survey. *Health Rep* 2016;27:3–10.
- 53 Furukawa TA, Kessler RC, Slade T, *et al.* The performance of the K6 and K10 screening scales for psychological distress in The Australian National Survey of Mental Health and Well-Being. *Psychol Med* 2003;33:357–62.
- 54 Kessler RC, Andrews G, Colpe LJ, *et al.* Short screening scales to monitor population prevalences and trends in non-specific psychological distress. *Psychol Med* 2002;32:959–76.
- 55 Kessler RC, Barker PR, Colpe LJ, *et al.* Screening for serious mental illness in the general population. *Arch Gen Psychiatry* 2003;60:184–9.
- 56 Beck AT, Kovacs M, Weissman A. Assessment of suicidal intention: the Scale for Suicide Ideation. *J Consult Clin Psychol* 1979;47:343–52.
- 57 Beck AT, Brown GK, Steer RA. Psychometric characteristics of the Scale for Suicide Ideation with psychiatric outpatients. *Behav Res Ther* 1997;35:1039–46.
- 58 Luxton DD, Rudd MD, Reger MA, *et al.* A psychometric study of the suicide ideation scale. *Arch Suicide Res* 2011;15:250–8.
- 59 Waern M, Beskow J, Runeson B, *et al.* Suicidal feelings in the last year of life in elderly people who commit suicide. *Lancet* 1999;354:917–18.
- 60 Suominen K, Isometsa E, Suokas J, *et al.* Completed suicide after a suicide attempt: a 37-year follow-up study. *Am J Psychiatry* 2004;161:562–3.
- 61 Andrews G, Slade T. Interpreting scores on the Kessler Psychological Distress Scale (K10). *Aust N Z J Public Health* 2001;25:494–7.