A NATIONAL EPIDEMIC WITH SEVERE LOCAL IMPLICATIONS

A Global to Local Review of Substance Use to Analyze the State of Addictions in Rural Eastern Ontario

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Introduction

Substance use and addiction is an urgent public health concern which has greatly worsened across Canada over the last two decades. The rapidly escalating opioid epidemic has fostered development of more effective interventions bettering medical understanding of substance use, expansion of evidence-based treatments, and increased awareness on how associated harms disproportionately affect certain populations.

The many barriers to adequate health care faced by rural communities are well known but not necessarily well understood. The lack in data collection and analysis as well as collaboration with the communities affected leads to major gaps in research and inability to effectively address the unique issues faced by these regions. Research in rural Northern Ontario has provided insight into the critical prevalence of substance use and addictions in these communities, but there is still limited data examining other rural regions in Ontario. Rural Eastern Ontario will therefore be the focus of this honours thesis project to review the data currently available and determine the current state of substance use in these regions.

Structure of Thesis Document

A series of reports is used to gain a comprehensive understanding of the state of substance use in rural Eastern Ontario. This first report, Understanding Substance Use from a National and Provincial Perspective, will encompass a review of substance use data, populations most impacted, and treatment options across Canada and then Ontario to provide context for the more local lens applied to rural Eastern Ontario. The second report, Substance Use in Rural Canada, will describe what is known of rural health in Canada and Ontario,

applying research from other rural regions to better understand the data analysed for Eastern Ontario. Lastly, utilizing ArcGIS Online and various data sources (Appendix 1), substance use services and resources as well as opioid-related harms data was visualized for Eastern Ontario, categorized by public health unit. Conclusions and next steps were developed by applying both background research and mapping analyses.

Report: Understanding Substance Use from a National and Provincial Perspective

Executive Summary

The dramatic rise in substance use disorder prevalence across North America has become an urgent and escalating health issue in need of rapid intervention. In 2012, Statistics Canada conducted a study concluding that 6 million Canadians met the criteria for substance use disorder, but even this value is thought to be an underestimate (1). It is likely this statistic has increased greatly since 2012 when considering the surging overdose crisis and significant increase in opioid-use, as well as opioid-related deaths in the past three years (2). In 2017, the cost of substance use was calculated to be $46 billion, a 5.4% increase since 2015, which factored for associated healthcare, lost productivity, criminal justice, and other direct costs (3). Substance use and addictions in Canada is therefore multifactorial, involving social, health, and economic implications. In Ontario, the urgency of addressing substance use disorders has also exponentially increased over the last 10 years. The opioid epidemic is of specific concern, as from 2016 to 2020 there were 7,549 opioid-related deaths and a 59.8% increase in cases from 2019 to 2020 (2). The cry for action has been amplified as this issue continues to worsen (4),

and it is becoming clearer that each region in Ontario has unique confounding factors contributing to their rates of addiction. These differences make it a priority to address substance use at a local level to treat those who are struggling most effectively. A recent understanding of addiction with a more scientific-approach has improved acceptance as a medical condition, expanding research and enhancing treatment practices, but there is still a long-way to go as prevalence continues to rise. The Covid-19 pandemic has also had severe negative consequences on mental health and substance use for Canadians, as closures and reduced capacities has reduced access to services and support for affected individuals (5).

Although recent acceptance of addiction as a medical condition has allowed for more in-depth data collection and analysis of substance use disorder prevalence, the data currently presented by government health organizations fail to specify data regarding rural communities. City centers are often focused on due to the presence of more addiction services and convenient means of collecting data, disregarding the unique factors affecting substance use in rural communities. The amalgamation of substance use data across Ontario's public health units overlooks the distinct needs of rural addiction issues and creates more barriers to advancing services in these regions. Northern Ontario is frequently used as a model for rural health, but this ignores the diversity of rural areas across Ontario and how the issues they face may have different contributing factors depending on geography, culture, and services. This makes it much more difficult to specifically evaluate addictions in rural Eastern Ontario and creates challenges in trying to address problematic substance use in these regions.

To effectively improve public health measures addressing substance use across all regions in Ontario, this senior honours thesis will comprehensively review and organize

available data regarding substance use and addiction in rural Eastern Ontario to identify prevalence and current services offered. By gaining a better understanding of the current state of addiction in these regions, evaluation of the strengths and weaknesses can help deduce gaps and create more regionally impactful initiatives to address problematic substance use in rural Eastern Ontario.

Addictions in Canada

Substance use and addiction is a global public health crisis that has rapidly escalated over the last decade. Substance use disorder is one of the most prevalent causes of morbidity and mortality internationally (6), with alcohol- and opioid-related harms being of most concern. According to the most recent World Drug Report created by the UNODC, it is estimated that 62 million people use opioids worldwide (7). This value has almost doubled since 2010 and was last estimated in 2019, so does not consider the increase in opioid consumption since the beginning of the Covid-19 pandemic. There has been a substantial increase in use of opioids in Asia and Africa which has contributed to the global rise, but North America still reigns as the continent with the highest prevalence (7). The United States of America and Canada have historically had the highest prevalence of opioid drug use mostly due to the availability of such drugs when compared to less developed countries and have both seen an even greater increase in use since the emergence of Covid-19. Of greatest concern, is the spike in opioid deaths which has also more than doubled since 2010 (7).

'Deaths of despair', death due to suicide, drug overdose, and alcoholism, is a measurement which compares health and wellbeing of a country's' citizens and impact of

substance use and mental health on their demographic. Canada and the United States has seen a substantial increase in deaths of despair, which has significantly impacted overall life expectancy, highlighting the urgent need for intervention to improve both quality and access to addiction and mental health treatments (8). The life expectancy of Canada has levelled for the first time since World War II, with one of the main contributors being opioid-related deaths. This negative trend was first observed in British Columbia, which has been in a declared public health emergency since 2016 due to significant opioid-related deaths, but life expectancy has since begun to plateau for all of Canada. Most deaths seen in the past five years have been males between the ages of 20-49, which therefore has a significant impact on life expectancy, with alcohol and drug use identified as the most important risk factor among young adults (9). Canada and the United States have the highest rates of prescribed opioids worldwide, and although the US sees considerably more opioid-related deaths, per capita opioid use, and alcohol-attributed health deficits, recent data shows Canada is paralleling increases in these areas which is a cause of great concern (8). Continuing health professions education programs have begun to gain a hold on prescription opioids and their potentially harmful effects, but there has been a major increase in non-pharmaceutical opioid use across Canada which accounted for 90% of apparent opioid deaths from January to June 2021 (9).

Alcohol and opioid use are currently a major focus for substance use disorder harms, as these sectors have seen the greatest increase in associated harms and affect the most individuals, although it should be noted that an increase in stimulant use as well as polysubstance use has been observed in the past few years. Substantially less mortality is seen with these substances, and toxic supply is less of a concern, but many of the initiatives and

treatment options addressing the opioid crisis can also benefit those impacted by stimulant addiction and polysubstance use. Other addiction disorders such as gambling can also have detrimental effects on overall health and wellbeing of Canadians, but this report will have a greater focus on drug addiction and substance use disorder, specifically regarding opioid use, as it is an incredibly urgent public health crisis causing the death of thousands and therefore requires immediate intervention. Much of the urgency is driven by the increased use of illicit opioids especially use of fentanyl and fentanyl analogues. Fentanyl is a synthetic opioid that is 50 times stronger than heroin and 100 times stronger than morphine which was first detected in the Canadian illicit drug marker in 2013 (10). The rise in illicit drug use has exponentially elevated the rate of opioid-related harms in the last five years, accelerated by more potent drugs and the increasing toxic drug supply, which has become even more detrimental with impacts of the Covid-19 pandemic.

North America was already in a rapidly escalating overdose crisis before the Covid-19 pandemic dramatically overtook the world in early 2020, but the pandemic has impacted people who use drugs (PWUD) disproportionately in comparison to the general public and other vulnerable populations. When reviewing the trends of overdose deaths over the last couple of decades, it can be separated into four waves as elegantly explained by Bonn et al. (2021). The first wave mainly involved prescription opioids, which then transitioned to heroin causing a second wave due to higher potency and a non-regulated supply. With the recent increase in synthetic opioid use, dominantly fentanyl and fentanyl analogues, a third wave was observed which aligns with the opioid crisis first identified in British Columbia. The use of synthetic opioids poses greater risk due to higher potency and toxic supply as seen with heroin,

but to a much greater extent making the traditional forms of treatment and intervention less effective than previously seen and the need for support to be much more readily accessible.

The Covid-19 pandemic introduced even more barriers, accelerating opioid-related harms and deaths, and initiating a fourth wave of the long-lasting overdose crisis. The intersection of these two public health crises has exacerbated the already worsening opioid epidemic, and subjected PWUDs to a syndemic where public health measures are contradictory to their urgent health and social deficiencies (11). By implementing social distancing, self-isolation, and border restrictions, the public health response to Covid-19 has been prioritized over other health ailments, and unintentionally harmed PWUDs in the process. Key harm reduction approaches adopted by many community health professionals highlight the importance of using with other individuals as the danger of overdose is therefore significantly decreased. This approach is essentially abolished in the context of Covid-19 as individuals are encouraged to physically distance and isolate as much as possible, and many services such as Supervised Consumption Sites and clinics which distribute harm reduction supplies were immensely strained during the multiple lockdowns and strict Covid restrictions applied. In addition, the closure of international borders has directly increased toxicity of the drug supply, making it a much more unpredictable and dangerous illicit drug pool that we have seen the consequences of (12). The government efforts needed to fight Covid-19 was of course necessary, but the unique emergency response provided a fake semblance that these measures were in place to protect *all* lives at all costs, when they clearly neglected a hurting population that have been crying for help long before Covid-19 was a concern. Public health efforts have therefore disproportionately harmed many Canadians who struggle with substance use during

the Covid-19 pandemic, and these consequences have emphasized the key groups which are most vulnerable and affected by substance use and addictions in Canada.

There are many populations in Canada which are disproportionately impacted by substance use and its associated harms. Although addiction could affect anyone, there are trends which show certain environments and circumstances leave some more susceptible than others. When reviewing the latest data on opioid-related harms in Canada, most opioid toxicity deaths occurred among males and individuals between the ages of 20 and 49 (9). From 2016 to June 2021, approximately 75% of opioid overdose deaths were male, over 25% were in the 30-39 age group in both sex categories, and about 20% were in each the 20-29 and 40-49 age groups. This data shows the prevalence of opioid use in young adult Canadians and emphasizes the need for early intervention and support to those who are vulnerable.

Substance use support specialized for youth is relatively scarce independent from general youth health initiatives, as the demographic is quite niche and not developed enough to be differentiated from adult addictions programs. Youth-targeted substance use programs are usually grouped into mental health initiatives, which can be helpful if co-morbidities are present, but can also make the system more convoluted and difficult to access if there are too many focuses of the program. In addition, the broad view of youth mental health efforts has made it quite labour-intensive to develop programs which are 'youth friendly' and specialized to a younger target population (13). It has been estimated that 70% of mental disorders manifest during adolescence, with unrecognized conditions being carried into adulthood (13). This statistic highlights the need to develop youth-targeted mental health and addictions interventions which are more age-appropriate and effective for adolescents. When looking at

current services, many barriers can be identified such as stigma, lack of diagnosis and identification of warning signs, and large variance in treatment standards. One of the key inconsistencies which make these services less accessible is the definition of 'youth' within health organizations. In different jurisdictions across Canada, 'youth' are considered 25 and under at some institutions, 18 and under at others, and even 16 and under in some clinics, shelters, and social support programs. This discrepancy creates more barriers to accessing substance use and mental health supports as lack of coordination between service providers can produce gaps and make the system incredibly difficult to navigate (14). The opioid- and stimulant-related harms data identify the 20-29 age group as a large proportion of deaths, hospitalizations, and emergency department visits across Canada, which demonstrates the need for expansion and refinement of youth substance use programs, including education, prevention, and intervention initiatives which cannot be properly strengthened with the current ambiguity of 'youth'. The specialized needs of both adolescents and young adults who struggle with mental health and substance use is in dire need of review, and more targeted programming may assist in lowering rates and trends seen in adult demographics as well.

There are also many risk factors of substance use disorder that are found across all age groups. In a 2019 study conducted by the Public Health Agency of Canada, researchers asked coroners, medical examiners, and toxicologists in Canada what characteristics they observed affected the majority of individuals who died of opioid-related causes. The frequently reported characteristics included those who lacked social support, experienced trauma and/or stigma, had a history of mental health concerns, had minimal comprehensive healthcare and social service follow up, and a history of polysubstance use (9). These factors are disproportionately

found amongst those of low socioeconomic status, especially those who experience extreme poverty, unemployment, and homelessness.

Canadians in the lowest income group are 3 to 4 times more likely to have poor to fair mental health than those in the highest income group, and it has been shown time and time again that low SES is a major risk factor for mental illness (15). Individuals living in extreme poverty face greater chronic stress and have increased exposure to environments that threaten health. Those of low SES are more often subjected to environments with greater uncertainty and conflict, traumatic events, and face more adversity which is detrimental to overall health (16). Being faced with more life challenges, but with access to less resources, puts significant strain on emotional wellbeing which manifests into higher prevalence of mood, anxiety, and substance use disorders (17). Prevalence is increased amongst these populations, but the major issue is the inaccessibility to quality treatment and health care services.

There has been immense growth in substance use research and treatment development in the last two decades, but even with the greater understanding of addiction and substance use disorder, there is still an observable treatment gap. In an international survey conducted by the WHO in 2018, it was found that even in high-income countries such as Canada, only 36.8% of those with mental disorders receive treatment (18), with room for underestimation due to self-report data collection and the many undiagnosed individuals unaccounted for. It was more likely for individuals with higher education to receive treatment, and this percentage was even less in lower-income countries. Considering mental illness is the leading cause of disability both worldwide and in Canada, this is particularly concerning (19). Within the mental health treatment gap, it has been found that substance use disorder has the largest amount of

untreated individuals, with a treatment gap wider than any other general medical disorder worldwide (6). Unequal access to health care has been a recurring issue for many years, but this especially impacts those with mental health and substance use disorders as speciality sector health services see even greater under-representation of low SES individuals worldwide (18). Although economic inequalities are less pronounced in Canada when compared to the United States or other highly developed countries (8), the proportion of the population living below the poverty line has risen in recent years and with the current housing crisis, this number is expected to increase, potentially putting the mental health of many Canadians at risk.

Substance use disorder has high comorbidity with other mental health disorders making it a complex health issue which requires intentional intervention that considers factors such as social, economic, environmental, and personal impacts on a patients' health. It has been estimated that those with a mental illness are twice as likely to have a substance use problem when compared to the Canadian public (20). Many affected individuals have complex mental health conditions which contribute to their dependence on drugs, including depression, anxiety, trauma/PTSD, and schizophrenia to name a few (6). This adds another dimension to substance use disorder and plays a role in what populations are more vulnerable.

Across Canada, Indigenous peoples have high rates of psychological distress, mental health issues, as well as substance use disorder compared to non-Indigenous people (21). This trend has been seen amongst both off- and on-reserve Indigenous peoples and is substantially high within their youth populations. The devasting history of colonization and its detrimental impact on Indigenous communities is well-known, and has led to inequities in employment, income, housing, food security, and access to social resources in current society.

Intergenerational trauma and isolation have had a major influence on the depleted mental health of many Indigenous families which has caused an increase in substance use. Far before the rest of Canada acknowledged the rising opioid crisis, First Nations leaders declared an opioid use epidemic in their communities in 2009 (22). This surfaced many other inequalities in health and gaps in services for the Indigenous peoples, making known some of the many social determinants of health plaguing their communities like minimal access to clean water and adequate housing. The supports offered to those struggling with substance use disorder are also less accessible to First Nations peoples, such as harm reduction equipment, and the current treatment options often displace individuals far away from their homes and loved ones. The lack in health resources further exacerbated substance use issues and this alienation has led to higher rates of hospitalizations and overdoses than in the general public and is a main contributor to the high rate of opioid-related harms in the Northern territories (23). In some provinces, First Nations peoples have up to three times the rate of opioid overdose deaths over non-Indigenous people and five times more likely to experience an opioid-overdose event (24). Covid-19 has caused Indigenous-specific rates to increase as well with an estimate that First Nations overdose rates increased 93% compared to pre-Covid pandemic in British Columbia (24). More substance use treatment centres specifically for First Nations and Inuit have been opened in recent years to provide a safer space for those needing treatment, but the mistrust in Western medicine and government-organized initiatives still serves as a barrier to accessing these resources and bridging this gap will require further reconciliation and intentional relationship rebuilding.

Another specific population at higher risk of substance use disorder are people who experience homelessness. Homeless morbidity and mortality rates are significantly higher than the housed population, and the relationship between health and stable housing has been demonstrated among diverse populations worldwide (25). Poor general health is reported amongst the homeless population with many people having pre-existing complex mental health conditions which can contribute to the onset of homelessness, and the deterioration of mental wellbeing is often seen with continued homelessness. There is a high prevalence of substance use within this population which was recently shown in a systemic review of homelessness across multiple high-income countries that concluded the most common mental health disorder was drug and alcohol use disorder (26). In a recent Canadian study, substance use was identified as a major barrier to maintaining stable housing with more than a quarter of participants self-reporting that substance use was the direct reason for loss of housing (27). Even if not stated as the direct reason for loss of housing, drug use could still be the underlying cause for many as it is difficult to effectively budget when needing to fuel your addiction simultaneously (26).

The high presence of drug use in shelters also exposes already vulnerable individuals to substances which can appear as an effective temporary coping mechanism, increasing substance use in the homeless population. Although it is difficult to accurately quantify the percentage of the homeless population which use substances, there does appear to be a strong relationship that often leads to a repetitive cycle of substance use and chronic homelessness. There are many barriers to breaking this cycle, especially as many inadequately housed people need to focus on day-to-day survival over improvement of health and wellbeing. The transient

lifestyle makes it incredibly difficult to set and achieve goals, and often results in loss of important belongings such as ID and paperwork which is necessary to access many services. For example, accessing opioid antagonist programs like methadone requires having a valid health card to receive prescriptions at the drug store. In addition, the lack of a permanent address also poses a problem in Canada's healthcare system limiting access to many health and social services which could benefit these individuals.

All the vulnerable populations mentioned have a recurring theme of inaccessibility to health resources due to bureaucratic barriers as well as social barriers such as stigma. Many health programs fail to meet the needs of these populations, leading to underserved communities and a fractured relationship between healthcare professionals and marginalised groups (28). This feeling of unacceptance emphasizes the need to prioritize care that is rooted in dignity, trust, and compassion to promote health of all Canadians more comprehensively.

The emergence of the syndemic, the intersection of the Covid-19 pandemic and opioid epidemic, has exacerbated these disparities which has serious health implications. Already overburdened treatment and harm reduction providers had restricted capacity due to Covid-19 restrictions, with some programs having to close temporarily during government lockdowns. This further strained the system, extending wait times due to the need to implement Covid-19 public health guidelines effectively reducing availability. The reduced treatment and harm reduction availability and limited capacity for support has led many to engage in higher-risk substance use, causing further harm to many individuals yearning to address their health needs (5). There has also been a surge in virtual medical care which has the potential to make healthcare more accessible for harder to reach populations, but currently still has a lot of gaps

especially for people struggling with homelessness as there is often limited access to technology or a phone number which can be consistently used to reach them (28). Although higher quality virtual programs could be developed to address substance use which had a positive impact on some, these services are still not equitably distributed or accessible to all populations and has not sufficiently filled the gap produced by the pandemic (5). As discussed earlier, the pandemic has had significant negative impacts on mental health and substance use, but as seen here, more specific detrimental effects on those who use opioids.

Due to the diverse populations at risk, and the complex mental health present within these populations, there therefore cannot be one universal solution to the opioid crisis and substance use intervention. Unique needs are seen in various communities and populations, which must be considered when producing effective intervention. The life and death manner of the issue makes immediate action necessary, especially when considering the future model of opioid deaths designed by public health experts, which may require radical policy change and expansion of treatment options for affected individuals. Long-term strategies need to be developed in parallel to truly address the evolving public health crisis and as we continue to learn from our interventions while prioritizing applying feedback from those directly affected. A collaborative approach between physicians, public health units, and the individuals and families involved is necessary to tackle the issue as a united front, or we will see a continued rise in death counts and wide-spread devastation. Reviewing the currently established treatment options as well as new potential therapeutics allows a comprehensive analysis of what is offered and how enhancement of these programs can effectively lower harm to PWUD.

Evidence-Based Treatments

Addiction treatment and supports have advanced over the last decade due to a deeper scientific understanding of substance use disorder and acceptance as a medical condition. The services developed are much more comprehensive and applicable to broader audiences to better tailor care to the diverse population substance use affects. Unfortunately, some of the evidence-based treatments currently developed are not widely available and treatment gaps are still highly prevalent, but the wide variety of options being developed and changing attitude towards substance use is promising. A review of established treatment methods, their history, and efficacy will help us to gain a better understanding of strengths and gaps in Canada's response to substance use.

Withdrawal Management

Beginning as a highly recommended treatment method for alcohol dependence, withdrawal management, or detoxification centres, have been a heavily relied upon treatment method for more than 50 years (29). Substance use disorder is characterised by drug dependency where the body becomes physically dependent on the substance and will go through drug withdrawal if substance use is abruptly stopped or diminished. This physiological response is due to biochemical changes in the brain induced by drug use, and involves a variety of severe symptoms such as nausea, vomiting, anxiety, insomnia, etc. (30) These simultaneous physical, mental, and emotional symptoms are incredibly taxing and difficult to fight through, especially for many vulnerable populations who do not have access to the proper resources or environment to support themselves. Withdrawal management involves medical and psychological care for those experiencing drug detoxification, and although once seen as a

promising treatment, it is now known that independently, it is not an effective long-term recovery method. Oral naltrexone is a medication for opioid use disorder which induces immediate withdrawal symptoms as it acts as an opioid antagonist and blocks the euphoric effects of any consumed opioids (31). It has historically been used in withdrawal management programs, but meta-analysis has shown this medication has no benefit on retention or abstinence especially considering the extreme side effects (32). Natural withdrawal is now more commonly advised, but not without its own precautions.

Withdrawal management alone has high rates of relapse and limited data demonstrating sustained abstinence following completion of the process (33). In recent years it has been shown to be an unsafe practice without supplemental interventions due to high rates of relapse which in turn leads to increased risk of overdose, as well as HIV and Hepatitis C infection (31). It is therefore recommended that withdrawal management be used in conjunction with other ongoing treatment such as opioid antagonist treatments, residential or outpatient treatment, and psychological therapy. Detoxification is necessary prior to some residential and out-patient treatment programs, making withdrawal management services beneficial as a first step towards further recovery involving wrap-around psychosocial support.

Harm Reduction

Harm reduction is a client-centred approach to addictions treatment which does not require abstinence and instead focuses on diminishing adverse health consequences associated with drug use (34). Harm reduction methods have recently gained immense support by health advocates as it is a more pragmatic approach which effectively minimizes death caused by substance use and acknowledges the complex needs of people who use drugs. By providing

care with dignity and compassion, many barriers seen when addressing addictions issues are eliminated leading to more meaningful and productive health promotion. There is a variety of services, programs, and practices which fall under the harm reduction category, all with unique focuses which provides comprehensive treatment options to improve the health of those who use drugs while prioritizing the individuals' needs and goals.

Needle exchange programs and sterile drug paraphernalia distribution are critical services which prioritize harms associated with using septic drug equipment. These programs significantly reduce the spread of blood-borne infections like HIV and Hepatitis C, as well as other drug use-associated infections like abscesses or infective endocarditis (31). Across Canada, the majority of new hepatitis C infections are people who inject drugs, making this an important public health issue (35). Working together with drug education initiatives, providing these supplies emphasize the importance of using sterile equipment every time an injection or inhalation of substances is performed. Usually provided as kits, some of the items available include alcohol swabs, sterile water, tourniquets, personal sharps containers, spoons and filters, and clean syringes, with the option to personalize kits based on needs. Public sharps disposal bins are also implemented by these programs which benefit entire communities by reducing publicly discarded needles and other used drug paraphernalia. These services therefore directly reduce potential harm to people who use substances and have increased referrals to further health and social services to address their substance use, benefiting both their individual health as well as their communities'.

Along with harm reduction kits, there are also naloxone overdose prevention kits available. Naloxone, or Narcan, is an opioid antagonist and therefore rapidly reverses the effect of opioids

by binding to and blocking opioid receptors. It is most commonly administered nasally, intravenously, or intramuscularly, only having an effect if there are opioids present in the recipients' system (36). When opioid overdose occurs, depression of the central nervous system and respiratory system will cause death unless there is prompt medical intervention. Naloxone will counteract this fatal effect, and although temporary, can alleviate symptoms to provide time for emergency medical attention (37). An environmental scan of naloxone access in Canada identified more than 61 000 naloxone kits were use between 2021 and 2018 to reverse an opioid overdose (38). Naloxone kits are distributed at some shelters, community health clinics, pharmacies, hospitals, and social outreach organizations, although not all general health facilities provide them.

A growing harm reduction strategy is the implementation of supervised consumption services. These are medical facilities which are legally sanctioned to allow drug consumption of pre-obtained illicit substances under supervision to ensure safe use and monitor for potential overdose events (34). In attempt to reduce open public use and encourage use with others to prevent accidental overdoses, supervised consumption sites are becoming more widely accepted as an effective method to protect people who use drugs. This also alleviates some strain on emergency medical services as trained staff act as first responders and intervene immediately, reducing injury of the individual. Safe use education is also a primary goal at these sites, teaching individuals how to safely prepare, inject, and/or inhale substances as well as emergency response in the case of an overdose. Supervised consumption facilities are not yet readily available in many regions of Canada, although more funding as recently been allocated for harm reduction programs which expands opportunity for implementation in additional

regions (39). It was estimated in early 2020 that each site receives around 3000 visits per day, that over 15 000 overdoses and drug-related medical emergencies were managed with no on-site overdose deaths, and over 35 000 Canadians used these services between 2017 and 2019 (40). Consistent contact with participants in these facilities fosters rapport with health care providers and has been seen to increase connection with other community health and social services. Between 2017 and 2019 alone, 70 000 referrals were made to further medical care, mental health, and/or housing support services (40). Supervised consumption services also provide access to other harm reduction amenities such as supplies or even drug checking services.

With growing illicit drug use and increased toxic supply, interest in drug testing services has greatly heightened. This drug pool is not monitored for safety, and therefore has a lot of associated harms due to contamination, adulteration, and dosing or purity errors (34). Drug checking uses technology to determine the composition of a substance and whether there are potent drugs present such as fentanyl. By knowing the compounds present in their substance, the individual can make more informed decisions about the amount they will consume or if it is safe for them to use at all. There are many different methods used to check drugs, including spectrometry, chromatography, and antibody-based test strips, but it is still a relatively new available technology which is continuing to be refined for simpler public use (41).

Harm reduction services promote health by prioritizing the needs and realities of its patient, leading to a more compassionate and non-judgemental approach. This mentality has shown to save lives and significantly reduce drug-related health harms which has beneficial impacts on

individual wellbeing, associated public health costs of substance use, and overall community health.

Opioid Agonist Treatments

Opioid agonist treatment is a medication-based treatment that has been shown to be more effective than many non-pharmacological treatments and has a variety of forms making it suitable for a diverse range of patients. Best results are seen when used in conjunction with counselling, mental health support, and other social support programs. In brief, an opioid agonist is a drug which will activate the opioid receptors without eliciting a euphoric effect, preventing immediate withdrawal symptoms and cravings (42). These agonists act slower in the body than most opioids allowing more productive time between doses and therefore lessening dependence. The goal of these programs is to implement a daily scheduled dose to relieve opioid dependence and gain more daily stability in order to more effectively manage withdrawal symptoms and better focus on recovery (43). Better treatment retention, reduced morbidity and mortality, and reduced risk of HIV and hepatitis C infection has been seen in OAT (31).

It is currently recommended to begin OAT with buprenorphine-naloxone, also called Suboxone, when able as it has the best safety profile and allows for dosing flexibility with the option for take-home doses, whereas other opioid agonist medication initially requires daily pharmacy visits (44). As a long-acting partial opioid receptor agonist, buprenorphine has a long half-life but also has lower opioid receptor activation than full opioid agonists. The high affinity of the drug still displaces other opioids present in the system, so sufficiently acts on opioid receptors to prevent withdrawal symptoms without euphoria or respiratory depression. The

buprenorphine is combined with naloxone, an opioid antagonist, to ensure proper medical use of the medication as it will have no antagonist effect if taken sublingually as directed but can induce symptoms of withdrawal if injected. Buprenorphine-naloxone has been found to be more effective than withdrawal management or psychological treatment alone, and equal efficacy when compared to methadone prescription (31).

Methadone is a long-acting synthetic opioid but, unlike buprenorphine, is a full opioid agonist. It has similar benefits as it prevents withdrawal symptoms, cravings, and euphoria induced by other opioids present, but has increased risk when compared to buprenorphine-naloxone. It has a narrower therapeutic index, making dosage incredibly important, and therefore is less accessible to take home in carries until long-term stability is demonstrated. It takes at least three months of daily attendance, weekly urine samples, and weekly doctor's appointments to be considered for flexible dosing, which is often disruptive to ones' life and creates barriers for those living in more remote areas (42). Until 2018, methadone prescriptions were difficult to obtain as physicians had to apply for exemption from Health Canada to utilize the medication. To better support those with opioid dependence, the government of Canada lifted this regulation in May of 2018, increasing access to Canadians in need (45). The safety profile of methadone is lower than Suboxone as there is a higher potential to interact with other substances such as alcohol and benzodiazepines, increasing risk for polydrug users, but use as directed has been shown to be a safe and effective treatment for opioid dependence, reducing many of the associated harms (31). Some medical professionals try to gradually reduce methadone dose to then transition to Suboxone for long-term use. This system does not

work for everyone, and stability is the main goal, giving individuals a chance to focus on other aspects of their life and improve their overall wellbeing.

For some, neither Suboxone nor methadone are adequate for stabilization and alleviated addiction symptoms. Slow-release oral morphine is another OAT option which may be a better suited option for some who do not react well to other medications. It is a pure opioid agonist and has a half-life which allows for administration once daily (44). There are higher risks associated when compared to other OAT medications such as potential for fatal overdose if the dose is too high and the ability to overcome the slow-release design by crushing the oral tablets and either chewing or injecting the morphine. Missed doses also have more consequential effects as significant loss of tolerance can occur, leading to higher risk of overdose when restarting. Due to these risks, witnessed doses are common practice with minimal take-home doses prescribed unless strict follow up is possible with frequent urine testing, random medication counts, and reassessment as needed (31).

All of the current opioid agonist treatment options have been found to have a high treatment retention when compared to non-pharmacotherapeutic approaches, and the multiple prescription options leads to greater accommodation to patients' diverse needs.

Safe Supply

Safe supply is becoming more and more accepted in Canada as the opioid crisis worsens and involves legal prescription of pharmaceutical-grade mind- or body-altering substances. The most common medication prescribed the treat opioid dependency is hydromorphone, heroin, or injectable diacetylmorphine, but safe supply can also be applied to stimulant dependency through prescription of methylphenidate and extended-release amphetamines (46). These

medications usually have similar effects which will prevent withdrawal and cravings but ensures safer use with the expanding toxic drug supply. Safe supply takes a more independent approach when compared to typical OAT, still with strict dosage, but with the ability to consume the medication unsupervised after obtaining it from a pharmacy (11). Throughout Covid-19, this treatment option has become greatly advocated for as the pandemic has had direct implications on the contaminated drug pool, skyrocketing opioid- and stimulant-related harms and causing the death of thousands (9). These programs have been critical for many during the pandemic as safety was more certain in times of social distancing and isolation, directly reducing the risk of overdose by not needing to rely on the illicit drug market. This past year, the Canadian Government provided funding for community health organizations to pilot these programs and gauge their effectiveness, even supporting some fentanyl-assisted treatment programs in Vancouver (12). The organizations chosen for funding were key to creating lower-barrier access to safe supply, prioritizing health clinics which engaged with vulnerable populations that use drugs (47). Prescribed opioids are also a topic of controversy for some, as it is seen as enabling drug users, but when considering the prevention of overdose mortality, reduced need to partake in criminal activity to obtain drugs, reduction in homelessness, and the enriched quality of life which allows individuals to engage in healthcare and other social support services, the benefits outweigh this idea (48). This treatment prioritizes saving lives over social expectation and stigma, protecting, and providing adequate, autonomous care to all people.

Inpatient Services

Inpatient services can refer to either 24/7 hospital programs or residential treatment, where structured activities are employed to address substance use, medical, and mental health issues. Usually involving group counselling, individual psychotherapy, case management support, and medical attention to monitor withdrawal and long-term effects of drug use, these programs vary in length from 21 days to multiple months (49). Both programs have similar structures, with residential treatment being a bit more restrictive and better suited for physically and emotionally stabilized individuals who are accustomed to routine and accountability. Although these types of treatment allow individuals to focus and reflect on their recovery, it is also not feasible for some as it is not flexible for those who want to work simultaneously and is disruptive to one's life. There are both public and privately funded residential treatment programs, with unpredictable wait times for public centres. Once treatment is sought out, there are often wait times of multiple weeks for initial assessment, and then several months before actual admittance into treatment programs. There is wide variability depending on the facility, but it is generally reported that individuals must wait at least two months to access residential treatment which can be discouraging for those struggling, especially vulnerable populations that are in unideal environments for improvement (50). Individuals are usually required to check in multiple times a month to stay on the waiting list and need to access withdrawal services prior to acceptance, adding more complexity to the process and creating barriers for many who do not have access to resources or supports needed for follow up. Private inpatient facilities have much lower wait times but are often not a choice for individuals as treatment is incredibly expensive and must be paid by the participant.

Only some inpatient institutions allow continued OAT while in the program as they are typically seen as abstinence-oriented, but in recent years, this has become more accepted as integrated treatment approaches appear to be more effective (31). Continued OAT following inpatient services has also shown to increase stabilization and decrease relapse, highlighting the efficacy of comprehensive treatment approaches.

Outpatient Services

Outpatient services include a wide range of programs which are part-time and not live-in. These programs provide more flexibility than inpatient services, so are often recommended for those with stable housing, employment, and more manageable substance use as there is an emphasis on self-management (49). It can be long-term to maintain stability following more intensive treatment or used as first line treatment depending on the patient. They often take place at specialized addiction or general healthcare centres and can involve counselling, education programs, support groups, or family therapy. Depending on the program, daily, weekly, or monthly activities are offered. Some virtual and mobile services have also been developed due to Covid-19, extending outreach to communities with less accessibility (41). There are both day programs where the individual returns home at night or evening programming that people can attend after their daily commitments.

Psychosocial therapy is a common treatment technique that provides non-judgemental support and advice that assists in analyzing barriers, assessing motivation, and developing strategies to promote wellbeing. Both individual and group therapy can benefit recovery as substance use disorder is a complex mental health disorder that often has many contributing

factors needed to be addressed for recovery (31). There is a high prevalence of PWUD who have experienced significant trauma leading to their substance use, as well as co-morbidity with other mental health disorders which can be improved upon with psychotherapy. Many struggling individuals emphasize the lack of social support and positive relationships to motivate them throughout recovery, highlighting the need for this type of treatment. It is not recommended however to rely solely on psychosocial support with the onset of abrupt abstinence as this has shown to have high rates of relapse and can lead to higher harm in the long-run (44). A specialized type of counselling gaining popularity is peer support. Just like psychological therapy, peer-based support can be one-on-one or in group formats and is most effective when used as an additional support to other treatment methods. The most well-known example is Narcotics or Alcoholics Anonymous which are thoroughly designed programs based on peer support groups and forming connections with others who have similar experiences (31). Both psychotherapy and peer support groups are also integrated in inpatient services, but access to these services in outpatient programs allow individuals waiting for, or not suitable for inpatient treatment to still benefit.

For those not pursuing abstinence, outpatient services can be an option to improve their mental health and manage dependence without barriers. They also give ample opportunity for referrals and exposure to treatment options maybe not previously known to the individual. In combination with other treatment programs, outpatient services can be very beneficial for those overcoming or maintaining their substance use disorder, but certain circumstances make this treatment option more effective for some than others.

Evidence in Ontario

The opioid epidemic seemingly prevailed in Western Canada over the last decade, but recent data suggests that stimulant- and opioid-related deaths, hospitalizations, and EMS responses have dramatically increased in Ontario from 2016-2021 (9). Opioid-related deaths especially saw a steep rise in the weeks following March 17th, 2020, when the state of emergency was declared in Ontario for Covid-19. When considering the populations most vulnerable to substance use disorder across Canada, the severity of addictions in Ontario is emphasized. There is a high prevalence of mental illness within Ontario, with the latest estimation occurring in 2012, concluding that at least 2.2 million Ontarians experience poor mental health and illness (51). There has been a lack of recent Ontario-wide studies quantifying mental health and addictions since 2012, making it difficult to convey the true prevalence provincially, but self-reporting polls have emerged that indicate there has been a major increase over the last decade. A recent poll conducted by the Canadian Association of Mental Health focused on the implications of Covid-19 on mental health in Ontario finding that almost three quarters of Ontarians think the province is facing a serious post-pandemic mental health crisis due to the negative effect isolation, heightened stress, and grief will have on the population, as well as the reduced access to services leaving a third of Ontarians finding it difficult to obtain adequate support (52). 45% of Ontarians had felt their mental health had deteriorated since March 2020, and more than a quarter feeling more tension in their household. The poll also highlighted both concerns with substance use and youth mental health in Ontario. Of the participants in this study, 42% had increased their substance use or gambling since the beginning of the pandemic and 59% of parents noticing a difference in behaviour in

their children including increased feelings of sadness and hopelessness, with 49% of children and youth indexed classified as high or moderate risk for mental health issues (52). The increased need for mental health support since the pandemic has provoked a provincial campaign called *Everything is Not Okay*, a movement supported by Ontario's top mental health and addictions leaders such as the Canadian Mental Health Association, Addictions and Mental Health Ontario, CAMH, CMHO, and multiple major mental health care and research facilities. Their campaign focuses on the growing need to make equal access to mental health and addiction care, dominantly by encouraging the government to prioritize reducing wait times for these services (53). The average wait time in Ontario for public residential addiction treatment is 100 days, producing gaps in our treatment system and not adequately supporting those reaching out for help (54). In regard to youth at risk, the longest wait time for mental health services can be 2.5 years with more than 28 000 children on the wait list for these services (55). Not only addressing wait times, this movement urges improvement in consistency of services and access for all no matter where someone resides, race, sexuality, age, income, or type of addiction.

Of the many struggling with mental health, there is a high prevalence of homelessness, socioeconomic inequalities, Indigenous peoples, and geographic factors which all contribute to health disparities and rates of substance use. The soaring real estate market will continue to drive more into homelessness, as the ability to secure affordable housing diminishes for those with lower income. In 2018, 13.9% of households in Ontario were in core housing need, meaning they require housing-related financial assistance to live in acceptable conditions, and with the rapidly rising housing market, this value is expected to increase (56). The

unaffordability of housing also prevents individuals who are homeless from obtaining permanent housing, which is of great need as the Financial Accountability Office of Ontario estimated in 2018 that more than 16 000 Ontarians are homeless with 40-60% experiencing chronic homelessness of 6 months or more (56). This statistic does not account for the 'hidden' homeless population making it difficult to gauge accuracy as some individuals live in encampments or stay with friends/relatives while experiencing homelessness, not being easily identifiable as without housing in comparison to those accessing emergency shelters. Lack of stable housing has a direct impact on health and seems to have a bi-directional relationship as it is often observed that health can influence the onset of homelessness. In the 2016 Ontario Point-in-Time (PiT) count data, the majority of those aged 24 to 49 years old indicated substance use as the main reason for lack of housing (57). Programs which take the housing-first approach to substance use and mental health care often stress the importance of supportive housing to combat chronic homelessness, but these programs are limited in Ontario with wait times being an average of 2.9 years, and the longest wait time being 8 years (58).

Those living in poverty and considered of low socioeconomic status face the greatest turmoil induced by the housing crisis and are also more likely to be affected by mental health and substance use issues. When reviewing income inequity in Ontario, the top one-fifth income group was found to have 9.6 times the income of the bottom one-fifth in 2011, making Ontario the province with the second-highest income inequality across Canada (59). The same report found that nearly double the total emergency department visits for mental health and addiction concerns were from those living in the lowest-income neighbourhoods in Ontario when compared to the richest neighbourhoods. Stigma and social exclusion of these

marginalized groups produces barriers to accessing services which can intervene before emergency visits are necessary, and overall, have a major impact on mental health and substance use. These already outcasted populations have less access to specialized services due to the complex factors present in the low socioeconomic population such as poverty, racism, isolation, violence, and inaccessibility to economic resources. Not only this, but these social determinants of health have serious implications on youth and their development. With the increasing prevalence and awareness of youth mental health in Ontario, it is important to consider these high-income disparities and how these conditions have long-term impacts on development of our youth. In a 2016 census of Ontario, it was concluded that 18.4% of children live in low-income households which will affect food security and nutrition, experiences of stress or trauma, and educational opportunities (60).

This statistic excludes data from Indigenous peoples who live on reserves in Ontario, another high-risk population in Ontario for substance use. The census data table enumerating Indigenous children was missing 8 First Nations communities, but even so, found that 29.5% of children represented lived in poverty. Being a severe underestimate, this data is incredibly concerning for the Indigenous communities in Ontario especially due to the high rates of mental illness and addictions amongst the Indigenous populations across Canada.

24% of all Indigenous peoples in Canada live in Ontario, representing the largest First Nations population nationally. Ontario has First Nations, Inuit, Métis, and other Indigenous self-identifying people, with 23% living on reserve and 78% of the communities being located in Northern Ontario (61). Of those living on reserve, a quarter of the reserves are remote communities only accessible by air or ice roads during the winter. Although improving, the

overall socioeconomic indicators of these populations show significant inequalities are present when comparing Indigenous to non-Indigenous populations. 21% of Indigenous peoples are considered low-income, with only 13% in non-Indigenous populations, and the rate of high school completion is 76% considering all self-identified Indigenous peoples and only 45% for First Nations living on reserves. 93% of the non-Indigenous population has a completed high school diploma, and in terms of health, have a life expectancy 10 years higher than Indigenous individuals (61). Although the health and social inequalities facing Indigenous communities are well-known, accessible and culturally relevant data is limited especially for non-reserve and urban Indigenous communities. Across Canada there have been multiple health surveys conducted to gain a better understanding of mental health in these communities, but lack of involvement of Indigenous peoples and incorporation of the diverse populations makes these studies less informative than intended. There is a disproportionate burden of harms associated with substance use in Ontario, especially in isolated communities, which Ontario Public Health has started to address.

The Crisis Team Program focuses on remote northern First Nations communities and takes a community-based approach to suicide, family violence, and mental health interventions (62). Integration of referrals to counselling and treatment programs in these northern communities hopes to lessen the treatment gap and make these services more accessible. These programs have good intention, but fails to address that standard treatment programs in Ontario foster disconnection from cultural values and traditions for many Indigenous peoples, leading to further pain and distance from their true heritage (63). Residential programs often dislocate individuals and cause more isolation and disruption, inhibiting healing and coping due to limited

cultural support. Specialized Indigenous mental health and addiction healing centres are a recent initiative by the Ontario government for this reason, as culturally safe treatment programs can be developed combining Indigenous healing and clinical approaches. Involvement of the communities is critical for effective treatment development, and both residential and non-residential day programs are being created to address this need. In October 2021, the Ontario government announced that they are designating $36 million to mental health and addictions support for Indigenous communities with $20 million directed towards supporting survivors of residential schools and $16 million to children and youth support, victim healing services, and an Indigenous-led response to opioid use (62).

This funding was announced in parallel with Ontario's *Roadmap to Wellness* report (2020), which outlined the government's new plan for the mental health and addictions system. An investment of $3.8 billion over 10 years is being implemented to build a more comprehensive mental health and addictions system which hopes to improve services for all Ontario's diverse populations. A focus of this initiative is co-development of services with Indigenous communities to better current supports in a culturally driven, holistic way by using a collaborative process and involving those directly affected. There is also emphasis on expanding services for Francophones, taking a similar integrated approach, and making French-language programs more readily accessible. In general, the report discusses the main systemic issues facing Ontarians in need of mental health and substance use services, being long wait times, barriers to knowledge of services as well as access, lack of coordination between programs, unequal service quality between regions, lack of evidence-based funding, and lastly, a lack of reliable data to properly evaluate both overall demand and efficacy of current interventions

(62). With a heavier emphasis on community-based services, the government has developed four pillars to address the complex needs of the province which are improving quality, expanding existing effective services, implementation of new innovative solutions, and improving access through continuous engagement with sector partners, medical professionals, clinical researchers, caregivers, as well as those who have lived experience.

There are a wide variety of services offered in Ontario to address substance use, although access to these treatment options may not always be guaranteed especially if you are a part of the above vulnerable populations. There are residential in-patient treatment centres, but as discussed earlier, have long wait times and often require individuals to move far distances sometimes causing further distress. Especially during the pandemic, there has been an emphasis on pharmaceutical interventions like OAT and safe supply programs as they are less effected by public health mandates and have more room for adaptation with the everchanging status of Covid-19 restrictions. There has been a rapid expansion of these programs as the government has reduced barriers in the prescription process, allowing physicians and nurse practitioners to prescribe OAT drugs without having to claim exemption as well as relaxing take-home policies making it discretion of the prescriber. The Ontario Telemedicine Network has also ramped up OAT programs as demand increased during the pandemic (64). Safe supply programs have gained particular attention this past year in Ontario, with both federal and provincial governments providing funding to local health organizations to provide safer supply options to more communities as the toxic drug supply prevails (65). Expansion of OAT and safe supply programs needs to continue, with a greater focus on integrating multiple forms of support in conjunction with pharmacological methods such as involving case management

workers, psychiatrists, social workers, social programming like group therapy, and other out-patient supports to promote continuity of care (64). The availability of these specialized services in Ontario require expansion as well, with multiple studies outlining the significant psychiatrist shortage occurring across Ontario having negative effects on the progression of many individuals with complex mental health needs. For example, it is estimated that Ontario will see a shortage of 350 psychiatrists by 2030, increasing the shortage by 15% since 2010, with current average wait times averaging 20.3 weeks (66). Limited access to these specialized services in a timely manner often causes the wellbeing of patients to worsen, especially when comorbid mental health conditions are present.

In attempt to alleviate some of the strain on mental health services, Ontario's newest health report outlined the priority of community health initiatives to address mental health and addictions needs. Community health centres are becoming more heavily relied upon in Ontario to reach more vulnerable populations and reduce the many identified barriers to obtaining health support. The wide breadth of these clinics makes services more coordinated and easily accessible, employing a variety of interprofessional health care professionals such as physicians, nurse practitioners, social workers, dieticians, social workers, and counsellors (67). With a mandate to address upstream health determinants, community health centres also have the ability to adapt programming depending on community factors, better supporting the people who access the services and able to customize care considering the unique geographic, social, and environmental contributors to health. The Ontario government has recently acknowledged the efficacy of these programs and are now prioritizing the development of centres to better mental health efforts provincially. Many of these clinics are associated with harm reduction

efforts as well. Although firstly only funded to reduce rates of HIV/AIDS and Hepatitis C, harm reduction initiatives have evolved to support a wide range of individuals who use substances, and increased advocacy for these programs in Ontario has gained greater public support. Consumption Treatment Services, or previously known as Supervised Consumption Sites, are one harm reduction effort which has been quite controversial since the first site opened in Canada in 2004 (68). Currently, there are 38 Consumption Treatment Service sites across Canada, with 21 of them in Ontario (69). There are five sites awaiting approval at the time of this report, with little insight on a potential opening date as the application process often takes several years before Health Canada approves them. There are emergency 1-year exemptions which can be given before Health Canada fully reviews these applications, but this is not ideal especially when trying to obtain funding. Another similar service is an overdose prevention site, which is much less complicated to develop as it only requires provincial Ministry of Health involvement and is not a permanent service. These sites are a temporary, emergency service which sometimes transitions to a Consumption Treatment Service centre, but in the beginning, does not require extensive support services and therefore only serves as a safe space to use drugs with supervision. The need for these sites has drastically increased during Covid-19 and were identified as priorities in the latest rapid review by Public Health Ontario on substance use-related harms. Other services identified include drug checking services, needle and syringe distribution programs, opioid overdose prevention education, naloxone distribution, and outreach programs like mobile services and virtual options (70). This rapid review focused on the negative impact the pandemic had on access of these services, which highlights a paradoxical of sorts occurring in Ontario. Covid-19 has restricted many services addressing

substance use, and further strained programs as they experienced a rapidly increasing demand, but simultaneously, the pandemic has finally brought those struggling with substance use to the forefront and serious progression has occurred both in policy and funding. The Ontario government is actively collaborating with those directly affected by addictions and trying to implement evidence-based services at a faster rate than previously, but the real question is if the response is too long overdue, and whether their current efforts are enough to overcome these challenges and effectively support the growing demand.

Report: Addictions in Rural Canada

Addictions in Rural Canada

Recently, substantially more research has been done to identify those who are most affected by substance use, but there is still minimal data that distinguishes geographical or cultural differences amongst these groups. Rural regions are specifically lacking in data reporting substance use rates, associated harms, resources available, and overall demographic of these communities which can be useful in identifying at-risk populations. Surveillance and effective analysis of substance use in rural communities is often lacking due to most addictions services and researchers being located in urban centres. Any research completed usually exclusively compares urban to rural instead of evaluating rural regions as their own entity, missing the many unique and dynamic factors contributing to health and wellness in these communities. The definition of 'rural' in Canadian health academia also varies, making it difficult to make distinct conclusions and produce effective policy or health initiatives. For example, Statistics Canada defines rurality by population and population density, whereas other ministries in the Ontario government consider rural to be all areas outside of the main nine urban centres (71). The lack of understanding of the diversity of rural communities and difficulty in defining the many aspects of rurality has direct implications in research and causes minimal data collection in these regions.

More recently, there has been an influx of research on Northern Ontario, which contains many small and remote communities, and has raised awareness of the many barriers rural regions are burdened with as well as promoted enrichment of rural-focused health services. Northern Ontario is intuitively a rural region both spatially and socially, with distinct

demographics and physical separation from the more recognized urban centres in Southern Ontario, which makes it a more manageable rural region to define and research. Although focus on Northern Ontario is obviously valuable and gives insight into many aspects of rural health, this research alone cannot fulfill the rural health data deficit across Canada as all these communities have unique political, environmental, economic, and social factors which contribute to their distinct health needs. Further expansion of research programs and collaborative initiatives with smaller communities are therefore needed to better understand the state of health care and more specifically, substance use, in rural areas nationwide.

Historically, rural regions have had limited access to the majority of health services, especially specialized services. Rural communities across Canada have long advocated for expansion of the current health care system and equal distribution of resources, prioritizing the health of all Canadians. Many rural areas have significant doctor and nurse shortages, leading to overburdened health care professionals unable to address all the needs of their underserved communities (72). Health care facilities that directly serve these communities usually have limited supplies and do not have as specialized equipment or treatment options, making it necessary to refer or transfer patients to facilities far away from their community which have access to the technologies and equipment needed. When focusing on substance use, these disparities in health care are echoed, with access to supports, drug education, harm reduction initiatives, and treatment options limited. This issue is incredibly prevalent within rural Canada, with higher rates of tobacco, alcohol, and methamphetamine use as well as rapidly climbing opioid use (73). Many rural health leaders, especially Indigenous leaders, have emphasized the need for more comprehensive substance use supports and culturally relevant services to

address the rapidly worsening state of addictions in small, rural communities. Based on the data available, various Canadian health organizations have evaluated the growing prevalence of substance use in rural regions. For example, within the last few years it was found in various studies that 22.4% of Canadians living in rural areas reported heavy drinking compared to 18.4% in urban areas (74), and opioid-related hospitalization rates in smaller communities were found to be 2.5X the rates in larger urban cities (75). Youth in rural regions were also more likely to drink alcohol as well as smoke tobacco cigarettes (73).

These statistics are only a small glimpse into the many measurable aspects of addiction in rural communities but demonstrate the equal need for intervention and adequate services when compared to urban rates, as well as the growing need to better understand the reasoning behind these trends. Most of the identified factors contributing to substance use trends in rural areas are attributed to socioeconomic factors such as low income, community safety, social supports, unemployment, high-risk occupations, and lower education. When considering the most high-risk jobs in Canada, most are highly laborious and exclusive to rural regions such as fishing and trapping, mining, quarrying, logging and forestry, transportation, and construction (76). These industries involve many occupational hazards and are therefore more stressful psychologically as well as lead to more workplace injuries. When combined with limited access to health services, lower income, social pressure, and less ability to change career paths, the high-risk jobs prevalent in rural communities can foster lower overall health and higher risk of substance use and addiction (77). Socially, people living in small communities are often more susceptible to feelings of shame associated with accessing health care, especially when related to workplace injury and substance use, as tighter-knit towns can lead to gossip and private

business quickly becoming public knowledge. Some habitants of rural regions have identified this as a personal barrier to getting the help they need, emphasizing the need for social programs raising awareness and educating communities on the health services available while concurrently reducing stigmatization (77). Smaller communities also usually have a smaller job field, leaving many with limited options when faced with workplace injuries. Not only this, but many with lower income cannot afford to take time off work to properly treat workplace injuries, encouraging use of pain medication to cope. Even if professional health advice is sought out in these scenarios, pain management has historically been low-quality in Western medicine and has contributed to the opioid epidemic as liberal opioid prescription without sufficient surveillance and guidance can cause unintentional opioid abuse (78). Inadequate pain management training is a hot topic in the health care industry, as prescription opioids have dramatically increased over the last 20 years and abuse of these medications has had devastating effects for many. Inability to access health care can also lead to use of non-prescription opioids or other substances such as alcohol, and this trend has been seen time and time again especially when working in a high-risk occupation. The unique socioeconomic factors affecting the health of rural residents are therefore complex and interact differently depending on the circumstances of each community, something which has not been effectively addressed in health care measures in the past.

As discussed in the previous report, urban communities across Canada have struggled with coordination of addictions and mental health services, and rural communities have even more barriers to communication and integration of these resources which has a severe impact on rural populations. The sheer distance between some of these services makes it much more

difficult to collaborate and develop more comprehensive care. It has been shown that substance use intervention is most effective when combining multiple evidence-based treatment methods, which often requires an interdisciplinary approach involving multiple services and health professionals (31). For example, a current popular treatment plan involves using pharmacological methods as a first-line treatment such as methadone or suboxone, and complimenting medication with psychotherapy, residential treatment, or other social supports. Without integration of these services, comprehensive treatment is much more difficult and increases risk of relapse. Not only this, but treatment is often not linear, with trial and error needed to find a treatment which works for each individual patient making it critical to have a variety of treatment options available, another aspect of substance use which is unmet in many rural communities.

The interdisciplinary approach to substance use and addictions has greatly expanded in recent years due to increased acceptance of substance use disorder as a medical condition and the increased efficacy of these types of programs, but this expansion is mostly in urban areas with a higher density of health resources. Although proven very effective so far in these urban regions, many of the services broadly available in Canada are still designed with an urban context in mind, making some evidence-based treatments impractical or ineffective for those living in rural regions. Connecting these issues, not only is access and integration of addiction services lacking in rural areas, but evidence-based interventions established in urban centres have not been thoroughly adjusted to better suit rural regions making it almost impossible to properly support these populations with the current structure of care. The most impactful example of this involves pharmacological treatments. Proper consultation and prescription of

medication-based treatments like methadone were almost completely inaccessible until recently, with strict policy requiring doctors to request special access on each individual case and jump through many hoops before being able to regularly prescribe the medications. Although much simpler now, mostly thanks to the Covid-19 pandemic, it is still routine to have weekly meetings with the patient to discuss dosage and progress with the treatment, as well as urine sampling (43). When beginning treatment, it is also common practice to receive single daily doses, requiring patients to go to a pharmacy or clinic every day to obtain their medication. Carries or weekly doses are only granted after long-term retention is demonstrated and is still avoided by many doctors and pharmacists. This creates a problem for those living in remote locations, where the cost and time of travel can be unattainable for those who need treatment. A similar issue is seen with outpatient services as they are not evenly distributed for all to access, and a similar immense commitment is needed to utilize in-person programming which is not feasible for many. These problems are amplified in harm reduction initiatives as distance makes it more difficult to readily obtain supplies and being further away from emergency health services put them at greater risk if overdose occurs. The lack of supervised consumption sites or similar services makes safe use almost impossible, which leads to higher opioid-related emergency department visits and deaths. The displacement of rural residents when accessing outpatient services, pharmacological treatment, harm reduction services, or inpatient services like residential programs can therefore be incredibly disruptive and put more strain on a patient as they are isolated from their loved ones and community where they are comfortable, need to consider travel and associated expenses, and may experience more intense culture shock when accessing these services, making an already difficult condition much

harder. Collaboration with rural health leaders and community members should be conducted to better expand services into rural areas and gain a better understanding of how urban-centred programs can be adapted to serve these populations.

Rural communities in general face barriers to health care both politically and geographically, but there is also a large proportion of marginalized groups living in these regions. It was found in a recent study that rural and northern communities, impoverished and homeless populations, incarcerated individuals, and Black, Indigenous, and People of Colour have seen the greatest increase in opioid-related harms (65). Feelings of displacement and subsequent isolation is felt to an even greater degree amongst these demographics, as urban-focused treatments are not often developed incorporating cultural relevance. Indigenous and francophone populations are quite prevalent in rural regions Canada-wide, making it necessary to consider culture and language when introducing treatment services into these communities. A large proportion of Indigenous communities are in rural or small population centres, with many being remote, highlighting the need to prioritize these populations when considering rural health in Ontario. The cultural barriers combined with unique obstacles faced by rural regions makes Indigenous health particularly vulnerable, and the consequences of neglecting these gaps have been demonstrated with the Chiefs of Ontario identifying opioid use disorder as an urgent health issue since 2009 (79). Many Indigenous leaders have outlined effective next steps for addressing substance use with a priority being expansion of specialized Indigenous programming which emphasizes culture and community by integrating traditional healing practices, spirituality, and elder-lead sessions while improving access to evidence-based treatments (80).

Similar culturally relevant services are necessary to support the Francophone populations in Ontario. The largest proportion of Francophone Ontarians live in Eastern Ontario or Northeastern Ontario which have more rural and remote regions relative to Southern and Central Ontario. There is substantial data documenting the detrimental outcomes of language barriers on access to and quality of health services, much of which is recounted by Francophone Ontarians (81). There is limited comprehensive data on the distribution of French-speaking physicians and whether these professionals are located amongst the identified high-density Francophone regions, making it difficult to evaluate the services offered and satisfaction with the care they receive. There is even less research on substance use in Francophone populations, creating a need for more specified and collaborative research before being able to identify the gaps in mental health and substance use services in these communities.

Another relatively hidden population in rural communities are those experiencing homelessness or housing instability. Often seen as a big city issue, homelessness is hard to quantify in rural regions but is still a prevalent issue. Most emergency shelters and social services intended for these populations are in urban centres which make data collection easier and makes homelessness more readily visible to the public, but less typical forms of temporary shelter like couch surfing or sleeping in vehicles occur outside of these geographic regions and often go under the radar (82). Due to lack of social infrastructure, rural residents struggling with homelessness also will sometimes migrate to urban centres to receive supports, which can have longer term effects as separation from family and loss of familiarity can be more harmful than helpful. Indigenous peoples who experience homelessness across rural Canada are also disproportionate to their population size, demonstrating the overlapping factors that are

involved in mental health and substance use issues. Another issue which rural communities face more than urban is the idea of relative homelessness, which involves people who are housed but in substandard shelter unfit for a high quality of life (83). Substandard conditions can include living with mould, poor heating or insulation, or other conditions which pose a risk to the health of the habitants. Low income and supportive housing options are also limited in rural regions due to lack of funding as most social infrastructure funding is distributed based on population, and due to the typical organization of these programs being less relevant to rural regions. This once again highlights how current initiatives to fight homelessness, complex mental health conditions, and substance use are often designed with an urban focus and are not readily applicable to rural settings. As described in the previous report, homelessness and lower income individuals are at a higher risk of substance use and addiction, making these populations in the context of rural communities incredibly important to consider. The revision of such programs is therefore necessary to address the barriers these populations face when struggling with substance use and make the services more effective for the unique communities they are serving.

There have been a few key developments in rural health access over the last few years which could benefit the mental health and addictions sectors exponentially if thoroughly developed with input from those living and working in these regions. The Local Health Hub Concept for rural and northern communities was presented by the Ontario Hospital Association in 2012 to improve on the current health care structure in these regions. In this model, there is emphasis on collaboration and integration of health delivery where predetermined core services are linked through a more efficient referral program, shared patient charts, and more

community partners which would all contribute to more comprehensive care (84). More recently, a combination of this approach with the Patient Medical Home concept, a primary care delivery program that focuses on family physicians and making their services more accessible as well as coordinated with other primary care services (85). The Patient Medical Home model focuses more on improving quality of primary care with a global perspective, making it more longitudinal and attempting to coordinate services within the entire primary care sector, whereas the Rural Health Hub concept prioritizes integration of services at a local small community level and heavily relies upon funding and administrative reform (85). These models complement one another well, with the pillars of each proposal being quite similar or working towards the same goals. Over the last decade, Ontario has seen a great deal of health care reform as changes in geographic borders of health regions and changes in both the names and responsibilities of these teams has varied greatly. The overlap between LHINs and Public Health Units is currently being refined to create a clearer system which encourages integration and communication between government and non-government organizations involved in health care. Currently, Ontario Health Teams are being created to address issues in the 34 public health regions, which has had a positive impact on patient navigation and general patient satisfaction (85). These teams bring health care providers together onto one collaborative team addressing the unique needs of Ontarians, which has shown to be particularly effective in improving mental health and addictions services especially for those in marginalized populations and living in rural and isolated areas (86).

These models can be further enhanced with the rise of telemedicine. Telemedicine has seen a dramatic expansion since the Covid-19 pandemic hit. The demand for continued health care

in a time of social distancing and limited in-person interaction provided the perfect platform for full deployment of telemedicine on a wider scale, as the services were available previously but not fully developed or readily available to all. The geographical barriers faced by rural regions are greatly alleviated by incorporation of telemedicine, allowing for more thorough follow up and frequent monitoring of progress, less economic pressure on both the health care system and the patient, and easier access to specialized services (87). Virtual supports for substance use have seen immense growth since the onset of the pandemic, causing change in health policy in Ontario and increasing accessibility to a wide range of populations. Changes to pharmaceutical evidence-based treatments like methadone has occurred with the advancement of virtual services as the government allowed for virtual check ins both initiating and throughout the prescription period, minimizing a barrier faced by many as thorough in-person weekly follow up was required pre-pandemic. The main obstacle in telemedicine is lack of equipment and reliable internet access, making health professionals urge governments to invest in improving internet access in remote and rural regions and educational programs for those who are not proficient at using the technologies needed (88). Substance use treatments utilizing telemedicine has seen greater retention rates and equal or more effective programs compared to in-person programs, mostly due to the increased accessibility and better suited outpatient programs for rural residents (89).

The development of new approaches to rural health and advancement of more integrated health services are critical for effective substance use supports and improvement of these services for rural communities. A high prevalence and wide variety of substance use is observed in rural regions, with opioid use rising at an alarming rate, but data is limited making it difficult

to fully understand the causes or effects of addiction in these communities. There is a great need for more collaborative research to occur in these regions to build more effective health care systems, and progression of the Rural Health Hub, Patient Medical Home, and telemedicine programs are a step in the right direction to better support rural regions and their vulnerable populations. More comprehensive, community-based approaches to health care therefore need to be invested in to better serve the currently underserved populations across Canada, especially in the overlooked rural areas.

Evidence in Eastern Ontario

The state of substance use and addictions in rural Northern Ontario has recently been well described due to the growing awareness of health inequity amongst these populations which has been a major advancement in rural health and research. This research emphasizes the unique factors which each individual rural community faces as well as identifies relatively universal deficits in rural health which has sparked the refinement and expansion of many health services to improve accessibility and relevance to rural populations. To an extent, this data is applicable to rural regions outside of the North, but still leaves many gaps for these other rural communities in Ontario. To improve this gap in research, this study explored substance use and addictions in rural Eastern Ontario, analysing rates, available resources, and potential barriers to these services to gain a better understanding of the current state of addictions across the Public Health Units located in Eastern Ontario. The Public Health Units involved in this region include the Eastern Ontario Health, Hastings Prince Edward Public Health, Kingston, Frontenac, and Lennox & Addington Public Health, Leeds, Grenville & Lanark

District Health, Ottawa Public Health, and Renfrew County and District Health Units. By reviewing data from 2016 to the latest available data, which is currently 2021 quarter 2, as well as doing a spatial analysis of the types of services available across Eastern Ontario, conclusions could be made about the evolving state of substance use in these regions. Based on these results, areas which require more thorough, locally driven assessments of their substance use services and factors influencing these rates could be identified, as the well-established rural health indicators can only provide foundational understanding of the data.

When reviewing the distribution of services across Eastern Ontario, as expected, the majority of resources are located in Ottawa, the largest city centre. Only publicly funded services were considered as they are more equally available to all populations whereas private sector health services like private treatment centres are less accessible for lower income individuals. Mental health services, community health centres, and harm reduction programs were concentrated in Ottawa and the surrounding area, with these services unevenly scattered amongst the rest of the region. Harm reduction services in Ottawa and the surrounding region as well as the city of Kingston were not included in our data. The Ottawa Public Health region offers over 110 services providing supplies, education, other resources encouraging safer use (90). This data was not included as the priority of this study is services accessible to rural communities. Due to the nature of harm reduction services, urban centres are not often feasible options as these resources are required quite frequently and in-person. For example, harm reduction supplies need to be replenished often, and safe consumption sites cannot be properly utilized with geographic distance. The Hastings and Prince Edward Counties Health Unit had the most offered services dispersed across the region, as the southern region has

many harm reduction resources spread fairly evenly across the area. The northern part of the public health unit is still relatively bare, with services only available in Bancroft. The KFL&A health unit only has five services offered outside of Kingston, and three are in Napanee. The rest of the public health unit does not have any known harm reduction services, which is a significant overlooked area. The Leeds, Grenville & Lanark District Health Unit has a greater number of harm reduction services available when compared to KFL&A, but they are still predominantly concentrated in population centres. There are still large areas with limited access to these resources. Similarly, the Renfrew County and District and Eastern Ontario Health Units have clusters of harm reduction services in their population centres and then no services readily available to the rest of the region. Overall, harm reduction services need to be better implemented across the Eastern Ontario public health units to be an accessible and effective treatment method for substance use and addiction.

When utilizing Health Canada's "Interactive Map: Canada's response to the opioid overdose crisis", prevention and harm reduction, treatment, and enforcement services can be visualized across Canada. From this data, the only services offered in Eastern Ontario by the Government of Canada are in Ottawa and Kingston (91). This data exemplifies the lack of services available outside of the urban centres and the need for greater federal support in responding to the opioid crisis. This data only includes Government of Canada programs and services, so does not illustrate the full scope of services available as there are many provincially and locally organized initiatives not represented. This highlights the need for coordination of substance use resources from a federal to local level to create more comprehensive care and easier to navigate health system for better treatment access and retention.

When reviewing data collected in this report, the local and provincial services available can be considered as well. There are less substantial clusters of services in the smaller urban population centres such as Cornwall, Brockville, Pembroke, Kingston, and Belleville. Outside of urban centres, there are the most community health centres in the Eastern Ontario Health Unit which have a wider distribution than the other public health units evaluated. More than half of the community health centres in the Eastern Ontario Health Unit predominantly offer francophone services, but there are no formal francophone clinics in any other regions. The effective distribution of these francophone services is difficult to evaluate as data outlining the francophone populations in Eastern Ontario is limited, but it has been shown that a great proportion of francophone Ontarians reside in the eastern-most region of Ontario closest to Quebec. In 2016, a study concluded that 43.1% of francophones in Ontario reside in Eastern Ontario, making this region contain the highest concentration of French-speaking Ontarians (92). These clinics are therefore serving an established francophone region, but it would be beneficial to this often-overlooked population for further analysis across Ontario to ensure there are no large gaps outside of the Eastern Ontario Health Unit.

The only specialized Indigenous community health centres are found in Ottawa and Cornwall, so limited culturally centred substance use supports for substance use are available in Eastern Ontario. There are multiple cultural healing centres in Northern Ontario as well as Central Ontario in urban centres like Toronto, but these programs require Indigenous peoples living in Eastern Ontario to displace themselves away from their support system which, as discussed previously, usually does more harm than benefit. The Hope for Wellness Help Line is targeted towards Indigenous peoples across Canada and offers 24/7 immediate intervention for

crises and offers counselling which can be utilized for severe mental health or addictions issues, connecting users to other wellness supports nearby. If cellular service or internet access is limited for rural residents this service may not be accessible to them, but in cases where this is not a barrier, it can provide ample support to Indigenous-identifying citizens across the country especially as multiple language options are available.

There are various virtual resources which have gained momentum in response to the Covid-19 pandemic. In most of the public health units examined, there are limited virtual programs developed for that specific region, but Ontario-wide as well as Canada-wide services are available to these residents. 211 Ontario, ConnexOntario, Wellness Together Canada, and Telehealth Ontario all offer 24/7 helplines and other virtual services to all Ontarians which can assist with crises and referrals to applicable services for further support (93). Hastings Prince Edward County Public Health provides two district-specific services for addictions and mental health support. Addictions and Mental Health Services Hastings Prince Edward provides a 24/7 helpline, drop-in centres in Belleville, Trenton, Picton Centre Hastings and North Hastings, and virtual referral services. The Crisis Intervention Centre is associated with the Hastings and Prince Edward hospitals and also provides a 24/7 crisis phone line which can provide assessments, referrals, and information about other services available (94). The Kingston, Frontenac, and Lennox & Addington Public Health Unit has addictions and mental health crisis lines for the Kingston & Frontenac and Lennox & Addington regions (95). The Lanark, Leeds & Grenville Counties have a distress crisis line, but is not specifically to support substance use, instead they are targeted to mental health emergencies. These crisis lines are critical for mental health support, but more extensive virtual care options should be developed in these regions

which provide longer term care options and improve access to other health services. The other Public Health Units do not provide region-specified virtual resources, but AccessMHA is a virtual resource targeted towards all residents of Eastern Ontario in need of mental health and/or substance use services. Both online resources and phone appointments are utilized to connect patients to necessary services as well as educational tools to support the needs of Eastern Ontario residents. It should be noted that of all the public health unit websites, only the Ottawa Public Health Unit mentions this resource even though it is intended for all of Eastern Ontario. Considering most of the Public Health Units only offer Ontario or Canada-wide virtual addictions services, it would be suggested that these public health units update the virtual resources available especially ones like AccessMHA which are aimed towards Eastern Ontario.

One of the principal initiatives recently led by the Ontario government was the expansion of Rapid Access Addictions Medicine (RAAM) Clinics as a more accessible substance use disorder resource. Amongst the 66 clinics, there are only five clinics within the entire Eastern Ontario region. The clinics available are in Brockville, Kingston, Belleville, and two in Ottawa. None of these clinics are within rural communities nor provide outreach programs to these areas. Similarly, there are five consumption and treatment service centres which provides supervised drug consumption services in Eastern Ontario with four in Ottawa and one in Kingston, both urban centres. There is currently an open application in the review stage for a mobile supervised drug consumption site in Bancroft, Ontario to serve the Hastings community, but at the time of writing, this site has no sign of opening in the near future (96). Even with research supporting the effectiveness of safe consumption services and reduction of harm seen implementing these resources, the process of government approval is strict and inefficient

making it difficult to utilize this public health measure. Consumption and treatment service centres have also shown to be key in coordination of services as education and referrals are prioritized and fundamental to their harm reduction approach. The other main in-person services include treatment centres, harm reduction supply distribution centres, mental health and counselling services, pharmaceutical intervention distributors, and detoxification centres.

The rate of opioid-related harms was reviewed over the past five years to gain a better perspective on the impact of opioid use on Eastern Ontario and if it is comparable to the increases seen nationwide. By applying the rural contexts of substance use discussed previously, these rates can supplement the known unique factors influencing addiction and substance use in rural communities and conclusions about potential next steps can be made. Comparisons were made from various time periods to gain insight on different social factors and overall change over time. In 2016, British Columbia declared a public health emergency due to increased opioid-related overdose deaths, whereas Ontario did not declare a state of emergency until 2020. A comparison of 2016 to 2020 was therefore made to observe the trends in Ontario since opioid-related harms were on the rise in Canada. A 2019 to 2020 comparison was made to observe the change in opioid-related harms during the first year of the Covid-19 pandemic. Lastly, comparison between the first quarter and second quarter of 2021 to gain insight on the current state of opioid use using the most updated data available. Data was classified into six rate ranges based on the data of the oldest year to effectively view change over time (see Appendix 1).

Overall, emergency department visits and deaths have substantially increased between all the time periods used (Table 1 and 3). Hospitalizations saw less consistent trends with a fair

number of decreasing rates especially within Renfrew County and Hastings Prince Edward Public Health Units (Table 2). There could be many factors influencing these statistics including marginalized populations feeling averse to hospital settings due to trends of stigmatization, the lack of proximity to hospitals in many of the public health units examined, or community initiatives providing adequate care to not require as heavy reliance on hospitals for substance use. Emergency department visits would be less affected by these factors as overdose events require immediate medical intervention with minimal input from the patient. Self-discharge is commonly seen amongst people who use drugs once able to leave the emergency department, further decreasing hospitalizations. Opioid-related emergency department visit rates increased across all public health units. This data aligns with growing toxic illicit drug supply reported across Canada and escalating use of fentanyl and other more potent synthetic opioids over the past 5 years. When considering these statistics with the distribution of hospitals, it is difficult to apply the results to rural communities as a great area of these Public Health Units do not have rapid access to emergency departments. In the case of overdose events, immediate medical attention is required, so travel time to a hospital would need to be limited, making it less likely rural residents would use these health facilities. This could highlight the potential gap in emergency overdose intervention for rural communities, as death rates are rapidly climbing in these areas and as seen previously, harm reduction services are limited making safe use less obtainable.

The immense increase in opioid-related deaths is of greatest concern in this data, with all the public health units analysed having an increase of over 110% from 2016 to 2020 (Table 3). Renfrew county has seen the largest increase with a 228.57% increase in opioid-related

deaths. From the first quarter of 2021 to the second quarter alone there was a 148.98% increase in opioid-related deaths in Renfrew County and District Health Unit. The only negative percentage change was seen between 2021's quarter 1 and quarter 2 in Leeds, Grenville & Lanark District Health Unit, but not shown is that between quarter 4 of 2020 and quarter 1 of 2021 there was a 404.30% increase, and the other time periods reviewed all saw positive changes making this decrease not representative of the overall trends in this region. A dramatic increase in opioid-related deaths and emergency department visits was seen from 2019 to 2020, and when considering the negative implications of the pandemic on mental health, access to supports, and the illicit drug supply as discussed in Report 1, these results are as expected.

When using the map function on the Ontario Public Health Interactive Opioid Tool, the data appears fairly consistent across the province, with high rates seen in almost every public health unit. The rate range presented by Ontario Public Health demonstrates the severity of opioid-related harms when considering ideal rates and the goal rates from a public health perspective, but this presentation does not give insight on what the data means for each public health unit relative to the other regions in Ontario. When analysing the data in ArcGIS online, the rates can be better visualized as the rate ranges can be set to better compare between public health units as opposed to comparing each public health unit to the rate threshold determined by public health. By classifying the data into six equal interval classes based on the Ontario-wide rates seen in 2016, 2018, and then 2020, it appears that Eastern Ontario has less severe rates when compared the Northern Ontario and Central Ontario. Although the rates of opioid harms in Eastern Ontario are relatively lower when reviewing the static yearly data

independent of time, when reviewing the data across time it can be concluded that opioid use and addictions are rapidly evolving in these regions and still requires immediate intervention. This data was visualized in six equal-interval classes based on the 2016 data for comparison. Especially when considering the distribution of services in these regions, the greatly increasing rates of the more rural public health units of Eastern Ontario are of particular concern, with the need for more integration of health services and specialized evidence-based resources both in-person and virtually to effectively address substance use and addictions within these areas. Emphasis on the vulnerable populations in these communities and further collaborative research with the communities directly is necessary to developing services which are appropriate for a rural context and culturally relevant.

Conclusions

Overall, the data reviewed in this study demonstrated the research gaps in rural communities as well as the lack of substance use services outside of urban centres. Medically based research has been rapidly expanding in addictions and substance use, providing many evidence-based treatment methods, but the even distribution and integration of these services has not been effectively executed across Ontario as of yet. The current system of care leaves many deficits when addressing substance use disorder, especially for rural and remote communities, which has recently been better documented in Northern Ontario. The expansion of research into Northern Ontario is incredibly valuable, but this project demonstrates that further development is needed, extending into other rural communities across Ontario like in Eastern Ontario. Further expansion of telemedicine programs would be recommended for more

rapid intervention and to supplement these overlooked regions until further reform is achieved. The Rural Health Hub and Patient Medical Home care concepts could also be used as foundation for an improved network of care when addressing substance use across all of Ontario. Better collaboration with local organizations and health initiatives would create a more effective system of data collection, expansion of services and resources available, and refinement of urban-focused care methods to serve unique rural communities in a more comprehensive way.

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Appendix 1: Data Sources and Geographic Analysis

Statistics – Opioid-Related Harms Percentage Change

Table 1. Values presented are percentage change of opioid-related emergency department visits per public health unit from varied time periods indicated. Data collected from Ontario Public Health Interactive Opioid Tool and statistics calculated using standard percentage change formula in Microsoft Excel.

Public Health Unit	2016-2020	2019-2020	2021 Q1-2021 Q2
Ottawa Public Health	189.60	67.21	29.03
Renfrew County and District Health Unit	7.22	-13.33	-16.82
Hastings Prince Edward Public Health	206.70	53.92	56.28
Leeds, Grenville & Lanark District Health Unit	110.54	65.99	69.53
Eastern Ontario Health Unit	51.84	147.31	112.78
KFL&A Public Health	252.98	8.17	32.01

Table 2. Values presented are percentage change of opioid-related hospitalizations per public health unit from varied time periods indicated. Data collected from Ontario Public Health Interactive Opioid Tool and statistics calculated using standard percentage change formula in Microsoft Excel.

Public Health Unit	2016-2020	2019-2020	2021 Q1-2021 Q2
Ottawa Public Health	-15.74	9.64	53.13
Renfrew County and District Health Unit	-36.70	-7.75	-73.89
Hastings Prince Edward Public Health	-23.95	-27.02	-9.06
Leeds, Grenville & Lanark District Health Unit	9.70	10.37	-44.50

Eastern Ontario Health Unit	52.73	55.56	273.68
KFL&A Public Health	50.49	-33.19	91.52

Table 3. Values presented are percentage change of opioid-related deaths per public health unit from varied time periods indicated. Data collected from Ontario Public Health Interactive Opioid Tool and statistics calculated using standard percentage change formula in Microsoft Excel.

Public Health Unit	2016-2020	2019-2020	2021 Q1-2021 Q2
Ottawa Public Health	183.33	88.89	15.71
Renfrew County and District Health Unit	228.57	148.65	148.98
Hastings Prince Edward Public Health	131.51	74.23	12.98
Leeds, Grenville & Lanark District Health Unit	112.20	148.57	-39.66
Eastern Ontario Health Unit	179.31	145.45	32.46
KFL&A Public Health	149.37	26.28	70.99

Data Sources

Data was collected from a variety of government sources, peer-reviewed primary literature, review articles, and grey literature. In the ArcGIS Online data analysis, the data was collected from the following sources:

Public health boundaries:

Statistics Canada. Canadian Census Analyser [Internet]. University of Toronto. 2014 [cited 2022 Apr 24]. Available from: http://dc1.chass.utoronto.ca.proxy.library.carleton.ca/census/

Services:

Living Atlas of the World | ArcGIS [Internet]. [cited 2022 Apr 24]. Available from: https://livingatlas.arcgis.com/en/home/

Ontario Harm Reduction Distribution Program. Find Supplies [Internet]. Kingston Community Health Centres. [cited 2022 Apr 22]. Available from: https://ohrdp.ca/find-supplies/

Local Resources & Support | Crisis Services Canada [Internet]. [cited 2022 Apr 22]. Available from: https://www.crisisservicescanada.ca/en/looking-for-local-resources-support/

Supervised consumption sites: Guidance for Application Form - Canada.ca [Internet]. [cited 2022 Apr 18]. Available from: https://www.canada.ca/en/health-canada/services/substance-use/supervised-consumption-sites/status-application.html#wb-auto-41.

Getting Help | Hastings Prince Edward Public Health [Internet]. [cited 2022 Apr 18]. Available from: https://www.hpepublichealth.ca/getting-help/

Health Services for Ontario - thehealthline.ca [Internet]. [cited 2022 Apr 24]. Available from: https://www.thehealthline.ca/

Health Equity Charter | Alliance for Healthier Communities [Internet]. [cited 2022 Apr 24]. Available from: https://www.allianceon.org/community-health-centres

Opioid-related harms data:

Government of Canada. Interactive map: Canada's response to the opioid crisis [Internet]. Responding to Canada's opioid crisis. 2021 [cited 2022 Apr 19]. Available from: https://health.canada.ca/en/health-canada/services/drugs-medication/opioids/responding-canada-opioid-crisis/map.html

Ontario Agency for Health Protection and Promotion (Public Health Ontario). Interactive Opioid Tool [Internet]. Queen's Printer for Ontario. 2020 [cited 2021 Nov 13]. Available from: https://www.publichealthontario.ca/en/data-and-analysis/substance-use/interactive-opioid-tool

Geographical Analysis

To better illustrate the data and make more informative comparisons, geographical analysis differed between the time periods observed. Every parameter had a different set rate range to better represent the data. In each time period, the oldest period was first analysed

using ArcGIS Online and altering the style presented. The oldest data was classified into 6 equal interval classes to visualize the spread of the data. This same rate range was then manually applied to the newer data to effectively show change over time. The legends shown display the respective rate ranges.