

Does Participation in Full-Time Kindergarten Improve Metis Students' School Outcomes? A Longitudinal Population-Based Study from Manitoba, Canada

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Article abstract

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Abstract

As a result of the colonization of Canada, Metis have faced many political and socioeconomic challenges, one of which is the lower educational achievement of Metis students vs other Canadian students. In this study, we examined whether full-time kindergarten (FTK) vs half-time kindergarten (HTK) was associated with improved educational outcomes for Metis students in Manitoba using linked, population-based administrative data from 1998/99-2012/13. The cohort included 271 FTK and 405 HTK Metis students. We used generalized linear models with binomial distribution to calculate predicted probabilities and risk ratios for the outcomes (assessments of numeracy and literacy in Grades 3, 7 and 8; student engagement in Grade 7; high school graduation). However, we observed no significant differences in outcomes between FTK and HTK students, suggesting that FTK is not sufficient to overcome the structural barriers to academic success Metis students may face.

Keywords

Metis, full-time kindergarten, Manitoba, Canada, population-based, propensity score, stepped wedge, academic achievement, assessment

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Globally, many children in Indigenous families face structural barriers, such as individual and/or systemic racism, colonial power imbalances, and attempts at forced assimilation, that negatively impact their health, development, and learning and educational experiences (Elek et al., 2020). Research focused on identifying, understanding, and eliminating these barriers has relevance for many populations worldwide, including in high-income countries like Canada (Elek et al., 2020). The Canadian government recognizes three groups of Indigenous Peoples: First Nations, Inuit, and Metis.

Metis (or Métis in some regions) are descendants of First Nations and European settlers, and have a proud history with a vibrant culture, language, and traditions that are unique to their people (Rupertsland Institute, 2021). Their Traditional Homeland is a vast territory that includes parts or all of present-day Ontario, Manitoba, Saskatchewan, Alberta, British Columbia, and Northwest-Nunavut Territory. Metis were instrumental in the development of western Canada, working as guides, interpreters, fur traders, provisioners, and intermediaries between European settlers and other Indigenous communities. They have also faced many political and socioeconomic challenges as a result of the colonization of Canada and the harms enacted on them by federal and provincial governments. In some cases, the Canadian government caused active harm to Metis families and communities, and, in other cases, they abdicated responsibility for providing appropriate supports or services for Metis citizens. The result has been poor outcomes for Metis across several important areas, including academic achievement (Gunn et al., 2011; Martens et al., 2010; Tait et al., 2013). Studies evaluating the education outcomes of Metis schoolchildren have revealed gaps in achievement between Metis students and other students in Canada (Martens et al., 2010). For example, Metis students in Manitoba are more likely to be held back in school than other Manitoba students (Martens et al., 2010); they are also less likely to pass provincial language arts and mathematics tests, or graduate from high school (Martens et al., 2010). Our Metis partners have recognized these discrepancies in education outcomes and support investigations such as this that focus on evaluating interventions meant to address the differences between groups and achieve equity in education. The purpose of this study is to examine whether Metis students in Manitoba who attended full-time kindergarten (FTK) had better education outcomes than those who attended half-time kindergarten (HTK).

Literature Review

Education Experiences of Metis

Implementing successful initiatives and investments in Metis community requires an understanding of the historical circumstances and experiences of Metis (Mayer et al., 2013). Metis have experienced a long history of removal, displacement, and violence due to Canadian settler colonialism, which has caused immense harm to many generations (Logan, 2015). Starting in the late 1800s, many Metis children were forced to attend day schools or residential schools. This practice was intended to assimilate them into Euro-Canadian society while attempting to eradicate Metis family ties and cultural practices. Students at these day and residential schools were subjected to abusive disciplinary practices, received little to no parental support because they had been forcibly separated from their family, and

were stripped of their language, culture, and heritage (Brave Heart, 2003; Logan, 2006). By tearing families apart, the schools ensured that children were often not able to participate in family ceremonies or celebrate milestones, nor were they taught respect for their parents and Elders, or imbued with the importance of spirituality and education. Additionally, in the first half of the 20th century, many Metis children were entirely excluded from formal education—they were sometimes turned away from day and residential schools for being “too white,” and were often not allowed to attend provincial schools for being “too Indian” (Logan, 2008). As the Canadian government increasingly rejected jurisdiction over education of Metis, the quality of education in day schools declined and school attendance among Metis children became more sporadic.

Involvement of Child Protection Agencies

In the 1950–60s, the residential school system began to be dismantled; the last residential school in Canada was finally closed in 1996. In their place, Child Protection Services became the new agent of assimilation and colonization (Logan, 2015). In the 1960–80s, the federal government initiated the *Adopt Indian-Métis* campaign, which was based on the racist belief that Indigenous families were unable to properly care for their children and that Indigenous culture and ways of life would harm the development of children (Tait et al., 2013). Child Protection Services used poverty, alcoholism, and neglect as reasons to apprehend Indigenous children. They failed to recognize that Metis families were struggling to recover from the multi-generational trauma caused by the day and residential school system, and made little effort to address the etiological reasons for what was interpreted as child maltreatment and neglect (Engel et al., 2012). The forced removal of Metis children and youth from their communities and placement in White settler families, referred to as the “Sixties Scoop,” has been linked to many serious social problems among Metis who were subjected to this injustice, including sexual exploitation, physical and emotional abuse, substance abuse, poverty, high rates of suicide, low educational achievement, and chronic unemployment (Lavell-Harvard & Lavell, 2006; Valiquette, 2019).

Metis and First Nations children continue to be apprehended by Child Protection Services at a disproportionately higher rate than other children in Canada (Logan, 2015), impacting their lives in many harmful ways. In 2015, a report on Aboriginal child welfare presented to the Premiers of Canada stated that “many of the factors that lead to children being placed in child welfare systems are rooted in events that have devastated Aboriginal individuals, families, and communities . . . [including] the structural violence and economic marginalization that perpetuate poverty and social challenges for Aboriginal people” (Carrière & Richardson, 2017, p. 60-61). Tait et al. (2013) reported that compared to other Canadian children in care, Indigenous children have a higher risk of being moved to a different residence multiple times throughout their involvement with Child Protection Services. Consequently, they are more likely to feel unsafe and insecure. Residential mobility also creates instability in their school environment and negatively affects their academic achievement. Many young Canadians exiting or aging out of foster care have lower levels of education, which leads to numerous challenges (Provincial Advocate for Children & Youth, 2012). There is ample evidence of the gap in education outcomes that Metis children in Canada face and the complex factors underlying the inequities between Metis students and other students in Canada. What strategies exist then for addressing these disparities?

Addressing Disparities in Academic Achievement: Starting with Kindergarten

In Canada, early education and kindergarten programs are common, and although there is no strict requirement that children attend kindergarten, most children are enrolled in a kindergarten program in September of the year they turn five (or where junior/senior kindergarten programs are available, in the year they turn four) (Brownell et al., 2015). Kindergarten offers children an introduction to school through intentional play-based and developmentally appropriate learning experiences that foster confidence and capability across all developmental domains. There is typically a strong emphasis on development of skills in literacy and communication, problem-solving, cooperation, and technology use.

Full-Time vs Half-Time Kindergarten. Kindergarten may be offered as a half-day or half-time program (with students attending either half days or 2–3 days each week), or as a full-day or full-time program (5 days of the week) (Brownell et al., 2015). Full-time kindergarten has been touted by governments and school divisions as having positive impacts on the academic, social, and emotional development of young learners (Louis Riel School Division, 2017; Preston et al., 2012). As well, it may have economic benefits for parents (especially in low-income and single parent families), since the cost of child care is reduced and parents may have more employment opportunities when their children are in school full-time. Thus, full-time (vs. half-time) kindergarten may address some of the challenges Metis students and families face. However, the scientific literature on the benefits of full-time vs. half-time kindergarten, especially the longer-term benefits, is mixed. Warburton et al. (2012) found that full-time (vs. half-time) kindergarten students enjoyed benefits that extended through to grade four, including improved reading and numeracy competencies. An Ontario study showed that students who attended full-time kindergarten for one or two years (i.e., junior and senior kindergarten) before starting grade 1 were less likely to be developmentally vulnerable in the domains of language and cognition, social competence, and communication (Government of Ontario et al., 2013). Others have demonstrated that attending full-time kindergarten is associated with improvements in reading, verbal, and mathematics achievements, as well as non-academic outcomes such as social development, but these improvements appeared to dissipate by the end of grade 3 (Cooper et al., 2010; DeCicca, 2007). Brownell et al.'s (2015) findings corroborated these latter findings by showing that full-time kindergarten had limited long-term impacts on academic achievement.

Given the lack of consensus on whether full-time kindergarten makes a difference in addressing disparities in academic achievement, and the dearth of research focusing on Metis outcomes in the context of systemic and historical barriers to education, an investigation of the impact of full-time vs. half-time kindergarten is warranted. Our study aims to address this gap in knowledge regarding the educational outcomes of Metis students. Therefore, in this retrospective cohort study we compared the short- and long-term education outcomes of full-time and half-time Metis kindergarten students in Manitoba, Canada to determine whether full-time kindergarten is associated with improvements in academic achievement for Metis students.

Methods

Study Setting & Approach

This study takes place in the province of Manitoba, Canada, which has a total population of 1.4M; approximately 7.2% of the population is Metis. This is the highest proportion of Metis residents among Canada's 10 provinces. The major urban centre of Manitoba is the capital city of Winnipeg (pop ~800,000), while the rest of the population lives in smaller towns and cities or rural and remote communities. The demographic and educational profiles of Manitoba are similar to national averages, typically making research findings from population studies generalizable to Canada as a whole (O'Grady et al., 2016; Oreopoulos et al., 2008).

The study was led by researchers at the University of Manitoba in partnership with scholars at the Manitoba Metis Federation (MMF), the democratic and self-governing representative body of Metis community in Manitoba that comprises Metis citizens, settlements, and Traditional Metis territories, and is defined by a common identity, culture, and history (Manitoba Metis Federation Inc., 2017). The authors' collective aim is to carry out this research in the spirit of truth and reconciliation and in recognition of the colonial harms enacted on Indigenous Peoples in Canada (United Nations, 2007). Throughout the study, all authors worked to foster an environment of co-learning and mutual respect. Metis perspectives were incorporated into the research process and honoured throughout the study, and we have purposefully aligned our approach with Metis principles of OCAS (Ownership, Control, Access, and Stewardship) (First Nation, Metis and Inuit Health Research Strategic Planning Committee, 2014).

Data Sources

The data for this study came from the Manitoba Population Research Data Repository, which contains a provincial registry of demographic information on all Manitoba residents registered for universal healthcare. For this study, we obtained permission from the MMF to use the Manitoba Metis Registry, a registry of Metis citizens living in Manitoba. The registry was linked to population-wide administrative data from the province's healthcare system, education system, social services, and public health programs. See Appendix Table 1 for a list of databases used in this study. To maintain the privacy of Manitobans, all the data in the Repository are de-identified (personal identifiers like names and addresses are removed), so that no individual can be personally identified in the research. Linkage of databases occurs using a scrambled version of each individual's personal health identification number that appears on each of their records. In this way, the data in the Repository can be used for longitudinal retrospective studies that can provide a broad overview and/or support an in-depth investigation of population health and social research questions. The Repository data have been used for population health research in many previous studies and their validity for this type of work is well established (Jutte et al., 2011; Roos et al., 2019; Roos & Nicol, 1999).

Linking the Manitoba Metis Registry to the Repository was the main method by which we identified Metis individuals in Manitoba for this study; however, we also drew from four other administrative databases containing information on Indigenous identity in which Manitobans had the opportunity to

self-identify as Metis (highlighted in Appendix Table 1). All individuals appearing in the Manitoba Metis Registry as well as those who self-identified as Metis in any of the other databases were included in the study population.

Study Population

As depicted in Figure 1, we created the study population by first identifying all Manitoba students enrolled in kindergarten from school years 1998/99 to 2012/13; this information was derived from provincial education data. The 1998/99 to 2012/13 timeframe was chosen to capture the earliest implementation of full-time kindergarten in Manitoba (1998/99), and to allow the youngest students in the population to reach at least grade 3 (2015/16), which was the earliest grade subsequent to kindergarten for which we could measure education outcomes with the data available at the time of the study. We then used the databases described in the section above to remove any children who were not Metis from the study population. Our study focused on two large urban school divisions in Winnipeg: one that started implementing full-time kindergarten in 1998/99 (school division A), and one that offered half-time kindergarten during the entire study period (school division B). The two school divisions were similar in size and served neighbourhoods with a similar distribution of socioeconomic status. We further narrowed the study population to Metis students enrolled in school division A, and then created a comparison group of students from school division B matched on age (± 2 months), sex, income quintile, and year of kindergarten enrolment.

Exposure and Comparison Groups

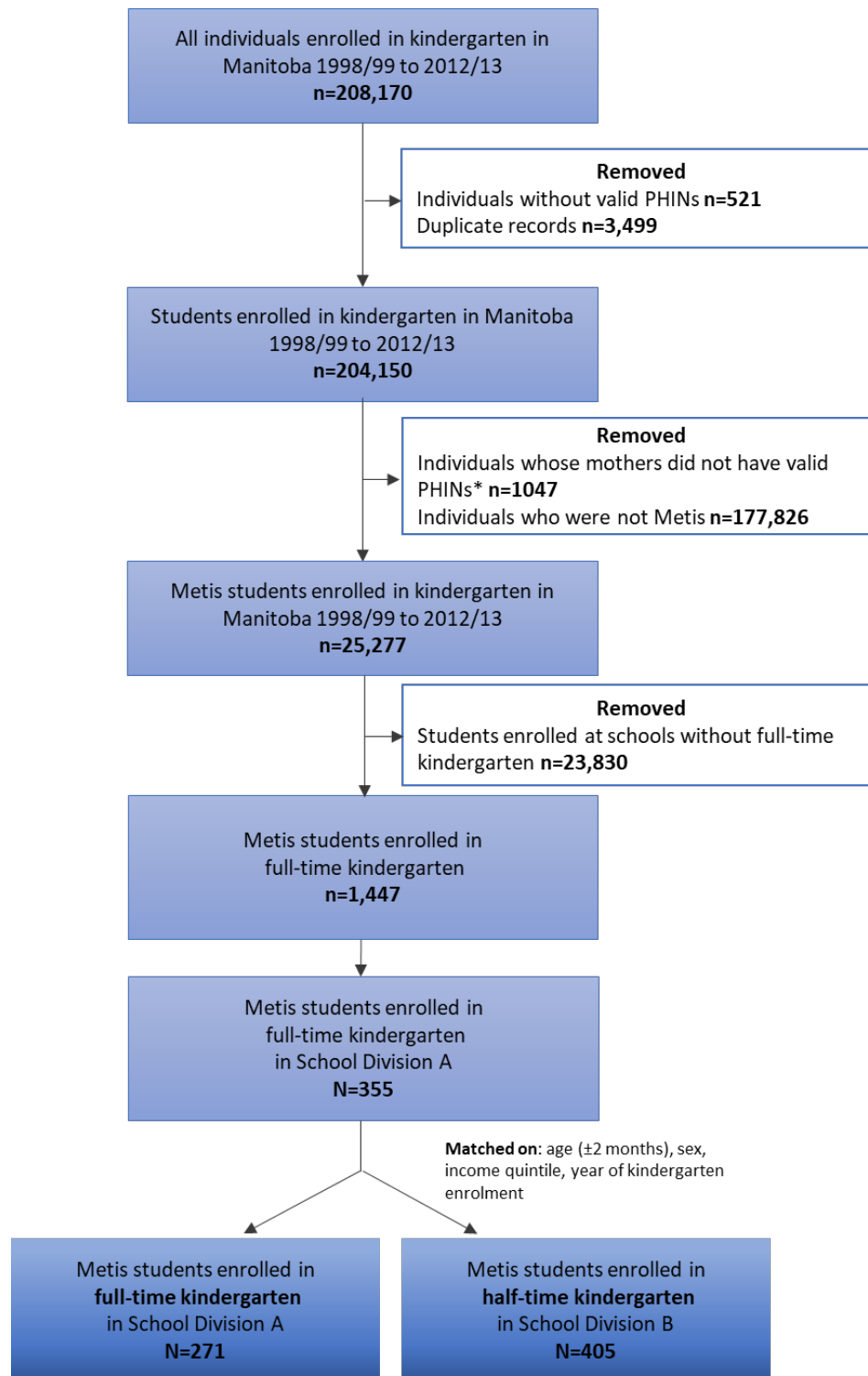
Although kindergarten is not mandatory in Manitoba, it is universally available, and most children enroll at age 5 (Brownell et al., 2015). Starting in September 1998/99, full-time kindergarten was introduced in school division A over the course of several years in a type of intervention known as a stepped-wedge design. In this design, the intervention starts in a staggered fashion, but all individuals or groups (in this case, all schools in the school division) will have received the intervention by the end of the study period (Brown & Lilford, 2006). The number of Metis students enrolled in full-time kindergarten (school division A) and in half-time kindergarten (school division B) over the course of the study period are shown in Table 1.

Table 1. Distribution of Metis Students Enrolled in Full-Time and Half-Time Kindergarten—Full-time Kindergarten Implemented Gradually During the Study Period (1998/99-2012/13)

Year in kindergarten	Schools with FTK in School Division A*	Metis students in FTK (School Division A)	Metis students in HTK (School Division B)
1998/99	1	7	11
1999/00	2	9	12
2000/01	2	16	24
2001/02	2	8	14
2002/03	4	13	20
2003/04	5	19	29
2004/05	5	25	34
2005/06	4	15	22
2006/07	5	26	37
2007/08	5	20	29
2008/09	5	18	33
2009/10	4	19	30
2010/11	5	24	33
2011/12	5	22	36
2012/13	5	30	41
Total		271	405

*These counts are limited to schools in which Metis students were enrolled in any particular year.

FTK: full-time kindergarten; HTK: half-time kindergarten



*Children were considered Metis if their mother was included in the Manitoba Metis Registry or had identified herself as Metis in another database – thus, we needed a valid PHIN for the mothers in the Repository.

Figure 1. Study Population

Using Propensity Scores to Adjust for Measurable Confounders

We adjusted for differences in the family and socio-demographic characteristics of students in school division A and B using propensity scores with inverse probability of treatment weights (IPTWs). This method adjusts for measurable confounders that are likely to influence participation in the intervention and/or the study outcomes (Rosenbaum, 2010). By first balancing these characteristics between study groups, we were then able to make fair comparisons between them. Propensity score weighting with IPTWs has the advantage over propensity score matching techniques of allowing us to retain all of the Metis students in the study population for the analysis (whereas matching might require us to exclude some individuals if an appropriate match cannot be found). Using logistic regression, propensity scores were calculated for each individual in the study population. We then assessed whether or not measurable confounders were balanced between the study groups using standardized differences with an *a priori* cut-off of 10% (Figure 2).

Main Outcomes

We examined the following education outcomes: reading and numeracy assessments in grade 3, mathematics and student engagement assessments in grade 7, reading/writing assessments in grade 8, grade 9 enrolment, standard test results for language arts and mathematics in grade 12, and high school graduation. In Manitoba, assessments in grades 3–8 are administered by teachers early in the school year to assess the students' strengths and needs in order to plan student learning. The teachers determine whether students are meeting expectations, approaching expectations, or not meeting expectations in a number of competencies and skills for their grade (see Appendix Table 2 for more details); teachers participate in professional development sessions to learn how to administer the assessments. The results for each student are entered into a provincial database and then transferred to the Manitoba Population Research Data Repository. For the outcomes in grades 3–8, we examined how many students were “meeting expectations” on competencies in the various assessments. The standards test results were examined as either continuous outcomes (scores out of 100) or binary outcomes (passed/did not pass), and Grade 9 enrolment and high school graduation were treated as binary (yes/no) outcomes.

Statistical Analysis

We used generalized linear models with binomial distribution to calculate the predicted probabilities of the outcome variables. The identity link function was used to calculate risk differences and the log link function was used to calculate risk ratios for full-time and half-time kindergarten students with an *a priori* significance level was $p < 0.05$. All analyses were conducted in SAS Version 9.4.

Ethics

The study was conducted in accordance with guidelines for ethical conduct of research at the University of Manitoba and the MMF. The study proposal was reviewed and approved by the University of Manitoba Health Research Ethics Board (HREB HS20783 – H2017:155) and the MMF committee that oversees the Manitoba Metis Community Research and Ethics Protocol. The Manitoba Government's Health Information Privacy Committee (HIPC #2017/2018–51) also reviewed the proposal and gave

approval for the study on the basis that there was very low risk of any individual being personally identified.

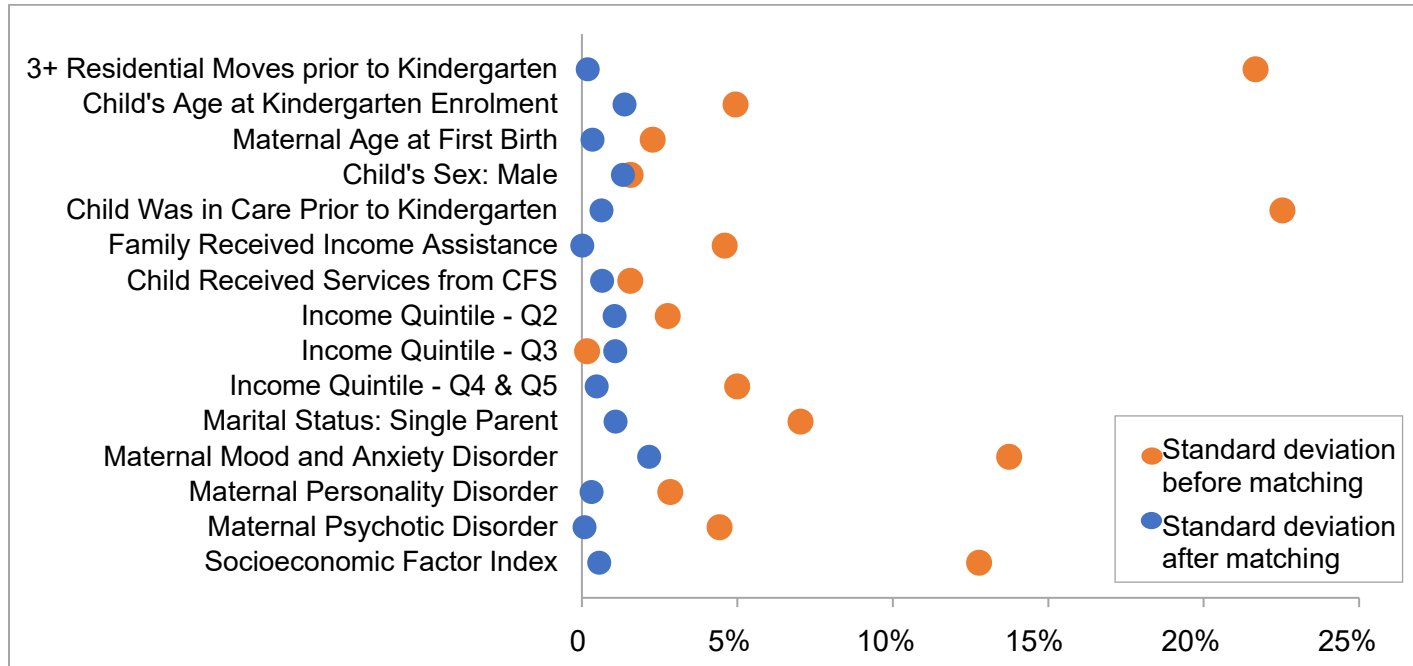


Figure 2. Standardized Differences in Family and Socio-Demographic Characteristics Before and After Propensity Score Weighting Metis Students in Full-time and Half-time Kindergarten

Results

Study Population

The total study population comprised 271 Metis students who attended full-time kindergarten and 405 Metis students who attended half-time kindergarten from 1998/99-2012/13. Presented in Table 1 is the distribution of the two study groups by kindergarten year, including the number of schools in school division A that offered full-time kindergarten each year of the study. Table 2 presents the number of students we examined for each outcome (by grade). After following each kindergarten cohort forward in time, each outcome had a slightly different study population size, either because of students moving to different school divisions or out of province, or because the youngest students in the study could not be assessed for later outcomes before the study period ended.

Table 2. Kindergarten Cohort Size by School Grade—Metis Students Enrolled in Full-time and Half-time Kindergarten

Year in Kindergarten	Grade 3		Grade 7		Grade 8		Grade 9		Grade 12	
	FTK	HTK	FTK	HTK	FTK	HTK	FTK	HTK	FTK	HTK
1998/99							7	11	7	11
1999/00							8	12	8	12
2000/01					s	s	15	22	15	22
2001/02			s	0	6	12	8	13	8	13
2002/03			13	17	13	17	13	18	13	18
2003/04			17	26	16	27	17	26	17	26
2004/05			24	31	25	32	24	33	24	33
2005/06			13	18	13	19	13	19	13	19
2006/07	25	34	25	32	25	35	25	35	24	34
2007/08	18	28	19	26	17	27	18	27		
2008/09	18	30	16	30	17	30	18	28		
2009/10	19	29	19	26	18	24	19	26		
2010/11	24	30	23	26	24	25				
2011/12	19	31	19	32						
2012/13	28	40	s	0						
Total	151	222	188	264	174	248	185	270	129	188

FTK: full-time kindergarten; HTK: half-time kindergarten; s: data suppressed due to small numbers.

The study population's characteristics are presented in Table 3 with significant differences between groups shown in bold. The proportion of male and female students was similar in each grade, as was the distribution of students across kindergarten years. Most students in the study population lived in lower income neighbourhoods, and the distribution of students by income quintile was similar in each study group. More than half the students in each grade came from families who had been on income assistance at least once, and their families' average socioeconomic factor index (SEFI-2) scores, which reflect social determinants of health like income, education, and marital status, ranged from 0.32 to 0.50. SEFI-2 scores range from -5 to +5 and a value of zero represents the Manitoba average; scores greater than zero indicate less favourable socioeconomic conditions. Close to half of all students in the study had a mother who had been diagnosed with a mood/anxiety disorder, and between 55–70% of students were being raised by a single mother. Before starting kindergarten, 16–26% of students had moved residences twice or more and up to 20% had spent at least one day in care of Child Protection Services.

Table 3. Study Population Characteristics by School Grade—Metis students in Full-Time and Half-Time Kindergarten

Variables		Grade 3			Grade 7			Grade 8			Grade 9			Grade 12		
		FTK	HTK		FTK	HTK		FTK	HTK		FTK	HTK		FTK	HTK	
		N (%)	N (%)	P	N (%)	N (%)	P	N (%)	N (%)	P	N (%)	N (%)	P	N (%)	N (%)	P
Sex	Female	72 (47.7)	106 (47.7)	0.990	84 (43.7)	117 (44.3)	0.904	82 (46.6)	114 (45.8)	0.869	86 (46.5)	129 (47.8)	0.786	58 (45.0)	91 (48.4)	0.546
	Male	79 (52.3)	116 (52.3)	0.990	108 (56.3)	147 (55.7)	0.904	94 (53.4)	135 (54.2)	0.869	99 (53.5)	141 (52.2)	0.786	71 (55.0)	97 (51.6)	0.546
Income quintile	Q1	61 (40.4)	78 (35.1)	0.304	71 (37.0)	77 (29.2)	0.080	62 (35.2)	75 (30.1)	0.270	64 (34.6)	89 (33.0)	0.718	42 (32.6)	58 (30.9)	0.749
	Q2	38 (25.2)	54 (24.3)	0.854	49 (25.5)	67 (25.4)	0.973	46 (26.1)	64 (25.7)	0.920	56 (30.3)	79 (29.3)	0.817	45 (34.9)	63 (33.5)	0.800
	Q3	28 (18.5)	42 (18.9)	0.927	39 (20.3)	59 (22.3)	0.599	34 (19.3)	50 (20.1)	0.846	33 (17.8)	50 (18.5)	0.853	23 (17.8)	34 (18.1)	0.954
	Q4	15 (9.9)	29 (13.1)	0.346	23 (12.0)	47 (17.8)	0.080	22 (12.5)	45 (18.1)	0.110	32 (17.3)	52 (19.3)	0.593	13 (10.1)	27 (14.4)	0.245
	Q5	6 (4.0)	10 (4.5)	0.802	8 (4.2)	7 (2.7)	0.386	9 (5.1)	7 (2.8)	0.241	0	0	n/a	6 (4.7)	s	0.139
Maternal mental health disorder	Mood/anxiety	98 (64.9)	115 (51.8)	0.011	111 (57.8)	137 (51.9)	0.209	103 (58.5)	129 (51.8)	0.169	106 (57.3)	133 (49.3)	0.090	70 (54.3)	91 (48.4)	0.304
	Personality	s	s	0.861	s	s	0.656	s	s	0.629	s	s	0.600	s	s	0.795
	Psychosis	s	s	0.711	s	s	0.970	s	s	0.948	s	s	0.712	s	s	0.400
Single mother		103 (68.2)	156 (70.3)	0.673	121 (63.0)	173 (65.5)	0.581	105 (59.7)	156 (62.7)	0.533	108 (58.4)	166 (61.5)	0.507	71 (55.0)	116 (61.7)	0.237
At least two residential moves before kindergarten		26 (17.2)	59 (26.6)	0.028	32 (16.7)	69 (26.1)	0.013	31 (17.6)	65 (26.1)	0.034	36 (19.5)	69 (25.6)	0.122	25 (19.4)	46 (24.5)	0.277
Child has been in care of child protection services		16 (10.6)	44 (19.8)	0.012	19 (9.9)	38 (14.4)	0.141	18 (10.2)	34 (13.7)	0.277	15 (8.1)	30 (11.1)	0.279	9 (7.0)	18 (9.6)	0.403
Family has received services from child protection services		55 (36.4)	83 (37.4)	0.850	70 (36.5)	90 (34.1)	0.602	63 (35.8)	88 (35.3)	0.923	67 (36.2)	93 (34.4)	0.698	48 (37.2)	61 (32.4)	0.383

Variables		Grade 3			Grade 7			Grade 8			Grade 9			Grade 12		
		FTK	HTK		FTK	HTK		FTK	HTK		FTK	HTK		FTK	HTK	
		N (%)	N (%)	P	N (%)	N (%)	P	N (%)	N (%)	P	N (%)	N (%)	P	N (%)	N (%)	P
Family has received income assistance		97 (64.2)	129 (58.1)	0.231	115 (59.9)	145 (54.9)	0.288	101 (57.4)	140 (56.2)	0.812	111 (60.0)	150 (55.6)	0.345	75 (58.1)	109 (58.0)	0.977
Child's age at kindergarten enrolment (months)	N	151	222		192	264		176	249		185	270		129	188	
	Mean	61.5	61.5		61.9	61.7		62.0	61.7		61.9	61.6		62.2	61.7	
	Std Dev	3.216	3.111		3.265	2.979		3.198	2.991		3.209	3.017		3.234	3.071	
	Min-Max	55-68	56-68		55-68	56-68		55-68	56-58		55-68	56-68		56-68	56-68	
Mother's age at first birth (years)	N	151	221		191	264		175	249		185	270		129	188	
	Mean	21.6	21.6		21.6	22.0		21.7	21.9		21.5	21.7		21.6	21.5	
	Std Dev	4.431	5.056		4.656	5.250		4.835	5.140		4.722	4.911		4.942	4.687	
	Min-Max	15-39	13-39		14-39	13-45		14-40	13-45		14-40	14-45		14-40	14-45	
Socioeconomic factor index (SEFI-2)	N	151	222		192	263		175	247		184	268		128	186	
	Mean	0.35	0.42		0.34	0.36		0.32	0.39		0.36	0.44		0.42	0.50	
	Std Dev	0.727	0.795		0.692	0.777		0.692	0.817		0.729	0.822		0.675	0.801	
	Min-Max	-1.6-2.4	-1.1-2.4		-1.2-2.4	-1.1-2.4		-1.2-1.9	-1.1-2.9		-1.2-2.5	-1.1-2.9		-1.2-2.5	-1.0-2.9	
Number of years of follow-up data after kindergarten	N	151	222		192	264		176	249		185	270		129	188	
	Mean	3.05	3.07		7.03	7.07		7.94	8.05		9.1	9.1		12.0	12.0	
	Std Dev	0.148	0.077		0.585	0.183		0.908	0.367		1.087	0.807		1.347	1.040	
	Min-Max	1.6-3.1	2.9-4.1		1.6-9.0	5.5-8.1		1.2-9.1	4.4-9.1		1.2-13.1	4.1-12.1		1.6-14.6	8.3-14.1	

FTK: full-time kindergarten; HTK: half-time kindergarten. Significant differences between FTK and HTK students are denoted with bold p-values ($p < 0.05$) calculated using a Generalized Linear Model

Figure 2 shows the standardized differences between study group characteristics before and after applying the IPTWs. Before applying the weights, measurable confounders differed by as much as 20% between the two groups (orange markers), but after adjusting, the standardized differences were reduced to 2% or less (blue markers). For example, the half-time kindergarten students were 22.5% more likely to have been in care of child protective services for at least one day before enrolling in kindergarten than the full-time kindergarten students. After we applied the IPTWs, this difference was only 0.6%.

Education Outcomes

In Figure 3, the outcomes of the study are presented as risk ratios and proportions. From the Forest plot (3a), it is evident that none of the nine outcomes we measured from grade 3–12 were significantly different between Metis students who attended full-time kindergarten vs. half-time kindergarten, since the 95% confidence intervals for all of the risk ratios overlap 1.0. We also examined the proportions of Metis students who achieved each outcome (3b), i.e. the proportion that ‘met expectations’ in Grade 3-8 assessments for all competencies, enrolled in grade 9, passed grade 12 standards tests in language arts and math, and graduated from high school. Although the findings presented in 3b largely reiterate the findings in 3a, they also provide a more detailed look at how many Metis students achieve academic benchmarks throughout their years in school and thus form a basis for comparison with Manitoba averages, as discussed below.

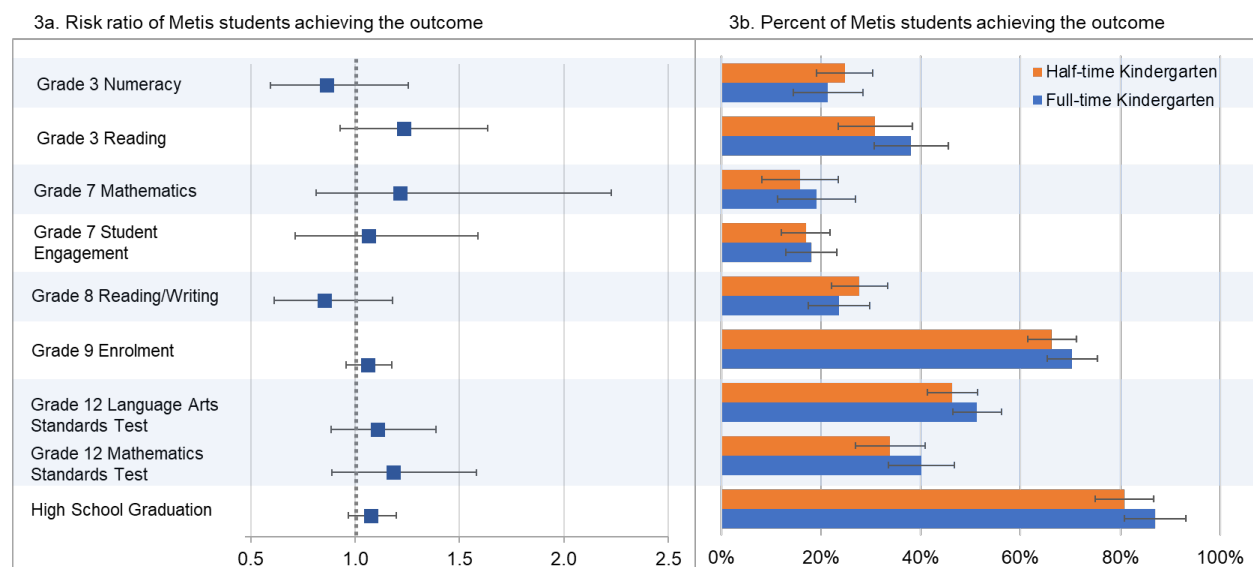


Figure 3. Education Outcomes Among Metis Students Who Attended Full-Time vs Half-Time Kindergarten Risk Ratios and Proportions with 95% Confidence Intervals

Discussion

This study adds to the small but growing literature focused on the well-being of Metis people in Canada. Drawing on the linkable and cross-sectoral population-based data repository in Manitoba, it contributes to our knowledge of what interventions are and are not effective in supporting Metis education. We observed no significant difference in any of the education outcomes we measured from grade 3–12 between Metis students in Manitoba who attended half-time kindergarten vs. those who attended full-time kindergarten. Thus, the findings suggest that full-time kindergarten does not overcome the challenges experienced by Metis students as they advance from kindergarten through elementary school, middle, and high school.

There is active debate in the literature over the value of investment in full-time kindergarten and whether it results in improved educational outcomes. The results of our study are in agreement with others that found limited significant long-term benefits (Brownell et al., 2015; Cooper et al., 2010; DeCicca, 2007; Leow & Wen, 2017; Youmans et al., 2018). Although some studies observed a positive association between preschool programs and long-term outcomes, such as high school completion, Brownell et al. (2015) cautioned against generalizing the results of preschool programs to full-time kindergarten, and along with others, recommend future evaluations focus specifically on the long-term outcomes of full-time kindergarten (Heckman et al., 2013; Yoshikawa et al., 2013). Our findings illustrate that the proportion of Metis students meeting expectations on numeracy and mathematics, reading, writing, and language arts assessments remains low as they move through school. Compared to the average assessment results from the English school programs across Manitoba, Metis students tended to perform at a lower level. For example, the average percentages of Manitoba students meeting expectations in grade 3 reading during the study years were 42–44% (Government of Manitoba, 2019b); for Metis students, it was 30–38%. The average proportion of Manitoba students who passed their provincial language arts test in grade 12 was 65–67% (Government of Manitoba, 2019a); among Metis students, it was 46–51%. Although we did not conduct statistical testing to determine whether the gap between Metis students and the Manitoba average was significant, this pattern, which was evident for all of the education outcomes we measured (except for high school graduation) is cause for concern. The findings for high school graduation appear more encouraging, since a similar proportion of Metis students in our study completed high school (87% in full-time kindergarten and 81% in half-time kindergarten) as the Manitoba average (81%) (Government of Manitoba, 2019c). However, there is a data caveat for graduation that is important to consider: When calculating graduation rates, the Manitoba government includes in the denominator only students who previously enrolled in grade 9, whereas our method includes all individuals in Manitoba who would be expected to graduate that year (based on age). This has the effect of making the government-reported graduation rates artificially high, whereas our method better reflects the actual percentage of young people graduating in any particular year or cohort. It is encouraging that graduation rates for Metis students in Manitoba are as high as they are. But given the persistent education gaps Metis students face throughout their school years, the question of whether graduating Metis students are sufficiently prepared for post-secondary education remains. Data from the 2012 Aboriginal Peoples Survey and the 2011 National Household Survey showed that in Canada, the percentage of people aged 18–44 who had completed requirements for a high school diploma or equivalent were 77% for the Metis population and 89% for the non-Indigenous

population, and the percentage of people aged 18–44 with postsecondary credentials was 47% for the Metis population and 64% for the non-Indigenous population (Bougie et al., 2013). Taken together, the study findings demonstrate that full-time kindergarten does not provide Metis students with a big enough boost to overcome the education gaps they face in their early years. But despite these challenges, Metis students show remarkable strength and resilience, and many are still able to complete high school.

Aside from full-time kindergarten, what other interventions might better support the academic achievement of Metis students? We argue there is a need to look upstream to influence social and structural determinants that would give Metis children a “leg up” at school entry and ensure their continued engagement in learning as they advance through school. A 2010 report produced for the Canadian Child Care Federation discusses strategies for improving literacy development in Indigenous children (Ball, 2010), emphasizing the need to recognize the immense diversity amongst First Nations, Metis, and Inuit children and families and acknowledging there is no single approach that will be effective or culturally relevant for all groups. Many educational programs in Canada designed with content for Indigenous students do not include a specific focus on Metis culture, language, history, and context (Ball, 2010; Bear Spirit Consulting, 2007; Preston et al., 2012). A report by Pascal (2009b) recommended that the implementation of full-day learning for 4- and 5-year-old children (and all subsequent grades) must recognize and account for Indigenous communities' unique concerns and priorities, including teaching students in an age-appropriate way about the continuing impacts of harmful colonial policies such as the residential school system. Mayer et al. (2013) reported that with every additional level of educational attainment Metis students achieve, the gap in rates of unemployment between Metis and others narrows, which they say “is clear evidence to suggest that policy makers should be supporting Metis students in all levels of educational attainment” (p. 24). Starting in 2018, the Government of Canada committed \$1.7 billion to be delivered over 10 years with the aim of strengthening Early Learning and Child Care (ELCC) programs and services for Indigenous children and families; up to \$450.7 million will go toward supporting ELCC for Metis children and families in the Metis Homeland, including to the MMF (Government of Canada, 2019). The main goal of the Metis Nation ELCC Framework supported by this funding is “to create and enhance early learning programs and supports for Métis children and their families, that are anchored in Métis culture and responsive to the unique needs of Métis children and families” (Government of Canada, 2019). These strategies are specifically meant to engage and empower Metis students to succeed academically.

Areas for Further Research

Although this study found no significant effects on educational outcomes when comparing full-time kindergarten to half-time kindergarten for Metis students in Manitoba, there are several potential benefits of full-time kindergarten outside of educational outcomes. A common argument supporting full-time kindergarten is a simplified arrangement for child-care for working parents, and studies looking at the low-cost, universal Quebec child-care system have shown benefits in the area of employment and earnings for women (Brownell et al., 2015; Ryan & Date, 2014). In addition, a study conducted by Dhuey et al. (2020) examining parental labour supply effects of half-day vs. full-day kindergarten in French schools in Ontario found effects on hours of work and employment for single mothers that were statistically significant. There has also been discussion of potential stress reduction for parents when

children are enrolled in full-time kindergarten, as they do not have to find arrangements for child care for half days as they would if their child was in a half-time kindergarten program (Brownell et al., 2015). Full-time kindergarten may not solve this problem for all families, however, as the hours of full-time kindergarten do not always align with parents' working hours (Baker et al., 2012; Brownell et al., 2015; Lefebvre & Merrigan, 2008; Pasolli, 2015; Roulston, 2012). Other potential benefits of full-time kindergarten include increased continuity with other full-day child experiences and future school schedules and a reduced number of daily transitions for children (Pascal, 2009a). Implementation of full-time kindergarten programs may also have drawbacks for some families. For example, the potential resulting loss of revenue for child-care programs may lead to fewer openings for the type of part-time spaces needed for children in full-time kindergarten (Brownell et al., 2015; Manitoba Childcare Association, 2011). Further studies on these potential benefits and drawbacks could provide more insight into the impact of full-time kindergarten in areas outside of educational outcomes.

Strengths and Limitations

Our study utilizes a distinctions-based approach, focusing on Metis children specifically rather than taking a pan-Indigenous view. This approach is one of the principles recognized by the Government of Canada for a respectful relationship with Indigenous Peoples, and it is the approach that our Metis partners recommended. Another notable strength is the use of individually linked, longitudinal, population-based administrative data for looking at educational outcomes in elementary, middle, and high-school. The data are anonymized, bypassing the need for individual consent and helping to avoid participation bias. The nature of the Repository also permitted the linkage of administrative data to the Manitoba Metis Registry, allowing a focus on Metis students in Manitoba to add to the small but growing body of literature on Metis education.

The main limitations of this study are due to the use of administrative data. One limitation is that the sample size for an observational study of this design may not be sufficient to detect subtle changes in outcomes between groups; the point estimates are modest with relatively large confidence intervals. Another limitation is that the grade 3, 7, and 8 teacher-administered assessments could be subject to racial or other biases—previous research points to ethnic and cultural bias in teacher ratings of student behaviour and in teacher expectations of students (Arbuthnot, 2011; Mason et al., 2014; McKown & Weinstein, 2008; van den Bergh et al., 2010). The assessments are also relatively broad measures that do not provide detailed information on student knowledge in all years or subjects, nor do they provide direction for Metis-specific learning objectives or priorities. Finally, we would have liked to examine other outcomes if the data required to do so had been available in the Repository; for example, it would have been interesting to examine full-time kindergarten students' social and emotional development, the relationship between parental working patterns and availability of full-time kindergarten, and the students' involvement in other (cultural or recreational) activities when they were not in class.

Conclusions and Policy Implications

This study found no significant differences in educational outcomes in Grades 3, 7, 8, 9, and 12 between Metis students who attended full-time kindergarten compared to those who attended half-time kindergarten. There was also no significant difference between the groups in high school graduation

rates. Taken together with evidence that an educational gap persists between Metis and other students throughout most school years until grade 12 graduation, these results suggest the need for more targeted educational programming for Metis students in Manitoba, as well as a need to more broadly address the underlying factors affecting the educational outcomes of Metis students.

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Appendix Table 1. Databases Used in this Study

Databases used to identify and describe individuals in the study population

Database	Description
Manitoba Health Insurance Registry	Demographic information on Manitoba residents registered for universal healthcare
Canada Census	Small geographical area-level data from the Canada Census, used to create the Socioeconomic Factor Index 2 (SEFI 2), an index of socioeconomic status*
Manitoba Metis Registry**	An official record of persons registered as Metis citizens in Manitoba.
Families First Universal Newborn Screen Data**	Information on biological, social, and demographic factors of Manitoba families, including parents' ethnic identity, history of alcohol and drug use, mental health disorders, and education.
Healthy Baby Prenatal Benefit Data**	Information on biological, social, and demographic factors of Manitoba families, including income, marital status, and benefits received.
Early Development Instrument**	The Early Development Instrument assesses children's developmental vulnerability across five domains through a kindergarten teacher-administered questionnaire.
Employment and Income Assistance Data**	Demographic information on Manitoba residents who receive financial or social assistance.

Databases Used in this Study ctd.

Database	Description
Education Data – Enrolment, Marks and Assessments	Education data maintained by Manitoba Education that provides information on enrolment, courses, marks, standard tests, assessments, graduation status and demographics for Manitoba students from kindergarten to grade 12. Students from public and private schools, as well as those that are home schooled, are included.
Pathways to Health and Social (PATHS) Equity Data	This research program aims to create a population-based capacity for understanding what works to reduce inequity in outcomes for children.
Medical Claims Data	Provider claims for services (e.g., physician visits, fee-for-service components for tests) submitted to the Government of Manitoba for payment, or as "shadow billing" that provides a record of the visit.
<i>Databases used to examine outcomes</i>	
Education Data – Enrolment, Marks and Assessments	Education data maintained by Manitoba Education that provides information on enrolment, courses, marks, standard tests, assessments, graduation status and demographics for Manitoba students from kindergarten to grade 12. Students from public and private schools, as well as those that are home schooled, are included.

*Reference 7.

**Databases used to identify Metis individuals.

Appendix Table 2. Detailed Description of Educational Outcomes

Outcome	Description
<p>Grade 3 Numeracy</p> <p>Meets expectations</p> <p>Approaching expectations</p> <p>Requires ongoing help</p>	<p>For Grade 3 numeracy, a student is scored on 4 competencies:</p> <ul style="list-style-type: none"> i) predicts an element in a repeating pattern; ii) understands that the equal symbol represents an equality of terms on either side; iii) understands that a given whole number may be represented in a variety of ways (up to 100); iv) uses mental math strategies to determine answers to addition and subtraction questions (up to 18).
<p>Grade 3 Reading</p> <p>Meets expectations</p> <p>Approaching expectations</p> <p>Requires ongoing help</p>	<p>For Grade 3 reading, a student is scored on 3 competencies:</p> <ul style="list-style-type: none"> i) reflects on and sets reading goals; ii) uses strategies during reading to make sense of texts; iii) demonstrates comprehension.
<p>Grade 7 Student Engagement</p> <p>Established</p> <p>Emerging</p> <p>Developing</p> <p>Inconsistent</p>	<p>For Grade 7 student engagement, a student is scored on 5 competencies:</p> <ul style="list-style-type: none"> i) demonstrates an interest in learning; ii) engages in self-assessment; iii) is aware of learning goals in a unit of study and/or personal learning goals; iv) participates in lessons; v) accepts responsibility for assignments.

Detailed Description of Educational Outcomes ctd.

Outcome	Description
<p>Grade 7 Mathematics</p> <p>Meets expectations</p> <p>Approaching expectations</p> <p>Not meeting expectations</p>	<p>For Grade 7 mathematics, a student is scored on 6 competencies:</p> <ul style="list-style-type: none"> i) develops mental images to represent numbers and compare them; ii) makes sense of the relationships between numbers and the structure of the number system; iii) understands that a given number may be represented in a variety of ways; iv) represents, recognizes, constructs and extends number patterns; v) models patterns on graphs; vi) writes an algebraic equation for number patterns to solve problems.
<p>Grade 7/8 Reading & Writing</p> <p>Meets expectations</p> <p>Approaching expectations</p> <p>Not meeting expectations</p>	<p>For Grade 7/8 reading and writing, a student is scored on 6 competencies:</p> <ul style="list-style-type: none"> i) understands key ideas and messages in a variety of texts; ii) can interpret a variety of texts; iii) can respond critically to a variety of texts; iv) generates, selects and organizes ideas to support a reader's understanding; v) chooses language to make an impact on the reader; vi) uses conventions and resources to edit and proofread to make meaning clearer.

Detailed Description of Educational Outcomes ctd.

Outcome	Description
Grade 9 Enrolment	Enrolment in the required number of courses for Grade 9
Grade 12 Language Arts & Mathematics Tests	These are provincial exams that Grade 12 students are required to write; they are curriculum-based and account for 30% of the students' final course mark. In the Repository, the outcome of the test are percentages (1-100%). A score of 50% or higher constitutes a “pass”, and a score of 0-49.9% constitutes a “fail”.
High School Graduation	Completed high school within two years of expected graduation year, based on birth year