Final Project

for

Geob 270 L2B: Geographic Information Science

Effects of Increasing the Speed Limit on Major Highways in BC

Submitted by

Project Group 2
Lia Slager, Srilakshmi Narayana, Uzair Siddique

for

Dr. Sally Hermansen
Department of Geography at the University of British Columbia
@geog.ubc.ca

04/09/2019

Table of Contents

Abstract

Over the last 5 years, the highway network under BC provincial jurisdiction has experienced significant increases and decreases in speed limits with a difference of up to 20 km/h. The changes in speed have been met with widespread debate regarding the effects of speed on road safety and its impacts on accident numbers. Pro-speed arguments have included that higher speed limits increase road safety and traffic efficiency, these arguments are conversely met with arguments saying that the increased speed limits would lead to decreased road safety and a large spike in accident numbers.

With 3 years of published data, this study investigates whether there is an obvious correlation between accidents numbers and the increases in speed on provincial highways that were instigated July 2014. While this study acknowledges that there are a number of factors and drivers that influence road safety, this study explores the possible correlation by looking at accident numbers per district that experience provincial highway network overlay. The study does not include changes in other important factors that influence road safety (such as changes in weather, roadway conditions, traffic numbers, changes in speed on municipal or federal roadways etc.) and therefore should only be considered an inquiry but by no means a full assessment.

Description

July of 2014, the BC Liberal Government announced a wide slate of changes to 9,100 km of highways under provincial jurisdiction, this included speed limit increases on dozens of highways comprised of 1,300 kilometers of roadways (Maclean's, 2014). Select stretches of highway were increased to a maximum speed of 120 km/h (making those stretches of highway the fastest in Canada) with a difference of up to 20 km/h, including the Connector and the Island Highway.

Pro-speed arguments have made their case referencing evidence that showed that drivers and motorists pick their travel speed based on driving conditions and road characteristics, rather than posted speed limits and that previous studies have suggested that raising speed limits don't actually encourage faster average speeds but rather makes lawful what is already common behaviour. The changes were supposedly implemented after careful consideration, calculation, and assessment using speed zoning practices recommended by the Institute of Transportation Engineers (Lindsay, 2018).

The BC's Transportation Ministry stated that the increase in speed limits were "based on a careful and thorough engineering assessment using speed zoning practices recommended by the Institute of Transportation Engineers and adopted by road authorities throughout North

America" (Ministry of Transportation, 2014 as cited by Lindsay, 2018) The B.C. Transportation and Infrastructure Minister Todd Stone went as far to claim that the changes would actually help to improve mobility and safety of provincial highways, as studies have shown roadways are safest when the difference between the slowest and fastest cars is minimal. The changes were conversely met with concerns expressed by the RCMP and BC Association of Chiefs who claim that higher speed limits will ultimately decrease road safety and lead to an increase in accidents (Maclean's, 2014).

It has been 5 years since the BC Liberals implemented the speed limit changes. Since 2014 it has been suggested that certain areas have experienced a significant rise in accidents and insurance claims (Lindsay, 2018). In response, the now in power New Democrat Party has issued an analysis of the last 3 years of crash data to determine the Provinces next steps (Lindsay, 2018). Using data that was collected from 2013-2016, this study hopes to similarly explore the changes in accident trends between the years of 2014-2018, and determine the if there is a possible correlation between motor vehicle accidents and the change in speed limits. The study does not include changes in other important factors that influence road safety (such as changes in weather, roadway conditions, traffic numbers, changes in speed on municipal or federal roadways, etc.) and therefore should only be considered an inquiry but by no means a full assessment.

Methodology

The methodology for this inquiry followed the logic that a significant change in accident numbers could be identified by looking at the number of accidents per district that overlapped with the provincial highway network. If there was a significant increase or decrease in accidents after 2014 then that would suggest a possible correlation between the changes in speed limits and its impacts on accident numbers.

A simple Canada polygon spatial layer was added to the map in order to obtain BC as its own layer, by selecting the province from the attribute table and added to the map using the export data function. Secondly, the Surveyed Railways, Highways and Roads of Canada layer was obtained through DataBC. In order to only present the provincial highways of Canada, a selection using the attribute table was carried out in order to isolate all highways from that initial layer which was then added to the map as its own distinct layer. The newly formed highways of Canada layer was then clipped to the BC layer. Since the BC highway network layer initially existed as a polygon, in order to identify the highways more clearly the layer was converted from polygons to polylines using the ArcGIS Data Management Tools.

The inquest was started by downloading accident data through DataBC. Initially, a spatial layer of BC's emergency management regions was downloaded and then the BC motor vehicular accident data, categorized by districts, was obtained as a .csv file since accidents by region were

not available. To join the accidents by districts attribute data table to the regions of BC, the districts were manually selected and grouped into the regions that they geographically fall into. This was done by years ranging from 2013-2016, in a new CSV file. The regions were joined by name and reclassified. To classify the data, we used manual breaks with five classes. 0-30, 31-60, 61-90, 91-120 to differentiate between the frequency of accidents in each region.

A Major Cities of Canada layer was added to our map which was clipped to BC and then a further re-selection was carried out to obtain relatively prominent cities from the Major Cities layer, this was done to give spatial context to the highway where the speed limits had increased. Once the highway network for the whole of BC had been obtained, a manual selection was performed to highlight and identify the sections of highway that underwent an increase in their official speed limits. Finally, these two combined data sets and map variables were then overlain with the BC accident data.

To identify possible trends in motor vehicle accident data we compared accident numbers from 2013 data to accident numbers that occurred after the period of 2014. It is important to note that the majority of the speed increases occurred in the month of July in 2014 (halfway through the year). Therefore, if there was a significant increase in accidents following these changes they would be noticed primarily in the time period between 2015-2016 in contrast to data found in our base year of 2013.

Results

Year	Central Accidents	North East Accidents	North West Accidents	Vancouver Island Accidents	South East Accidents	South West Accidents
2013	76	53	0 (No data)	42	0 (No data)	98
2014	110	56	0 (No data)	27	0 (No data)	93
2015	99	58	0 (No data)	38	0 (No data)	100
2016	82	57	0 (No data)	39	0 (No data)	109

In the Central region of BC, comparing to the base year 2013, when the speed limit was increased in 2014 the number of accidents increased by 45%. Then in 2015, there was a 30% increase, and 2016 saw a 7% increase. Overall, this region has had an increase in the number of accidents.

In the Northeast region of BC, compared to the base year 2013, in 2014 there was 6% increase in the number of accidents, in 2015 there was a 9% increase, in 2016 there was a 7% increase. Overall, again this region has experienced an increase in accidents

In the Southwest region of BC, compared to the base year 2013, in 2014 there was a 5% decrease in the number of accidents, in 2015 there was a 2% increase and in 2016 there was an 11% increase. Overall, this region has seen an increase and a decrease in the number of accidents.

In the Vancouver Island region of BC, compared to the base year 2013, in 2014 there was a 36% decrease in the number of accidents, in 2015 there was a 10% decrease, in 2016 there was a 7% decrease. Overall, this region is the only region that has experienced a consistent decrease in the number of accidents since the speed limit was increased.

Discussion

The results of this inquiry suggest that there is no obvious and direct correlation with the increase in speed limits to the number of accidents. The conclusion of this overarching study lines up with research evidence that ultimately, posted speed limits do not change the number of accidents (Maclean's). However, a number of interesting trends can be explored when looking at the data sets on a smaller scale and comparing it to other News findings.

For example, one district that stands out, experiencing a significant spike in speed limits after 2014 (when the speed limit was initially increased) was in the district of the Central region of BC. The dataset shows an initial rise in the number of accidents during the year of 2014, however, those numbers dropped later in 2015 and 2016 but still remained higher than the initial number of accidents in 2013.

While Central BC experienced the most dramatic and significant increase in accidents, there was an overall increase in the number of accidents that can be noted for most other regions in 2014. This study transcripts two significant and therefore noteworthy observations:

1) The number of accidents in other regions did not rise as drastically as the region of Central BC

And

2) the data from Vancouver Island contrastingly showed a considerable drop in the number of accidents as compared to the number of accidents that took place before the new speed limits went into effect.

When further exploring these observations, it should be noted that the majority of the sections of the highways that underwent the increase in speed limits were located in the Central BC region. This trend can be seen from the accident dataset. While all of the regions experienced an initial spike in accident numbers in the year of 2014, it was the Central BC region which experienced the most dramatic increase in accident numbers. South West BC also showed an increase in the number of accidents even though, the increase was relatively less dramatic.

A few speculations can be made to theorize the cause of these trends. It could be speculated that the initial spike in accident numbers, support research evidence that suggests roadways are safest when the difference between the highest and lowest motorist speeds is minimized (MacLean's,2014). While this is extremely speculative as there is no concrete evidence or way to determine this from our findings, this occurrence could correlate with the initial changes in speed limits. It could be theorized that as motorists slowly adopt higher speeds in their driving the initial difference in speed following the posted speed limit of motorists is greater.

It is also interesting to note that related studies have found that speed increases disproportionately affect more rural central BC driving conditions. An article posted by CBC quotes a study which writes: "travel in central B.C. is particularly hazardous because of a harsh winter climate, mountainous terrain causing curvilinear alignments, fewer roundabouts (which reduce risk of side impact collisions), and the fact that large regions of the province are remote, with limited access to post-crash trauma care," (Lindsay, 2018).

Another interesting point is while Vancouver Island had the longest stretches of highway roadways that underwent an increase in the speed limit but the region, itself, proved to be an outlier, compared to all other regions. The district of Vancouver Island experienced a sharp decrease in the number of accidents following the speed limit changes in 2014. While there are a number of factors which could contribute to this occurrence, one possible explanation might be that: the provincial network of highways on Vancouver Island consists of one main freeway, Highway 19 that runs along the length of the East shore of the island, with smaller sections branching off to head into towns. When this is compared to areas such as the Lower Mainland, which consists of a relatively denser and more complicated network of highways which intersect and merge with each other at multiple junction points, the simplicity of the highway network could be an essential contributing factor in this occurrence.

Conversely, our findings could also support research evidence that suggested that posted speed limits do not have any effect on accidents. Such studies have found that while speed, itself, is an influential driver of accident rates, posted speed limits are not. An editorial written by Maclean's entitled *Editorial: It's time for Canada to increase highway speed limits* outlined

studies which found that drivers ultimately pick their speeds based on roadway conditions and not posted speed limits (2014).

In conclusion, the overall results of our study did not show an obvious correlation between posted speed limits and the number of accidents, however when the trends of different regions are looked at coupled with different studies and arguments made by news outlets, it can be speculated that posted speed limits work with a number of different factors to cause accidents. For example, the trends might suggest that while posted speed limits may have led to an increase in speed limits in rural BC where weather is unpredictable, conversely when coupled with the more simplistic network of highways on Vancouver Island, increased speed limits may have led to safer and more efficient traffic patterns. While the findings of our inquiry are inconclusive, the different patterns and trends of different regions suggest that roadway safety is ultimately complex and influenced by a number of interacting factors. Our inquiry ultimately concludes that roadway safety would benefit from a more in-depth assessment of the effects of speed limits.

Error and Uncertainty

As road safety is dictated by a number of interconnected and changing factors, there is a number of factors which could add to error and uncertainty in our inquest. The information and datasets used simply based on the comparison of the number of accidents before and after the speed limits were increased. This study assumes that speed and the number of accidents is straightforward and directly connected but in reality, a number of factors influence accident numbers (including speed). This study had no way of determining whether the motor vehicular accidents were caused by the increased speed limits, other important factors (such as bad weather conditions, road infrastructure quality, traffic numbers, driver sobriety or a combination of the aforementioned factors), or a combination of all these factors.

Unfortunately, the study had access to few resources and therefore some of the datasets were not ideal. The data that was obtained for accident numbers was only available per district and the location of these accidents was not available. Therefore, this study was looking for a significant increase in accidents per district which overlapped with provincial highways. The data obtained from DataBC for accidents are given by much larger regions than would be idyllic. Additionally, the datasets didn't specify the specific locations that the accidents occurred on or the causes of the accidents, therefore, the study didn't have a way to determine out if the accidents occurred on a provincial, municipal or a federal roadway. Furthermore, there were also a couple of districts that overlapped in two regions and therefore, a decision about what district the data would appear in had to be made this would ultimately impact our results.

Human error also adds into this equation. To conduct our study the number of accidents per district had to be added in and broken down manually. While we were careful in our manual calculations and entries, human calculation always adds an additional element of error.

Research has provided evidence that suggests that while speed can greatly impact accident numbers, speed limits have a limited effect on the actual speed of motorists. Therefore, it could be possible that the 2014 changes do not directly affect accident numbers. However, due in part to a large number of factors that cause and influence roadway accidents, and the high level of uncertainty these factors add to our inquest, our study should not be considered by any means a full assessment. This inquiry looked for an obvious spike or decline in accident numbers that could be correlated to the speed limit increases on provincial highways. The high level of uncertainty in our study ultimately calls for further research and recommendations.

Further Research/Recommendations

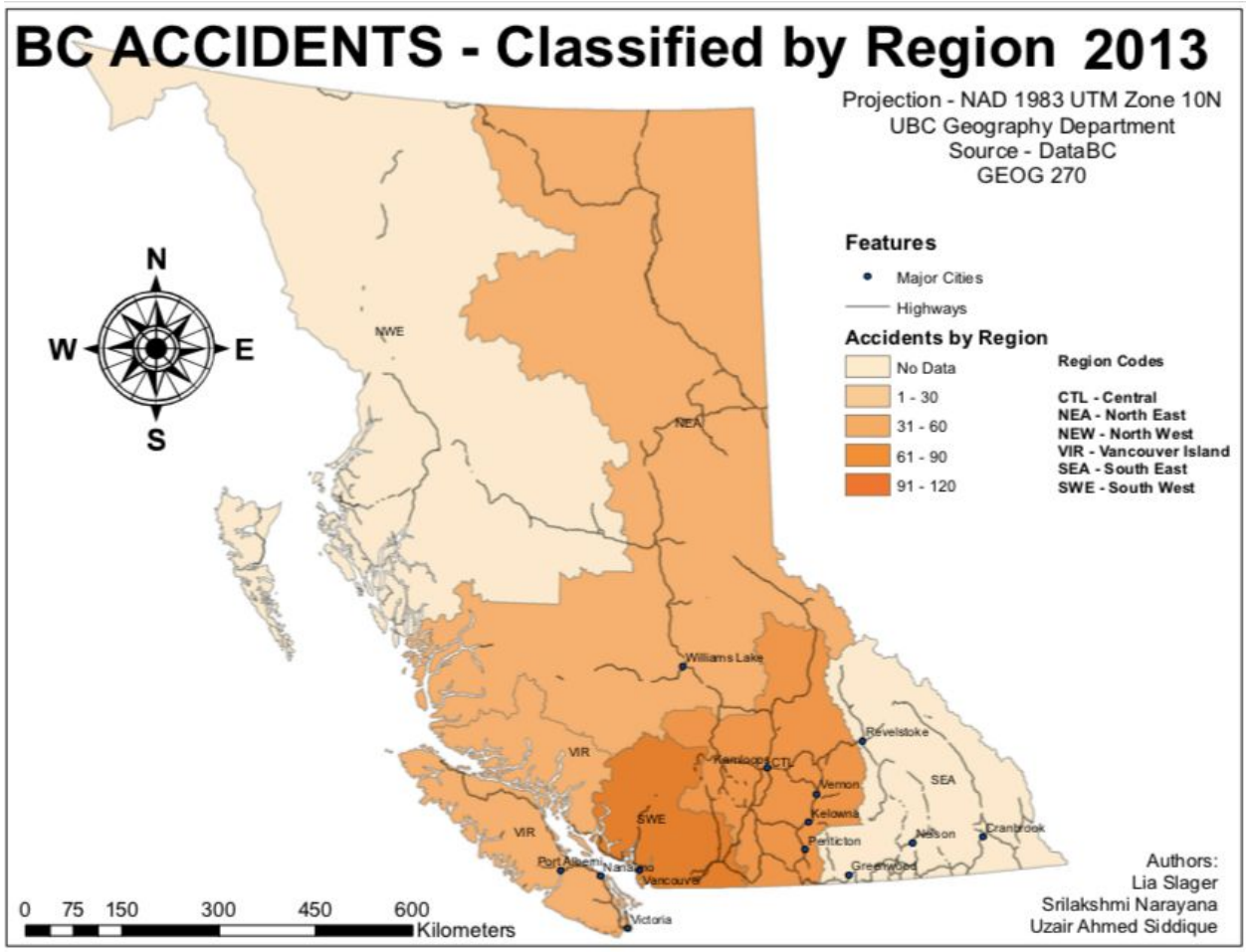
While the results of this inquest did not suggest any direct and obvious correlation to trends in accidents with the changes in speed limits, further research must be done to determine how and whether the changes in speed limits have affected or caused any changes in the number of accidents.

As the New Democratic Party has launched an inquiry by the Ministry of Transport to provide recommendations on how the province should move forward, these recommendations need to be made after a study which looks at the effects of posted speed limits, when coupled with other driving factors. A full and complete assessment of all influencing factors would be ideal to make any recommendations for future changes in speed limits or highway infrastructure. A full and complete assessment would ideally be completed at a smaller scale and look more specifically at roadway jurisdiction. As accidents are influenced by a combination of factors, a full and complete assessment would need to consider influencing factors such as the location of accidents, changing traffic levels, driver sobriety, quality of road infrastructure, changing population demographics, the specific changes in speed and weather, etc. Additionally, while there is no published public data for accidents after 2016 it would be interesting to see if different trends emerge since speed limits have been lowered starting in 2018 (Lindsay, 2018)

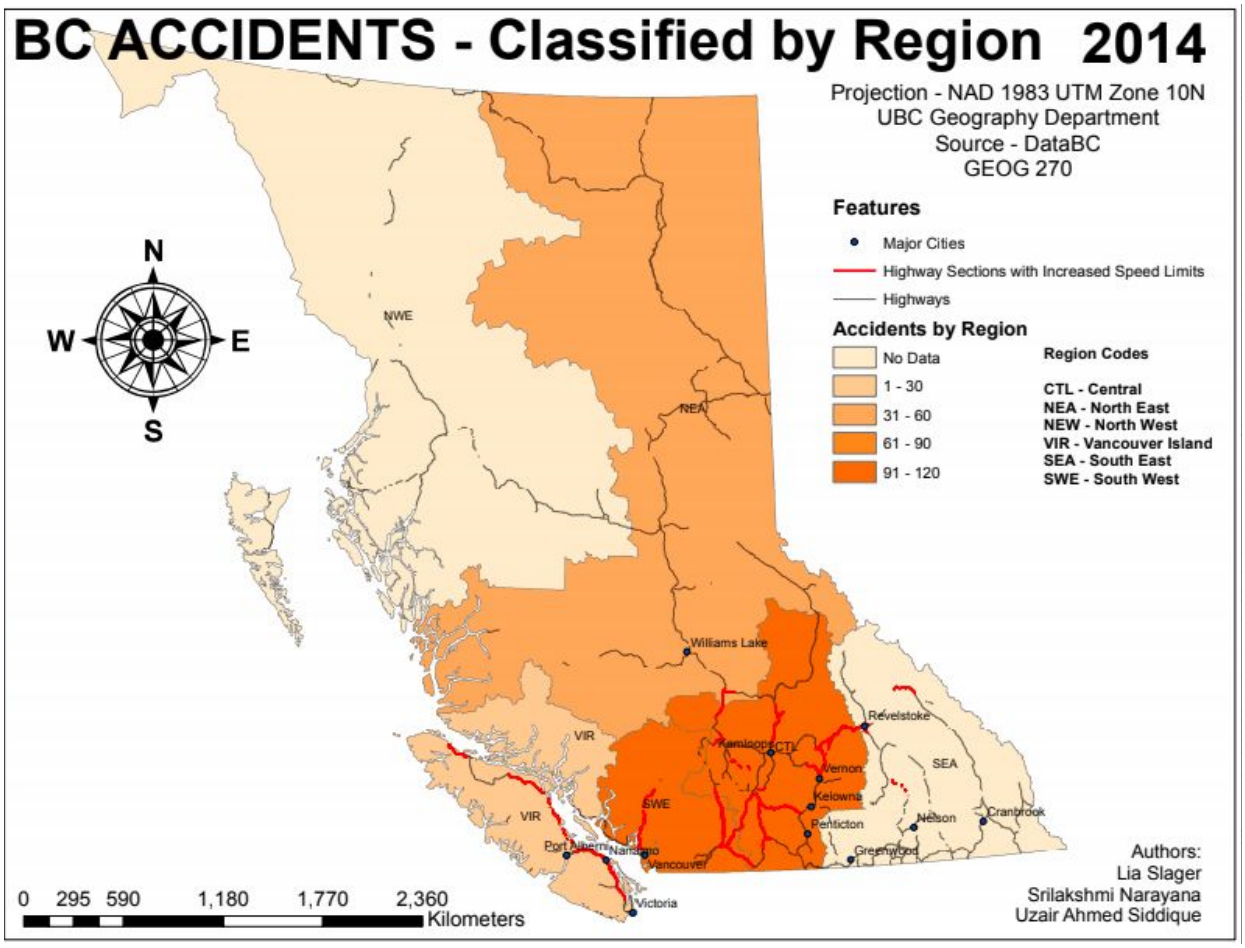
Appendices

I. Maps and Figures

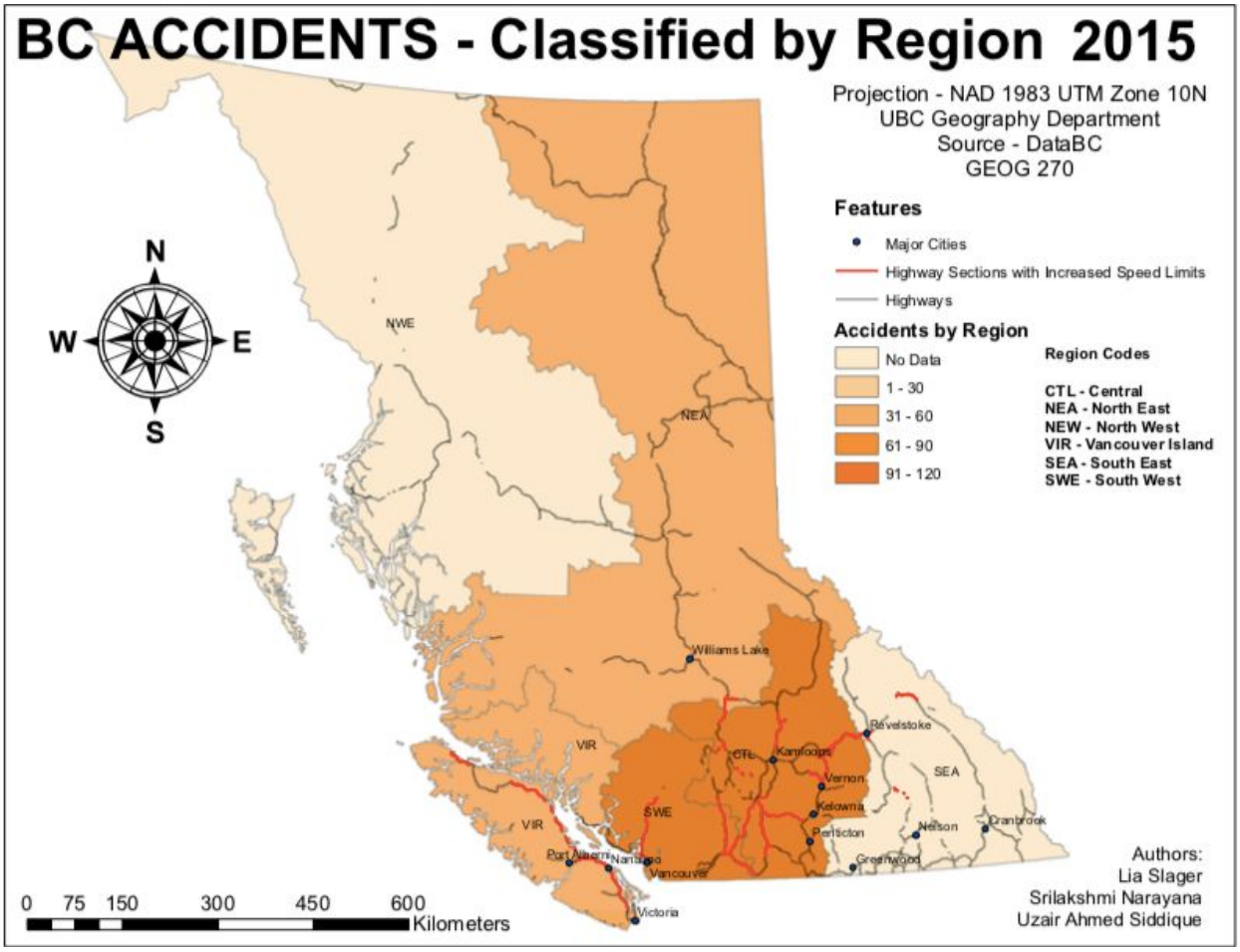
01. BC Accidents classified by region for Years 2013-2016



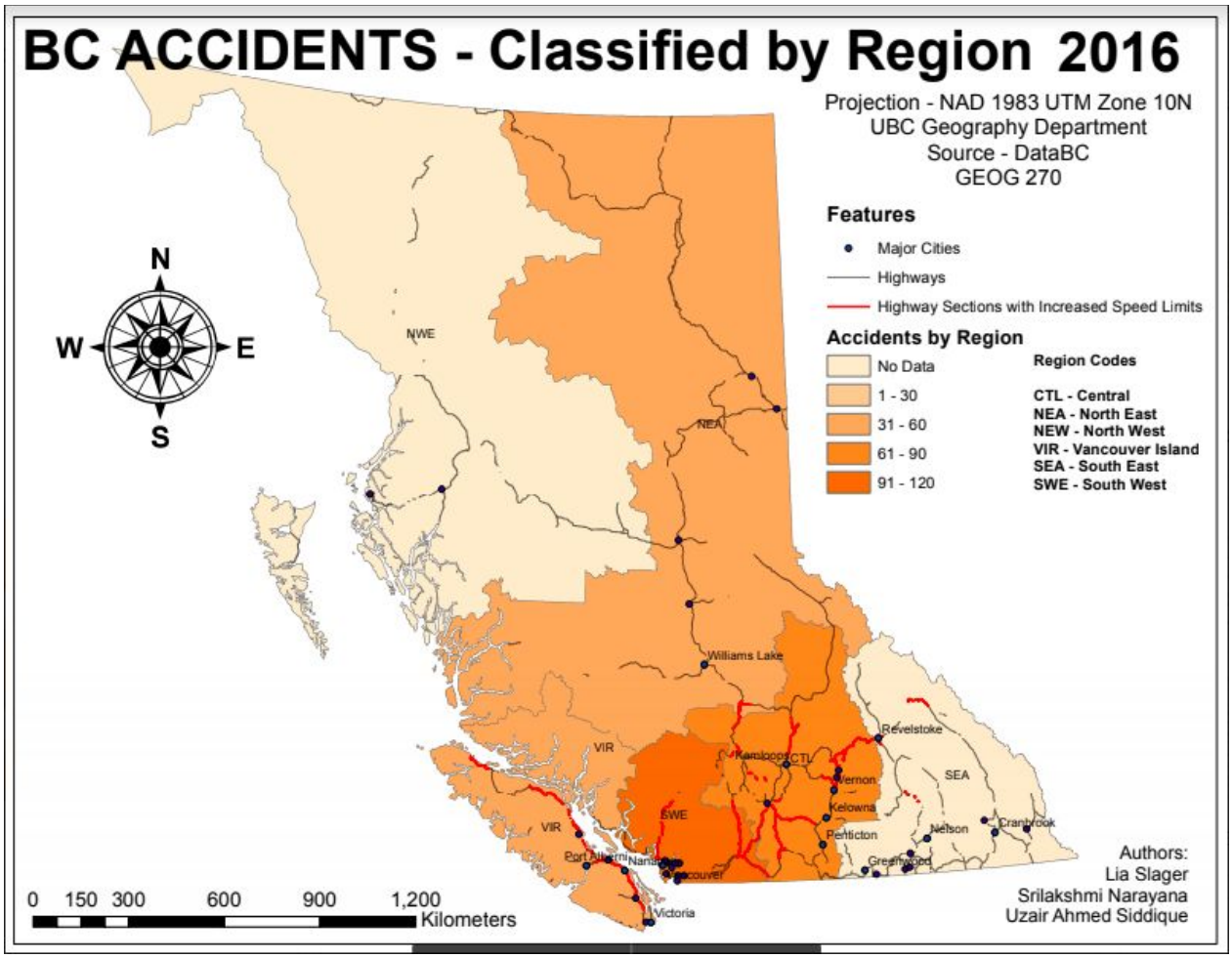
Map 1 - Reported accidents in British Columbia classified by region for Year 2013



Map 2 - Reported accidents in British Columbia classified by region for the Year 2014

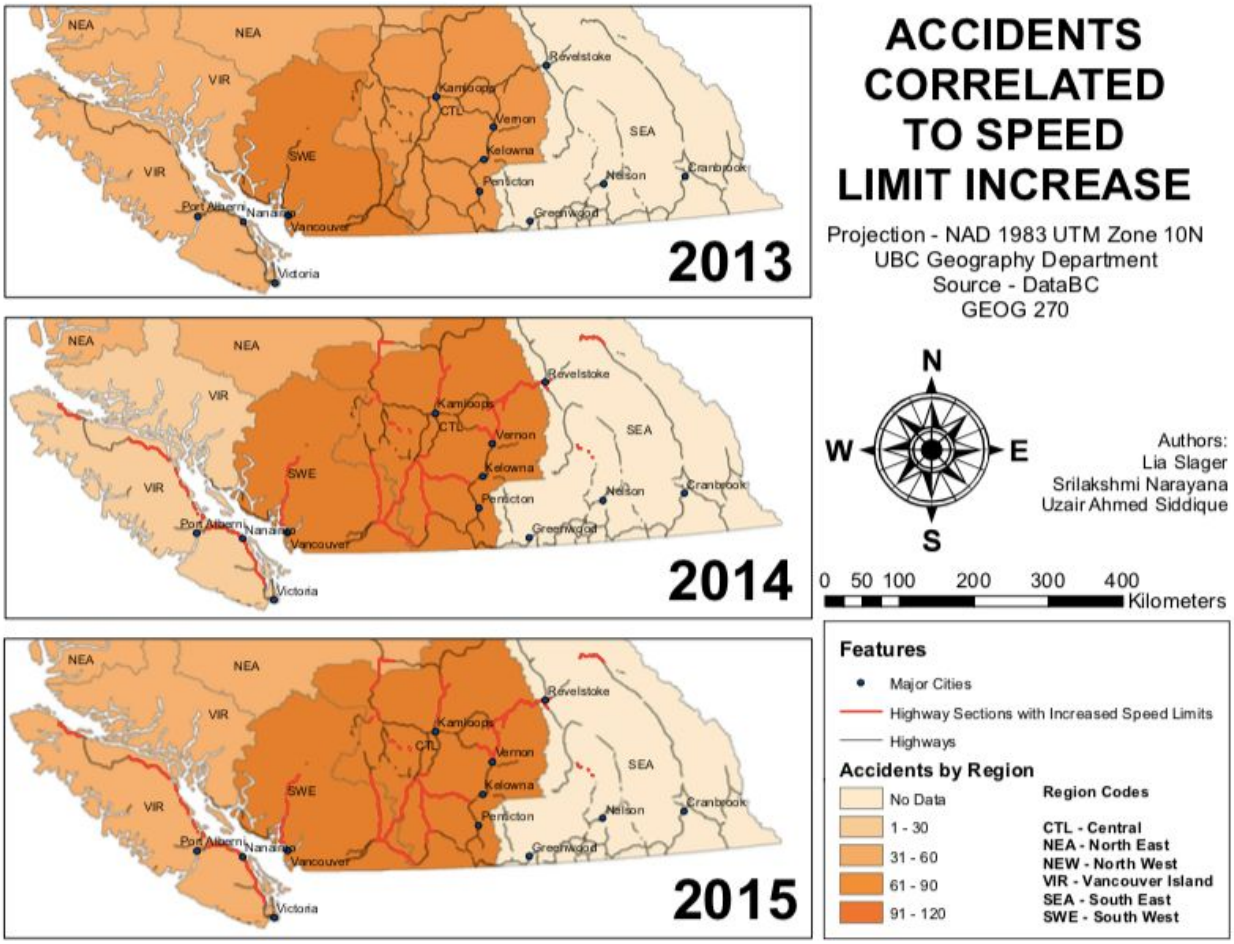


Map 3 - Reported accidents in British Columbia classified by region for the Year 2015



Map 4 - Reported accidents in British Columbia classified by region for the Year 2016

02. BC Accidents Comparison before and after Speed Limit Increase



Map 5 - BC Accidents for Years 2013, 2014 and 2015 showing variations in the number of accidents, by region, before and after the speed limit was in July of 2014.

II. Flowchart

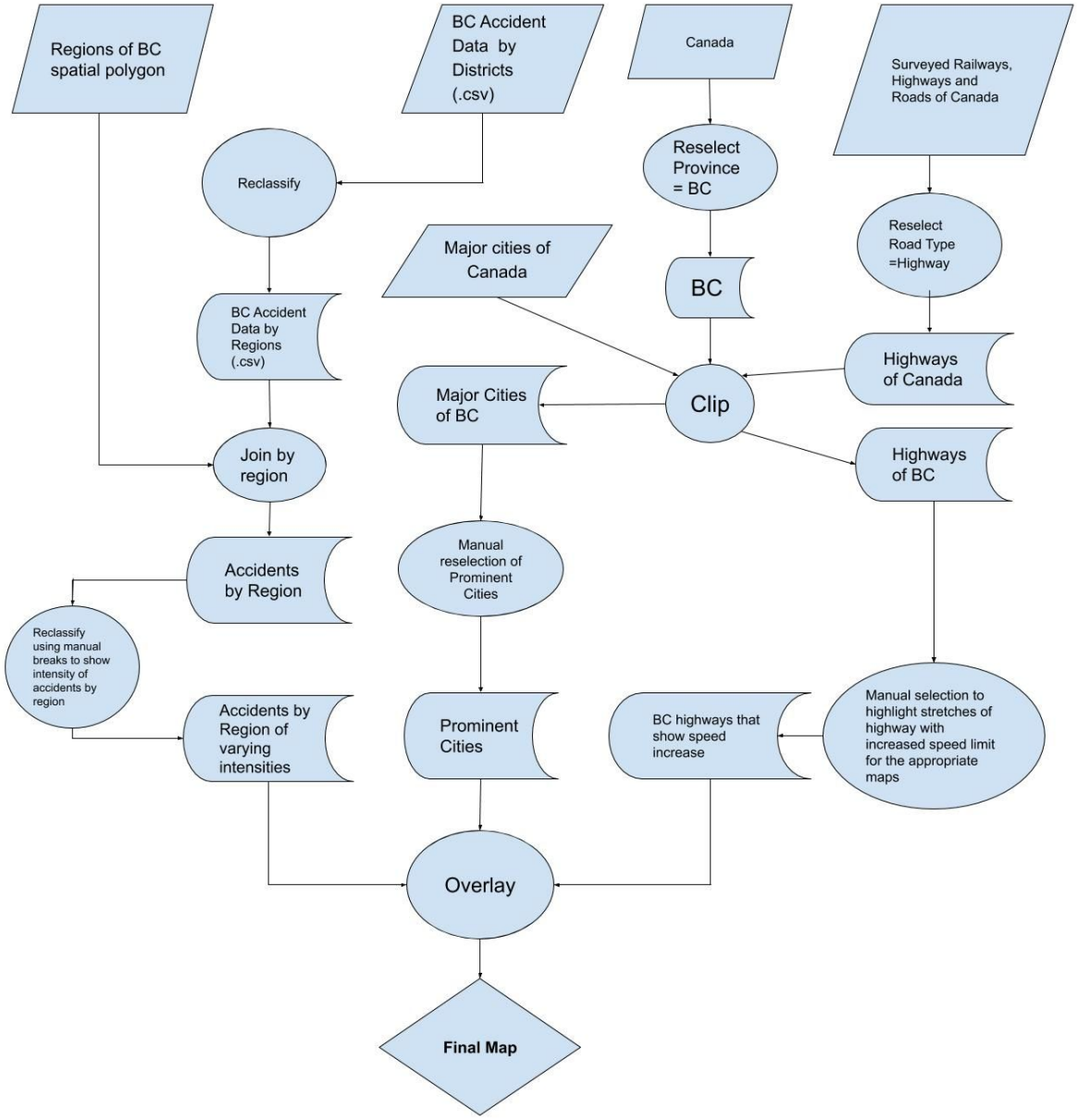


Figure 1 - Flowchart showing the processes involved in the analysis carried out to determine the correlation between accident data and speed limit increase.

Bibliography

Lindsay, B. (2018, October 10). Fatal crashes more than doubled on B.C. roads with higher speed limits, study says | CBC News. Retrieved from https://www.cbc.ca/news/canada/british-columbia/fatal-crashes-more-than-doubled-on-b-c-roads-with-higher-speed-limits-study-says-1.4857985

Maclean. (2014, July 11). Editorial: It's time for Canada to increase highway speed limits. Retrieved from https://www.macleans.ca/society/life/b-c-is-going-to-let-drivers-go-120-kmh-on-some-highways-the-rest-of-canada-needs-to-get-up-to-speed/

Regions in B.C. (n.d.). Retrieved from https://www.welcomebc.ca/Choose-B-C/Explore-British-Columbia/Regions-in-B-C

Research and Data Unit. (2018, October). Motor Vehicle Related Fatalities 10-year Statistics for British Columbia 2008-2017. Retrieved from https://www2.gov.bc.ca/assets/gov/driving-and-transportation/driving/publications/motor_vehicle_related_fatalities_10-year_statistics_for_british_columbia_2008-2017.pdf

RoadSafetyBC. (2019, April 02). Road Safety Data. Retrieved from https://www2.gov.bc.ca/gov/content/transportation/driving-and-cycling/road-safety-rules-and-consequences/publications-legislation-and-data/road-safety-data

Speed limits being lowered on 15 sections of B.C. highways | CBC News. (2018, November 07). Retrieved from https://www.cbc.ca/news/canada/british-columbia/speed-limit-bc-highways-reduced-1.4893914