Online Appendix: The Intergenerational Legacy of Indian Residential Schools

Last Updated: August 5, 2024

A Additional Data Sources

Many of the control variables used in Section 5.2.1 were taken from Feir et al. (2023a), but rely on a number of different original sources. These include:

1. **Statistics Canada Geographic Boundary Files:** Contemporary reserve boundaries were obtained from Statistics Canada's Geographic Boundary Files: https://www12.statcan.gc.ca/census-recensement/2011/geo/bound-limit/bound-limit-eng.cfm

2. **Smithsonian Handbook of the North American Indians:** Feir, Gillezeau, and Jones (2023b) digitized the ancestral territory maps of all Canadian Indigenous groups in the Smithsonian Handbook of the American Indian:

   Sturtevant, William C. 1978. *Handbook of North American Indians.* Washington: Smithsonian Institution.

3. **Historical Trading Posts:** The location of historical trading posts in 1823 was provided to Feir, Gillezeau, and Jones (2023a) by ESRI Canada. These data can be viewed online at https://www.arcgis.com/home/item.html?id=13154b9a326e4399be30df48ac574634

4. **Historical Railway Stations:** The location of historical railway stations was also provided to Feir, Gillezeau, and Jones (2023a) by ESRI Canada. These data can be viewed online at https://hub.arcgis.com/datasets/62becc07811d40448576e2fd23d1afcd

5. **Ruggedness:** Average ruggedness by reserve was computed in QGIS by overlaying digital elevation model (DEM) files from the Food and Agriculture Organization of the United Nations with the census subdivision boundaries from Statistics Canada. DEM files available here: http://www.fao.org/soils-portal/soil-survey/soil-maps-and-databases/harmonized-world-soil-database-v12/terrain-data/en/. We computed average ruggedness by ancestral territory by overlaying the DEM files with the digitized ancestral territories from the Smithsonian Institution. The ruggedness index is computed based on the following methodology:

   Riley, S. J, S. D. DeGloria, and R. Elliot (1999). A terrain ruggedness index that quantifies topographic heterogeneity. *Intermountain Journal of Sciences 5(4),* 23-27.

6. **Treaties and Treaty Clauses:** Treaties were linked to reserves by consulting the Map Room from used to be known as "Indigenous and Northern Affairs Canada": https://www.aadnc-aandc.gc.ca/eng/1290453474688/1290453673970 and treaty texts were obtained from https://www.rcaanc-cirnac.gc.ca/eng/1370373165583/1581292088522. Feir, Gillezeau, and Jones (2023a) went through the historical treaties and constructed an indicator equal to 1 if the historical text included a clause related to the provision of education.

B Additional Figures

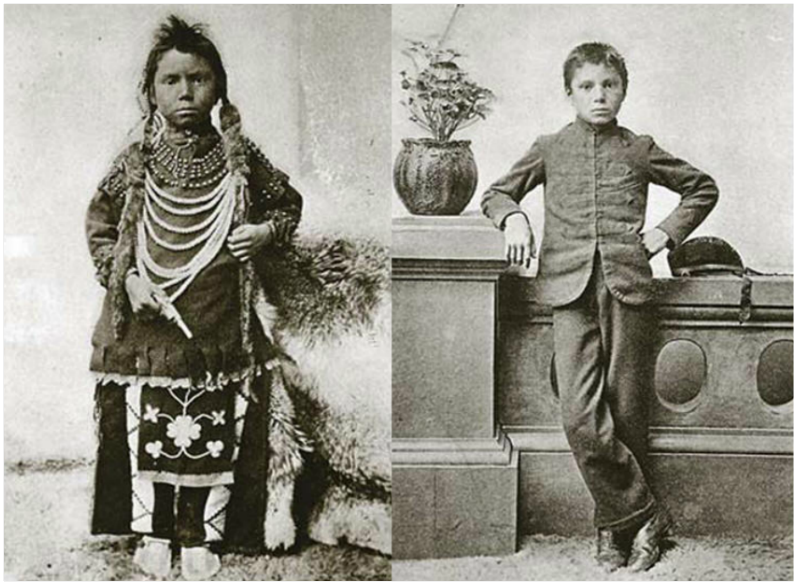
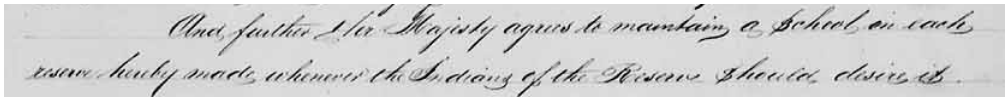
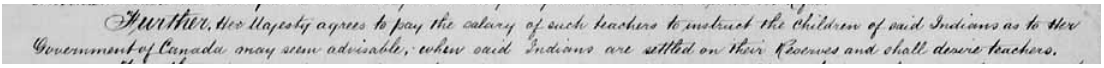


Figure B.1: Thomas Moore "before and after tuition". Retrieved from the Department of Indian Affairs Annual Report of 1904.



(a) The education clause contained in Treaty 1, which was signed between the Queen and the Chippewa and Cree Indians of Manitoba and adjacent country in 1871.



(b) The education clause contained in Treaty 7, which was signed between the Queen and Blackfoot (and other) tribes in 1877. Retrieved from Library and Archives Canada microfilm T-9939.

Figure B.2: Examples of the education clauses contained in Treaty 1 and Treaty 7. Retrieved from Library and Archives Canada microfilm T-9940.

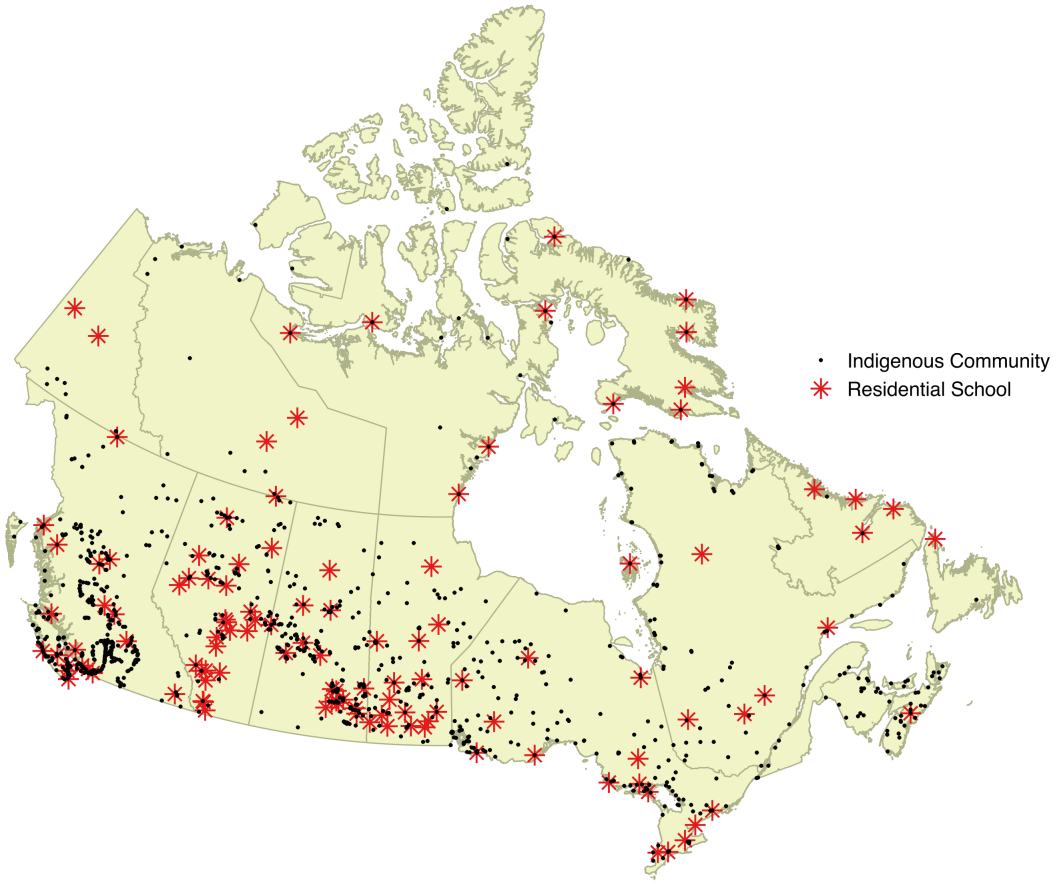


Figure B.3: Location of residential schools and Indigenous communities in Canada. Locations were compiled from the Aboriginal Healing Foundation (AHF), supplemented with records from the Anglican Church of Canada, and court documents from the Newfoundland and Labrador Lawsuit Against Residential Schools.

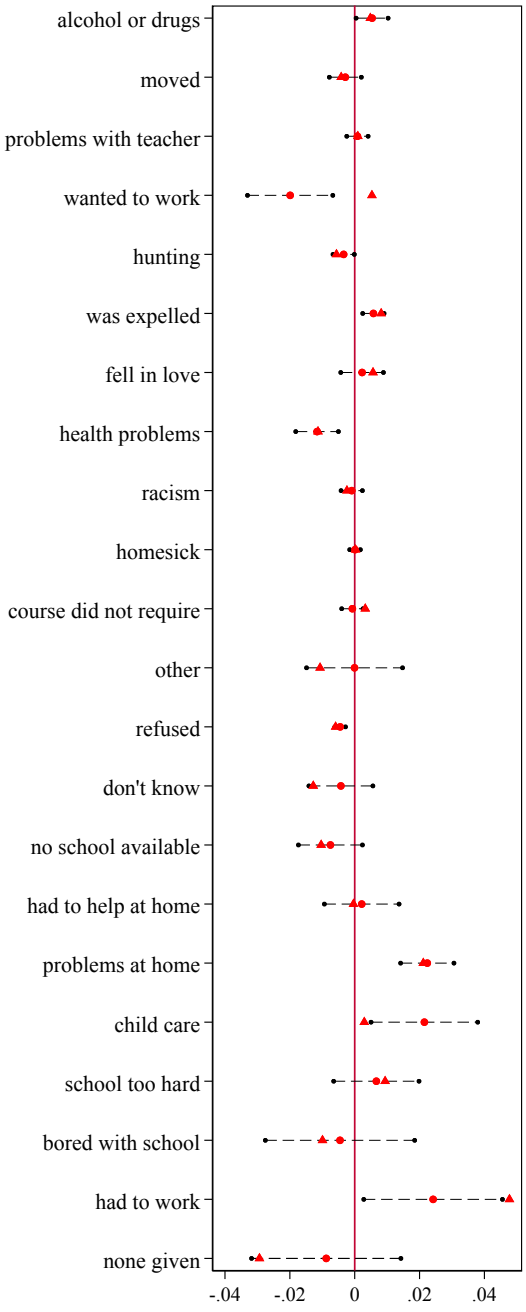


Figure B.4: Estimates of the reasons for leaving high school. Coefficient estimates and 90% confidence intervals for regressions of the reason for leaving high school on an indicator for whether or not a parent attended a residential school. Red circles indicate coefficient estimates, while red triangles indicate the Oster (2019).

C Additional Tables

Table C.1: Effect of parent's residential schooling on child's probability of graduating high school (western provinces)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Parent RS	-0.184***	-0.187***	-0.137***	-0.139***	-0.106***	-0.0879***	-0.0837***
	(0.016)	(0.015)	(0.006)	(0.006)	(0.008)	(0.013)	(0.012)
Gender				-0.0544***	-0.0546***	-0.0561***	-0.0564***
				(0.006)	(0.006)	(0.007)	(0.007)
First Nation					-0.127***	-0.0935***	-0.0930***
					(0.013)	(0.007)	(0.008)
Métis					-0.0695***	-0.0702***	-0.0706***
					(0.011)	(0.013)	(0.013)
Inuit					-0.117*	-0.112*	-0.109*
					(0.044)	(0.043)	(0.043)
Status						-0.0723**	-0.0707**
						(0.024)	(0.025)
Own RS							-0.0340
							(0.020)
Constant	0.584***	0.216*	0.201	0.235	0.322*	0.336*	0.335*
	(0.032)	(0.079)	(0.153)	(0.150)	(0.142)	(0.141)	(0.142)
birth year f.e.		X	X	X	X	X	X
csd f.e.			X	X	X	X	X
Observations	47190	47190	47190	47190	47190	47190	47190
Adj. R^2			0.168	0.171	0.178	0.181	0.181
R^2	0.0238	0.101					

Notes: Dependent variable is 1 if individual has a high school degree. Standard errors, clustered by province, are reported in parentheses. Census wave fixed effects are included in each regression. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table C.2: Effect of parent's residential schooling on child's probability of graduating high school by decade of birth

	1920s	1930s	1940s	1950s	1960s	1970s	1980s
			Panel A: Full Sample				
Parent RS	-0.0583	-0.0215	0.0250	-0.0340	-0.0637**	-0.0968***	-0.0787**
Oster Correction	[-0.07628]	[0.02043]	[0.08822]	[0.02974]	[0.00924]	[-0.02428]	[0.00357]
	(0.080)	(0.061)	(0.034)	(0.032)	(0.021)	(0.025)	(0.033)
Observations	1100	3430	7580	13520	17390	17380	8690
Adj. R^2	0.537	0.352	0.291	0.216	0.213	0.189	0.154
			Panel B: Western Provinces				
Parent RS	-0.0742	-0.0400	0.0121	-0.0533	-0.0744**	-0.127***	-0.0906*
Oster Correction	[-0.13917]	[0.01685]	[0.06564]	[0.01900]	[0.00337]	[-0.05644]	[-0.02753]
	(0.082)	(0.078)	(0.042)	(0.030)	(0.021)	(0.022)	(0.039)
Observations	760	2360	5020	8950	11810	11830	5550
Adj. R^2	0.426	0.358	0.252	0.194	0.162	0.144	0.103

Notes: Dependent variable is 1 if individual has a high school degree. Standard errors, clustered by province are reported in parentheses. All specifications include the full set of controls, as well as census wave, year of birth, and census subdivision fixed effects. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

D Bivariate Probit Sensitivity Analysis

Consider the following bivariate probit model that relates the student's outcome, high school graduation (HS_{irt}) to parental residential schooling and other observables

$$\begin{aligned} \text{RS\_parent}_{irt} &= \mathbf{1}\left(\text{RS\_parent}^*_{irt} > 0\right) && \text{(D.1)} \\ \text{HS}_{irt} &= \mathbf{1}\left(\text{HS}^*_{irt} > 0\right), && \text{(D.2)} \end{aligned}$$

where equation D.1 determines whether a parent of individual i in region r born in year t attended a residential school, and equation D.2 determines whether this individual completed high school. The unobserved latent variables RS_parent^*_{irt} and HS^*_{irt} can be expressed as

$$\begin{aligned} \text{RS\_parent}^*_{irt} &= \alpha_p + \mathbf{X}_{irt}\boldsymbol{\beta_p} + \psi_r + \zeta_t + \epsilon_{irt} && \text{(D.3)} \\ \text{HS}^*_{irt} &= \alpha_c + \gamma_c \text{RS\_parent}_{irt} + \mathbf{X}_{irt}\boldsymbol{\beta_c} + \psi_r + \zeta_t + u_{irt} && \text{(D.4)} \\ \begin{bmatrix} \epsilon_{irt} \\ u_{irt} \end{bmatrix} &\sim \mathcal{N}\left(\begin{bmatrix} 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 & \rho \\ \rho & 1 \end{bmatrix} \right), && \text{(D.5)} \end{aligned}$$

where $\mathbf{X}_{irt}$ is a matrix of controls, ψ_r and ζ_t are region and time dummies. Without including an exclusion restriction the correlation between the error components of equation D.3 and D.4 will be non-zero. As a result, estimating equation D.2 using univariate probit would lead to biased coefficient estimates of the effect of parental residential schooling on children's outcomes.[32] To assess how the bias changes with the correlation between errors, ρ, I perform a sensitivity analysis in the spirit of Altonji et al. (2005) that estimates the bivariate probit model above under various assumptions about ρ. Specifically I estimate the model for $\rho \in [-0.3, 0.1]$. As controls, I include whether the individual is a Registered Status Indian, whether they are First Nation, Inuit, or Métis, whether they live on- or off-reserve, and their gender. I do not include the individual's gender in the parent's equation. I also include province and year of birth dummies and standard errors are clustered at the province level.

Figure D.1 plots the average marginal effects of parental residential school attendance on the probability that the child completes high school for each value of ρ. Panel (a) displays the results for the full sample (who know their family's history with residential schools) and panel (b) displays the results for those born after 1974.

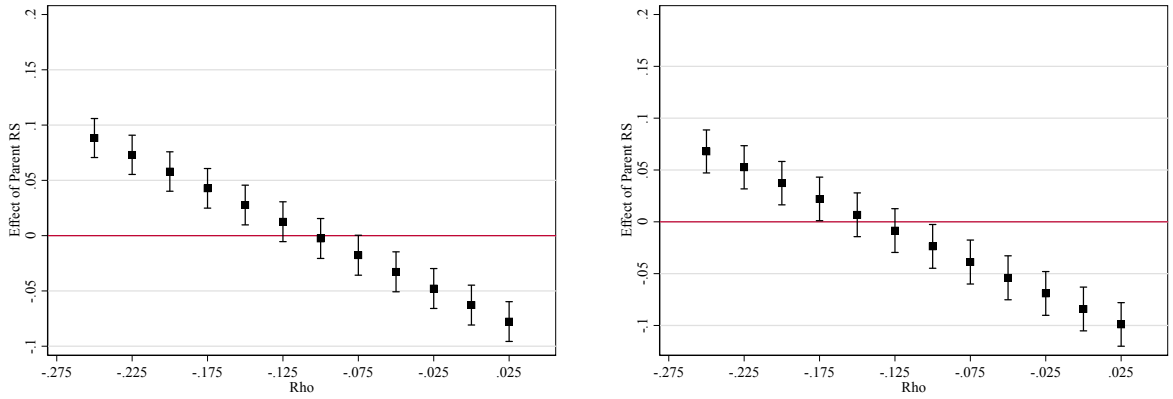
Given that students who were selected to attend residential schools were done so on the basis of characteristics that would be correlated with lower educational outcomes in the absence of residential schools–such as coming from more traditional backgrounds, more likely to be orphaned or come from troubled families–we would expect ρ to be negative. A natural upper bound on ρ is therefore 0. Panel (a) shows that if we assume no correlation between the errors of the selection and outcome equation, then the effect of a parent attending residential school on the probability of the child graduating high school is approximately -4.96 percentage points, and this value is statistically different from 0 at the 5% level.

[32] For the same reasons estimating the analogous OLS regression

$$\text{HS}_{irt} = \alpha_c + \gamma_c \text{RS\_parent}_{irt} + \mathbf{X}_{irt}\boldsymbol{\beta_c} + \psi_r + \zeta_t + u_{irt} \quad \text{(D.6)}$$

will also lead to biased estimates of γ_c.

Figure D.1: Constrained bivariate probit effects of parental residential school attendance



(a) Full Sample

(b) Western Provinces

Description: This figure displays the coefficient estimates from a bivariate probit for the effect of a parent attending a residential school on whether or not the child completes high school, while constraining $\rho \in [-0.3, 0.1]$. Regressions control for gender, whether the individual lives on a reserve, whether the individual attended a residential school themselves, whether the individual is First Nation, Métis, or Inuit, whether they are Registered Status Indians, and year of birth and province dummies.

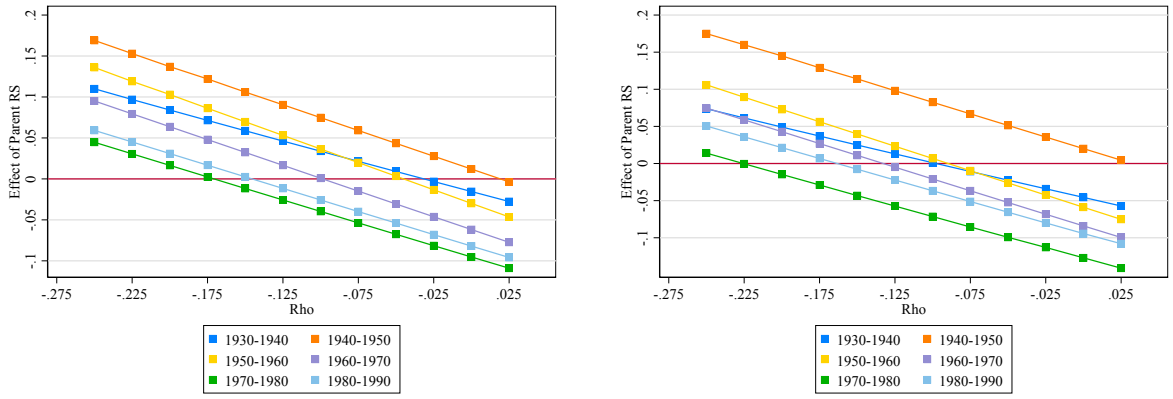
However, if the correlation between the two equations is -0.09 then the effect becomes 0, and for $\rho < -0.09$ the effect of parental residential school attendance on a child's likelihood of graduating high school is positive.

Feir (2016b) estimates ρ for the outcome equation of one's own high school graduation and the selection equation of one's own residential school attendance to be between -0.222 and -0.234.[33] It seems reasonable to assume that the degree to which a parent's selection and a child's outcome equations are correlated is not greater than the correlation between an individual's selection and their own outcome equations. Under this assumption, we can bound ρ below by the value of ρ from Feir (2016b), -0.234. Overall, this exercise shows that the effect of parental residential schooling on a child's likelihood of graduating high school, $\hat{\gamma}_c \in [-4.96, 9.0]$ percentage points, thus we cannot rule out the possibility that the effect of a parent's residential schooling on their child's outcomes is positive.

We can redo this thought experiment for the sample of students who are born after 1974 and who are more likely to have had a parent attend a residential school during the peak of the system. Panel (b) displays these results. Again, bounding ρ from above at 0 translates to an effect of -9.47 percentage points. Bounding from below using the estimates

[33]The observables used in Feir (2016b) are slightly different than those in the current analysis. Specifically, Feir (2016b) controls for gender, whether the individual comes from a single ethnicity background, their latitude of residence, distance to the closest city, band fixed effects and year of birth fixed effects. I control for each of the three main Aboriginal groups, which would capture the effect of someone having a background of multiple ethnicities. Further, I use province fixed effects which will not be capturing the exact same effects as the combination of band, latitude, and distance to city from Feir (2016b).

Figure D.2: Constrained bivariate probit effects of parental residential school attendance by decade



(a) Full Sample

(b) Western Provinces

Description: This figure displays the coefficient estimates from a bivariate probit for the effect of a parent attending a residential school on whether or not the child completes high school, while constraining $\rho \in [-0.3, 0.1]$. Regressions control for gender, whether the individual lives on a reserve, whether the individual is First Nation, Métis, or Inuit, whether they are Registered Status Indians, and year of birth and province dummies.

from Feir (2016b) yields a coefficient of approximately 1.0 percentage point. So for this sample $\hat{\gamma}_c \in [-9.47, 1.0]$ percentage points.

The sensitivity analysis suggests that the bias in the effect of parental residential school attendance on children's outcomes could be quite large and, based on the bounding exercise, we have seen that the effect of parental residential schooling on a child's likelihood of completing high school may be positive or negative depending on the estimate of ρ and on the time period under analysis.

E Additional Adult Outcomes

This section analyses some of the other factors that may have been impacted by the intergenerational legacy of residential schools. These include additional measures of human capital and employment, subjective measures of health, and reported involvement in traditional activities. An important consideration to keep in mind while interpreting the impact of parental residential schooling on these outcomes is that they may either be consequences of the same channel through which high school graduation was impacted or they may be a product of reduced human capital acquisition, which in turn can affect other outcomes.

Table E.1: Descriptive statistics

	Know History			Western Provinces		
	Parent RS	No Parent RS	Diff	Parent RS	No Parent RS	Diff
A: Education Outcomes						
Trade (%)	10.4	11.0	-0.6***	9.6	10.7	-1.0*
	(0.5)	(0.3)	(0.5)	(0.5)	(0.3)	(0.6)
College (%)	19.8	22.8	-2.9***	19.7	23.0	-3.2***
	(0.7)	(0.4)	(0.7)	(0.7)	(0.4)	(0.9)
Bachelor (%)	8.5	11.3	-2.8***	8.4	10.5	-2.1***
	(0.4)	(0.3)	(0.5)	(0.5)	(0.3)	(0.6)
Some PS (%)	58.1	62.0	-4.0***	57.8	62.2	-4.4***
	(0.8)	(0.4)	(0.9)	(0.9)	(0.5)	(1.0)
B: Health Outcomes						
Employed (%)	64.4	70.4	-6.0***	63.8	72.3	-8.5***
	(0.7)	(0.4)	(0.8)	(0.8)	(0.4)	(0.9)
Drinks Heavily (%)	3.7	3.2	0.5**	3.5	3.4	0.0***
	(0.3)	(0.1)	(0.3)	(0.3)	(0.2)	(0.3)
Smokes	38.7	30.7	8.1***	37.7	30.4	7.3***
	(0.8)	(0.4)	(0.8)	(0.8)	(0.4)	(1.0)
Excellent Health (%)	18.4	22.6	-4.2***	17.9	21.9	-4.1***
	(0.6)	(0.3)	(0.7)	(0.6)	(0.4)	(0.7)
Poor Health (%)	7.3	5.4	1.9***	7.7	5.5	2.2***
	(0.5)	(0.2)	(0.5)	(0.6)	(0.2)	(0.6)
Diabetes (%)	10.5	7.3	3.1***	11.3	7.5	3.8***
	(0.5)	(0.2)	(0.5)	(0.6)	(0.3)	(0.6)
C: Traditional Activities						
AB Lang (%)	51.9	16.7	35.3***	52.4	17.6	34.9***
	(0.8)	(0.3)	(0.8)	(0.9)	(0.3)	(0.9)
Hunt/Trap/Fish (%)	40.1	36.9	3.2***	36.0	35.9	0.1***
	(0.8)	(0.4)	(0.8)	(0.8)	(0.5)	(0.9)
Gathering (%)	37.0	28.5	8.5***	35.2	26.7	8.6***
	(0.7)	(0.4)	(0.8)	(0.8)	(0.4)	(0.9)
N	14,800	55,700	70,500	10,400	36,800	47,200

Notes: this table shows sample means from the pooled 2001, 2006, 2012 Aboriginal Peoples Surveys weighted by the survey weights. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

To begin, Table E.1 displays summary statistics analogous to Table 1 in the main text. As before, we see differences in the unconditional probability of completing a trade, college, or bachelor program, though these differences are not as stark as for high school graduation. We also see that the children of residential school survivors are less likely to be employed and have lower measures of self reported health, including a higher prevalence of diabetes. That being said, we do see that the children of residential school survivors are substantially

more likely to speak an Indigenous language, participate in hunting, trapping, or fishing, and participate in gathering. The following sections investigate these patterns in more detail.

E.1 Human Capital Attainment

Table E.2 displays the parental residential school effect for a set of other education outcomes as well as an employment indicator. Each of the education variables refers to the highest level of schooling reported by the individual. There is virtually no impact of parental residential schooling on any of the additional human capital variables. The only exception is that the children of residential school attendees are 1.5 percentage points more likely to report having some post-secondary as their highest level of schooling. Although this estimate is only marginally statistically significant, it increases in magnitude to 4.1 percentage points once the Oster (2019) correction is applied.

Table E.2: Effect of parent's residential schooling on human capital outcomes

	Trades	College	Bachelor's	Some PS	Employed
	(1)	(2)	(3)	(4)	(5)
			Panel A: Full Sample		
Parent RS	-0.000941	-0.00513	-0.00815	0.0149*	-0.0303***
Oster Correction	[0.00164]	[0.00625]	[0.00139]	[0.04086]	[-0.01609]
	(0.008)	(0.009)	(0.005)	(0.008)	(0.008)
Observations	70450	70450	70450	70450	70450
Adj. R^2	0.0882	0.0920	0.0918	0.133	0.228
			Panel B: Western Provinces		
Parent RS	-0.00568	-0.0124	-0.00707	0.0106	-0.0302**
Oster Correction	[-0.00343]	[-0.00236]	[-0.00009]	[0.03796]	[-0.00206]
	(0.007)	(0.010)	(0.007)	(0.010)	(0.011)
Observations	47180	47180	47180	47180	47180
Adj. R^2	0.0726	0.0799	0.0657	0.108	0.206

Notes: Standard errors, clustered by province are reported in parentheses. All specifications include the full set of controls, as well as census wave, year of birth, and census subdivision fixed effects. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Given the robust negative relationship between high school graduation and parental residential school attendance, it may seem surprising that there is little to no impact on post-secondary attainment; however, it may simply be that post-secondary is not the relevant margin in this situation. In other words, those who are on the margin of dropping out of high school are not the same students who are attending post-secondary institutions.

Column (5) shows the estimate of the impact of parental residential school attendance on employment. Adult children whose parents attended a residential school are 3.0 percentage points less likely to be employed than those whose parents did not attend a residential school in the full sample, and 3.02 in the sample from western provinces. Applying the Oster

(2019) correction reveals a 1.6 percentage point lower likelihood of employment for children of residential school attendees in the full sample, and a 0.2 percentage point lower likelihood of employment for the sample of students in western provinces. The lower incidence of employment among the children of residential school survivors is likely a result of high school graduation rates being affected, as there were no discernible negative impacts on other levels of educational attainment.

E.2 Health and Health Behaviours

Table E.3: Effect of parent's residential schooling on health outcomes

	Drink	Smoke	Excellent Health	Poor Health	Diabetes
	(1)	(2)	(3)	(4)	(5)
			Panel A: Full Sample		
Parent RS	0.00172	0.0480***	-0.0232***	0.0142**	0.0191***
Oster Correction	[-0.00004]	[0.03238]	[-0.01424]	[0.01181]	[0.01320]
	(0.004)	(0.008)	(0.005)	(0.006)	(0.006)
Observations	70450	70450	70450	70450	70450
Adj. R^2	0.0530	0.0955	0.0899	0.0932	0.129
			Panel B: Western Provinces		
Parent RS	-0.000306	0.0486***	-0.0214**	0.0114	0.0197*
Oster Correction	[-0.00069]	[0.03579]	[-0.01142]	[0.00616]	[0.01004]
	(0.005)	(0.009)	(0.007)	(0.007)	(0.008)
Observations	47180	47180	47180	47180	47180
Adj. R^2	0.0483	0.0715	0.0689	0.0804	0.127

Notes: Standard errors, clustered by province are reported in parentheses. All specifications include the full set of controls, as well as census wave, year of birth, and census subdivision fixed effects. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

The health effects associated with education are typically large, with some studies finding a causal link between high school graduation and health outcomes (Heckman et al., 2017a,b). As such, if residential schooling led to a decline in the educational attainment of subsequent generations, we might expect to see worse health outcomes among those whose parents attended a residential school. However, Auld and Feir (2022) show that residential schooling led to increases in height and body weight for status First Nations born after the 1960s. Since maternal health is known to be related to child health, the results in Auld and Feir (2022) would suggest that parents who attended residential schools may have better health outcomes. Which of these two effects dominates is therefore an empirical question.

E.3 Participation in Traditional Activities

One of the goals of residential schools was to effectively break the link between Indigenous children and their Indigenous identity and culture. In accordance with this goal, scholars

have found that the schools led to a decline in traditional activities (Feir, 2016b),[34] which we may expect to persist intergernationally (Fernandez, 2013; Tam, 2015; Nunn, 2012). On the other hand, if traditional livelihood activities are at odds with the western conventional economic systems, then lower levels of high school graduation rates among Indigenous youth whose parents attended a residential school may actually be accompanied by higher involvement in traditional activities.

Table E.4: Effect of parent's residential schooling on traditional activities

	Aboriginal Language	Hunt/Trap/Fish	Gathering
	Panel A: Full Sample		
Parent RS	0.115***	0.0296***	0.0751***
Oster Correction	[-0.00869]	[0.02831]	[0.07027]
	(0.014)	(0.006)	(0.004)
Observations	70450	70450	70450
Adj. R^2	0.394	0.203	0.131
	Panel B: Western Provinces		
Parent RS	0.116***	0.0279***	0.0780***
Oster Correction	[-0.01518]	[0.04148]	[0.07371]
	(0.017)	(0.005)	(0.004)
Observations	47180	47180	47180
Adj. R^2	0.333	0.171	0.103

Notes: Dependent variable is 1 if individual has a high school degree. Standard errors, clustered by province are reported in parentheses. Census wave fixed effects are included in each regression. Geographic controls include a second order polynomial in latitude and longitude of census subdivision. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table E.4 shows children whose parents attended a residential school are more likely to engage in traditional activities, like hunting, fishing, trapping, and gathering, as adults. This finding is in line with the latter two theories connecting the residential school experience to later generations, but does not favour one possibility over the other. The coefficient on parental residential schooling in the regression of the likelihood of speaking an Aboriginal language provides some insight into which conjecture may be more accurate. After accounting for selection using the Oster (2019) methodology, students whose parents attended a residential school are less likely to speak an Aboriginal language themselves. If low levels of high school graduation was the reason behind an increase in traditional livelihood activities like hunting and gathering, it is paradoxical to find a decline in the likelihood of speaking an Aboriginal language. The more plausible explanation is that healing initiatives that incorporate traditional ways of life were successful in reviving some of the cultural practices among Indigenous groups.

[34](Gregg, 2018) finds this in the United States, too.