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The Effect of High School Completion on Aboriginal Canadians: Measuring Financial and Health Outcomes

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ABSTRACT: How can we explain the poor Aboriginal high school completion rates in Canada? Is completing high school "worth it" for Aboriginals? Using the Aboriginal Peoples Surveys from 2001 and 2006, this statistical investigation explored the role of financial incentives and health outcomes on high school completion rates for young, urban Aboriginals. First, the labour market returns for completing high school were identified and measured. Significantly higher high school credential effects were determined to exist for Aboriginal females compared to Aboriginal males. The implications of the financial returns to a high school diploma and pathways to post-secondary education are also discussed. Second, effects of high school completion were determined. Results suggested that completing high school lead to a reduction of health conditions in an Aboriginal person's adult life. Significantly higher health outcome effects were also found to exist for Aboriginal males than females. This paper's principal finding is that low high school completion rates for Aboriginals cannot be explained by poor financial or health incentives. More research needs to be conducted to explore other channels that could explain the poor education outcomes for this marginalized Canadian subpopulation.

Introduction

The extent to which the education and skills of Aboriginal Canadians are developed, utilized and rewarded in the labour market is a major policy issue. It has been calculated that the federal government spends nearly $10 billion per year on Aboriginal programs and affairs (Government of Canada, 2007). Richards and Scott (2009) have reported that the overall "excess spending" on the provision of five core services to Aboriginals due to their below-average socioeconomic condition amounts to $6.3 billion annually.[1] Despite significant media coverage and government investment in Aboriginal post-secondary educational attainment, education outcomes for this demographic remain dismal. The national high school dropout rates for Aboriginals are three times the national

[1] The five core services were transfer payments (excluding pensions), health care services, housing costs, protection of people, child and family services. This number excluded the cost of providing education opportunities. These services were considered "excess" because the federal government was the provider, rather than the provincial and territorial governments.

average. Perhaps counter-intuitively for some, the education gap between Aboriginals and non-Aboriginals is actually widening in Canada (see Figure 1). These stylized facts emphasize the need to understand this social equity issue from a policy development standpoint. Why are young, urban Aboriginals not completing high school? Before policy recommendations can be made, it is important to investigate both the effects of high school completion on an Aboriginal person's life and why the high school completion rates are lower among Aboriginals compared to the general Canadian population.

This study used statistical analysis to examine how the human capital of Aboriginals is rewarded in Canada's labour market, particularly that of a high school diploma. National Aboriginal high school dropout rates are three times the average, yet the mechanisms that lead to this statistic are poorly understood. In this study, the employed datasets allowed the researcher to link high school completion with health outcomes in the adult life. Thus, out of the myriad of reasons and circumstances that could affect education choices for Aboriginals, the focus of this study was financial incentives and health outcomes.

To answer the questions at hand, this paper followed in the footsteps of recent literature on returns to education and distinguished between two dimensions of educational attainment: years of schooling, and degrees and diplomas received. Employing this methodology, this paper estimated credential effects or "sheepskin" effects: the gains in earnings associated with receipt of a high school diploma after controlling for years of schooling. These effects can be interpreted as the value of program completion: the difference in earnings between those with a diploma and non-completers with the same years of schooling. Ferrer and Riddell (2008) found that this differentiation between the returns to education in two dimensions has important effects for policy makers deciding on the human capital of immigrants. More specifically, they found that, for immigrants, years of education have less importance and educational credentials seem to have even more importance in determining earnings relative to nonimmigrant Canadians. Can something similar be said about Aboriginal human capital? Even though the following was outside the scope of this paper, assessing the value of high school credentials may not only help develop sound policies in the schooling system but also help design better adult educational programs aimed at the unemployed. Thus, a systematic exploration of returns to Aboriginal high school education and its possible implication on the education inequities in Canada under this methodology holds merit.

This paper's contributions to the existing literature are threefold. Using the Aboriginal Peoples Surveys (APS) from 2001 and 2006, it was found that the returns to high school completion for Aboriginal females were three times as large as the returns of Aboriginal males. Specifically, the returns are 30.9% for females and 10.8% for males. This means that for an Aboriginal female (male), having a high school diploma results in annual wages being 30.9% (10.8%) higher compared to one who has not finished high school, controlling for a variety of factors. It was also found that for Aboriginals considering any form of post-secondary educational credential (trades, college, or university), it was beneficial to have a complementary high school diploma. Finally, regression results suggested that completing high school significantly reduced the risk of being diagnosed with a serious health condition in early adult years. Specifically, completing high school reduced the chances of being diagnosed with an additional health condition by 35.4% and 21.8% for males and females respectively.

The central finding of this paper was that returns from high school completion are high, both in terms of labour market earnings and reduced health outcomes. Results suggested that Aboriginals are not dropping out of high school because of poor financial incentives in the labour market or lack of health advantages later on in life. Other reasons underlie the poor education outcomes for this

Canadian subpopulation and researchers will need to incorporate innovative research designs that maximize the capacity of available datasets to uncover the true underlying mechanisms.

This paper is organized as follows: (1) the context is set with a literature review from the fields of Aboriginal education and health, and returns to education literature; (2) the wage equation model is presented; (3) the data and summary statistics are described; (4) regression analysis and results are discussed; and (6) conclusions are made.

Background and Literature Review

In Canada, the term "Aboriginal peoples" is defined in two ways. The first definition of Aboriginal Canadians refers to those who have registered as an "Indian" with the federal government of Canada under the Indian Act of 1876. Every registered Indian has Aboriginal ancestry, holds the right to live on designated reserves, and receives associated benefits. The second and more widely used definition is based on self-identification. Individuals can self-identify themselves as belonging to one (or more) of three Aboriginal groups: North American Indian or First Nation (Mohawk, Ojibway, Cree and more), Métis (descendants of intermarriage communities of "Indians" and *coureurs de bois* engaged in the fur trade), or Arctic Inuit. Census Canada, and this paper, use the second definition when referring to Aboriginal Canadians. According to latest available figures, there are 1.4 million Aboriginals, who amount to approximately 4.3% of the population (Statistics Canada, 2013).

In Canada, it is generally understood that there are significant disparities in socioeconomic characteristics between Aboriginals and non-Aboriginals. According to the 2006 Census of Population, more than one in five (21.8 per cent) Aboriginal individuals lived in economic families with an after-tax income below the low-income cut-off, which was two times higher than the non-Aboriginal figure. Pendakur and Pendakur (2011) have found substantial income and earning gaps for Aboriginal peoples in comparison with Canadian-born majority-group workers with similar characteristics. Mendelson (2006) reported that, on average, the Aboriginal population has suffered from higher unemployment, lower levels of education, below average incomes and many other indicators of limited socioeconomic circumstances. Looking for solutions, many researchers and policy-makers have linked higher educational attainment as an explanatory factor of income disparities. According to Sharpe, Arsenault, Lapointe, and Cowan (2009), 47.3% of the employment income gap between Aboriginals and non-Aboriginals can be attributed to differences in educational attainment. Jenkins (2007), Mendelson (2006), and Hull (2000) indicated similar findings.

Despite investments by the government in post-secondary educational attainment for Aboriginals, the education gap between Aboriginals and non-Aboriginals is increasing. Figure 1 highlights this widening education gap between the two groups. Across age groups (and through the years), education gap measured in percentage points is increasing across all types of education between Aboriginals and non-Aboriginals. Underlying this trend are two stylized facts of dramatic intergenerational increases in investments in education among the non-Aboriginal population and only modest improvements among the Aboriginal population.

Research has also demonstrated a disproportionate gap in health status between Aboriginal and non-Aboriginal populations (Waldram, Herring, & Young, 2006; Estey, Kmetic, & Reading, 2007; Wilson, Rosenberg, & Abonyl, 2010). While there is documented information about inequalities in mortality and morbidity between Aboriginal and non-Aboriginal populations in Canada, most of this research has been focused on Aboriginals living on reserves (see, for example, Barton, Thommasen, & Tallio, 2005; Martens, Sanderson, & Jebamani, 2005). Young (2003; 2008)

conducted reviews of Aboriginal health research in medical sciences and have reported a severe under-representation of urban Aboriginal peoples in the literature. Recent studies in academic literature, outside of economics, have attempted to fill this gap. Two general conclusions ahave been reached: (1) off-reserve Aboriginals are generally in better health than those living on reserves, and (2) there is a need to understand Aboriginal health issues in the context of broad socioeconomic determinants. The role of confounding factors such as poverty, unemployment rates, and education on health need to be better understood (Cardwell & Wilson, 2011; Curtis, 2007). This paper's examination of the effects of completing high school on health outcomes for urban Aboriginals contributes to this growing body of literature.

According to the conducted literature review, there has been no paper in economic literature that strives to accurately estimate returns of a high school diploma for Aboriginals in the labour market and their personal health. This study aimed to determine whether poor financial and health incentives hold explanatory power for why Aboriginals are not finishing high school at the same rate as non-Aboriginals. Stronger financial and health incentives for high school completion were indicated, suggesting that poor high school completion rates for Aboriginal Canadians must be attributed to other reasons.

It is still largely not understood how to interpret Aboriginal education intake levels and gaps, or what can help Aboriginal people successfully complete high school. From classical human capital theory, the factors of production of high school diplomas for Aboriginals can be separated between the supply side and the demand side. Theory suggests Aboriginal students demand more high school diplomas as financial incentives or cultural expectations for formal academic achievement increase. From the supply side, high school completion rates can be expected to increase if the socio-economic characteristics of students' families improve, or if the quality of elementary and high school schooling provided increases. For more information on human capital theory and its commentary on Aboriginal education, readers are encouraged to consult Richards and Scott (2009). For the purposes of this paper, it is important to note that while this study quantitatively links financial and health incentives to high school completion rates, the employed datasets cannot explore these other important factors.

The Wage Equation Model

In this brief section, the wage equation model is outlined, and it is explained how, econometrically, the effect of high school completion on earnings is extracted. The positive correlation between education and earnings is one of the most well-established relationships in economics. Mincer (1974) provided the foundation for empirical research on the determinants of market earnings:

$$\ln w = a_0 + a_1 S + a_2 EXP + a_3 EXP^2 + a_4 X + u$$

where the logarithm of individual earnings ($ln\ w$) is expressed as a linear function of years of completed schooling (S) and a quadratic function of labour market experience (EXP and EXP^2). Additionally, the function includes a vector of variables (X) that may also influence earnings such as language, marital status, and province of residence. The parameters $a_1 \ldots a_4$ measure the marginal effects of each variable on the logarithm of wages. According to this view, diplomas and degrees play no role in determining earnings, only years of education matter. Thus, only human capital matters. The alternative model, the "credentialist model," implies that only diplomas and degrees matter. When one receives a credential, one is able to signal his or her productivity level to

an employer. Together, these two extremist models encapsulate the debate about the role of education in labour market returns.

In reality, both views are likely to have some validity. In Ferrer and Riddell (2002), the human capital earnings function, in which earnings are assumed to depend only on years of schooling, and the credentialist model, in which earnings are assumed to be only a function of degrees received, were rejected in favour of a more general model that incorporated both years of completed schooling and education credentials received. This value of a high school diploma came from both specific knowledge gained in each year of schooling and from what they have referred to as the "'package' of behavioural, intellectual and social experiences that only graduation from the whole program provides." To evaluate the extent to which credentials have an economic reward over and above the years of schooling an individual receives, economists have extended the Mincer equation to include dummy variables for different types of education credentials:

$$\ln w = a_0 + a_1 S + a_2 EXP + a_3 EXP^2 + a_4 X + a_5 CD + u$$

where *CD* is a vector of credential dummies and a_5 is a vector of parameters that measure the value of completing each degree. The interest here is to measure the marginal effects of a high school diploma for an Aboriginal Canadian. Econometrically, it is a well-established fact that including variables that could potentially correlate with high school completion will lead to unbiased estimates of the credential effects. Thus, the following set of covariates was deemed to hold important, but not exhaustive, explanatory power:

- **Gender**: Pendakur and Pendakur (2011) found that the earnings gap between non-Aboriginal males and Aboriginal males with similar characteristics is between 20 to 50 per cent and only 10 to 20 per cent for the female groups.

- **Residence in urban area**: Education services, health services and labour markets conventionally look quite different between urban and less urbanized areas.

- **Province of residence**: Under the current federalist structure of Canadian governance, provincial governments hold jurisdiction over many important sectors such as provision of educational services and employment insurance programs, both of which can affect educational choices.

- **Health conditions**: Access to health services and a person's genetic makeup can affect both their education choices and employment prospects. Thus, including it in the regression can help provide more reliable estimates of high school completion. It will be shown that the availability of this information is one of the major advantages the Aboriginal Peoples Survey datasets has over Censuses.

- **Density of Aboriginals in area of residence**: Pendakur and Pendakur (2011) reported that the greater the size of an urban Aboriginal community, the worse the economic outcomes for its members. Sharpe et al. (2009) also reported a negative peer effect amongst Aboriginal students in British Columbia. Together, these studies highlighted that the density of Aboriginals in the surrounding area affects an Aboriginal person's education and earning outcomes.

- **Distinction between post-secondary degree completion with and without high school diploma**: Riddell (2008) found important differences between those that complete post-secondary education with a high school diploma compared to those that do not.

- **Individual discount factor**: Education is a time-consuming investment where realized returns are experienced in the future. For individuals with a high discount factor, economic theory predicts that the opportunity cost of investing in high school completion could lead to low completion rates.

To account for some of the other possible sources of endogeneity, only individuals who are 20-44 years of age and who live in urban areas were analyzed from the datasets. The age restriction helped focus on the years 1981 and after, the time period where non-Aboriginals substantially increased their high school completion rates and Aboriginals did not. The geographical constraint helped mechanically solve obvious endogeneity problems as many rural schools in Aboriginal areas are quite different, if existent at all. It also helped eliminate rural areas where there was a lack of health services that impacted both education and earnings.

Despite the rich datasets available and attempts to eliminate endogeneity concerns, the specifications did not include all possible omitted variables and thus, the linear approximations may have been biased. Therefore, this paper relied upon Card (1999) to claim validity of its results, as he reported that a cross-sectional regression will produce an upward bias of around ten per cent. Thus, with a comprehensive dataset that provided information on the aforementioned covariates, one could arrive at a reasonably accurate measure of returns to high school completion for Aboriginals.

Data and Summary Statistics

The Aboriginal Peoples Survey (APS) is a national survey of Canadian Aboriginals administered by Statistics Canada as a supplemental package to the Census of Population. For every person that reported Aboriginal identity in Census 2001 and 2006, Statistics Canada sent the APS four months later to the reported address. Designed in consultation with key Aboriginal organizations, the survey provides valuable data on the social, health and economic conditions of Aboriginal people ages six and over who live on and off reserves. Econometrically, it allows researchers to account for a wider variety of controls than the publicly available Census micro-data file. As demonstrated in the next section of this paper, it can also help implement proxies for important covariates such as health conditions, Aboriginal density in residential areas, and discount factor for individuals. Observations from the 2006 Survey were combined with the 2001 Survey to help increase the size of the dataset threefold.

Table 1 presents the descriptive statistics for individuals from APS 2001 and APS 2006 groups.[2] The two groups were quite similar, but the APS 2006 dataset contained a more educated cohort: the high school and university completion rates were 8.55% and 11.77% greater than the APS 2001 group's statistics. The literature review presented no significant changes in education policies or employment prospects for Aboriginals between 2001 and 2006 that would deem the two APS datasets incompatible.

[2] For more information on how variables were created from the dataset, readers are encouraged to visit the appendix section A1.

Table 2 disaggregates Aboriginals in both datasets between genders and emphasizes the fact that the education and labour market realities were quite distinct for the two groups. Aboriginal women had higher years of education, lower high school dropout rates, higher percentage of post-secondary degrees, and made less money on average. It is interesting to note that Aboriginal women without any educational credentials fared far worse than their male counterparts. Women in this cohort earned only $11,109.35 on average, while men earned $17,056.74. This might have been due to occupational differences, but a closer look is warranted in future work. For the purposes of this paper, Table 2 highlights the need to run separate regressions for the two genders.

The employed datasets contained the variation necessary for investigating the questions of interest. Additionally, analysis from the summary charts reinforced the need to run separate regressions for males and females.

Regression Results and Data Analysis

The analysis in this section benefitted from the rich set of information available on individuals in the APS datasets. However, before the regression results are presented, a case is made for proxies of important covariates. Then, labour market returns to a high school diploma for Aboriginals are measured. Finally, the effects of high school completion on the chances of being diagnosed with an additional health condition are estimated.

Proxies

The Aboriginal Peoples Survey does not contain explicit data on individual discount rates or geographical markers from which density of Aboriginals in that urban area could be derived. Thus, proxies were introduced to account for these factors. First, high discount rates were inferred for individuals if they were a daily cigarette smoker. Numerous economic studies have investigated and used smoking habits as an indicator of an individual's worth of time. Fuchs (1982) found that health habits like smoking are related to implicit and explicit discount rates for individuals. Subsequently, studies like Evans and Montgomery (1994) have contributed further evidence that smoking habits are a good predictor for discount rates. Such studies have found negative correlations between an individual's smoking habit and his or her decision-making ability in long timeframes (such as home ownership choices). This paper followed this line of work and denoted an individual with a high discount factor if, at the time of the survey, they were a daily smoker.

Additionally, a variable was created for an individual with a "high probability of having lived in an area of high Aboriginal density." This information was inferred from whether the individual was taught an Aboriginal language in their last year of high school. An assumption was made that if an Aboriginal language was taught in the individual's school then the school was located in an area where mostly Aboriginal people lived. This proxy captured the effect of the negative peer effect mentioned in Sharpe et al. (2009). It should be acknowledged that neither of these proxies completely captured the variables of interest; however, they captured valuable personal information that could potentially affect both education and earnings. As demonstrated in the next section, both proxies remained significant at the 99% level in most regressions thereby confirming their importance.

Labour Market Returns to High School Completion

Tables 3 and 4 summarize the main findings regarding the magnitude of credential effects for Aboriginal females and males. These estimates measured the impact on earnings of the degree, diploma or certificate after controlling for years of high school education.[3]

High school graduation increased female earnings by 30.9% relative to those who did not graduate from secondary school; male earnings increased approximately by 10.8%. A year of education yielded a 7% increase in market earnings for women and 10.6% for males. A college diploma or trades certificate after high school graduation increased earnings by a further 22.2% and 17.6% for females and males respectively. Earning a college diploma or trades certificate without completing high school yielded lower returns of 17.7% and 10.7% for females and males respectively. Manifestly, completing high school even if one did not wish to enter university education later was highly beneficial for both females and males. The most significant increases, however, occurred at the university level. A university credential increased female earnings by 32.1% and male earnings by 22.6%.

On a technical note, one of the chief concerns about the validity of these estimates was that the unemployment rate for this subpopulation is unconventionally high. Because so many Aboriginals reported no annual earnings, the OLS cross-sectional regression ignored 2,631 individuals or 22.68% of the dataset. As a robustness check against this source of bias, the Heckman selection model was employed.[4] In this model, the dependent variable (log of earnings) was treated as a censored variable and the regression was run looking at the effect of education on the earnings of all Aboriginals, including the non-earners. The instrument used to measure the probability of an individual working or not was the number of household maintainers they reported in the APS. A "household maintainer" referred to the person or persons in the household who paid the rent, or the mortgage, or the taxes, or the electricity, et cetera, for the dwelling. This number would have had a substantial impact on the total household earnings, and thus, an individual's decision to look for work or not. However, it is assumed that this variable had no impact on the actual amount of wages earned. The results in Table 5 and 6 indicated that female returns were 31.5% for a high school diploma and the male returns were 14.9%. However, the male returns were not significant at the 95% confidence levels. A combined regression reported that women received returns 21% greater than their male counterparts. After having accounted for this source of bias, Aboriginal female returns did indeed seem closer to the 30% range and considerably larger than returns for Aboriginal males.

Post-secondary Education Pathways

The implications of the measured credential effects on the educational pathways of Aboriginals served as one of the most important results of this study. As shown in Table 1, a large percentage of Aboriginals attained non-university post-secondary education without completing

[3] The publicly available APS dataset did not allow the researcher to develop a reliable measure of years of post-secondary education. It was hypothesized that the true value of credential effects for post-secondary degrees was lower than the ones reported in Tables 1 and 2. The idea was that the post-secondary completion variable captured both the effects of each year of post-secondary schooling and the credential effects. For more on this topic, please see Ferrer and Riddell (2002).

[4] A Heckman selection model was employed to take into account the 22.68% of observations not included previously. An Instrumental variable (IV) strategy was more suitable to account for endogeneity concerns. Please see the section on caveats for further discussion on other possible sources of bias.

high school. This statistic can be explained by the high opportunity costs of acquiring a high school diploma for this population and thus, many could have been choosing between completing high school, opting for a non-university post-secondary education credential (a trades certificate, for example), earning both credentials, or none of the above. For Aboriginals interested in earning a non-university post-secondary degree, completing high school beforehand can yield significantly higher returns. For females, completing high school with non-university post-secondary education resulted in earning 52.9% more than completing neither credential. However, if she were to complete only one credential, she was better off with a high school diploma as this could have meant a difference in returns of 20.2% more than what a college credential or trades certificate could have provided. For males, completing a college degree or trades certificate meant returns in earnings 17.6% more than ones earned by completing high school alone. It is interesting to note, however, that there were no statistically significant differences between completing high school or a non-university post-secondary education credential.

Through this exercise, it was realized that for Aboriginal females there were strong financial incentives for completing high school regardless of future educational aspirations. In the case of Aboriginal males, strong incentives were found to complete high school only if they wanted to pursue a non-university post-secondary credential. Thus, additional insights were gained into how Aboriginals could be choosing their investments in education. Any model or research design that aims to explain high school completion choices needs to incorporate the ability of an individual to substitute that credential with a non-university post-secondary credential.

Measuring Health Outcomes for High School Completion

Along with examining the rewards in the labour market that a high school diploma provides, this paper also investigated whether completing high school could be linked with better health outcomes. If substantially positive health outcomes were realized, it could be claimed that low Aboriginal high school completion rates cannot be explained by poor health incentives. The APS questionnaire not only asked whether the individual had been diagnosed with a certain condition, but also at what age they were diagnosed. This level of detail allowed for an identification strategy that investigated the relationship between high school graduation and chances of being diagnosed with a serious health condition in the adult years, after controlling for health conditions from childhood and adolescent years. The health conditions accounted for include: diabetes, arthritis, asthma, chronic bronchitis, emphysema, cancer, stroke, high blood pressure, heart problems, stomach problems or intestinal ulcers, hepatitis, and other long-term illnesses.

In this research design, an outcome variable was constructed that acted as a counter for the number of health conditions that an individual had been diagnosed with between the ages of 20 and 44. Since this dependent variable was counted for each individual and could only take on non-negative values, a Poisson regression design was employed. Essentially, this regression design took into account that the number of health conditions will be either 0 or higher. Poisson regressions assume that the underlying dependent variable (in this case: the number of diagnosed health conditions later on in a person's life) are chance events that follow a Poisson distribution, rather than a normal distribution. The health condition model is described as follows:

$$\ln HC = a_0 + a_1 CD + a_2 PHC + a_3 X + u$$

where the logarithm of the number of diagnosed health conditions between the ages of 20 to 44 ($ln\ HC$) is expressed as a linear function of education captured by education credentials (CD) and previously diagnosed health conditions (PHC). Additionally, the function included a vector of

variables (X) that may have also influenced earnings such as language, marital status, and Aboriginal identity. The vector of parameters $a_1 \ldots a_3$ measured the marginal effects of each variable on the logarithm of the onset of health conditions later in an individual's life.

Separate regressions for females and males and the results are presented in Tables 7 and 8. For females, completing high school reduced the risk of being diagnosed with an additional health condition by 21.8%. For males, the effect of completing high school was even stronger at 35.4%. Relative to having no Aboriginal identity, being First Nations or Métis increased chances of being diagnosed with a health condition. This aligns with common knowledge of current socioeconomic realities. Furthermore, almost all of the early health conditions were positively related with adult health outcomes, which corroborates with health economics findings. Completing post-secondary education led to no statistically significant impact on health outcomes. Thus, only high school completion can be seen as an important interventionist strategy to improve Aboriginal health outcomes through educational attainment. These results suggested that there are substantial health incentives for an Aboriginal person to complete high school.

Caveats and Scope for Future Work

These two explorations of the causes and effects of Aboriginal high school completion can best be interpreted as an initial step into understanding the perplexing reality for this group. From a conservative standpoint, the returns to high school completion and other credentials should be treated with caution. There is the possibility of an omitted variable influencing the positive correlation between education and earnings, and biasing the estimates. If the underlying conclusion from this study is that other variables are affecting Aboriginal education choices then they need to be included in the above regressions to more accurately measure labour market and health outcomes. One of the other significant concerns might be that Aboriginals who complete high school may inherently have higher cognitive ability or resiliency than non-completers, and that what the credential effects were actually measuring were the returns to higher ability. This interpretation, if true, would severely restrict the options available to policy-makers to increase high school completion rates as completers would be inherently different than non-completers. In an important study that accounted for this concern, Riddell (2008) used the International Adult Literacy and Skills Survey (IALSS) to measure credential effects after controlling for cognitive skills by using test scores from four areas: prose literacy, document literacy, numeracy and problem solving. The results indicated that although the magnitude of returns to a high school diploma did decrease by 20%, they were still statistically significant and positive. Conservatively, one can interpret the credential effects in this paper as inflated, but indicative of positive returns in earnings for Aboriginals.

Many of the other omitted variables of interest could be acquired if one were to have access to the private Aboriginal Peoples Surveys from 2001 and 2006 available through Statistics Canada's Research Data Centre. These datasets would include important covariates such as exact age, years of post-secondary schooling and provincial markers. However, to account for more sources of endogeneity, an instrumental variable (IV) strategy needs to be explored in future work. It is hoped that the richness of APS questionnaire provides a valid IV. As a final note to improve the accuracy of returns to education, non-linearity in the years of schooling could be utilized.[5]

[5] See Ferrer and Riddell (2008) for an example.

Considering the limitations of the public datasets, an analysis of the effect of financial incentives on high school completion would not be rigorous enough. The private APS data could possibly allow one to run regressions and formally test the hypothesis. Since the Census dataset would not be useful in comparing Aboriginal/non-Aboriginal education gap, perhaps the private Labour Force Survey data could be utilized.

Conclusions

The first national evidence on the magnitude of high school credential effects for Aboriginal Canadians was provided by taking advantage of the rich detail on educational attainment, health conditions and personal attributes in the Aboriginal Peoples Surveys. Aboriginal female returns to high school completion were three times as large as Aboriginal male returns. In contrast, for each year of high school education, there was a greater return for Aboriginal males than females. According to the wage equation model, credential effects associated with high school graduation were approximately 31% for females and 11% for males. The returns to a year of schooling were 7% for females and 10% for their male counterparts. For Aboriginals considering earning a non-university credential, there were significant gains in completing high school as well. For females, completing high school additional to a college diploma or trades certificate was rewarded by a 35% increase in yearly earnings. Males received 18% more annually in the labour market in the same scenario. Both females and males received the highest boost in earnings with a university credential with returns of 32% and 23% respectively. This paper also reported significant health advantages for high school completion. Using the Poisson regression design, the effects of a high school diploma on the chances of being diagnosed with an additional health condition were measured. For Aboriginal males, completing high school results decreased these chances by 35% and for Aboriginal females the chances were reduced by 22%.

Statistically, these results highlight the importance of taking into account individual discount factors, density of Aboriginals in urban areas, frequency of recent mobility in analyzing Aboriginal earnings, and health and education policy. Studies of Aboriginal returns in these topics that do not take into account these dimensions of educational attainment ignore a salient feature of the way Aboriginal education is rewarded in the labour market and how high school education can affect health outcomes.

For policy makers, increasing Aboriginal high school completion rates and closing the widening education gap between Aboriginal and non-Aboriginal Canadians can have far-reaching, positive consequences for many facets of Canadian society. As demonstrated here, completing high school for Aboriginals can reduce social inequality between Aboriginals and non-Aboriginals, and gender inequality between Aboriginal females and males, through higher earnings and better health outcomes.

Taken together, the principal finding of this paper was that Aboriginals are rewarded with labour market returns and better health outcomes from a high school diploma and thus, these factors cannot explain why Aboriginal high school completion rates have lagged behind the Canadian average and why the education gap is increasing. Other reasons likely underlie the poor education outcomes for this population such as schooling, parental demographics, cultural expectations and history. Researchers need to incorporate innovative research designs that maximize the capacity of available datasets to uncover these underlying mechanisms. Improved education outcomes promises to be an important means through which the poverty and marginalization of Aboriginal peoples can be alleviated, yet any policy or paradigm that fails to acknowledge the complexity of the influencing factors may be doomed to repeat the inefficacies of the past.

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Tables and Figures

Table 1 Summary statistics for Aboriginals, APS 2001 & APS 2006

	APS 2001	APS 2006	Combined
Age	32.05	31.79	31.89
Potential Years of Experience	12.97	11.83	12.27
Years of Schooling	11.21	11.38	11.32
Highest Educational Attainment			
% Less than high school completion	21.17	15.49	17.63
% Completed high school	12.45	15.91	14.59
% Some post-secondary experience	25.07	19.81	21.82
% Postsecondary degree (trade school, college or university certificate, diploma or degree	40.28	48.83	45.57
High School Completion Rate	58.10	69.87	65.38
Average number of health conditions	0.691	0.697	0.695
Average yearly employment income	$20,370.12	$16,607.29	$18,043
Total number of Observations	4,427	7,172	11,599

Table 2: Summary statistics by gender, APS 2001 & APS 2006 combined

	Males	**Females**
Age	31.99	31.81
Potential Years of Experience	12.56	12.04
Years of Schooling	13.42	13.77
Highest Educational Attainment[4]		
% Less than high school completion	20.21	15.75
% Completed high school	16.32	13.32
% Some post-secondary experience	20.35	22.89
% Postsecondary degree (trade school, college or university certificate, diploma or degree	42.81	47.57
High School Completion Rate	62.41	67.54
Average yearly employment income	$19.746.57	$16,802.53
Average yearly employment income for those without any credential (high-school or post-secondary)	$17,056.74	$11,109.35
Total number of Observations	4,889	6,710

Table 3: Returns to high school education for Aboriginal females, APS 2001 & 2006

Variable	Coefficient	Standard Error
High School Completion	0.309**	0.052
Years of High School Education	0.070**	0.017
Non-University Credential with High School Completion	0.222**	0.052
Non-University Credential without High School Completion	0.177**	0.035
University Completion	0.321**	0.043
GED Completion	0.121*	0.059
Potential Years of Experience	0.036**	0.007
Potential Years of Experience Squared	-0.001**	0.000
Living in a Census Metropolitan Area (CMA)	-0.048	0.034
Common law / Partner / Husband or Wife	0.109**	0.028
1 health condition	-0.015	0.032
2 health condition	-0.172**	0.046
3 health condition	-0.284**	0.071
4 or more health conditions	-0.505**	0.084
Moved Once	-0.204	0.037
Moved Twice	0.078†	0.043
Moved 3 times	-0.085*	0.037
First Nations	-0.172**	0.037
Metis	-0.094*	0.037
Inuit	0.001	0.080
Other / Multiple	-0.137†	0.071
Taught an Aboriginal Language (Proxy for High Aboriginal Density)	-0.236**	0.051
Cigarette Smoker (Proxy for High Discount Factor)	-0.085**	0.029
2006 Year Effect	-0.069*	0.032
Intercept	8.407**	0.190
N	5359	
R^2	0.118	
$F_{(25,5334)}$	31.009	

Significance levels: † : 10% * : 5% ** : 1%

How to read the table: These variables are regressed on the log of reported annual wages. In effect, the coefficients represent the increase (or decrease) in yearly wages in terms of percentages if the variable were true for the individual. According to this regression, for urban, Aboriginal females, graduating high school results in an increase in yearly wages of 30.9% compared to someone who does not have a high school diploma. Similarly, if an individual has 1 health condition (compared to none), it results in a decrease of yearly wages of 1.5%.

Table 4: Returns to high school education for Aboriginal males, APS 2001 & 2006

Variable	Coefficient	Standard Error
High School Completion	0.108*	0.051
Years of High School Education	0.106**	0.018
Non-University Credential with High School Completion	0.176**	0.053
Non-University Credential without High School Completion	0.107**	0.041
University Completion	0.226**	0.052
GED Completion	0.120 †	0.066
Potential Years of Experience	0.029**	0.008
Potential Years of Experience Squared	0.000	0.000
Living in a Census Metropolitan Area (CMA)	0.031	0.042
Common law / Partner / Husband or Wife	0.353**	0.033
1 health condition	-0.111**	0.037
2 health condition	-0.256**	0.059
3 health condition	-0.456**	0.102
4 or more health conditions	-0.423**	0.143
Moved Once	0.027	0.041
Moved Twice	-0.042	0.050
Moved 3 times	-0.088*	0.044
First Nations	-0.204**	0.042
Metis	-0.007	0.041
Inuit	-0.089	0.090
Other / Multiple	-0.092	0.075
Taught an Aboriginal Language (Proxy for High Aboriginal Density)	-0.258**	0.062
Cigarette Smoker (Proxy for High Discount Factor)	-0.113**	0.032
2006 Year Effect	-0.002	0.037
Intercept	8.349	0.208
N	3609	
R^2	0.153	
$F_{(25,5334)}$	27.404	

Significance levels: † : 10% * : 5% ** : 1%

How to read the table: These variables are regressed on the log of reported annual wages. In effect, the coefficients represent the increase (or decrease) in yearly wages in terms of percentages if the variable were true for the individual. According to this regression, for urban, Aboriginal males, graduating high school results in an increase in yearly wages of 10.8% compared to someone who does not have a high school diploma. Similarly, if an individual has 1 health condition (compared to none), it results in a decrease of yearly wages of 11.1%.

Table 5: Heckman Robustness Check, Returns for Aboriginal females, APS 2001 & 2006

Variable	Coefficient	Standard Error
Equation 1: Log of Earnings		
High School Completion	0.315**	0.055
Years of High School Education	0.044*	0.021
Non-University Credential without High School Completion	0.334**	0.066
Non-University Credential with High School Completion	0.245**	0.041
University Completion	0.526**	0.101
GED Completion	0.081	0.061
Potential Years of Experience	0.062**	0.015
Potential Years of Experience Squared	-0.001**	0.000
Living in a Census Metropolitan Area (CMA)	0.014	0.048
Common law / Partner / Husband or Wife	0.092**	0.031
1 health condition	-0.024	0.034
2 health condition	-0.156**	0.050
3 health condition	-0.284**	0.069
4 or more health conditions	-0.515**	0.080
Moved Once	0.015	0.043
Moved Twice	-0.029	0.052
Moved 3 times	-0.067 †	0.040
First Nations	-0.075	0.054
Metis	-0.055	0.043
Inuit	0.009	0.083
Other / Multiple	-0.060	0.080
Taught an Aboriginal Language (Proxy for High Aboriginal Density)	-0.193**	0.054
Cigarette Smoker (Proxy for High Discount Factor)	-0.109**	0.033
2006 Year Effect	-0.212**	0.066
Intercept	8.738**	0.249

Variable	Coefficient	Standard Error
Equation 2: select		
Number of Household Maintainers	0.110**	0.036
High School Completion	0.064	0.068
Years of High School Education	0.080**	0.021
Non-University Credential with High School Completion	0.152 †	0.080
Non-University Credential with High School Completion	-0.096	0.053
University Completion	-0.585**	0.056
GED Completion	0.045	0.075
Potential Years of Experience	-0.108**	0.011
Potential Years of Experience Squared	0.003**	0.000
Living in a Census Metropolitan Area (CMA)	-0.258**	0.051
Common law / Partner / Husband or Wife	-0.002	0.040
… (Some variables are omitted for spatial reasons)…		
Taught an Aboriginal Language (Proxy for High Aboriginal Density)	-0.082	0.066
Cigarette Smoker (Proxy for High Discount Factor)	0.098*	0.039
2006 Year Effect	0.388**	0.043
Intercept	0.702**	0.236
Equation 3: mills		
2006 Year Effect	-0.757*	0.356
N	6710	
Log likelihood	.	
$\chi^2_{(25)}$	639.332	

Significance levels: † : 10% * : 5% ** : 1%

Table 6: Heckman Robustness Check, Returns for Aboriginal males, APS 2001 & 2006

Variable	Coefficient	Standard Error
Equation 1: Log of Earnings		
High School Completion	0.149	0.139
Years of High School Education	0.067	0.047
Non-University Credential without High School Completion	0.440*	0.174
Non-University Credential with High School Completion	0.553**	0.178
University Completion	0.934**	0.287
GED Completion	-0.098	0.169
Potential Years of Experience	0.132**	0.042
Potential Years of Experience Squared	-0.003*	0.001
Living in a Census Metropolitan Area (CMA)	-0.035	0.108
Common law / Partner / Husband or Wife	0.623**	0.129
1 health condition	-0.158	0.098
2 health condition	-0.337*	0.152
3 health condition	-0.675**	0.250
4 or more health conditions	-0.165	0.312
Moved Once	0.107	0.113
Moved Twice	-0.068	0.129
Moved 3 times	-0.208 †	0.120
First Nations	0.005	0.141
Metis	0.140	0.127
Inuit	0.120	0.246
Other / Multiple	-0.138	0.216
Taught an Aboriginal Language (Proxy for High Aboriginal Density)	-0.162	0.158
Cigarette Smoker (Proxy for High Discount Factor)	-0.260*	0.101
2006 Year Effect	0.625**	0.243
Intercept	8.467**	0.514

Variable	Coefficient	Standard Error
Equation 2: select		
Number of Household Maintainers	0.092*	0.037
High School Completion	-0.032	0.073
Years of High School Education	0.037	0.023
Non-University Credential with High School Completion	-0.136	0.083
Non-University Credential with High School Completion	-0.333**	0.058
University Completion	-0.575**	0.070
GED Completion	-0.028	0.084
Potential Years of Experience	-0.097**	0.013
Potential Years of Experience Squared	0.003**	0.000
Living in a Census Metropolitan Area (CMA)	0.044	0.050
Common law / Partner / Husband or Wife	-0.274**	0.045
… (Some variables are omitted for spatial reasons)…		
Taught an Aboriginal Language (Proxy for High Aboriginal Density)	-0.072	0.079
Cigarette Smoker (Proxy for High Discount Factor)	0.135**	0.044
2006 Year Effect	-0.583**	0.050
Intercept	1.487**	0.260
Equation 3: mills		
2006 Year Effect	-2.644**	0.892
N	4889	
Log likelihood	.	
$\chi^2_{(25)}$	91.173	

Significance levels: † : 10% * : 5% ** : 1%

Table 7: Effect of High School Completion on likelihood of an additional health condition for Aboriginal females, APS 2001 & 2006

Variable	Coefficient	Standard Error
High School Completion	-0.218**	0.065
Age	0.066**	0.014
Non-University Credential without High School Completion	0.088	0.099
Non-University Credential with High School Completion	0.024	0.075
University Completion	-0.092	0.084
GED Completion	0.020	0.077
Potential Years of Experience	0.061**	0.023
Potential Years of Experience Squared	-0.001**	0.001
Living in a Census Metropolitan Area (CMA)	0.064	0.054
Common law / Partner / Husband or Wife	-0.163**	0.043
Registered Indian	-0.126*	0.058
Moved Once	-0.037	0.056
Moved Twice	-0.089	0.068
Moved 3 times	-0.142*	0.057
First Nations	0.197**	0.074
Metis	0.144*	0.064
Inuit	-0.280*	0.142
Other / Multiple	-0.288**	0.106
Taught an Aboriginal Language (Proxy for High Aboriginal Density)	0.007	0.083
Cigarette Smoker (Proxy for High Discount Factor)	0.134**	0.044
2006 Year Effect	-0.158**	0.051
Previously diagnosed with Diabetes	0.644**	0.191
Previously diagnosed with Arthritis	0.290**	0.096
Previously diagnosed with Asthma	0.198**	0.072
Previously diagnosed with Bronchitis	0.679**	0.097
Previously diagnosed with Cancer	1.025**	0.113
Previously diagnosed with Blood Pressure	0.125	0.231
Previously diagnosed with Long Term Illness	-0.071	0.107
Intercept	-3.354**	0.269
N	6710	
Log likelihood	-6261.738	
$\chi 2(25)$	91.173	

Significance levels: † : 10% * : 5% ** : 1%

How to read the table: A Poisson regression design is used when regressing these variables on the number of health conditions. In effect, the coefficients represent the increase (or decrease) in the likelihood of being diagnosed with an additional health condition between the ages of 20 and 44. According to this regression, for urban, Aboriginal females, graduating high school results in a 21.8% decrease in the likelihood of being diagnosed with a serious health condition, compared to someone who does not have a high school diploma.

Table 8: High School Completion and health outcomes for Aboriginal males, APS 2001 & 2006

Variable	Coefficient	Standard Error
High School Completion	-0.354**	0.088
Age	0.108**	0.020
Non-University Credential without High School Completion	-0.084	0.131
Non-University Credential with High School Completion	0.019	0.106
University Completion	-0.035	0.119
GED Completion	-0.066	0.100
Potential Years of Experience	0.001	0.034
Potential Years of Experience Squared	0.000	0.001
Living in a Census Metropolitan Area (CMA)	0.022	0.073
Common law / Partner / Husband or Wife	-0.130*	0.062
Registered Indian	-0.030	0.078
Moved Once	-0.035	0.080
Moved Twice	-0.045	0.093
Moved 3 times	0.138 †	0.079
First Nations	0.092	0.099
Metis	0.114	0.087
Inuit	-0.438*	0.198
Other / Multiple	0.009	0.154
Taught an Aboriginal Language (Proxy for High Aboriginal Density)	-0.172	0.121
Cigarette Smoker (Proxy for High Discount Factor)	0.227**	0.062
2006 Year Effect	-0.110	0.070
Previously diagnosed with Diabetes	-0.244	0.371
Previously diagnosed with Arthritis	-0.007	0.253
Previously diagnosed with Asthma	-0.247*	0.120
Previously diagnosed with Bronchitis	0.579**	0.149
Previously diagnosed with Cancer	0.905 †	0.495
Previously diagnosed with Blood Pressure	0.468	0.413
Previously diagnosed with Long Term Illness	-0.139	0.218
Intercept	-4.422**	0.373
N	4889	
Log likelihood	-3843.675	
$\chi 2(25)$	523.159	

Significance levels: † : 10% * : 5% ** : 1%

How to read the table: A Poisson regression design is used when regressing these variables on the number of health conditions. In effect, the coefficients represent the increase (or decrease) in the likelihood of being diagnosed with an additional health condition between the ages of 20 and 44. According to this regression, for urban, Aboriginal males, graduating high school results in a 35.4% decrease in the likelihood of being diagnosed with a serious health condition, compared to someone who does not have a high school diploma.

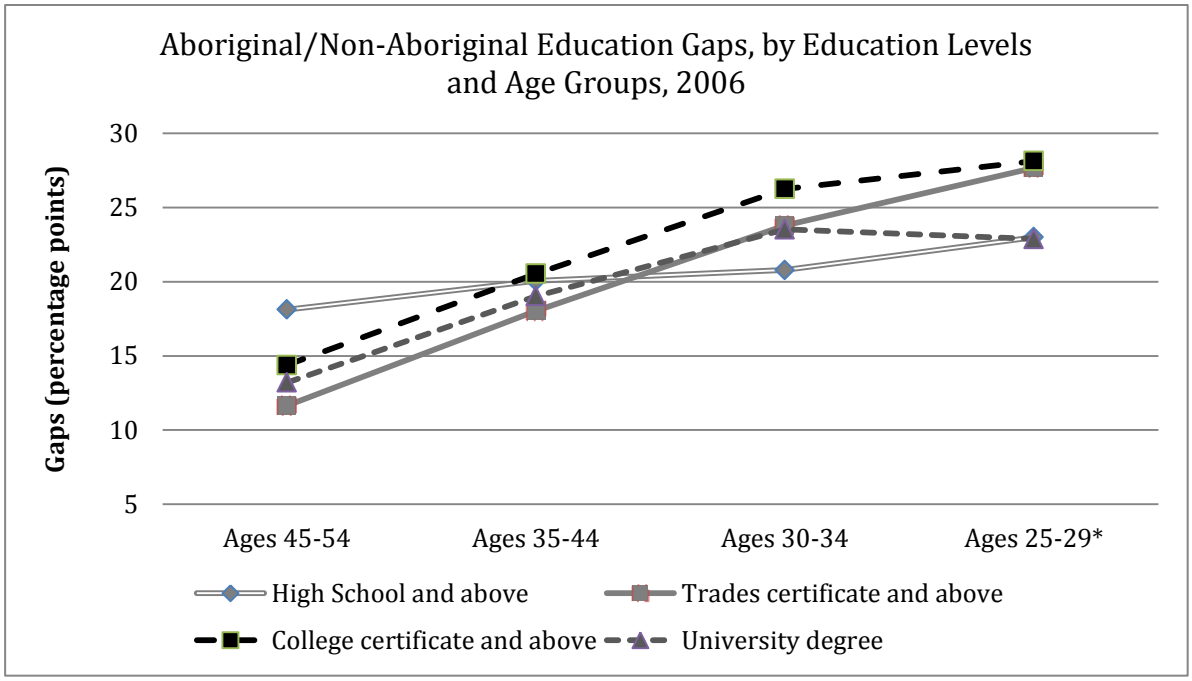

Figure 1: Aboriginal – Non-Aboriginal Education Gap, Census 2006.

Appendix

A1: How the variables were created

The Aboriginal Peoples Survey public use micro-data files (PUMFs) list an individual's age and annual earnings by groupings and not explicitly. Thus, the researcher must create approximations to be able to calculate means and run regressions. Here is a short list of how key variables were created for this paper:

- Age: If an individual is between the ages of 20-24, 25-34, or 35-44, their rough age is considered to be 22, 29 and 39 respectively.

- Years of schooling: The number of grades an individual completes in high school and their post-secondary education experience are added to calculate their years of schooling. If an individual has some post-secondary schooling, two more years are added to this variable. If the individual completes at least one post-secondary credential, four years of schooling are added to their count.

- Potential years of labour market experience: Following Card (1999), the experience years are calculated using the formula (Age - Years of schooling - 6).

- Yearly income: Earnings are reported by brackets of $0, $1-$4999, $5000-$9999, $10,000-$19,999, $20,000-$29,999, $30,000-$39,999, and $40,000 or more. For the ranges are that are defined, the midpoint is assumed to be the individual's year earnings. So if an individual's income is reported to be between $10,000 and $19,999, the regressions are run assuming their income is $15,000. For individuals, earning more than $40,000, their incomes are assumed to be $56,000, which is 40% higher than the low point to account for the extremely high earners.