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Examination of the Geographic Parameters of Suicide: A Historical Comparison Study of Ontario and Alberta

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Keywords
Suicide, Mental Health, Health Care.

Area of Interest
Suicide is defined as "the result of actions taken to deal with intolerable mental anguish and pain, fear or despair that overwhelms an individual's value for living and hope in life" (Canadian Association for Suicide Prevention [1]. There is no single reason that an individual may commit suicide as it is a complicated issue which may be impacted by "interconnected factors, individual, environmental, biological, psychological, social, cultural, historical, political and spiritual" [1]. In Canada, suicide is one of the top ten causes of death among adult men and women. It occurs at a higher rate within the male population [2]. It is estimated to be the second most common cause of death among Canadian youth. The suicide rate also varies among population and province within Canada. For example, the rate is ten times higher within the territory of Nunavut and often recorded as five to six times greater among Aboriginal populations [3].

The Canadian Association for Suicide Prevention (CASP) has advocated for a national suicide prevention plan since the early 1990s [2]. They continue to recommend a national suicide prevention strategy within Canada [3]. The Canadian federal government introduced legislation to investigate a national suicide prevention and the Public Health Agency of Canada recently "published a federal framework for suicide prevention" in November of 2016 [3]. However, an actual strategy with responsibilities, a mission/ mandate, or resources has yet to be determined.

Suicide in Canada
Suicide in Canada has a history laden with stigma and misunderstanding. The act of suicide was considered a crime with the creation of the Criminal Code in 1892. Roughly 40 years ago in Canada, suicide was decriminalized in 1972 [4]. In the mid-80s, Health Canada created the National Task Force on Suicide, which provided an in-depth report regarding the "size of the suicide crisis and examined the epidemiological and etiological knowledge base and presented findings on particularly high-risk populations. It also provided recommendations on prevention, intervention, and postvention measures" [5]. A trend emerged within Canada, whereby research was conducted and reports were created regarding suicide in 1995 and 2004, regarding Aboriginals and general prevention strategies, respectively. One benefit of the reports and research was the development of crisis support via telephone centres established within some of the country's provinces [4,5].

However, stigma and judgment surrounding suicide continues to be prevalent today with many Canadian private health insurance companies refusing to cover costs associated with "attempted suicide or intentionally self-inflicted injuries" [6]. At the time of the literature review, only one Canadian company, Desjardins, had removed the clause which would eradicate payment refusal due to suicide attempts [7]. Canada has implemented many strategies to foster and develop a healthy conversation to promote awareness and education regarding suicide prevention.

In 2007, the Canadian federal government created the Mental Health Commission of Canada (MHCC), which is described as a "catalyst for change" regarding mental health issues for Canadian citizens. Their six strategic directions included suicide prevention initiatives (Mental Health Commission of Canada [8]. One of their endeavors in 2014 was the #308conversations, a hashtag addressed to the 308 Members of Parliament to encourage discussions and presentations regarding suicide prevention [9]. This approach led to further information, education, and awareness regarding suicide prevention and intervention within the country. The Mental Health Commission of Canada continues to work with organizations such as CASP and agrees with the Federal Framework for Suicide Prevention [9].

In recent years, when compared to countries such as the United States, Demark, Finland, Germany, Japan, Ireland, and Scotland, all of which have developed their own National Suicide Prevention Plan, Canada appeared to be lagging behind with a national suicide prevention policy [4]. It is estimated that nearly 4,000 Canadians die each year by suicide, a statistic in itself which warrants a federal policy regarding prevention methods [10]. At time of publication, the Canadian government had proposed a national suicide prevention phone service in late 2017. The service will utilize "text, chat, and phone technology to integrate and link existing regional distress and crisis line services across Canada" [11]. The federal government noted that this is one initiative outlined within the Federal Framework for Suicide Prevention which will ensure every Canadian could pick up their phone and access telephone crisis services 24 hours a day, seven days a week [11].

Although there are many reports regarding suicide rates within Canada, there continue to be numerous issues with the health care system to address an individual who is contemplating suicide. In North America, it is estimated that a third of emergency room patients have suicidal ideation [12]. Individuals, who experience a mental health crisis including suicide, often go to the emergency department for treatment. This has been attributed to Canada's universal health care system model, the lack of community supports for individuals in crisis, and the 24/7 availability of the emergency department [13]. Many individuals are frequently visiting the emergency department for treatment regarding suicidal thoughts or ideations. Research identifies such visits as contributing to the increase in emergency department wait times.

Additionally, individuals who frequent the emergency room to address suicidal thoughts often find that, due to the medical model of care, physical injuries are given precedence to emotional concerns. "As a result, a suicidal person may simply leave the hospital without having received treatment, or may wait unaided for hours only to be released without an appropriate safety plan and outpatient supports in place" [9]. Research by Cerel, Currier & Conwell [14] examined the satisfaction levels of youth and their families with the received care in the emergency department following a suicide attempt. They found that less than 40% of the individuals believed that the emergency department staff were listening to them. Additionally, results identified that a similar percentage believed that the staff did not properly explain the type of treatment in hospital or addressed their injury in a serious manner [14].

In Canada, there are a variety of suicide assessment tools utilized within emergency departments and the individuals who work in emergency departments often vary in their level of crisis training. This may contribute to issues regarding treatment explanations and stigma perceived by patients [15].

However, due to the increasing rates of emergency department usage for those experiencing suicidal ideation/crisis, a trend exists within the research in promoting and implementing evidence-based practices to address suicide. For example, the medical model would advocate the "assess, diagnose, treat" framework which may not be as helpful to an individual contemplating suicide. The importance of building rapport, understanding the suicidality from a shared framework by individual and clinician, along with a non-judgmental attitude from the clinician are all supported within the literature [12,15]. Solution-focused therapy is one type of evidence-based practice which is becoming more common within emergency room departments [12].

One Canadian study examining the Canadian Community Health Survey (CCHS) data from 2002 found that perceived need impacted an individual's likelihood to seek treatment for suicidal thoughts. Pagura, Fotti, Katz, & Sareen [16] found that "41% of individuals with a suicide attempt felt that they needed help that they did not receive in the past year" (p.945). The help they believed that they needed was counselling or psychotherapy. Of the sample, only 5% obtained an assessment within an emergency room [16]. Barriers to seeking immediate assistance due to suicidal thoughts included scheduling issues, lack of transportation, and lack of childcare [16]. The statistics originate from one of the first Statistics Canada data cycles, however, they outline relevant information as to perceived need and barriers to care.

Upon further examination of suicide statistics for adults, studies have found no specific occupational differences among females and males. A study, which examined 11 years of suicide mortality rates of working individuals who were aged 30 to 69, found no specific associations or relationships between the type of occupation and gender within Canadian data [17].

Alberta and Ontario: A comparison

Within Canada, suicide rates vary by province which may be attributed to several factors which have been studied. A longitudinal study examining social factors such as birth, divorce and marriage rates from 1950 to1990 found a positive correlation between divorce rates and suicide rates and "a negative association between birth rates and suicide rates" [18]. Other research has found a correlation between the amount of alcohol purchased and an increase in suicide rates, where Alberta had one of the highest suicide rates and alcohol consumption rates [19]. More recent research has found that the social and economic determinants of suicide in Canada vary based on the type of statistical analysis employed [20].

Alberta was once considered a "world leader" in suicide prevention which arose from its cutting-edge research in the 1970s [3]. The government began studying suicide rates and developed a provincial Office of the Suicidologist to research suicide trends across the province. "Later, a Ministerial Order created a citizen committee to work with the Provincial Suicidologist and the Canadian Mental Health Association (CMHA) to implement a 4 part 'Alberta Model' of suicide prevention" [3]. The model created gatekeeper training where suicide intervention strategies were provided throughout the province. The initiatives were the

initial development of Applied Suicide Intervention Training Skills (ASIST), which is considered a "gold standard" in suicide prevention training [3]. Albertan officials brought their research and training to global conferences and leaders to integrate practices of suicide prevention and intervention. Unfortunately, due to budget cuts in the 1990s, the Office of the Suicidologist was removed and mental health funding was diminished. The Alberta government published A Call to Action in 2005 to provide a framework for suicide intervention within the province. However, the guide has not been put into fruition and "it is a sad reminder of the once vital progress made in suicide prevention that has now been rendered virtually impotent" [3].

Alberta is a unique province as it has experienced sufficient growth within its labour markets, specifically coal, oil and natural gas from the years 1971 to 1981 and 1996 to 2006 [21]. Within the time between the two periods, Alberta experienced a "bust" to their economic system, which many argue has occurred in recent years [21]. After the 2008 recession, Canada experienced a depressed economy and Alberta began to see the impact. In recent years, "the price of oil fell from $149 in June 2014 to $49 in January 2015" and unemployment rates are on the rise [5]. The economic trends in Alberta may have impacted the emotional wellbeing of its citizens.

While the province of Alberta was rich in resources, the province of Ontario developed numerous industries, including the automobile industry over the past 30 to 40 years. However, the global recession of 2008 led to massive layoffs and closures in many cities across the province [22]. Researchers have studied the impact of the depressed economy within Ontario on autoworkers and related industry workers' mental health and wellbeing [22,23]. The literature has shown an increase in levels of stress and negative emotions such as depressed mood and anxious thoughts [22,23]. One study focusing on rural areas found that a sense of cohesiveness and support within the community acted as a protective factor in reducing the intensity of reported stress levels [23].

In recent years, Ontario has focused on providing increased suicide prevention and intervention to children and youth as rates of suicide and suicidal ideation have increased [24]. However, the purpose of the following study will examine the Ontario and Albertan overall populations and focus on individuals aged 15 and older due to the collected data from Statistics Canada. The study will provide a historical overview of two Canadian provinces.

To examine Canadian trends, the research will highlight the most populated province (Ontario) and a province which has experienced economic growth and decline within the past five years (Alberta) [25]. It will allow for both a suburban view as well as rural/remote view of historical trends related to suicide within Canada. Geographic Information Software (GIS) will be used to determine the spatial and geographic distribution of suicidal thoughts and rates as well as location of emergency departments.

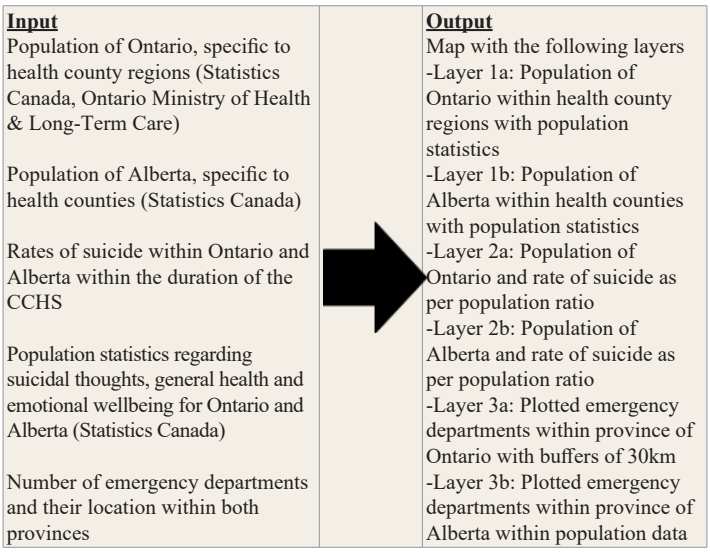
An individual who is experiencing suicidal thoughts may be considered as "in crisis" [16]. Within Canada's universal health care system, they can access assistance and support at any time by calling 911 or going to their local emergency department [16]. Therefore, this study will examine the location of emergency departments as per population ratio which may assist in funding for future crisis centres.

Research Questions

Historically, what are the provincial rates of suicidal thoughts among the citizens of Ontario and Alberta? These rates will be compared from 2007 to more recent data from 2012.

What are the rates of suicide within the provinces of Ontario and Alberta from 2007 to 2012?
Where are the locations of emergency departments within Ontario and Alberta and per what population ratio?

GIS project model



Data Collection

The majority of data used was obtained from Statistics Canada research, the Conference Board of Canada and Alberta Health Services. The population data for Ontario was from the 2011 census, however, Alberta's population data obtained from their Health Services organization in 2014 [26].

The 2011 public health region shapefiles for Ontario and Alberta were downloaded from the Statistics Canada website. Statistics Canada [27,28] collected the data and made it available to the public via their website. The provincial population was divided into public health regions as it corresponded to further data obtained from Statistics Canada. The population data provided the reader with an idea of Ontario and Alberta's overall population distribution. It was also useful to combine population density with location and distance of emergency departments, as access to care is a concern with suicide prevention.

Statistics Canada began collecting information health status,

health care use, and determinants of health since 2002. They obtained nation-wide sampling via the Canadian Community Health Survey (CCHS) available to Canadian citizens. The CCHS has been administered to those 15 years of age and older within the population [29]. "Excluded from the survey's coverage were: persons living on reserves and other Aboriginal settlements; full-time members of the Canadian Forces and the institutionalized population. Altogether, these exclusions represented less than 3% of the target population" [29].

Statistics Canada incorporated questions on suicidal ideation, or thoughts of suicide, within the majority of CCHS questionnaires. The author chose to examine two years, 2007 and 2012, to examine the impact of economic changes and health care availability on Alberta and Ontario residents. With a data agreement in place, Statistics Canada provided the full data of the CCHS from 2007 and 2012 to the author. The data was divided into public health units within the province of Ontario.

The author utilized the Alberta Health Services research website to obtain information regarding emergency room location, which was then plotted using longitudinal and latitudinal coordinates. The emergency room locations of Ontario were obtained from a Statistics Canada education agreement and delivered in shapefile form. Furthermore, the author obtained yearly suicidal rates of both provinces from the Conference Board of Canada website [30].

Results

To effectively compare both Alberta and Ontario, a map regarding each component such as population, suicide rates, and ideation for both provinces will be outlined and described within this section.

The above figure provides a visual representation of Ontario's population within each designation health unit. The population of Ontario was roughly 12 million people in 2011 [27]. It is apparent that the majority of residents live within the Southwestern area of the province.

In 2014, Alberta's population was roughly four million people, which is one-third of that of Ontario. The above map identifies two densely populated areas within the province, Calgary and Edmonton. Both areas are also considered two of the fastest-growing populations within Canada [31].

Prior to identifying the rate of suicide and prevalence of suicidal thoughts within each province, the following maps will outline the locations of Emergency Departments within each province. As stated earlier in the paper, often 911 or the Emergency Department is the most accessible crisis care within both provinces.

The population map of Ontario includes locations of emergency rooms within the province. For each emergency room, a buffer of 35 kilometers is shown. It becomes apparent that emergency rooms are less available within more rural and remote areas of the province.

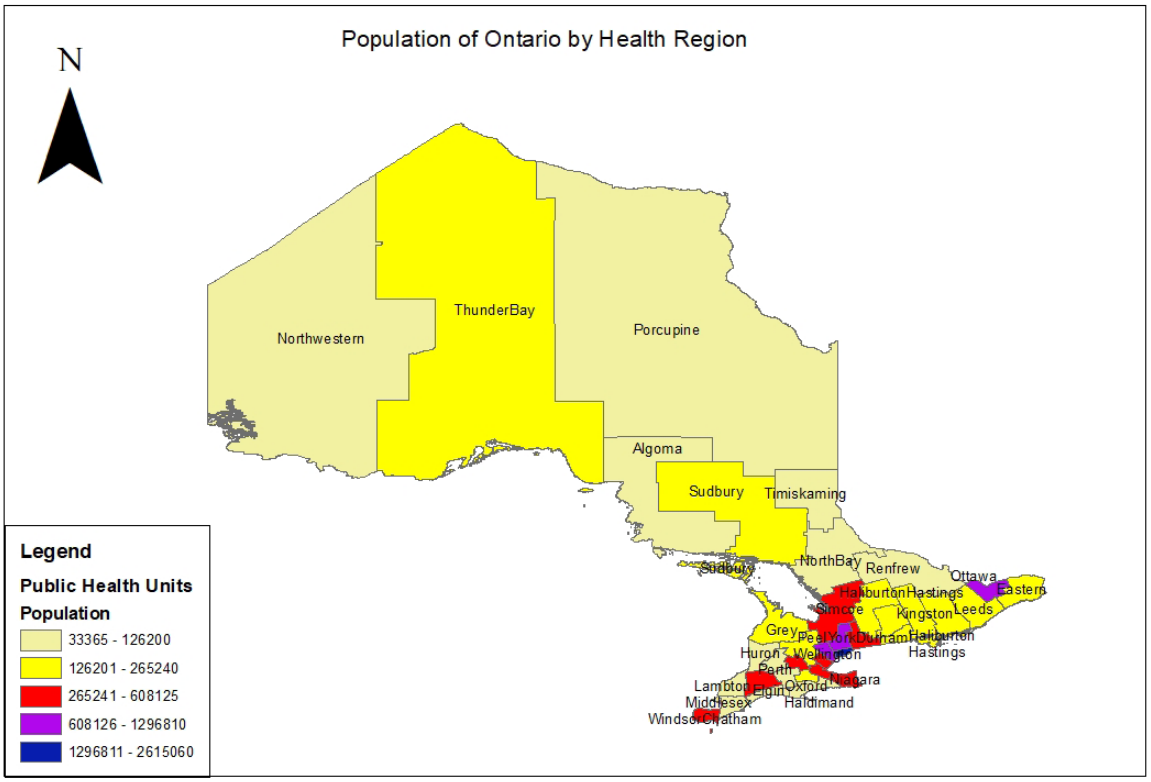


Figure 1: Ontario population by Public Health Region.

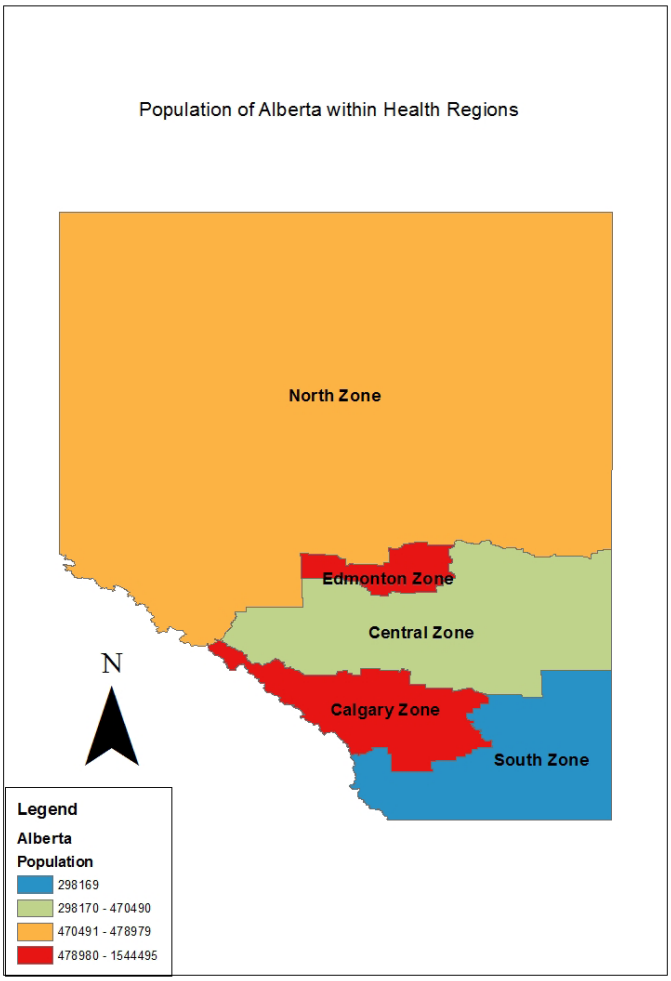


Figure 2: Population of Alberta by Health Region

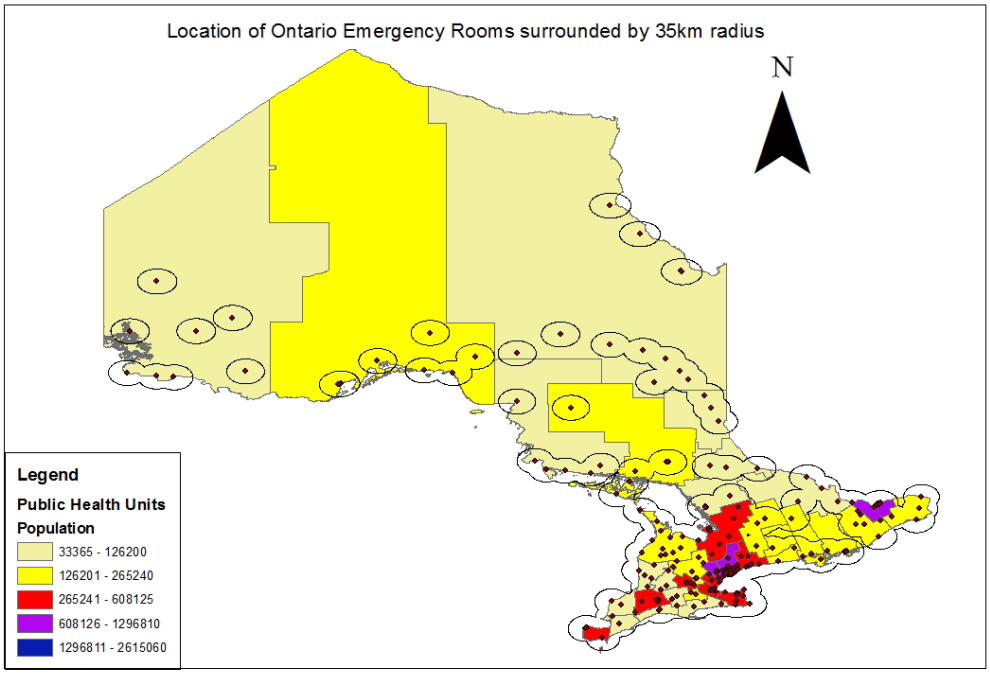


Figure 3: Location of Ontario Emergency Rooms with a 35-km buffer.

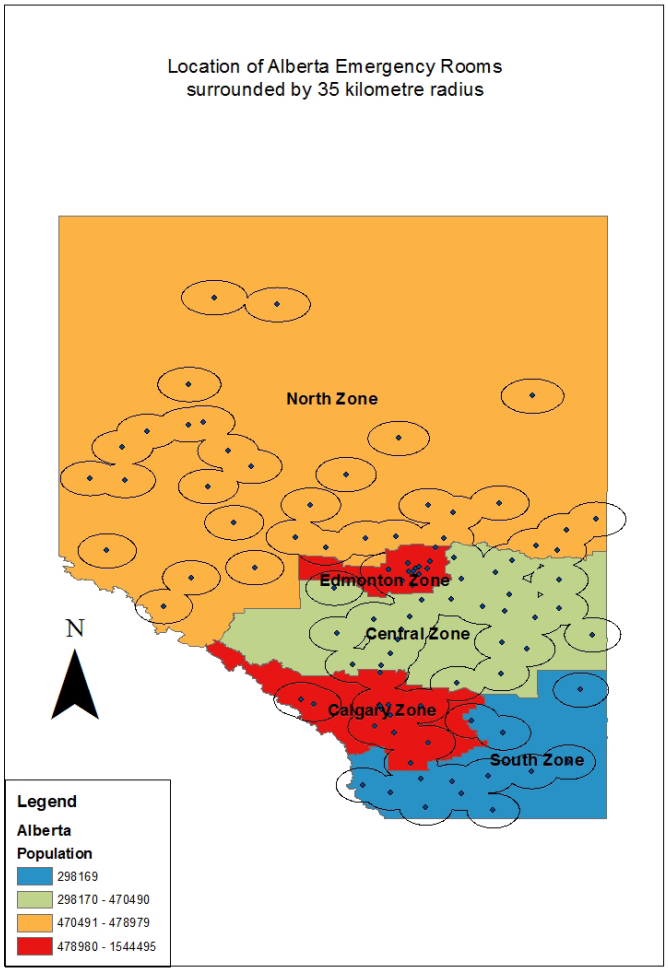


Figure 4: Location of Alberta Emergency Rooms with a 35-km buffer.

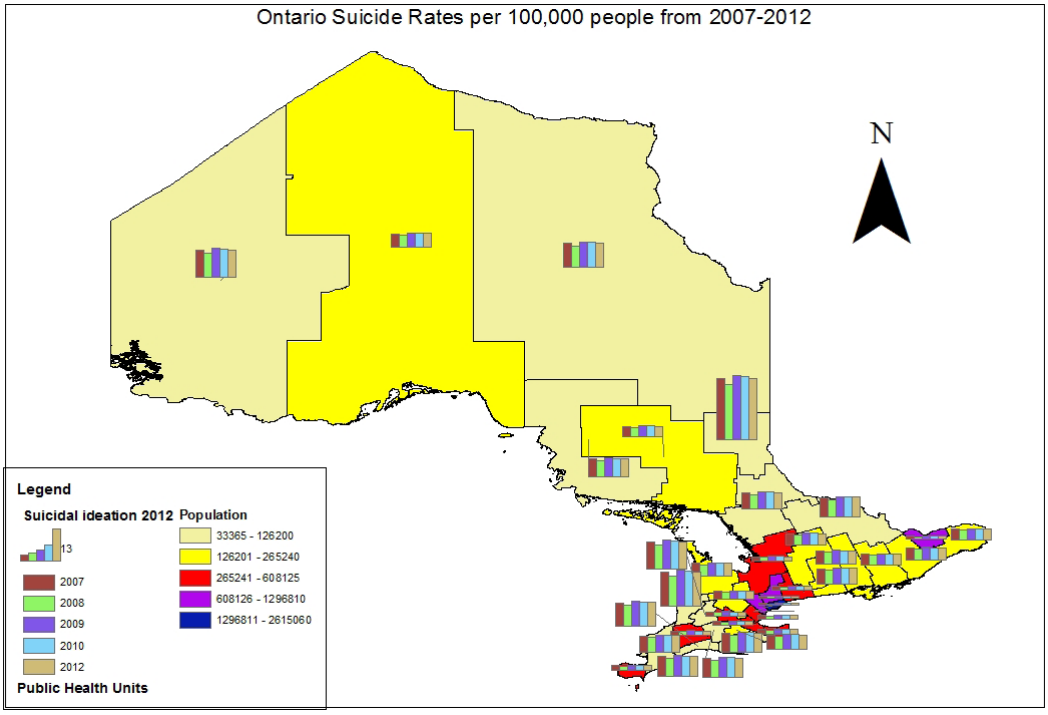


Figure 5: Suicide rates per 100,000 individuals within Ontario from 2007-2012.

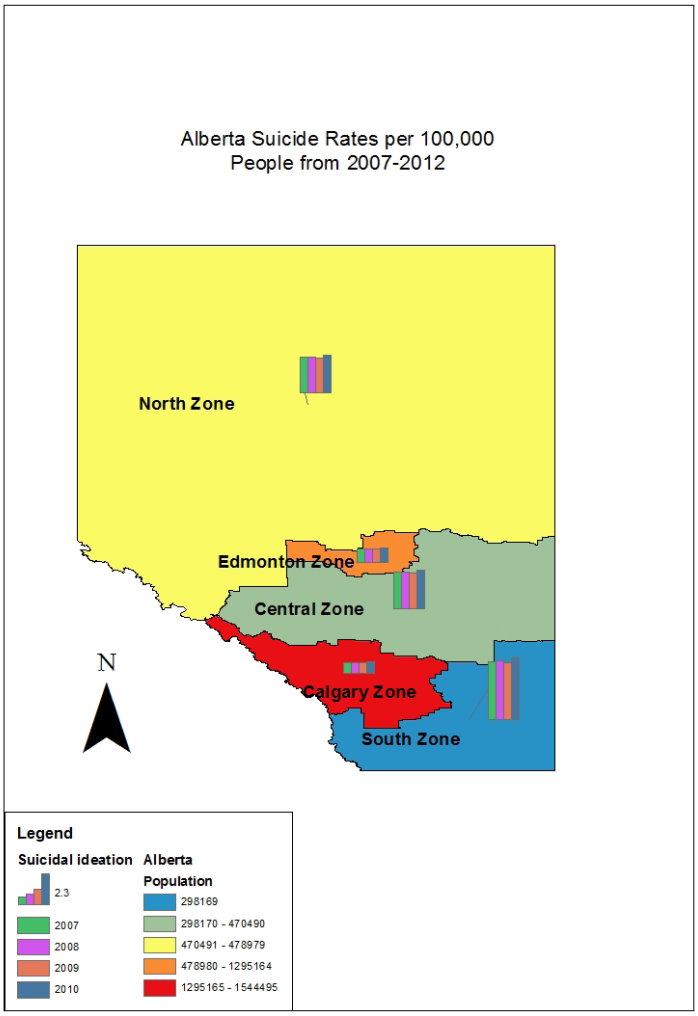


Figure 6: Suicide rates per 100,000 individuals within Alberta from 2007-2012.

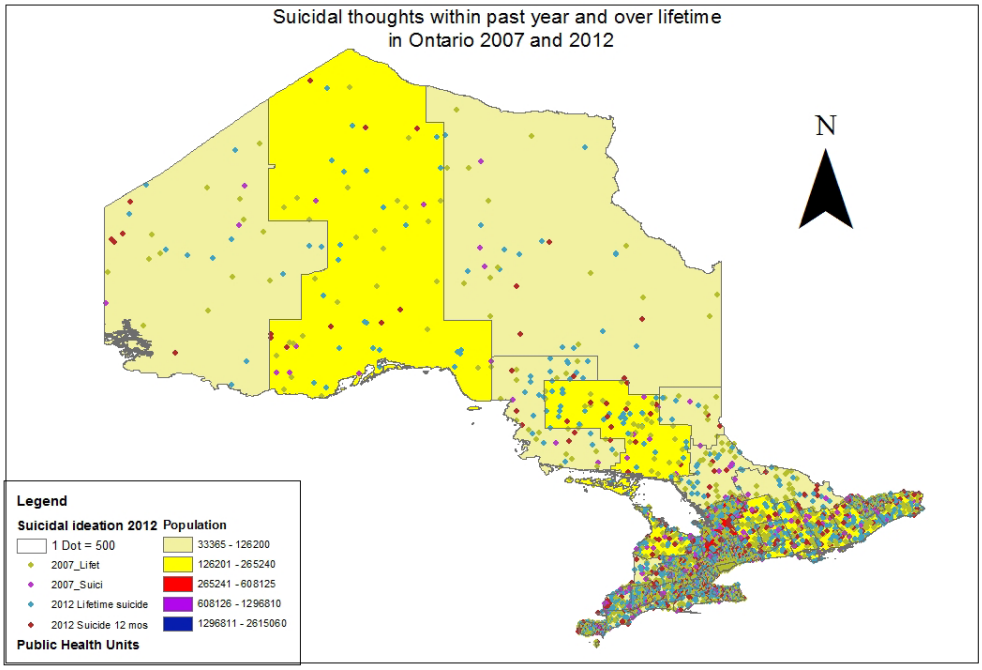


Figure 7: Suicidal thoughts within the past year and over lifetime, within Ontario 2007 and 2012.

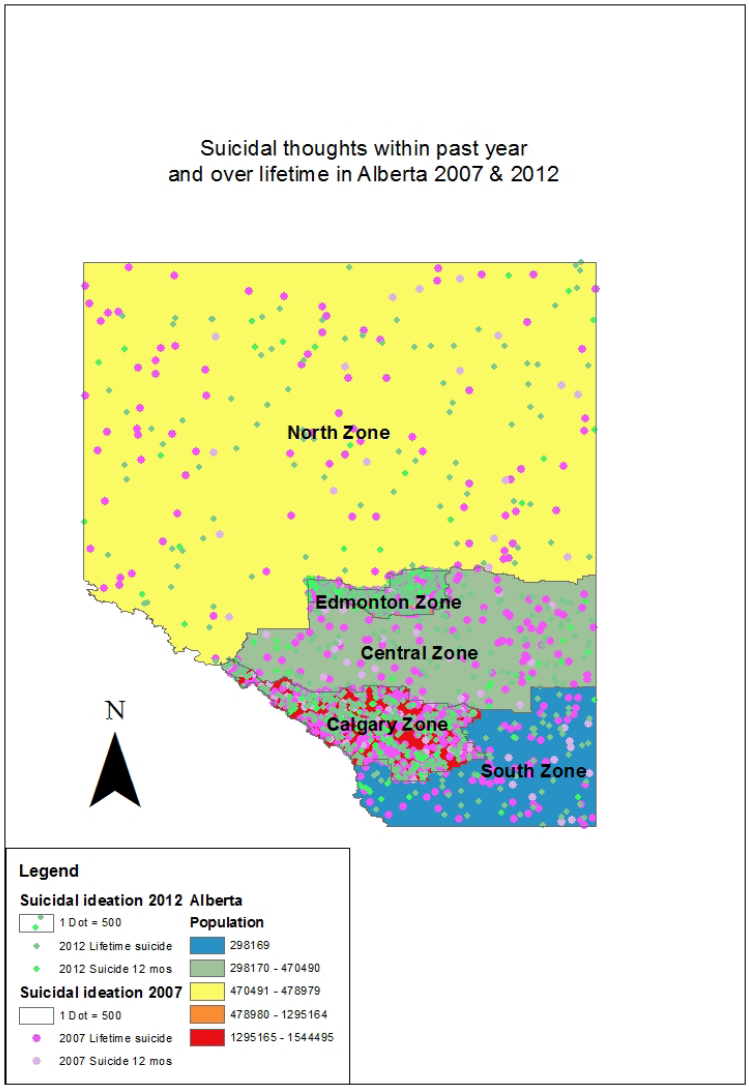


Figure 8: Suicidal thoughts within the past year and over lifetime, within Alberta 2007 and 2012.

The Local Integrated Health Network (LHIN) is an organization that coordinates funding and planning for health care within Ontario [32]. There are 14 LHINs within different geographic locations of Ontario. The Waterloo Wellington LHIN conducted a study in 2010 which found no consensus on access to care within distance. However, Ontario previously followed guidelines which encouraged hospitals and emergency services within 40 kilometers of rural areas. The 2010 report by the Waterloo Wellington LHIN found research suggesting a distance of 20-35km in travel to hospitals was not "overly burdensome" to residents (p.11). Therefore, the writer has implemented buffers of 35 kilometers to identify access to care [32].

Figure 4 shows the location of emergency rooms within Alberta surrounded by a 35-kilometer buffer. The most populated areas of the province have increased emergency or crisis services available. The trend of fewer emergency departments in remote/rural areas is found in Alberta as in Ontario.

Figure 5 visually outlines the population of Ontario and the variation of suicide rates over a period of five years. As can be identified, there was a decline in suicides in 2008 and generally, the rate increased in 2010 and 2012. Additionally, the rate of suicide appeared to be increasing among certain rural and remote populations. The rate of suicide within Ontario fluctuated from 8.3 persons per 100,000 population in 2007 to 8.4 persons per 100,000 population in 2012 [30].

The suicide rates per population within Alberta appear to spike in 2010 and then appear to slowly decline in 2012. The rates of suicide within Alberta are higher than Ontario. Ontario's suicide rates are roughly 8% and Alberta is roughly 12-13%, both of which depend on year. The province of Alberta has different characteristics regarding job growth and economy than Ontario, which will be further explained in this paper.

The map of Ontario identifies an increase in suicidal thoughts over the past 12 months when comparing rates in 2007 and 2012.

Table 1: Ontario residents with suicidal thoughts over the course of their lifetime and within past year in 2007 and 2012.

Health Region	Population	SI Life 2007	SI Life 2012	Increase rate	SI past year 2007	SI past year 2012	Increase rate
The District of Algoma	114,785	10560	10331	-2.17	33058	34436	4.17
Brant County	137,100	12339	10968	-11.11	29202	29339	0.47
Durham Regional	608,125	45001	48650	8.11	159329	164194	3.05
Elgin-St. Thomas	87,460	7522	7172	-4.65	25014	25188	0.70
Grey Bruce	158,670	13487	13471	-0.12	26022	26181	0.61
Haldimand-Norfolk	108,050	10589	10373	-2.04	23123	23231	0.47
Haliburton, Kawartha, Pine Ridge	172,370	17582	17237	-1.96	28441	28786	1.21
Halton Regional	501,670	39632	42140	6.33	112374	113377	0.89
City of Hamilton	519,950	47315	47835	1.10	123748	124788	0.84
Hastings and Prince Edward Counties	160,190	16660	16500	-0.96	28514	28674	0.56
Huron County	59,100	3782	4964	31.25	17730	18321	3.33
Chatham-Kent	104,075	56145	55554	-1.05	20815	21856	5.00
Kingston, Frontenac, and Lennox and Addington	191,560	17624	17240	-2.17	36396	36971	1.58
Lambton	126,200	9591	10601	10.53	45180	45306	0.28
Leeds, Grenville and Lanark District	164,970	18147	16497	-9.09	38768	38933	0.43
Middlesex-London	439,150	49185	43915	-10.71	101005	101883	0.87
Niagara Regional Area	431,345	47017	47448	0.92	69878	70007	0.19
North Bay Parry Sound District	124,790	12479	11231	-10.00	29076	29126	0.17
Northwestern	74,745	8147	8371	2.75	11511	11959	3.90
City of Ottawa	883,395	83039	79506	-4.26	187279.74	187456.419	0.09
Oxford County	105,720	9515	9409	-1.11	19029.6	19981.08	5.00
Peel Regional	1,296,810	129681	141352	9.00	168585.3	173772.54	3.08
Perth District	75,110	7060	6910	-2.13	12543.37	12618.48	0.60
Peterborough County	134,935	16192	17542	8.33	16192.2	16327.135	0.83
Porcupine County	84,245	6740	6655	-1.25	12215.525	12299.77	0.69
Renfrew County	102,620	8620	8548	-0.83	18266.36	18368.98	0.56
Eastern Ontario	196,545	18082	17689	-2.17	30661.02	30857.565	0.64
Simcoe Muskoka	504,110	40329	40833	1.25	100822	105863.1	5.00
Sudbury and District	194,620	19462	20435	5.00	27830.66	28025.28	0.70
Thunder Bay District	147,350	13262	13851	4.44	11788	13114.15	11.25
Timiskaming	33,365	2969	2936	-1.12	4337.45	4437.545	2.31
Waterloo	507,095	44624	45131	1.14	60851.4	62372.685	2.50
Wellington-Dufferin-Guelph	265,240	22015	21750	-1.20	45090.8	47212.72	4.71
Windsor-Essex County	388,780	29936	30714	2.60	54429.2	54817.98	0.71
York Regional	1,032,525	91895	92927	1.12	134228.25	136293.3	1.54
City of Toronto	2,615,060	230125	230099	-0.01	444560.2	462865.62	4.12

*SI means Suicidal Ideation or thoughts of suicide

Table 2: Alberta residents with suicidal thoughts over the course of their lifetime and within past year in 2007 and 2012.

Health Region	Population	SI Life 2007	SI Life 2012	Increase rate	SI Past Year 2007	SI Past Year 2012	Increase rate
South Zone	298,169	36078	36973	2.48	59634	65597	10.00
Calgary Zone	1,544,495	200784	203873	1.54	278009	281098	1.11
Central Zone	470,490	60223	60693	0.78	89864	94098	4.71
Edmonton Zone	1,295,164	155420	156715	0.83	207226	211112	1.88
North Zone	478,979	58435	58914	0.82	91964	92443	0.52

*SI means Suicidal Ideation or Suicide Thoughts

The results are concerning as it identifies that individual were experiencing crisis more frequently after 2007, especially within more populated areas.

Figure 8 outlines similar trends within Alberta as Ontario. There is an increase in individuals with suicidal thoughts for both lifetime rates and past year upon comparison of data from 2007 and 2012. The results shown in the last two figures are found within the next four tables.

Discussion

The six maps within the Results section identify trends regarding population density, emergency department location, suicide rates and suicidal ideation for two provinces, Ontario and Alberta. Ontario is the most populated province of Canada; however, Alberta consists of over 10% of the Canadian population.

The results illuminate the differences in suicide rates between Ontario and Alberta. Alberta's suicide rates are recorded as higher

than Ontario's, which may be attributed to lack of mental health resources as well as economic influence. Residents of Ontario and Alberta reported more suicidal thoughts within the past 12 months in 2012 than in 2007. Alberta also showed an increase among suicidal thoughts within their population's lifetime from 2007 to 2012.

For Canada, the five-year difference between the two data points led to increased stress within the provinces. The province of Alberta has generally profited from their oil sands as a primary resource and the market increased in the early 2000s. However, the impact from political discord, environmental concerns, and the economic recession in Canada has led to a reduction in oil sands production and jobs [33]. Recent media articles state that Alberta's suicide rates have increased 30% in 2015 due to "mass oil patch layoffs" [34]. Unfortunately, the data points to increased suicidal ideation amongst Alberta residents.

Similar data was obtained from Ontario, where industries were negatively impacted by the recession and an increasing demand for mental health services has not been resolved. In addition, socioeconomic theories of suicide identify a correlation between lower income and decreased life satisfaction [35]. This may present evidence for Alberta's increased suicidal ideation among past year and lifetime within 2007 and 2012.

For both Ontario and Alberta, emergency rooms are often the first point of contact for individuals who are experiencing a crisis or suicidal thoughts. The emergency rooms are more equally located amongst well-populated areas for the two provinces.

Recent research by the Canadian Institute for Health Information [36] found that 29% of Canadians spend four hours or more waiting for care in the emergency room. For someone who is experiencing suicidal ideation, this would be a delayed access to intervention.

Implications of the Study

The study has implications for the Canadian health care system regarding crisis care. The results will provide a graphical understanding of suicidal rates among the most populated areas of the country and areas which have experienced economic success and decline. The information obtained regarding population and distance from emergency departments will allow health care policymakers to determine whether community supports are required. This study is also aligned with the Federal Suicide Prevention Framework, which outlines the importance of "a need to better understand suicide prevention research at the national, provincial, territorial and regional levels" [10]. The article findings may provide further support for the Canadian government's recent plans to implement a national crisis telephone service, in it would allow 24/7 access to crisis services via phone and release the burden from emergency departments.

Strengths and Limitations

The use of GIS software is a strength within the study since similar comparison studies regarding Canadian data have not been conducted. GIS was used within studies focusing on the spatial distribution of suicide within Australian and South Korean neighborhoods [37,38]. Within Canada, the Canadian Institute for Health Information (CIHI) is one organization which has used GIS software to map health information including as wait times for health procedures.

However, a limitation of the study is that the CCHS surveys are from 2007 to 2012, which ranges from ten to five years from date of analysis. A national statistical organization collected the data; however, it is not reflective of current practices within each province.

Conclusion

The research article provides a visual representation of two provinces within Canada: Alberta and Ontario. It provides a comparison of two provinces which have experienced the economic downturn of the global recession in 2008.

A trend in increased suicidal ideation over the past 12 months was found in 2012 data for both provinces as compared to 2007 data for both Alberta and Ontario. Additionally, rates of suicide peaked for the two provinces studied in 2010 which was the beginning of the depressed economic environment. One may conclude that the economy does have an impact on an individual's emotional well-being and stress levels.

Furthermore, it was apparent that Ontario and Alberta have emergency rooms situated more than 35 kilometers away from different rural locations. Unfortunately, residents within these areas will have to travel farther to obtain universally paid crisis care within an emergency department. The increased rates of suicidal ideation provide rationale for exploration of innovative crisis care delivery.

Overall, Alberta had a historically higher suicide rate than Ontario which is reflected within the study. The visualization of emergency rooms show that Ontario has more emergency departments available to residents than Alberta within more populated areas. This may be due to the difference in hospital funding for each province.

Funding opportunities for different types of crisis care within each province should be investigated to address the increasing trend of suicidal ideation. Additionally, the anecdotal data regarding Alberta's increased suicide rates provide further justification of accessible crisis care for all residents (CBC News, 2015). It is the authors' intent that this research article be used as a framework to develop an innovative crisis care model, rather than solely depend on emergency departments. This will ensure that both Ontario and Alberta are prepared to address their citizens' emotional well-being in the times of economic uncertainty.

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