Unveiling Trends: A 5-year Analysis of Non-Emergency Visits to the Emergency Department Amidst Primary Care Challenges in the USA and Canada

ABSTRACT

Background: Regular unscheduled low-acuity visits to the emergency departments (ED) significantly cause crowding and prolonged wait times, adversely affecting patient outcomes. **Aims:** To analyze and explore the relationship between socio-demographic factors, and the most frequent reasons for low-acuity ED visits; and the effect of availability and accessibility

of primary health care services on these factors.
Methodology: A retrospective cross-sectional study; used datasets from CIHI (Canada) and NCHS (US) focusing on low triage ED visits from 2018 – 2023. We included all age-groups, sexes and races with triage levels 4-5 for NCHS and CTAS IV-V for CIHI. Analyzed data through functionalities of Microsoft Excel (Microsoft, Washington, USA) and Google spreadsheets.
Results: An inverse negative correlation exists between different age-groups, and low-acuity visits in both countries. A chi-square test of independence showed a significant relationship between age and triage levels at presentation (c.l= 0.95, p value = 0.05), while this association was constant over the years for Canada, it was variable in the US. There are also sex and racial disparities among frequent ED visitors. The effect of pandemic changes on low-acuity visits is reflected in a 3.8% reduction in low-triage visits in Canada and a 3.6% reduction in the US between 2018 and 2022.
Conclusion: Our investigation revealed a higher prevalence of ED visits among females in Canada and males in the US, and higher visits among the White race compared to other races, offering a starting point to address ED over-utilization for low triage visit dispositions and allocation of healthcare resources to improve access to primary care services; reduce the burden of overwhelming the ED system capacity; and inform policy changes. Confronting the reasons for these disparities among social groups and demographic factors is pivotal to channeling healthcare resources towards more effective primary care services, and an area of future direction.

Keywords: low acuity; ED visits; primary care; system capacity; emergency department; non-urgent; less urgent; semi-urgent; low triage levels; pandemic

1. INTRODUCTION

Frequent visits to the emergency department (ED) for non-emergency reasons can easily lead to ED overcrowding and are of primary interest to key decision-makers in ED systems. ED overcrowding and prolonged wait times in the ED have been recognized as major issues in the US, Canada, and globally, negatively impacting patient safety [1,2,3,4]. Recognizing the relationship between health-seeking behaviours and ED use and understanding other modifiable contributory factors are essential in advancing patients' overall well-being and improving access to primary care.

An ED is vital to hospital function, is easily accessible, operates continuously, offers unplanned medical services to individuals requiring immediate care, is round the clock every day of the week, and ensures patients receive prompt and critical medical attention whenever needed [2,3,5]. Patients can seek care at any ED, their capacity to pay notwithstanding [6]. An ED visit is an unmediated transaction between a patient and a physician (or other healthcare providers (HCP) working under the physician's leadership) to request immediate medical care or personal health services [5]. ED services include triaging, diagnosing, and treating a range of mild to life-threatening medical problems [2,3]. Non-urgent ED visits are generally defined as visits for health conditions in which a time gap in treatment would not increase the likelihood of an adverse outcome [7]. In this study, we focused on low-acuity visits such as Canadian Triage Acuity Scale (CTAS) levels IV-V for Canada and Triage levels 4-5 for the US, each corresponding to less-urgent versus non-urgent levels and semi-urgent versus non-urgent levels respectively. CIHI uses the CTAS levels for both pre-hospital and hospital triaging as obtainable in Canada, while in the US, the triage used by the NCHS is the emergency severity index (ESI), simply represented as Levels 1 -5, as reported in the national statistics reporting database. This research is driven by two main objectives. The first aim is to analyse the relationship between socio-

demographic factors, and the most frequent reasons for low-acuity ED visits. The second aim is to explore the effect of availability and accessibility of primary health care services on these variables. The research questions - does sociodemographic factors affect low triage ED visits, and what is the role of primary care services in reducing frequent non-urgent ED visits? - guided the study, with the goal of arriving at a comprehensive conclusion of the relationship between these variables. The subsequent sections emphasized low-acuity ED visits due to significant effects on patients' care, such as overcrowding and overwhelming the available system capacity, leading to a healthcare crisis; and presents our corresponding hypotheses and results.

1.1 Epidemiology and System Capacity

The populations of both Canada and the U.S.A. have been steadily increasing, with Canada experiencing an 11.1% population growth from 2016 to 2023, primarily driven by annual rises in immigration [8]. Despite this growth, healthcare resources in Canada and available community services (input factors), such as the number of family physicians per capita, emergency mental health services, and off-hours services, are low [8]. This affects the availability of high-quality, accessible primary care essential for a well-functioning healthcare system, leading to system dysfunction [2,9]. The number of ED physicians per 1,000 population in Canada ranges between 0.030 and 0.24 [8]. Given the ED's provision of round-the-clock care and availability of diverse healthcare professionals and diagnostic tools [9], the rise in non-emergency ED visits, which further strains ED resources, is no surprise. Severe patient safety issues such as ED crowding (EDC), reduced care quality, avoidable medical errors, lack of timely intervention for more serious illnesses, leaving against medical advice (AMA) and/or without being seen, increased mortality, and the physical and emotional impact to HCPs [2,10] are the sequelae of these systemic issues.

Data from Canadian studies showed non-urgent ED use ranged from 17% to 27%, with influencing factors such as younger age, season, time of day, ED arrival mode, geographical proximity of residence to the ED, and lack of primary care access [11,12]. Studies from the United States showed that despite the emergence and increased utilization of newer healthcare venues for acute care, such as urgent care centers, retail clinics, and telemedicine, the number of ED visits and spending associated with low-acuity conditions increased by 31% and 14%, respectively [13]. Avoidable ED visits is a key source of inpatient admissions, accounting for over 50% of all inpatient admissions nationally in the US [14]. This places significant strain on the healthcare system by increasing overall cost and leading to ED overcrowding [15]. According to the 2021 NHAMCS data [16], Computer-assisted triage and separate fast-track units for non-urgent care were implemented at approximately 34-39%, whereas physician involvement at triage, along with pool and zone nursing, was observed at rates of 43-49% of the time.

1.2 Effects of ED Crowding

ED crowding (EDC) is a consequence of frequent low-acuity visits to the ED and a source of patient harm. It emerges when there's a disconnect between the need for ED services and the capacity of the health system to deliver appropriate healthcare (supply) within a specific timeframe [10,12]. As the ED is a function of a larger health and social system, EDC represents a complex challenge within this system [10]. It is a significant economic burden on health systems, leading to inefficient management of high in-patient levels [1]. Due to the high cost of care associated with EDC, redirecting non-urgent ED visits in the U.S. to retail clinics or urgent care facilities could result in an estimated annual savings of $4.4 billion [17]. However, factors such as insufficient hospital capacity and in-patient beds for individuals

presenting to the Canadian and U.S. EDs requiring admission makes this impossible, leading to prolonged boarding times [10,17].

Crowding is further compounded in the current post–COVID–19 environment as hospitals are eager to re-institute comprehensive inpatient services. At the same time, hugely regulatory but requisite infection control practices remain in place, limiting hospital and ED functions [14]. While EDs are the door openers for healthcare for most SARS–CoV–2–infected patients, the pandemic has further exposed the challenges faced by severely crowded EDs in responding effectively and safely during crises [14]. Acutely ill ED patients requiring urgent intervention leave without being seen (LWBS) due to prolonged waits and resulting setback in treatment of both high- and low-acuity patients, ambulance diversion, increased adverse events and preventable error, and increasing patient morbidity and mortality [1,14]. EDC leads to increased violence toward staff, high HCP turnover, decreased provider productiveness, and increased staff befuddlement, resulting in human and diagnostic errors and ensuing legal action. Physician burnout, approaching 75%, is also a result of EDC. In contrast, patient experience is poor regardless of the quality of care when patients have to wait for long hours in various states of discomfort, generating both poor patient and staff satisfaction [12,18]. The consequences of ED crowding on patient harm, staff burnout, and excessive healthcare costs cannot be overemphasised.

1.3 ED visits and Mental Health/ Substance Use

The number of ED users related to substance use disorders have grown since the onset of COVID-19, suggesting a heightened need to recognize high-risk substance use patterns in the ED to mitigate future harms. Substance use disorders account for one in 11 ED visits [19]. The ED is steadily being used as an initial health care contact for individuals with mental illnesses and addictions, as nearly half of incident psychiatric ED visits were first-contact visits, which may have been averted with better access to outpatient mental health and addiction services [20]. 45.4% of patients aged 16 and above had no outpatient contact for mental health or addiction-related reasons between 2010 and 2018 prior to their ED visit [20]. Subgroups of people with “extreme” (13–19 visits/year) and “moderate” (4–6 visits/year) frequent ED visits and substance use had similar utilization patterns and characteristics in Ontario, Alberta, and British Columbia, and the “extreme” subgroup had high mortality [19].

2. MATERIAL AND METHODS

In this study, we utilized specific primary data from the National Center for Health Statistics (NCHS) related to non-emergency visits to the US and data from the Canadian Institute for Health Information (CIHI), a source of essential information on the health of Canadians. The gathered information included triage levels, visit disposition, main problems, expected source of payment, and demographic factors such as age, sex and race. During the data extraction process, we focused on low-acuity triage visits to the ED, which included CTAS IV-V in Canada and Levels 4 and 5 in the US, corresponding to less-urgent and non-urgent visits, and semi-urgent and non-urgent visits in Canada and US respectively. Our study focused on the triage levels and variable demographic factors between 2018- 2023. We used the age brackets and demographic variables provided in the originally collated data from CIHI and NCHS. We also conducted a prior quick google search of published articles and reviewed literature focused on ED visits in the US and Canada published within the study period to identify research gaps which formed the basis of our study. Papers outside our search criteria were excluded.

2.1 Study perspectives - Different factors contribute to the utilisation of ED resources. The significance of these factors have not been discussed by current literature in depth. Our

study emphasizes the impact of diversity of the ED population who present with low triage reasons on ED resources and system capacity. The study hypothesizes that:
H1. There is a significant relationship between sociodemographic factors and the frequency of low-acuity visits.
H2. No significant relationship exists between sociodemographic factors and the frequency of low-acuity visits.

2.3 Data Management - We employed the functionalities of Microsoft Excel (Microsoft, Washington, USA) and Google spreadsheets to analyze and manage the collated information. Due to the limitations of both software in analyzing information compared to specialized statistical software, we calculated the resulting frequencies on Microsoft Excel spreadsheet. We organized them into tables and figures to comprehensively and succinctly represent our findings. We carried out inferential statistics and exploratory data analysis demonstrated through our hypothesis tests, correlation analysis, and multivariate graphical illustrations. We used the correlation coefficient test to examine the relationship between the ED triage levels and the age of presenting patients during the five-year period. The correlation coefficient indicated whether statistically significant differences existed between age and triage levels during this time. Our findings are illustrated in figures and tables.

3. RESULTS AND DISCUSSION

The presentation of results in the Tables and Figures provides a comprehensive understanding of our research findings on non-emergency ED visits in these two countries within the study period. For this study, pre-pandemic period is between 2018- late 2019, intra-pandemic is between 2020- early 2023, and post-pandemic period begins after May 2023.

3.1 Based on Triage Levels - The COVID-19 pandemic impacted non-emergency ED visits in Canada (CTAS IV-V) and the USA (Triage level 4). Canada saw a drop from 15.02M to 11.62M visits, while the USA non-emergency ED visits decreased from 150.6M to 131.2M in 2020-2021 [24]. However, both countries observed increased visits in subsequent years: Canada in 2021-2023 and the USA in 2021 [16,24,25]. This rebound, which may indicate a return to pre-pandemic levels or reflect an increased complexity of cases presented to EDs, invites further exploration and thoughtful consideration of its potential implications. While Canada consistently showed higher proportions of low-acuity visits (CTAS IV-V) compared to the USA's semi-urgent (Triage level 4) visits, it is essential to note that direct comparison between the two countries is limited due to their differing triage systems. However, similar terms were used for low-acuity visits.

In addition, trends in median Length of Stay (LOS) in Canada for less-urgent and non-urgent visits show notable variability, likely reflecting pandemic-related healthcare challenges. There was a decrease in median LOS in 2020-2021, with less-urgent visits dropping from 156 minutes to 138 minutes, and non-urgent visits decreasing from 114 minutes to 90 minutes and a rebound in 2021-2022 [24]. A rebound followed this in 2021-2022 (intra-pandemic). These fluctuations in LOS provide insight into the dynamic nature of ED operations and resource utilization during this period, potentially indicating changes in patient volume, acuity mix, or hospital processes in response to the pandemic [16,21,22,23,24,25]. Table 1 below summarises changes in trends during the study period.

Table 1: Frequency of ED Visits for all Population based on non-emergency Triage levels in the US and Canada

Country	Year	Less-urgent Visit		Non-urgent Visit		Total Visits
		Proportion of Visits (%)	Median LOS (minutes)	Proportion of Visits (%)	Median LOS (minutes)	
Canada	2018 – 2019	30.80%	144	9.60%	108	15,084,395
	2019 – 2020	28.90%	156	9.80%	114	15,027,239
	2020 – 2021	27.20%	138	9.10%	90	11,625,660
	2021 – 2022	27.00%	162	8.90%	114	13,997,906
	2022 – 2023	-	-	-	-	15,129,313
USA	2018	21.90%	-	3.10%	-	129,974,000
	2019	21.20%	-	2.70%	-	150,650,000
	2020	18.10%	-	2.50%	-	131,297,000
	2021	18.30%	-	2.50%	-	139,781,000

3.2 Based on Sex - Interestingly, gender disparities in ED utilisation for non-urgent care differed between both countries. In Canada, females consistently had a higher number of non-urgent visits, while in the USA, males had a slightly higher percentage of semi-urgent visits until 2020, after which the proportions became nearly equal, during the pandemic [16,21,22,23,24], see Table 2 below. These patterns could inform targeted interventions to reduce unnecessary ED visits and mitigate crowding in both countries.

Table 2: Comparison of Low-acuity visits to the EDs of Canada and US between 2018-2023 based on Sex. Note: N/A = not available

Country	Fiscal Year	Total No of ED Visits for all sexes (Whole figures) for CTAS IV-V Triage Levels	No of ED Visits for Sex for CTAS IV (Less Urgent)	No of ED Visits for Sex for CTAS V (Non-Urgent)

			Female	Male	Proportion of Less Urgent (%)	Female	Male	Proportion of Non-Urgent (%)
Canada	2018-2019	6,088,604	2,389,976	2,250,887	76	714,785	731,151	23.75
	2019–2020	5,807,710	2,220,865	2,116,460	74.68	724,485	744,072	25.29
	2020–2021	4,216,897	1,587,885	1,575,769	75.02	509,823	542,184	24.95
	2021–2022	5,028,518	1,915,017	1,867,488	75.22	606,335	637,620	23.74
	2022-2023	N/A	N/A	N/A	N/A	N/A	N/A	N/A

USA	**Year**	**Total Number of Visits for all sexes for all Triage levels (in Thousands)**	**Proportion of Semi Urgent- Triage level 4 (% distribution)**		**Proportion of Non-Urgent- Triage level 5 (% distribution)**	
			Female	**Male**	**Female**	**Male**
	2018	129,174	21.5	22.4	2.6	3.6
	2019	150,650	20.3	22.3	2.5	3
	2020	131,296	18.2	18	2.1	2.6
	2021	139,782	18.1	18.6	2.3	-
	2022	N/A	N/A	N/A	N/A	N/A

	2023	N/A	N/A	N/A	N/A	N/A

3.3 Based on Age - In Canada, the highest number of ED visits for non-emergency reasons was notable during the pandemic period for all ages. Ages 20-44 had a slight peak between 2020-2021 fiscal year, while those between 00-19 years had a dip in trend of visits in 2020-2021 fiscal year [24]. The other age groups maintained a relatively stable trend between 2018- 2022. In the US, children (under 15) visited the ED more frequently for low triage levels between 2018-2021, with a decline in 2020 which remained proportionately steady during the following year. Meanwhile, the number of low-acuity visits was comparably the same for 15-25 and seniors (65 years and above) [16,21,22,23]. See Figures 1, 2 and Table 3 below. Table 4 summarises the chi-square and *P* values between variables of age, triage levels, the year and country

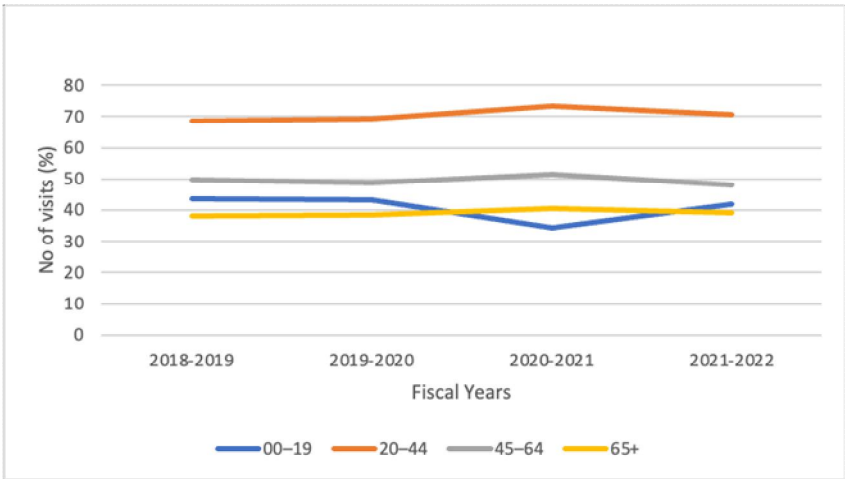

Figure 1: Trends of Non-emergency visits in Canada based on Age

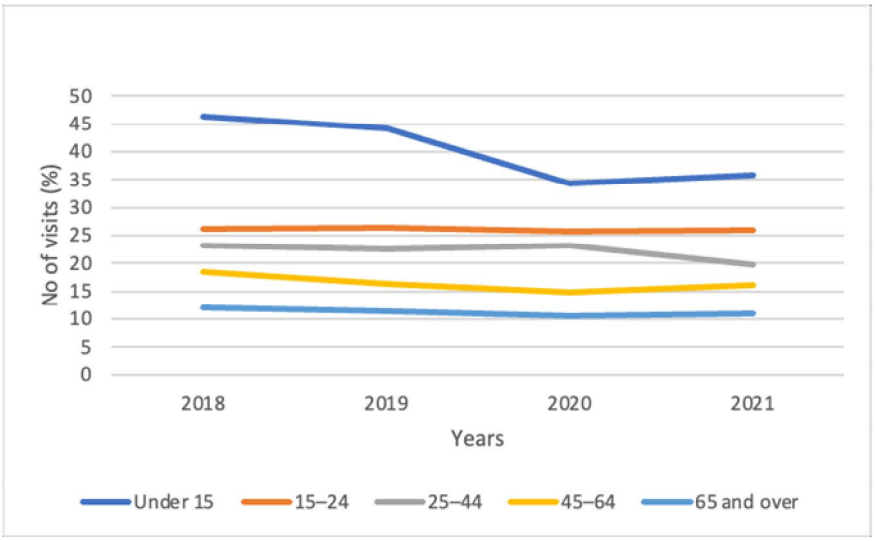

Figure 2: Trends of Non-emergency visits in the US based on Age

Table 3: A Pearson Correlation Coefficient table illustrating the negative correlation between age and frequency of low-acuity ED visits

Canada			USA	
Type of visit, year	*Correlation coefficient w.r.t age*		*Type of visit, year*	*Correlation coefficient w.r.t age*
less urgent, 18-19	-0.56		semi urgent, 18	-0.93
non urgent, 18-19	-0.20		non urgent, 18	-0.72
less urgent, 19-20	-0.52		semi urgent, 19	-0.93
non urgent, 19-20	-0.20		non urgent, 19	-0.86
less urgent, 20-21	-0.09		semi urgent, 20	-0.99
non urgent, 20-21	-0.03		non urgent, 20	-0.97
less urgent, 21-22	-0.36		semi urgent, 21	-0.96
non urgent, 21-22	-0.26		non urgent, 21	-0.92

The above correlation table illustrates the relationship between age and low triage visits in both the US and Canada. A correlation more than 0 indicates a positive relationship, while a correlation less than 0 shows a negative relationship, and a correlation of 0 shows no relationship exists between the variables.

Table 4: Statistical Tests of Significance between Age, Triage levels, Year and Country: Chi-square and P values

Country	**Stratified Years**	**Fiscal Year**	**Age group (years)**	**Chi square (χ^2)**	
				Less-urgent	**Non-urgent**
Canada	Pre-pandemic to intra-pandemic periods	2018-2019	00 – 65+	0.82	0.15
		2019–2020	00 – 65+	0.71	0.085
		2020-2021	00 – 65+	0.31	1.17
		2021–2022	00 – 65+	0.18	0.02
	Late intra-pandemic to Post-pandemic	2022-2023	00 – 65+	NA	NA
	Stratified Years	**Fiscal Year**	**Age group (years)**	**Chi square (χ^2)**	
				Semiurgent	**Nonurgent**
USA	Pre-pandemic	2018	Under 15 – 65+	10.44	1.06
	Pre-pandemic	2019	Under 15 –	0.13	0.22

	to intra-pandemic periods		65+		
		2020	Under 15 – 65+	0.71	0.31
		2021	Under 15 – 65+	0.20	0.21
		2022	Under 15 – 65+	NA	NA
	Post-pandemic	2023	Under 15 – 65+	NA	NA

c.l= 0.95; *P* = 0.05; df for Canada = 3, χ^2 critical value = 7.815; df USA = 4, χ^2 critical value = 9.488. Note: N/A = not available; c.l= Confidence level; df= degrees of freedom

3.4 Based on the Main Problem and Visit Disposition - Based on available data, the study analyzed the outcome of low-acuity ED visits in Canada between 2018-2022 (intra-pandemic) and some months in 2023 (post-pandemic). Pre-pandemic, there were more visits to the ED, and thus a higher proportion were discharged or left without being seen, compared to those who were admitted or transferred to another facility. The numbers tended to reduce in the following years as seen in *Figure 3* below.

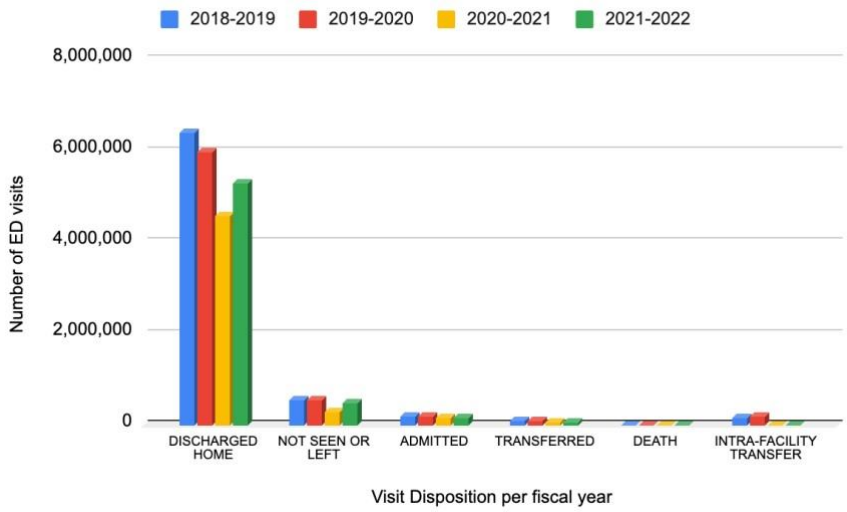

Figure 3: The Outcome of Low-acuity Visits to the EDs in Canada

Based on CIHI data in the period covering pre-and-intra-pandemic, between 2018- 2022 [24], the most frequent reasons for ED visits include acute myocardial infarction (MI), asthma, unintentional falls, influenzal pneumonia, motor vehicular collisions (MVCs), and trauma for all triage levels. In the pre-pandemic period (2018-2019 fiscal year), 29.14% and 27.74% of total less urgent and non-urgent ED visits for any reason, respectively. These figures rose to 47.10% for less urgent and 48.37% for non-urgent visits intra-pandemic (2019-2020, 2020-2021 and 2021-2022 fiscal years) [24]. Individuals aged 65 and older account for the highest number of ED visits across the study period for unintentional falls, pneumonia, and acute MI [24]. They share a similar frequency of visits for influenza pneumonia with individuals aged 45-64. Individuals aged 0-19 exhibit the highest frequency of ED visits for asthma throughout the study period, except between 2020 and 2021 when they ranked second highest to those aged 20-44. Individuals aged 20-44 have the highest frequency of ED visits for trauma and MVC throughout the study period. The youth aged 20-44 have the highest frequency of ED visits for non-emergency reasons, such as trauma, and

rank third highest for MVC visits, yet they experience the lowest LOS [24]. Data from 2022-2023 fiscal year shows abdominal and pelvic pain, pain in throat and chest, and acute upper respiratory infections of multiple and unspecified sites as the top three main problems for ED visits in six Canadian provinces, however the triage levels were not available [25].

The length of stay (LOS) in the ED is notably prolonged among patients presenting with acute myocardial infarction (MI) as their primary reason for visit, with a decline during the peak of the pandemic (2020-2021) followed by a return to pre-pandemic levels [24]. Similarly, patients presenting with influenza pneumonia during the height of the pandemic experienced extended LOS, which has since reverted to pre-pandemic levels. Conversely, LOS due to trauma has significantly decreased post-pandemic. Asthma, most prevalent among individuals aged 0-19, is associated with lower LOS. While acute MI and influenza pneumonia are most common among individuals aged 65 and older, they are associated with the highest LOS in the ED. There is a paucity of data on the number of ED visits for non-urgent reasons, such as influenza pneumonia, between 2020 and 2022, with influenza pneumonia consistently exhibiting the lowest number of ED visits throughout the study period [24]. No data is available on the LOS, triage levels and main problems for the 2022-2023 fiscal year immediately post-pandemic (2023).

The most common reasons for ED visits to the US between 2018- 2021 were stomach and abdominal pain, chest pain and related symptoms, fever, cough, shortness of breath, headache/pain, pain elsewhere, back symptoms, leg symptoms, and vomiting [16,21,22,23]. However, there was no correlation between these reasons and the triage levels. Hence, they could not be analyzed. Figure *4* below illustrates the main reasons for visits within the study period

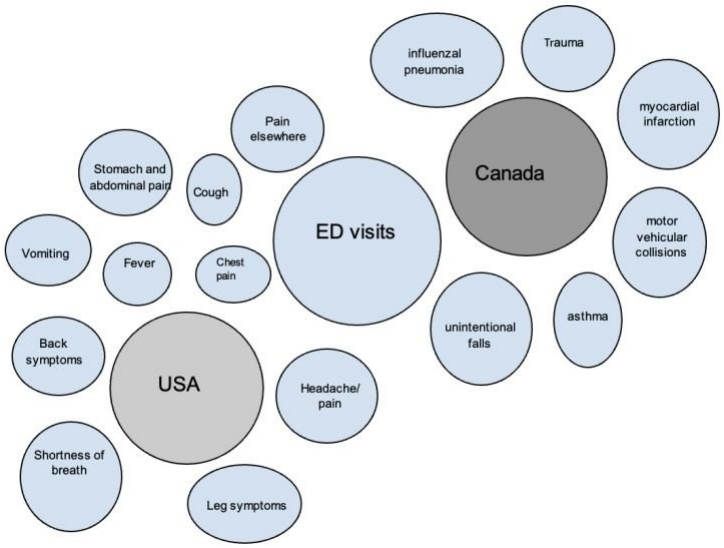

Figure 4: Main Reasons for Visits for all triage levels in the US and Canada

The main reasons for ED visits as illustrated in the figure above do not have a direct relationship to specific triage levels. They represent reasons for presenting to the ED for all triage levels (CTAS I -V for Canada, and ESI Levels 1- 5 in the US).

3.5 Based on Race and Expected Source of Payment - In 2021, there were approximately 34.8 million ED visits by Black or African American of which 2.7% were for non-urgent visits; ~ 99.3 million ED visits by Whites, of which 2.5% were for non-urgent visits; and ~ 5.7 million ED visits by other race groups of which 1.2% were for non-urgent visits [16]. Similarly, in the earlier years between 2018- 2021, the white population had higher numbers of ED visits for non-urgent reasons compared to other races [16,21,22,23]. See Table 5 below.

Table 5: Non-Emergency Visits to the US Based on Race

Year	**Race**	**% Distribution of Semi-urgent visits (SE)**	**% Distribution of Non-urgent visits (SE)**	**Total (In Thousands)**
2018	White	22.3(1.5)	2.7(0.5)	88,707
	Black or African American	23.3(2.6)	3.8(1.0)	35,639
	Other	23.0(2.6)	4.5(0.9)	5,628
2019	White	21.2 (1.4)	2.5 (0.3)	107,781
	Black or African American	21.4 (1.9)	3.5 (0.5)	36,598
	Others	19.8 (3.0)	3.1 (0.9)	6,271
2020	White	17.8 (1.7)	2.3 (0.4)	95,434
	Black or African American	19.8 (3.0)	3.1 (0.8)	29,267
	Others	13.8 (1.9)	2.2 (0.7)	6,596
2021	White	17.7(1.7)	2.5(0.4)	99,266
	Black or African American	20.5(2.4)	2.7(0.5)	34,808
	Others	15.4(2.9)	1.2(0.4)	5,708

SE= standard error of measurement; Others include persons of Hispanic and non-Hispanic origin, categories of Asian, Native Hawaiian or Other Pacific Islander, American Indian or Alaska Native, and persons with more than one race.)

In 2018, 2019 and 2021, the highest percentage of semi-urgent ED visits (level 4) was 28% (SE 4.4%), 46.6% (SE 7.0) and 25.8% (SE 5.1) respectively, representing those who had Worker's compensation [21,22,23]. The highest level 5 visits (non-urgent) in 2018 and 2021 at 3.9% (SE 0.8) and 3.6% (SE 0.5) were from those with government-based insurance such as Medicaid, Children's Health Insurance Program (CHIP) or other state-based program [21,22,23]. In 2019, non-urgent (level 5) visits were highest in those with no insurance at 4.2% (SE 0.9), whereas in 2020, the no insurance category had the highest level 4 visits at 23.5% (SE 3.7) and had equal percentage of 3.4% of government-based insurance and no insurance for level 5 visits [16,21,22,23]. The no insurance category are those who paid out of pocket, had no charge or had a charity payment source. Figure 5 below summarizes data for expected source of payment for non-emergency visits in the US during the study period [16,21,22,23]. Canadian data not available to compare.

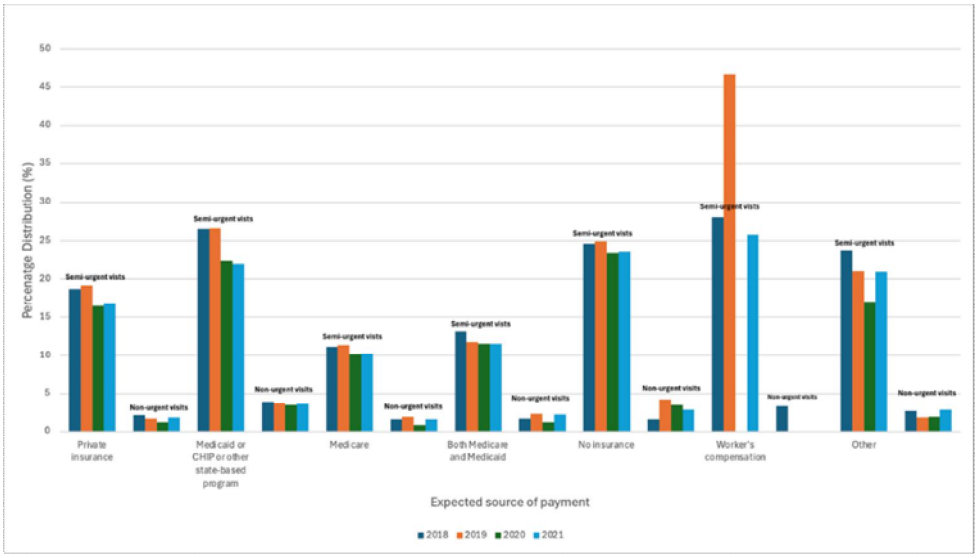

Figure 5: Non-emergency visits to the US Based on Expected source of payment
(CHIP= Children's Health Insurance Program; No insurance= having only self-pay, no charge, or charity as payment sources.)

4. DISCUSSION

The 2021 national hospital ambulatory medical care survey (NHAMCS) showed a total of approximately 139.8 million ed visits in the united states, of which 2.5% were for non-urgent reasons [16]. These non-urgent visits were more common among males than in females, with the most common in the 16 – 64 age group (7.5%), while the under 15 age group accounted for 4.5% of non-urgent ed visits, while those 65 and above accounted for 3.8% [16]. The largest proportion of visits in the us during the study period was 150,650 (in thousands) for all triage levels in 2019, whereas in Canada, low-acuity ed visits (CTAS iv-v) was highest in the 2018-2019 fiscal year.

The average acute care length of stay (LOS) in Canadian eds was 7.8 days in 2021, ranked the fourth-longest among OECD countries [8], whereas from our study, the median LOS in 2021 was 162 minutes (2 hours, 47 minutes) for less-urgent visits. Year 2021 had the highest LOS for both less-urgent and non-urgent ed visits. Patients with diabetes and heart diseases were reported to be less likely to visit the emergency department for nonurgent purposes, whereas patients with musculoskeletal problems were the most common visitors to the emergency department for nonurgent conditions [12]. Data from our study did not identify if the most frequent reasons for triage levels 4 and 5 visits in the us and Canada were due to chronic illnesses like diabetes or heart-related problems or other causes. However, those with heart diseases such as acute mi were among those who presented for non-urgent and less-urgent reasons.

According to Toseef et al., [26] having access to health insurance such as Medicaid has no relationship to whether a preventable ED visit would occur or not in the US, as their study found no correlation between the type of insurance and the likelihood of visiting the ED for non-urgent reasons. However, in our study, the highest number of ed visits in the us for non-urgent reasons in 2018 and 2021, were from those with government-based insurance such as Medicaid, chip, or other state-based programs 16,21 compared to 2019 and 2020, where the highest visits for the same triage level were in those with no insurance [22,23]. A retrospective, secondary analysis of data from two community hospitals in southwestern Ontario, Canada, showed that nonurgent visits constituted approximately 27% of all ed visits and were more likely to be associated with patients with a primary care provider referral and with patients who had no primary care provider [1]. Our study did not find any data on the relationship between access to primary care and low-acuity ED visits in Canada.

In one national study of ED visits and utilization, non-urgent ed visits were shown to be more prevalent in older, non-Hispanic white, and Medicare-insured patients [19]. This increased usage was more pronounced for African American and Latino children and youth than white children and is increasing for the publicly insured and uninsured while decreasing for the privately insured [15]. Another review showed that younger age, convenience of the ed compared to alternatives, and referral to the ed by a physician all contributed to driving up non-urgent ed use [19]. Compared to our study, there were more white people using the ed for low-acuity visits in relation to black or African American and other race groups [16,21,22,23]. Similarly, individuals with workers' compensation and government-based insurance in the US, utilized the ed more often than individuals with other sources of payment.

In 2021-2022, there were 536,666 total visits to eds across ns. During this same time period, 43,142 (8.0%) patients who visited eds were LWBS by staff at an ed [1]. The findings from our study agrees with the above research, as a higher proportion of patients were discharged or left without being seen, compared to those who were admitted or transferred to another facility in the pre-pandemic year (2021) [24]. Just prior to the covid-19 pandemic,

ed visits had risen more than 60% since 1997 to about 146 million, with nearly 46 visits per 100 persons in 2016 [14]. Although ED demographics have not fully returned to previous levels due to a significant decrease in patient volumes during the first wave, the covid-19 pandemic has only further intensified factors associated with crowding and increased overall ed patient LOS. The normalization of ED crowding by hospitals as a tolerable dysfunction has resulted in patient susceptibility during “normal” times and has contributed to capacity failure, affecting the ability to meet the challenges of public health emergencies [14].

Based on our findings, in Canada during the research period, there is a weakly negative correlation between the ages of individuals and the number of visits. This observed correlation is weakest in 2020/21 (significantly less than all other years) which corresponds to the period of extended covid-19 lockdowns with partially lifted re-strictions and was strongest in 2018/19 before the covid-19 pandemic. Whereas, in the us, there is a strong negative correlation between the ages of patients and the number of visits. This effect is observed to be generally stronger during and post-covid-19 lock-downs, peaking in 2020 and remaining above average afterwards. Trauma emerges as the leading cause of non-emergency visits to the ed in Canada, followed by unintentional falls and MVCs. A gradual decline in ED visits was observed from pre-pandemic levels to the lowest point during the pandemic. This is likely attributable to global lockdowns and reduced mobility, alongside increased utilization of virtual services. By 2022, there was a gradual rebound in ED visit levels. For all ages, x^2 values are more than critical value for 2018-2021 and for all non-emergency triage levels, with *P* at 0.05 in Canada. This shows that the relationship between the age and triage levels during the study period is statistically significant, and thus the null hypothesis (H2) is rejected. Meanwhile, in the US for the same factor as age, x^2 is greater than the critical value for semi-urgent visits during the pre-pandemic era of 2018; but less than its critical value for non-urgent visits in 2018 and all non-emergent visits between 2019-2021 (intra-pandemic). This demonstrates a statistically significant variable relationship during the years. (c.l= 0.95, *P* value = 0.05)**.** More studies need to be conducted in this area to explore the reasons for this variation.

The impact of COVID-19 on emergency systems in Canada included public health restrictions that led to fewer visits to the ed, compared to the pre-and-post pandemic period [27]. This finding agrees with our study that there was a steady decrease in ed visits for low-triage reasons intra-pandemic. The steep drop during the early times of the pandemic is postulated to be due to health-seeking behavior during the covid pandemic and fears of intra-hospital transmissions of the disease [27]. Similarly in the us, total ed visits fell during the early intra-pandemic period, however, many visits during this period were due to infectious diseases [28]. According to our study, this downward trend continued throughout the pandemic. The center for disease control (CDC) had during the pandemic, advised virtual visits and the use of triage levels in controlling ed visits [28].

The relationship between availability and accessibility of primary healthcare ser-vices appears to be intertwined with frequency of non-emergency ed visits. This can be inferred from the above results of our study showing patterns of presentations to the ed for reasons that could be diverted to non-emergency centers, if a pre-emergency de-apartment triage is done before presenting at the ed. This raises questions as to whether the available primary care resources are sufficient to meet community needs and whether they are readily accessible. Our investigation poses more questions than answers, creating an avenue for more exploration of this area.

4.1 Areas For Future Direction - Due to insufficient hospital capacity for patients needing hospital admission [10,17], diversion of low-acuity ED visitors to urgent care facilities would be beneficial in reducing EDC. Thus, further reducing boarding times, LOS

and overall, patient harm. A significant number of patients in some Canadian provinces had no primary care or outpatient contact before presenting to the ED [19,20]. These visits could have been avoided or reduced if there were better access to outpatient mental health and addiction services [20], such as an outpatient urgent mental health clinic. Also, access to 24-hour urgent care centres would address frequent reasons for ED visits such as abdominal pain, chest pain, falls and trauma.

The pattern of non-emergency ED visits between the sexes could also guide targeted interventions to reduce unnecessary ED visits and mitigate crowding in both countries. Increased certification of emergency responders to provide care to low acuity cases and triage them to acute care clinics is another potential area to investigate, to reduce hospital diversion of EMS/ paramedic calls. Further research also needs to be done to explore the relationship between utilising insurance services, access to primary care and the exploitation of ED services for lower triage levels.

Also, our study did not find any data on the relationship between ED visits and substance use or mental health. We believe this is significant in ED resource utilization and an opportunity for pre-hospital triage and diversion to primary health centers like urgent care clinics as appropriate. This presents another area for data reporting and future research considerations.

4.2 Limitations - The absence of data on the median length of stay and the top reasons for ED visits categorised by their acuity level in the US data limits accurate analysis of non-emergency visits, healthcare utilisation patterns, assessment of timely and targeted care, and interpreting discharge processes in the US ED. The potential benefits of enhanced transparency in hospital reporting guidelines could provide a more comprehensive understanding of ED efficiency and patient flow, facilitating benchmarking efforts and comparisons between healthcare facilities. The results could power quality improvement initiatives and reduction of wait times in the ED. It's also important to stress the importance of race-based CIHI data. Its absence restricts our ability to examine racial disparities in healthcare outcomes in Canada comprehensively. This slows down efforts to identify and address systemic inequalities, delaying progress toward equitable healthcare delivery.

Another significant limitation is the incomplete documentation and missing data from certain provinces in Canada. This situation creates gaps in thorough analysis of healthcare ED trends and our understanding of regional healthcare practices and outcomes. The study's cross-sectional design over a limited timeframe precludes the establishment of causal relationships or tracking behavioural changes over time. Future research endeavours could consider employing longitudinal or experimental study designs and the use of statistical software in analyses of ED trends.

The potential source of error inheres in the fact that the data sources do not specifically categorise demographics into subgroups, like underserved or underrepresented populations; and socioeconomic status like educational and income, as such, it creates a bias in comprehensively analysing sociodemographic data, as they may be underreported. This area could have potentially provided insights into health seeking behaviours of subgroups and the larger stratified sociodemographic groups. This research gap can be mitigated by including these specific subgroups in the national reporting systems in both countries and provides another area for future research on the impact between socioeconomic factors, health seeking behaviour and low-acuity visits to the emergency departments.

The study's strength lies in its utilisation of large databases from the US and Canada, coupled with a robust study design. This enabled a thorough examination of various

healthcare indicators and facilitated a comprehensive analysis of healthcare trends and outcomes, enhancing the reliability and generalizability of the study findings.

5. CONCLUSION

Our study identified a statistically significant relationship between age and frequent non-emergency ED visits, as seen in the negative correlation between the study period in the USA and Canada. Younger age groups (20-44 in Canada and under 15 in the USA) visited the ED frequently for non-emergency reasons. It can be inferred that the quality adjusted life years may be lower in young people, thus the frequent non-urgent ED visits. Females had a significantly higher number of ED visits in Canada, while in the US, it was the male population for the same triage level during the pandemic year of 2020. The triage levels were also beneficial in identifying these demographic relationships, as the elderly groups were less likely to visit the ED for lower triage levels compared to the younger population. Conversely, more White people visited the ED regularly for low triage reasons compared to other non-White populations.

These findings offer a starting point for addressing the over-utilization of the EDs for low triage visit dispositions and allocation of healthcare resources to improve access to primary care services; reduce the burden of overwhelming the ED system capacity; and inform policy changes. These regular low-acuity visits affect ED staff productivity, therefore, work strategies can be put in place to reduce workplace stress and burnout, such as flexible shift schedules, and a system of diversion of low-triage patients to urgent or acute care clinics. This suggested system entails a coordination between the ambulance services, acute care clinics and the emergency departments, enhancing a better triage system. Further, CDC recommendations such as triage lines and virtual healthcare during the pandemic could still be applied to mitigate unnecessary frequent ED use. Also, a return to pre-pandemic levels, as seen by increasing ED visits while maintaining standard infection prevention protocols, could reflect an increased complexity of cases presenting to EDs, inviting further exploration and thoughtful consideration of its potential effects on ED use and system capacity. Addressing these underlying reasons is vital to the smooth functioning of the ED and, by extension, the overall healthcare system.

CONSENT

All authors declare that written informed consent was not needed for the study, as information was gotten from public domain on government websites and have been de-identified.

ETHICAL APPROVAL

Both NCHS and CIHI provide information that is available in the public domain. These government websites grant freedom to access, copy, distribute, and publish the information without additional permission

REFERENCES

1. Kelen, G.D., Wolfe, R., D'Onofrio, G., Mills, A.M., Diercks, D., Stern, S.A., et al. (2021). Emergency Department Crowding: The Canary in the Health Care System. NEJM CATALYST, 2. Doi:10.1056/CAT.21.0217.
2. McKenna, P., Heslin, S.M., Vecellio P., Mallon, W.K., Hernandez, C., Morley, E.J. (2019). Emergency department and hospital crowding: causes, consequences, and cures. Clin Exp Emerg Med, 6(3), 189-195. Doi: 10.15441/ceem.18.022. PMCID: PMC6774012 PMID: 31295991
3. Morley, C., Unwin, M., Peterson, G.M., Stankovich, J., Kinsman, L. (2018). Emergency department crowding: A systematic review of causes, consequences and solution. PLoS ONE, 13(8): e0203316. Doi: 10.1371/journal.pone.0203316. PMCID: PMC6117060 PMID: 30161242
4. Affleck, A., Parks, P., Drummond, A., Rowe, B.H., Ovens, H.J. (2013). Emergency department overcrowding and access block. CJEM,15,(6):359-370. Doi: 10.1017/s1481803500002451. PMID: 24176460.
5. National Center for Health Statistics. Health United States 2020-2021: Sources and Definitions. Centers for Disease Control and Prevention (2022). https://www.cdc.gov/nchs/hus/sources-definitions.htm?Sort=Title%3A%3Aasc. Accessed 17 January 2024
6. Hooker, E.A., Mallow, P.J., & Oglesby, M.M. (2019). Characteristics and Trends of Emergency Department Visits in the United States (2010–2014). The Journal of

Emergency Medicine. 56(3):344-351. doi: 10.1016/j.jemermed.2018.12.025. PMID: 30704822.

7. Bahadori, M., Mousavi, S.M., Teymourzadeh, E., & Ravangard, R. (2019). Emergency department visits for nonurgent conditions in Iran: a cross-sectional study. *BMJ Open*, 9(10): e030927. doi: 10.1136/bmjopen-2019-030927. PMID: 31601591; PMCID: PMC6797411
8. Li, Y., & Chao Y. (2023). Emergency Department Overcrowding: Utilization Analysis (CADTH Health Technology Review). Canadian Agency for Drugs and Technologies in Health, 55.
9. Lau, T. (2020). Correlates of Preventable Emergency Department Visits in Canada: Evidence from the Literature and the Canadian Community Health Survey. Traditional thesis, The University of Western Ontario, London Ontario.
10. Rowe, B.H, McRae, A., & Rosychuk, R.J. (2020). Temporal Trends in Emergency Department Volumes and Crowding Metrics in a Western Canadian Province: A Population-Based, Administrative Data Study. BMC Health Services Research 20 (1):356. Doi: 10.1186/s12913-020-05196-4. PMID: 32336295; PMCID: PMC7183635.
11. Ly, O., Price, D., Saskin, R., & Howard, M. (2021). Low-acuity emergency department use among patients in different primary care models in Hamilton and Ontario. Healthcare management forum, 34(4):234–239. doi: 10.1177/08404704211012027. PMID: 33969739; PMCID: PMC8225686.
12. El-Masri, M., Bornais, J., Omar, A., & Crawley, J. (2020). Predictors of Nonurgent Emergency Visits at a Midsize Community-Based Hospital System: Secondary Analysis of Administrative Health Care Data. Journal of Emergency Nursing, 46(4): 478 – 487. Doi: 10.1016/j.jen.2020.02.002. PMID: 32507725.
13. Poon, S.J, Schuur, J.D., & Mehrotra, A. (2018). Trends in Visits to Acute Care Venues for Treatment of Low-Acuity Conditions in the United States From 2008 to 2015." JAMA Intern Med, 178(10):1342–49. Doi: 10.1001/jamainternmed.2018.3205. PMID: 30193357; PMCID: PMC6233753.
14. Tsai, M.H., Xirasagar, S., Carroll, S., Bryan, C.S., Gallagher, P.J., Davis, K., et al. (2018). Reducing High-Users' Visits to the Emergency Department by a Primary Care Intervention for the Uninsured: A Retrospective Study. INQUIRY: The Journal of Health Care Organization, Provision, and Financing**,** 55:46958018763917. Doi: 10.1177/0046958018763917. PMID: 29591539; PMCID: PMC5888802.
15. Hoge, M.A., Vanderploeg, J., Paris, M. Lang, J.M., & Olezeski, C. (2022). Emergency Department Use by Children and Youth with Mental Health Conditions: A Health Equity Agenda. Community Ment Health J, 58(7):1225–1239. Doi: 10.1007/s10597-022-00937-7. PMID: 35038073; PMCID: PMC8762987.
16. Cairns, C., & Kang, K. National Hospital Ambulatory Medical Care Survey: 2021 Emergency Department Summary Tables. National Center for Health Statistics. Available at: https://www.cdc.gov/nchs/data/nhamcs/web_tables/2021-nhamcs-ed-web-tables-508.pdf Accessed December 11, 2023.
17. Yang, Y., Yu, J., Liu, S., Wang, H., Dresden, S., & Luo, Y. (2022). Predicting Avoidable Emergency Department Visits Using the NHAMCS Dataset. AMIA Joint Summits on Translational Science proceedings. AMIA Joint Summits on Translational Science Proc, 514–523. PMID: 35854758; PMCID: PMC9285177.
18. Newman-Toker, D.E., Peterson, S.M., Badihian, S., Hassoon, A., Nassery, N., Parizadeh, D., Wilson, L.M, et al. (2022). Diagnostic Errors in the Emergency Department: A Systematic Review. Rockville (MD): Agency for Healthcare Research and Quality (US). Report No.: 22(23)-EHC043, 23, 1–750. PMID: 36574484
19. Moe, J., Wang, Y.E., Schull, M.J., Dong, K., McGregor, M.J., Hohl, C.M, Holroyd, B.R, et al. (2022). Characterizing People with Frequent Emergency Department Visits and Substance Use: A Retrospective Cohort Study of Linked Administrative Data in Ontario, Alberta, and B.C., Canada. BMC Emergency Medicine 22**(**1**)**:127. Doi: 10.1186/s12873-022-00673-x. PMID: 35836121; PMCID: PMC9281237.

20. Kurdyak, P., Gandhi, S., Holder, L., Rashid, M., Saunders, N., Chiu, M., Guttmann, A. et al. (2021). Incidence of Access to Ambulatory Mental Health Care Prior to a Psychiatric Emergency Department Visit Among Adults in Ontario, 2010-2018. JAMA Netw Open, 4(4): e215902. Doi: 10.1001/jamanetworkopen.2021.5902. PMCID: PMC8047734 PMID: 33852001
21. Cairns C., Kang K., & Santo L. National Hospital Ambulatory Medical Care Survey: 2018 emergency department summary tables. Available at: https://www.cdc.gov/nchs/data/nhamcs/web_tables/2018_ed_web_tables-508.pdf. Accessed December 11, 2023.
22. Cairns C., & Kang, K. National Hospital Ambulatory Medical Care Survey: 2019 emergency department summary tables. Available at: https://dx.doi.org/10.15620/cdc:115748 Accessed December 11, 2023.
23. Cairns C., & Kang, K. National Hospital Ambulatory Medical Care Survey: 2020 emergency department summary tables. Available at: https://dx.doi.org/10.15620/cdc:121911 Accessed December 11, 2023.
24. Canadian Institute for Health Information. NACRS Emergency Department Visits: Volumes and Median Lengths of Stay, 2003–2004 to 2021–2022 — Supplementary Statistics. Ottawa, ON: CIHI; 2022. Available at: https://www.cihi.ca/en/nacrs-emergency-department-visits-and-lengths-of-stay Accessed December 8, 2023.
25. Canadian Institute for Health Information. NACRS Emergency Department Visits and Lengths of Stay by Province/Territory, 2022–2023 (Q1 to Q4). Ottawa, ON: CIHI; 2023. Available from https://www.cihi.ca/en/topics/emergency-and-ambulatory-care/data-tables Accessed March 2, 2024.
26. Toseef, M.U., Jensen, G.A., & Tarraf, W. (2020). Medicaid managed care and preventable emergency department visits in the United States. PLoS ONE, 15 10):e0240603. Doi: 10.1371/journal.pone.0240603. PMID: 33119642; PMCID: PMC7595391.
27. Canadian Institute for Health Information. COVID-19's impact on emergency department. Available from https://www.cihi.ca/en/covid-19-resources/impact-of-covid-19-on-canadas-health-care-systems/emergency-departments.Accessed November 17, 2024.
28. Hartnett, K.P., Kite-Powell, A., DeVies, J., Coletta, M.A., Boehmer, T.K., Adjemian, J., et al. (2020). Impact of the COVID-19 Pandemic on Emergency Department Visits — United States, January 1, 2019-May 30, 2020. MMWR Morb Mortal Wkly Rep, 69(23):699–704. Doi: 10.15585/mmwr.mm6923e1. PMID: 32525856; PMCID: PMC7315789