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Graduation of High School Students in British Columbia from 2010/2011 to 2018/2019: A Focus on Special Needs Status

by Allison Leanage and Rubab Arim

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Abstract

Using British Columbia Ministry of Education administrative school data within the Education and Labour Market Longitudinal Platform, this study compared the proportions of high school graduates among Grade 12 students with and without special needs across nine cohorts from 2010/2011 to 2018/2019 before and after controlling for several sociodemographic characteristics. Two major strengths of this study were the use of longitudinal administrative education data integrated with income tax data from the T1 Family File and the further disaggregation of the special education needs categorization. Students with special needs in all different categories (excluding those with gifted status) were less likely to have graduated across all nine cohorts compared with students without special needs, even after controlling for sociodemographic characteristics and academic achievement, suggesting that students with special needs may face other types of barriers in completing high school. Yet there was diversity among students with special needs, with the highest proportions of graduation among students with learning disabilities or those with sensory needs and the lowest among students with intellectual disabilities. A larger share of females than males graduated high school among students without special needs. However, sex differences were less consistent among students with special needs status (including students with gifted status). As expected, the proportions of graduation were significantly higher at age 19 compared with at age 18 or younger, with the differences being slightly higher among students with special needs (excluding those with gifted status; 5 to 10 percentage points) compared with those without special needs (3 to 7 percentage points). The largest age differences were observed among students with autism spectrum disorder, behavioural needs or mental illness, and those with physical needs across all nine cohorts.

1 Introduction

For many young people in Canada, the completion of high school marks the end of a structured era of compulsory, freely provided education and a shift to adulthood with less structured and optional education. Researchers have highlighted that high school graduation is a means for quantifying a successful transition to adulthood, where life-altering decisions become more imminent and impactful for an individual's quality of life (Hogan and Astone 1986; Shanahan 2000; Kennedy et al. 2004). However, the achievement of high school graduation varied greatly among youth, given individual, familial and other contextual factors (Fussell and Furstenberg 2005).

A recent publication by Elez and Zeman (2022) showed that Canada had higher high school graduation rates than the Organisation for Economic Co-operation and Development average in 2019. Furthermore, young women (87%) were more likely to complete high school on time than young men (81%), and a similar pattern was shown for extended-time graduation.[1] Although Elez and Zeman (2022) demonstrated that high school graduation increased over the years in Canada, relatively less is known for youth with special needs. Their completion of high school and a successful transition to adulthood may be especially challenging because of various difficulties or barriers they may face in their daily lives. Only in recent decades have researchers begun to focus on the successful transitions of youth with special needs (Arim and Frenette 2019; Stewart et al. 2013). Most recently, Berrigan, Scott and Zwicker (2020) found that people with developmental disabilities (DDs) were less likely to graduate from high school, complete postsecondary education, and participate in the labour force or be employed when compared with people without DDs. Furthermore, they showed that while 40% of people with DDs did not complete high school, the figure was lower, at about 18%, for people with autism spectrum disorder (ASD), a specific type of DD, compared with 10% for people without disabilities. Their study highlighted not only differences in high school graduation between people with and without disabilities but also differences among people with DDs. Overall, the researchers indicated that substantial disparities existed between people with and without disabilities.

As a signatory to the United Nations Convention on the Rights of Persons with Disabilities in 2007, Canada recognizes that every child has the right to education and that inclusive education is a fundamental human right for children with disabilities (Article 24 - Education). Although multiple pieces of legislation protect the right to education for all children, inclusive education varies widely across Canadian provinces and territories because of differences in educational policies across jurisdictions (Kohen et al. 2006). In the last few decades, Canada has certainly moved toward more inclusive education; however, challenges remain in terms of increasing the access, participation and inclusion of students with special needs in secondary school (Coster et al. 2013). The present study aimed to shed light on inclusive education in the province of British Columbia by comparing how students with and without special needs progressed through the kindergarten to Grade 12 (K–12) education system from 1999 to 2019.

In British Columbia, a K–12 funding policy has been in effect since March 1, 2002, which recognizes that students with special needs might require additional support and accommodations. This K–12 funding policy aims to encourage an inclusive education system by allowing students with special needs to participate fully as members of a community of learners. According to this policy, there is a basic allocation where a standard amount of money is provided per school-age student enrolled in a school district. This standard amount of money includes funding to help meet the learning needs of students who may be identified as gifted students or as having a learning disability or mild learning disability, requiring moderate behavioural support. Additional supplemental funding acknowledges the added cost of providing programs for students with special needs who have physical or sensory needs, a moderate to profound intellectual disability, ASD, intensive behavioural intervention needs, or serious mental illness. Overall, this

1. The extended-time high school graduation rate represented the percentage of a cohort of young people who completed their high school studies within five years of starting Grade 10 ("Secondary 3" in Quebec) (Elez and Zeman 2022).

policy aims to provide an inclusive education system where students with special needs are enabled to fully participate in education. More recently, British Columbia's special education policy stated, "All students should have equitable access to learning, opportunities for achievement, and the pursuit of excellence in all aspects of their educational programs" (British Columbia Ministry of Education 2016).

2 Previous research

Despite the progress, a study by BC Stats (2009) using data from the 2006 Participation and Activity Limitation Survey (PALS) illustrated that a higher proportion of people with disabilities in British Columbia did not graduate from high school compared with those without disabilities (23.4% vs. 15.4%). In terms of sex differences, the gap between people with and without disabilities was three times larger for males than it was for females. Consequently, fewer males with disabilities completed high school than females with disabilities.

The integration of the British Columbia K–12 data from 1991/1992 to 2020/2021 into the Education and Labour Market Longitudinal Platform (ELMLP) allowed for new analytical opportunities to better understand student pathways and graduate outcomes through a disaggregated data lens. For example, Barnett and Gibson (2021) recently conducted a case study of the graduate class of 2009/2010. They examined high school graduation of British Columbia students with special needs and their enrolment in postsecondary education in comparison with students without special needs. Barnett and Gibson illustrated that students with special needs (excluding students with gifted status) accounted for about 5% of all graduating students, with a majority (almost 9 in 10 students) having a mental health-related or cognitive special need and the remainder having a physical or sensory need. Moreover, they highlighted that males made up a larger share of high school graduates among students with special needs.[2]

The present study expanded on previous research by Barnett and Gibson (2021) and examined the proportions of high school graduates with special needs compared with students without special needs in the British Columbia school system across nine graduation cohorts from 2010/2011 to 2018/2019. Sex and age differences were noted. Lastly, the likelihood of high school graduation of students with special needs compared with students without special needs was examined before and after accounting for several socioeconomic factors (e.g., parental income, average neighbourhood income and economic region) that were known to be associated with high school graduation, as well as academic achievement.

In addition to using longitudinal integrated data within the ELMLP, a major strength of this study was the ability to further disaggregate the special needs classification. This approach aimed to address the information needs of various data users and a wide range of audiences, including parents. Indeed, recent research by Baumbusch and Lloyd (2022) found that parents of K–12 students in British Columbia reported a need to study high school graduation separately among students with learning disabilities, ASD, and moderate behavioural support needs or mental illness.

3 Data

This study used the British Columbia Ministry of Education administrative data—British Columbia K–12 database—within the ELMLP. It followed students from grades 1 through 12 and compared proportions of high school graduation between students with and without special needs. The British Columbia K–12 dataset contained information from 1991 onwards on student enrolment in

2. A remark should be made here for clarification purposes. While the British Columbia study (BC Stats 2009) that used the PALS data reported the proportion of male students with special needs who graduated, Barnett and Gibson (2021) presented the proportion of male students among graduates with special needs. Thus, while the former results represent sex differences in completion of high school, the latter are related to sex differences in disabilities.

public and independent schools in British Columbia, including students' individual characteristics (e.g., sex, age,[3] special needs status) and their progression throughout the British Columbia education system (e.g., graduation).

The British Columbia K–12 database structure included one record per school year, student and school, where most students had one record per school year. However, there were students who attended more than one school in a given school year and had multiple records per year. For example, if a student changed schools or took distance classes offered by another school in the same school year, the student had multiple records for that school year. The British Columbia K–12 database accounted for students with multiple records and used the term "authority school" to refer to the school that was most likely to be associated with the most complete record for the student for that year. The remaining records for that student were classified under "non-authority school." For this analysis, the authority school was used as the student's primary record since that was the most complete record for the student. Student records from non-authority schools were excluded.

The study used nine cohorts, which were defined as follows: students who entered Grade 1 from 1999/2000 to 2007/2008 and were in Grade 12 in the British Columbia school system between 2010/2011 and 2018/2019.[4] For example, Cohort 1 was those students who were in Grade 1 in the school year 1999/2000 and were in Grade 12 in 2010/2011.[5,6] These years were chosen for several reasons. First, student special needs status information was not available until the school year 1996/1997. Second, the graduation data available for the 2019/2020 and 2020/2021 school years were incomplete;[7] therefore, these school years were excluded from the analysis. Third, there was an analytical plan to extend this study in a follow-up study to examine the postsecondary education of the students within the final sample using the Postsecondary Student Information System (PSIS), and thus the choice of cohort years was in line with the PSIS enrolment data that were available for 2009 onwards for all provinces and territories with the ELMLP.

In the British Columbia K–12 administrative data, the special needs variable included 16 categories as follows: ASD, behavioural disorder—moderate, behavioural—rehabilitation, intensive behavioural intervention, moderate behavioural support, deaf or hard of hearing, deafblind, gifted, mild intellectual disability, moderate to profound intellectual disability, learning disability, physical disability or chronic impairments, physically dependent, severe learning disability, visual impairment, as well as a category for those without special needs. Following the guidelines in the manual for special education services (British Columbia Ministry of Education 2016), the special needs variable was first collapsed into the following 11 categories: ASD, behavioural needs or mental illness,[8] deaf or hard of hearing, deafblind, gifted, intellectual disabilities,[9] learning disabilities,[10] physical disability or chronic impairments, physically dependent, visual impairment and without special needs. Subsequently, the deaf or hard of

3. Age is calculated based on calendar year.
4. Grade repetition was not a frequent event among all cohorts. Less than 1% of students in each cohort repeated a grade. School drop-out was lowest at around 0.5% to 2% in grades 1 to 9, reached 3% to 5% in Grade 10 and was highest around 6% to 9% in Grade 11 across all cohorts. Regarding the differences between students with and without special needs, the results were mixed and inconsistent. Some cohorts (i.e., cohorts 1, 4, 6, 7 and 9) showed no significant differences in drop-out between the two groups, whereas in other cohorts (i.e., cohorts 2, 3, 5 and 8) slightly more students with special needs than without special needs dropped out from school. Overall, less than 10% of students who dropped out (across all cohorts) appeared in the Postsecondary Student Information System between the ages of 17 to 25, suggesting that they had completed high school elsewhere.
5. Students for whom there was not enough information to match to other data sources (less than 1% in all cohorts) were removed from the study sample.
6. Students who entered the school system in their later years (e.g., Grade 10) and graduated through the British Columbia school system were kept in the study sample.
7. The student success count variable was used to validate proportions of graduation among students.
8. This category combines behavioural disorder—moderate, behavioural—rehabilitation, intensive behavioural intervention and moderate behavioural support.
9. Mild intellectual disability and moderate to profound intellectual disability were included under this category.
10. Severe learning disability was incorporated under this category.

hearing, deafblind and visual impairment categories were combined under sensory needs, whereas the physical disability or chronic impairments and physically dependent categories were combined under physical needs. These combinations were in line with the study by Barnett and Gibson (2021) and necessary because of the low sample size for these categories. Thus, the final special needs variable in this study included eight categories as follows: ASD, behavioural needs or mental illness (e.g., attention deficit hyperactivity disorder, depression), gifted, intellectual disabilities (e.g., weakness in cognitive processing, such as difficulties with social perception, social interaction and perspective taking), learning disabilities, physical needs (e.g., nervous system impairment that impacts movement or mobility), sensory needs and without special needs.[11] Further information about these categories can be found in the 2016 British Columbia *Special Education Services: A Manual of Policies, Procedures and Guidelines*.

Since this study examined students with various special needs, it was essential to acknowledge that students may have multiple special needs at a time. In the British Columbia K–12 database, a student was assigned to a maximum of one category in a given school year, and students may have been assigned to a different category from one school year to the next. For this study, students who were assigned to a special needs category ***twice or more*** throughout their school years were identified as students with special needs,[12] as were students who were assigned to a special needs category only once in Grade 12.[13] The special needs category was identified by the last special needs classification of the students in their final school year.[14,15]

4 Methods

This analysis examined the proportions of students[16] in British Columbia with a secondary school diploma (known as a Dogwood Diploma in British Columbia)[17,18] across nine cohorts (see Table 1 for sample sizes) by student characteristics, including sex, age and special needs status. High school graduation was defined as those students who entered Grade 12 and graduated that

11. Initial analyses showed that (data not shown) each cohort had about 10% to 12% of students with special needs (including those with gifted status) and 8% to 11% excluding those with gifted status. The proportions of students with special needs status have increased over time, and this increase was not because of students with gifted status, but those with special needs. Further disaggregation of special needs categories suggested that the highest increase in proportions was observed among students with ASD, followed by those with learning disabilities, physical needs, and behavioural needs or mental illness.
12. A validity analysis indicated that (data not shown) a majority of students who had one special needs status throughout their school years in the British Columbia system graduated without a special needs status. Therefore, these students were classified as students without special needs.
13. If students had a special needs status in their graduating year (Grade 12), regardless of their previous status, they were classified as students with special needs. The special needs classification was adopted to be consistent with previous research.
14. Further analysis was conducted to examine stability and change in students' special needs status over time. About 90% of students did not change their special needs status, about 9% changed status once, and about 1% changed twice or more. Among students whose special needs status changed once or more, about 69% changed their status from no special needs to special needs, and about 31% changed from special needs to no special needs. Note that the former may simply indicate a later diagnosis.
15. An additional examination of stability and change only for students with special needs indicated that 88% had the same special needs category over time, 11% changed their category once and 1% changed twice or more. Given these results, once students were identified as having special needs, their last categorization was considered as the final grouping within different special needs status categories.
16. High school graduates were 15 to 19 years old at the time of graduation.
17. Students who are 18 years of age or older can obtain an Adult Dogwood Diploma and combine credits earned at both secondary and postsecondary schools. These students were excluded from the study sample as the focus was on students within the British Columbia K–12 school system.
18. Students can receive an Evergreen Certificate, which was developed in response to concerns from parents and educators to address the needs of students with special needs. An Evergreen Certificate is a meaningful recognition of student achievement before leaving school; however, this certificate is not equivalent to a Dogwood Diploma, for which students meet the Ministry of Education's provincial graduation requirements set out in the Graduation Program Order. Therefore, these students were not considered as graduates in this study.

school year or within the following two school years.[19] Descriptive statistics were first presented on high school graduation among the nine cohorts for the following three groups: students without special needs, students with special needs and students with gifted status. They were subsequently disaggregated further into six special needs categories. Next, these proportions were examined by sex and age. Comparison (e.g., chi-square) tests were conducted to examine group differences that were statistically significant at $p < 0.05$.

Finally, the likelihood of high school graduation among students with and without special needs across all nine cohorts in the British Columbia K–12 school system was examined before and after controlling for several sociodemographic characteristics. Ordinary least squares (OLS) regression analysis was used. In the first model, the likelihood of high school graduation for students with and without special needs was examined after controlling for the cohort effects. In the second model, the effects of sociodemographic characteristics (i.e., sex, age, parental income, average neighbourhood income and economic region) were taken into consideration. The third model further built on the second model, taking into consideration academic achievement. The academic achievement variable was created by using Grade 10 course marks in English, math and science. Since students may complete more than one course in math, for example, the average grade for all math courses taken in Grade 10 was used, and the average percentage grades were converted into letter grades (i.e., "A," "B" and "C," including plus or minus grades such as "A+" and "C-," and "F") according to the British Columbia grading system (Government of British Columbia n.d.a). The economic region variable was constructed using the Postal Code Conversion File (Statistics Canada 2021) to match the postal codes from the British Columbia K–12 data to identify students' economic region. Additionally, the British Columbia K–12 administrative data were integrated to the T1 Family File to consider the parental income variable from when a student was in Grade 10.[20]

5 Results

The proportions of male students in each cohort by special needs status are shown in Table 1.[21] Across all nine cohorts, there was roughly an even distribution of males and females. This pattern was driven by students without special needs. In contrast, but as expected, there were more males than females among students with special needs across all cohorts. This pattern was consistent among all disaggregated special needs categories (including those with gifted status) across all nine cohorts, with the largest differences observed being between males and females with ASD, followed by those with learning disabilities.

19. High school graduation was calculated by first year entered in Grade 12 and two years later to account for those students who may have entered Grade 12 at age 17 and graduated two years later by age 19.
20. If parental income was missing for when a student was in Grade 10, parental income from one year down or up was considered.
21. Final sample sizes (and proportions) of students in cohorts were matching between data from grades 1 to 12 and those from grades 8 to 12 only.

Table 1

Proportions of male students in British Columbia, by cohort (school year) and special needs status

	Male								
	Cohort (school year)								
	Cohort 1 2010/2011	Cohort 2 2011/2012	Cohort 3 2012/2013	Cohort 4 2013/2014	Cohort 5 2014/2015	Cohort 6 2015/2016	Cohort 7 2016/2017	Cohort 8 2017/2018	Cohort 9 2018/2019
					percent				
Percentage	50.4	50.7	50.6	50.4	50.5	50.3	50.9	51.1	50.6
Special needs status									
Without special needs	49.3	49.4	49.3	49.0	48.9	48.7	49.2	49.6	49.1
Special needs	65.5	65.4	65.5	64.6	65.0	64.0	64.7	63.8	62.9
Gifted	53.0	53.3	53.0	53.5	54.7	54.1	55.5	53.5	53.8
Special needs categories									
Autism spectrum disorder	86.1	86.1	81.7	83.6	82.6	83.7	82.8	82.2	83.3
Behavioural needs or mental illness	57.5	57.5	58.4	55.4	54.9	54.3	53.7	52.3	50.1
Intellectual disabilities	57.1	57.1	56.8	60.6	56.9	56.7	60.3	58.3	56.4
Learning disabilities	68.5	68.5	67.8	66.1	67.3	66.4	66.9	65.2	64.8
Physical needs	59.5	59.5	65.3	60.6	61.2	57.8	62.3	61.9	61.5
Sensory needs	57.8	57.8	56.3	59.2	66.7	52.1	51.4	58.6	48.9
					number				
Total sample size, N	51,548	51,231	52,150	51,631	49,894	49,329	48,876	48,720	43,412

Source: Statistics Canada, British Columbia Ministry of Education kindergarten to Grade 12 dataset, 1999/2000 to 2018/2019.

Table 2 presents the proportions of high school graduates across the nine cohorts, by special needs status. Overall, approximately 9 in 10 students graduated across all cohorts. However, the figure differed significantly by special needs status. About 80% of students with special needs graduated across the nine cohorts, compared with about 90% of students without special needs. Over the nine years, the percentage of students with special needs who graduated high school increased by about 7 percentage points from 78.4% in 2010/2011 to 85.2% in 2018/2019. The proportions of students with gifted status who graduated high school were the highest, at around 95% or higher, and relatively stable over time. Overall, these results suggest that the proportions of high school graduates across the nine cohorts were relatively steady but differed by special needs status.

Table 2

Proportions of students who graduated high school in British Columbia, by cohort (school year) and special needs status

	Cohort (school year)								
	Cohort 1 2010/2011	Cohort 2 2011/2012	Cohort 3 2012/2013	Cohort 4 2013/2014	Cohort 5 2014/2015	Cohort 6 2015/2016	Cohort 7 2016/2017	Cohort 8 2017/2018	Cohort 9 2018/2019
					percent				
Total	88.1	88.7	89.1	89.3	89.5	89.6	89.7	90.2	91.4
Special needs status									
Without special needs (reference category)	88.8	89.5	90.0	90.3	90.5	90.6	90.7	91.2	92.2
Special needs	78.4 *	79.0 *	79.2 *	79.2 *	80.2 *	81.0 *	80.8 *	82.1 *	85.2 *
Gifted	95.4 *	94.7 *	94.9 *	95.2 *	95.2 *	95.3 *	96.7 *	96.1 *	94.9 *
Special needs categories									
Autism spectrum disorder	76.6 *	79.8 *	76.1 *	78.3 *	79.3 *	78.9 *	78.5 *	77.4 *	80.3 *
Behavioural needs or mental illness	74.4 *	73.9 *	72.2 *	72.5 *	73.8 *	76.1 *	76.8 *	76.9 *	81.7 *
Intellectual disabilities	64.0 *	67.2 *	69.6 *	67.9 *	63.4 *	66.4 *	67.4 *	70.0 *	71.2 *
Learning disabilities	86.1 *	87.4 *	87.2 *	86.3 *	88.8 *	88.6 *	88.7 *	90.4	91.9
Physical needs	72.2 *	71.3 *	75.7 *	76.9 *	76.2 *	76.5 *	73.4 *	79.4 *	81.2 *
Sensory needs	83.0 *	83.3	88.9	89.6	89.0	84.2 *	88.2	84.5 *	87.6

* significantly different from reference category ($p < 0.05$)

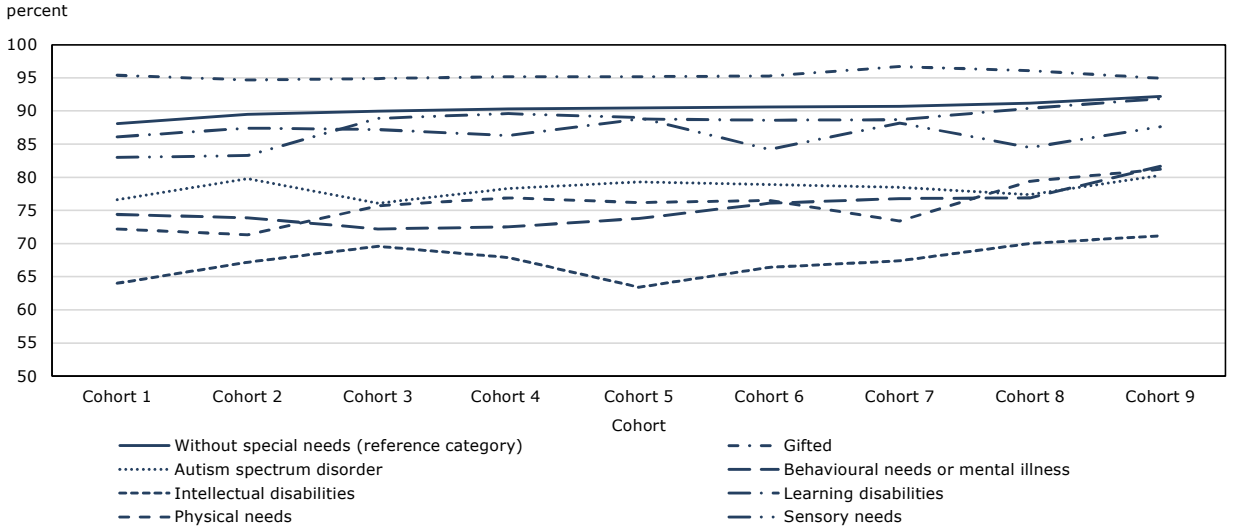
Source: Statistics Canada, British Columbia Ministry of Education kindergarten to Grade 12 dataset, 1999/2000 to 2018/2019.

Further disaggregation of the special needs status variable indicated that the proportions of high school graduates significantly differed among the various groups of students with special needs (excluding students with gifted status). However, the proportions were still lower than that among students without special needs, with the exception of most cohorts of students with sensory needs and two recent cohorts of students with learning disabilities (Table 2). For instance, while the

proportions of graduation among students with learning disabilities were highest at around 90% or just under, followed by those with sensory needs, across the nine cohorts, the proportions were lowest among students with intellectual disabilities, at around 63% to 71%. About 70% to 80% of students with ASD, behavioural needs or mental illness, or physical needs graduated across the nine cohorts.

The proportions of high school graduates by disaggregated special needs status across the nine cohorts are presented in Chart 1. The figure shows that while the proportions of high school graduates were steady across students without special needs and those with gifted status, most categories of special needs status saw changes over time. Notably, there was an increase (about 7 percentage points) in the proportions of students with intellectual disabilities who graduated over the nine years. A similar pattern was observed for those with behavioural needs or mental illness. Similarly, the proportions of students with learning disabilities who graduated steadily increased over the nine years by just under 6 percentage points.

Chart 1
Proportions of students who graduated high school in British Columbia, by cohort (school year) and special needs status



Source: Statistics Canada, British Columbia Ministry of Education kindergarten to Grade 12 dataset, 1999/2000 to 2018/2019.

The proportions of high school graduates by special needs status and sex are shown in Table 3. Across all nine cohorts, the total proportions of high school graduates were about 1 to 2 percentage points higher among females compared with males. This pattern was driven by students without special needs. However, a somewhat opposite pattern was observed among students with special needs, albeit statistically significant in only one cohort (Cohort 7). Mixed sex differences were observed among students with gifted status in two cohorts (cohorts 7 and 9). Overall, these findings suggest that while more females than males, in general, tended to graduate from high school, sex differences were mixed and less consistent when special needs status was taken into consideration. Although this finding seems to contradict previous research, it may be attributable to the further disaggregation of the special needs status and differences in sex distributions in certain special needs categories.

Further disaggregation of the special needs status variable largely indicated no statistically significant differences between males and females, except in three cases. There was a larger share of male than female high school graduates among students with ASD in cohorts 2 and 9 and among students with intellectual disabilities in Cohort 7 (the differences being about 8 percentage points in each cohort). In contrast, there was a larger share of female than male high school graduates among students with learning disabilities in cohorts 8 and 9 (the differences being about 3 percentage points in each cohort).

Table 3

Proportions of students who graduated high school in British Columbia, by cohort (school year), special needs status and sex

	Cohort (school year)																	
	Cohort 1 2010/2011		Cohort 2 2011/2012		Cohort 3 2012/2013		Cohort 4 2013/2014		Cohort 5 2014/2015		Cohort 6 2015/2016		Cohort 7 2016/2017		Cohort 8 2017/2018		Cohort 9 2018/2019	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
	percent																	
Total	87.2	88.9 *	87.9	89.4 *	88.3	89.9 *	88.4	90.2 *	88.7	90.2 *	88.8	90.4 *	89.2	90.2 *	89.5	90.9 *	90.8	92.1 *
Special needs status																		
Without special needs	88.0	89.5 *	88.9	90.1 *	89.4	90.6 *	89.7	90.9 *	90.0	91.1 *	89.8	91.3 *	90.3	91.2 *	90.7	91.6 *	91.8	92.6 *
Special needs	79.0	77.2	79.4	78.5	79.6	78.5	79.4	79.0	80.5	79.6	81.7	79.7	82.0	78.9 *	82.1	82.0	84.9	85.9
Gifted	95.0	95.8	94.9	94.5	94.6	95.3	93.3	97.5 *	94.5	96.0	95.5	95.0	97.8	95.3 *	95.6	96.6	92.8	97.5 *
Special needs categories																		
Autism spectrum disorder	78.2	67.8	81.6	70.7 *	77.7	69.4	79.5	72.8	79.4	78.9	79.9	73.9	79.9	72.2	77.8	75.5	81.8	73.4 *
Behavioural needs or mental illness	73.7	75.2	72.0	76.7	70.2	75.2	71.9	73.3	74.0	73.5	76.8	75.4	77.7	75.8	77.3	76.4	81.5	81.9
Intellectual disabilities	64.0	64.2	66.1	68.7	70.6	68.3	69.8	65.1	62.5	64.8	66.8	66.0	70.8	62.8 *	69.1	71.1	69.1	74.1
Learning disabilities	85.6	87.1	88.3	85.5	87.8	86.0	85.6	87.7	88.4	89.6	88.6	88.5	88.3	89.4	89.5	92.2 *	90.8	93.8 *
Physical needs	74.8	68.5	69.5	74.1	75.5	76.2	75.6	78.9	75.9	76.7	76.1	77.0	75.1	70.8	79.9	78.6	80.0	83.3
Sensory needs	83.1	82.8	82.5	84.4	90.0	87.5	88.4	91.3	87.5	92.1	84.8	83.6	90.0	86.4	87.9	80.0	88.2	87.0

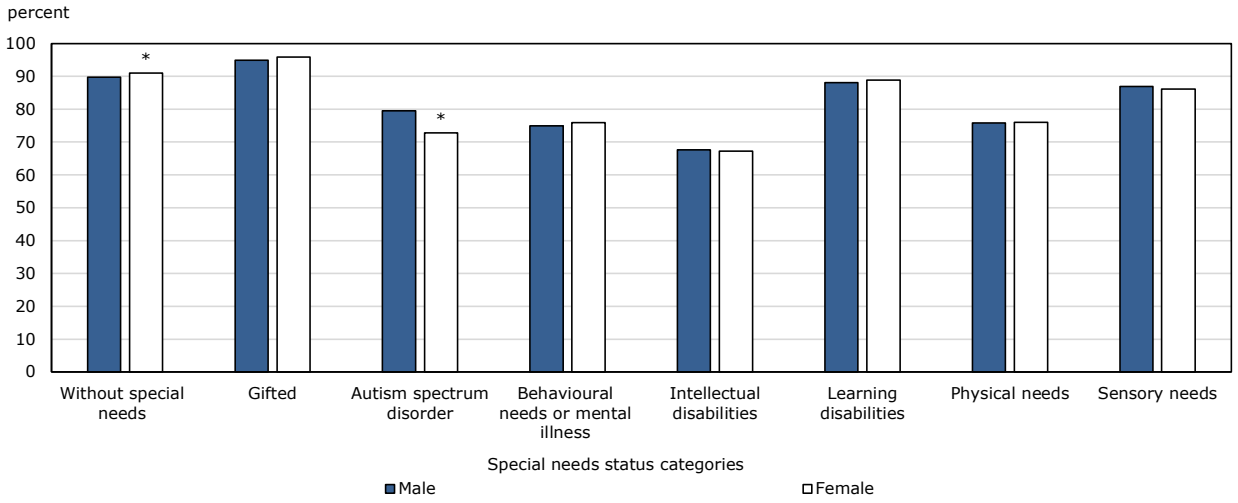
* significantly different from reference category ($p < 0.05$)

Note: The significant difference is based on the difference of percentage between males and females.

Source: Statistics Canada, British Columbia Ministry of Education kindergarten to Grade 12 dataset, 1999/2000 to 2018/2019.

Chart 2 presents the average proportions of students who graduated high school by disaggregated special needs status and sex. When all cohorts were considered together, sex differences were observed among students without special needs and students with ASD. While more females than males graduated among students without special needs, the opposite was true among students with ASD. These results should be interpreted in light of well-established sex differences in different types of disabilities (e.g., there are more males than females with ASD; see Maenner et al. 2021 for another example). All together, males accounted for four-fifths (86%) of students with ASD, about two-thirds (69%) of students with learning disabilities and about three-fifths of students with either intellectual disabilities (57%) or physical needs (60%).

Chart 2
Average proportion of students who graduated high school in British Columbia, all cohorts, special needs status and sex



* significantly different from reference category ($p < 0.05$)
Source: Statistics Canada, British Columbia Ministry of Education kindergarten to Grade 12 dataset, 1999/2000 to 2018/2019.

Table 4 shows the proportions of high school graduates across the nine cohorts by special needs status and age. About 80% to 85% of students graduated at age 18 or younger across all nine cohorts, and the figure differed significantly (about 5 to 7 percentage points) at age 19 across all cohorts. This pattern was driven by students without special needs (3 to 7 percentage points higher). For students with gifted status, the differences between graduation at age 18 or younger and at age 19 were smaller (1 to 2 percentage points) in earlier cohorts (cohorts 1 to 3) and negligible (not significant) for all other cohorts. In contrast, the proportions of graduation also differed (5 to 10 percentage points) among students with special needs at age 19 compared with age 18 or younger. Overall, these results suggest that significant age differences in high school graduation (i.e., graduation at age 18 or younger compared with at age 19) exist among students with and without special needs (but not those with gifted status).

Further disaggregation of the special needs status variable largely followed this pattern (except for those with intellectual disabilities). The largest significant age differences were seen among students with ASD (about 7 to 14 percentage points), those with behavioural needs or mental illness (about 5 to 13 percentage points), and those with physical needs (7 to 14 percentage points) across all cohorts. These findings once again revealed diversity in high school graduation when age differences were considered, particularly among students with special needs (excluding those with gifted status).

Table 4

Proportions of students who graduated high school in British Columbia by cohort (school year), special needs status and age

	Cohort (school year)																	
	Cohort 1 2010/2011		Cohort 2 2011/2012		Cohort 3 2012/2013		Cohort 4 2013/2014		Cohort 5 2014/2015		Cohort 6 2015/2016		Cohort 7 2016/2017		Cohort 8 2017/2018		Cohort 9 2018/2019	
	Age 18 or younger	Age 19	Age 18 or younger	Age 19	Age 18 or younger	Age 19	Age 18 or younger	Age 19	Age 18 or younger	Age 19	Age 18 or younger	Age 19	Age 18 or younger	Age 19	Age 18 or younger	Age 19	Age 18 or younger	Age 19
	percent																	
Total	80.5	88.1 *	81.3	88.7 *	82.1	89.1 *	82.7	89.3 *	83.3	89.5 *	83.5	89.6 *	83.5	89.7 *	85.6	90.2 *	88.3	91.4 *
Special needs status																		
Without special needs	81.3	88.8 *	82.3	89.5 *	83.1	90.0 *	83.9	90.3 *	84.5	90.5 *	84.8	90.6 *	84.9	90.7 *	86.9	91.2 *	89.1	92.2 *
With special needs	69.3	78.4 *	69.3	79.0 *	70.2	79.2 *	70.5	79.2 *	71.4	80.2 *	72.4	81.0 *	71.5	80.8 *	75.0	82.1 *	80.9	85.2 *
Gifted	94.2	95.4 *	93.8	94.7 *	93.5	94.9 *	93.4	95.2	93.8	95.2	93.2	95.3	95.9	96.7	95.5	96.1	94.6	94.9
Special needs categories																		
Autism spectrum disorder	61.2	76.6 *	65.1	79.8 *	62.5	76.1 *	63.9	78.3 *	65.5	79.3 *	63.7	78.9 *	61.7	78.5 *	66.0	77.4 *	73.4	80.3 *
Behavioural needs or mental illness	61.2	74.4 *	60.7	73.9 *	61.8	72.2 *	62.2	72.5 *	64.1	73.8 *	66.8	76.1 *	67.0	76.8 *	69.2	76.9 *	76.6	81.7 *
Intellectual disabilities	53.1	64.0	55.1	67.2	57.1	69.6	54.6	67.9	50.2	63.4	50.7	66.4	52.3	67.4	60.1	70.0	65.3	71.2
Learning disabilities	81.1	86.1 *	82.1	87.4 *	82.1	87.2 *	82.7	86.3 *	84.4	88.8 *	85.0	88.6 *	84.4	88.7 *	86.8	90.4 *	89.4	91.9 *
Physical needs	61.8	72.2 *	59.1	71.3 *	63.0	75.7 *	63.1	76.9	63.0	76.2 *	63.6	76.5 *	59.5	73.4 *	69.0	79.4 *	74.6	81.2 *
Sensory needs	76.0	83.0 *	75.9	83.3	79.6	88.9 *	80.0	89.6	81.4	89.0 *	77.2	84.2 *	81.5	88.2 *	77.7	84.5	83.8	87.6

* significantly different from reference category ($p < 0.05$)

Note: The significant difference is based on the difference of percentage between age 18 or younger and age 19.

Source: Statistics Canada, British Columbia Ministry of Education kindergarten to Grade 12 dataset, 1999/2000 to 2018/2019.

The final set of analyses examined the likelihood of graduation from high school before and after controlling for several sociodemographic characteristics known to be associated with high school graduation simultaneously, along with the disaggregated special needs status variable.[22] Table 5 presents a summary of OLS regression results predicting high school graduation among British Columbia students with special needs compared with students without special needs before (Model 1) and after (Model 2) controlling for sex, age (at age 18 or younger vs. at age 19), parental income, neighbourhood income and economic region. Model 3 built on Model 2 by further controlling for the academic achievement of students. The cohort effects were controlled for in all models.

22. Marginal probability effects from probit and logit regression models were also estimated and yielded nearly identical results. These results are not included in this paper; however, they are available from the authors upon request. Given that the OLS models achieved the same results as the marginal effects from the logit and probit models, the OLS models were presented for simplicity.

Table 5

Predicting high school graduation among British Columbia students–ordinary least squares regression results

	Model 1		Model 2		Model 3	
	regression coefficient	standard error	regression coefficient	standard error	regression coefficient	standard error
Intercept	0.95 *	0.00	0.77 *	0.00	0.62 *	0.03
Special needs categories						
Without special needs (reference category)	...	...	...	...	...	...
Gifted	0.04 *	0.00	0.03 *	0.00	0.03 *	0.00
Autism spectrum disorder	-0.09 *	0.00	-0.08 *	0.00	-0.08 *	0.00
Behavioural needs or mental illness	-0.14 *	0.00	-0.12 *	0.00	-0.13 *	0.00
Intellectual disabilities	-0.23 *	0.00	-0.21 *	0.00	-0.21 *	0.00
Learning disabilities	-0.02 *	0.00	-0.02 *	0.00	-0.02 *	0.00
Physical needs	-0.13 *	0.00	-0.11 *	0.00	-0.11 *	0.00
Sensory needs	-0.03 *	0.01	-0.03 *	0.01	-0.03 *	0.01
Sex						
Female	...	...	0.01 *	0.00	0.01 *	0.00
Male (reference category)	...	...	...	...	...	...
Age						
Age 18 or younger	...	...	0.21 *	0.00	0.21 *	0.00
Age 19 (reference category)	...	...	...	...	...	...
Parental income						
Less than $30,000	...	...	-0.02 *	0.00	-0.02 *	0.00
$30,000 to $39,999	...	...	-0.01 *	0.00	-0.01 *	0.00
$40,000 to $49,999	...	...	-0.01 *	0.00	0.00 *	0.00
$50,000 to $59,999	...	...	-0.01 *	0.00	0.00	0.00
$60,000 to $69,999	...	...	0.00	0.00	0.00	0.00
$70,000 to $79,999	...	...	-0.01	0.00	0.00	0.00
$80,000 or more (reference category)	...	...	...	...	...	...
Missing income	...	...	-0.05 *	0.00	-0.03 *	0.00
Neighbourhood income						
Less than $30,000	...	...	-0.04 *	0.01	-0.04 *	0.01
$30,000 to $39,999	...	...	-0.08 *	0.01	-0.08 *	0.01
$40,000 to $49,999	...	...	-0.05 *	0.00	-0.05 *	0.00
$50,000 to $59,999	...	...	-0.04 *	0.00	-0.04 *	0.00
$60,000 to $69,999	...	...	-0.03 *	0.00	-0.03 *	0.00
$70,000 to $79,999	...	...	-0.02 *	0.00	-0.02 *	0.00
$80,000 or more	...	...	...	...	...	...
Missing income	...	...	-0.01	0.01	-0.01	0.01

... not applicable

* significantly different from reference category ($p < 0.05$)

Sources: Statistics Canada, British Columbia Ministry of Education kindergarten to Grade 12 dataset, 1999/2000 to 2018/2019, and T1 Family File dataset, 2007 to 2017.

Table 5

Predicting high school graduation among British Columbia students–ordinary least squares regression results (continued)

	Model 1		Model 2		Model 3	
	regression coefficient	standard error	regression coefficient	standard error	regression coefficient	standard error
Economic region						
Lower Mainland–Southwest (reference category)	...	...	...	...	...	...
Vancouver Island and Coast	...	...	-0.01 *	0.00	-0.01 *	0.00
Thompson–Okanagan	...	...	0.00 *	0.00	0.01 *	0.00
Kootenay	...	...	0.00	0.00	0.00	0.00
Cariboo	...	...	-0.02 *	0.00	-0.02 *	0.00
North Coast	...	...	-0.04 *	0.00	-0.04 *	0.00
Nechako	...	...	0.00	0.00	0.00	0.00
Northeast	...	...	-0.03 *	0.00	-0.03 *	0.00
Academic achievement						
English—Grade 10						
English grade A	...	...	...	...	0.03	0.04
English grade B	...	...	...	...	0.06	0.03
English grade C	...	...	...	...	0.03	0.03
English grade F (reference category)	...	...	...	...	...	...
Missing English grade	...	...	...	...	0.04	0.03
Science—Grade 10						
Science grade A	...	...	...	...	0.09 *	0.00
Science grade B	...	...	...	...	0.08 *	0.00
Science grade C	...	...	...	...	0.06 *	0.00
Science grade F (reference category)	...	...	...	...	...	...
Missing Science grade	...	...	...	...	0.05 *	0.00
Math—Grade 10						
Math grade A	...	...	...	...	0.04 *	0.00
Math grade B	...	...	...	...	0.04 *	0.00
Math grade C	...	...	...	...	0.04 *	0.00
Math grade F (reference category)	...	...	...	...	...	...
Missing Math grade	...	...	...	...	0.04 *	0.00
Cohort						
Cohort 1 (reference category)	...	...	...	...	...	...
Cohort 2	-0.05 *	0.00	-0.02 *	0.00	-0.02 *	0.00
Cohort 3	-0.04 *	0.00	-0.02 *	0.00	-0.02 *	0.00
Cohort 4	-0.04 *	0.00	-0.02 *	0.00	-0.03 *	0.00
Cohort 5	-0.04 *	0.00	-0.02 *	0.00	-0.02 *	0.00
Cohort 6	-0.04 *	0.00	-0.02 *	0.00	-0.03 *	0.00
Cohort 7	-0.04 *	0.00	-0.02 *	0.00	-0.02 *	0.00
Cohort 8	-0.03 *	0.00	-0.02 *	0.00	-0.02 *	0.00
Cohort 9	-0.03 *	0.00	-0.02 *	0.00	-0.02 *	0.00

... not applicable

* significantly different from reference category ($p < 0.05$)

Sources: Statistics Canada, British Columbia Ministry of Education kindergarten to Grade 12 dataset, 1999/2000 to 2018/2019, and T1 Family File dataset, 2007 to 2017.

In Model 1, the results suggest that students across all special needs categories (except for students with gifted status) were less likely to graduate from high school compared with students without special needs. More specifically, keeping the cohort variable constant, students with ASD (9 percentage points), behavioural needs or mental illness (14 percentage points), intellectual disabilities (23 percentage points), and physical needs (13 percentage points) were less likely to graduate from high school compared with students without special needs. Similarly, but to a lesser extent, students with learning disabilities (2 percentage points) and sensory needs (3 percentage points) were also less likely to graduate from high school compared with students without special needs. In contrast, students with gifted status were more likely to graduate high school by 4 percentage points compared with the reference category.

In Model 2, considering the effects of several sociodemographic variables did not change the pattern of results obtained in Model 1. Students with gifted status remained more likely (3 percentage points) to graduate from high school compared with students without special needs. Overall, when sociodemographic covariates were added into the model, there was partial mediation where the gap in high school graduation among students with ASD, behavioural needs or mental illness, intellectual disabilities, physical disabilities and gifted status decreased 1 to 2 percentage points compared with Model 1. For instance, students with intellectual disabilities were 23 percentage points less likely to graduate high school compared with students without special needs (Model 1), but when controlling for sociodemographic factors, the difference decreased to 21 percentage points (Model 2). Additionally, females were more likely to graduate high school than males (by 1 percentage point), and students were more likely to graduate at age 18 or younger compared with at age 19 (21 percentage points). Regarding income characteristics, students who were in families and neighbourhoods with lower income were generally less likely to graduate high school compared with students from families and neighbourhoods with the highest income. In addition, compared with students who lived in Lower Mainland–Southwest, students who lived in other economic regions had lower high school graduation percentages (except for Kootenay and Nechako).

Model 3 further accounted for academic achievement by using students' Grade 10 marks for math, science and English. After the effects of academic achievement were considered, the results were very similar. Students with special needs (except those with gifted status) remained significantly less likely to graduate from high school compared with students without special needs. Compared with students without special needs, students with intellectual disabilities were least likely (21 percentage points) to graduate from high school, followed by students with behavioural needs or mental illness (13 percentage points), physical needs (11 percentage points) and ASD (8 percentage points). Students with gifted status also remained significantly more likely to graduate from high school compared with students without special needs. In terms of academic achievement, students who had higher marks in science and math were significantly more likely to graduate high school compared with students who failed math and science. All other sociodemographic variables were statistically significant in the same direction in Model 3.[23] Overall, these findings indicated that substantial disparity existed in high school graduation among students with and without special needs after controlling for various socioeconomic characteristics and student academic achievement. This may suggest that students with special needs may face other types of barriers in completing high school.

23. Multiple regression analyses (data not shown) were also conducted separately for males and females as part of a sensitivity analysis. The pattern of results was similar.

6 Conclusion

Previous research has well documented that students with special needs are less likely to graduate high school and more likely to encounter barriers such as low family income, poor academic performance and other socioeconomic factors. However, previous research has been largely limited to examining graduation of one cohort and focusing on broader types of special needs categories. Examining the proportions of high school graduation among students with different types of special needs across cohorts provides deeper insights, including whether proportions of graduation among students with various special needs improved over time. Using longitudinal administrative education data, this study found that about 9 in 10 students across all nine cohorts graduated from high school in British Columbia with a Dogwood Diploma. This pattern was largely driven by students without special needs. However, by comparison, while the rate of high school graduation was slightly higher among students with gifted status (95% or just over), students with special needs (excluding those with gifted status) graduated high school at a lower rate, about 80%. These results are in line with previously published British Columbia statistics (BC Stats 2009) and other research that used nationally representative data (Sentenac et al. 2019).

Further disaggregation of the special needs categories revealed that there was diversity among students with special needs. While students with learning disabilities had the highest proportions of high school graduation among students with special needs, at around 90% or just under, students with intellectual disabilities had the lowest proportions of graduation, at around 60% to 70%. The proportions of graduation among students without special needs and those with gifted status were steady across the years; however, the proportions mostly fluctuated among students with special needs. The proportions of graduation among students with special needs in most categories (except those with ASD and sensory needs) increased over the years. Improvements among students with special needs, particularly completion rates, have been previously noted (Government of British Columbia n.d.b). There may be various reasons for these observed differences, including practices in student classification, assessment and evaluation, which are beyond the scope of this study. Overall, these results indicated that, compared with students without special needs, a higher proportion of students with gifted status graduated, while a lower proportion of students with special needs graduated across all nine cohorts, even before considering any socioeconomic factors known to be associated with high school graduation.

When sex differences were considered, females were more likely than males (by about 1 to 2 percentage points) to graduate from high school in total, an established pattern that was driven by students without special needs. However, there were no consistent significant sex differences between males and females among students with gifted status and those with special needs, even when further disaggregation was considered. When all cohorts were examined together, sex differences were apparent only among students with ASD. As noted earlier, the results related to sex differences should be interpreted in light of known sex differences in special needs, such that there were more males than females in all special needs categories (with the largest difference observed among students with ASD). Overall, these findings were consistent with previous research (e.g., Elez and Zeman 2022) showing that females were more likely to graduate from high school compared with males. However, sex differences were mixed and less consistent among students with special needs.

Regarding age differences, across all nine cohorts, a majority of students graduated at age 18 or younger. The figure was lower, at around 70% (or just over), among students with special needs and higher, at around 90% (or just over), among students with gifted status, compared with around 80% (or just over) among students without special needs. Yet the proportions of graduation at age 19 were significantly different compared with those at age 18 or younger among students with and without special needs (5 to 10 and 3 to 7 percentage points, respectively) but not among those with gifted status. These results were generally in line with previous research indicating that students with special needs were generally older when they completed high school (Sentenac et

al. 2019). Further disaggregation revealed consistent similar age difference patterns, albeit not significant among students with intellectual disabilities and for some cohorts of students with sensory needs. The lack of statistical significance for these groups may be due to relatively low sample size. These findings suggest that the proportions of graduates were significantly higher at age 18 or younger compared with age 19 for both students without and with special needs (excluding those with gifted status).

When all student characteristics (i.e., sex, age, special needs status, cohort and academic achievement) were considered simultaneously along with socioeconomic factors, students with gifted status remained more likely (3 percentage points) to graduate from high school compared with students without special needs. By comparison, students with special needs (excluding students with gifted status) remained less likely to graduate. Students with intellectual disabilities were the furthest behind students without special needs (by 21 percentage points) regarding high school graduation proportions, followed by those with behavioural needs or mental illness (13 percentage points behind) and those with physical needs (11 percentage points behind). Students with learning disabilities and those with sensory needs were also less likely to graduate compared with students without special needs, but to a much lesser extent (2 and 3 percentage points behind, respectively), followed by students with ASD (8 percentage points behind). These results suggest that, even after controlling for known socioeconomic factors and academic achievement associated with high school graduation, students with special needs remain considerably less likely to graduate from high school. Moreover, those with intellectual disabilities (e.g., weakness in cognitive processing, such as difficulties with social perception, social interaction and perspective taking), with behavioural needs or mental illness (e.g., attention deficit hyperactivity disorder or depression) and with physical needs (e.g., nervous system impairment that impacts movement or mobility) are at a higher risk of not completing high school.

In summary, this study showed that even after controlling for the effects of socioeconomic characteristics and academic achievement, students with special needs were less likely to graduate high school in comparison with students without special needs over the nine cohorts, but the extent of the disparity within the high school graduation proportions varied greatly by special needs type. These results highlight diversity among this vulnerable population and suggest that students with special needs may have faced other types of barriers in completing high school. Future research should continue to disaggregate special needs categories since students with different special needs (including those with gifted status) may vary in their graduation proportions compared with students without special needs. Differences in socioeconomic characteristics explained 11% of the gap between students with and without special needs. More specifically, differences in socioeconomic characteristics explained 10% and 13% of the gap between students without special needs and those with intellectual disabilities and behavioural needs or mental illness, respectively. While differences in age (at age 18 or younger vs. at age 19) were the largest contributor to the gap between the two groups (7% for intellectual disabilities and 11% for behavioural needs or mental illness), differences in sex contributed much less (about 1% in each case). These findings suggest that other factors that were not considered in this study play a role. Future research may focus on specific barriers and accommodation needs to shed light on challenges and opportunities for this vulnerable population to achieve a successful transition to adulthood.

Several limitations of this study should be acknowledged. First, this study did not account for the change in students' special needs categories from one year to another (albeit a relatively small percentage—12%—registered such changes). Second, the sample sizes for students who were deaf or hard of hearing, were deafblind, had a visual impairment, had a physical disability, or had a chronic impairment were low, and, therefore, these groups could not be examined separately. Third, the Evergreen Certificate was not available in the 2021 British Columbia K–12 dataset, and thus, this study was not able to examine whether students who did not graduate in fact obtained an Evergreen Certificate. Finally, this study did not consider students who graduated with an Adult Dogwood Diploma. Despite these limitations, the consideration of students who were assigned to a special needs category *twice or more* throughout their school years was a unique strength of

this study, which enabled a focus on a more inclusive sample. Another strength of the study was examining high school graduation separately among students with learning disabilities, ASD, and behavioural needs or mental illness, an approach that was highlighted as a need in previous research (Baumbusch and Lloyd 2022).

Future research may also examine the transition of these high school students into postsecondary education and subsequently the labour force by continuing to use a special needs lens. Additionally, disaggregation by other characteristics (e.g., population group or immigrant status) could be a focus. Finally, new data linkage opportunities on the horizon that will integrate these datasets with other data at Statistics Canada (e.g., justice and health administrative data) will allow new venues to conduct multidisciplinary research.

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