

# **Monitoring Attention Deficit Disorder with or Without Hyperactivity (ADHD) in Children and Young Adults in Québec: Medication Use**

**CHRONIC DISEASE SURVEILLANCE**

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## ABBREVIATIONS AND ACRONYMS

ADHD:	Attention deficit disorder with or without hyperactivity
CADDRA:	Canadian Attention Deficit Hyperactivity Disorder Resource Alliance
ICD:	International Classification of Diseases
INSPQ:	Institut national de santé publique du Québec
MED-ÉCHO:	Maintenance and exploitation of data for the study of hospital users
MSSS:	Ministère de la Santé et des Services sociaux du Québec
PPDIP:	Public prescription drug insurance plan
QICDSS:	Québec Integrated Chronic Disease Surveillance System
RAMQ:	Régie de l'assurance maladie du Québec



## HIGHLIGHTS

- This report presents data on the prescription of medications for attention deficit disorder with or without hyperactivity (ADHD) taken from the Québec Integrated Chronic Disease Surveillance System (QICDSS). Estimates were obtained from longitudinal monitoring between April 1, 2000, and March 31, 2020, for all individuals aged 24 years and younger who were eligible for Québec's public prescription drug insurance plan (PPDIP).
- The results show a steady increase in the prescription of ADHD medications over time. In 2019–2020, 56,080 Quebecers (7.7%) aged from 1 to 24 years enrolled in the PPDIP received at least one prescription for ADHD medication.
- The percentage of ADHD medication prescribing differs by the sex and age of the person.
- The prevalence of ADHD medication prescribing varied considerably across regions, ranging from 3.2% to 14.4%.
- People living in highly economically advantaged environments have a lower prevalence of ADHD medication prescribing.
- More than half of them received their first prescription from a family physician.
- Psychostimulants remain by far the most prescribed class of ADHD medications.

## 1 INTRODUCTION

Attention deficit disorder with or without hyperactivity (ADHD) is one of the most frequently diagnosed neurodevelopmental disorders in children and adolescents, with an annual prevalence of between 2% and 7%.<sup>1–5</sup> In Ontario, an epidemiological study using standardized questionnaires showed a prevalence of ADHD of 10.5% in children aged 4–11 years and 6.8% in youth aged 12–17 years.<sup>6</sup> Estimates obtained from the Québec Integrated Chronic Disease Surveillance System (QICDSS) indicate a steady increase in ADHD diagnosis over time.<sup>4</sup> In 2015–2016, the annual prevalence was 4.1% and the lifetime prevalence was estimated to be 11.3% among Quebecers aged 24 years and younger. In general, the current state of knowledge indicates a trend towards increasing prevalence of this disorder over time.<sup>2,4,7</sup>

ADHD is often diagnosed in school-aged children and can persist into adulthood. Symptoms can have repercussions in different areas of an individual's life including family, school, social, and professional life. ADHD is often accompanied by multiple psychiatric and developmental comorbidities.<sup>1,4,8–18</sup> Its management is multidisciplinary and focuses on improving symptoms and their impact on the person's life by reducing impulsivity and hyperactivity, thus enabling the individual to use the available psychosocial strategies more effectively.<sup>19–21</sup> To ensure effective treatment, a multimodal, collaborative approach combining psychosocial interventions with pharmacological treatment is recommended.<sup>22,23</sup> Drug treatment plays an important role in the management of many symptoms<sup>24,25</sup> by helping improve concentration. Medication use is generally associated with a reduced risk of several conditions including, but not limited to, injury, trauma, suicide, mood disorders, conduct disorders, and substance-use disorders.<sup>26–34</sup>

Increasingly, people with ADHD are receiving medication for this purpose.<sup>35–39</sup> In the United States, a 2016 national survey of parents indicates that 62% of children with ADHD ages 2 to 17 take the medication.<sup>35,39</sup> In Canada, the prevalence of ADHD-specific medication use among those 25 years of age and younger increased from 3.3% in 2014–2015 to 4.0% in 2017–2018<sup>36,37</sup> according to the Institut national d'excellence en santé et en services sociaux (INESSS). In Québec this percentage was 6.5% and 8.1%, in 2014–2015 and 2017–2018, respectively. Considering only those insured by Québec's public prescription drug insurance plan (PPDIP), the prevalence of ADHD medication use has increased from 5.9% in 2014–2015 to 7.6% in 2018–2019. A study using administrative health databases from 13 countries around the world (Asia, Europe, North America, and Australia) showed considerable variation in the use of ADHD medications among children aged 3 to 18 years, ranging from 0.3% to 6.7%, depending on the country.<sup>38</sup> The highest percentage of use was observed in North America. It is therefore not surprising that Québec is part of this North American trend.



INESSS research indicates that Québec has the highest number of ADHD medications prescribed in Canada compared to other provinces.<sup>36,37</sup> This increased use of prescription drugs is causing some concern in the population and is generating many reactions.<sup>37,40</sup> As such, as part of its mandate to monitor and analyze the health of populations, the Institut national de santé publique du Québec (INSPQ) has studied the problem in order to better inform and support health and social service providers in making informed decisions.

The purpose of this report is to document the prescription of medication for ADHD in children, adolescents, and young adults in Québec using matched administrative data. Specifically, this includes estimating the annual prevalence of ADHD medication prescribing by sex, age, health regions, level of deprivation, specialty of the first prescriber, and class of medication prescribed (psychostimulants and non-psychostimulants) among individuals 24 years of age and younger.

## 2 METHODOLOGY

### 2.1 Data source

Estimates were produced using data from a combination of five administrative health files from the Régie de l'assurance maladie du Québec (RAMQ) and the Ministère de la Santé et des Services sociaux du Québec (MSSS), which form the Québec Integrated Chronic Disease Surveillance System (QICDSS).<sup>41</sup> The QICDSS contains information from:

1. the health insurance registry (Fichier d'inscription des personnes assurées [FIPA]), which provides demographic information as well as periods of eligibility for health insurance;
2. the physician claims database (Fichier des services médicaux rémunérés à l'acte);
3. the hospital inpatient and day surgery database (Système de maintenance et d'exploitation des données pour l'étude de la clientèle hospitalière [MED-ÉCHO]), which identifies the primary and secondary diagnoses associated with a hospital admission;
4. the vital statistics death database (Fichier des décès du Registre des événements démographiques [RED]);
5. the pharmaceutical services database (Fichier des services pharmaceutiques, which contains all prescription drug claims made by pharmacy owners (data available for all individuals covered by the public prescription drug insurance plan).

The QICDSS has covered the total population of Québec since January 1, 1996 and is updated annually. International Classification of Diseases (ICD) codes are used to code diagnoses. Revision 9 (ICD-9) codes are used in the medical services file for the entire observation period, as well as in the MED-ÉCHO file until March 31, 2006, while revision 10 (ICD-10) codes are used in the MED-ÉCHO file beginning on April 1, 2006.

### 2.2 Case identification

The population under study is comprised of all individuals 24 years of age and younger with a prescription for ADHD medication between the years 2000 and 2020 who are eligible for the PPDIP during the observation year. In Québec, any person who resides permanently in the province and who does not have access to a private plan is eligible for the PPDIP, managed by the RAMQ.<sup>42</sup> In the QICDSS, approximately one third of the study population is covered by the PPDIP per year, and this coverage may be uninterrupted ("PPDIP always" category) or interrupted ("PPDIP partial" category). Note that individuals covered under the PPDIP may or may not have received a prescription for ADHD medication.

To be eligible for the study, the individual must have had continuous PPDIP coverage in the 365 days before and 183 days after the date of entry into the study (i.e., the date of the first prescription for ADHD medication). The individual is followed for as long as he or she is covered by the PPDIP until the age of 24 or until death. Anyone with at least one medical visit or hospitalization with a principal diagnosis of ADHD (ICD-9 code 314 or its ICD-10-CA equivalent) is considered as having ADHD.

The ADHD medications considered in this report are those approved by the Canadian Attention Deficit Hyperactivity Disorder Resource Alliance (CADDRA).<sup>22,43</sup> CADDRA guidelines recommend the use of psychostimulants (methylphenidate and amphetamines) and non-psychostimulants (atomoxetine and guanfacine hydrochloride XR) when pharmacological intervention is considered appropriate for the management of ADHD.<sup>22,43-5</sup>

#### Common name codes used to identify ADHD medications in the QICDSS

Class of drugs	Drugs	Common name codes
Psychostimulants	Methylphenidate	48003; 39302
	Amphetamines	00507; 47601; 48001; 47486; 02626; 47818; 48000
Non-Psychostimulants	Norepinephrine reuptake inhibitor: Atomoxetine	47547
	Selective alpha 2-adrenergic receptor agonist: Guanfacine hydrochloride XR	47979

## 2.3 Periods covered and comparisons

The estimates presented in this report were obtained from longitudinal monitoring. The analysis period begins on April 1, 2000, and ends on March 31, 2020.

The indicator chosen to assess the extent of ADHD medication prescribing in the population is **annual prevalence**. Therefore, the individual must meet the case definition during the study year to be considered a prevalent case. The calculation of ADHD medication prescribing prevalence is based on all individuals eligible with or without a break from the PPDIP (the “PPDIP all” category). Note that this calculation does not consider whether or not the diagnosis of ADHD is listed on the payment slip for the visit. The drug classes considered for analysis are psychostimulants and non-psychostimulants (these are mutually exclusive groups). Comparisons over time and across health regions are made using age-adjusted measures. Note that the Nord-du-Québec, Nunavik, and Terres-Cries-de-la-Baie-James regions are excluded from the

regional presentation, but included in the provincial total. These measures are obtained using the direct standardization method based on the age distribution of the Québec population in 2001. The age ranges considered for the analyses are: 1–5 years; 6–11 years; 12–17 years, and 18–24 years. Prevalence of use by specialty of first prescriber was broken down into: family physician (general practitioner), pediatrician, psychiatrist, or other specialist.

## **2.4 Definition of socioeconomic level**

The estimation of socioeconomic level in the QICDSS is based on geographic indices of social and material deprivation.<sup>46</sup> Deprivation measures have been updated according to 2016 census data. Approximately 94% of the Québec population in the QICDSS was assigned a socioeconomic deprivation index in 2019–2020 (most recent file available). Quintile 1 represents the more advantaged regions and, conversely, quintile 5 represents the most disadvantaged. Analyses were conducted separately for the material and social components. The material component is defined by education, employment, and income, while the social component is linked to family structure and marital status.

## 3 RESULTS

### 3.1 Portrait of the study population

From 2000 to 2020, there are 4,401,387 individuals 24 years old and younger in the QICDSS database. Of these, 13% were covered by the PPDIP for the entire observation period (i.e., April 1, 2000, through March 31, 2020), 44% were partially covered, and 43% were never covered by the PPDIP (Figure 1).

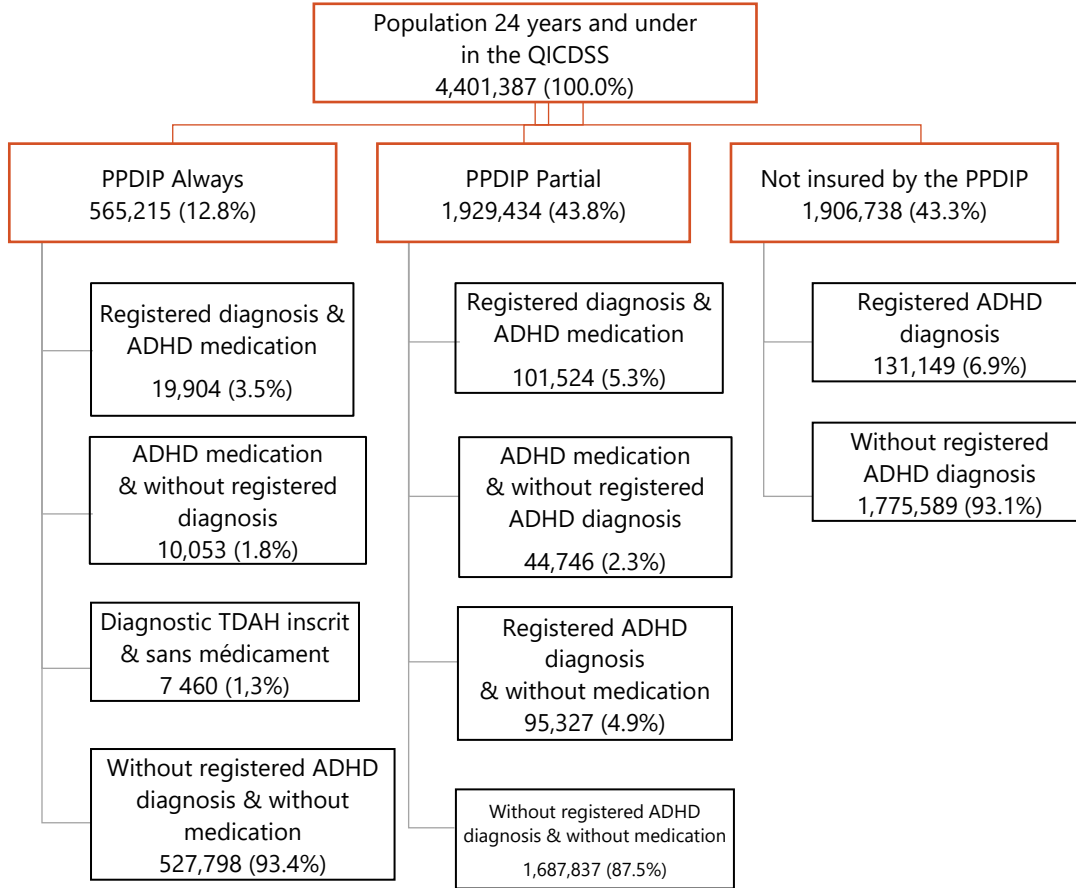
Regarding ADHD medication prescribing, 176,227 individuals aged 1 to 24 years in the QICDSS database received at least one prescription for ADHD medication between April 1, 2000, and March 31, 2020 (Figure 1). Of these, 29,957 had PPDIP coverage without interruption (“PPDIP always”), while 146,270 had coverage with interruption (“PPDIP partial”).

Complementing the overall results in Figure 1, the year-by-year breakdown (results not shown) indicates that the proportion of individuals 24 years and younger with at least one prescription for ADHD medication, by PPDIP coverage, is as follows:

1. the proportion of people covered by the PPDIP without interruption, per year, varies between 24.5% and 26.9% (“PPDIP always”);
2. the proportion of people covered by the PPDIP with interruption, per year, varies between 6.3% and 9.7% (“PPDIP partial”);
3. the proportion not covered by the PPDIP, by year, is between 63.4% and 67.4%.

Between April 1, 2000, and March 31, 2020, the proportion of individuals covered by the PPDIP without interruption with a registered ADHD diagnosis represents 4.8% (i.e., 3.5% + 1.3% in Figure 1), whereas the proportion of individuals covered by the PPDIP with interruption with a registered ADHD diagnosis is 10.2% (i.e., 5.3% + 4.9% in Figure 1). Among those not covered by the PPDIP, the proportion with a registered ADHD diagnosis is 6.9%.

**Figure 1** Portrait of ADHD medication prescribing among people aged 1 to 24, by coverage under the public prescription drug insurance plan (PPDIP), Québec, 2000–2020



The absence of a diagnosis of ADHD on the payment slip of a physician who has prescribed medication for ADHD does not equate to a lack of a diagnosis of ADHD on the medical record maintained by the physician. As such, for the purposes of further analysis, we assume that in the presence of any ADHD medication prescription, a diagnosis of ADHD has been made by the prescribing physician.

### 3.2 Annual prevalence of ADHD medication prescribing

Table 1 as well as Figure 2 indicate an increase in the annual prevalence of ADHD medication prescribing among those 24 years and younger. However, there is some stability in the trend of increasing cases from 2016–2017. Regardless of whether there is a lapse in coverage by the PPDIP, the percentage of prescriptions ranged from 1.9% to 7.9% per year during the study period (Table 1). This varies considerably by sex. It is 9.6% and 5.8% for boys and girls in 2019–2020, respectively (Figure 3).

Prevalence also differs according to the age of the individual (Figure 4). In 2019–2020, it is 0.5%; 11.3%; 13.4%; and 6.3% in the under-5, 6–11, 12–17, and 18–24 age groups, respectively.

In 2019–2020, the prevalence of drug prescribing is 7.7% for Québec as a whole (Table 2). However, there is a significant variation between health regions, ranging from 3.2% in Montréal to 14.4% in Saguenay-Lac-Saint-Jean (Table 2 and Figure 5).

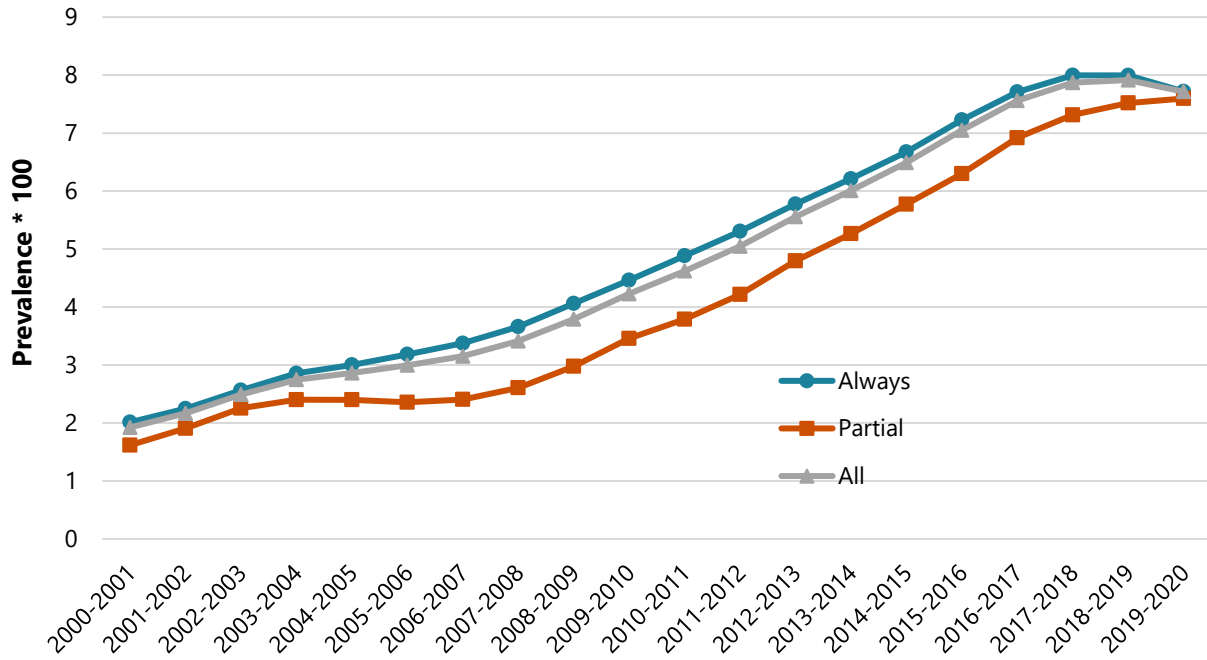
**Table 1** Number and age-adjusted annual prevalence of ADHD medication prescribing among individuals aged 1 to 24 years, by type of public prescription drug insurance plan (PPDIP) coverage, Québec, from 2000–2001 to 2019–2020

Year	PPDIP All*			PPDIP Always (without interruption)			PPDIP Partial (with interruption)		
	Number	Prevalence (*100)	95% CI	Number	Prevalence (*100)	95% CI	Number	Prevalence (*100)	95% CI
2000–2001	17,115	1.9	1.9–2.0	13,975	2.0	2.0–2.1	3,140	1.6	1.5–1.7
2001–2002	18,980	2.2	2.1–2.2	15 260	2.2	2.2–2.3	3,715	1.9	1.8–2.0
2002–2003	21,315	2.5	2.4–2.5	17,025	2.6	2.5–2.6	4,295	2.3	2.2–2.3
2003–2004	23,085	2.7	2.7–2.8	18,615	2.9	2.8–2.9	4,470	2.4	2.3–2.5
2004–2005	23,740	2.9	2.8–2.9	19,330	3.0	2.9–3.1	4,410	2.4	2.3–2.5
2005–2006	24,415	3.0	2.9–3.0	20,250	3.2	3.1–3.2	4,165	2.4	2.3–2.5
2006–2007	25,475	3.2	3.1–3.2	21,150	3.4	3.3–3.4	4,330	2.4	2.3–2.5
2007–2008	26,840	3.4	3.4–3.5	22,280	3.7	3.6–3.7	4,565	2.6	2.5–2.7
2008–2009	29,000	3.8	3.7–3.8	23,655	4.1	4.0–4.1	5,345	3.0	2.9–3.1
2009–2010	31,580	4.2	4.2–4.3	25,915	4.5	4.4–4.5	5,665	3.5	3.3–3.6
2010–2011	34,135	4.6	4.6–4.7	27,705	4.9	4.8–5.0	6,430	3.8	3.7–3.9
2011–2012	36,700	5.0	5.0–5.1	29,820	5.3	5.2–5.4	6,880	4.2	4.1–4.4
2012–2013	39,970	5.6	5.5–5.6	32,355	5.8	5.7–5.9	7,610	4.8	4.7–4.9
2013–2014	42,860	6.0	5.9–6.1	34,715	6.2	6.1–6.3	8,140	5.3	5.1–5.4
2014–2015	46,350	6.5	6.4–6.6	37,385	6.7	6.6–6.8	8,960	5.8	5.6–5.9
2015–2016	50,395	7.0	7.0–7.1	40,755	7.2	7.1–7.3	9,640	6.3	6.1–6.5
2016–2017	54,625	7.6	7.5–7.6	44,045	7.7	7.6–7.8	10,580	6.9	6.7–7.1
2017–2018	57,235	7.9	7.8–8.0	45,975	8.0	7.9–8.1	11,260	7.3	7.1–7.5
2018–2019	57,590	7.9	7.8–8.0	46,370	8.0	7.9–8.1	11,220	7.5	7.3–7.7
2019–2020	56,080	7.7	7.6–7.8	45,500	7.7	7.6–7.8	10,585	7.6	7.4–7.8

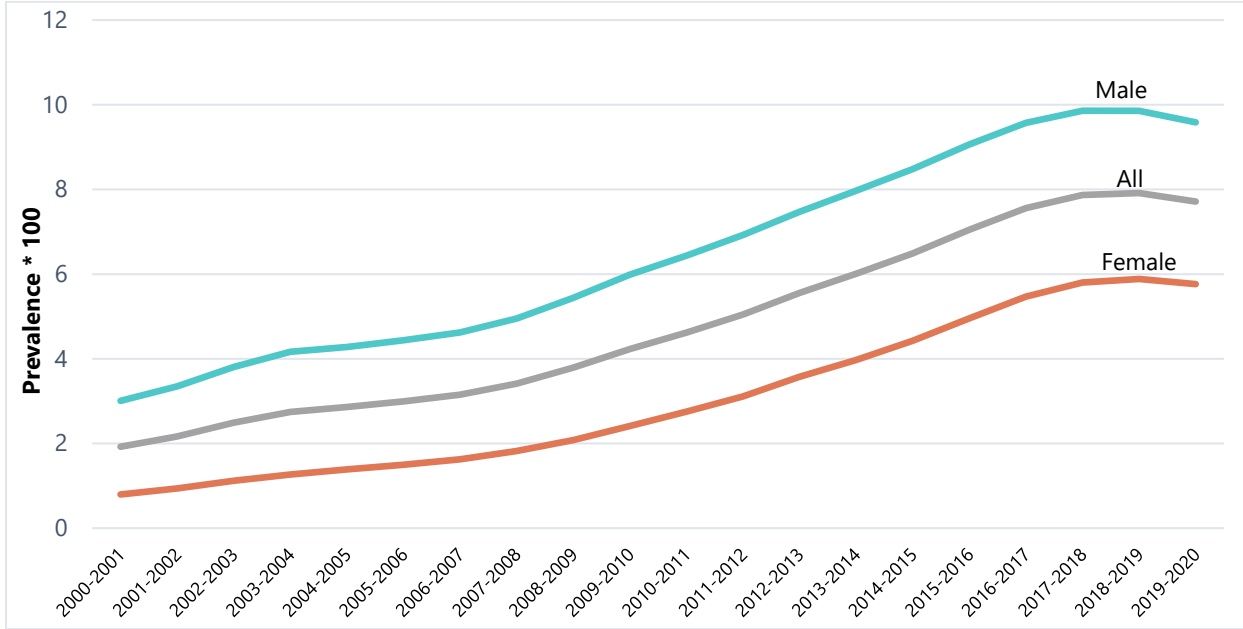
\* The “PPDIP all” category includes the “PPDIP always” and “PPDIP partial” categories.



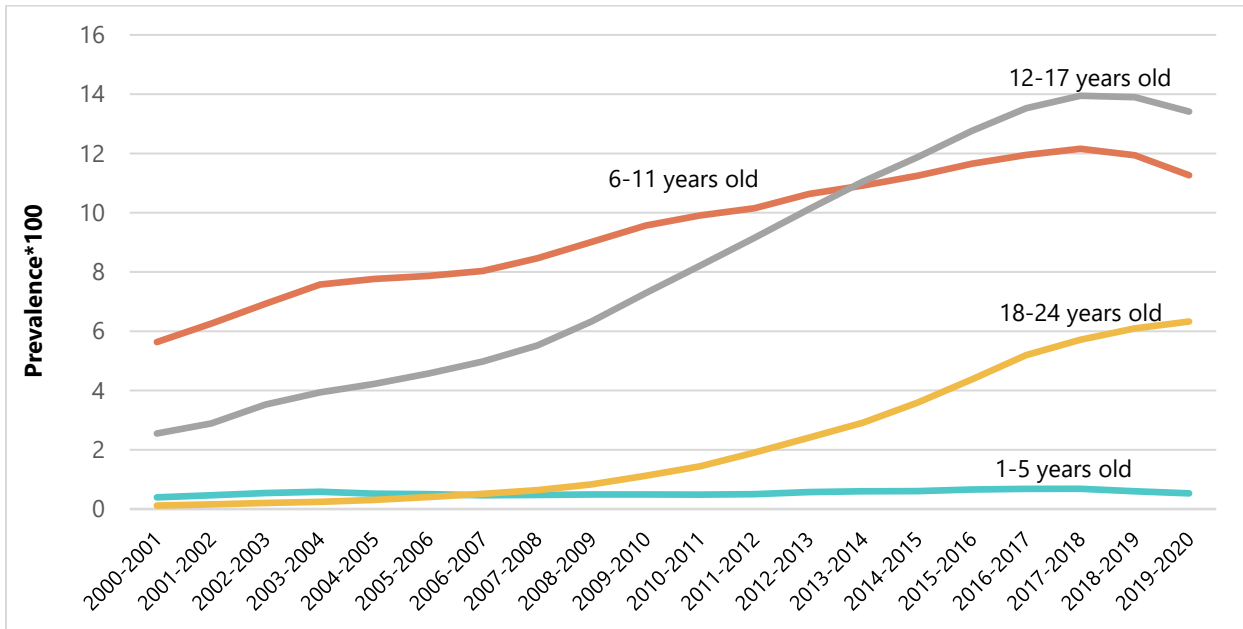
**Figure 2** Age-adjusted annual prevalence of ADHD medication prescribing among individuals aged 1 to 24 years, by type of public prescription drug insurance plan (PPDIP) coverage, Québec, from 2000–2001 to 2019–2020



**Figure 3** Age-adjusted annual prevalence of ADHD medication prescribing among individuals aged 1 to 24 years, covered by the public prescription drug insurance plan (PPDIP), by sex, Québec, from 2000–2001 to 2019–2020



**Figure 4** Age-adjusted annual prevalence of ADHD medication prescribing among individuals aged 1 to 24 years, covered by the public prescription drug insurance plan (PPDIP), by age, Québec, from 2000–2001 to 2019–2020

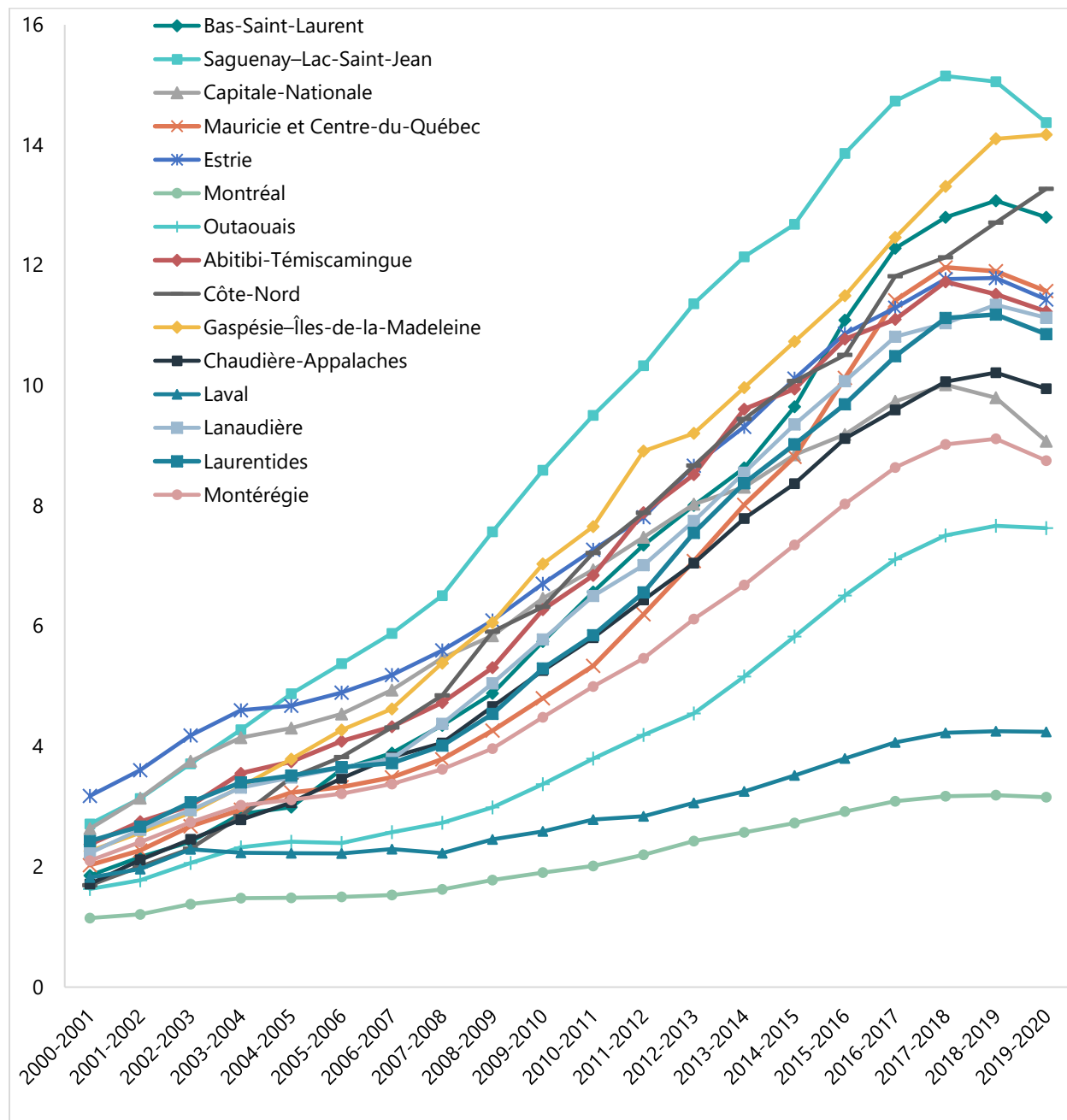


**Table 2** Age-adjusted annual prevalence of ADHD medication prescribing among individuals aged 1 to 24 years, covered by the public prescription drug insurance plan (PPDIP), by health region, Québec, 2000–2001, 2005–2006, 2010–2011, 2015–2016, 2019–2020

Health Regions*	2000–2001		2005–2006		2010–2011		2015–2016		2019–2020	
	Prevalence (*100)	95% CI	Prevalence (*100)	95% CI	Prevalence (*100)	95% CI	Prevalence (*100)	95% CI	Prevalence (*100)	95% CI
Bas-Saint-Laurent	1.9	1.7–2.1	3.6	3.3–4.0	6.6	6.1–7.1	11.1	10.4–11.8	12.8	12.1–13.6
Saguenay–Lac-Saint-Jean	2.7	2.5–3.0	5.4	5.0–5.8	9.5	9.0–10.1	13.9	13.2–14.6	14.4	13.7–15.1
Capitale-Nationale	2.6	2.5–2.8	4.5	4.3–4.8	6.9	6.6–7.3	9.2	8.8–9.6	9.1	8.7–9.5
Mauricie et Centre-du-Québec	2.0	1.9–2.2	3.3	3.1–3.5	5.3	5.1–5.6	10.1	9.7–10.5	11.6	11.2–12.0
Estrie	3.2	3.0–3.4	4.9	4.6–5.2	7.3	6.9–7.6	10.9	10.5–11.3	11.4	11.0–11.9
Montréal	1.1	1.1–1.2	1.5	1.4–1.6	2.0	1.9–2.1	2.9	2.8–3.0	3.2	3.1–3.3
Outaouais	1.6	1.5–1.8	2.4	2.2–2.6	3.8	3.5–4.1	6.5	6.1–6.9	7.6	7.2–8.1
Abitibi-Témiscamingue	2.4	2.1–2.7	4.1	3.7–4.5	6.8	6.3–7.5	10.8	10.0–11.6	11.2	10.4–12.1
Côte-Nord	1.7	1.4–2.1	3.8	3.3–4.4	7.2	6.4–8.2	10.5	9.4–11.7	13.3	12.0–14.7
Gaspésie–Îles-de-la-Madeleine	2.3	2.0–2.6	4.3	3.8–4.8	7.7	7.0–8.4	11.5	10.5–12.5	14.2	13.1–15.3
Chaudière-Appalaches	1.7	1.6–1.9	3.5	3.2–3.7	5.8	5.5–6.2	9.1	8.7–9.6	9.9	9.5–10.5
Laval	1.8	1.6–2.0	2.2	2.0–2.4	2.8	2.6–3.0	3.8	3.6–4.1	4.2	4.0–4.5
Lanaudière	2.2	2.1–2.4	3.6	3.4–3.9	6.5	6.2–6.8	10.1	9.7–10.5	11.1	10.7–11.6
Laurentides	2.4	2.3–2.6	3.7	3.5–3.9	5.9	5.6–6.1	9.7	9.3–10.1	10.9	10.5–11.2
Montérégie	2.1	2.0–2.2	3.2	3.1–3.4	5.0	4.8–5.2	8.0	7.8–8.3	8.8	8.5–9.0
<b>QUÉBEC</b>	<b>1.9</b>	<b>1.9–2.0</b>	<b>3.0</b>	<b>2.9–3.0</b>	<b>4.6</b>	<b>4.6–4.7</b>	<b>7.0</b>	<b>7.0–7.1</b>	<b>7.7</b>	<b>7.6–7.8</b>

\* The Nord-du-Québec, Nunavik, and Terres-Cries-de-la-Baie-James regions are excluded from the regional presentation, but included in the provincial total.

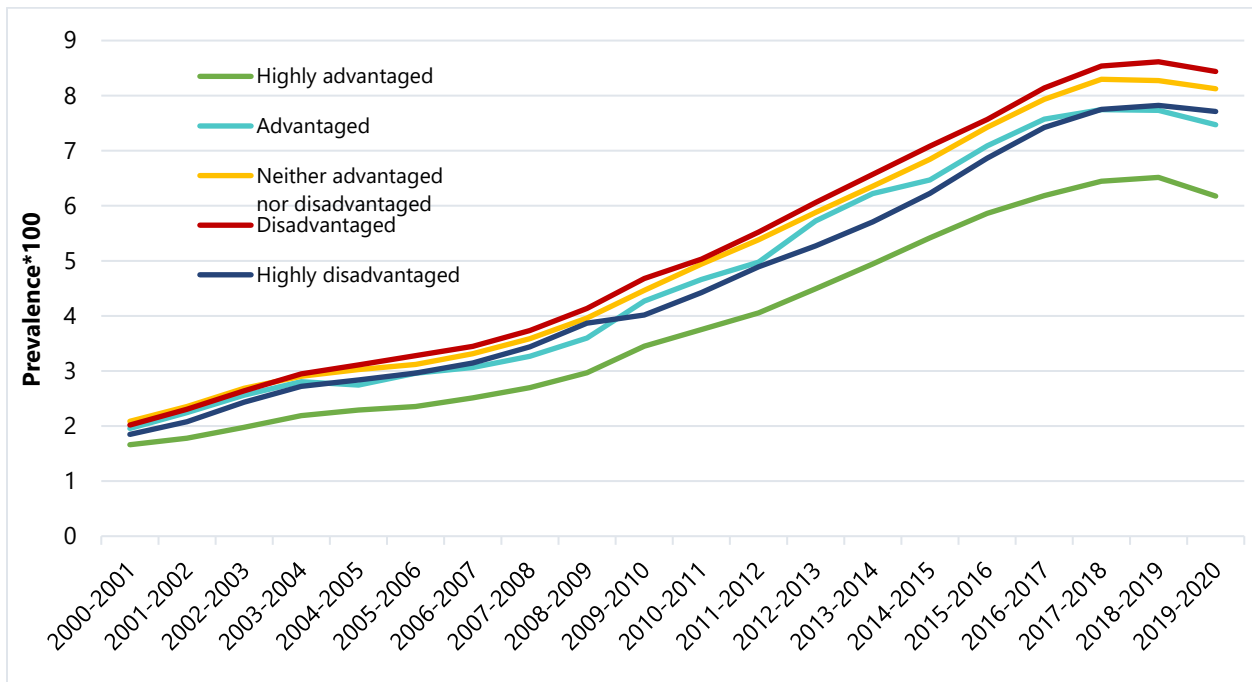
**Figure 5** Age-adjusted annual prevalence of ADHD medication prescribing among individuals aged 1 to 24 years, covered by the public prescription drug insurance plan (PPDIP), by health region, Québec, from 2000–2001 to 2019–2020



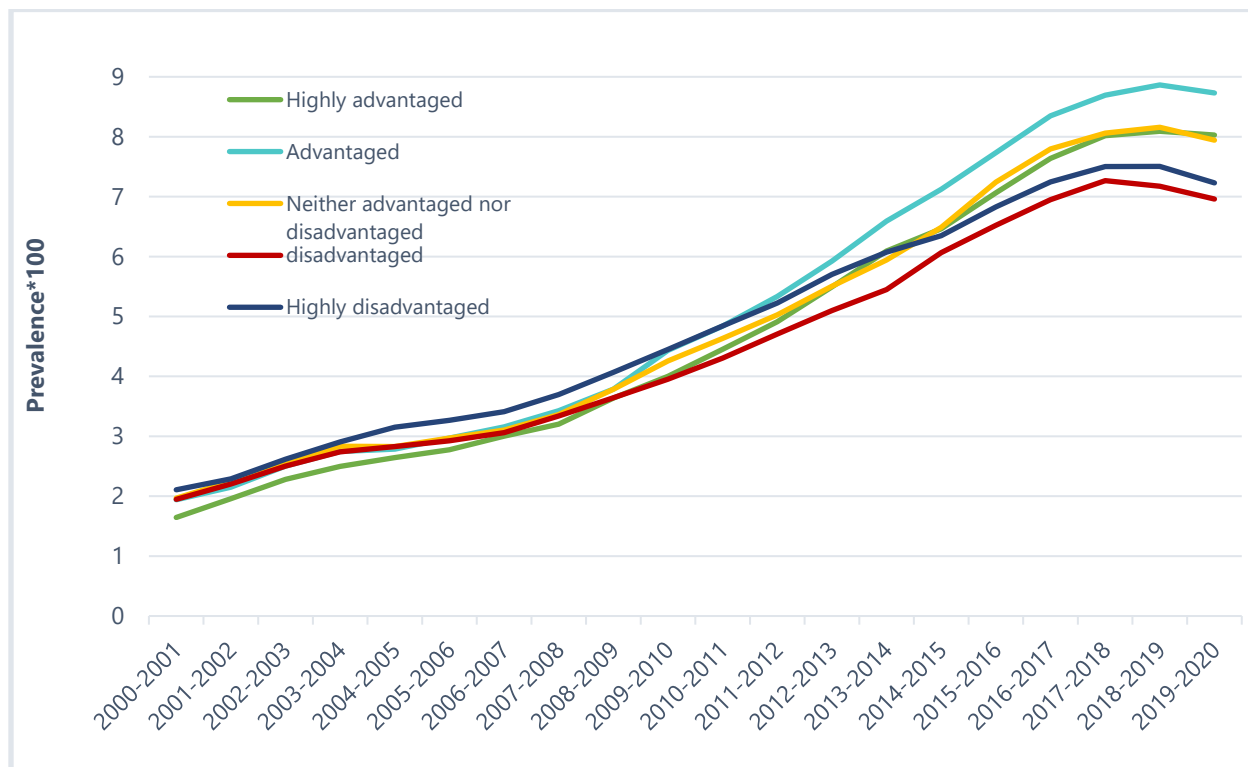
### 3.3 Prevalence of ADHD medication prescribing according to the Material and Social Deprivation Index by living environment at birth

Figures 6 and 7 show the prevalence of ADHD medication prescribing according to the Material and Social Deprivation Index at birth. The results indicate a lower prevalence of prescribing among those living in a high materially advantaged environment (Figure 6), whereas the Social Deprivation Index shows a higher prevalence of prescribing among those living in an advantaged environment (Figure 7).

**Figure 6** Age-adjusted annual prevalence of ADHD medication prescribing among individuals aged 1 to 24 years, covered by the public prescription drug insurance plan (PPDIP), according to the Material Deprivation Index at birth, Québec, from 2000–2001 to 2019–2020



**Figure 7** Age-adjusted annual prevalence of ADHD medication prescribing among individuals aged 1 to 24 years, covered by the public prescription drug insurance plan (PPDIP), according to the Social Deprivation Index at birth, Québec, from 2000–2001 to 2019–2020



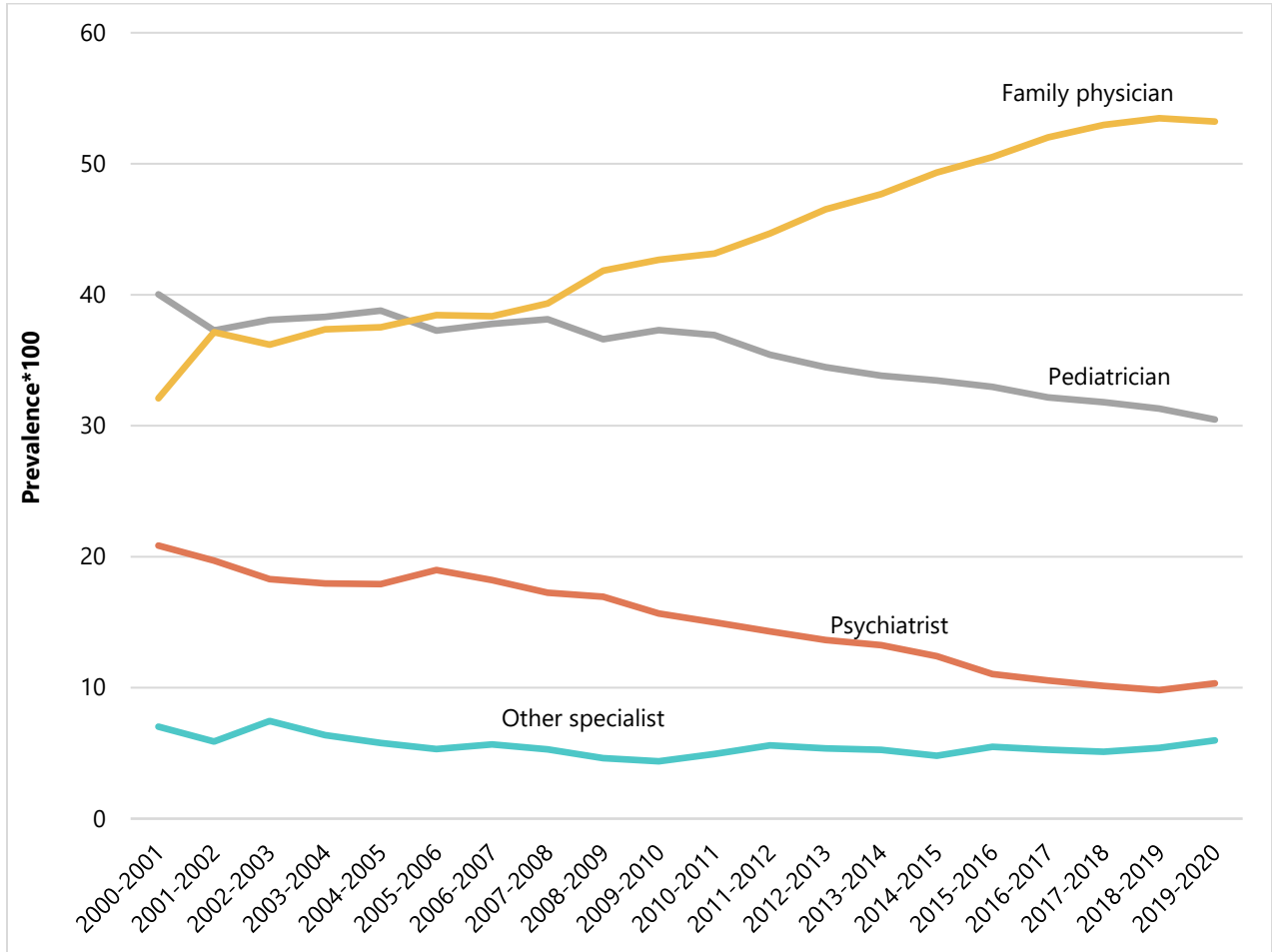
### 3.4 Profile of use of medical health services

Figure 8 presents the proportion of individuals 24 years of age and younger who have received at least one prescription for ADHD medication by the specialty of the primary prescriber. Family physicians, followed by pediatricians, are the primary prescribers of ADHD medications. This figure also shows that from 2005–2006 onwards, the position of first prescriber for pediatricians and psychiatrists gradually decreases over time, while that of family physicians continues to rise.

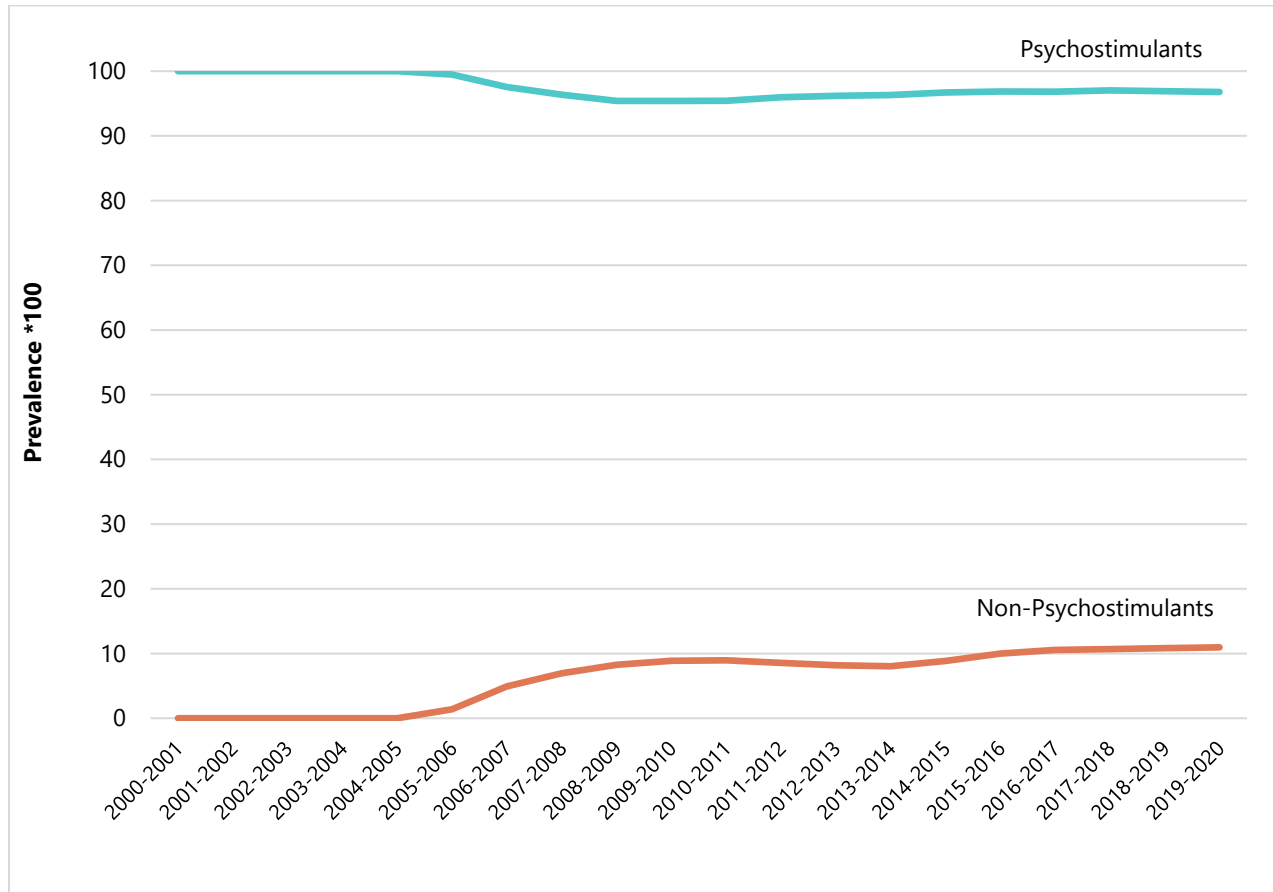
Prescriptions of psychostimulants and non-psychostimulants is relatively stable over time (Figure 9). However, psychostimulants remain by far the most prescribed class of ADHD medications for people aged 24 and under in Québec. Beginning in 2005–2006, there was a slight increase in the prescription of non-psychostimulants, accompanied by a decrease in the prescription of psychostimulants.

Figure 10 shows a trend of increasing amphetamines that coincides with a decrease in methylphenidate prescribing.

**Figure 8** Proportion of individuals aged 1 to 24 years covered by the public prescription drug insurance plan (PPDIP) who received at least one prescription for ADHD medication, by year and by specialty of the first prescriber, Québec, from 2000–2001 to 2019–2020

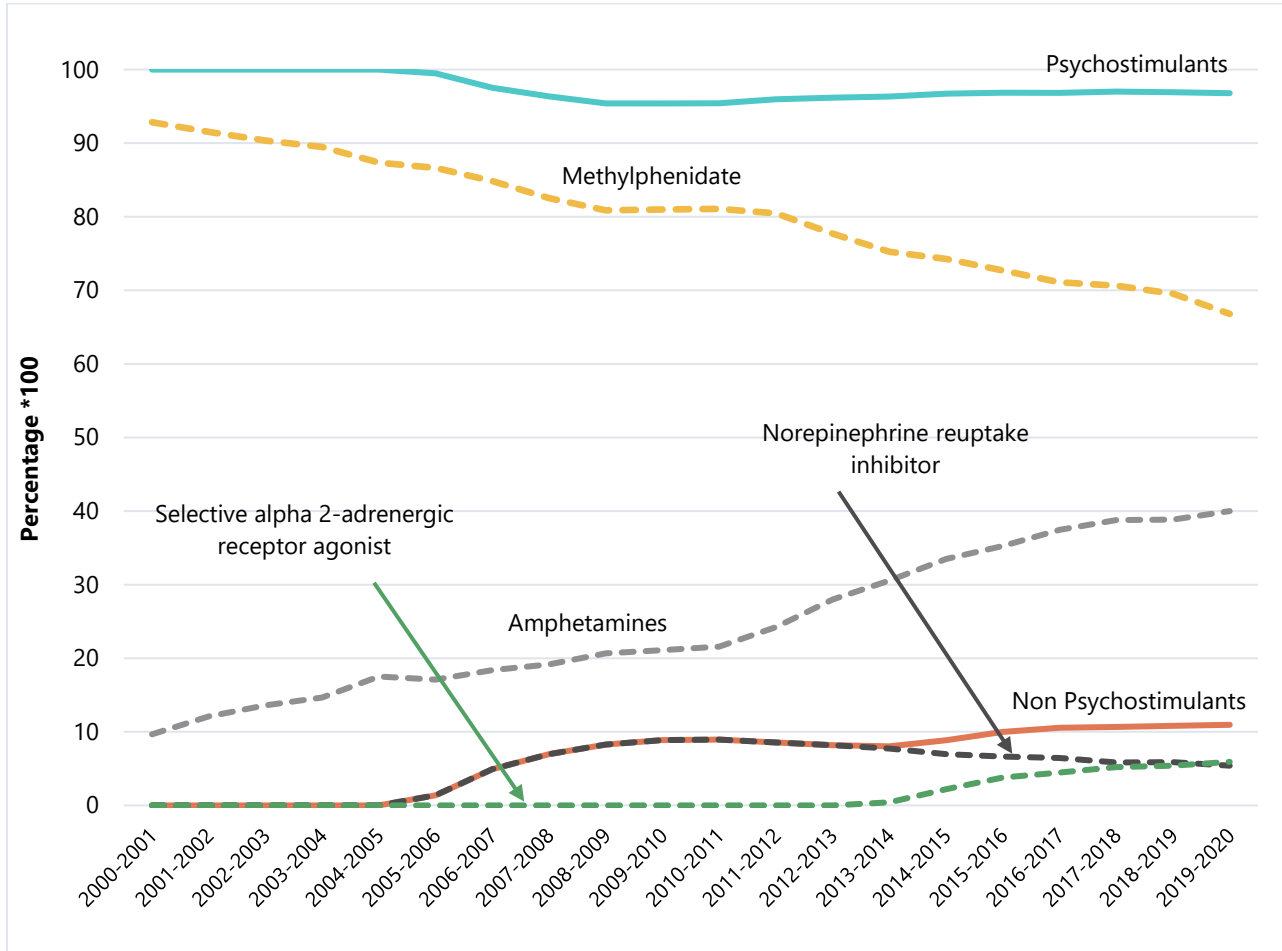


**Figure 9** Proportion of individuals aged 1 to 24 years covered by the public prescription drug insurance plan (PPDIP) who received at least one prescription for ADHD medication, by year and by class of medication prescribed, Québec, from 2000–2001 to 2019–2020





**Figure 10** Proportion of individuals aged 1 to 24 years covered by the public prescription drug insurance plan (PPDIP) who received at least one prescription for ADHD medication, by year and by class of medication prescribed, Québec, from 2000–2001 to 2019–2020



Note: Amphetamines and methylphenidate are classified as psychostimulants, while the norepinephrine reuptake inhibitor and the selective alpha 2-adrenergic receptor agonist are classified as non-psychostimulants.

## 4 DISCUSSION

The QICDSS data indicate a general trend of increasing prevalence of ADHD diagnosis over time, as defined by the presence of a diagnosis of ADHD in the MED-ÉCHO file or the fee-for-service physician file during the year. The annual prevalence of ADHD diagnosis among children aged 1 to 24 years has increased from 0.9% in 2000–2001 to 4.1% in 2015–2016.<sup>4</sup> Because only one diagnosis code is required for billing a medical service, ADHD may not be reported if, for example, associated disorders are also present. This may contribute to an underestimation of the overall burden of ADHD. Considering the prescription of ADHD-specific medications can help reduce this underestimation. Data from this study show that between the years 2000 and 2020, 54,799 Quebecers between the ages of 1 and 24 who were insured under the PPDIP had at least one prescription for ADHD-specific medications without having a diagnosis registered in the fee-for-service or MED-ÉCHO file.

Annual prevalence data for ADHD medication prescriptions show a steady increase over time, from 1.9% in 2000–2001 to 7.7% in 2019–2020 among Quebecers aged 24 and under enrolled in the PPDIP. This trend of increased prescribing is consistent with the trend of ADHD diagnosis in Québec.<sup>4</sup> Prescription prevalence estimates obtained from the QICDSS for the year 2018–2019 (7.9 per 100) are comparable to those observed in the INESSS work on individuals insured by Québec's PPDIP (7.6 per 100).<sup>36,37</sup> However, compared with data from Canada as a whole,<sup>36,37</sup> and with the study conducted using administrative health databases from 13 countries around the world,<sup>38</sup> the QICDSS indicates a higher annual prevalence of prescribing in Québec. Several hypotheses can explain these disparities between Québec and the other Canadian provinces. Given the higher prevalence of diagnosed ADHD in Québec, the increase in prescribing likely represents an increased recognition of ADHD and the potential effectiveness of medication. The difference could also be explained by the fact that ADHD medication is free for Quebecers aged 18 and under and for full-time students aged 18 to 25. This report also supports evidence from the literature that the prevalence of ADHD medication prescribing differs by sex and age of the individual.<sup>27,38,47</sup>

ADHD medications are not only prescribed for those with a registered ADHD diagnosis, but also prescribed for those without a diagnosis listed on the payment slip for the visit. Indeed, the entry of the diagnosis by physicians for administrative purposes has always been optional; nevertheless, it has been more frequently observed. In 2017, the new electronic billing method introduced made it even more optional to include the diagnosis on the slip. However, the absence of an ADHD diagnosis on the payment slip of a physician who has prescribed medication for ADHD does not equate to a lack of a diagnosis of ADHD on the medical record maintained by the physician. We therefore assume that when a prescription for ADHD medication is present, a diagnosis of ADHD has been made by the prescribing physician. Also, recall that ADHD may not be reported in the presence of associated disorders since only one diagnosis code is allowed for billing a medical service. A decrease in diagnostic registration was

observed in three medical specialties, including family physicians, psychiatrists, and pediatricians. Furthermore, these three specialties represent the majority of physicians who prescribe ADHD medications.

From 2000 to 2020, prescriptions for ADHD medications in the 24 and under age group increased over time in all regions of Québec; the increase by region ranged from 2.1% to 11.9%. Estimates obtained from the QICDSS also indicate that the proportion of individuals who have received a prescription for ADHD medication varies considerably from one region to another across Québec. The rates reported for Saguenay, Gaspésie, and Bas-Saint-Laurent are quite high compared to Montréal and Laval. In general, our results are consistent with data reported by other authors.<sup>38</sup> Multiple factors can explain the interregional differences observed in this report.

First, the observed variation between regions may reflect geographic differences in the epidemiological prevalence of ADHD.<sup>4</sup> Second, these disparities could be explained by different clinical approaches to treating the disorder across the province and by the organization of school services (access to social workers) and health services, such as access to specialists and the availability of non-pharmacological treatments for ADHD, all of which may influence prescription patterns.<sup>48</sup> In fact, a report on the accessibility of health services in Québec by researchers from the Institut de recherche en santé publique (IRSPUM) reveals a considerable variance in the use of services across the province.<sup>49</sup> Services appear to be significantly less accessible in some settings than in others. For example, the rate of use of front-line mental health services among people aged 17 and under is 30.9 per 1,000 at the CISSS de Gaspésie, while it is 6.7 per 1,000 at the CISSS de l'Outaouais. Also, the proportion of people who receive psychosocial services within 30 days is estimated at 70% at the CISSS de Laval, while it is 58% at the CISSS du Bas-Saint-Laurent.<sup>49</sup> Third, cultural differences in the perception of ADHD between regions may also contribute to the gap in ADHD medication prescribing.<sup>50</sup> For example, perceived stigmatization may influence a parent's or individual's willingness to use medication.<sup>51</sup> Family beliefs and attitudes, as well as negative perceptions associated with the use of ADHD medications, can vary widely and contribute to the decision of whether to accept a prescription or not.<sup>51-58</sup> Finally, we note that the diversity of ADHD prevalence across regions remains an area for further study.

Our work has shown a lower prevalence of prescribing among people from highly economically advantaged backgrounds. One hypothesis is that parents of better-educated children with higher incomes are better able to identify specialized medical, school, and community services available in their areas. As a result, their children may benefit from services other than medication. This is consistent with the analysis by Sun et al. that upper-class parents express more concern for their children than lower-class parents.<sup>59</sup> The low prevalence of prescribing among people from socially disadvantaged backgrounds may be explained, in part, by problems of access to health care and fear of stigmatization compounded by their socially disadvantaged status.<sup>51</sup>

More than half of all participants received their first prescription from a family physician and nearly one third received a prescription from a pediatrician. The increasing prescribing of ADHD medications by family physicians may partly explain the high prevalence of prescribing in remote areas where there is a lack of specialists. The higher prevalence of psychostimulant prescribing observed in this report is entirely consistent with the scientific literature.<sup>26,34,38</sup>

### **Limitations**

The QICDSS is a set of linked administrative health databases providing useful information on the health status of Quebecers. However, this databank was developed to meet administrative needs, so some useful information may be missing.<sup>41</sup> The results of this report must be taken in the context of a number of limitations. The QICDSS does not contain information on services rendered outside of Québec and it excludes people covered by federal health programs, which could lead to an underestimation of services received and a reduction in the sensitivity of this database. The pharmacy services file that makes up the QICDSS contains only prescription data for individuals covered by the PPDIP (individuals covered by a private prescription drug insurance plan are excluded). It has a national coverage of nearly 30% per year in terms of numbers of prescriptions in the 24 and under age group, so the results shown in this report are not based on the entire population, which is likely to under- or overestimate the prescribing of ADHD medications in Québec. Additionally, there may be an underestimation of the prevalence of prescribing among individuals partially covered by the PPDIP (“PPDIP partial”) due to the fact that these individuals may be receiving medications during the period not covered by the PPDIP. However, our results are very similar to those of the INESSS, which used data from community pharmacies with a national coverage in Québec of 73.4% in terms of number of prescriptions.<sup>36,37</sup>

## 5 CONCLUSION

This report confirms the increasing prevalence of ADHD medication prescribing over time. This trend of increasing prescribing is consistent with the trend of ADHD diagnosis in Québec. The proportion of people who receive a prescription differs by age and varies considerably by region. This wide variation in the prevalence of prescribing may be linked to the different clinical approaches to managing the disorder. However, the extent of the disparity in the prevalence of prescribing leads us to consider explanatory hypotheses other than those of drug accessibility.

The information from this report provides a picture of the prescription of ADHD medications in Québec. These monitoring results can contribute to a better understanding of the potential effects of health care access and medication use for ADHD. The results of this report also serve to equip decision-makers and stakeholders in defining priorities and courses of action, developing appropriate policies, and implementing services that meet the needs of the population.

This report also provides many avenues for future research. Additional analyses are needed, particularly to describe the short- and long-term association between ADHD medication use and health outcomes (e.g., mortality), as well as medical service use (e.g., hospitalizations) in the ADHD population.

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