# Exploring Prevalence Rates of Students with Exceptionalities in British Columbia

David Fainstein[1], Janette Avelar[1], Makayla Whitney[1], Joe Swineheart[1,2]
*University of Oregon[1], Behavioral Research and Teaching [2]*
*USA*

## Abstract

*The changes and complexity of identifying and supporting students with exceptionalities in K-12 schools are dynamic. We examine longitudinal data from two regions, British Columbia and Oregon, to explore the potential impact of varying policies on the practice of designating students with disabilities or disorders (e.g., Autism Spectrum Disorder) in a public-school context. Although the two jurisdictions selected for the current study are similar by geography and population distribution, there are remarkably different approaches to special education policy and practice. Still, longitudinal prevalence rate data across jurisdictions should be similar, and notable differences may illuminate policy events. Data visualization allows representation of large datasets using informative plots where observations and analysis can be systematically applied to longitudinal trends. Follow up descriptive and inferential statistical testing reveals noteworthy trends in prevalence rates of students with disabilities and disorders in British Columbia.*

## 1. Introduction

Educational policy can impact practice by reorganizing educational delivery and reconceptualizing the meaning and impact of education on society [1]. Educational policy exists as a mechanism to drive changes in school buildings that result in socially important outcomes (e.g., increasing literacy acquisition through improved instruction, reducing instances of bullying through prevention programs). However, the relationship between policy and practice in Western formal systems of education is often unclear, misdirected, or atheoretical [2]. Leveraging the power of policy as a change agent for the delivery and conceptualization of education stands to benefit a significant proportion of students [3]. When a policy is enacted, the intended outcomes are often not realized for months, years, or decades [4]. For example, changing school district policy on professional development to align with research-informed practices may be constructed to increase student academic achievement; though, there is insufficient evidence pointing to how long professionalized intervention with teachers will take to increase student academic scores [5]. Longitudinal data helps to understand the policy change's impact because of the year-over-year comparisons that illustrate differences, inflection points, or anomalies of interest [6].

## 2. Current Study

Our project primarily examines two datasets detailing headcounts of students with exceptionalities eligible for special education services aged 6-21. The datasets offer insights to the categorization for special education eligibility in public schools within British Columbia (BC) and Oregon (OR). The headcounts from BC are collected from 2002/2003 to the most recent data from 2019/2020. The OR headcounts are drawn from an annual dataset spanning 2002 through 2020. Levels of categorization include school-, district-, and provincial-level headcounts for BC. The OR data set includes state-wide headcounts that are not aggregated by school or district.

We intend to explore several questions regarding longitudinal trends where educational policy may have impacted special education practice. First, we will use descriptive statistics to describe trends in disability prevalence over time. The initial analyses will inform a discussion on prevalence growth rates by identifying shifts in prevalence growth from static to linearly increasing based on the age of diagnosis for the Oregon data, which can serve as a springboard to make inferences about BC data (e.g., the common age of onset for diagnosis per category and diagnostic patterns over time). In studying the differences and similarities between OR and BC datasets, we will also engage in a discussion on diagnostic terminology across regions with respect to the definitions as detailed by the Diagnostic and Statistical Manual of Mental Disorders [7], in part as a response to a challenge set by differing terminology between BC and OR categorization (i.e., the United States federal guidelines for exceptionality designation are similar but not identical to exceptionality designation guide-

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lines in BC).

Second, we hope to closely analyze any changes, or lack thereof, within the BC data following Canadian Supreme Court rulings between the British Columbia Teachers Federation and the province of BC (see Lambert; [8]). Canadian Supreme Court rulings have significant implications on educational policy in the provinces. In 2016, it resulted in a limit to the number of students with disability designations in classrooms resulting in an expansion of the number of specialist teachers' that school districts are required to hire. The driving theory of change is that decreasing student-to-teacher ratios and capping the number of students with exceptionalities in each classroom causes student designation practices to change. Theoretically, school district administrators made decisions based on current staffing levels, student designations, diagnostic capacity and malleability, and external pressures to adjust practice according to legal mandates.

## 3. Problem Statement and Research Questions

Compared to the United States, the Canadian education policy landscape receives little attention and scholarly interest [9]. While Canadian K-12 academic achievement outcomes are generally higher than a national-level comparison with the US, there are ongoing policy issues to address when provincial ministries of education are crafting legislation and procedures to impact a top-tier education system. Significant events, such as the 2016 Canadian supreme court ruling that directly impacted British Columbia classrooms, have downstream effects on instructional interactions; yet a retroactive policy lens is rarely applied after such events occur.

The current study seeks to address the knowledge gap of downstream instructional effects after a significant BC educational policy event. Concerning the 2016 Supreme Court of Canada decision to revert BC classroom composition, size, and ratios for teachers:

- Do student prevalence rates of disability or disorder decrease in BC schools after 2016 against existing trends?

- Are there different patterns for disability or disorder designations for rural versus urban school districts in BC after 2016?

## 4. Method

Datasets were extracted from publicly available sources. Specifically, the BC Ministry of Education, Oregon Department of Education, and Statistics Canada are the data sources for the current study. Note that the primary region of interest is BC, and OR is selected as a reasonable basis of comparison (i.e., similar geography, population metrics, and growth rate). Further, BC has distinct educational policy from OR as Canadian education is administered entirely by provincial ministries of education, and special education law is remarkably different between BC and OR. Together, these datasets help achieve three objectives for acquiring data appropriate to the research questions: Headcount data at multiple levels (e.g., district and state or province) for students with exceptionalities, disaggregated by category of exceptionality, year, and location. Population data to fit school district locations to a geographical classification (e.g., urban, suburban, rural) as specified in national documentation (e.g., urban centers have a minimum of 10,000 inhabitants based on census data) and calculate prevalence rates. For example, special education law in the United States uses a different legislative approach from BC special education law (e.g., federal educational policy in the US versus the Canadian context where educational policy is entirely implemented by provinces). Policy changes are not the same, nor are they implemented simultaneously, between Canada and the United States.

The current study is intentionally exploratory within a systematic approach of viewing data, testing a priori hypotheses against descriptive statistics, calculating effect sizes if appropriate, and, finally, exploring notable anomalies in prevalence trends that were not preconceived. As a first step, the authors took the approach of examining provincial-level data in BC. Then, BC data trends were compared against trends in OR data to see if similar rates of students were designated with exceptionalities across jurisdictions. When anomalies were suspected in the BC trends of exceptionality prevalence, effect size tests were conducted according to the research questions. Finally, any anomalies that were identified *a posteriori* were tested with effect size calculations and discussed.

The three datasets were used for analysis in R [10] for reproducibility and data visualization. There are several caveats for data use and cleaning in the current analysis. First, the BC and OR datasets were not a completely parallel comparison because the OR data set includes a broader age range of students (ages 3 - 21) compared to the BC data set (ages 5 - 19). The Oregon data set was pared down to include a similar age range to BC data; however, it is worth noting that differences in age range may represent different approaches to diagnostic categorization (e.g., intellectual disability in BC can be diagnosed at age five; whereas the Oregon data follows IDEA and it is more likely young children will be categorized as developmentally delayed). Second, data masking necessitates a decision-point for analysis.

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Specifically, the BC Ministry of Education data masks all cells with headcounts below ten students; therefore, our analyses left out these cases when computing effect sizes for provincial-level data. Data masking was most prominently an issue when examining school district-level data in BC, as smaller school districts often masked low-incidence exceptionality data. When appropriate, masked data is assigned a conservative estimate of (n = 9) such that enough data units were included in effect size comparisons. Third, Canadian census data from 2016 is used for classification for school district geographical location (e.g., urban, suburban, rural, exurban). Due to the geographical distribution of the BC population, only two categories are used for the current analyses: urban and rural. Fourth, due to low population numbers with independent schools in BC, the current study will only examine public school data for 2002 - 2019.

### 4.1 Analysis Plan

The majority of the analyses for the current study are descriptive in nature. The descriptive analysis includes a table or visual representation of students' prevalence rates or headcounts with exceptionalities over time. As the current study examines anomalies in trend data, trends that break the longitudinal trendline (e.g., a sudden drop in prevalence after a decade of linear increase in prevalence) may be examined further. That is, effect sizes between two groups (e.g., group one is three years before a policy change, and group two is three years after a policy change) may be examined to detect the magnitude of differences between groups if they are hypothesized to represent a change in practice stemming from policy implementation. More specifically, on the calculation of effect sizes, the Hedges' g statistic will be used because of the robustness against unequal group sizes.

## 5. Results

To answer the first research question, we examine the provincial-level prevalence data by exceptionality to view trendlines over 15 years. It is apparent that 2016 is not a point of inflection for any of the twelve designations listed. Low-incidence exceptionalities remain consistent (e.g., Deafblind), and high-incidence exceptionalities are linearly (e.g., Learning Disabilities) or exponentially (e.g., Autism) increasing, and some high-incidence exceptionalities are linearly decreasing (e.g., Gifted). Due to the fact that there are no significant points of inflection observed on any of the 12 trendlines in Figure 1, no further investigation (e.g., calculating effect size) was warranted.

This is roughly in line with OR's designation data, showing that there were no state-wide anomalies after the year 2016. Similar to the BC data, there is a

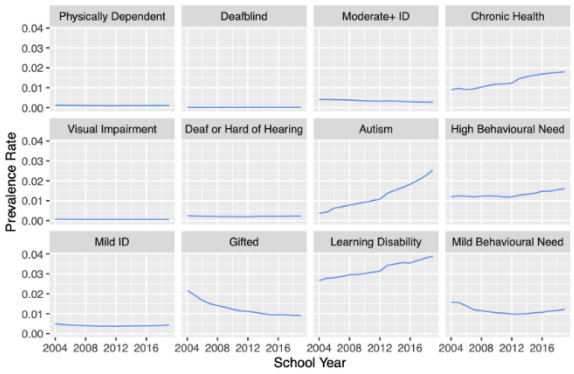


Figure 1. BC Provincial Prevalence Rates of Students with Exceptionalities by Category

steady increase in students identified on the Autism spectrum, while most categories remained relatively stable over all of the years surveyed. We can reasonably predict that more rigid categories like Deaf-Blindness and Traumatic Brain Injury will remain stable in the years to come based on visual analysis of 15-year trends in low-incidence disabilities or disorders for the OR population. When examining diagnostically malleable categories, such as students classified in OR has having an "emotional disturbance," or in BC students requiring a "high behavioural need", Oregon and BC had highly similar trends (see Figure 2). These two designation categories do not have a perfect symptomatology overlap; however, they do represent the subgroup of students with highly similar educational needs.

Taken together, we observe at the provincial- and state-levels that there is consistency in identification rates of students with exceptionalities. It is clear that a notable inflection point in 2016 for the BC data would have represented a significant change from practice, and this did not occur as both OR and BC data follow similar trends over time and the patterns observed were not specific to 2016.

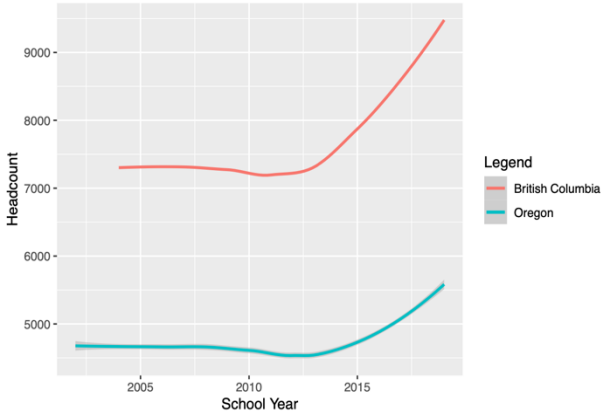


Figure 2. BC and Oregon Headcount of Students Designated as Requiring Significant Support for Emotional Regulation or Behavioural Control

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To examine potential differences within BC, the authors chose to divide school districts by urban or rural designation according to Statistics Canada guidelines on characterizing living populations. The district classification data was scaled down to include only public schools, while excluding private institutions. Several school districts were excluded from the rural data subset due to a lack of sufficient population information (e.g., Peace River North, Fraser-Cascade, Stikine, Conseil Scolaire Francophone). The urban versus rural classifications in BC were made based on the school district's geographical jurisdiction reported by the Ministry of Education and 2016 census data. A population above 100,000 is classified as urban, and below the 100,000 threshold is classified as rural. School district jurisdictions do not map on to census regions perfectly, but major metropolitan regions were distinct enough that there were no "edge cases" to make a rural versus urban classification.

There are two major outcomes of interest observed with the data sets when disaggregated by rural and urban school districts. First, the trends of rural student exceptionality designations followed urban trends closely, and urban trends were an near perfect match to provincial trends. The vast majority of urban school districts did not differ in their post-2016 prevalence rates for exceptionality designations (*p*s > 0.05). However, for diagnostically malleable categories (e.g., Moderate Behavioural designation) in rural school districts, 2016 was an inflection point for an increase in prevalence rates. When comparing prevalence rates between two groups: 2013-2016 (pre-2016 group) and 2017-2019 (post-2016 group) as cohorts of rural students, the prevalence rate increased for the following student designation categories: High Behavioural Interventions ($t(239) = -2.113$, $p = 0.036$, $g = 0.261$, CI[-0.504, -0.019]), Learning Disability ($t(262) = -1.984$, $p = 0.483$, $g = 0.230$, CI[-0.453, -0.007]), and Chronic Health ($t(255) = -2.068$, $p = 0.040$, $g = 0.247$, CI[-0.479, -0.015]). Note that the exceptionality category Mild Behavioural Intervention did not result with the same small, detectable effect size (Hedges' $g > 0.2$, and $g < 0.5$), but did show an increasing trend post-2016 ($t(195) = -0.879$, $p = 0.380$, $g = 0.120$, CI[-0.383, 0.144]).

The Gifted designation suffers a severe drop around 2004 - 2005 for urban and rural areas alike (see Figure 3), though the change is more pronounced within rural districts. The significant drop presents a second major outcome of interest, from which *a posteriori* visual analysis served as a basis for understanding notable trends. For example, multiple rural school districts reported a headcount of more than 1,000 gifted students in 2004, and then by 2008 the districts reported fewer than 10 gifted students. This magnitude of declining gifted student designations is significant and specific to rural school districts in BC. Of particular note is the school district of Prince George, where gifted students appear to have accounted for the majority of overall students with exceptionalities until 2006.

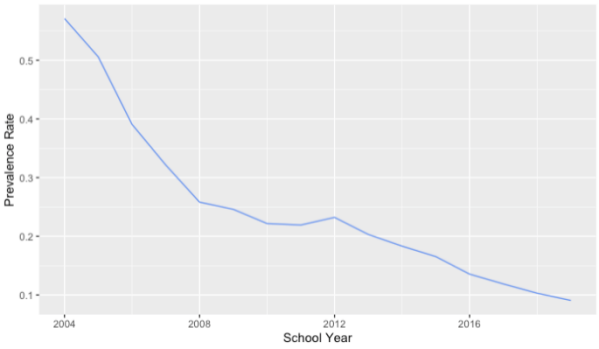


Figure 3. Prevalence of Gifted Designations in Rural BC School Districts

## 6. Discussion

Regarding the first research question, it is apparent that the 2016 Supreme Court decision did not impact any of the 12 designation categories at a provincial level, as hypothesized. The trendlines for each of the exceptionality categories remained consistent post-2016 in BC and this mapped on to OR trends in exceptionality designation reasonably closely. This finding suggests that the resources and practices around supporting students with exceptionalities did not differ significantly from a provincial policy determination in 2016.

Data on the second research question suggests that the authors correctly hypothesized differences for rural versus urban districts. Urban school districts largely followed provincial-level trends, and rural school districts had small effect sizes of increased prevalence for the post-2016 cohort of students. That is, when looking at all rural school districts and comparing two groups, four years preceding 2017 and three years 2017 through 2019, there is a significant increase in prevalence for designations in which school-based designation practitioners have diagnostic flexibility (e.g., behavioural designations, medical conditions that impact educational engagement). 2016 may have been an inflection point towards an increased prevalence of students with exceptionalities in rural school districts as savvy administrators and diagnosticians sought pathways to acquire human resources tied to staffing ratios.

## 7. Future Directions

The rapid decrease in students identified as gifted in rural school districts between 2004 and 2019 cannot be explained by one sole factor in this exploratory analysis. For this assertion's speculative nature, the authors assume that educational policy at the provincial level impacts educational practice across

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school districts. In 2006, the British Columbia Ministry of Education released Special Education Services: A Manual of Policies, Procedures, and Guidelines, which explicitly states the acceleration programming that should be afforded to students with exceptional academic talent [11]. The 2006 version of the manual was a revision of the original 1995 manual, and this initial version included scant guidance on service provision to gifted students. This 2016 shift in policy links to a higher degree of resources afforded to gifted students through "independent, guided education" (p. 52). Given the additional resources needed to properly implement gifted educational services, rural school districts may have de-designated students and sought other ways to provide instruction that meets the needs of their students. For example, Lo and colleagues [12] suggest that the BC Ministry of Education's recent curriculum update makes amends for the traditional test-and-place gifted student support model by giving educators the tools and inclusive framework to offer a rich, meaningful education to all students with exceptionalities.

## 8. Conclusion

Exploratory research in this domain adds value to the rapidly growing mountain of available data in the field of education. Novel research questions can be crafted out of exploratory analyses such as what we presented in the current paper, and we suggest that interested scholars and practitioners consider using an open-source approach to leveraging large datasets. The majority of the R code used analysis and data representation in the current paper is publicly available for reproducibility [13].

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