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Modeling Educational Success of First Nations Students in Canada: Community Level Perspectives

Abstract

Canadian assessments of First Nation and Aboriginal education lack any real modelling of reasons for the particular patterns of attainment — it is this void that we wish to fill. This paper examines educational attainment in First Nations communities using combined data from the 1996 Census and Department of Indian Affairs and Northern Development Education Survey for the school year 1995/1996, aggregated to the band level, for registered and non-registered Indian and Inuit students who live on reserve in Canada. Multiple sequential regression analysis is used to model the educational success of grade 12 and 13 students with community level characteristics, including an isolation variable, school type variable, demographic variables, economic variables, and human capital variables. We use three measures of educational success: the age appropriate rate, graduate rate, and withdrawal rate. It is shown that the community level variables are similar in their explanatory power of educational success; however, the effects of variables within blocks on measures of educational success differ. The demography and human capital blocks play a particularly important role for all three measures of educational success. Additional analysis includes an examination of standardized regression weights. The paper discusses research and policy implications and articulates future avenues for research.

Résumé

Au Canada, les évaluations portant sur l'éducation des Premières Nations et des autochtones manquent de véritable modélisation concernant les raisons sous-jacentes à des schémas particuliers d'acquisition. C'est ce manque que nous voudrions adresser. Dans cet article nous examinons l'acquisition en éducation dans les communautés des Premières Nations à partir de données provenant du recensement de 1996 ainsi que du sondage sur l'éducation tenu par le département des Affaires indiennes et du Développement du Nord pour l'année scolaire 1995/1996; ces données ont été regroupées pour servir au niveau de la bande, et concernent les étudiants indiens et inuits vivant dans les réserves du Canada, qu'ils soient enregistrés ou non. Une analyse de régression séquentielle multiple sert à modéliser les succès en éducation d'étudiants de 12e et 13e années selon des caractéristiques au niveau de la communauté, dont les variables mesurant des composantes telles que l'isolation, le type d'école, la démographie, l'économie et le type de peuplement. Nous nous servons de trois mesures du succès en éducation : le pourcentage selon l'âge approprié à l'année scolaire, celui de finissants et celui de retraits. Le résultat montre que les variables au niveau de la communauté peuvent expliquer le succès en éducation de façon semblable; cependant, les effets des variables sur ces mesures varient à l'intérieur des composantes citées. La démographie et le peuplement jouent un rôle particulièrement important pour chacune de ces trois mesures. Une analyse complémentaire inclut un examen des coefficients centrés réduits de régression. Dans cet article, nous examinons les implications de la recherche et de la politique dans ce domaine, et nous expliquons de nouvelles avenues pour la recherche.



INTRODUCTION

The life experiences of First Nations people have been characterized on average by a lower standard of living and quality of life relative to the greater society (see Department of Indian Affairs and Northern Development 1995; Royal Commission on Aboriginal People 1996¹). Virtually all measures related to social outcomes, from health to housing to socioeconomic conditions, indicate the disparities in our society. Improving the situation in First Nations communities has proven to be quite difficult. The role of education in numerous social outcomes is unmistakable. However, as noted by King (1993) in the Royal Commission on Aboriginal People Report, there are significant problems related to the low educational attainment of First Nations students. The Census data indicate that average educational levels are below national averages (e.g., Hull 200). A recent analysis of income inequality provides a clear indication of educational inequities (Maxim et al. 2003). Considering the importance of this ongoing issue, an attempt is made in this paper to explore the characteristics of successful schooling for First Nations communities; specifically, the study explores the community level characteristics that explain aggregate levels of educational success.

There are five categories of explanatory variables used in our regression model: isolation, school type, demographic, economic, and human capital. The present study is the first of its kind where the explanatory power of the community is examined. We add to the information on Aboriginal school experience and contribute to a better understanding of the indicators of attainment by looking at three issues related to quality: the graduate rate, withdrawal rate, and age appropriate rate. We consider these indicators to be important as they focus on the school and community.²

We are studying those individuals who fall under the jurisdiction of the Department of Indian Affairs and Northern Development. The Constitution Act, 1867, Section 92, places education under the jurisdiction of the provinces. Section 91(24), however, extends exclusive Legislative Authority of the Parliament of Canada to all matters related to “Indians and Lands reserved for the Indians.”³ Federal responsibility for education does not extend to any Indian who does not ordinarily reside on a reserve or on lands belonging to Her Majesty in right of Canada or a province. Accordingly, we evaluate the education outcomes of all First Nations students who report that they reside on a First Nations reserve, have qualified to register under the Indian Act, and appear in the Indian Registry. Information on such students is reported to the Department of Indian Affairs and Northern Development, and our analysis is based on those data and the 1996 Census.

PREVIOUS RESEARCH

Research on Aboriginal educational attainment is rare. In fact in 1996, the Royal Commission on Aboriginal People noted that there is a critical problem in terms of data availability and a lack of assessments of educational attainment.⁴ Much of the time spent discussing the issue centres on the perceived problems and the assumed patterns of underachievement. Empirical work is often restricted to small case studies or regional investigations and, at best, descriptive measures of trends. While previous studies are sparse, there is some research to evaluate.

Studies of First Nations education indicate that certain patterns exist. First, off-reserve Indians have a greater educational attainment than those on-reserve (Government of Canada 1971; McDonald 1991). Hull (2000) notes that this pattern is particularly noticeable in the case of secondary and university completion rates. Using data from 1986, Armstrong et al. (1990) found that only 25% of Canada's First Nations people completed high school compared with one-half of the non-Indian population. In terms of the transition to university, only 23% of First Nation graduates proceeded to this next stage of education compared to 33% of the non-Indian population. The total First Nation population with a university degree was 1.3% compared to 9.6% of the general population. Data from Hull (2000), using the 1996 Census, indicates that 37% of Registered Indians attained "some post-secondary" education (university, trades schools, and other non-university post-secondary education)⁵; however, this figure was much smaller than the other Aboriginal population (47%) and the greater Canadian population (51%).⁶ Since 1986 the Registered Indian population with some post-secondary attainment has increased 14% from 23% to 37%. Among the Registered Indian population fifteen years of age and older not attending school, Hull found that 44% have completed secondary school or continued with some post-secondary education, although this figure is smaller than the percentage for the Aboriginal identity group (51%) and other Canadians (67%). In terms of university degrees, only 3% of Registered Indians attained this level of education compared to 4% of other Aboriginal identity groups and 14% of other Canadians. While the indicators of post-secondary success have improved for Registered Indians, the relative success of this group compared to the general population has been offset to some extent because of the latter's increased success.

What about at lower levels of education? Studies suggest significant improvements in educational attainment in recent years. As Tait (1999) notes, the percentage of young Aboriginal adults with less than a high school diploma dropped from 60 % to under 45% between 1986 and 1996. While the 1980s had been a time of great change, as King (1993) notes, education levels of Aboriginal people are still too low compared to the non-Aboriginal population. For instance, in 1986 Aboriginal people

were 2.2 times more likely not to complete high school than non-Aboriginals. By 1996, this figure had increased to 2.6 times (Tait 1999). This implies once again, as with post-secondary education, that the relative improvement in lower levels of education of the Aboriginal population tends to be offset to some degree by the increases in attainment found in the general population.

The importance of education is most clearly seen when one examines the returns.⁷ Several researchers have found that the return to education for Aboriginals is greater than for other groups (George and Kuhn 1994; Patrinos and Sakellariou 1992; Sandefur and Scott 1983), although this finding is not consistent (Lian and Matthews 1998). Jankowski and Moazzami (1995) found that there was an earnings return to education for First Nations persons of about 7.8% for each year of elementary and secondary school completed and 31% for university training. Other studies, such as Drost (1994), also find positive outcomes for education in terms of labour force participation. Analyses indicate that the largest gains in reducing the risk of unemployment come from improvement of completion rates for elementary and high school (Ryan 1996).

The provinces of British Columbia and Saskatchewan have undertaken research to highlight some of the issues surrounding First Nations education. In British Columbia studies have found that 14% of Aboriginal students do not progress to high school as compared to 4% of non-Aboriginal students. In addition, Aboriginal students score significantly lower on foundation skills assessment in the standard testing in grades 4, 7, and 10 (British Columbia Ministry of Education 2000a). The British Columbia Ministry of Education and the Saskatchewan Department of Education have found that some of the most influential proposals for building effective schools and enhancing education attainment for First Nations students are premised on the community setting. Communities that generally engage in activities supporting both home and school are found to be a key to success (British Columbia Ministry of Education 2000b; Epstein 1987, 1988; Levesque 1994).

The striking point about the Canadian assessments of First Nation and Aboriginal education is the lack of any real modelling of reasons for the particular patterns of educational attainment – it is this void that we wish to fill. Given the limitations of data in Canada, we looked at what is available and asked what we could model that would be useful. Our models use aggregate data, but the results must be interpreted with caution. Specifically, one must avoid making the ecological fallacy (i.e., making inferences at the individual level based on findings from the aggregate level); in other words, relationships observed at the aggregate level are not necessarily reproduced at the individual level (see Robinson 1950).⁸ The OECD (2007) has implicitly addressed this issue in its discussion of educational indicators; specifically, a distinction is made between the various levels of educational indicators and related determinants that may be examined, and it is emphasized that the data must be

appropriate given the goals of the research. In this case, using aggregate data to assess macro level propositions is an acceptable and commonly used method of inquiry (Snijders and Bosker 1999).

HYPOTHESES

Educational attainment has been found to vary by place of residence. Those outside metropolitan areas have less educational attainment by age and cohort than those in urban centres (Ward 1995). Isolation from economic centres probably makes many parts of the educational system seem somewhat irrelevant to students as a result of the high unemployment and shortage of opportunities. Is location of the community also predictive of educational attainment in Canada? We believe that this is the case; viz., we hypothesize that an inverse relationship exists between the distance of a community from economic centres and educational success.

We think that school type is directly related to educational success in Canada. The literature has documented the difficulties faced by band schools in hiring and retaining qualified and experienced teaching staff. In short, band school teachers tend to have lower salaries and less job security, opportunities for change and advancement, professional development, and employment benefits than their peers because these institutions are not governed by district or provincial collective agreements (Bell 2004; Royal Commission on Aboriginal People 1996). Moreover, the teaching climate is characterized by a shortage of specialists and resources within the school which facilitate the learning process (*ibid*). A school system that aims to arm students with the human capital, cultural capital, and social capital to succeed in mainstream society may appear pointless and detached from reality as First Nations students know it, in the absence of well-qualified teachers who are able to bridge the gap using appropriate pedagogy.

Another issue is the lack of a national system of quality control to evaluate the education received by students (*ibid*). The absence of mandatory common benchmarks for monitoring purposes could quite possibly contribute to a perpetual system of long-term ineffectiveness in these schools with little accountability, even after taking into account differences in student intake and community contexts.⁹ In the case of provincial and federal/private schools, the role of vertical ties, that is, increased interaction between ethnic minorities and the dominant groups, may result in the former becoming more familiar with the dominant culture, acquiring accepted cultural capital, and establishing networks (social capital), which can be used for educational attainment. Thus, we hypothesize that the provincial and federal/private schools would positively affect educational success, while band schools would have a negative effect on educational outcomes.

Poor achievement and dropping out is found to be related to an inability to translate education into work in American studies of minorities. Therefore, poor socioeconomic development in a particular community could be linked with poor educational attainment or school leaving (Snipp and Sandefur 1988). One aspect not examined in the empirical literature is whether the economic status of communities (e.g., income and employment) affects rates of educational outcomes. Higher income and employment would be expected to be related to the level of educational resources available in the community and positive norms of attainment as the incentive or link between education and jobs would be concrete, and there would be greater focus on educational attainment at a collective level (see White et al. 2005). Also a high proportion of students may withdraw from school early in order to take advantage of job opportunities on reserve (high employment rate on reserve) if they believe that short-term gains from employment will outweigh the long term benefits of human capital accumulation associated with remaining in school. This process is, however, mediated by the type of job and degree of competition in the market. If there are no jobs, then there is no reason to study; if there are only many low-end jobs, there is no reason to study; if there is a mix of low-, medium-, and high-end jobs with competition, then school becomes more relevant. Previous research has found that only a small proportion of withdrawers tend to be employed (White et al. 2004). We expect that higher levels of economic success will have a positive effect on educational success.

A variable associated with economic development is the degree of occupational diversity in a community. The more occupational diversity on a reserve, the more incentive there will be for a band to increase investment in human capital. Hence, this variable is expected to have a positive effect on education outcomes because it measures human capital opportunities that exist. There may be a large percentage of the labour force employed, but all in a few occupations. This limits the demand for a comprehensive educational system and narrowly focuses attainment towards those occupations. Similarly to our discussion of income and employment, the effect of occupational diversity on educational demand and outcomes is influenced by competition and the nature of the skills required for the job.

We expect that demographic variables would be determinants of the educational outcomes of First Nations bands. Demographic conditions, such as the age-dependency ratio, marital status, family size, and the sex ratio, affect the educational outcomes of on-reserve students through their determination of the community's collective needs and goals. For example, the more children there are in the band, the more educational needs (financing, schools, teachers, etc.) there will be. The extent of education provided to meet these needs depends on the collective goals of the community, i.e., how much education and of what quality do they want their children to have, as well as the resources available to meet their needs and goals. Since bands tend

to have young populations, the need for educational services is high; however, this need is countered by a relatively smaller proportion of adults who are able to provide for such services, beyond those provided by the government. We hypothesize that this phenomenon of a high age dependency ratio would have an adverse effect on educational success. Similarly, a high proportion of larger families would be characterized by a greater distribution of finite community social resources to accommodate the needs of children, which would decrease the investment in children and, therefore, lower educational success. This is similar to the popular “resource dilution theory” in the literature on effects of sibling size in families on various social outcomes but at a community level (see Steelman et al. 2002 for a comprehensive discussion). Family type is also predictive, as the proportion of single parent families is positively correlated with the prevalence of community problems and poverty (Bianchi 1999; Bursik and Grasmick 1993; Sampson 1992), which is antagonistic to the educational attainment process. Bands that have a higher proportion of single and/or divorced/separated/widowed people would be expected to have a higher proportion of single parent families, which would be an indication of lowered community cohesion and less focus on education than bands with a greater proportion of married people. Thus, we expect that the proportion of single or no-longer-married people in a band would be correlated with lower rates of educational success and the proportion of married, two-parent families would be positively correlated with educational attainment. The sex ratio — adult females to one hundred males in a Band — will also affect educational outcomes. Lower female-to-male ratios can result from a high rate of spousal abuse on reserve, resulting in females migrating off reserve, signalling serious societal problems that interfere with the education outcomes of students.¹⁰

Parental high school completion rates have been linked to lower dropout rates and reduced age inappropriateness (Ward 1998). Human capital accumulation on reserve is estimated using adult education levels. Conceptually, this variable can be thought of in terms of community norms and values. A high achieving community provides the yardstick against which members measure themselves. In other words, the ideological context is one which places a premium on educational attainment, and this is probably reflected in the resource allocation of the community. Community human capital will have an effect even after taking into account the isolation, school type, demographic, and economic variables. Higher adult education levels in a band are expected to increase the educational attainment of children in the band even above the effect of income (see White et al. 2005).

In summary, our main hypotheses are as follows:

1. The distance of a community from metropolitan areas will have a significant effect, with increasing distance of a community from economic centres having a negative effect on educational success.

2. School type will have a significant effect, with attendance at provincial and federal/private schools having a positive effect on educational success.
3. The employment rate, average income, and occupational diversity will have a positive effect on educational success.
4.
 - i) The sex ratio (adult females to males) will have a positive effect on educational success.
 - ii) The age dependency ratio will have a negative effect on educational success.
 - iii) Family type will have a significant effect, with the proportion of single adults and separated, divorced, and widowed adults having a negative effect on educational success.
 - iv) Family size will have a significant effect, with the proportion of one-child families having a positive effect on educational success and the proportion of families with two or three or more children having a negative effect on educational success.
5. Human capital attainment will have a significant effect, with community attainment at all levels of the educational system having a positive effect on educational success. Further, as community attainment increases at *higher levels* of education, the effect on educational success will be stronger.

METHOD

Sample

This analysis uses band level data from the 1996 Census and Department of Indian Affairs and Northern Development Program Data – Education Survey for the school year 1995-1996, including all registered and non-registered (negligible) Indian and Inuit students who live on reserve in Canada.¹¹ There were 397 communities that are used in the study.¹²

Measures¹³

The educational attainment variables: Three different measures of educational attainment are used in this study: the age - appropriate rate, graduate rate, and withdrawal rate. These measures are widely used throughout the literature and are considered standard outcomes of interest for this population (OECD 2007; Royal Commission on Aboriginal People 1996).¹⁴ The age-appropriate rate is the percentage of age-appropriate grade 12 and 13 students in a band.¹⁵ This gives us an analytically simple measure of the number of students that are behind the norm. In our sample, the average age appropriateness of students in our bands is 46.8%.¹⁶ Our second measure of

educational success, the graduate rate, is the proportion of grade 12 and 13 students, ages 16 to 22 years, in a band who were included on nominal rolls and graduated. The average graduate rate is 19.8%. The third measure of educational success, the withdrawal rate, is the percentage of grade 12 and 13 students on the nominal rolls who withdrew from high school in 1995-1996. For the purposes of this measure we exclude students who transferred to other schools, moved off reserve, died and/or graduated. This leaves those individuals who, for whatever reason, do not proceed with their education. The average withdrawal rate is 17.8 %. Our focus upon grade 12 and 13 students is intentional; it is a critical point in the educational system in two respects — as a minimum entry point into the job market and post-secondary training or studies.¹⁷

Isolation variable: A revised version of the original one developed by Indian Affairs Canada, this variable measures the distance from a First Nation community to the closest major centre as well as accessibility to the community (i.e., road access). It provides a measure of the degree of isolation of a community from the greater society. In our sample, 31.2% of bands are 0-50 km away from a major centre; 49.1% of bands are 51-350 km away from a major centre; and 19.7% of bands are more than 350 km away from a major centre, with some communities having no year-round road access.¹⁸

School type: This measure examines the proportion of students from a band attending a specified type of school: band schools, provincial schools, and federal/private schools. In our sample, the average figures are 21.4%, 77.2%, and 1.4% respectively.

Demographic variables: This analysis uses four demographic measures: the sex ratio, age ratio, marital status, and number of children. The sex ratio is the number of females per 100 males in a band. This figure is 92.7 in our sample. The age ratio, a form of dependency ratio, is a measure of the number of children (0-14 years) to 100 adults (15 years and over) in a band. Among our sample of First Nations bands, there are 55.9 children to 100 adults. For our measure of marital status, the proportion of the adult band population with a particular legal marital status is examined: married, single, and separated/divorced/widowed. In our sample of communities, on average, 32.4% of adults are married; 53.0% of adults are single; and 14.6% of adults are separated, divorced, and/or widowed. The number of children is examined as a proportion of families with a specified number of children: none, one, two, and three or more.¹⁹ The averages for our sample are 18.8%, 26.2%, 23.0%, and 32.1%, respectively.

Economic variables: There are two measures of the economic status of a community: the ratio of employed to the total population of working age and average income. These two indicators provide a point of comparison that gives us a view of the economic activity in and around the First Nation community and the adaptation of the adult population to that economic market. Sometimes analysts calculate the

employment to population ratio. This measures the percentage of the total population 15 years and older employed during the week prior to the Census. While this is an interesting measure, some analysts exclude those in school from the population to calculate the ratio as we have done. Thus, one must be cognizant of this issue when comparing studies. This figure is 39.5 to 100 for our sample.

The other indicator of the economic status of First Nations communities is the average income of communities. This is a crude measure, but it is a proxy for wealth. Many studies have linked income and well-being (e.g., Wilkinson 1997). This measure of economic strength is restricted to the population 15 years of age and over.²⁰ The average income for the bands in our sample is \$7742.00. First Nations people living on reserves tend to have a much lower employment rate than the rest of the Canadian population, and a high proportion of their income comes from government transfers (approximately 40% of the total income on average). Other income sources such as investments account for less than 2% of reported income. In our sample 65% of average band income comes from employment. It should be kept in mind that people living and employed on reserve are not required to pay income tax; therefore, incomes are not readily comparable to the general population.

Human capital variables: There are two human capital variables in this analysis: the highest level of schooling among adults and occupational diversity. The extent of educational success in a community indicates past performance and allows us to assess how educational levels in a community influence current attainment. This would include aggregate effects such as norms and community priorities. We look at the proportion of adults in a band attaining a specified level of schooling. Our findings by educational level of attainment are as follows: no high school graduation diploma (55.7%), high school graduation diploma (6.5%), trade certificate or non-university post-secondary education (24.2%), some university with no degree (11.2%), and a bachelor's degree or higher (2.4%). Occupational diversity is an index of the diversity of occupations within a band.²¹ It allows us to assess the degree of economic opportunities in the community. Interpreting this variable is as follows: the higher the coefficient, the greater the occupational diversity of the community. For our sample, the average is .795.

RESULTS

A series of sequential multiple regression analyses were conducted to assess the extent to which blocks of independent variables are predictive of educational success, i.e., the age appropriate rate, graduate rate, and withdrawal rate. The blocks of independent variables were entered as follows: Block 1 — the isolation variable (distance from a band to a centre using dummy coding); Block 2 — school type; Block 3 — the

Table 1. Descriptive Statistics of Variables

Variable	N=397	Mean	Std. Dev.
Dependent Measures			
Age Appropriate Rate		.468	.249
Withdrawal Rate		.178	.210
Graduate Rate		.198	.206
Spatial			
0 to 50 km		.312	.464
51 to 350 km		.491	.501
More than 350 km		.197	.398
School Type			
Proportion of band school attendance		.214	.317
Proportion of provincial school attendance		.772	.320
Proportion of federal and private schools attendance		.014	.072
Demographic			
Sex ratio (female to 100 males)		92.7:100	10.965
Age ratio (0-14 to 100-15+)		55.9:100	20.259
Proportion of married adults		.324	.120
Proportion of single adults		.530	.128
Proportion of separated, divorced and widowed adults		.146	.062
Proportion of families with no children		.188	.169
Proportion of families with one child		.262	.183
Proportion of families with two children		.230	.167
Proportion of families with three or more children		.321	.200
Economic			
Ratio of employed to total population of working age		39.5:100	12.356
Income of population 15 years and over (Canadian \$)		7742.00	6981.15
Human Capital			
Proportion of adults with no high school graduation diploma		.557	.176
Proportion of adults with high school graduation diploma		.065	.051
Proportion of adults with trade certificate or other non-university, post-secondary education		.242	.128
Proportion of adults with some university (no degree)		.112	.094
Proportion of adults with bachelors degree or higher		.024	.033
Occupational diversity		.795	.126

*Percentages may not equal 100 due to rounding.

Table 2. Hierarchical Regression of Age Appropriate Rate, Withdrawal Rate, and Graduate Rate on Community Level Predictors

	Age Appropriate Rate n=397	(Square root of) Withdrawal Rate n=397	(Square Root of) Graduate Rate n=397
Step 1: Isolation			
0 to 50 km (Reference)			
51 to 350 km	-.042	-.035	.071
More than 350 km	-.074	.008	.008
F change (<i>df, df</i>)	8.613 (2, 394)***	.660 (2, 394)	.778 (2, 394)
R ² change	.042	.003	.004
Step 2: School Type			
Proportion of band school attendance (Omitted)	.116*	.004	.080
Proportion of provincial school attendance	.057	.072	.053
Proportion of federal and private schools attendance	4.445 (2, 392)*	5.099 (2, 392)**	1.957 (2, 392)
F change (<i>df, df</i>)	.021	.025	.010
R ² change			
Step 3: Demographic			
Female to male ratio	-.032	-.079	-.024
Age ratio	.004	.084	-.239***
Proportion of married adults (Omitted)			
Proportion of single adults	-.203**	.137*	-.219**
Proportion of separated, divorced and widowed adults	-.016	.071	-.087
Proportion of families with no children (Omitted)			
Proportion of families with one child	-.038	-.005	.109
Proportion of families with two children	.082	-.042	.222***
Proportion of families with three or more children	-.038	-.138	.312***
F change (<i>df, df</i>)	3.312 (7, 385)**	2.363 (7, 385)*	5.916 (7, 385)***
R ² change	.053	.040	.096
Step 4: Economic			
Ratio of employed to total population of working age	-.095	.121*	-.161**
Average income of population 15 years and over	-.020	-.058	.017
F change (<i>df, df</i>)	0.232 (2, 383)	2.502 (2, 383)	3.006 (2, 383)++
R ² change	.001	.012	.014
Step 5: Human Capital			
Proportion of adults with no high school graduation diploma (Omitted)			
Proportion of adults with high school graduation diploma	-.022	.018	.056
Proportion of adults with trade certificate or other non-university, post-secondary education	.188**	.121	-.005
Proportion of adults with some university (no degree)	-.016	-.103	.148**
Proportion of adults with bachelors degree or higher	.085	-.163**	.064
Occupational diversity	.081	-.048	.040
F change (<i>df, df</i>)	2.857 (5, 378)*	.414 (5, 378)**	2.277 (5, 378)++
R ² change	.032	.051	.026
Full Model			
F test (<i>df, df</i>)	3.693 (18, 378)***	3.176 (18, 378)***	3.676 (18, 378)***
R ² Total	.150	.131	.149
R ² Total (adjusted)	.109	.090	.108

Note: Standardized (B) coefficients are from the final regression model, with the exception of the isolation block as it is a categorical variable and uses unstandardized (B) coefficients. Coefficients for 'Reference' and 'Omitted' categories are not entered into the model to avoid singularity. **p* < .05, ***p* < .01, ****p* < .001. ++*p* < .055 and in the case of the final regression coefficients, (B) is also meaningful; therefore, we chose to interpret this coefficient

demographic variables (sex ratio, age ratio, marital status, and number of children); Block 4 — the economic variables (ratio of employed to the total population of working age and average income); and Block 5 — the human capital variables (highest level of schooling among adults and occupational diversity).

The results of the evaluation of assumptions led to a square root transformation of the dependent variables, the withdrawal rate and graduate rate to reduce skewness and improve the normality, linearity, and homoscedasticity of residuals.²² The measures reported for this analysis include the change in R^2 and the final standardized regression coefficient of each independent variable for the full model. Changes in R^2 indicate the amount of incremental variation explained in the dependent variable by a block of independent variables having statistically eliminated the effects of previously entered independent variables. An adjusted R^2 value for the full model is also presented. All information can be found in table 2.

With the exception of the model for the age appropriate rate, the isolation variable is unrelated to educational outcomes. This block explains 4.2% of the variance in the age appropriate rate when entered first into the model. In the full model, the dummy variables for isolation are not found to affect the main results reported here, and a thorough examination did not find these effects to be mediated by the economic block as hypothesized.

When the school type block is added to the regression model in step 2, statistically significant changes in the age appropriate rate and withdrawal rate appear. This block accounts for 2.1% of the variance in the age appropriate rate and 2.5% of the variance in the withdrawal rate. An examination of the final betas shows that the only variable with a significant effect is the proportion of provincial school attendance on the age appropriate rate.

The block of demographic variables contributes significantly to explaining educational outcomes in all three models, beyond the geography and school type variables. Specifically, demographics accounts for 5.3% of the variance in the age appropriate rate, 4.0% of the variance in the withdrawal rate, and 9.6% of the variance in the graduate rate. The proportion of single adults has a negative effect on the age appropriate rate and a positive effect on the withdrawal rate. The final beta scores for the graduate rate show that the age ratio and the proportion of single adults have a negative effect on the graduate rate, while the proportion of families with two and three or more children has the opposite effect.

In step 4, we find that the economic characteristics of the community explain a significant amount of the variance only in the graduate rate (1.4%) beyond that afforded by those variables introduced in the first three steps. The final beta scores show that the ratio of the employed to the total population of working age has a positive effect on the withdrawal rate and a negative effect on the graduate rate.

The final step assesses whether community human capital improves prediction of the dependent variables after taking into account the previous blocks. This block has a statistically significant impact and explains 3.2% of the variance in the age appropriate rate, 5.1% of the variance in the withdrawal rate, and 2.6% of the variance in the graduate rate. For the age appropriate rate, the proportion of adults with a trade certificate or other non-university, post-secondary education has a positive effect on this measure of educational success. The proportion of adults with a bachelor's degree or higher has a negative effect on the withdrawal rate. In the case of the graduate rate, the proportion of adults with some university (no degree) has a positive effect. Collectively, the full model explains 15.0% of the variance in the age appropriate rate, 13.1% of the variance in the withdrawal rate, and 14.9% of the variance in the graduate rate. The adjusted R^2 values in this analysis are 10.9%, 9.0%, and 10.8% respectively.

DISCUSSION

This study has revealed several key findings. The effect of isolation is only important for the age appropriate rate when entered first into the model. School type effects for the age appropriate rate are seen with the proportion of provincial school attendance. We believe that the unique positive effect of this variable is best understood in terms of the earlier discussion of vertical ties. As ethnic minorities interact with the dominant groups, they may become familiar with the dominant culture, acquire accepted cultural capital, and establish networks (social capital) which can be used for educational attainment. In terms of the withdrawal rate, the effect of the school type block's variables disappears in the presence of the demographic, economic, and human capital variables.

The demography block plays a particularly important role in this analysis. The age ratio has a strong negative effect on the graduate rate. This is no surprise as we would expect a dilution effect of resources at the community level; that is, there would collectively be fewer financial, emotional, and time resources available as the proportion of children to adults increases. The end result is the mitigation of educational attainment of youth. The proportion of single adults exhibits an effect across all measures of educational success which reduces educational success; i.e., it decreases the age appropriate rate and graduate rate and it increases the withdrawal rate. Recall that as the proportion of single adults increases, this is associated with a higher proportion of children in single parent households (lone parenthood) and higher levels of poverty (Bianchi 1999). We argue that these communities tend to be structurally deficient in social capital (e.g., less cohesive networks), which is necessary for the transmission of other forms of capital, such as financial or human (Coleman 1988; Coleman 1990; Martin 2004). This context would undermine the educational outcomes of the community.

The fertility variables, the proportion of families with two children and the proportion of families with three or more children, are important in their effects on the graduate rate. Most notable is the strong *positive* effect of these variables on the graduate rate, while controlling for all of the other variables in the entire model. How can this be explained? The context of a community — including prevailing norms and priorities surrounding child rearing — is an important consideration. For example, large families are accepted and encouraged among Mormons. The communities play an important supporting role in raising children (we call this social capital), and the social norms dictate that societal resources be prioritized and allocated towards the needs of youth (Downey and Neubauer 1998). What all this means is that cultural context and institutions of governance at the community level can influence the effects of fertility on educational attainment. So it appears that in communities where the proportion of two children increases, the dynamics (e.g., culture, resource allocation) are such that positive aggregate effects in education are observed. A greater understanding of the positive effect of this fertility variable on educational outcomes in First Nations communities is needed. This could prove quite fruitful in the ongoing discussions regarding sibship size and resource dilution theory (Steelman et al. 2002). Parental decisions regarding the allocation of various forms of resources could be found through qualitative research. Moreover, this type of research could enable us to better understand the role of culture in social norms relating to child rearing in the community. Our previous work on social capital in Aboriginal communities indicates this would be a useful exercise (White et al. 2005).

The strong positive effect of the proportion of families with three or more children on the graduate rate is noteworthy. This variable has a statistically significant positive effect on graduate rates, with a beta value of .312 ($p < .001$). An analysis of this coefficient from the bivariate case ($r = .03$, $p > .05$) through to the full multiple regression model is informative, since the change in the coefficient between the former and latter is significant. Indeed, in combination, the other variables in the model suppress variance in the proportion of families with three or more children that is irrelevant to prediction of graduate rates, which results in a dramatic increase in the effects of this independent variable. Hence, this variable's importance cannot be understood in isolation from the other variables in the model.²³ At this point we conclude that further analysis needs to be done to understand the dynamics surrounding the suppression of this variable and the possible consequences.

Although the entrance of the economic block does not contribute much in explaining variance in the dependent variables, given its point of entry, the final beta values for the ratio of the employed to the total population of working age are statistically significant for the withdrawal rate and the graduate rate. This effect is adverse for educational success. Following from our discussion earlier, it appears that higher

levels of employment may be promoting an acceptable culture of premature exiting of the educational system in order to take advantage of job opportunities on reserve. These school leavers may feel that the short term gains from employment will outweigh the long term benefits of human capital accumulation associated with remaining in school.

The effect of the community's educational levels across all three models in this analysis is most notable. While holding constant the isolation, school type, demographic, and economic variables, the educational attainment levels of a community have a distinctly important role in the educational success of students. When we examine the betas within the human capital block, the proportion of adults with some university (no degree) is an important variable in increasing the graduate rate, and the proportion of adults with a bachelor's degree or higher plays a key role in reducing the withdrawal rate. Thus, it appears that high levels of community educational attainment may breed a social context which values, supports, and expects high academic achievement (high average norms), which could result in high rates of educational success. This effect would not be entirely surprising; after all, since behaviour is socially determined, societal level norm effects are naturally of great significance.²⁴

The proportion of adults with a trade certificate or other non-university post-secondary education is important for increasing the age appropriate rates; in fact, it has the strongest unique effect on educational success out of all the variables in the human capital block. In addition to the norm effects of higher education mentioned previously, we note that the trades demand individuals who are highly visual, enjoy hands-on work, and respect senior workers with more expertise and training who can pass on their knowledge. The key traits of Aboriginal culture include visualization, learning through the process of doing, and passing on teachings from elders. As an increasing proportion of the community attains this type of education and works in these culturally congruent jobs that offer a respectable average pay, the mass perception of the value of education would be apparent; this may result in high age appropriate rates.²⁵ This positive relationship between norms, community capacity, and educational attainment in communities has been found in a recent comparative study of New Zealand, Australia, and Canada (White et al. 2005).

It is our belief that the issue investigated in this work — identifying predictors of educational success — is a crucial area of concern for all stakeholders. Despite the shortcomings, our findings are useful. Indeed, our analysis shows that using different indicators of attainment and success yielded somewhat similar results. A brief analysis of the final beta values demonstrates that despite the similarities in terms of the importance of blocks of variables, certain variables within those blocks appear to be playing different roles in their effects on each measure of educational success. This indicates that researchers must be aware of the validity issues surrounding var-

ied measures of “educational success,” as our understanding of the processes of success are shaped by the outcome measure used.²⁶ In the process of developing and evaluating policies and programs, a clear understanding of these varied causes and determinants is essential to achieve desired outcomes.

It is clear to us that given the relatively low explanatory power of the three models and the residual unexplained variance, there is a need for further research into the determinants of our measures of educational success. Given that this area is underresearched, it is not unexpected that our study is an initial glance that tends to spawn many more questions — such is the nature of research. Without a doubt, we believe that further theorizing and empirical analysis is necessary to gain more insight into the complexities of the factors that contribute to educational outcomes. Methodologically, an aggregate cross-sectional snapshot of the average effects of the variables used in our analysis limits our understanding of the phenomena at hand. Longitudinal, multilevel, and qualitative studies would be useful in shedding more light upon the processes of attainment in these diverse communities. In terms of variables, cultural content and the use of traditional language in the educational system are obvious directions to proceed. As mentioned earlier, our focus upon grade 12 and 13 students is intentional; it is a critical point in the educational system in many respects, given that it functions as a minimum entry point into both the job market and post-secondary education institutions. However, further work on the effects of community level characteristics at various points in the educational system is needed. Work by White et al. (2004) indicates that the transition to high school from elementary school is problematic as educational success measures decline substantially for First Nations. Do the variables used in this model explain educational success at lower levels of the educational system? Are the effects of these variables constant at all levels of the educational system? Are variables absent from this analysis that are fundamental for explaining educational success at lower levels of the educational system? Stakeholders, including policy makers, require this type of research to arm them with the knowledge necessary to develop and implement meaningful social policy, programs, and initiatives at strategic points in the educational system.

POLICY IMPLICATIONS

From a policy perspective, this research does not provide a recipe for the educational success of First Nations. However, a policy lens that recognizes community effects as more than the sum of the individual level characteristics of members of the community is a step in the right direction. Moreover, our findings indicate that policy, programming, and initiatives aimed at the following areas would potentially yield positive results:

1. Supporting communities through long-term sustainable initiatives with a high proportion of single parents to offset economic disadvantage and associated social problems.
2. Providing resources of various kinds that reinforce the importance of both youth and education as priorities in a community; for example, creating public meeting places, opportunities for exchange and interaction in a community can facilitate the development and reinforcement of these community norms.
3. Building social capital in communities to enhance outcomes.²⁷ This process is particularly important where there is a high rate of community problems (e.g., crime, family disintegration).
4. Promoting community capacity strategies and economic development in a manner that promotes a highly educated populace.
5. Data collected in future surveys must capture detailed individual as well as contextual level variables. It is difficult to make definitive claims on any phenomenon without good data. Efforts can be focused on collecting high quality data and, where possible, data that is amendable to multi-level analyses.

More informed policy can only be made after data have been collected that will provide meaningful insights into the processes of the trends documented in this research.

What can we conclude from this study? Instituting social policy that can foster the development of human capital in the Aboriginal population is a key starting point to economic development and the well-being of communities. Thus, improving the rates of educational success of Aboriginal students in the educational system is paramount. We know that the structural components of society impact on the decisions individuals make in their day-to-day lives. Decisions are always made in a given social context. If that social context is not supportive or conducive to staying in school, then we can expect poor educational attainment outcomes. Our regression analysis has shown that the social structure of the community affects educational success. Thus, educational policy can only be examined in the context of other social policy. Through further research, it is our hope that more light can be shed upon the key determinants of human capital in Aboriginal communities. While we are edging closer to articulating the process through which these determinants operate to affect educational outcomes, we have much to learn. Utilizing and combining various modes of research (qualitative/quantitative) will be very useful. Given the paucity of research in understanding the structural issues surrounding educational attainment in Aboriginal communities, we see this as an area ripe for much theorization and deliberation.

NOTES

1. In 1996, the Government of Canada convened a Royal Commission to examine the social, economic, cultural, and political situation of Canada's Aboriginal population. The thirty-five thousand page report is an extensive investigation of conditions with many recommendations.

2. This study builds on work by White et al. 2004.

3. See http://justice.gc.ca/en/const/annex_e.html for a copy of the act. The federal government subsequently enacted the *Indian Act* and has maintained that its statutory authority in education extends only to those individuals defined as "Indians – persons with status – within the terms of the *Indian Act*." Federal responsibility is limited by Section 91(24) and by the Indian Act, Section 4(3), Sections 114 - 122, which further assigns jurisdiction based on residence.

4. A clear example is the issue of native language instruction in schools. Language and culture are thought to play vital roles in the improvement of attainment since the preservation of traditional languages is extremely important for all Aboriginal peoples (King 1993; see also Ledlow 1992; White and Cook 2001). Kaulback (1984) states that students from some cultures may have a different way of processing information than those children who have been raised in mainstream culture. Despite the call for more traditional culture and language in the curriculum by First Nations, there has been a slow institutional uptake. Moreover, there seems to be little research into how this is accomplished and a lack of good data to do any rigorous testing.

5. The higher percentage in this category reflects the large number of training courses offered to Registered Indians through Indian and Northern Affairs Canada programming.

6. It is useful to differentiate between Registered, status, or treaty Indians (those who are registered under the *Indian Act* of Canada) and other Aboriginals. Treaty Indians are persons who are registered under the *Indian Act* of Canada and can prove descent from a band that signed a treaty. The other Aboriginal population includes all of those individuals who report Aboriginal identity but are not Registered Indians. It includes those who identify themselves as Metis, Inuit, or North American Indian and those with multiple Aboriginal or Aboriginal and non-Aboriginal identities.

7. Returns to education can be observed in a number of social outcomes such as income and health as well as community well-being.

8. Educational outcomes are a product of numerous effects at the micro and macro levels of analysis. The best approach to address this methodological issue is to use multilevel models. Multilevel models have been used in modelling educational outcomes to separate out the various levels of influence, for example, school and community effects as well as individual level effects (e.g., Goldstein 1995). Unfortunately, the researchers were unable to secure individual data to match individuals to communities because of confidentiality issues. Nevertheless, this paper is useful as it provides a model of educational outcomes that focuses on community effects as opposed to basic descriptive data. Particularly in the areas of population health, community level variables have gained prominence in the social sciences in recent years.

9. Band school authorities make several important points for not requiring their schools to take existing provincial assessment programs, such as the biases of the measures, unfair comparisons with provincial schools, and the potential loss of autonomy and control over their community's education (Bell 2004).

10. Property laws and band practices tend to favour the male keeping the reserve residence, which can force women to migrate to cities. Thus, although spousal abuse and sexist formal laws and practices are both linked to the sex ratio, these effects cannot be distinguished using this measure alone.

11. We use data from 1996 because the 2001 Department of Indian Affairs and Northern Development program data is not currently available.

12. Approximately 2% of cases had missing data and were deleted from the analysis.

13. Please contact the authors regarding questions related to the derivation of variables.

14. These three variables are analytically and statistically independent. Statistically, we found that the variables do not come close to any known criteria for constituting a scale. The Pearson's correlation coefficient between the three variables are as follows: r (age appropriate rate, graduate rate) = 0.101; r (age appropriate rate, withdrawal rate) = -0.259; r (graduate rate, withdrawal rate) = -0.303).

15. The equation for the age-appropriate measure is provided below:

Age Appropriate Rate = Number of Age appropriate/Total

Total = Age - appropriate + Not Age - appropriate

Age - appropriate = (Age - 7) - grade, which will result in a value < 0

Not age - appropriate = (Age - 7) - grade, which will result in a value >=0.

We used a more generous 7 years instead of the usual 6 years as our age-appropriate base level for grade one to account for the likelihood that students on reserve would not be age-appropriate compared to the rest of the population as a result of a higher rate of absenteeism.

16. See table 1 for the mean values for all variables.

17. "Minimum" refers to the minimum accepted level of educational attainment in general Canadian society. Non-completion of high school is considered an absolute liability to economic involvement. Ontario was the only province

with grade 13 in the dataset, and one might, therefore, expect rates to differ; however, an analysis of the data found no significant difference between Ontario and the rest of the country.

18. INAC uses four zones used to describe isolation, but because of low frequency counts in zones three and four we have combined them.

19. Our decision to group families with three or more children into one category is based on a few important reasons: 1) we feel that issues related to family size do not change at three and over; 2) the proportion of families with four, five, six, etc., children, are very small and the analytic value diminishes with the increasing number of categories. Thus, the low end is more important to capture for the analysis.

20. Measurement error is created by the rounding of data in the Census to protect the privacy of individuals in bands with small populations; however, the implications are trivial for this analysis.

21. The data does not distinguish between occupations on and off reserve. The coefficient ranges from zero to one, as given by the following formula:

$$1 - E(P_i^2)$$

$$P_i = \text{population in occupation } i / \text{total population in all occupations}$$

$$i = 1 \dots 12$$

Note that 'i' is indicative of twelve different occupations: management, administration, clerical, science, health, law, teaching, art, sales, food/ travel, construction/trades, and manufacturing, machine operation and primary industries.

22. The graduate rate (Statistic = 1.446, Std. Deviation = 1.625) and withdrawal rate (Statistic = 1.625, Std. Error = .121) were transformed to reduce skewness, resulting in the square root transformation of the graduate rate (Statistic = .020, Std. Error = .121) and withdrawal rate (Statistic .260, Std. Error = .121).

23. Deriving theoretical explanations for suppression results is questionable unless these findings are replicated (Maassen and Baker 2001). Moreover, it is recommended that any attempts to test for the presence of a suppression effect should be based on a priori assumptions about the theoretical relation between the variables and the role of the suppressor variable (MacKinnon et al. 2000). The idea of suppressor variables and their utility has come under scrutiny by many. Readers are advised to read the discussions on this issue in Wiggins 1973; Cohen and Cohen 1975; Pedhazur 1982; Maassen and Baker 2001.

24. Structural approaches to examining social issues have underscored the effects of social norms on a number of social outcomes (e.g., Durkheim 1979; Kawachi et al. 1997; Rose 1992; White et al. 2005.)

25. The Alberta Aboriginal Apprenticeship Program has been heralded as groundbreaking and extremely successful. The premise of the program is that apprenticeship training is essentially congruent with the core values of Aboriginal culture (Alberta Human Resource Development Council of Canada 2004). Thus, we are not surprised to find a positive effect on educational success.

26. The entire domain of the concept "educational success" is vast. Indicators of educational success are numerous, such as standardized testing, employment rates after graduation, average earnings after graduation, student attitudes/self evaluations, etc., and we are limited in terms of the number of indicators available to use due to the availability of data. Conceptual debates on the content validity of this concept continue (OECD 2007).

27. A recent study by White et al. (2005) confirms the payoffs of using the social capital lens in developing Aboriginal educational programming and policy.

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