

Dispensing of attention-deficit hyperactivity disorder medications for adults in Aotearoa New Zealand

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ABSTRACT

AIM: To report dispensing trends for attention-deficit hyperactivity disorder (ADHD) in Aotearoa New Zealand, focussing on adults in order to highlight increasing demand for ADHD treatment by adults and to prompt discussion.

METHOD: Demographic and dispensing data for ADHD were obtained from the Pharmaceutical Collection between the years 2006 and 2022. This was stratified according to child (<18 years) and adult (≥18 years) populations. Population dispensing rates for methylphenidate and atomoxetine were calculated. Key findings are reported to reveal demographic and dispensing trends for medication treated ADHD in Aotearoa New Zealand.

RESULTS: More males are dispensed ADHD medication than females, although this is less evident for adults (54.8% male). Māori adults are dispensed ADHD medication at a lower rate (10.1%) than Māori children (22.9%). There was a 10-fold increase in dispensing of ADHD medication for adults compared to a three-fold increase for children over the study period. New dispensing for adults doubled between 2011 and 2022.

CONCLUSION: Medication treatment for adult ADHD is increasing in Aotearoa New Zealand and includes treatment for persisting childhood ADHD and new diagnoses made in adulthood. Despite increases, dispensing rates for ADHD remain lower than prevalence estimates, suggesting a significant treatment gap. Addressing the treatment gap for ADHD may reduce negative effects of ADHD, but wider social influences should also be considered.

Attention-deficit hyperactivity disorder (ADHD) is a neurodevelopmental disorder characterised by persistent patterns of inattention and/or hyperactivity-impulsivity that impairs functioning or development.¹ ADHD is associated with major health, societal and economic burdens through negative impacts on healthcare utilisation, work and social service utilisation, and crime and incarcerations.^{2,3}

For ADHD to be diagnosed, several symptoms are required to be present before the age of 12 years,¹ and the traditional conceptualisation of ADHD is that of a childhood disorder with impacts that lessen with age. However, adult ADHD is now increasingly recognised.⁴ Adult ADHD includes childhood ADHD that persists into adulthood and those with ADHD first diagnosed as an adult. The issue of whether childhood ADHD and adult ADHD constitute continuous populations is debated. Longitudinal cohort studies have reported that if the requirement for symptoms to be present before the age of 12 years is not applied, then childhood ADHD and adult ADHD appear to be largely non-overlapping populations.^{5,6} In contrast, the Multimodal Treatment Study of

ADHD made repeated rigorous ADHD assessments through childhood and reported that substantial proportions of young adult ADHD diagnoses without childhood onset were false positives confounded by comorbidity and substance use.⁷

The reported prevalence rates for ADHD vary substantially. A systematic review by Polanczyk et al. reported that more than 5% of the population experience ADHD globally and considered whether rates of ADHD varied geographically and were increasing over time.⁸ This review concluded that variance in prevalence rates related to methodological characteristics in included studies and that increasing rates of diagnosis and treatment were explained by increased awareness, access to treatment or changing clinical practice as opposed to increased prevalence.⁸ Song et al. reported that the global prevalence of ADHD persisting into adulthood is 2.58% and the prevalence of symptomatic ADHD in adulthood (regardless of childhood onset) is 6.76%, suggesting substantial health burden globally.⁹ We are unaware of epidemiological studies reporting national prevalence data for ADHD in Aotearoa New Zealand, although the Dunedin Multidisciplinary

Health and Development Study reported a cohort prevalence of ADHD in childhood of 6% that had reduced to 3% by the age of 38 years.⁵

Treatment for ADHD includes behavioural and pharmacological options. Medications include stimulants and non-stimulant options such as atomoxetine and clonidine. The evidence base for stimulants is greater than for non-stimulants, and stimulants result in larger clinical improvements.¹⁰ However, non-stimulant options are preferred in cases when there are concerns about the potential for substance misuse or the risk of destabilising comorbid conditions such as bipolar disorder or schizophrenia with stimulants.¹⁰ In Aotearoa New Zealand, the stimulant methylphenidate is most commonly used and is dispensed at a rate of 9–11 times other options.¹¹

Our clinical impression is that demand for ADHD assessments and treatment by adult specialist mental health services is increasing markedly. Demand appears to be driven by patients with childhood ADHD seeking treatment as adults, and adults without previous ADHD diagnoses seeking assessment and treatment. D'Souza et al. have already reported on longitudinal trends in medication dispensing for young people in Aotearoa New Zealand but did not include data for adults older than 24 years.¹¹ In this study we report longitudinal dispensing trends for ADHD treatment in Aotearoa New Zealand. We focus on adults with ADHD in order to raise awareness of demand for treatment in this group and to prompt discussion.

Methods

This study underwent Māori consultation and was granted ethical approval by the University of Otago Ethics Committee (approval HD23/002).

The Pharmaceutical Collection is the national dispensing database for Aotearoa New Zealand.¹² Data for individuals dispensed methylphenidate (any formulation) and atomoxetine from 2006 (when data from the Pharmaceutical Collection are first available) to September 2022 were requested from the Pharmaceutical Collection. Methylphenidate data were requested because this is the first-choice stimulant treatment for ADHD in Aotearoa New Zealand. Atomoxetine was requested because we were interested in rates of non-stimulant treatment for adults and its sole indication is for ADHD, unlike other non-stimulant treatments. This data included gender, ethnicity, level of deprivation measured in

deciles using the New Zealand Index of Deprivation (NZDep) scale (with higher numbers indicating greater deprivation) and age. Data were provided after anonymisation using a unique encrypted identifier. For each calendar year an individual was counted as having a dispensing if they received at least one dispensing of any methylphenidate formulation or atomoxetine. Data for 2022 were extrapolated to year's end. Population data were obtained from Stats NZ using their website Infoshare. Population estimates for the years 2006 to 2022 were obtained and stratified based on <18 or ≥18 years to describe a child and adult population.

Dispensing prevalence rates were calculated for each year by dividing the number of individuals dispensed ADHD treatment by the number of individuals in the population that year, and are presented per 100,000 population. This was further stratified by age (<18 or ≥18 years) to capture age-related differences in prescribing, and the ratio of child to adult dispensing is reported. We also report first dispensing of an ADHD medication for adults to differentiate from childhood ADHD that persists into adulthood. This measure captures those not previously dispensed to in the database. It is only reported from 2011 onwards, providing a 5-year lag period to avoid including those who could have been dispensed a medication prior to establishment of the Pharmaceutical Collection.

Results

Table 1 reports the demographic characteristics of the 76,922 individuals who were dispensed methylphenidate or atomoxetine between 2006 and September 2022. There were more males dispensed ADHD treatment than females and the gender gap was most evident in the child population (75.4% of the child population were males compared to 54.8% adults). Māori were 22.9% of the child population but only 10.1% of the adult population. The mean NZDep index was 5.48 (standard deviation [SD] 2.9) for the overall population and this was similar for children and adults.

Dispensing for ADHD medication increased from 188/100,000 population in 2006 to 819/100,000 population in 2022. Figure 1 reports the dispensing rates for the total population and for children (<18 years) and adults (≥18 years). The dispensing rate for children increased from 566 per 100,000 in 2006 to 1,722 per 100,000 in 2022, representing a

Table 1: Characteristics of the study population.

| Category | | <18 years | ≥18 years | Total |
|-------------------------------------|---------------------|---------------|---------------|---------------|
| Gender | Male (%) | 35,745 (75.4) | 16,168 (54.8) | 51,913 (67.5) |
| | Female (%) | 11,586 (24.4) | 13,229 (44.8) | 24,815 (32.3) |
| Ethnicity | NZ European (%) | 28,138 (59.3) | 19,115 (64.8) | 47,253 (61.4) |
| | Māori (%) | 10,874 (22.9) | 2,970 (10.1) | 13,844 (18.0) |
| | Pacific peoples (%) | 1,633 (3.4) | 484 (1.6%) | 2,117 (2.8) |
| | Asian (%) | 1,645 (3.5) | 1,501 (5.1) | 3,146 (4.1) |
| | Other (%) | 5,129 (10.8) | 5,433 (18.4) | 10,562 (13.7) |
| NZDep | Mean (SD) | 5.64 (2.9) | 5.22 (2.8) | 5.48 (2.9) |
| Age when first dispensed medication | Mean (SD) | 9.82 (3.5) | 32.47 (11.8) | 18.51 (13.5) |

Figure 1: Dispensing of ADHD medication per 100,000 population.

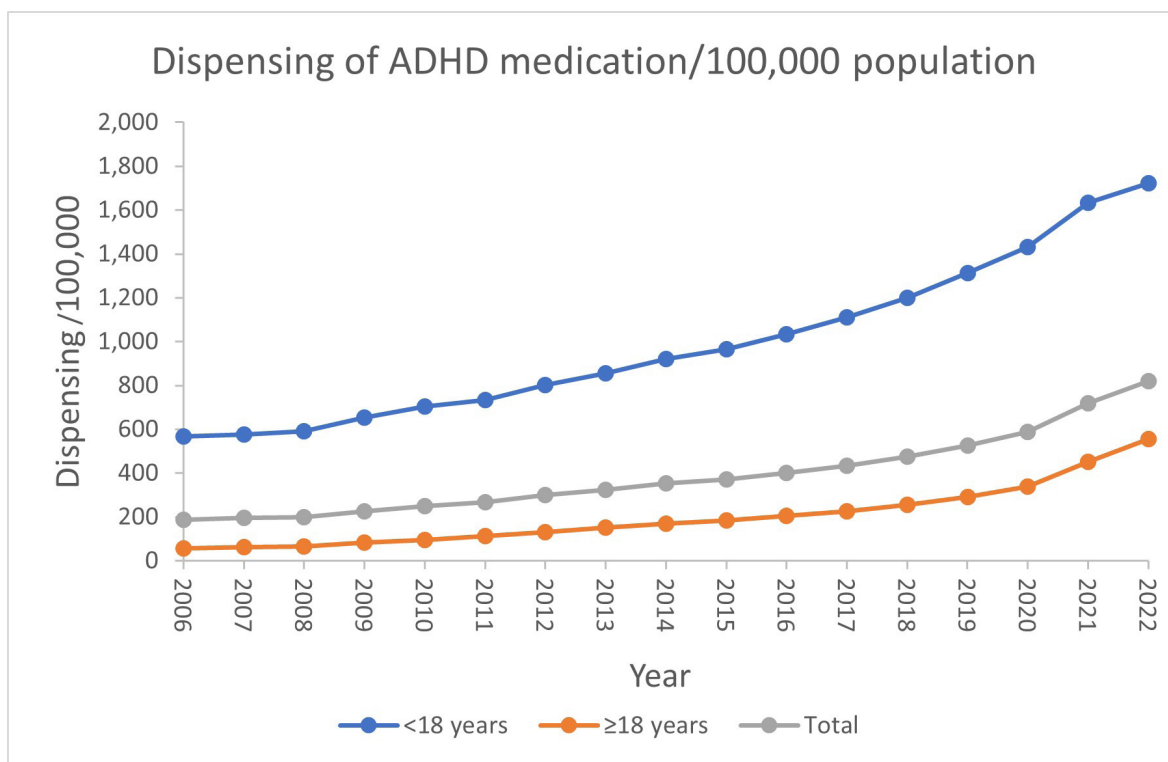
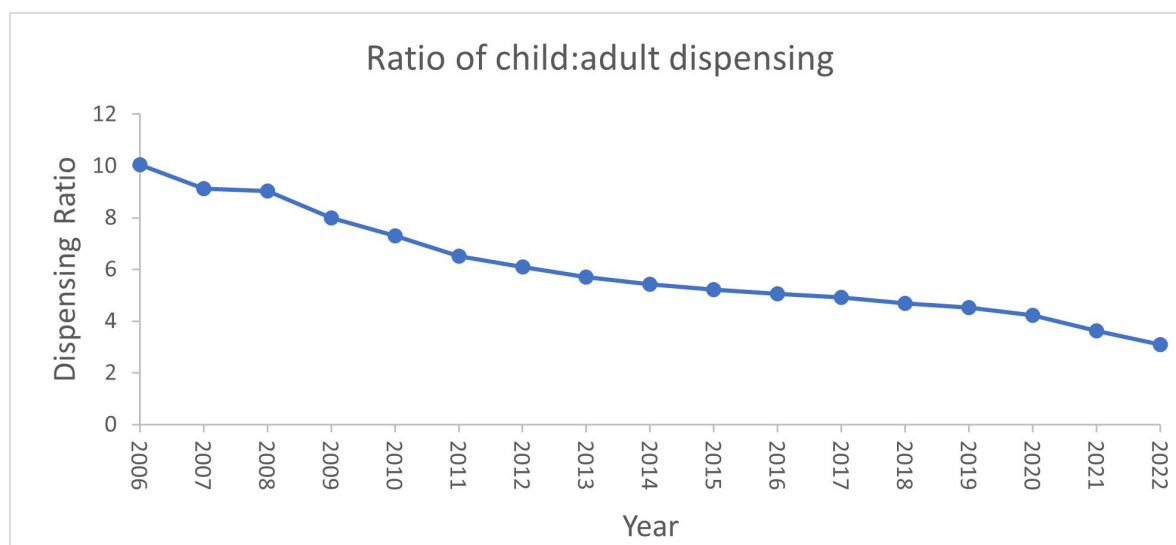
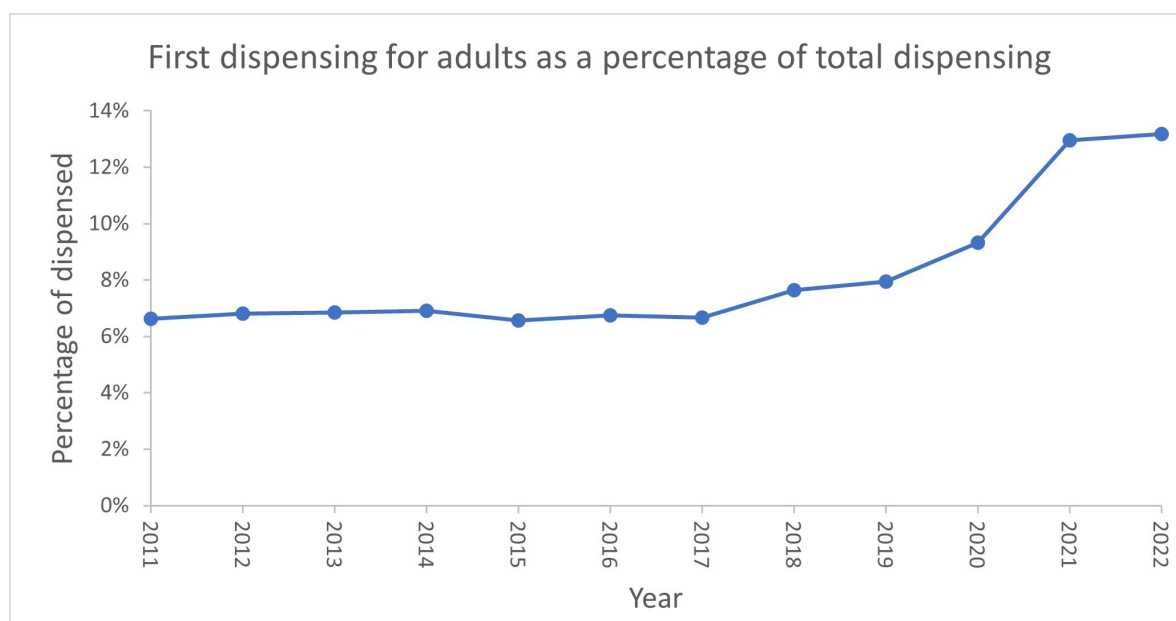


Figure 2: Ratio of child:adult dispensing for ADHD over time.**Figure 3:** First dispensing of ADHD medication for adults as a percentage of total dispensing.

three-fold increase. The dispensing rate for adults increased from 55 per 100,000 in 2006 to 556 per 100,000 in 2022, representing a 10-fold increase.

The ratio of childhood to adult prescribing reduced markedly over the study period. In 2006, there were approximately 10 child prescriptions to every adult prescription, dropping to 3.1 child prescriptions for every adult by 2022. Figure 2 demonstrates the change in this ratio over time.

First dispensing of ADHD medication as an

adult represented 6.6% of the total dispensing in 2006. This rose to 13.2% by 2022. Figure 3 reports first dispensing for adults over the study period.

Atomoxetine became available for use in Aotearoa New Zealand in 2009. The percentage of the adult study population who were dispensed atomoxetine rose from 2.5% in 2009 to 5.2% in 2022. Atomoxetine use was largely stable in the child population, varying between 2.1% and 3.2% of this population.

Discussion

This study confirms the presence of increasing treatment of ADHD in adults in Aotearoa New Zealand over time. From 2006 to 2022, there was a 10-fold increase in dispensing of ADHD medications to adults. Despite corresponding increases in dispensing for children, the ratio of child:adult dispensing fell during the study period. New dispensing for adults also increased over the study period, suggesting that the group receiving treatment as adults consists of those with a diagnosis of ADHD made in adulthood in addition to childhood ADHD persisting into adulthood.

The highest rates of treatment prevalence were observed in 2022 for both age groups. This was 1.72% in the child category and 0.56% in adults. These rates should be compared with the population prevalence for ADHD, which is estimated to be more than 5% of the total population with 2.58% persisting into adulthood.^{8,9} This suggests that a large treatment gap exists for New Zealanders with ADHD. Receiving treatment for ADHD relies upon access to assessment and treatment options. The prescription of methylphenidate requires special authority from Pharmac (the government body overseeing funding and supply of medications in Aotearoa New Zealand) and endorsement by a paediatrician or psychiatrist. In Aotearoa New Zealand, access to public mental health services is heavily restricted due to a mental health workforce facing considerable strain.¹³ This means that many ADHD assessments are now undertaken in the private sector, leaving access and equity issues for those unable to afford expensive assessments. It is possible that if there were greater access to ADHD assessments and treatment that individual and societal harms would reduce given the known burdens associated with ADHD.^{2,3} However, increasing access to ADHD assessments and treatment is not straightforward. It requires increasing the pool and range of professionals with the skill sets to complete ADHD assessment. Additionally, reducing structural barriers to prescribing by reviewing Pharmac prescribing restrictions would also need to occur.

The presence of a large ADHD treatment gap is undesirable, particularly when there are inequities of access to ADHD assessments and treatment. However, it is possible that some unintended negative consequences would follow increased ADHD treatment in the community. A qualitative study of general practitioners and community

pharmacists assessing prescribed drug misuse identified that stimulants were one of the main treatments of concern.¹⁴ Would this issue increase with greater access to stimulant medications or would it reduce as the pool of people with undiagnosed ADHD seeking treatment reduces? A database study such as ours is unable to provide answers to this question. The highlighting of under-treatment of ADHD in Aotearoa New Zealand is not without some misgivings on our behalf. Rising rates of antidepressant treatment and mental health service use have not been accompanied by reductions in psychological distress.¹⁵ It is therefore possible that greater treatment of ADHD may not be accompanied by expected societal benefits and that focussing on other factors such as deprivation with psychosocial responses is more fruitful.¹⁵

There were noteworthy gender and ethnicity differences across the age span. Three quarters of children dispensed ADHD medication were male, whereas the gender split was more even for adults. There is debate about the relative prevalence of ADHD according to gender with some suggesting that males with ADHD are more easily recognised due to hyperactivity and females are relatively under-recognised due to greater levels of inattention.^{16,17} The trends we report for gender are consistent with longitudinal trends reported internationally.¹⁸ Dispensing of ADHD medication for Māori for all ages was commensurate with the population prevalence of Māori.¹⁹ However, adult Māori only constituted 10% of this treatment group, consistent with ethnic disparities with respect to Māori accessing treatment for ADHD as an adult.

We focussed our attention on dispensing of methylphenidate and atomoxetine. Methylphenidate is the recommended first-line medication for ADHD in Aotearoa New Zealand and use of the alternative stimulant dexamphetamine is minimal.¹¹ We did not attempt to link dispensing data to a database with diagnostic information, such as PRIMHD, because this primarily captures secondary care service provision and would not include those treated privately.²⁰ Accordingly, we could not confirm that methylphenidate use was for ADHD but we expect use for other indications like narcolepsy to be minimal. Alternative non-stimulant options to atomoxetine are available (modafinil and clonidine). We chose not to request data for these because we expected the frequency of their use for non-ADHD indications to be significant, meaning frequency of use could

not be solely attributed to ADHD.

In conclusion, rates of medication treatment for ADHD in Aotearoa New Zealand are rising and dispensing of ADHD treatment for adults is becoming more substantial over time. The group receiving treatment as adults includes children with persisting ADHD in adulthood and adults

who have not previously received treatment. Despite increasing treatment, there remains a significant treatment gap when global prevalence rates of ADHD are considered. Greater treatment may reduce some of the negative impacts associated with ADHD although other societal issues may emerge in this context.

COMPETING INTERESTS

The authors have no competing interests to declare.

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