Landscape of Prescription Stimulant Use

Patterns, Trends and Geographic Variation in Ontario, Canada

A Report on Behalf of the
Ontario Drug Policy Research Network
Citizens' Panel

September 25, 2018

ODPRN ONTARIO DRUG POLICY RESEARCH NETWORK

About the ODPRN

The Ontario Drug Policy Research Network (ODPRN) is a province wide network of researchers who provide timely, high quality, relevant drug policy research to decision makers. We conduct research to determine real-world drug utilization, safety, effectiveness, and costs of drugs in Ontario, and have developed partnerships that allow us to engage in cross-provincial comparisons of drug safety and utilization.

We are funded to conduct pharmacoepidemiologic and drug policy research as part of an initiative to provide evidence to inform policy at the Ontario Ministry of Health and Long-Term Care (MOHLTC). As such, the ODPRN works closely with the Ontario Public Drug Programs (OPDP), MOHLTC and other stakeholders to select key priority areas and topics for analysis.

About the ODPRN Citizens' Panel

The ODPRN Citizens' Panel (CP) is a group of 21 volunteer citizens from across Ontario who were brought together to ensure that the ODPRN appropriately identifies issues of importance to the public, and incorporates these priorities into all phases of our research.

This research report is a project identified by the CP as being of joint interest to policymakers, researchers and the general public. The CP members identified the research questions of interest, chose the measures to be included in the report, provided interpretations on study findings and reviewed the final report. This report was led by all members of the ODPRN Citizens' Panel, with specific recognition provided to the following project sub-committee members: Kris Lee, Donna May, Jane Sanders and Josephine Quercia. The ODPRN researchers provided oversight, methodological advice and drafted the report.

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Research Summary

Take away message

- Approximately 1 in 78 (1.3%) Ontarians received a prescription stimulant in 2017 (180,699 individuals). This rate was highest among children aged 0-12 (N=47,649; 2.5%) and youth aged 13-18 (N=35,473; 3.8%).

Trends in Prescription Stimulant Use

- The monthly rate of individuals who received a prescription stimulant in Ontario increased 29% over the past 5 years, from 4.7 individuals per 1,000 residents in January 2013 to 6.0 individuals per 1,000 residents in December 2017.
- Prescription stimulant use among children and youth (aged 18 and younger) was lower in the summer months of July and August, which may be attributable to “drug holidays” when children and youth are on school vacations.
- The rate of new stimulant use was consistently highest among individuals aged 24 and younger, and likely reflects timing of attention-deficit/hyperactivity disorder (ADHD) diagnoses.

Characteristics of Prescription Stimulant Use

- Among individuals who received a prescription stimulant in 2017, almost half were children and youth (46.0% aged 18 and younger), about two-thirds were men (62.6%) and almost one-third were being treated with a stimulant for the first time (29.0%).
- In 2017, methylphenidate (e.g., Ritalin) products and long-acting formulations of stimulants were the most common types of prescription stimulant dispensed (60.3% and 90.0% of all prescriptions, respectively).
- Approximately half (48.0%) of individuals who newly received a stimulant obtained their initial prescription from a family physician, followed by a psychiatrist (20.5%) and a pediatrician (21.6%).

Potentially Inappropriate Prescriptions

- The proportion of potentially inappropriate stimulant prescriptions was low, and halved between 2013 and 2017 (0.12% to 0.06%). This decrease may be due to the introduction of the Narcotics Monitoring System in 2012, which flags potentially inappropriate prescriptions.

Geographical Variations

- There was considerable geographic variation in the rate of prescription stimulant use and the percent of these individuals who had a recent psychiatrist visit prior to receiving their prescription.
- In general, the rate of prescription stimulant use was lower in central Ontario relative to other regions, although the percent of individuals who had a recent psychiatrist visit prior to receiving their stimulant prescription was higher in central Ontario relative to other regions.

Objective

The objective of this report is to describe patterns of prescription stimulant use in Ontario over time, by age and gender, and to explore how the use of these medications differs across the province.

Background

Stimulants are a class of medications approved in Canada for the treatment of attention-deficit/hyperactivity disorder (ADHD) and sleeping disorders (e.g., narcolepsy)[1]. These medications act on the central nervous system to increase alertness, attention and energy. In Canada, stimulants are available in methylphenidate or amphetamine (mixed-salt amphetamine, dextroamphetamine lisdexamfetamine) forms, as well as in long and short-acting formulations. Long-acting formulations have the convenience of being taken with less frequency, which can improve compliance, and are currently recommended as the first-line treatment medication for ADHD based on Canadian guidelines[2]. In Canada, the estimated prevalence of stimulant use in the population is about 1%, with higher rates of use among youth (3.5%)[3].

Stimulants are most commonly used to treat ADHD, which is characterized by symptoms of inattention, hyperactivity and/or impulsivity. Current guidelines for ADHD treatment recommend the use of stimulants and/or the use of behavioural therapy as first-line treatment [2,4,5]. The exception is for preschoolers, where cognitive and behavioural therapy is suggested as first-line treatment. In addition to stimulants, atomoxetine is a non-stimulant medication that is also available for the management of ADHD symptoms. In Ontario, approximately 1 in 20 children and youth have a diagnosis of ADHD, with rates higher among males and teenagers. The majority of children and youth with ADHD (approximately 70%) receive prescriptions for stimulant or non-stimulant ADHD medications[6]. ADHD is considered a life-long condition with symptoms often persisting into adulthood, and diagnoses of ADHD among adults may occur in cases where a diagnosis was missed in childhood[7-9].

Stimulants are also used for the treatment of narcolepsy. Additionally, off-label use of stimulants include the treatment of bipolar depression disorder[10], depression and fatigue among medically ill older adults and adults receiving palliative care[11,12], fatigue among individuals with cancer[13], as well as to improve cognitive function among individuals with certain medical conditions (e.g., cancer, HIV, neurodegenerative disorders)[14].

Despite the benefits of stimulant use for managing symptoms of ADHD and other conditions, there are risks associated with these medications. In particular, stimulants can increase blood pressure and heart rate[15], though the long-term risks are unknown. There is currently conflicting evidence on the cardiovascular risks associated with stimulant use, with most studies reporting no increased risk[16]. Despite this, Health Canada has issued warnings of rare cardiovascular events (e.g., cardiac arrests, strokes, sudden death) and does not recommend use among individuals with cardiovascular risk factors (i.e., high blood pressure, heart disease/abnormalities)[17]. Warnings for rare psychiatric adverse risks associated with stimulants have also been noted, including agitation and hallucinations in children, an increased risk of psychosis and mania shortly following stimulant initiation, and a potentially increased risk of suicidal thoughts and behaviours[18-21]. It is also important to note that ADHD is often accompanied by other psychiatric illnesses (e.g., anxiety, depression, bipolar disorder, substance abuse)[6,22] that may contribute to increased risks of some psychiatric events.

Stimulants also have the potential for misuse, and there is concern around the diversion of these medications among adolescents and young adults[23]. Misuse is highest among university students and younger adults, and particularly higher among those who have received prescriptions for stimulants (31% to 49%), compared to those who did not (5% to 35%). Among university students, the most common reason for misuse is to improve study skills, while nonacademic reasons include misuse for euphoria effects (getting high) and to combine

use with alcohol or other illicit drugs. Among young adults, the most common reasons for misuse are to increase productivity, to stay wake, and for euphoria effects. Misuse of stimulants has also been found to be higher among men compared to women. Given this potential for misuse and diversion, stimulants are currently listed as a controlled substance under the Controlled Drugs and Substances Act in Canada.

In Ontario, the Narcotics Monitoring System (NMS) was launched in 2012 to capture information on all prescriptions dispensed for controlled substances in the province, including stimulants. The main purpose of the NMS is to promote safe and appropriate prescribing of controlled substances that have the potential for inappropriate use or misuse. However, the database can also be used to monitor patterns of prescribing and safety of medication use in the province.

Methods

Setting

We conducted a cross-sectional study among individuals living in Ontario who were dispensed a prescription stimulant between January 2013 and December 2017. We used data from the NMS, which captures information on prescriptions dispensed for stimulants regardless of how the individual paid for the medication (i.e. private insurance, public insurance or cash payment) in any outpatient pharmacy in Ontario. We limited the analysis to individuals who presented a valid Ontario health card as their source of identification at the time of prescription dispensing, which accounted for 97% of prescriptions captured in the database. In Ontario, individuals can receive a stimulant prescription from a registered physician or dentist, and nurse practitioners were given authority to prescribe them in April 2017. All datasets used in this study were linked using unique, encoded identifiers and analyzed at ICES using SAS Enterprise Guide Version 6.1.

Type of Stimulants

We report stimulant utilization overall and stratified by type of drug (methylphenidate, mixed-salt amphetamine, dextroamphetamine, lisdexamfetamine) and formulation (long-acting (LA), immediate release (IR)). **Table 1** lists the stimulants we studied.

Prescription Stimulant Use

Table 1: Stimulants by drug, brand name and formulation

Medication (Generic Name)	Brand Name	Formulation Type
Methylphenidate	Ritalin	IR
	Ritalin SR	LA
	Biphentin	LA
	Concerta	LA
	Generics	LA and IR options
Amphetamine mixture (mixed-salt amphetamine)	Adderall XR	LA
	Generics	LA
Dextroamphetamine	Dexedrine	LA and IR options
	Generics	IR
Lisdexamfetamine	Vyvanse	LA

XR: Extended Release
SR: Sustained Release

We report the number of individuals with an Ontario health card who were dispensed a stimulant prescription in the province. In 2017, we reported the number and percent of individuals in the province who received a prescription stimulant, using population estimates from Statistics Canada as the denominator, and stratified this by gender and age group (0-12, 13-18, 19-24, 25-34, 35-44, 45-64, 65+). We also report the monthly rate of stimulant use between January 1, 2013 and December 31, 2017, calculated as the number of individuals who were dispensed a stimulant prescription divided by the population in Ontario, expressed per 1,000 residents. Rates are stratified by gender and age group. We also report the rate

of new stimulant use, defined as individuals who were dispensed a stimulant prescription in the year of interest and not in the preceding 365 days, expressed per 10,000 residents. This measure was reported between January 1, 2014 and December 1, 2017 and stratified by age group.

Characteristics of Ontarians who Received Prescription Stimulants

Demographic characteristics were captured for all individuals dispensed a stimulant prescription between January 1, 2017 and December 31, 2017, including age, gender, neighbourhood income quintile, and urban/rural area of residence using information from the Ontario Health Insurance Plan Registered Persons Database (OHIP RPDB). An individual was defined as living in a rural area if they resided in a community with less than or equal to 10,000 people. Neighbourhood income quintile, a measure of socioeconomic status, is derived from census data and is adjusted for household size and community. The neighbourhood income quintiles range from 1 (lowest neighbourhood income) to 5 (highest neighbourhood income) and have roughly 20% of Ontarians represented in each quintile. We report the type of stimulant and the formulation for the first prescription dispensed in the year (mutually exclusive groups). To determine use of stimulants and opioids at the same time, which can increase risks of an overdose, we report the number of individuals who were dispensed 3 or more stimulant and opioid prescriptions during the year. We also describe the characteristics of the initial prescriber in the year, categorized as family physician, psychiatrist, pediatrician, neurologist, other physician specialty, and non-physician (e.g., dentist, nurse practitioner), as well as recent physician visits similarly categorized. A recent physician visit was defined as a visit in the 3 months prior to the first stimulant prescription dispensed in the year. These estimates are reported overall, stratified by new or ongoing use and stratified by age.

Potentially Inappropriate Prescriptions

A potentially inappropriate stimulant prescription was defined as an early refill of a stimulant prescription that was from both a different doctor and different pharmacy. To identify potentially inappropriate use of stimulants, we first identified all prescriptions for stimulants where at least 30 units (e.g., tablets) were dispensed. We then identified those that were 1) dispensed within 1-7 days after the 30-unit prescription and 2) issued by a different physician and 3) dispensed at a different pharmacy. This definition has been used in the past as a conservative approach to identify potentially inappropriate prescriptions[24]. We report the number and percent of all stimulant prescriptions that are potentially inappropriate by age group in 2013 and 2017.

Geographic Variation

Regional variations in the rate of prescription stimulant use and recent psychiatrist visits was illustrated by mapping standardized rates in calendar year 2017 according to Public Health Unit (PHU) and Local Health Integration Network (LHIN; Ontario's regional health planning authorities). Rates were standardized by age and gender to account for the variations in age and gender between LHINs and PHUs. We also report the average age and gender in each region in 2017. Individuals were assigned to a PHU and LHIN using their residential postal code at the time of their first stimulant prescription in 2017. We report if standardized rates in LHINs and PHUs are statistically higher than the Ontario average.

Key Findings

Prescription Stimulant Use in 2017

- Approximately 1 in 78 (1.3%) Ontarians received a prescription stimulant in 2017, representing 180,699 individuals.
- Stimulant use was highest among children aged 0-12 (N=47,649; 2.5%) and youth aged 13-18 (N=35,473; 3.8%).
- Stimulant use was almost twice as high among men (N=113,102; 1.6%) compared to women (N=67,301; 0.9%), however this difference was more pronounced among school-aged individuals (24 and younger).

Approximately 1 in 78 (1.3%) Ontarians received a prescription stimulant in 2017 (**Table 2**), and this was higher among children and youth. Specifically, stimulant use was highest among children and youth aged 12 and younger (2.5%), 13-18 (3.8%) and among young adults aged 19-24 (2.2%), which likely reflects use for the management of ADHD. The higher proportion of stimulant use among the 13-18 year old group may be due to increased diagnoses of ADHD in high school, where school grades may be impacted by the symptoms of ADHD, and aligns with the high prevalence of ADHD diagnosis among this age group in Ontario[6]. The lower rate of stimulant use among individuals aged 19-24 compared to those aged 13-18, may be indicative of individuals leaving school for the workforce and no longer requiring stimulants. However, this could also highlight a potential barrier to medication access as young adults may lose drug coverage when turning 19, and therefore may no longer be able to afford continued medication use.

Stimulant use also differed by gender, with use among men (1.6%) being almost twice as high compared to women (0.9%). Among men, stimulant use was highest among those aged 18 and younger (1.6% of boys aged 0-12 and 5.1% of boys aged 13-18). While among women, stimulant use was highest among those aged 13-18 (2.4%) and 19-24 (1.8%). Interestingly, the use of stimulants was similar between men and women with increasing age, particularly among those aged 35 and older.

Table 2: Number and percent of Ontarians who received a prescription stimulant in 2017

Characteristic		Number (Percent)		
		Total	Men	Women
Overall		**180,699 (1.28)**	**113,102 (1.63)**	**67,301 (0.94)**
Age Group	**0-12**	47,649 (2.46)	36,028 (3.63)	11,621 (1.23)
	13-18	35,473 (3.80)	24,484 (5.10)	10,989 (2.43)
	19-24	24,655 (2.16)	14,568 (2.48)	10,087 (1.82)
	25-34	25,754 (1.33)	14,670 (1.54)	11,084 (1.13)
	35-44	17,713 (0.97)	9,239 (1.04)	8,474 (0.91)
	45-64	24,619 (0.62)	11,853 (0.61)	12,766 (0.64)
	65+	4,539 (0.19)	2,259 (0.21)	2,280 (0.17)

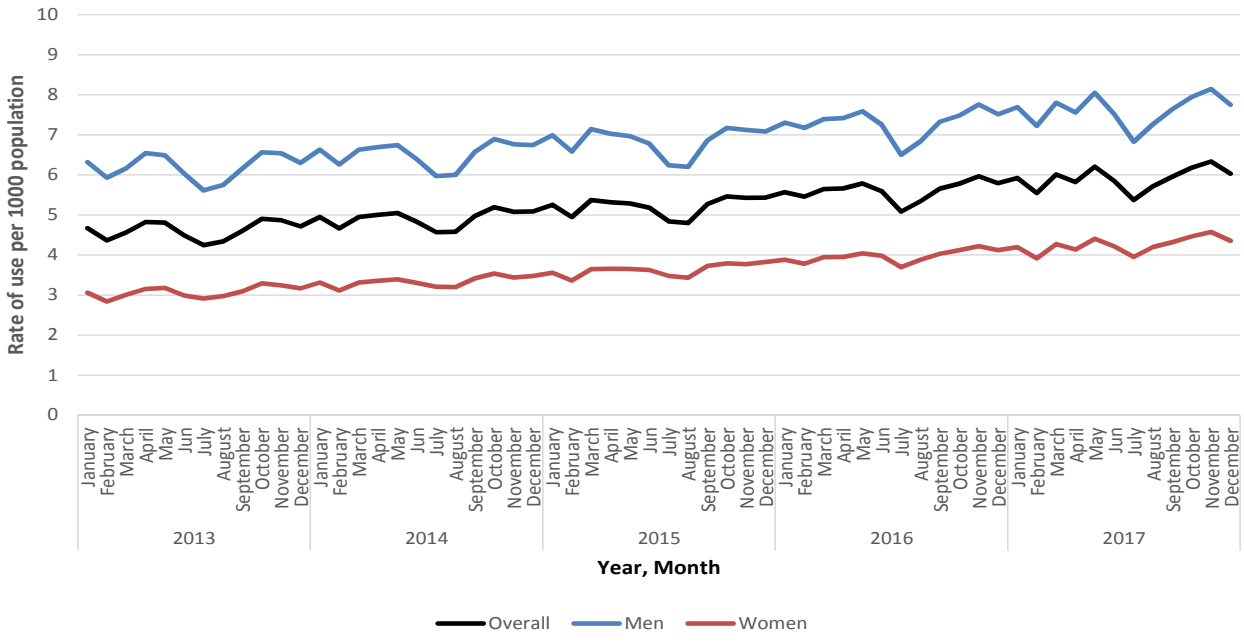
Trends in Prescription Stimulant Use

- The monthly number and rate of individuals in Ontario who received a prescription stimulant has increased 29% over the past 5 years, with a greater increase occurring among adults between the ages of 25 and 44.
- Lower rates of stimulant use in the summer months of July and August were observed among children and youth aged 18 and younger, which may reflect discontinuation of therapy when children are not in school ("drug holiday").
- Over the study period, the rate of new stimulant use was consistently highest among individuals aged 24 and younger, which may result from the timing of new diagnoses of ADHD that typically occur in childhood.

The monthly rate of stimulant use in Ontario increased 29% between January 2013 and December 2017, from 4.7 individuals to 6.0 individuals per 1,000 residents (**Figure 1**). Men consistently had a higher rate of stimulant use compared to women during the study period. For example, in December 2017, the rate of stimulant use among men (7.8 per 1,000 men) was almost twice that of women (4.4 per 1,000 women). Despite this, the rate of stimulant use grew more quickly among women compared to men (42.5% vs. 22.6% increase over the study period).

The rate of stimulant use increased among all ages over the study period. In particular, the rate increased most quickly among individuals aged 25-34 (72%) and 35-44 (67%), followed by individuals aged 45-64 (51%), 19-24 (51%), 65+ (35%), 13-18 (21%), and 0-12 (11%; **Figure 2**). The faster growth in stimulant use among adults (25 and older) may reflect increased awareness and diagnoses of ADHD among older individuals, missed diagnoses in childhood, or increased stimulant use for off-label indications. Among children and youth aged 18 and younger, rates of stimulant use were lower in the summer months (July and August), which may reflect decisions by some parents to discontinue these medications when children are not in school ("drug holiday")[2,25].

Figure 1: Trends in prescription stimulant use in Ontario, overall and by gender



TRENDS OVER THE PAST 5 YEARS (2013-2017):

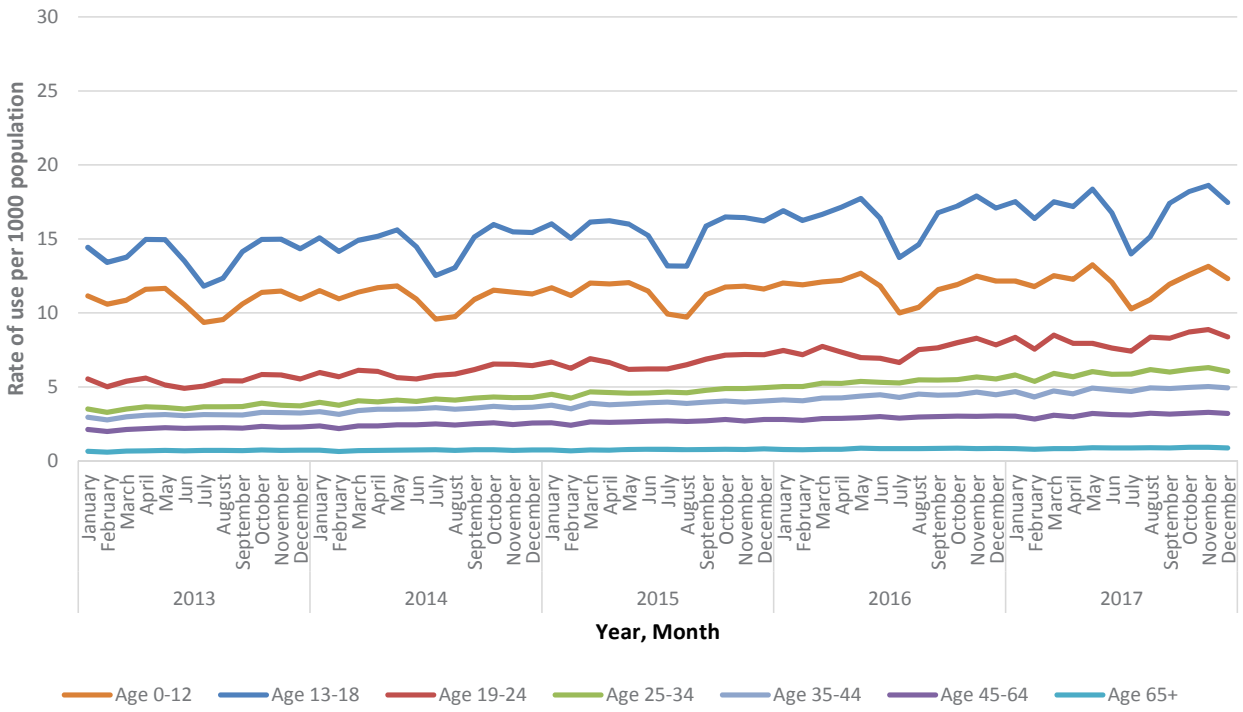
29%
increase in monthly rate of individuals who received a prescription stimulant

"DRUG HOLIDAY"
Prescription stimulant use lower during the summer months among children and youth

NEW USE
was highest among those aged 24 and younger, reflecting timing of ADHD diagnoses

INAPPROPRIATE USE
The proportion of potentially inappropriate stimulant prescriptions was rare and decreasing

Figure 2: Trends in prescription stimulant use in Ontario, by age



The rate of stimulant use was highest among individuals aged 13-18 over the study period, and this rate was higher among boys compared to girls (**Figures 3 & 4**). High rates of stimulant use were also observed among boys aged 12 and younger (18.4 per 1,000 boys in December 2017). However, this pattern was not observed among girls in this age group, where rates among those aged less than 12 were similar to rates among young adults aged 19-24 (5.9 vs. 7.0 per 1,000 girls in December 2017, respectively). The rate of stimulant use grew more quickly among women compared to men across all age groups. The lower rate of stimulant use in the summer months among recipients aged 18 and younger was present for both genders.

Figure 3: Trends in prescription stimulant use among men in Ontario, by age

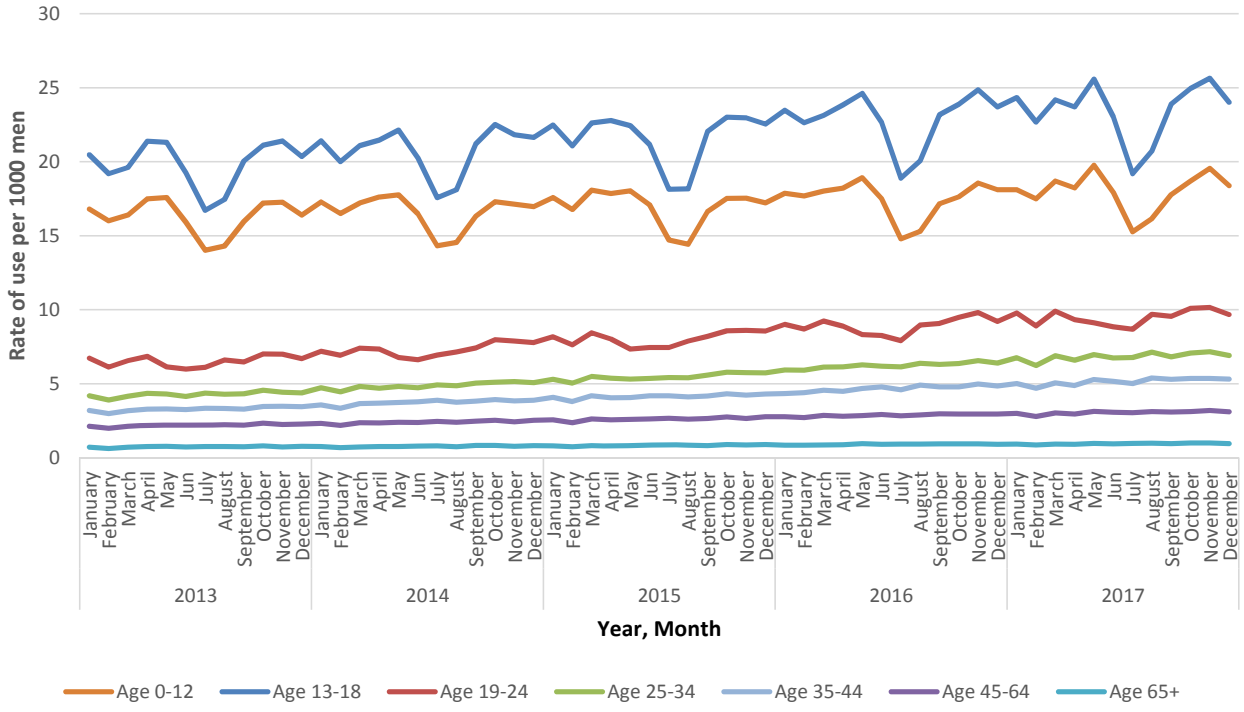
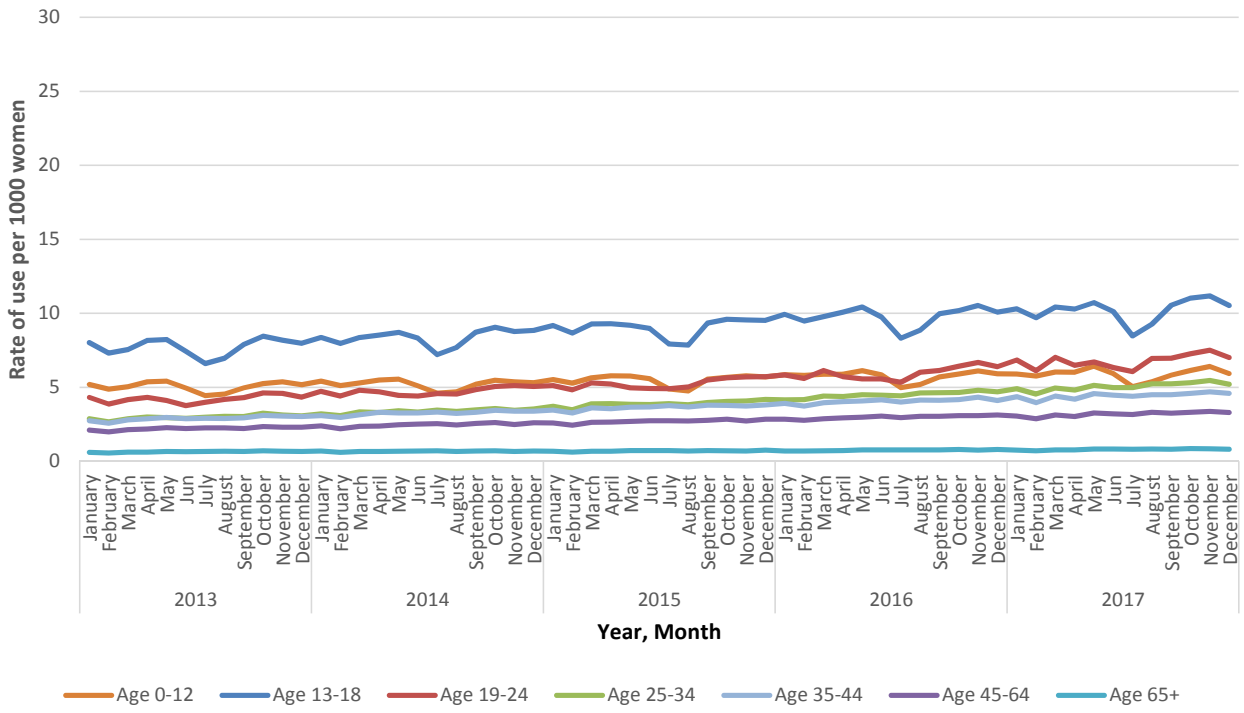
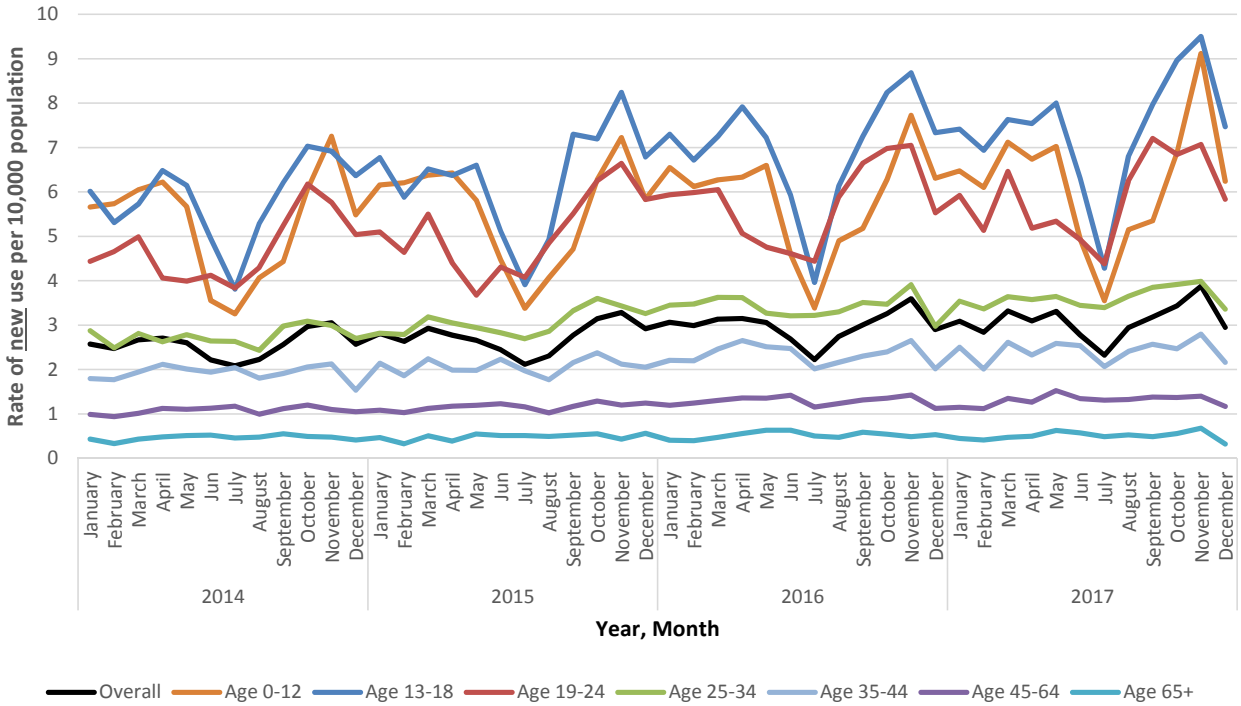


Figure 4: Trends in prescription stimulant use among women in Ontario, by age



The number of individuals who received a prescription stimulant for the first time in Ontario increased by nearly 20%, from 3,502 individuals in January 2014 to 4,184 individuals in December 2017. This corresponded to a 15% increase in the rate of new use (from 2.6 to 3.0 individuals newly receiving a prescription stimulant per 10,000 residents; **Figure 5**). The rate of new stimulant use was consistently highest among individuals aged 24 and younger (6.2 individuals aged 0-12, 7.5 individuals aged 13-18, and 5.8 individuals aged 19-24, per 10,000 residents in December 2017, respectively) and also followed a seasonal pattern of use, with higher use during the school months (September to May). This trend likely reflects stimulant initiation for the management of ADHD symptoms among children and youth in school.

Figure 5: Trends in new prescription stimulant use in Ontario, overall and by age



Note: New use defined as no stimulant prescription in the preceding 365 days and only presented from January 1, 2014 onwards due to data availability.

Characteristics of Ontarians who Received Prescription Stimulants

- Among individuals who received a prescription stimulant in Ontario in 2017, almost half were children and youth (46.0%), about two-thirds were men (62.6%), and almost one-third newly received a stimulant (29.0%).
- The majority of individuals who received a prescription stimulant lived in urban regions (88.9%) of Ontario and higher income neighbourhoods (44.0% in highest income quintiles).
- Methylphenidate (e.g., Ritalin) products and long-acting formulations of stimulants were the most common types of stimulants dispensed (60.3% and 90.0%, respectively).
- Approximately half of individuals newly receiving a prescription stimulant received their first prescription from a family physician, followed by 1 in 5 from a psychiatrist and just over 1 in 5 from a pediatrician.
- As expected, individuals aged 18 and younger were more likely to see and receive a stimulant from a pediatrician, while individuals 19 and older were most likely to receive their prescription from a family physician.

There were 180,699 individuals in Ontario who received a prescription stimulant in 2017, approximately one-third of whom newly received a stimulant (29.0% with no prescription in the past year; 52,444 individuals; **Table 3**). Characteristics of individuals who received a stimulant were similar between those newly receiving a stimulant compared to those receiving stimulants on an ongoing basis, with the majority of individuals being children and youth (median age of 20) and two-thirds being men (62.6%). Generally, stimulant use was evenly distributed across neighbourhood income quintiles (a measure of socioeconomic status), with only a slightly larger proportion of individuals living in higher income neighbourhoods (44.0% in higher neighbourhood income quintile [Q4, Q5] compared to 36.6% with lower neighbourhood income quintile [Q1, Q2]). The majority of individuals who received a stimulant lived in urban areas of the province (88.9%).

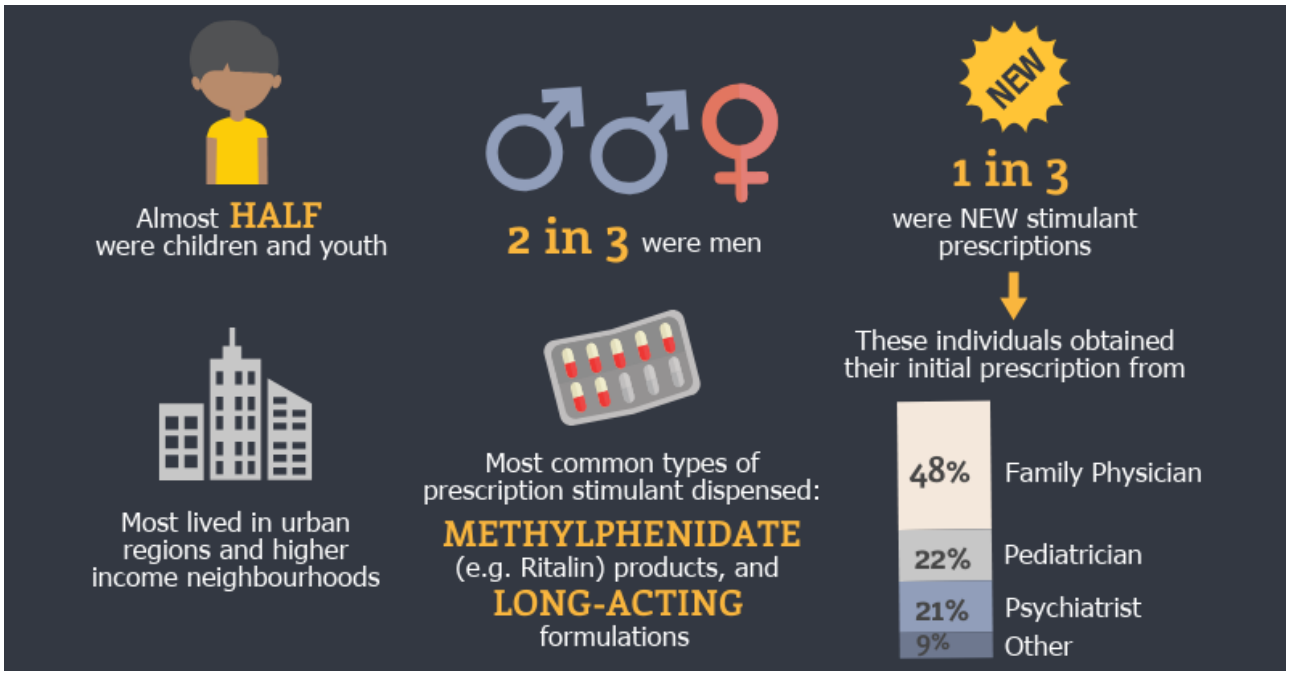


Table 3: Characteristics of prescription stimulant use in Ontario in 2017, by ongoing and new use

Characteristic		Total	Ongoing Use	New Use
Number of Individuals		**N=180,699**	**N=128,255**	**N=52,444**
Age	**Median (IQR)**	**20 (12-35)**	**20 (12-36)**	**21 (11-34)**
Age Group	**0-12**	47,649 (26.4%)	33,214 (25.9%)	14,435 (27.5%)
	13-18	35,473 (19.6%)	27,151 (21.2%)	8,322 (15.9%)
	19-24	24,655 (13.6%)	16,491 (12.9%)	8,164 (15.6%)
	25-34	25,754 (14.3%)	17,302 (13.5%)	8,452 (16.1%)
	35-44	17,713 (9.8%)	12,395 (9.7%)	5,318 (10.1%)
	45-64	24,619 (13.6%)	18,438 (14.4%)	6,181 (11.8%)
	65+	4,539 (2.5%)	3,093 (2.4%)	1,446 (2.8%)
Neighbourhood Income Quintile	**Q1 (low)**	33,692 (18.6%)	23,932 (18.7%)	9,760 (18.6%)
	Q2	32,476 (18.0%)	23,138 (18.0%)	9,338 (17.8%)
	Q3	33,666 (18.6%)	23,957 (18.7%)	9,709 (18.5%)
	Q4	38,115 (21.1%)	27,089 (21.1%)	11,026 (21.0%)
	Q5 (high)	41,440 (22.9%)	29,279 (22.8%)	12,161 (23.2%)
Residence Area	**Urban**	160,731 (88.9%)	113,617 (88.6%)	47,114 (89.8%)
	Rural	19,355 (10.7%)	14,247 (11.1%)	5,108 (9.7%)
Gender	**Men**	113,102 (62.6%)	81,541 (63.6%)	31,561 (60.2%)
	Women	67,301 (37.2%)	46,544 (36.3%)	20,757 (39.6%)
Formulation Dispensed	**Long-Acting**	162,599 (90.0%)	115,942 (90.4%)	46,657 (89.0%)
	Immediate Release	18,100 (10.0%)	12,313 (9.6%)	5,787 (11.0%)
Stimulant Dispensed	**Dextroamphetamine**	9,516 (5.3%)	7,681 (6.0%)	1,835 (3.5%)
	Lisdexamfetamine	56,574 (31.3%)	38,614 (30.1%)	17,960 (34.2%)
	Methylphenidate	108,898 (60.3%)	76,511 (59.7%)	32,387 (61.8%)
	Mixed-Salt Amphetamine	25,398 (14.1%)	18,908 (14.7%)	6,490 (12.4%)
Concomitant Opioid Use	**>3 Stimulant and >3 Opioid Prescriptions**	9,682 (5.4%)	7,805 (6.1%)	1,877 (3.6%)

Note: New use defined as no stimulant prescription in the preceding 365 days

Methylphenidate products were the most common stimulant dispensed (60.3%), followed by lisdexamfetamine (31.3%), mixed-salt amphetamine (14.1%) and dextroamphetamine (5.3%). Long-acting stimulants were the most common formulation dispensed (90.0%). The type of stimulant and the formulation (long-acting vs. short-acting) were generally similar between individuals receiving ongoing and new stimulant treatment. Among individuals with ongoing stimulant use, approximately 1 in 16 individuals (N=7,805; 6.1%) received more than 3 stimulant prescriptions and 3 opioid prescriptions during the year.

Among individuals newly receiving stimulants in 2017, nearly half (48.0%) received their first prescription from a family physician, compared to 1 in 5 (20.5%) from a psychiatrist and 1 in 5 (21.6%) from a pediatrician (**Table 4**). There were 601 (1.1%) individuals who received their first stimulant from a non-physician health provider, the vast majority of which were received from nurse

Table 4: Recent physician visits and initial prescriber among individuals newly receiving a prescription stimulant in Ontario in 2017

Characteristic		Number (Percent)
Individuals newly receiving a prescription stimulant:		**N=52,444**
Recent physician visits	**Family Physician**	35,790 (68.2%)
	Specialist	31,349 (59.8%)
	Pediatrician	11,271 (21.5%)
	Psychiatrist	12,508 (23.9%)
	Neurologist	948 (1.8%)
Physician who wrote first prescription	**Family Physician**	25,190 (48.0%)
	Pediatrician	11,322 (21.6%)
	Psychiatrist	10,739 (20.5%)
	Neurologist	325 (0.6%)
	Other physician	1,015 (1.9%)
	Non-physician (e.g. Nurse Practitioner, Dentist)	601 (1.1%)
	Unknown	3,252 (6.2%)

Note: New use defined as no stimulant prescription in the preceding 365 days. Nurse Practitioners were given authority to prescribe stimulants in April 2017.

practitioners. Approximately two-thirds (68.2%) of individuals newly receiving stimulants had a recent family physician visit, and 59.8% had a recent visit with a specialist. The most common specialist visits included pediatricians (21.5%) and psychiatrists (23.9%). This distribution in recent visits is in line with Canadian guidelines for managing ADHD, which recommend that care be managed by general practitioners and referrals should be made to a psychiatrist for patients with psychiatric comorbidities or complex diagnoses[2].

The use of prescription stimulants varied both by age and gender in 2017, with use in younger age groups being more prevalent among boys (**Table 5**). Specifically, three-quarters (75.6%) of individuals who received a stimulant aged 12 and younger were boys. In contrast, among recipients aged 35 and older, stimulant use was similarly distributed among men and women. The higher prevalence of ADHD among school-aged boys in Ontario likely explains this finding[6].

As expected, recent pediatrician visits were most common among children aged 12 and younger and 13-18 (49.8% and 27.1%, respectively), which corresponded to a higher proportion of these individuals receiving their stimulant prescriptions from a pediatrician (63.3% and 39.7%, respectively). A family physician was the most common prescriber of stimulants among individuals aged 19 and older, and was highest for those aged 19 to 34 years. In contrast, prescribing by psychiatrists increased with age, with nearly 1 in 3 (29.9%) adults aged 45 to 64 years being prescribed stimulants by a psychiatrist, which may reflect more complex diagnoses among older individuals.

Combined use of stimulants with opioids can be dangerous due to their potential for misuse and addiction, as well as the risks associated with the opposing effects of these drugs on the central nervous system. While use of these two medications was relatively rare among individuals aged 24 years and younger (<2%), rates were much higher among older adults. In particular, approximately 1 in 7 individuals receiving a stimulant aged 35 and older had indications of chronic stimulant and opioid use, defined as more than three prescriptions of each drug during the year (14.5% of individuals aged 35-44; 15.4% of individuals aged 45-64; 13.9% of individuals aged 65+).

Table 5: Characteristics of prescription stimulant use in Ontario in 2017, overall and by age

Characteristic		Total	Age 0-12	Age 13-18	Age 19-24	Age 25-34	Age 35-44	Age 45-64	Age 65+
Number of Individuals		**N=180,699**	**N=47,649**	**N=35,473**	**N=24,655**	**N=25,754**	**N=17,713**	**N=24,619**	**N=4,539**
Gender	**Men**	113,102 (62.6%)	36,028 (75.6%)	24,484 (69.0%)	14,568 (59.1%)	14,670 (57.0%)	9,239 (52.2%)	11,853 (48.1%)	2,259 (49.8%)
	Women	67,301 (37.2%)	11,621 (24.4%)	10,989 (31.0%)	10,087 (40.9%)	11,084 (43.0%)	8,474 (47.8%)	12,766 (51.9%)	2,280 (50.2%)
Recent Physician Visit	**Family Physician**	100,556 (55.6%)	17,493 (36.7%)	16,197 (45.7%)	16,624 (67.4%)	17,698 (68.7%)	12,352 (69.7%)	16,970 (68.9%)	3,222 (71.0%)
	Specialist	105,615 (58.4%)	37,410 (78.5%)	22,590 (63.7%)	9,147 (37.1%)	10,622 (41.2%)	8,676 (49.0%)	13,935 (56.6%)	3,069 (67.6%)
	Pediatrician	34,570 (19.1%)	23,742 (49.8%)	9,624 (27.1%)	618 (2.5%)	260 (1.0%)	146 (0.8%)	171 (0.7%)	9 (0.2%)
	Psychiatrist	33,477 (18.5%)	4,538 (9.5%)	5,575 (15.7%)	4,700 (19.1%)	5,848 (22.7%)	4,750 (26.8%)	7,093 (28.8%)	973 (21.4%)
	Neurologist	2,740 (1.5%)	550 (1.2%)	361 (1.0%)	239 (1.0%)	317 (1.2%)	337 (1.9%)	684 (2.8%)	252 (5.6%)
Prescriber Specialty	**Family Physician**	89,979 (49.8%)	10,840 (22.7%)	14,239 (40.1%)	17,276 (70.1%)	17,774 (69.0%)	11,475 (64.8%)	15,300 (62.1%)	2,961 (65.2%)
	Pediatrician	45,969 (25.4%)	30,184 (63.3%)	14,072 (39.7%)	996 (4.0%)	267 (1.0%)	159 (0.9%)	185 (0.8%)	14 (0.3%)
	Psychiatrist	32,848 (18.2%)	3,880 (8.1%)	5,251 (14.8%)	4,682 (19.0%)	5,827 (22.6%)	4,789 (27.0%)	7,349 (29.9%)	1,001 (22.1%)
	Neurologist	1,176 (0.7%)	415 (0.9%)	257 (0.7%)	83 (0.3%)	81 (0.3%)	73 (0.4%)	191 (0.8%)	74 (1.6%)
	Non-physician (e.g. Nurse Practitioner, Dentist)	918 (0.5%)	181 (0.4%)	139 (0.4%)	149 (0.6%)	173 (0.7%)	116 (0.7%)	124 (0.5%)	35 (0.8%)
Concomitant Opioid Use	**>3 Stimulant and >3 Opioid Prescriptions**	9,682 (5.4%)	≤5 (<0.01%)	40-44 (<0.1%)	406 (1.6%)	2,235 (8.7%)	2,563 (14.5%)	3,795 (15.4%)	630 (13.9%)

Note: In cases where the number of individuals is less than 6, this number has been suppressed to ensure confidentiality. In cases where there is only one record being suppressed, another record has been suppressed to provide a range in order to avoid residual disclosure.

Potentially Inappropriate Prescriptions

- Potentially inappropriate stimulant prescriptions occurred rarely (less than 1,000 prescriptions in 2017 [0.06%]), and has decreased considerably from 1,319 in 2013.
- Despite their rare occurrence, potentially inappropriate stimulant prescriptions occurred more frequently among young and middle-aged adults (ages 25-64).

Methodological Note:

A potentially inappropriate stimulant prescription was defined as an early refill of a prior stimulant prescription (filled within 1 to 7 days of a prior prescription that had a quantity of 30 days or more) that was from both a different doctor and different pharmacy.

Overall, potentially inappropriate stimulant prescriptions were rare, with declining numbers between 2013 and 2017. In 2013, there were 1,319 stimulant prescriptions identified as being potentially inappropriate, representing 0.12% of all stimulant prescriptions dispensed in the year. By 2017, the proportion of potentially inappropriate stimulant prescriptions fell to only 0.06% (973 prescriptions; **Table 6**). There was considerable variation in the percent of potentially inappropriate prescriptions by age (**Figure 6**). In particular, the percent of potentially inappropriate stimulant prescriptions was highest among adults aged 25 to 64 in 2013. Among these adults (aged 25-64), the percent of potentially inappropriate prescriptions dropped dramatically between 2013 and 2017, compared to smaller reductions among other age groups. Overall, these findings align with previously published research suggesting that the implementation of the Narcotics Monitoring System in 2012 significantly reduced inappropriate prescribing of this class of controlled medications[24].

Figure 6: Potentially inappropriate prescriptions for stimulants in 2013 and 2017, by age

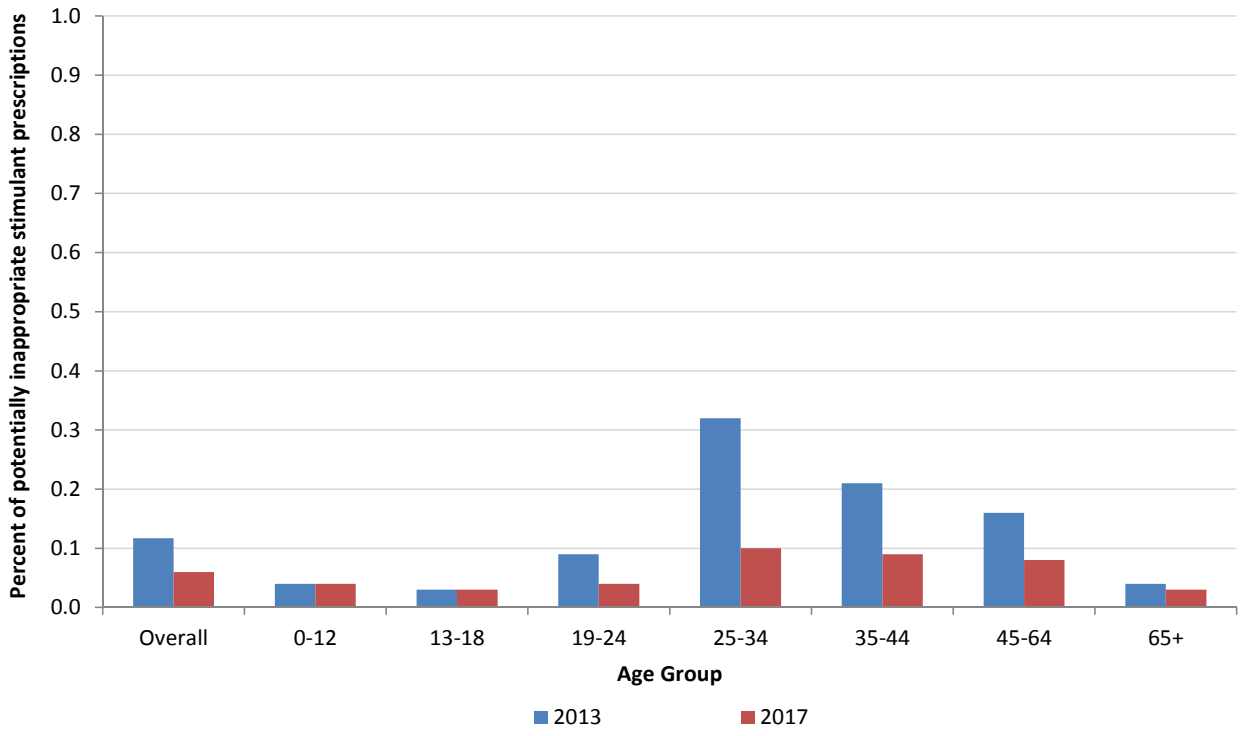


Table 6: Potentially inappropriate prescriptions for stimulants in 2013 and 2017, by age

Measure	Total	Age 0-12	Age 13-18	Age 19-24	Age 25-34	Age 35-44	Age 45-64	Age 65+
2013								
Number of Stimulant Prescriptions	1,127,866	304,860	233,872	112,446	149,437	126,796	169,670	29,489
Potentially Inappropriate Prescriptions	1,319	108	77	101	479	263	278	13
Percent of Potentially Inappropriate Prescriptions (%)	0.12	0.04	0.03	0.09	0.32	0.21	0.16	0.04
2017								
Number of Stimulant Prescriptions	1,626,235	353,962	265,723	169,867	281,357	233,931	273,139	46,269
Potentially Inappropriate Prescriptions	973	134	70	67	271	202	213	16
Percent of Potentially Inappropriate Prescriptions (%)	0.06	0.04	0.03	0.04	0.10	0.09	0.08	0.03

Geographic Variation

- Rates of prescription stimulant use were lower in regions of central Ontario, compared to eastern, western and northern areas in Ontario.
- The percent of individuals who received a prescription stimulant and had a recent psychiatrist visit was highest in central and urban areas of Ontario, which may be due to a higher supply of psychiatrists and lower wait times.

To explore using our interactive maps, please visit our **website**.

By LHIN

In 2017, 12.8 individuals received a prescription stimulant per 1,000 residents in Ontario; however this varied considerably by LHIN, ranging from 6.4 individuals per 1,000 residents in the Central West LHIN to 19.6 individuals per 1,000 residents in the South East LHIN (**Figure 7 & Table S1**). In general, lower rates of stimulant use were observed in LHINs located in central Ontario, whereas the highest rates of use observed in the South East LHIN (19.6 individuals per 1,000 residents; eastern Ontario), Erie St. Clair LHIN (18.4 individuals per 1,000 residents; western Ontario), Champlain LHIN (18.0 individuals per 1,000 residents; eastern Ontario), and North East LHIN (17.3 individuals per 1,000 residents; northern Ontario).

In 2017, 18.5% of individuals who received a prescription stimulant had a recent psychiatrist visit (**Figure 8 & Table S2**); yet this also varied across the province. In particular, a higher percentage of psychiatrist visits were observed in central LHINs and urban areas, including Toronto Central LHIN (24.1%) and its neighbouring LHINs including Mississauga Halton LHIN (24.8%), Central LHIN (24.4%), and Central West LHIN (22.3%). This may be driven by the higher supply of psychiatrists in Toronto Central LHIN, which has more than double the supply of psychiatrists compared to other LHINs in Ontario[26]. In contrast, lower percentages were observed in LHINs located in northern Ontario and rural areas, where the supply of psychiatrists is also lower. Generally, LHINs with higher rates of stimulant use had lower rates of recent psychiatrist visits, with the exception of Erie St. Clair and Waterloo Wellington (western Ontario), which both had high rates of stimulant use and recent psychiatrist visits. The North West LHIN also demonstrated both low rates of stimulant use and recent psychiatrist visits.

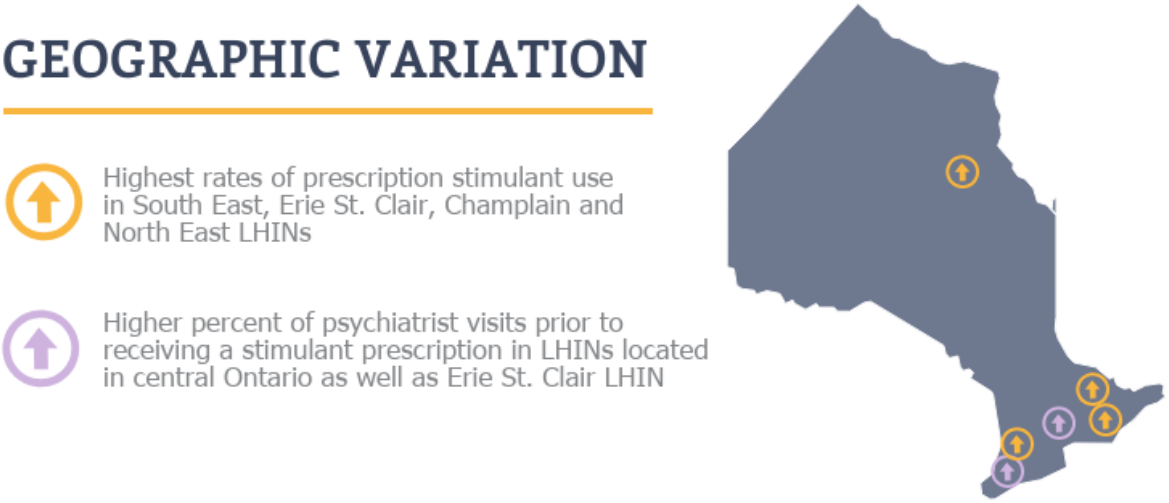
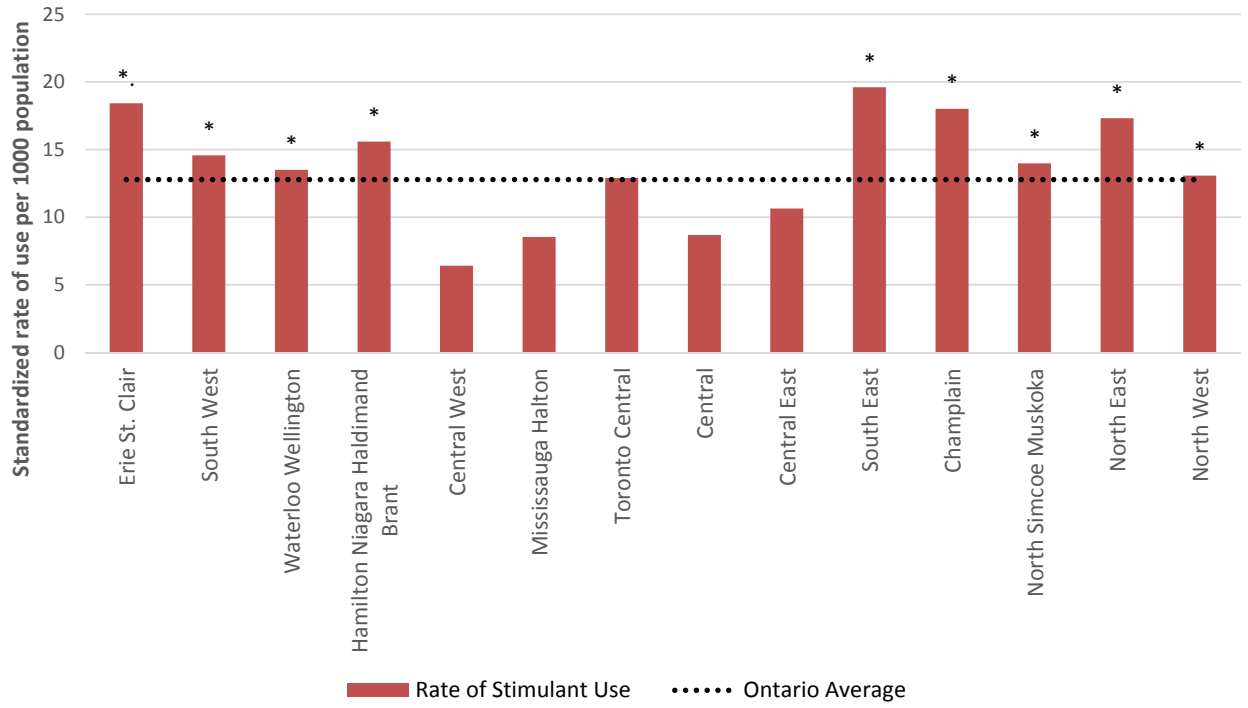
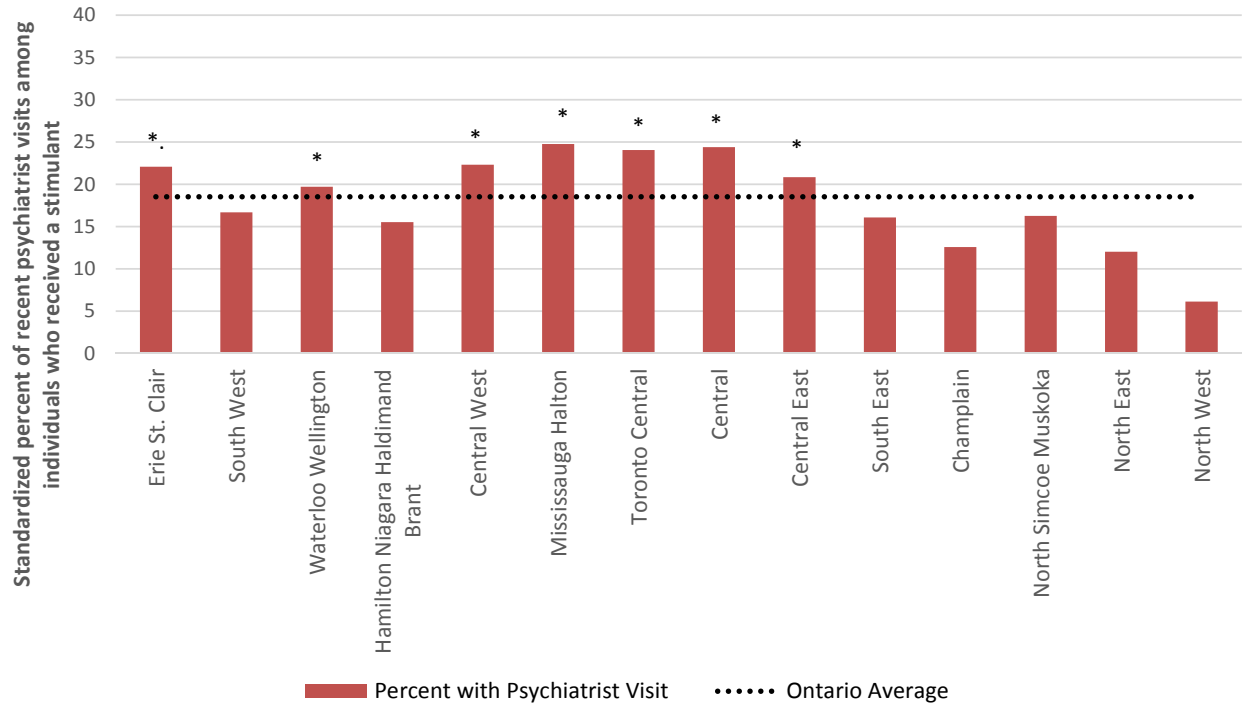


Figure 7: Geographic variation in prescription stimulant use in Ontario in 2017, by LHIN



**Represents rates that are statistically higher than provincial rate. Rates are standardized by age and gender.*

Figure 8: Geographic variation in recent psychiatrist visits in Ontario in 2017, by LHIN

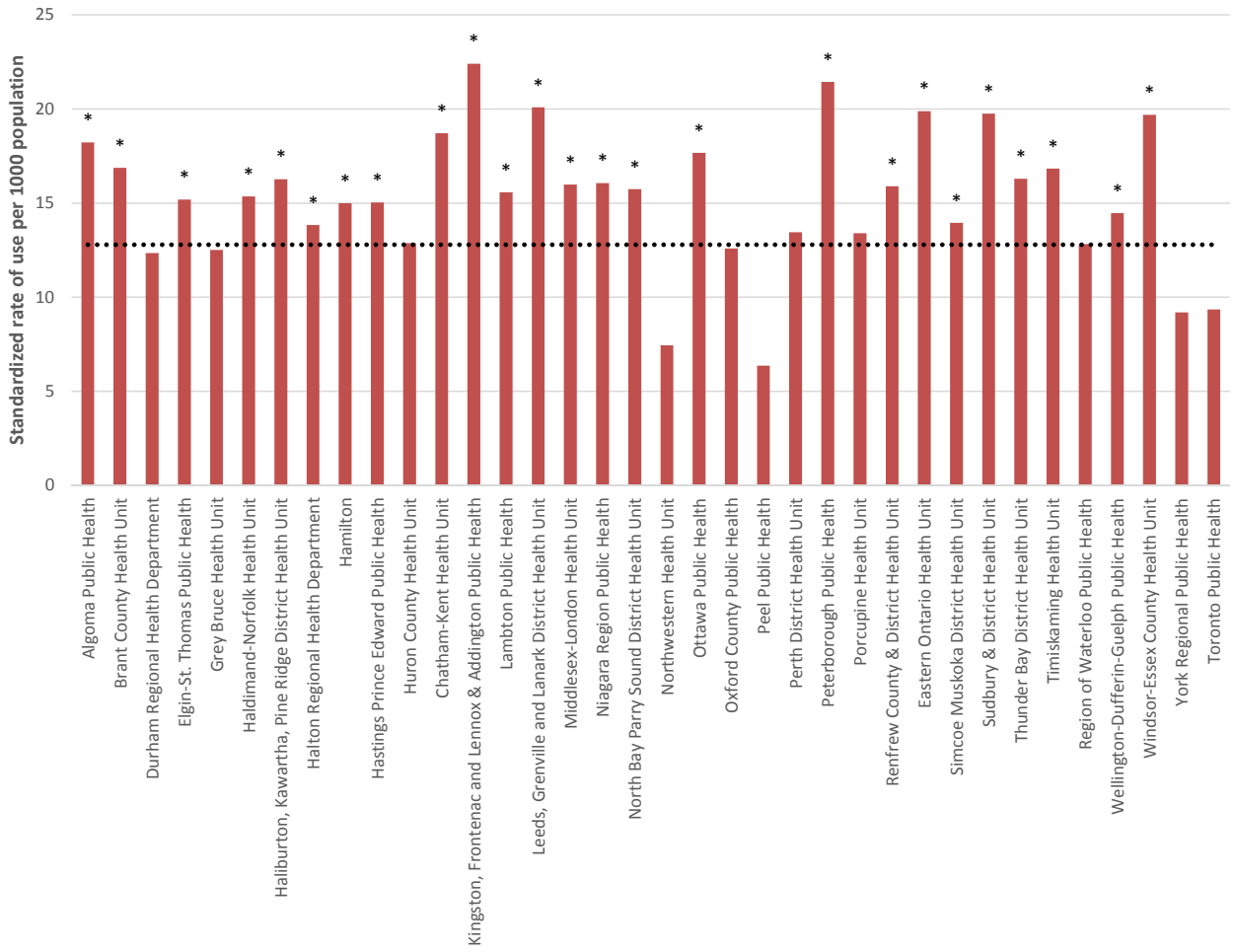


**Represents rates that are statistically higher than provincial rate. Rates are standardized by age and gender.*

By PHU

The rate of prescription stimulant use also varied dramatically by PHU in 2017, ranging from 6.4 individuals per 1,000 residents in Peel Public Health (central Ontario) to 22.4 individuals per 1,000 residents in Kingston, Frontenac and Lennox & Addington Public Health (eastern Ontario; **Figure 9 & Table S3**). The PHUs with the highest rates of stimulant use were all located in eastern Ontario, and included Kingston, Frontenac and Lennox & Addington Public Health (22.4 individuals per 1,000 residents), Peterborough Public Health (21.4 individuals per 1,000 residents), Leeds, Grenville and Lanark District Health Unit (20.1 individuals per 1,000 residents) and Eastern Ontario Health Unit (19.9 individuals per 1,000 residents). High rates were also notable in northern regions of Ontario, including Sudbury & District Health Unit, Algoma Public Health, Timiskaming Health Unit, and Thunder Bay District Health Unit, ranging from 16.3 to 19.7 individuals per 1,000 residents. Generally, lower rates of prescription stimulant use were observed in PHUs located in central Ontario (Durham Regional Health Department, Peel Public Health, York Regional Public Health, Toronto Public Health), with the exception of Northwestern Health Unit that is located in northern Ontario and also had lower rates of stimulant use.

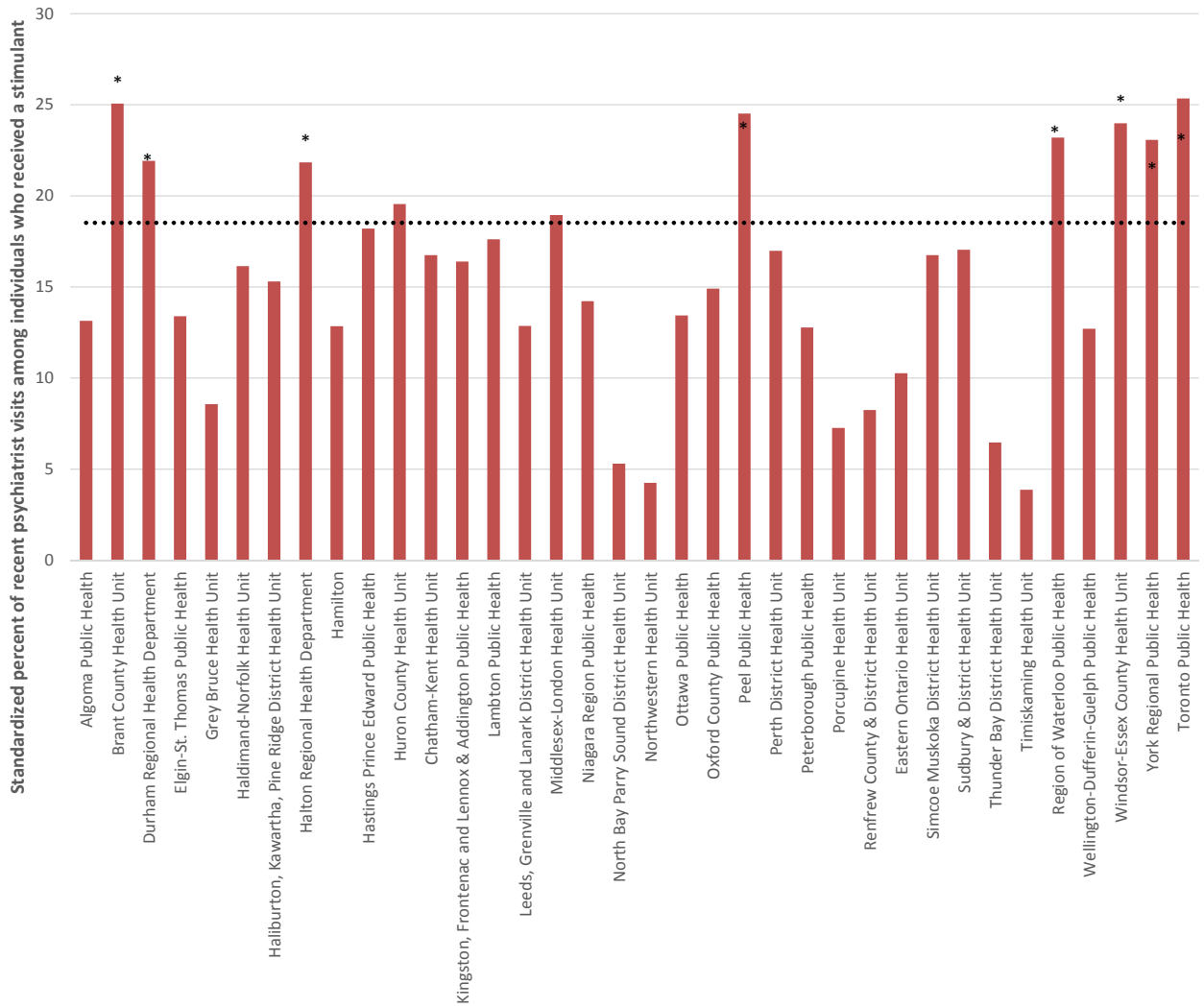
Figure 9: Geographic variation in prescription stimulant use in Ontario in 2017, by PHU



**Represents rates that are statistically higher than provincial rate. Rates are standardized by age and gender.*

The percent of individuals who received a prescription stimulant and had a recent psychiatrist visit varied 6.5-fold in Ontario (**Figure 10 & Table S4**), ranging from 3.9% of individuals in Timiskaming Health Unit (northern Ontario) to 25.3% of individuals in Toronto Public Health (central Ontario). Overall, the percent of individuals with a recent psychiatrist visit were lowest in PHUs located in northern Ontario, with the exception of Sudbury & District Health Unit that had rates similar to the provincial average. In contrast, the highest percentage of individuals with a recent psychiatrist visit occurred among PHUs located in central Ontario. Western Ontario (Windsor-Essex County Health Unit, Region of Waterloo Public Health and Brant County Health Unit) also had some of the highest rates of individuals with a recent psychiatrist visit. This variation may be driven by supply of psychiatrists, which is higher in central Ontario and in urban areas[26].

Figure 10: Geographic variation in recent psychiatrist visits in Ontario in 2017, by PHU



**Represents rates that are statistically higher than provincial rate. Rates are standardized by age and gender.*

Discussion

Stimulant use in Ontario has increased 29% over the last 5 years, with approximately 1 in 78 (1.3%) Ontarians receiving a prescription stimulant in 2017. More rapidly increasing use over the last 5 years occurred among individuals aged 25 to 44 years, which may be indicative of greater diagnosis of ADHD among young adults who were not diagnosed in childhood, a higher degree of continued treatment of children into adulthood, or increasing use of stimulants for off-label indications. Yet, stimulant use was consistently highest among children and youth (aged 18 and younger), which is likely related to the management of ADHD among school aged individuals. We also observed lower rates of use among children and youth in the summer months (July and August), which may be reflective of decisions to temporarily discontinue treatment when children are no longer in school (sometimes referred to as a 'drug holiday')[25]. Although the majority of stimulant recipients in Ontario were men, this was most pronounced in younger age groups, which is likely driven by the higher prevalence of ADHD diagnoses among school aged boys compared to girls[6]. Interestingly, the gender distribution of stimulant use was similar among recipients aged 35 and older.

Generally, long-acting formulations of stimulants were most commonly used (over 90% of medications dispensed), which is likely due to the greater convenience of dosing schedules for these formulations, particularly among school aged children and youth, as well as being recommended as first-line medication therapy for the management of ADHD[2]. Long-acting formulations can also improve compliance since these medications can often be taken only once daily. There is also a lower chance of abuse or diversion of long-acting formulations, which may lead to preferred prescribing among physicians.

We observed differences in the specialty of physicians prescribing stimulants by patient age. As expected, individuals aged 18 and younger were more likely to see and receive a prescription stimulant from a pediatrician, whereas individuals 19 and older were more likely to receive their prescription from a family physician. This is in line with current guidelines for managing ADHD that recommended treatment from family physicians, with referrals to psychiatrists only necessary when psychiatric comorbidities exist[2]. Psychiatric visits and prescribing occurred most often among individuals aged 35 to 64 years, which might be due to a more complex set of symptoms and diagnoses among older individuals (e.g., use for fatigue, depression).

The percentage of stimulant prescriptions that were potentially inappropriate was rare and decreasing, which is reassuring. In 2013, approximately 1 in 833 (0.12%) stimulant prescriptions were identified as being potentially inappropriate, which dropped to only 1 in 1,667 (0.06%) in 2017. This decreasing trend may be due to the introduction of the Narcotic Monitoring System in Ontario in 2012, which flags potentially inappropriate prescriptions and provides pharmacists with information that may lead them to reject prescriptions they suspect are being filled inappropriately. This finding aligns with previously published evaluations of the NMS, and highlights the benefits of introducing systems to monitor prescriptions for medications that have the potential for misuse[24].

The geographic variation in stimulant use observed, with lower rates in central Ontario and higher rates in eastern Ontario, may provide insight into potential barriers to access in some parts of the province as well as over-prescribing in others. Although this was not specifically explored in this report, studies in the United States and Europe have found similar geographic variations in use of stimulants. These studies report that higher prescription stimulant use is associated with higher physician supply/availability, younger physicians, urban areas, no immigration background (based on person/parents immigration and country of birth history), communities with greater percent of white individuals, and communities with higher income[27-32]. A person/parents preference for stimulant use can also impact these trends[33] and may contribute to the variation if this differs geographically. Overall, there are several factors that may contribute to the observed geographic variation in stimulant use

in Ontario, which are likely multifaceted. Further exploration of prescribing patterns in areas with very high and low rates of use is needed to better understand the factors associated with of this variation in Ontario.

We also found that there was considerable variation in the proportion of recent psychiatrist visits among individuals receiving a stimulant, which was generally higher in central Ontario. This variation may be attributable to the greater supply of psychiatrists in the Toronto Central LHIN[26]. However, other factors could influence this variation, including wait times to see a psychiatrist, complexities of patient diagnosis, as well as practice differences in family physicians referring patients to a specialist.

Limitations

This report contains information on stimulant prescriptions dispensed to all individuals in Ontario, however, the reason for use is unknown. Although stimulant use among children and youth is predominantly for the management of ADHD symptoms, the use among older adults may vary (e.g., use for ADHD, fatigue, depression, cognitive function). Further, we cannot comment on use among those who access stimulants through illicit means. Our definition of potentially inappropriate prescriptions is conservative and only identifies a prescription as such if it was filled early and received from both a different doctor and different pharmacy. As a result, we may not capture potentially inappropriate prescriptions from individuals who do not access stimulants from multiple providers (i.e., use the same physician or same pharmacy). Finally, we observed differences in rates of prescription stimulant use across the province; however, the reasons for these differences are unknown and require further investigation.

Conclusions

Overall, the use of prescription stimulants has increased across Ontario over the past 5 years, and 1 in 78 individuals received a prescription stimulant in 2017. Stimulant use was consistently highest among school-aged individuals and among this age group the use was higher among boys (1 in 20 boys aged 13-18), which is likely for use to manage ADHD symptoms. Yet, recently there has been a trend towards growing stimulant use among adults and older individuals that should be monitored to determine if these medications are being used appropriately and whether there are any associated risks among this population. Finally, the geographical variation in stimulant use offers an important opportunity for policy makers, public health officials and educators to identify physician practice differences in treatment strategies using stimulants, or potential barriers to accessing these medications in Ontario.

Remaining Questions

The ODPRN Citizens' Panel identified the following questions for future research:

1. Has there been a change in the number and type of stimulant prescribers (i.e. family physicians, psychiatrists, nurse practitioners etc.) over time?
2. How will reimbursement changes (OHIP+) in Ontario impact use?
3. Does prescription stimulant use lead to better school performance in students with ADHD?
4. What are the long-term effects of stimulant use from childhood to adulthood?
5. Are alternative therapies more effective in relieving symptoms of ADHD compared to stimulants?

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Supplemental Appendix

Table S1: Geographic variation in prescription stimulant use in Ontario in 2017, by LHIN

LHIN	Ontario Population	Number of Individuals that received a Prescription Stimulant	Rate of Stimulant Use per 1,000 residents	Rank (1=highest)
Ontario	**14,130,262**	**180,699**	**12.8**	
Erie St. Clair	641,631	11,597	18.4*	**2**
South West	985,400	14,205	14.6*	**6**
Waterloo Wellington	790,821	11,078	13.5*	**8**
Hamilton Niagara Haldimand Brant	1,471,087	22,359	15.6*	**5**
Central West	953,452	6,608	6.4	**14**
Mississauga Halton	1,281,397	11,440	8.5	**13**
Toronto Central	1,305,393	17,064	12.9	**10**
Central	1,926,873	17,013	8.7	**12**
Central East	1,633,728	17,098	10.6	**11**
South East	500,656	8,850	19.6*	**1**
Champlain	1,349,624	24,190	18.0*	**3**
North Simcoe Muskoka	492,041	6,584	14.0*	**7**
North East	562,003	9,004	17.3*	**4**
North West	236,156	3,044	13.1	**9**

**Represents rates that are statistically higher than provincial average. Rates are standardized by age and gender.*

Table S2: Geographic variation in recent psychiatrist visits in Ontario in 2017, by LHIN

LHIN	Ontario Population	Number with recent psychiatrist visit**	Percent with recent psychiatrist visits (%)	Rank (1=highest)
Ontario	**14,130,262**	**33,477**	**18.5**	
Erie St. Clair	641,631	2,596	22.1*	**5**
South West	985,400	2,259	16.7	**8**
Waterloo Wellington	790,821	2,194	19.7*	**7**
Hamilton Niagara Haldimand Brant	1,471,087	3,415	15.5	**11**
Central West	953,452	1,433	22.3*	**4**
Mississauga Halton	1,281,397	2,855	24.8*	**1**
Toronto Central	1,305,393	4,398	24.1*	**3**
Central	1,926,873	4,171	24.4*	**2**
Central East	1,633,728	3,460	20.9*	**6**
South East	500,656	1,356	16.1	**10**
Champlain	1,349,624	3,017	12.6	**12**
North Simcoe Muskoka	492,041	1,081	16.3	**9**
North East	562,003	1,006	12.0	**13**
North West	236,156	200	6.1	**14**

**Represents rates that are statistically higher than provincial average. Rates are standardized by age and gender*

***Measured in the 3 months prior to a persons first stimulant prescription in the year*

Table S3: Geographic variation in prescription stimulant use in Ontario in 2017, by PHU

PHU	Ontario Population	Number of Individuals that received a Prescription Stimulant	Rate of Stimulant Use per 1,000 residents	Rank (1=highest)
Ontario	**14,130,262**	**180,699**	**12.8**	
Algoma Public Health	114,312	1,817	18.2*	**8**
Brant County Health Unit	146,813	2,512	16.9*	**10**
Durham Regional Health Department	678,279	8,716	12.4	**32**
Elgin-St. Thomas Public Health	91,820	1,458	15.2*	**20**
Grey Bruce Health Unit	164,696	1,861	12.5	**31**
Haldimand-Norfolk Health Unit	109,217	1,576	15.4*	**19**
Haliburton, Kawartha, Pine Ridge District Health Unit	182,853	2,451	16.3*	**13**
Halton Regional Health Department	584,381	8,466	13.8*	**25**
Hamilton	563,198	8,406	15.0*	**22**
Hastings Prince Edward Public Health	163,097	2,208	15.0*	**21**
Huron County Health Unit	57,412	712	12.9	**28**
Chatham-Kent Health Unit	103,840	1,857	18.7*	**7**
Kingston, Frontenac and Lennox & Addington Public Health	205,742	4,296	22.4*	**1**
Lambton Public Health	129,336	1,900	15.6*	**18**
Leeds, Grenville and Lanark District Health Unit	170,922	3,043	20.1*	**3**
Middlesex-London Health Unit	477,416	7,636	16.0*	**15**
Niagara Region Public Health	450,884	6,729	16.1*	**14**
North Bay Parry Sound District Health Unit	128,625	1,802	15.7*	**17**
Northwestern Health Unit	80,618	649	7.5	**35**
Ottawa Public Health	985,815	17,647	17.7*	**9**
Oxford County Public Health	113,299	1,465	12.6	**30**
Peel Public Health	1,482,109	10,044	6.4	**36**
Perth District Health Unit	78,461	1,071	13.5	**26**
Peterborough Public Health	141,255	2,717	21.4*	**2**
Porcupine Health Unit	85,387	1,155	13.4	**27**
Renfrew County & District Health Unit	106,246	1,568	15.9*	**16**
Eastern Ontario Health Unit	207,571	3,941	19.9*	**4**
Simcoe Muskoka District Health Unit	557,939	7,522	14.0*	**24**
Sudbury & District Health Unit	199,131	3,704	19.8*	**5**
Thunder Bay District Health Unit	154,923	2,398	16.3*	**12**
Timiskaming Health Unit	34,066	515	16.8*	**11**
Region of Waterloo Public Health	558,827	7,481	12.8	**29**
Wellington-Dufferin-Guelph Public Health	289,498	4,296	14.5*	**23**
Windsor-Essex County Health Unit	400,858	7,823	19.7*	**6**
York Regional Public Health	1,191,290	11,405	9.2	**34**
Toronto Public Health	2,902,058	27,144	9.4	**33**

**Represents rates that are statistically higher than provincial average. Rates are standardized by age and gender.*

Table S4: Geographic variation in recent psychiatrist visits in Ontario in 2017, by PHU

PHU	Ontario Population	Number with recent psychiatrist visit**	Percent with recent psychiatrist visits (%)	Rank (1=highest)
Ontario	**14,130,262**	**33,477**	**18.5**	
Algoma Public Health	114,312	229	13.1	**24**
Brant County Health Unit	146,813	566	25.1*	**2**
Durham Regional Health Department	678,279	1,830	21.9*	**7**
Elgin-St. Thomas Public Health	91,820	177	13.4	**23**
Grey Bruce Health Unit	164,696	148	8.6	**30**
Haldimand-Norfolk Health Unit	109,217	221	16.1	**18**
Haliburton, Kawartha, Pine Ridge District Health Unit	182,853	346	15.3	**19**
Halton Regional Health Department	584,381	1,868	21.8*	**8**
Hamilton	563,198	1,056	12.9	**26**
Hastings Prince Edward Public Health	163,097	366	18.2	**11**
Huron County Health Unit	57,412	119	19.6	**9**
Chatham-Kent Health Unit	103,840	254	16.7	**16**
Kingston, Frontenac and Lennox & Addington Public Health	205,742	687	16.4	**17**
Lambton Public Health	129,336	312	17.6	**12**
Leeds, Grenville and Lanark District Health Unit	170,922	357	12.9	**25**
Middlesex-London Health Unit	477,416	1,426	19.0	**10**
Niagara Region Public Health	450,884	953	14.2	**21**
North Bay Parry Sound District Health Unit	128,625	95	5.3	**34**
Northwestern Health Unit	80,618	19	4.3	**35**
Ottawa Public Health	985,815	2,448	13.4	**22**
Oxford County Public Health	113,299	200	14.9	**20**
Peel Public Health	1,482,109	2,485	24.5*	**3**
Perth District Health Unit	78,461	176	17.0	**14**
Peterborough Public Health	141,255	338	12.8	**27**
Porcupine Health Unit	85,387	76	7.3	**32**
Renfrew County & District Health Unit	106,246	105	8.3	**31**
Eastern Ontario Health Unit	207,571	364	10.3	**29**
Simcoe Muskoka District Health Unit	557,939	1,273	16.8	**15**
Sudbury & District Health Unit	199,131	587	17.0	**13**
Thunder Bay District Health Unit	154,923	181	6.5	**33**
Timiskaming Health Unit	34,066	18	3.9	**36**
Region of Waterloo Public Health	558,827	1,745	23.2*	**5**
Wellington-Dufferin-Guelph Public Health	289,498	549	12.7	**28**
Windsor-Essex County Health Unit	400,858	2,027	24.0*	**4**
York Regional Public Health	1,191,290	2,626	23.1*	**6**
Toronto Public Health	2,902,058	7,187	25.3*	**1**

**Represents rates that are statistically higher than provincial average. Rates are standardized by age and gender*

***Measured in the 3 months prior to a persons first stimulant prescription in the year*