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Does the definition of preventable emergency department visit matter? An empirical analysis using 20 million visits in Ontario and Alberta

Tammy Lau MSc[1] (tlau82@uwo.ca), Alana Maltby MSc[1] (amaltby3@uwo.ca), Shehzad Ali PhD[1,2] (shehzad.ali@uwo.ca), Valérie Moran PhD[3,4] (valerie.moran@lih.lu), Piotr Wilk PhD*[1,5,6,7,8,9] (pwilk3@uwo.ca)

[1] Department of Epidemiology and Biostatistics, Western University, London, Ontario, Canada

[2] Bruyère Research Institute, Ottawa, Canada

[3] Luxembourg Institute of Health, Department of Precision Health, Strassen, Luxembourg

[4] Luxembourg Institute of Socio-Economic Research, Living Conditions, Esch-sur-Alzette, Luxembourg

[5] Department of Paediatrics, Western University, London, Ontario Canada

[6] Child Health Research Institute, London, Ontario, Canada

[7] Lawson Health Research Institute, London, Ontario, Canada

[8] ICES, London, Canada

[9] Institute of Social and Preventive Medicine, University of Bern, Bern, Switzerland

*Corresponding Author – Piotr Wilk

Department of Epidemiology and Biostatistics, Schulich School of Medicine and Dentistry, Western University, 3rd Floor, Western Centre for Public Health and Family Medicine, 1465 Richmond St. London, Ontario N6G 2M1, Canada

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Abstract (300/300)

Objectives: This study had two objectives: (1) to estimate the prevalence of preventable emergency department (ED) visits during the 2016-2020 time-period among those living in 19 large urban centres in Alberta and Ontario, Canada; and (2) to assess if the definition of preventable ED visits matters in estimating the prevalence.

Does the definition of preventable emergency department visits matter?

Methods: A retrospective, population-based study of ED visits that were reported to the National Ambulatory Care Reporting System (NACRS) from April 1, 2016 to March 31, 2020 was conducted. Preventable ED visits were operationalized based on the following approaches: (1) Canadian Triage and Acuity Scale (CTAS), (2) Ambulatory Care Sensitive Conditions (ACSC), (3) Family Practice Sensitive Conditions (FPSC), and (4) Sentinel Non-Urgent Conditions (SNC). The overall proportion of ED visits that were preventable was estimated. We also estimated the adjusted relative risks (RRs) of preventable ED visits by patients' sex and age, fiscal year (FY), province of residence, and census metropolitan area (CMA) of residence.

Results: There were 20,171,319 ED visits made by 8,919,618 patients ages 1 to 74 who resided in one of the 19 CMAs in Alberta or Ontario. On average, there were 2.26 visits per patient over the period of four fiscal years; most patients made one (44.22%) or two ED visits (20.72%). The overall unadjusted prevalence of preventable ED visits varied by definition; 35.33% of ED visits were defined as preventable based on CTAS, 12.88% based on FPSC, 3.41% based on SNC, and 2.33% based on ACSC.

Conclusion: There is a substantial level of variation in prevalence estimates across definitions of preventable ED visits, and care should be taken when interpreting these estimates as each has a different meaning and may lead to different conclusions. The conceptualization and measurement of preventable ED visits is complex, multi-faceted, and may not be adequately captured by a single definition.

Does the definition of preventable emergency department visits matter?

Introduction

Emergency departments (EDs) are an essential component of emergency care systems and play a key role in the delivery of healthcare.[1] While they are intended to provide immediate care for acute injuries and illnesses,[1] a considerable proportion of ED visits are for non-emergent reasons or conditions that could be addressed in non-ED settings.[2,3] These preventable ED visits place a burden on EDs and healthcare systems due to the misallocation of services and resources as these patients could be otherwise treated or managed in primary healthcare settings.[4,5] High volumes of preventable ED visits are also indicative of inadequate access to and quality of primary healthcare.[6,7] While not all ED visits can be prevented or avoided, high quality, effective, and appropriate primary healthcare can help reduce the use of EDs and acute health services through the provision of preventative care, earlier detection and treatment of disease, and ongoing care, management, and follow-up of health conditions.[8,9]

Despite the widespread attention that preventable ED visits have received, researchers and healthcare providers differ in their definition and measurement of preventable ED visits, which has resulted in a great deal of variation within the literature on the prevalence of these visits.[10-13] For instance, in an international systematic review, Durand *et al.* found that among studies published between 1980 and 2008, the prevalence of preventable ED visits ranged from 4.8% to 90.0% and attributed this wide range to the heterogeneity in the methods and criteria used to define and measure these visits.[11] Specifically, they reported 51 methods of categorization of ED visits as preventable ranging from implicit (expert opinion, patients' self-assessment) to explicit (chief complaint, duration of complaint, vital signs and physiological cues, triage score, type of diagnosis, referral to the ED, diagnostic tests and treatments performed at the ED, hospitalizations).[11] Similarly, Uscher-Pines *et al.* found that among studies published

between 1990 and 2010, 8.0% to 62.0% of ED visits in the United States were categorized as non-urgent, and that no studies used the same definition.[13]

In Canada, the Canadian Triage and Acuity Scale (CTAS)[14-18] and Ambulatory Care Sensitive Conditions (ACSC) have been used in previous studies to identify preventable ED visits.[15,19,20] In addition, Alberta and Ontario have developed two provincial measures of preventable ED visits: Family Practice Sensitive Conditions (FPSC)[21-24] and emergency visits for conditions that could be treated in alternative primary care settings (hereafter called Sentinel Non-urgent Conditions [SNC]).[25,26] The Canadian Institute for Health Information (CIHI) reported that, based on the FPSC definition, 21.0% of non-admitted ED visits in 2013-2014 were preventable ED visits,[23] while other studies have reported estimates ranging from 7.2% in 2002-2003 (using the SNC definition)[26] to 59.1% in 2000-2001 (using the CTAS definition).[27]

While these four definitions of preventable ED visits have been independently applied to divergent sub-populations of patients, there have been no studies that have simultaneously applied all these definitions to obtain population-level estimates of preventable ED visits that can be compared with each other. To facilitate proper interpretation of the estimates, there is a need to assess how the prevalence of ED visits differs based on the type of definition used. Furthermore, with the majority of Canadians currently living in large urban centres[28] and the high demands and pressures that are experienced by urban EDs,[18,29] it is important to gain further insight into preventable ED visits in the urban context and the extent to which ED visits made by urban residents – who have comparatively better access to and availability of primary healthcare options[30,31] – are preventable.

Therefore, the objectives of this study were to 1) estimate the prevalence of preventable ED visits during the 2016-2020 time-period among those ages 1 to 74 years living in 19 large

urban centres in Alberta and Ontario, Canada, and 2) assess if the definition of preventable ED visits matters in estimating the prevalence. Specifically, we aimed to explore how the prevalence of preventable ED visits differed across four definitions of preventable ED visits used in Canada: (1) CTAS, (2) ACSC, (3) FPSC, and (4) SNC. Assessing these estimates simultaneously provides a more comprehensive depiction of preventable ED visits in urban settings in Canada. We also estimated the sex-, age-, time- (by fiscal year [FY]), province-, and urban centre-specific prevalence to assess how these group-specific estimates differ across the four definitions.

Materials and Methods

Study Design and Setting

We conducted a retrospective, population-based study of ED visits in Ontario and Alberta that were reported to CIHI's National Ambulatory Care Reporting System (NACRS) from April 1, 2016 to March 31, 2020 (i.e., four consecutive FYs). The NACRS is a population-based health administrative database that contains administrative, clinical, and demographic data on emergency and ambulatory care, which includes ED visits, day surgeries, and outpatient clinic visits.

Ontario and Alberta are the largest and fourth-largest provinces in Canada with a population size in 2016 of 13,448,494 and 4,067,175, respectively.[32] We restricted our analysis to ED visits from residents of Alberta and Ontario because these two provinces had complete ED coverage for all years of our study period and two of our definitions of preventable ED visits (FPSC and SNC) were developed in these provinces. Ethical approval was not required as this study used anonymous secondary data from CIHI.

Study Population

All unscheduled ED visits made during the study period by patients (1) ages 1 to 74 years, (2) living in Alberta and Ontario's large urban centers, (3) who had a valid health care number (HCN), and (4) whose ED visits did not result in inpatient admissions, were included in the study. Scheduled ED visits, duplicate ED visit records, and visits by patients with missing or invalid HCNs were excluded from the analysis.

We used census metropolitan areas (CMAs) as a proxy measure of Canada's largest urban centres. A CMA is formed by one or more adjacent municipalities centred around a large urban core with a total population of at least 100,000, of which at least 50,000 must live in the urban core.[33] There are 16 CMAs in Ontario and three in Alberta; as of 2020, there were 12,091,336 people in Ontario and 3,141,060 people in Alberta who resided in CMAs.[34] The patients' place of residence at the time of their ED visit was recorded in NACRS as their forward sortation area (FSA), which are geographic areas defined by the first three characters of the Canadian postal code.[35] Statistics Canada's Postal Code Conversion File Plus (PCCF+) was used to match patients' FSA to their corresponding CMAs.[36]

Study Outcome

Following previous Canadian research, preventable ED visits were operationalized as: (1) CTAS, (2) ACSC, (3) FPSC, and (4) SNC. Each outcome measure was treated as a categorical binary variable.

Canadian Triage and Acuity Scale: The CTAS is a five-level triage system (I – resuscitation, II – emergent, III – urgent, IV – less urgent, and V – non-urgent) used in Canadian EDs.[37] Its primary objective is to provide benchmark target times to physician assessment, as well as quickly and accurately assess patients' severity and need for medical attention, prioritize and stream patients to appropriate treatment areas, and allow for more efficient allocation and

use of ED resources.[37-39] The CTAS has been extensively studied across different populations and is a valid and reliable measure of patient acuity, resource utilization, and ED performance.[40-45] Preventable ED visits were defined as visits that had a triage level of CTAS IV or V; this definition has been used elsewhere.[16,27,46,47]

Ambulatory Care Sensitive Conditions: ACSC are conditions for which timely and effective primary healthcare could prevent or reduce the risk of hospitalization by either preventing the onset of the illness, controlling the acute illness episode, or managing a chronic condition or disease.[48] Although they were originally developed as a measure of preventable hospitalizations, they have also been adapted and utilized in ED settings.[49] While there are varying definitions of ASCS, for this study we used the ACSC definition from CIHI, which includes the following seven chronic conditions (with some exclusions for certain cardiac procedures) that were identified based on the most clinically significant reason for the patient's ED visit: angina, asthma, chronic obstructive pulmonary disease, congestive heart failure and pulmonary edema, diabetes, grand mal status and other epileptic convulsions, and hypertension.[50]

Family Practice Sensitive Conditions: FPSC visits are ED visits for conditions that may be appropriately managed at a family physician's (FP) office, as treating these conditions at a FP's office would allow for proper follow-up and would lead to better patient outcomes.[21,51] FPSCs were developed by the Health Quality Council of Alberta, based on conditions or diseases for which the probability of admission as an inpatient was less than 1%.[21,51] Examples of FPSCs include migraine, chronic sinusitis, and scabies; the full list of FPSCs is available from Alberta Health.[21]

Sentinel Non-Urgent Conditions: SNC visits are ED visits for conditions that could be managed in non-hospital, alternative primary healthcare settings.[25,52] This indicator was developed by the Ontario District Health Councils' Local Health System Monitoring Technical Working Group and includes visits that were triaged as CTAS IV or V with an SNC as the most clinically significant reason for the patient's ED visit.[25,52] The included conditions were selected by ED physicians and public health experts and are considered as high-volume conditions that are important to track in assessing and monitoring how clinical alternatives could potentially reduce the burden of these visits on EDs.[52] Examples of SNCs include conjunctivitis, cystitis, and upper respiratory tract infection; the full list of SNCs is available from the Health Analytics Branch, Ministry of Health and Long-Term Care.[25]

Statistical Analysis

Univariate descriptive statistics (frequencies and proportions) were produced to describe the sex, age, temporal, and geographic (province and CMA of residence) distribution of the ED visits in our sample. To address our first objective, we estimated the overall proportion of ED visits that were preventable using the four definitions of preventable ED visits (CTAS, ACSC, FPSC, and SNC). We also estimated the adjusted relative risks (RRs) of preventable ED visits by patients' sex (male or female), age (ages 1-4, 5-9, 10-14, 15-17, 18-24, 25-44, 45-64, 65-74), over time (by FY), by province of residence (Alberta or Ontario), and by CMA of residence. The adjusted estimates for RR at the individual level for each definition were computed using a Poisson regression model for binary data with a robust error variance to account for multiple visits by the same patient.[53] These adjusted models included all above mentioned covariates. All statistical analyses were conducted using SAS 9.4 (SAS Institute Inc., Cary, NC, USA), with statistical significance at the level of $p < 0.05$.

Results

Between April 1, 2016 and March 31, 2020, there were 20,454,138 unscheduled ED visits made by patients ages 1 to 74 who resided in one of the 19 CMAs in Alberta or Ontario. After removing ED visits from patients with missing or invalid HCNs (282,819 visits), there were 20,171,319 ED visits made by 8,919,618 patients available for the analysis. On average, there were 2.26 visits per patient over the period of four FYs; the majority of patients had one (44.22%) or two ED visits (20.72%).

The univariate descriptive statistics for the ED visits included in our study are presented in Table 1. The overall mean (standard deviation) patient age at the time of each visit was 36.19 (20.54) years and 52.41% of visits were made by females. The annual number of ED visits was stable across the study period (4,981,225 in 2016-2017 FY, 5,094,652 in 2017-2018 FY, 5,066,083 in 2018-2019 FY, and 5,029,359 in 2019-2020 FY, respectively), with the majority of visits reported in Ontario (75.19%). The number of ED visits made across residents of the 19 CMAs in Ontario and Alberta ranged from 184,259 (0.91%) visits in Guelph, Ontario, to 6,594,160 (32.69%) visits in Toronto, Ontario.

The overall prevalence of preventable ED visits for all patients residing in one of the 19 CMAs in Alberta or Ontario ranged from 2.33% to 35.33% (see Table 2). Specifically, 35.33% (95% confidence limits [CL] 35.31%-35.35%) of ED visits were defined as preventable based on the CTAS definition, 12.88% (12.86%-12.89%) based on the FPSC definition, 3.41% (3.41%-3.42%) based on the SNC definition, and 2.33% (2.33%-2.34%) based on the ACSC definition.

The adjusted estimates for RR of having a preventable ED visit with their 95% CL by sex, age, FY, province of residence, and CMA of residence are presented in Table 3 and summarized in Table 4. Based on the CTAS and ACSC definitions, across all CMAs, males had

1.10 (CL=1.10-1.10) and 1.14 (CL=1.13-1.15) times higher risks of having a preventable ED visit, respectively, compared to females and controlling for other covariates. The opposite findings were reported for the FPSC and SNC definitions, however, where males had 0.90 (CL=0.90-0.90) and 0.66 (CL=0.66-0.67) times lower risks of preventable ED visits, respectively, compared to females. The risk of a CTAS visit increased and peaked at ages 10-14 (RR=1.22; CL=1.21-1.22, compared to those ages 1-4), and then decreased with older age. The age profiles for the risk of FPSC and SNC visits were similar; the RRs of these visits were highest among ages 1-4 (the reference group) and then decreased with older age to 0.27 (CL=0.27-0.27) and 0.28 (CL=0.28-0.29), respectively for those ages 65-74. The RRs for ACSC visits were relatively stable until ages 45-64 (1.56; CL=1.54-1.58) and 65-74 (2.55; CL=2.52-2.58). When assessing changes in the risk of ED visits over time, there was a pronounced decrease in RR for the CTAS and SNC definitions, with the RR at 0.85 (CL=0.85-0.86) in 2017-2018 FY and 0.81 (CL=0.80-0.81) in 2019-2020 FY, compared to the 2016-2017 FY. In comparison, there were no substantial trends across FYs observed for the ACSC and FPSC definitions. Residents of Alberta had substantially greater RRs of CTAS (1.37; CL=1.37-1.38) and SNC (1.50; CL=1.49-1.51) visits than residents of Ontario; for ACSC (RR=1.05; CL=1.04-1.05) and FPSC (RR=1.05; CL=1.05-1.06), differences in the RRs were also statistically significant but less pronounced. In terms of the differences in RR across CMAs, for CTAS, Lethbridge, Alberta had 2.11 (CL=2.10-2.12) times the risk of having a preventable ED visit compared to Toronto, Ontario while Windsor, Ontario had the highest RR for ACSC visits (1.35; CL= 1.33-1.38), controlling for other covariates. For FPSC, Belleville, Ontario had 1.49 (CL= 1.48-1.50) times the risk of preventable ED visits compared to Toronto. Lastly, for SNC visits, Kingston, Ontario had the highest RR (3.16; CL= 3.11-3.20).

Discussion

Using the four definitions of preventable ED visits that have been employed in previous Canadian research, the objective of this study was to estimate the proportion of preventable ED visits and to assess if the adjusted RRs of these visits differ by sex, age, time, and place of residence. The results of our analysis involving a population-based health administrative database indicate that, depending on the adopted definition, there was a substantial variation in the proportion of preventable ED visits, ranging from 2.33% (ACSC) to 35.33% (CTAS), with 12.88% of visits for an FPSC and 3.41% for an SNC. These findings are consistent with previous research which reported that 35.1% of ED visits in 16 of Alberta's high volume EDs[18] and 33.4% of ED visits in Ontario[17] were triaged as CTAS IV or V. While there are limited Canadian studies on preventable ED visits that have used the CIHI definition of ACSC, McAlister *et al.* found that approximately 2% of ED visits made by patients in Alberta who had previously seen a primary care physician at least once during the study period were for a Patient Medical Home indicator condition, which are similar to the CIHI definition of ACSC.[20] Our findings on the proportions of FPSC and SNC visits were lower than estimates reported in previous studies; Altmayer *et al.* found that 7.2% of ED visits in Ontario were for an SNC,[26] while Alsabbagh *et al.* and a CIHI report found that 19.3% of ED visits in Ontario[22] and 21% of ED visits in Canada,[23] respectively, were for an FPSC. A potential explanation for these differences may be due to our exclusion of rural residents, as Altmayer *et al.* noted that rural areas had substantially higher rates of SNC visits whereas urban areas had rates that were much lower.[26] Similarly, the CIHI report also noted that FPSC visits were more common in rural areas, with 32% of FPSC ED visits made by rural patients compared to 17% made by urban patients.[23]

The results from the adjusted models suggest that, controlling for other covariates, all four measures of preventable ED visits were significantly associated with sex and age, although there were some important differences in the nature of these associations. Males were more likely to have a CTAS or an ACSC visit and less likely to have an FPSC or SNC visit. FPSC and SNC visits had a similar pattern of distribution across age groups with the risks being relatively high for children ages 1 to 9 and then declining gradually for older age groups. A similar pattern of gradual decline was observed for CTAS visits for those ages 10 to 74; however, there was a noticeable increase between ages 1 and 9. For the ASCS visits, there was a U-shape relationship between age and risk of preventable ED visits with the risk being highest among those ages 65-74. Thus, CTAS, FPSC, and SNC visits were more likely to occur among younger patients, whereas ACSC visits were more likely to occur among older patients.

These results may reflect potential sex differences in health services and ED utilization and the differential burden and impact of illnesses and diseases across different age groups and stages of the life course which, in turn, may affect an individual's heath status and their subsequent use of health services and EDs. Older patients – in particular, those ages 45 and older – were more likely to have an ACSC visit and less likely to have a CTAS visit. A potential explanation for this may be that the CIHI's definition of ACSC only includes chronic conditions, which are more prevalent among older adults.[54] Previous research has also found that older adults use ED services at higher rates and their visits are more likely to be of greater urgency and complexity as they often visit with atypical presentations of medical illnesses or complaints, cognitive impairment, polypharmacy, and comorbidities.[55,56] We also found that the likelihood of having an FPSC or SNC visit decreased with older age, which aligns with previous studies that have found that older age was associated with lower odds of having an FPSC visit.[22,24] FPSCs

and SNCs are primarily composed of acute minor medical complaints that may be more reflective of timely access to and availability of primary healthcare during the illness episode itself, thus representing different dimensions of access to primary healthcare. Specifically, younger patients are less likely to have regular access to a family physician and therefore need to seek care elsewhere, such as at the ED.[24,57]

Two definitions, CTAS and SNC, showed a decrease in risk across the four FYs (2017-2020) whereas ACSC and FPSC remained stable. SNC visits have an additional criterion of only including visits that were triaged as CTAS IV or V, which may explain why the prevalence of preventable ED visits based on this definition also declined across time. Decreases in CTAS IV and V have been observed in previous studies in Ontario, British Columbia,[58] and Nova Scotia.[59] There were also geographic differences in the RRs of preventable ED visit. Compared to Ontario, residents in Alberta had a substantially greater risk of CTAS and SNC visits. Differences in risk were also found across CMAs in Ontario and Alberta; Lethbridge, Alberta had the highest risk of having a CTAS ED visit compared to Toronto, Ontario whereas Windsor, Ontario had the highest risk for ACSC visits. Belleville, Ontario had a higher risk of having a FPSC visit than Toronto. Lastly, for SNC visits, Kingston, Ontario had the highest risk.

Overall, there is a substantial level of variation in prevalence across definitions of preventable ED visits, and researchers and health policy makers should be mindful about interpreting these estimates as each of them has a different meaning and may lead to different conclusions. Moreover, depending on the definition used, preventable ED visits may be impacted by a multitude of factors. Ultimately, the conceptualization and measurement of preventable ED visits is complex, multi-faceted, and may not be adequately captured by a single measure. Future research that incorporates factors related to the distribution and geographic accessibility to

primary healthcare services in CMAs would further our understanding of the associations between access to primary healthcare and preventable ED visits in urban settings. Additionally, further research is warranted that explores how other individual- and area-level factors (e.g., race, ethnicity, income, education) are associated with different risks of preventable ED visits across the definitions.

Strengths and Limitations

Our study was strengthened by the use of a population-based health administrative database with complete ED coverage for the two selected provinces. This allowed us to compute and compare the estimates for the four measures of preventable ED visits. Our focus on preventable ED visits by urban residents removed variability in ED utilization that may arise from urban-rural differences and allowed us to uniquely explore the extent to which urban residents visit the ED for low acuity, primary healthcare-treatable conditions. There are, however, several limitations that should be noted. As the aim of our study was to broadly explore and quantify the prevalence of preventable ED visits and the relative risk of having these visits, we limited our analyses to the patient demographic characteristics that are available in the NACRS database. There is also potential for non-differential misclassification due to coding errors in data elements such as the visit's triage level or main diagnosis, which would bias our estimates towards the null.

Conclusion

We demonstrated the applicability of four different definitions of preventable ED visits to a national health administrative database, which can be used for future research in monitoring and assessing the magnitude and burden of preventable ED visits at the population level. In the context of low acuity visits or visits that are amenable to treatment and care from primary health

care, between 2.3% to 35.3% of ED visits made by urban residents of Alberta and Ontario were preventable. Thus, despite living in large urban centres with comparatively better access to and availability of primary healthcare than rural and remote areas, a sizable proportion of ED visits were amenable to care and treatment in primary healthcare settings or of low acuity. Future studies should look not only at inter- but also intra-urban differences in preventable ED visits and what role neighbourhood characteristics play.

Using various types of definitions in conjunction with each other would provide a more holistic understanding of the pathways through which preventable ED visits occur and how they can be addressed and reduced through more targeted interventions in improving and strengthening the delivery of healthcare. Thus, further research is required to better understand the associations between preventable ED visits and individual and geographic correlates of these visits. Such research, for instance, may focus on different dimensions of access to primary healthcare in order to develop more effective healthcare policies and strategies to reduce these visits and enhance the delivery of primary healthcare.

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Table 1 – Descriptive statistics for study variables

Variable	Category	Population Size	Frequency (n)	Percentage (%)
Sex	Female		10,570,185	52.41
	Male		9,598,972	47.59
	Unknown		2,162	
Age	1-4		1,518,962	7.53
	5-9		1,046,941	5.19
	10-14		981,463	4.87
	15-17		736,013	3.65
	18-24		2,219,630	11
	25-44		6,121,047	30.35
	45-64		5,514,715	27.34
	65-74		2,032,548	10.08
Fiscal Year	2016-2017		4,981,225	24.69
	2017-2018		5,094,652	25.26
	2018-2019		5,066,083	25.12
	2019-2020		5,029,359	24.93
Province	Ontario	14,223,942	15,166,145	75.19
	Alberta	4,262,635	5,005,174	24.81
CMAs in *Ontario*	Ottawa	1,125,306	1,520,615	7.54
	Kingston	176,467	375,574	1.86
	Belleville	113,729	392,397	1.95
	Peterborough	131,608	350,797	1.74
	Oshawa	434,736	537,573	2.67
	Toronto	6,572,524	6,594,160	32.69
	Hamilton	812,528	1,086,136	5.38
	St. Catharines - Niagara	439,777	723,504	3.59
	Kitchener - Cambridge - Waterloo	600,304	633,856	3.14
	Brantford	154,483	336,481	1.67
	Guelph	169,674	184,259	0.91
	London	556,397	986,485	4.89
	Windsor	351,116	424,234	2.10
	Barrie	221,576	304,458	1.51
	Greater Sudbury	172,781	320,061	1.59
	Thunder Bay	125,247	395,555	1.96
CMAs in *Alberta*	Lethbridge	130,027	338,310	1.68
	Calgary	1,559,284	2,108,226	10.45
	Edmonton	1,480,754	2,558,638	12.68

Note: CMA, Census Metropolitan Area

Table 2 – Prevalence of preventable emergency department visits in Alberta and Ontario by definition

Definition	Prevalence	95% Lower CL	95% Upper CL
CTAS	35.33	35.31	35.35
ACSC	2.33	2.33	2.34
FPSC	12.88	12.86	12.89
SNC	3.41	3.41	3.42

Note: ACSC, Ambulatory Care Sensitive Conditions; CL, confidence limit; CTAS, Canadian Triage and Acuity Scale; FPSC, Family Practice Sensitive Conditions; SNC, Sentinel Non-Urgent Conditions

Table 3 – Relative risks of preventable emergency department visit in Alberta and Ontario by definition and selected correlates

Variable	Category	CTAS	ACSC	FPSC	SNC
Sex	Female (REF)				
	Male	1.10 (1.10, 1.10)	1.14 (1.13, 1.15)	0.90 (0.90, 0.90)	0.66 (0.66, 0.67)
Age	Age 1-4 (REF)				
	Age 5-9	1.21 (1.20, 1.21)	1.10 (1.08, 1.12)	0.77 (0.77, 0.78)	0.92 (0.91, 0.93)
	Age 10-14	1.22 (1.21, 1.22)	0.81 (0.79, 0.83)	0.48 (0.48, 0.48)	0.50 (0.49, 0.51)
	Age 15-17	1.08 (1.07, 1.08)	0.64 (0.63, 0.66)	0.43 (0.43, 0.43)	0.49 (0.49, 0.50)
	Age 18-24	1.05 (1.05, 1.05)	0.64 (0.63, 0.65)	0.44 (0.44, 0.44)	0.49 (0.49, 0.50)
	Age 25-44	0.96 (0.96, 0.96)	0.72 (0.71, 0.73)	0.40 (0.40, 0.41)	0.38 (0.38, 0.38)
	Age 45-64	0.92 (0.91, 0.92)	1.56 (1.54, 1.58)	0.34 (0.34, 0.35)	0.31 (0.31, 0.32)
	Age 65-74	0.84 (0.84, 0.84)	2.55 (2.52, 2.58)	0.27 (0.27, 0.27)	0.28 (0.28, 0.29)
Fiscal Year	2016-2017 (REF)				
	2017-2018	0.98 (0.97, 0.98)	1.02 (1.01, 1.03)	1.01 (1.01, 1.01)	0.97 (0.97, 0.98)
	2018-2019	0.93 (0.93, 0.93)	1.01 (1.00, 1.02)	0.97 (0.96, 0.97)	0.84 (0.83, 0.84)
	2019-2020	0.85 (0.85, 0.86)	1.01 (1.00, 1.02)	1.00 (0.99, 1.00)	0.81 (0.80, 0.81)
Province	Ontario (REF)				
	Alberta	1.37 (1.37, 1.38)	1.05 (1.04, 1.05)	1.05 (1.05, 1.06)	1.50 (1.49, 1.51)
CMAs in Ontario	Toronto (REF)				
	Ottawa - Gatineau	1.34 (1.34, 1.35)	1.21 (1.20, 1.23)	1.18 (1.17, 1.18)	2.06 (2.04, 2.08)
	Kingston	1.91 (1.90, 1.92)	1.18 (1.15, 1.20)	1.43 (1.42, 1.44)	3.16 (3.11, 3.20)
	Belleville	1.48 (1.47, 1.49)	1.33 (1.30, 1.35)	1.49 (1.48, 1.50)	2.75 (2.71, 2.79)
	Peterborough	1.46 (1.45, 1.47)	1.23 (1.20, 1.25)	1.38 (1.37, 1.39)	2.62 (2.58, 2.66)
	Oshawa	1.38 (1.37, 1.39)	1.13 (1.11, 1.15)	0.87 (0.86, 0.88)	1.23 (1.21, 1.25)
	Hamilton	1.22 (1.22, 1.22)	0.94 (0.93, 0.95)	1.12 (1.11, 1.13)	1.76 (1.74, 1.78)
	St. Catharines - Niagara	1.14 (1.14, 1.15)	1.18 (1.16, 1.20)	1.38 (1.37, 1.39)	2.28 (2.26, 2.31)
	Kitchener - Cambridge - Waterloo	1.05 (1.04, 1.05)	1.04 (1.02, 1.05)	0.91 (0.91, 0.92)	1.18 (1.16, 1.20)
	Brantford	1.43 (1.42, 1.44)	1.24 (1.21, 1.26)	1.45 (1.44, 1.46)	3.05 (3.00, 3.09)
	Guelph	0.98 (0.97, 0.99)	0.91 (0.88, 0.94)	1.04 (1.03, 1.05)	1.17 (1.14, 1.21)

	London	1.44 (1.44, 1.45)	1.07 (1.05, 1.08)	1.32 (1.31, 1.32)	2.34 (2.31, 2.37)
	Windsor	0.87 (0.86, 0.87)	1.35 (1.33, 1.38)	0.87 (0.86, 0.87)	1.18 (1.16, 1.21)
	Barrie	1.27 (1.26, 1.28)	1.06 (1.04, 1.09)	1.11 (1.10, 1.12)	1.72 (1.69, 1.76)
	Greater Sudbury	1.47 (1.46, 1.48)	1.28 (1.26, 1.31)	1.07 (1.06, 1.09)	1.87 (1.83, 1.90)
	Thunder Bay	1.29 (1.29, 1.30)	1.03 (1.01, 1.06)	1.30 (1.29, 1.31)	1.70 (1.67, 1.74)
CMAs in Alberta	Lethbridge	2.11 (2.10, 2.12)	0.94 (0.92, 0.97)	1.30 (1.29, 1.31)	3.00 (2.95, 3.04)
	Calgary	1.50 (1.50, 1.50)	1.12 (1.11, 1.13)	1.14 (1.13, 1.14)	2.11 (2.10, 2.13)
	Edmonton	1.65 (1.65, 1.65)	1.16 (1.15, 1.17)	1.18 (1.17, 1.18)	2.45 (2.43, 2.47)

Note: ACSC, Ambulatory Care Sensitive Conditions; CL, confidence limit; CMA, Census Metropolitan Area; CTAS, Canadian Triage and Acuity Scale; FPSC, Family Practice Sensitive Conditions; REF, reference category; RR, relative risk; SNC, Sentinel Non-Urgent Conditions