

## Trends in Pacific Northwest Special Education Population

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### Abstract

This paper will examine the changes in public school special education populations in Vancouver, British Columbia and Oregon over the last 20 years. The British Columbia (BC) data was pulled from an open-source data catalogue, published by the education analytics division of the Ministry of Education in British Columbia. This longitudinal data acquisition is part of formal student status reporting that is required within BC public schools - typically occurring in October of each school year. The Oregon data was pulled from the Oregon Department of Education and covers special education enrollment from 2002 - 2020. This data acquisition is part of formal student status reporting that is required for compliance with federal IDEA laws - typically occurring in November or February of each school year. Within the BC dataset, students with exceptionalities are categorized in one of 12 eligibility categories; within the Oregon dataset, this is 13 categories.

Two to three sentences of **more detailed background**, comprehensible to scientists in related disciplines.

One sentence clearly stating the **general problem** being addressed by this particular study.

One sentence summarizing the main result (with the words “**here we show**” or their equivalent).

Two or three sentences explaining what the **main result** reveals in direct comparison to what was thought to be the case previously, or how the main result adds to previous knowledge.

One or two sentences to put the results into a more **general context**.

Two or three sentences to provide a **broad perspective**, readily comprehensible to a scientist in any discipline.

*Keywords:* Vancouver, British Columbia, Oregon, Special Education, SpEd

Word count:  $0 < n < 1,000,000$

## Trends in Pacific Northwest Special Education Population

### Introduction

Our project was built around two datasets detailing head counts of students with exceptionalities eligible for special education services aged 6-21. The datasets detail the categorization for special education eligibility in public schools within British Columbia (BC) and Oregon (OR). The head counts from BC are collected from 1996/1997 to the most recent data from 2019/2020. The OR head counts include years 2002-2020. Levels of categorization include school- district- and provincial-level head counts for BC. The OR data set includes state-wide head counts that are not aggregated by school or district.

We intend to explore several questions regarding longitudinal trends. Firstly, we hope to analyze trends in disability prevalence over time. We will engage in a discussion on developmental trajectories by studying how trends shift from static/linear to increasing linear trends based on age of diagnosis for the OR data, which can serve as a springboard to make inferences about BC data. In studying the differences and similarities between the two datasets we will also engage in a discussion on diagnosis terminology across regions with respect to the definitions as detailed by the Diagnostic and Statistical Manual of Mental Disorders (DSM), in part as a response to a challenge set by differing terminology between BC/OR categorization.

Secondly, we hope to more closely analyze any changes, or lack thereof, within the BC data following the year 2016 during which a BC Supreme Court ruled in favor of limiting the number of special needs students in classrooms and expanding the number of specialist teachers schools are required to hire.

Finally, we will also explore differences between urban and rural school districts in BC. Districts are categorized by population size and proximity to metropolitan areas, as recorded and defined by the Statistics Canada census from 2016. Two fringe rural districts

exhibiting high populations will be picked out and high-incidence diagnoses will be compared to those of other regions over time.

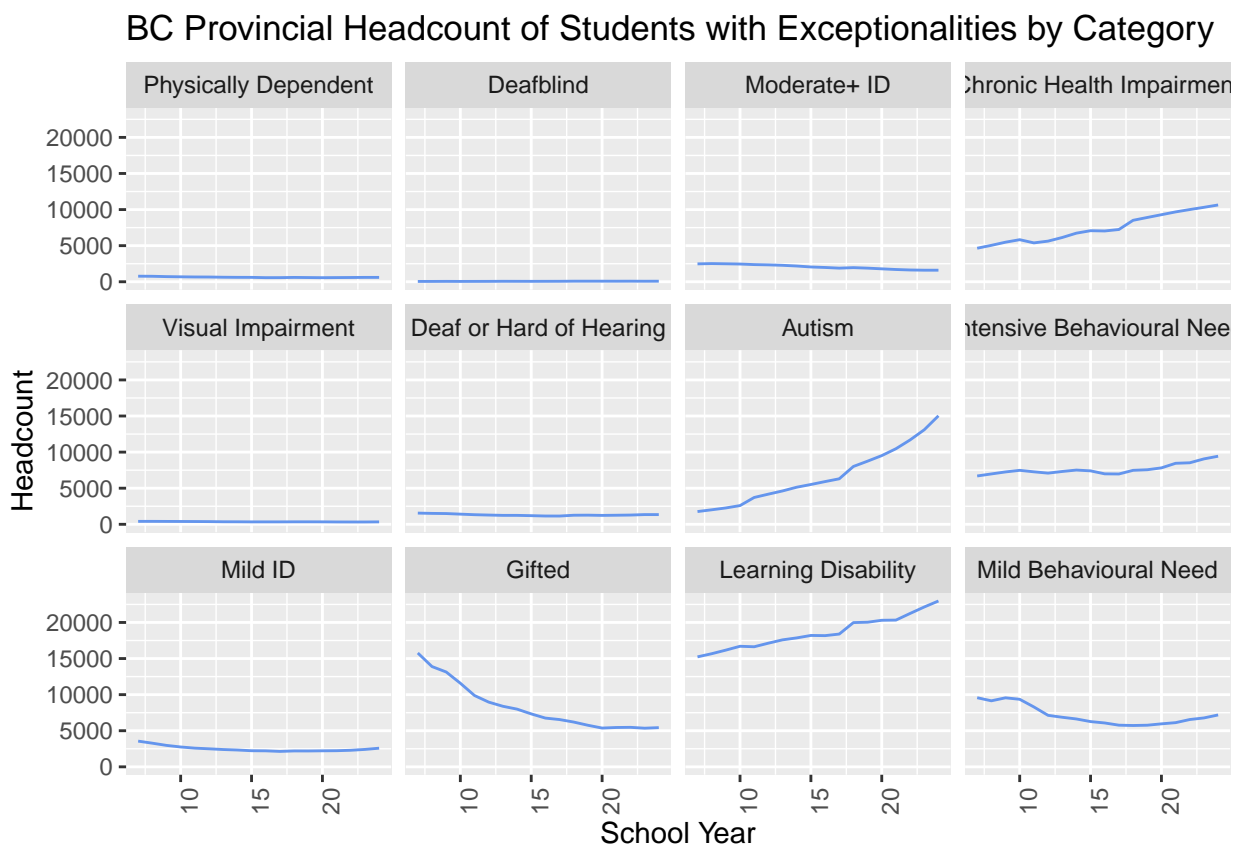
– more introductory text here – Children designated with Special Needs categories have predominantly increased at different rates in British Columbia over time. The figure below demonstrates growth of 12 potential designations over an 18 year time period:

```
## Warning: Problem with 'mutate()' input 'NUMBER_OF_STUDENTS'.
```

```
## i NAs introduced by coercion
```

```
## i Input 'NUMBER_OF_STUDENTS' is 'as.integer(NUMBER_OF_STUDENTS)'.
```

```
## Warning in mask$eval_all_mutate(dots[[i]]): NAs introduced by coercion
```



```
## Warning in FUN(newX[, i], ...): NAs introduced by coercion
```

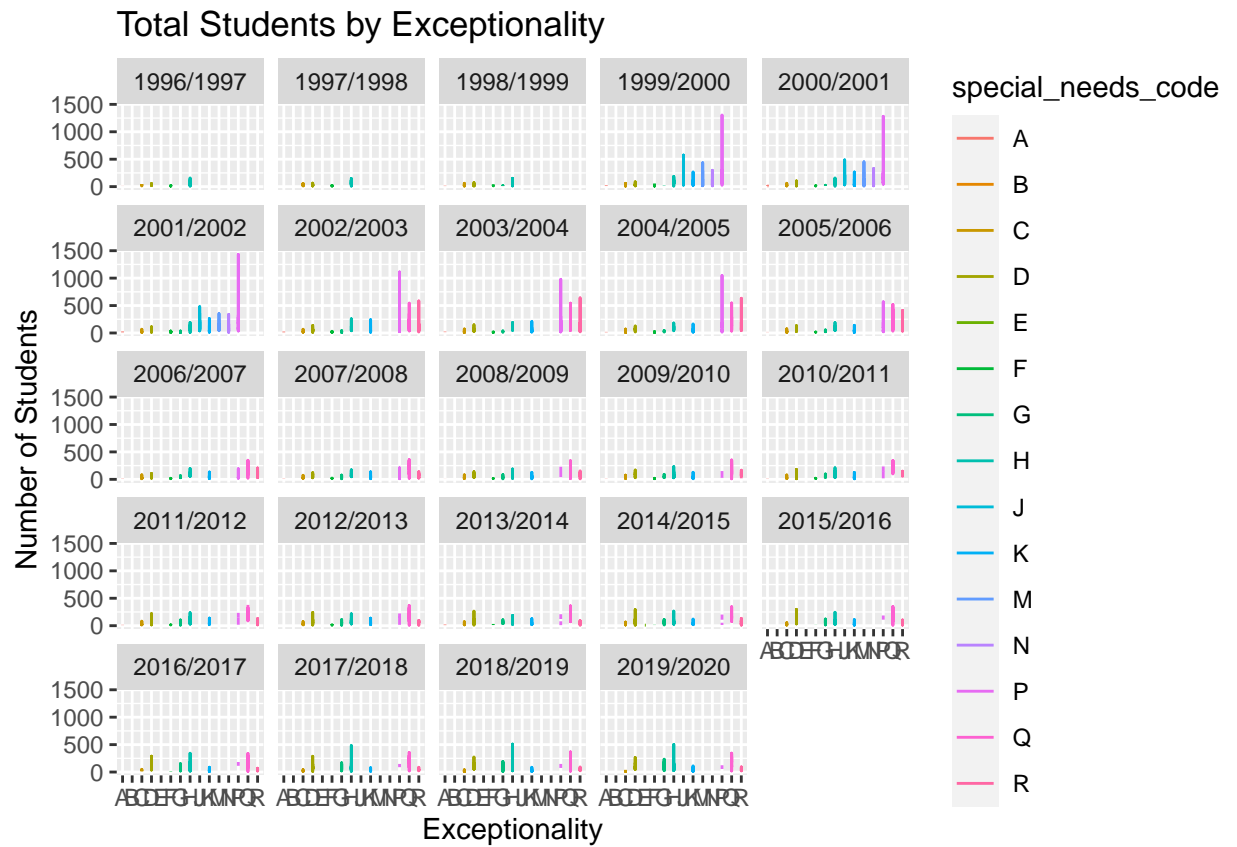
```
## [1] "1996/1997" "1997/1998" "1998/1999" "1999/2000" "2000/2001" "2001/2002"
## [7] "2002/2003" "2003/2004" "2004/2005" "2005/2006" "2006/2007" "2007/2008"
## [13] "2008/2009" "2009/2010" "2010/2011" "2011/2012" "2012/2013" "2013/2014"
## [19] "2014/2015" "2015/2016" "2016/2017" "2017/2018" "2018/2019" "2019/2020"
```

```
## Warning in FUN(newX[, i], ...): NAs introduced by coercion
```

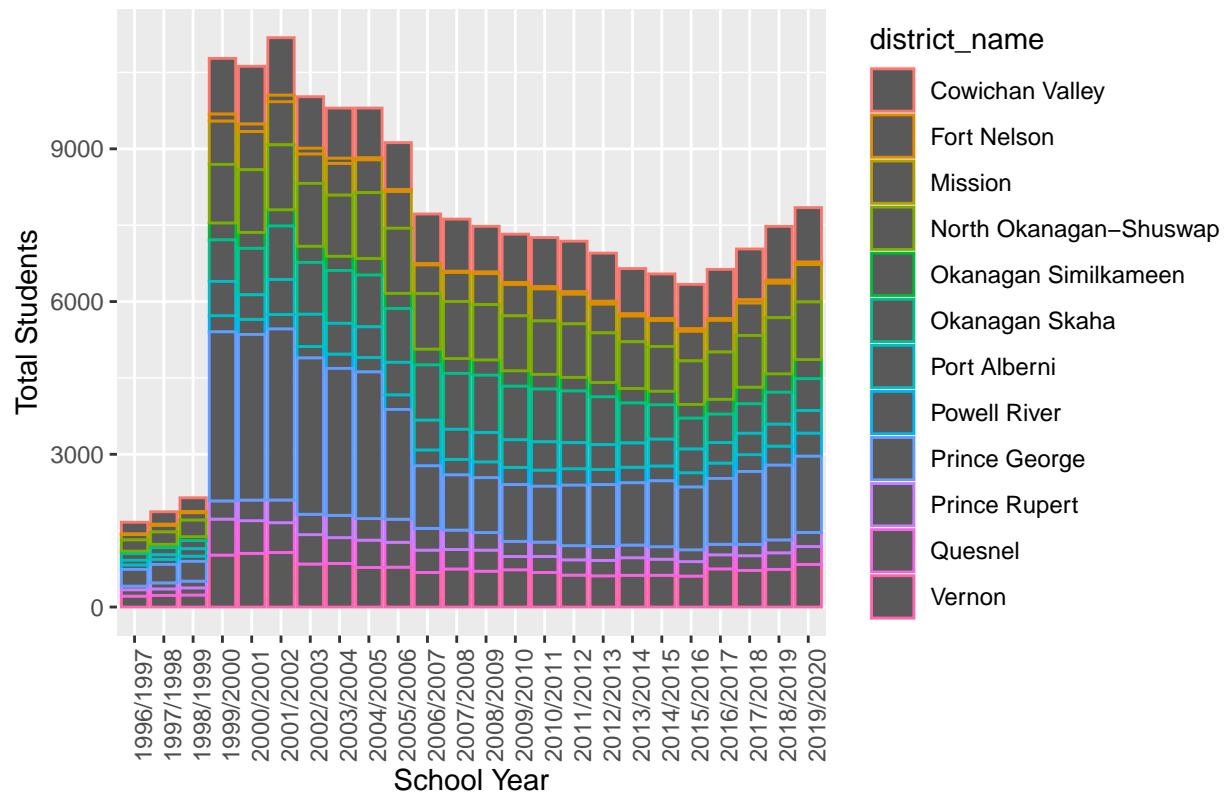
The district classification data was scaled down to include only public schools, while excluding private institutions. The school districts of Southeast Kootenay, Rocky Mountain, Kootenay Lake, Arrow Lakes, Revelstoke, Kootenay-Columbia, Cariboo-Chilcotin, Sea to Sky, Central Coast, Haida Gwaii, Boundary, Bulkley Valley, Nicola-Simikameen, Peace River South, Peace River North, Gulf Islands, Qualicum, Comox Valley, Campbell River, Gold Trail, Fraser-Cascade, Coast Mountains, Vancouver Island West, Vancouver Island North, Stikine, Nechako Lakes, Nisga'a, and Conseil scolaire francophone were excluded from the data set due to the lack of sufficient population information. The urban vs. rural classifications were made based on the district's population on the 2016 census. If the population was above 100,000 individuals, it is classified as urban. If the population was below 99,999 individuals, then it is classified as rural.

This table displays the census results from 2011 and 2016 for our school districts. Many of the populations have stayed consistent within their urban or rural category. Three districts to note from the table are Nanaimo, Kamloops, and Chilliwack. In 2011, they were rural, but for our dataset they have been classified as urban due to their population increase in 2016.

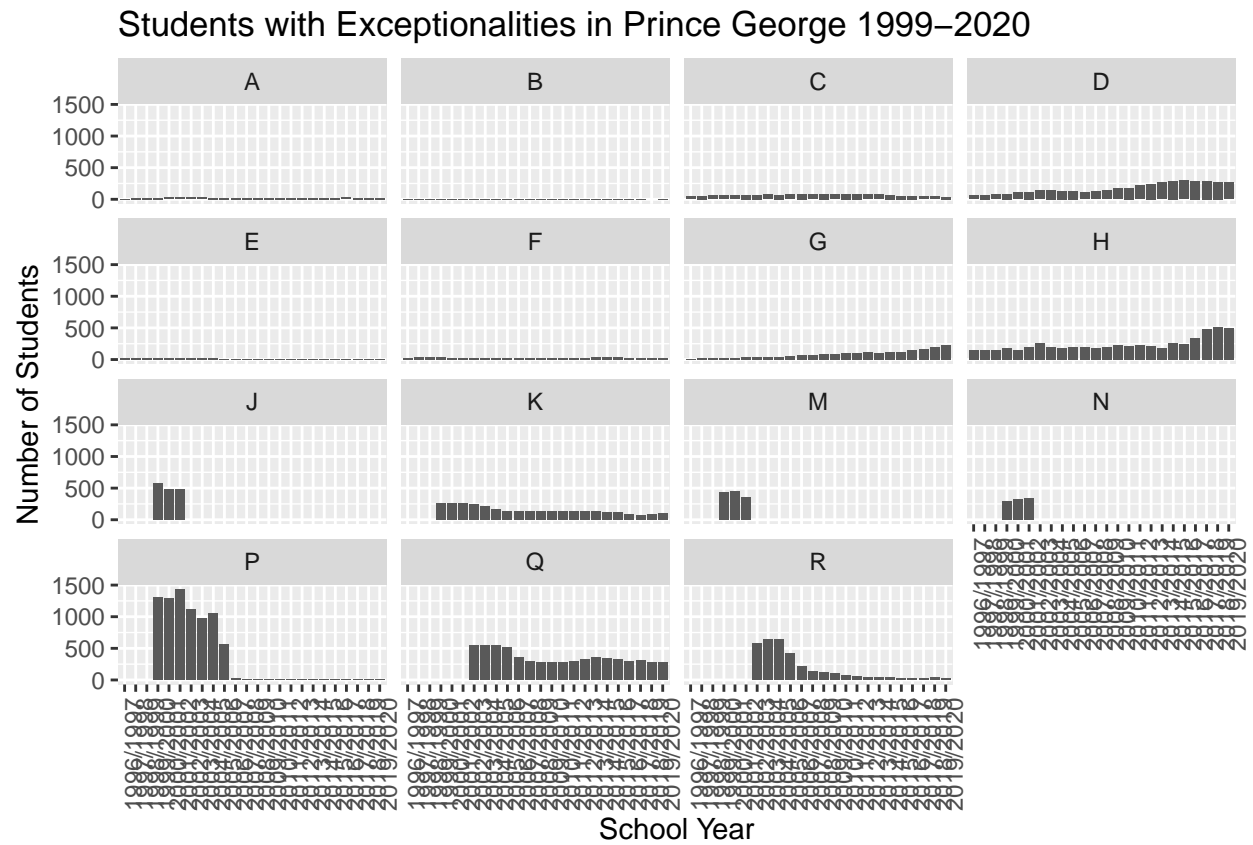
```
## Warning: Removed 129 row(s) containing missing values (geom_path).
```



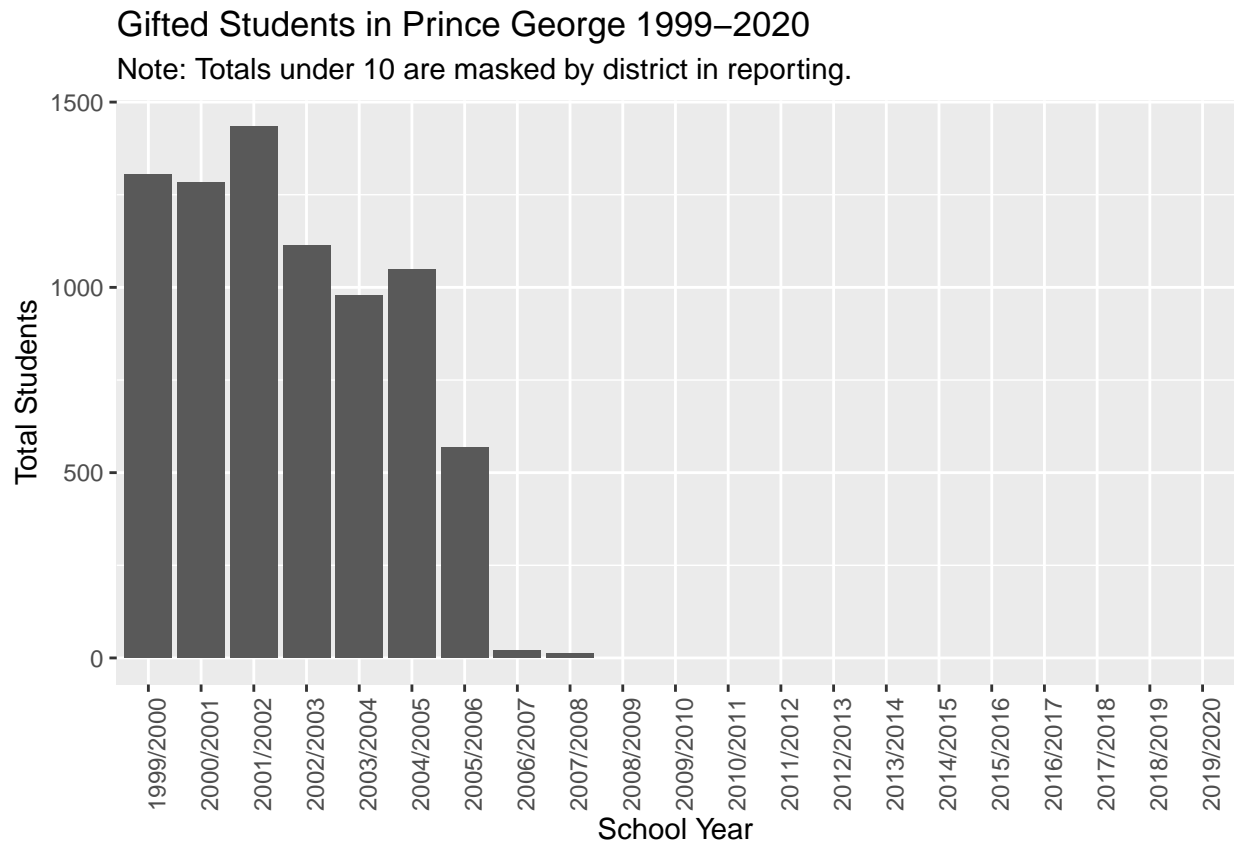
## Students with Exceptionalities in Rural Districts 1996–2020

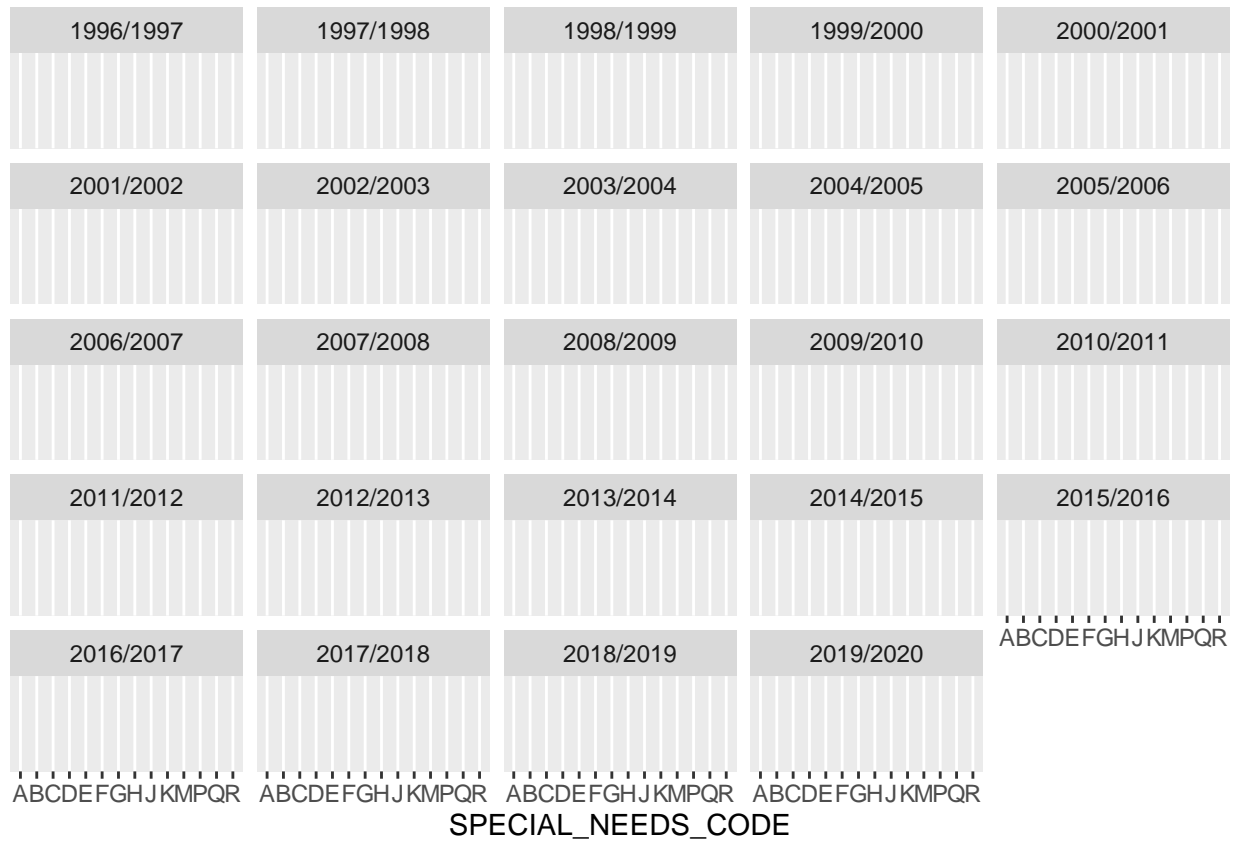






## Warning: Removed 12 rows containing missing values (position\_stack).

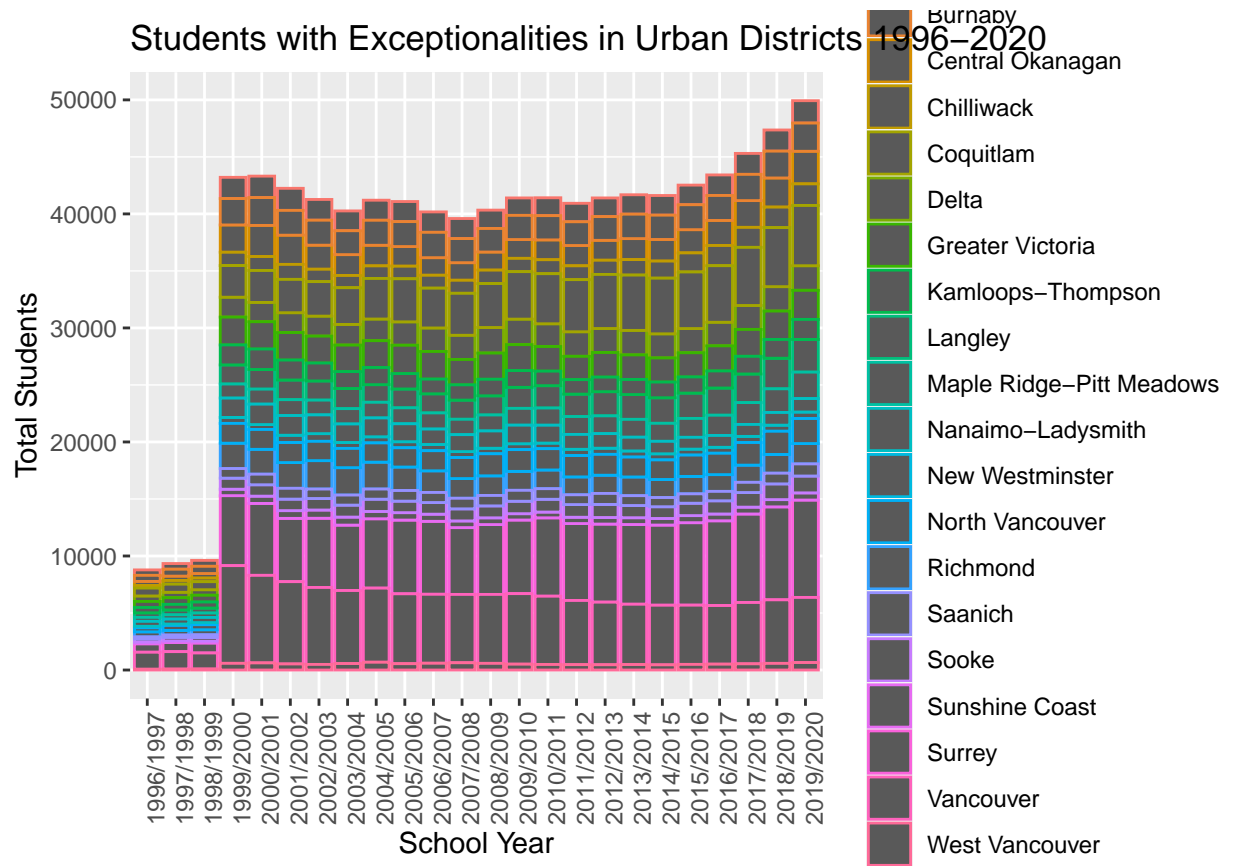




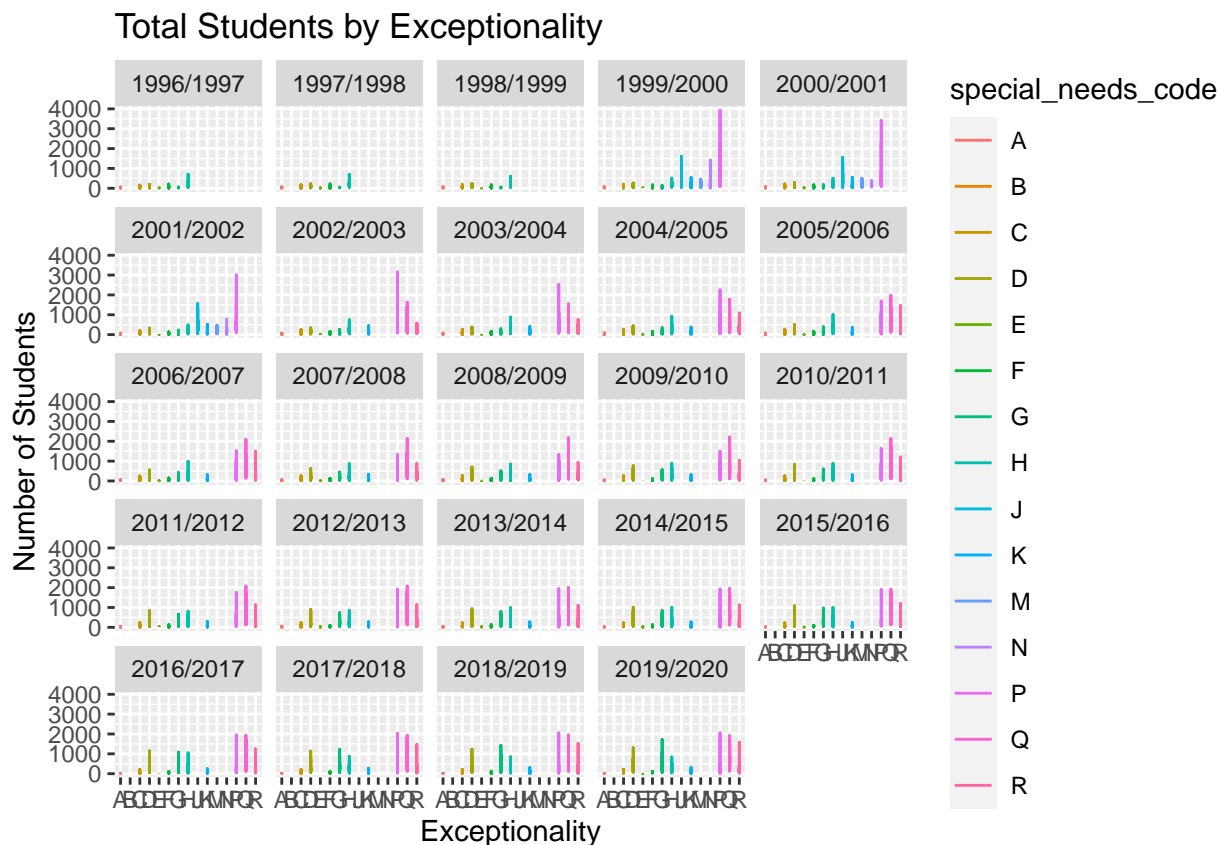
```
## geom_col: width = NULL, na.rm = FALSE
```

```
## stat_identity: na.rm = FALSE
```

```
## position_stack
```



## Warning: Removed 25 row(s) containing missing values (geom\_path).



```
## # A tibble: 198 x 18
```

	year	disability	x6	x7	x8	x9	x10	x11	x12	x13	x14	x15
	<chr>	<chr>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>
##	1	2002~	INTELLECT~	135	172	220	261	279	303	370	364	378
##	2	2002~	HEARING I~	46	66	69	67	79	78	69	70	72
##	3	2002~	SPEECH OR~	2502	2466	2443	2205	1894	1282	874	677	493
##	4	2002~	VISUAL IM~	18	27	25	16	12	26	19	24	31
##	5	2002~	EMOTIONAL~	81	178	241	292	347	433	504	487	549
##	6	2002~	ORTHOPEDI~	65	77	64	49	64	71	50	48	44
##	7	2002~	DEAF-BLIN~	0	2	0	0	1	0	2	0	4
##	8	2002~	MULTIPLE ~	0	0	0	0	0	0	0	0	0
##	9	2002~	AUTISM	267	289	290	334	325	316	290	256	243
##	10	2002~	TRAUMATIC~	6	11	17	23	22	19	21	23	36

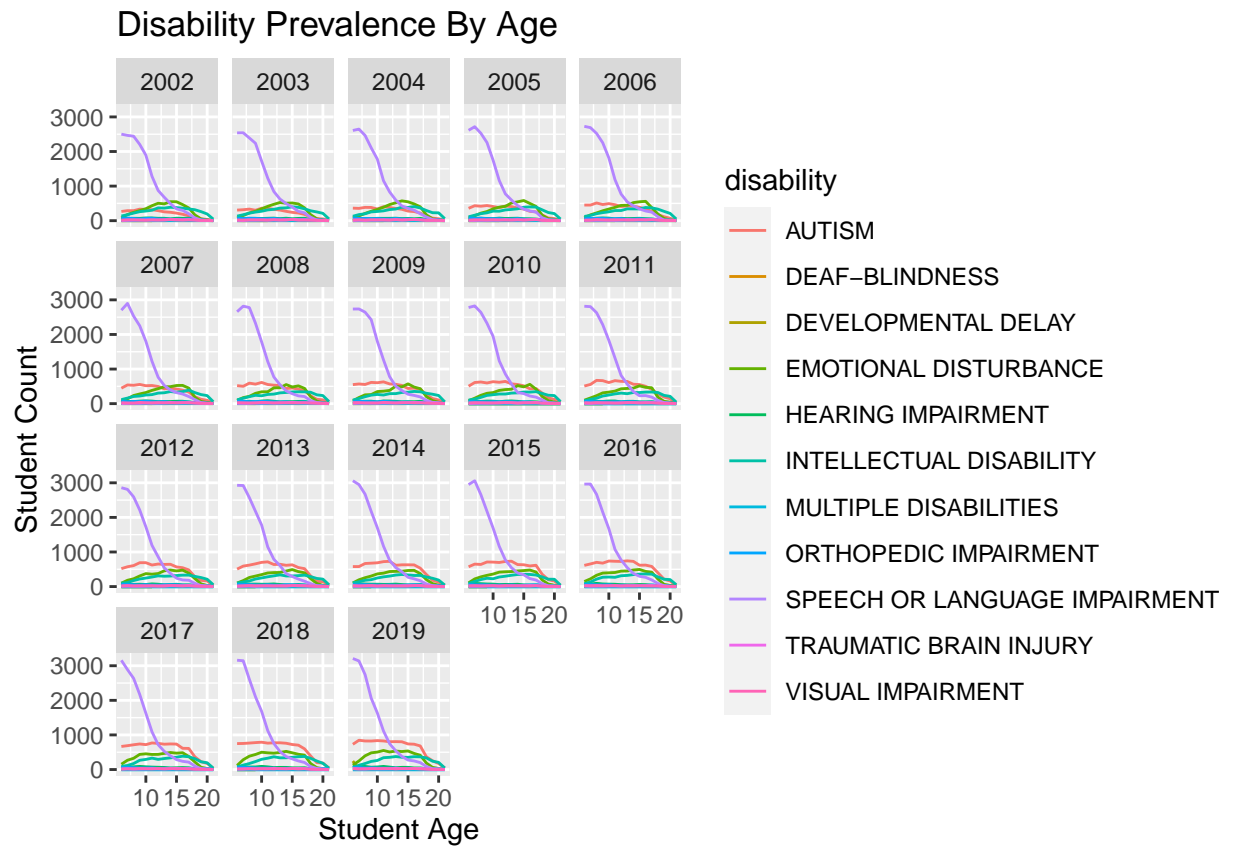
```
## # ... with 188 more rows, and 6 more variables: x16 <dbl>, x17 <dbl>,
## #   x18 <dbl>, x19 <dbl>, x20 <dbl>, x21 <dbl>
```

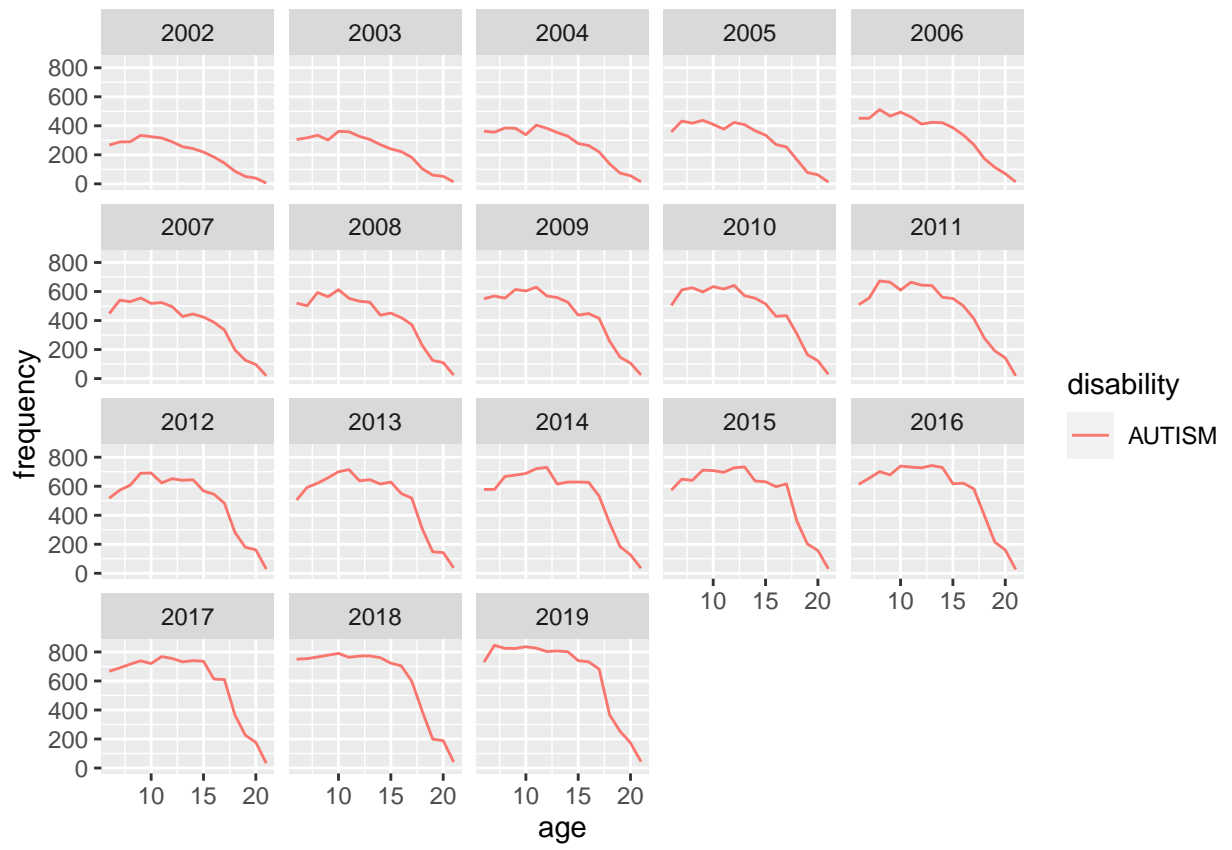
```
## # A tibble: 198 x 3
```

```
## # Groups:   year [18]
```

	year	disability	total
		<dbl> <chr>	<dbl>
##	1	2002 AUTISM	3339
##	2	2002 DEAF-BLINDNESS	17
##	3	2002 DEVELOPMENTAL DELAY	0
##	4	2002 EMOTIONAL DISTURBANCE	4736
##	5	2002 HEARING IMPAIRMENT	873
##	6	2002 INTELLECTUAL DISABILITY	4387
##	7	2002 MULTIPLE DISABILITIES	0
##	8	2002 ORTHOPEDIC IMPAIRMENT	754
##	9	2002 SPEECH OR LANGUAGE IMPAIRMENT	15784
##	10	2002 TRAUMATIC BRAIN INJURY	306
##	# ... with 188 more rows		

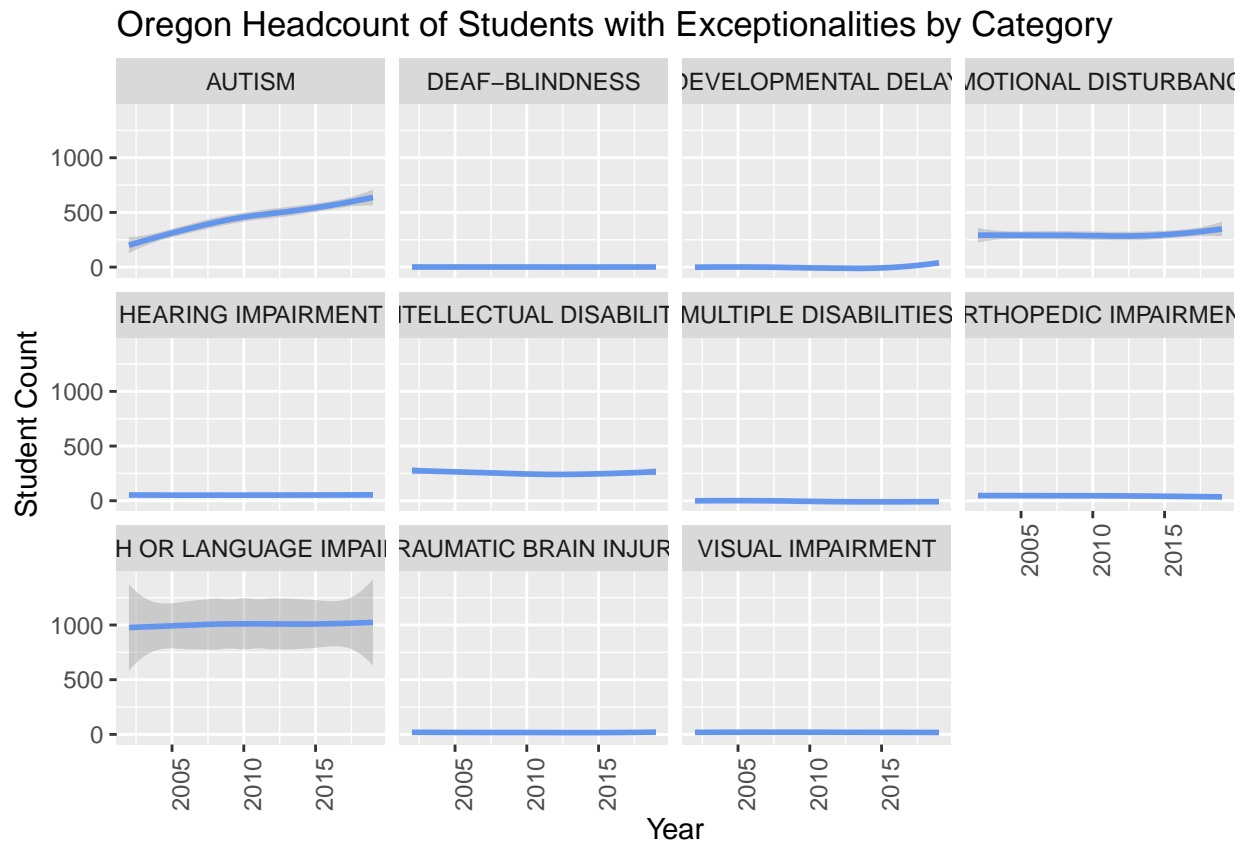
```
## Warning: Removed 12 row(s) containing missing values (geom_path).
```





## Warning: Removed 190 rows containing non-finite values (stat\_smooth).





## Methods

We report how we determined our sample size, all data exclusions (if any), all manipulations, and all measures in the study.

### Participants

### Material

### Procedure

### Data analysis

We used R (Version 4.0.3; R Core Team, 2020) and the R-packages *dplyr* (Version 1.0.2; Wickham et al., 2020), *forcats* (Version 0.5.0; Wickham, 2020a), *ggplot2* (Version

3.3.2; Wickham, 2016), *here* (Version 0.1; Müller, 2017), *janitor* (Version 2.0.1; Firke, 2020), *papaja* (Version 0.1.0.9997; Aust & Barth, 2020), *purrr* (Version 0.3.4; Henry & Wickham, 2020), *readr* (Version 1.4.0; Wickham & Hester, 2020), *readxl* (Version 1.3.1; Wickham & Bryan, 2019), *stringr* (Version 1.4.0; Wickham, 2019), *tibble* (Version 3.0.4; Müller & Wickham, 2020), *tidyr* (Version 1.1.2; Wickham, 2020b), and *tidyverse* (Version 1.3.0; Wickham, Averick, et al., 2019) for all our analyses.

## Results

## Discussion

## References

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Wickham, H., & Hester, J. (2020). *Readr: Read rectangular text data*. Retrieved from <https://CRAN.R-project.org/package=readr>

Table 1

*District Classification by Population According to 2016 Census*

District Number	District Name	Population	Classification	Number of Students
022	Vernon	61,334	Rural	16,768
023	Central Okanagan	194,882	Urban	43,609
028	Quesnel	23,146	Rural	9,036
033	Chilliwack	101,512	Urban	28,997
034	Abbotsford	180,518	Urban	38,369
035	Langley	2,463,431	Urban	43,043
036	Surrey	2,463,431	Urban	143,222
037	Delta	2,463,431	Urban	43,897
038	Richmond	2,463,431	Urban	40,221
039	Vancouver	2,463,431	Urban	132,584
040	New Westminster	2,463,431	Urban	11,714
041	Burnaby	2,463,431	Urban	47,952
042	Maple Ridge-Pitt Meadows	2,463,431	Urban	33,633
043	Coquitlam	2,463,431	Urban	88,291
044	North Vancouver	2,463,431	Urban	39,657
045	West Vancouver	2,463,431	Urban	11,732
046	Sunshine Coast	2,463,431	Urban	13,283
047	Powell River	16,783	Rural	6,816
052	Prince Rupert	12,687	Rural	7,222
053	Okanagan Similkameen	43,432	Rural	6,596
057	Prince George	86,622	Rural	39,443
061	Greater Victoria	367,770	Urban	50,051
062	Sooke	367,770	Urban	24,126
063	Saanich	367,770	Urban	19,533
067	Okanagan Shuswap	43,432	Rural	19,156
068	Nanaimo Ladysmith	104,936	Urban	30,870