Medication dispensing for attention-deficit/hyperactivity disorder to New Zealand youth

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ABSTRACT

AIMS: Global trends show an increase in medication dispensing for attention-deficit/hyperactivity disorder (ADHD) in young people over time. The current study aimed to examine whether similar trends were observed in New Zealand youth over the period of 2007/08 to 2016/17.

METHODS: We estimated the prevalence in ADHD medication dispensing using national pharmaceutical data for each fiscal year from 2007/08 to 2016/17 in approximately 2.4 million New Zealand youth aged 1–24 years. We also examined whether trends varied by sociodemographic factors.

RESULTS: The total dispensing prevalence almost doubled from 516 per 100,000 to 996 per 100,000 over the study period. Males had a consistently higher dispensing prevalence relative to females. Young people aged 7–17 years had the highest dispensing prevalence. The most deprived quintile had a slightly lower dispensing prevalence relative to other quintiles. Ethnic differences in dispensing prevalence were apparent, with deprivation differences also existing within most ethnic groups.

CONCLUSIONS: Overall, our study showed an increase in ADHD medication use by young people in New Zealand, similar to international findings. Further research is needed into why disparities in dispensing prevalence occur across ethnic and socioeconomic groups.

Attention-deficit/hyperactivity disorder (ADHD) is a childhood-onset neurodevelopmental disorder characterised by symptoms of hyperactivity/impulsivity and inattention.[1] It is more common in males than females, with symptoms decreasing with age.[2,3] The disorder is associated with adverse health, academic and social outcomes and an increased risk of comorbidity with oppositional defiant disorder, conduct disorder and substance abuse.[3]

ADHD has an estimated worldwide prevalence of 3.4%.[4,5] Varying diagnosis rates across countries and regions may reflect different diagnostic criteria rather than actual differences in disorder prevalence.[5] For example, European countries generally show lower prevalence than other regions, as the more stringent International Classification of Diseases (10th edition; ICD-10) is used for diagnosing ADHD (referred to as hyperkinetic disorder).[6,7] In contrast, other regions (including New Zealand) use the Diagnostic and Statistical Manual of the American Psychiatric Association (5th edition; DSM-V).[1]

Treatment for ADHD consists of a combination of talk therapy and behavioural interventions for child and parent, lifestyle changes and medication.[8] For preschool children, behavioural intervention is recommended as the first line of treatment, with medication given only when intervention alone is unsuccessful in improving symptoms.[3,9,10] For older children and adults, it is recommended that a combined approach is used (ie, medication and behavioural intervention/therapy).[11,12] Internationally, medications for ADHD include stimulants, such as methylphenidate and amphetamines, and non-stimulants, such as atomoxetine, clonidine and guanfacine.[8,11] In New Zealand,

methylphenidate hydrochloride, dexamphetamine sulphate, atomoxetine and modafinil are publicly funded for clinical use as stimulants (for stimulant medication) and in the treatment of ADHD.[13]

International studies using administrative databases have shown that the prevalence of ADHD medication prescription and dispensing is increasing. Bachmann et al examined the trends in ADHD medication prescription in children aged 0 to 19 years across five regions (Denmark, Germany, the Netherlands, the UK and the US) between 2005 to 2012.[6] They found that while prevalence in ADHD medication varied across regions, it increased across all areas ranging from 10.7% in the US to 302.7% in Denmark. Raman et al also observed similar trends across Asia, Australia, North America, and Northern and Western Europe between 2001 to 2015.[14] Given that there is no evidence of an increase in disorder prevalence, the rise in ADHD medication use has led to concern about medication over-prescription.[5]

To date, one study by Barczyk et al has examined dispensing prevalence and trends for ADHD medication, alongside other psychotropic medication, in New Zealand.[15] Using national administrative records on pharmaceutical dispensing, the study found that the prevalence of ADHD medication increased from 0.75% in 2011 to 1.06% in 2016 (an increase of 41.33%) in 0- to 17-year-olds. The authors also observed that the dispensing prevalence for all psychotropic medication was much lower for Māori. However, the study did not calculate the dispensing prevalence for other demographic groups (other than ethnicity and sex) nor the group-specific dispensing trends over time.

This study aimed to investigate the prevalence and trends in ADHD medication dispensing in young New Zealanders, similar to Barczyk et al.[15] However, we extended the observation period from 1 July 2007 to 30 June 2017, focused on individuals aged 1 to 24 years, and examined prevalence and trends by sex, age, ethnicity and area-level deprivation. We hypothesised that there will be:

1. Increasing dispensing prevalence over time, consistent with trends observed in other studies.[6,14,15]
2. Higher prevalence of dispensing among males than females, given the higher ADHD prevalence in males.[2,3]
3. Lower dispensing prevalence for young children (1–6 years) and young adults (18–24 years) relative to middle childhood and adolescence (7–17 years), given that ADHD symptoms reduce with age and medication of preschool children is discouraged.[9]
4. Lowest dispensing prevalence in the highest socioeconomic deprivation quintile. This is based on observed socioeconomic disparities in the dispensing of other medications in New Zealand.[16] For example, Bowden et al found that antidepressant dispensing to young people was lower in deprived areas, despite depression prevalence being similar.[16,17] They speculated that this could be due to access barriers.
5. Higher dispensing rates for New Zealand Europeans, with lower rates for other ethnic groups. New Zealand Health Survey (NZHS) results indicating highest ADHD prevalence in European/Other and Māori children and lowest in Pasifika and Asian children.[16] However, studies of youth antidepressant prescribing have indicated that the European/Other ethnic group has a higher antidepressant dispensing prevalence than Māori, despite having similar depressive disorder rates.[16,17] Barczyk et al also reported a lower psychotropic medication dispensing prevalence for Māori.[15]
6. Different socioeconomic patterns in dispensing prevalence for different ethnic groups, indicating socioeconomic barriers to accessing medication for some ethnic groups.

Methods

Study population

Data for this study were obtained from Statistics New Zealand's Integrated Data Infrastructure (IDI), a large database of de-identified administrative and survey data about people and households linked at the individual level. A detailed description of the IDI can be found elsewhere.[18]

Table 1: Population counts per fiscal year and stratified by age bands and sex.

Fiscal year	Total population	1–6yrs	7–12yrs	13–17yrs	18–24yrs	Male	Female
2007/2008	1,441,674	348,471	356,280	317,352	419,568	738,837	702,834
2008/2009	1,455,660	356,754	354,468	313,989	430,449	746,367	709,290
2009/2010	1,468,593	363,885	353,088	311,220	440,400	754,248	714,345
2010/2011	1,473,105	367,950	350,829	307,953	446,379	757,107	715,998
2011/2012	1,468,284	369,765	348,477	303,342	446,700	754,725	713,559
2012/2013	1,466,064	369,945	346,275	301,296	448,551	754,209	711,855
2013/2014	1,475,529	370,479	349,962	300,906	454,182	759,831	715,695
2014/2015	1,489,050	368,178	358,218	300,288	462,366	769,122	719,928
2015/2016	1,501,488	366,984	367,329	300,501	466,674	776,106	725,382
2016/2017	1,509,429	363,873	376,521	303,123	465,912	779,124	730,305

The study population consisted of repeated cross-sections of all New Zealand residents aged between 1 to 24 years, taken for each fiscal year between 1 July 2007 to 30 June 2017 (see Table 1 for population counts). The combined study population across all fiscal years was 2,395,209 individuals. This time-period represents when reliable data are available for this study. The resident population is identified based on activity in health, tax, education, and injury claims datasets and falls within 2% of official resident population estimates.[19,20]

ADHD medication dispensing

Information on ADHD medication dispensing was obtained by linking data from the Ministry of Health community pharmaceutical dispensing collection to the study population. The pharmaceutical collection contains information about subsidised prescription drugs dispensed by community pharmacists.

For each fiscal year, individuals were classified as obtaining a dispensing if they received at least one dispensing of a publicly funded stimulant/ADHD medication: atomoxetine, dexamphetamine sulphate, methylphenidate hydrochloride (immediate- and extended-release), and modafinil.[13] In addition, clonidine, typically prescribed for hypertension in adults, is used off-label to treat ADHD in the New Zealand paediatric population and was therefore also included.[12]

Sociodemographic information

Age was calculated at the end of each fiscal year (ie, 30 June) and categorised into the following four bands: 1–6, 7–12, 13–17 and 18–24 years.

Ethnicity was measured in total response format; that is, individuals could belong to one or more ethnic groups, as it is common for children in New Zealand to identify with multiple ethnicities.[21] We focused on six ethnic groups, using Level 1 Statistics New Zealand categorisation: European; Māori; Pasifika; Asian; Middle Eastern, Latin American and African (MELAA); Other.[21]

The NZDep2013 Index was used to capture area-level deprivation. The NZDep2013 Index assigns each meshblock a deprivation decile value from 1 (least deprived) to 10 (most deprived), based on socioeconomic indicators from the 2013 New Zealand census.[22] Meshblocks are evenly distributed across each deprivation level. For the current study, deprivation scores were converted into quintiles.

Table 1 presents the count of individuals in the study population within each fiscal year, by age and sex. Table 2 presents the count of individuals in the study population by fiscal year, stratified by total response ethnicity and area-level deprivation.

Data analysis

Dispensing prevalence rates were calculated for each fiscal year by dividing the

Table 2: Counts per fiscal year, stratified by total response ethnicity and NZDep2013 quintiles.

Fiscal year	Asian	European	Māori	MELAA	Pasifika	Other	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
2007/2008	162,066	995,313	352,434	41,871	175,023	18,792	240,330	256,377	270,855	300,312	362,412
2008/2009	168,396	1,000,572	355,344	41,235	179,586	19,125	244,422	258,978	272,619	301,302	365,928
2009/2010	174,126	1,005,000	360,567	39,912	184,116	19,122	247,446	261,285	274,662	302,073	369,528
2010/2011	180,789	1,002,462	362,451	37,431	186,936	19,131	250,500	262,971	275,373	302,484	371,994
2011/2012	187,242	995,394	361,230	34,011	187,791	19,143	251,169	262,467	273,732	299,436	369,726
2012/2013	193,932	992,325	360,276	31,791	187,452	19,071	253,692	264,156	274,167	298,086	367,359
2013/2014	201,543	992,001	363,132	32,802	189,690	19,062	256,524	266,679	275,967	299,037	368,928
2014/2015	214,425	991,083	366,120	33,450	192,222	18,771	258,078	267,939	276,990	298,785	370,134
2015/2016	227,187	988,932	369,168	33,654	194,730	18,459	259,749	270,336	279,258	298,734	375,627
2016/2017	234,885	986,130	371,514	33,921	196,782	18,210	263,304	272,250	280,287	297,000	376,377

number of young people dispensed an ADHD medication within that year by the number of resident New Zealand youth in that year, and presented as 'per 100,000 population'. These counts were random rounded to base 3 to reduce disclosure risk, as per the confidentiality rules of Statistics New Zealand. This method was used to calculate the dispensing prevalence for the total population, by sex, age, ethnicity, and deprivation quintiles and for each ADHD medication type. All data management and analyses were conducted using SAS version 7.1.

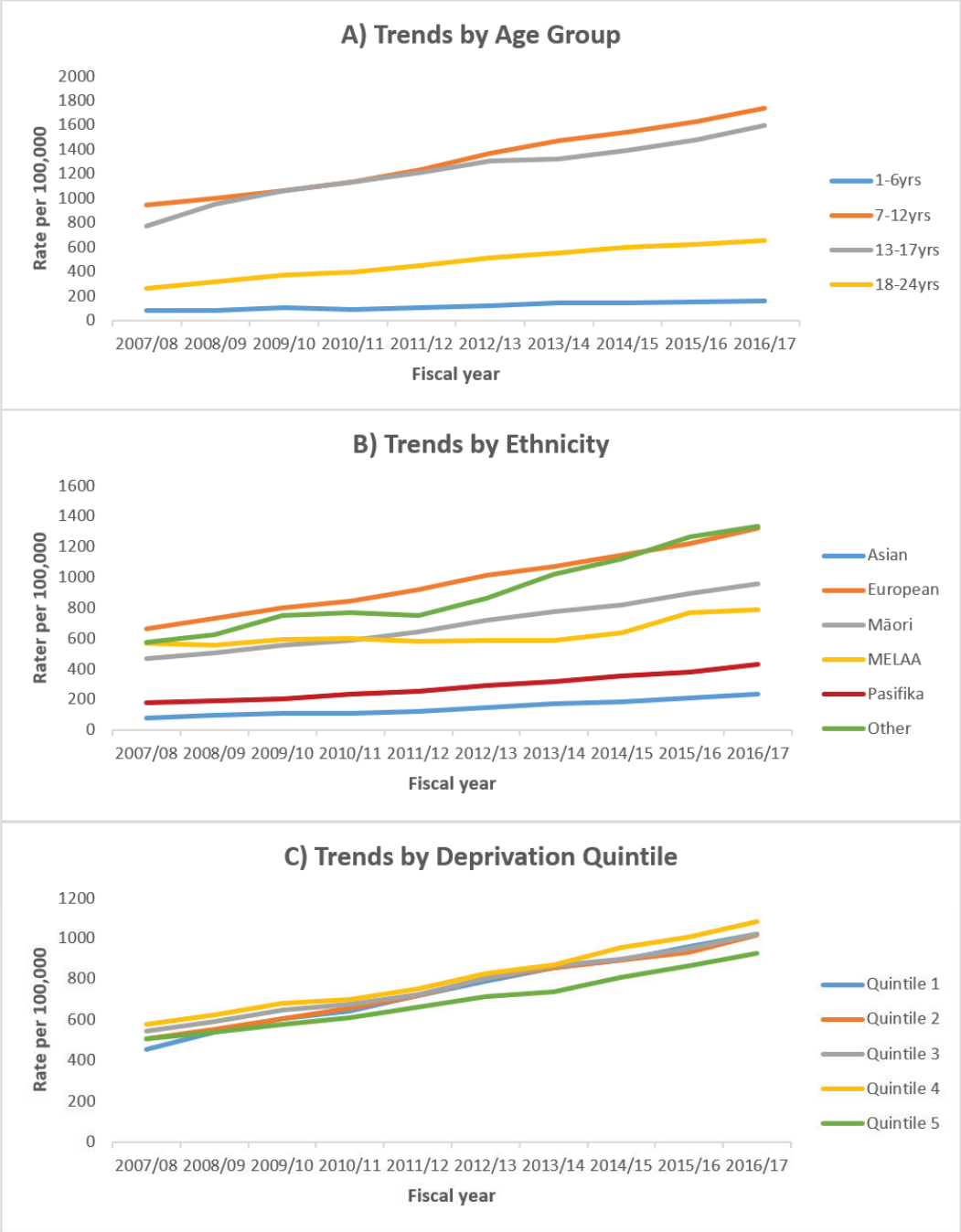
Results

The period prevalence for ADHD medication dispensing between 2007/08 and 2016/17 was 1.18%. The dispensing prevalence almost doubled from 2007/08 to 2016/17, increasing from 516 per 100,000 to 996 per 100,000 (Table 3). The dispensing prevalence for both males and females increased over time, with the prevalence for males being consistently 3–4 times higher than females (Table 3). However, the rate of increase was far greater for females

Table 3: Annual dispensing prevalence (per 100,000 population) overall and by sex.

Fiscal year	Overall	Male	Female
2007/08	516	802	216
2008/09	566	878	237
2009/10	617	952	265
2010/11	652	1,003	282
2011/12	708	1,081	313
2012/13	780	1,176	362
2013/14	826	1,241	385
2014/15	876	1,302	420
2015/16	928	1,378	446
2016/17	996	1,472	488
% Change	93.0	83.5	126.6

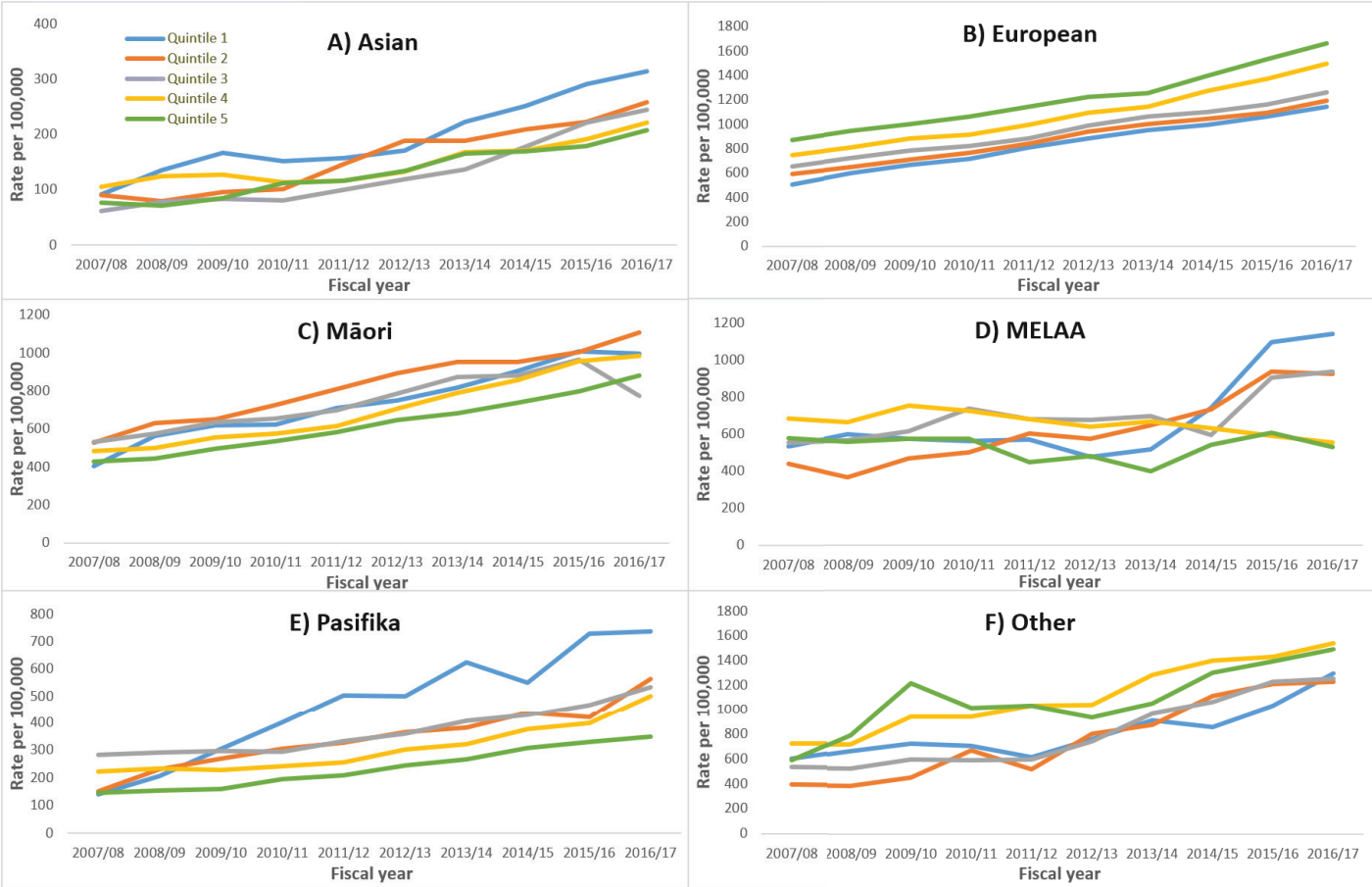
Figure 1: ADHD dispensing prevalence from 2007/08 to 2016/17, broken down by age group (Panel A), ethnicity (Panel B), and 2013 NZ Deprivation Index quintiles (Panel C).



(127%) than for males (84%) from 2007/08 to 2016/17. As indicated in Figure 1A, 7–17-year-olds had the highest dispensing prevalence over the entire study period, followed by 18–24-year-olds and then 1–6-year-olds. Rates increased over time for all age groups, with the greatest increase for 18–24-year-olds (152%) and lowest for 7–12-year-olds (84%).

Figure 1B stratifies dispensing prevalence by ethnicity. The European and Other ethnic groups generally had the highest dispensing prevalence across fiscal years. The Asian ethnic group had the lowest dispensing prevalence, with the Pasifika ethnic group second lowest. All groups showed an increase in dispensing prevalence over time. Rate increases were greatest for Asian

Figure 2: ADHD dispensing prevalence by 2013 NZ Deprivation Index quintiles within each ethnic group.



(190%) and Pasifika (144%) followed by Other (132%), Māori (105%), then European (99%). The MELAA group had the lowest rate increase over the study period (39%).

Dispensing prevalence increased over time for all NZDep quintiles (see Figure 1C). Quintile 5 generally had the lowest dispensing prevalence, although differences in dispensing prevalence between quintiles were small. Increases over time were greater in less deprived quintiles. Quintiles 1 and 2 approximately doubled in dispensing prevalence (126% and 101%, respectively). Quintiles 3 and 4 had the next highest rate increase (both at 88%), with Quintile 5 showing the lowest rate increase (83%).

We also examined whether the dispensing prevalence trends for NZDep quintiles differed across ethnic groups. For the European group, dispensing prevalence was greater with increasing deprivation (Figure 2B). The least deprived quintile had the highest dispensing prevalence from 2009/10 for Pasifika and from 2013/14 for the Asian population (Figures 2E and 2A, respectively). The most deprived quintile generally had the lowest dispensing prevalence for Māori and Pasifika (Figures 2C and 2E, respectively). For the MELAA group, there appeared to be a separation in dispensing prevalence between quintiles from 2014/15 (Figure 2D); The least deprived quintile had the highest dispensing prevalence, followed by quintiles 2 and 3, and the most deprived quintiles (quintiles 4 and 5) had the lowest dispensing prevalence. For the Other ethnic group, quintiles 4 and 5 had had a slightly higher dispensing prevalence relative to other quintiles (Figure 2F).

Table 4 shows the dispensing prevalence for each ADHD medication type. The prevalence for methylphenidate hydrochloride, atomoxetine and clonidine increased from 2007/08 to 2016/17, whereas the rates of dexamphetamine sulphate and modafinil remained consistent over time. Methylphenidate hydrochloride had a much higher

Table 4: Annual dispensing prevalence (per 100,000 population) for each medication type.

Fiscal year	Methylphenidate hydrochloride	Clonidine	Dexamphetamine sulphate	Atomoxetine	Modafinil
2007/08	462	50	36	<1	<1
2008/09	507	51	33	12	<1
2009/10	555	50	28	28	<1
2010/11	586	52	26	28	<1
2011/12	638	57	28	31	01
2012/13	703	66	29	35	01
2013/14	744	70	30	37	01
2014/15	790	79	32	39	01
2015/16	834	89	31	42	01
2016/17	899	98	34	46	01

dispensing prevalence than the other medications, with a rate 9–11 times greater than the next most prescribed drug (clonidine). Modafinil was the least prevalent drug, with prevalence ranging from <1–1 per 100,000. Dispensing prevalence for Atomoxetine increased quickly between 2007/08 to 2016/17, though prevalence was still low.

Discussion

Using administrative data on community pharmaceutical dispensing, we investigated the dispensing trends of ADHD medication to New Zealanders aged 1–24 years. Between 1 July 2007 and 30 June 2017, the prevalence of ADHD medication dispensing to young people increased by 93%. These results are consistent with our hypothesis and findings in New Zealand, although the increase in prevalence was greater than that observed by Barczyk et al (41.33%).[15] This difference in prevalence rate increase is likely due to a variety of factors including the different age ranges and study periods.

Our results also support the findings by Bachmann et al and Raman et al, who observed that ADHD medication use was increasing over time across different regions worldwide.[6,14] Specifically, methylphenidate hydrochloride, clonidine and atomoxetine all increased in prevalence over the study period. The rapid increase in prevalence for atomoxetine from 2007/08 to 2016/17 is likely due to its subsidisation as a prescription drug for ADHD in 2009.[23] Similar to other countries, methylphenidate hydrochloride was the most commonly prescribed medication within our study and considerably more prevalent than other ADHD medications.[3,6,14] This is unsurprising as it is recommended as the first-line medication for treating ADHD.[8] Modafinil was the least prevalent medication, likely due to a lack of recommendation for its use in children and adolescents with ADHD. International guidelines typically state that methylphenidate, amphetamines, atomoxetine, clonidine or guanfacine could be prescribed for the pharmacological treatment of ADHD in children.[8,11]

As noted previously, there is no evidence of an increase in the prevalence of ADHD diagnoses.[5] Polanczyk et al reported that, throughout 1985 to 2012, ADHD prevalence did not vary over time; rather, variability in ADHD prevalence could be explained by methodological differences between studies.[5] Therefore, the increase in ADHD medication prevalence over time is likely not due to an increase in the prevalence of ADHD. While our study cannot elucidate what may be underlying the increase in medication prevalence, potential explanations could be increased access to healthcare and medication, greater awareness, and changes to clinical practice.[24] It is important to note that the dispensing prevalence at the end of our study period (1% in 2016/17)

remained below the pooled worldwide prevalence of the disorder (3.4%), indicating that the medication is probably not over-dispensed. However, this does not mean that medicating every child with a diagnosis of ADHD should therefore be encouraged. The choice to medicate should depend on what is best for the child and family preferences, with particular consideration given to the benefits of going on medication against the potential risks associated with medication side effects.[11]

Consistent with our hypothesis, we found a higher dispensing prevalence in males than females. This mirrors the sex difference in ADHD prevalence, which has a male to female ratio of 3–4:1.[3] However, the relative increase in dispensing prevalence over time was much greater for females than males. ADHD has historically been harder to detect in females than males, as females tend to show primarily inattentive symptoms rather than more disruptive hyperactivity and impulsivity symptoms. The greater relative increase in dispensing prevalence for females may reflect increased recognition of ADHD in this group.[25] Nevertheless, the rate still remains consistently higher for males relative to females.

We observed the highest prevalence in ADHD medication dispensing in 7–12 and 13–17-year-olds, followed by a notably lower prevalence in 18–24-year-olds. The lowest dispensing prevalence was for very young children (1–6-year-olds). These findings also support our age-specific hypothesis. As noted previously, pharmacological treatments are not encouraged in pre-school children unless symptoms are severe, likely explaining the very low prevalence observed in this age band.[9] The lower prevalence for 18–24-year-olds could be due to the reduction in the severity of ADHD symptoms.[3] It may also be due to caution on the part of the prescriber over concerns regarding stimulant misuse and abuse. International guidelines do recommend that healthcare professionals monitor adolescents and adults receiving ADHD medication for signs of stimulant abuse.[11] However, the 18–24-year-old age group also had the greatest relative increase in ADHD dispensing prevalence (152%). One explanation for this could be improved detection of ADHD in adults.

Our results did not support our deprivation-specific hypothesis (ie, that dispensing prevalence would increase with deprivation level, except for the most deprived quintile which would show the lowest prevalence rates over time). While the most deprived quintile generally had the lowest dispensing prevalence for ADHD medication, this disparity was small. Furthermore, there were no clear differences in dispensing prevalence between quintiles 1–3. However, more deprived areas showed a smaller relative increase in dispensing prevalence. This suggests that there may be differences in access to medication over time for different socioeconomic groups, with more deprived areas having less access.

Consistent with our hypothesis, the European and Other ethnic groups showed the highest dispensing prevalence while Pasifika and Asian groups showed the lowest prevalence (though the greatest relative increase in dispensing prevalence). These disparities are similar, but do not exactly mirror ethnic differences in ADHD diagnosis. In the NZHS, the prevalence of parent-reported doctor-diagnosed ADHD was found to be highest in European/Other and lowest in Pasifika and Asian children.[16] However, the diagnosis prevalence for Māori children (2.4%) was similar to the diagnosis prevalence for European/Other (2.7%). This finding was not replicated in our study, where the dispensing prevalence for Māori children is lower than European or Other. Barczyk et al similarly observed lower dispensing prevalence among Māori for all psychotropic medication.[15]

This difference in relative disorder prevalence and relative dispensing prevalence for Māori may be due to barriers in accessing medication. Our results did indicate that for Māori, those in the most deprived quintile generally had the lowest dispensing prevalence, suggesting that financial barriers to access may play a role. However, cultural choices regarding treatment may also underly the lower dispensing prevalence. Indeed, whānau or community-based models of treatment are dominant in Māori culture and may be preferred over pharmacological interventions.[26,27]

For the European and Other ethnic groups, greater dispensing prevalence was observed for more deprived quintiles

(though these differences were small). In contrast, the least deprived quintile within Asian, MELAA and Pasifika groups had the highest dispensing prevalence by the end of the study period. These differences were small for the Asian and MELAA group but particularly pronounced for Pasifika. Additionally, those in the most deprived quintile generally had the lowest dispensing prevalence among Pasifika. While we did find that both Pasifika and Asian groups showed the greatest relative increase in dispensing prevalence over time, these results suggest that this increase may be driven by those from low deprivation areas. Overall, these results imply that there may be a barrier to accessing healthcare for certain groups, particularly Pasifika who come from more deprived regions. As such, these groups may need targeted support in the management of ADHD.

It is important to note that as we allow for the identification of multiple ethnicities, caution is advised when comparing one group to another. However, multi-ethnic identification represents the reality of many New Zealand children. Given that we are not running inferential statistics but describing general trends, we do not believe that this impacts the fidelity of our results. Caution is also advised when interpreting findings relating to the MELAA, Asian and Other groups, given their ethnic and cultural heterogeneity. Additionally, it is worth noting the considerable increase in Asian youth across the study period (Table 1), likely due to increased immigration. It may be of interest to investigate whether immigration status influences medication use for this group, particularly for psychotropic medication.

Our selection of medications for this study was primarily based on what is publicly funded for ADHD treatment in New Zealand (ie, methylphenidate hydrochloride, dexamphetamine sulfate, atomoxetine and modafinil).[13] However, we are also aware that clonidine is internationally recommended for ADHD treatment and appears to be used "off-label" for ADHD in New Zealand.[11] This is supported by our results, which show a doubling of the clonidine dispensing rate from 2007/08 to 2016/17. Furthermore, its dispensing prevalence is consistently higher than that of both dexamphetamine sulphate and atomoxetine combined. This suggests that it may be beneficial to subsidise clonidine for the treatment of ADHD in New Zealand.

In addition, a review of the most recent ADHD assessment and treatment guidelines is needed in New Zealand. Guidelines were last published by the New Zealand Ministry of Health in 2001 and do not mention all currently publicly funded medications in New Zealand (eg, atomoxetine), let alone internationally approved and recommended ADHD medications such as clonidine and guanfacine.[11,12] These guidelines also align with outdated diagnostic criteria from the DSM-IV rather than the current DSM-V. Any updated New Zealand guidelines should also consider the ethnic and socioeconomic disparities apparent in ADHD medication use, and take these into account in their recommendations so that equitable health outcomes can be achieved.

A limitation of this study is the absence of information on why the medication was dispensed. In some cases ADHD medication can be prescribed for narcolepsy, or hypertension.[13] Therefore, not all children dispensed a medication may have a diagnosis of ADHD. However, given that narcolepsy and hypertension are rare in children, we believe that non-ADHD prescribing will be rare in our sample.[28] While our results suggest that over-dispensing is likely not of concern in New Zealand, we cannot conclude whether New Zealand prescribing practices for ADHD medication are appropriate without complementary information on non-pharmacological treatments. Furthermore, the IDI only provides information on medication dispensings (ie, filled prescriptions), which may not reflect the total number of prescriptions given. However, despite these data limitations, the availability of a national dataset on pharmaceuticals that is linkable to sociodemographic data is an important strength. As a result, we were able to estimate the dispensing prevalence of ADHD medication for all New Zealand children and young people as well as subgroups. The availability of data over 10 years also allowed us to examine temporal trends in dispensing prevalence.

This study demonstrates that the dispensing of ADHD medication to children and young people is increasing over time in New Zealand but remains lower than the worldwide pooled prevalence of the disorder. There is evidence of differences in dispensing prevalence across ethnic and socioeconomic groups, suggesting disparities in ADHD medication use. To ensure that equitable health outcomes are achieved, investigating the reasons underlying these disparities is important. Further research that incorporates diagnostic and treatment information would also help determine whether current prescription practices are appropriate.

Statistics New Zealand Disclaimer

Access to the data presented was managed by Statistics New Zealand under strict micro-data access protocols and in accordance with the security and confidentiality provisions of the Statistic Act 1975. Our findings are not Official Statistics. The opinions, findings, recommendations, and conclusions expressed are those of the researchers, not Statistics NZ.

Access to the anonymised data used in this study was provided by Statistics NZ under the security and confidentiality provisions of the Statistics Act 1975. Only people authorised by the Statistics Act 1975 are allowed to see data about a particular person, household, business, or organisation, and the results in this paper have been confidentialised to protect these groups from identification and to keep their data safe.

Careful consideration has been given to the privacy, security and confidentiality issues associated with using administrative and survey data in the IDI. Further detail can be found in the Privacy impact assessment for the Integrated Data Infrastructure available from www.stats.govt.nz.

Competing interests:

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