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RESEARCH ARTICLE

Epidemiology of Treated Epilepsy in New Zealand Children

A Focus on Ethnicity

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Abstract

Background and Objectives

To determine the period prevalence and incidence of treated epilepsy in a New Zealand pediatric cohort with a focus on ethnicity and socioeconomic status.

Methods

This was a retrospective cohort study. The New Zealand Pharmaceutical Collection database was searched for individuals ≤18 years of age dispensed an antiseizure medication (ASM) in 2015 from areas capturing 48% of the New Zealand pediatric population. Medical records of identified cases were reviewed to ascertain the indication for the ASM prescription. Population data were derived from the New Zealand 2013 Census.

Results

A total of 3,557 ASMs were prescribed during 2015 in 2,594 children, of whom 1,717 (66%) children had epilepsy. An indication for prescription was ascertained for 3,332/3,557 (94%) ASMs. The period prevalence of treated epilepsy was 3.4 per 1,000 children. Children in the most deprived areas had 1.9 times the rate of treated epilepsy (95% confidence interval [CI] 1.6–2.2) as those from the least deprived areas. Prevalence was similar for most ethnic groups (European/other: 3.7, 95% CI 3.4–3.9; Pacific Peoples: 3.6, 95% CI 3.2–4.1; Māori: 3.4, 95% CI 3.1–3.8) apart from Asians, who had a lower prevalence of 2.3 per 1,000 (95% CI 2.0–2.6). However, when adjusted for socioeconomic deprivation, the prevalence of epilepsy was highest in European and similar in Māori, Pacific, and Asian children.

Discussion

This is the largest pediatric epidemiology epilepsy study where diagnosis of epilepsy was confirmed by case review. This is the first study to provide epidemiologic information for pediatric epilepsy in Māori and Pacific children.

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Glossary

ASM = antiseizure medication; **CI** = confidence interval; **DHB** = District Health Board; **MELAA** = Middle Eastern/Latin American/African; **NHI** = National Health Index; **NZDep** = New Zealand index of deprivation.

Epilepsy is the most common serious chronic neurologic condition in children and adolescents.[1] An international meta-analysis of 222 studies reported the period prevalence of active epilepsy in children ≤18 years old as 4.8 per 1,000 and incidence of epilepsy as 46.9 per 100,000. A lack of studies from Oceania, the region comprising New Zealand, Australia, Melanesia, Micronesia, and Polynesia, was noted.[2] There is extremely limited epidemiologic information for different childhood ethnic groups, with no robust data for indigenous children globally.

Epidemiologic studies of childhood epilepsy are essential as they quantify the burden of epilepsy in children. To adequately identify health inequalities and subsequently inform fair resource allocation, it is imperative to understand how ethnicity and socioeconomic status influence this burden.

We aimed to determine the period prevalence and incidence of treated epilepsy in children and young people (≤18 years) in New Zealand, with a focus on ethnicity and socioeconomic status. In the population census data prior to this study, New Zealand had a population of 4,242,051 people, of whom 1,044,863 were aged ≤18 years.[3] In the pediatric population, these comprised New Zealand European/other (55.7%); Māori, the New Zealand indigenous population (23.9%); Pacific Peoples (9.2%); and Asian Peoples (11.2%).[3] New Zealand provides a favorable setting for epidemiologic studies as it has a universal tax-funded national health service[4] and all dispensed pharmaceuticals are captured in a national database.

Methods

We reviewed the medical records of all New Zealand children in the Auckland, Northland, and Wellington regions prescribed an antiseizure medication (ASM) through the calendar year of 2015 to identify those with epilepsy.

Data Source

This was a retrospective cohort study using routinely collected data from the New Zealand Ministry of Health's Pharmaceutical Collection in conjunction with review of each child's medical records. In New Zealand, pediatric medical care is essentially delivered through the public health system, which is divided geographically into District Health Boards (DHBs). Every person who uses health services is assigned a National Health Index number (NHI). The Pharmaceutical Collection is a database of all community and hospital dispensed pharmaceuticals in New Zealand and thus captures all dispensed ASM prescriptions. In New Zealand, pharmaceuticals are subsidized by the national health system. They are free for children <13 years or individuals on a low income, with others paying $5 NZD for each 3-month prescription. The Pharmaceutical Collection database holds dispensing data linked to an individual's NHI number, age, ethnicity, DHB, and New Zealand index of deprivation (NZDep). However, this database does not record the indication for why the drug was prescribed.

Cohort Dispensed ASMs

The Pharmaceutical Collection was searched for all individuals aged ≤18 years resident in the Wellington (Capital and Coast, Wairarapa, and Hutt Valley DHB), Auckland (Auckland, Counties Manukau, and Waitematā DHB), and Northland (Northland DHB) regions who were dispensed an ASM in a 2-year period between January 1, 2014, and December 31, 2015. This cohort was called the ASM cohort. These health care regions represent 48% of the New Zealand pediatric population[9] and include both urban and rural areas. We searched for all approved or funded ASMs available in New Zealand over the 2-year study period: acetazolamide, carbamazepine, clobazam, clonazepam, ethosuximide, gabapentin, lacosamide, lamotrigine, levetiracetam, nitrazepam, oxcarbazepine, phenobarbital, phenytoin, primidone, sodium valproate, stiripentol, topiramate, and vigabatrin. Rescue medications were not included.

Cohort With Epilepsy

All children with epilepsy in New Zealand are diagnosed by a pediatrician or pediatric neurologist and then jointly managed by their family doctor and specialists. Standard care in New Zealand is that children with epilepsy have an EEG at diagnosis. To determine the indication for ASM prescription, public hospital medical records were reviewed for all NHIs identified using the 2015 dispensing Pharmaceutical Collection data search. These hospital records capture clinical information relating to all inpatient and outpatient pediatric hospital, emergency, radiology, and neurophysiology department visits. Electronic family doctor records were also reviewed where available. The medical specialty of the prescribing clinician was determined using the Medical Council of New Zealand registry.

Two authors, including at least one pediatric epileptologist, reviewed the clinical records for each individual. Individuals with a clear diagnosis of epilepsy, as per the 2014 International League Against Epilepsy definition,[5] were included in the study cohort (epilepsy cohort). In cases where there was doubt as to the diagnosis of epilepsy, a consensus opinion of at least 2 pediatric epileptologists was required for the case to be included in the epilepsy cohort. As all children with epilepsy were referred to specialists, family doctor files were used

predominantly to identify nonepilepsy indications for ASM prescription.

Variables

All demographic data were taken from the Pharmaceutical Collection records.

Socioeconomic Status

The NZDep is an area-based measure of socioeconomic deprivation derived from census data on income, home ownership, employment, qualifications, family structure, housing, and access to transport and communications. Deprivation index scores for small geographical areas are classified into quintiles from 1 (least deprived 20% of New Zealand population—high socioeconomic status) to 5 (most deprived 20% of New Zealand population—low socioeconomic status).[6] For individuals where the age, sex, ethnicity, or deprivation index changed for ASM dispensing records within the 2015 calendar year, demographic information was taken from the first record.

Ethnicity

We used ethnicity categories that correspond to the New Zealand census data.[3] In New Zealand, ethnicity is considered a measure of cultural affiliation. Ethnicity is self-reported, and people can belong to multiple ethnic groups. When an individual self-reports more than one ethnicity, national-level health data (including the Pharmaceutical Collection) use an ethnic prioritization algorithm to report only one ethnicity for that individual.[7] The categorization of ethnicity was conducted according to ethnicity data guidelines for health settings in New Zealand that combine ethnic groups into broad categories.[8] These principles are consistently applied across the case data (numerator, national health records) and population data (denominator, from the Census), avoiding numerator–denominator bias. Further disaggregation is not always possible (e.g., for the denominator data derived from the census) or may result in small cell counts that cannot be validly interpreted (e.g., disaggregation of Pacific ethnicities). The order of prioritization is as follows: Māori, Pacific Peoples, Asian, Middle Eastern/Latin American/African (MELAA), European, and Residual ("don't know" or "not stated") categories. Due to small case numbers and population counts in the MELAA category in New Zealand, a combined European/other group was made for reporting, combining these 3 groups (MELAA, European, and Residual), according to standard practice in New Zealand epidemiologic studies. The results for European/other group largely reflect the European ethnic group due to small numbers of the other ethnicities. The Pacific Peoples ethnic group includes any ethnicity indigenous to the Pacific region, excluding Māori. These are as follows: Pacific Island not further defined, Samoan, Cook Island Māori, Tongan, Niuean, Tokelauan, Fijian, and Other Pacific Island. The Asian ethnic group includes South East Asian, Chinese, Indian, Other Asian, and Asian not further defined.

Data Analyses and Statistics

New Zealand 2013 Census data were used to determine the denominators for rates by identifying the total number of individuals in the population aged ≤18 years from each region, further broken down by single-year age and NZDep quintile.[12] The New Zealand 2013 Census ethnicity population data were only available for particular age groups (0–4, 5–9, 10–4, 5–9, 10–14, and 15–19 years). As our epilepsy cohort included individuals ≤18 years of age, an approximation was made by taking 80% of the numbers from the census ethnicity data for 15- to 19-year-olds.

Period prevalence of treated epilepsy was determined using individuals who were dispensed an ASM any time in 2015, for whom the indication for the ASM was epilepsy based on clinical record review. The 1-year period prevalence was calculated by taking the total number of individuals with treated epilepsy and dividing by the total number of people in the population (derived from census data) and reported per 1,000 persons.

For the incidence analyses, newly treated epilepsy was defined as individuals identified as having epilepsy in the 2015 cohort who had a prescription in 2015 and did not have an ASM dispensed in 2014. Incidence was calculated as the number of cases of newly treated epilepsy divided by the total number of people in the population at risk of developing epilepsy during a 1-year period (using census-derived denominators for each region).

Period prevalence ratios and incidence rates were compared within age, ethnic, and socioeconomic deprivation (NZDep) groups. In New Zealand, there are proportionately more European and Asian people in the richer socioeconomic groups and proportionately more Māori and Pacific Peoples in the poorer socioeconomic groups. As ethnicity and socioeconomic deprivation are strongly related in New Zealand, Poisson regression analyses were performed to mutually adjust the prevalence and incidence rate ratios. An order 2 polynomial trendline was used for both prevalence and incidence data. R version 3.4.4 (R Institute) was used to organize the data and calculate rates with their 95% confidence intervals (CIs).

Ethical approval was obtained from the New Zealand Health and Disability Ethics Committee (17/STH/180) and the local ethics committee from each DHB.

Data Availability

Qualified investigators may request access to anonymized individual patient data including raw datasets, analysis-ready datasets, trial protocols, statistical analysis plan, and dataset specifications. Prior to the use of the data, proposals need to be approved by the New Zealand Health and Disabilities Ethics Committee and a signed data sharing agreement must be written. All documents will be available for 12 months.

Results

A total of 2,594 children and young people (0–18 years old) were dispensed at least 1 ASM during the 2015 calendar year. Following review of their medical records, 1,717 (66%) children had a confirmed diagnosis of epilepsy (55% male). A total of 2,594 children were prescribed a total of 3,557 ASMs. The indication for the ASM was identified for 3,332/3,557 (94%) ASMs. We could not identify an indication for 225 ASMs given to 217 individuals. The most commonly prescribed ASMs in these 217 individuals were topiramate (74/225 [33%]), gabapentin (31/225 [14%]), or acetazolamide (39/225 [17%]).

Period Prevalence

The period prevalence of treated epilepsy was 3.4 per 1,000 children (95% CI 3.2–3.5; Figure 1). Boys had a slightly higher prevalence (3.6 per 1,000, 95% CI 3.4–3.9) compared to girls (3.1 per 1,000, 95% CI 2.9–3.3). The period prevalence of epilepsy was similar across most ethnicities: European/other (3.7 per 1,000, 95% CI 3.4–3.9, n = 879), Māori (3.4 per 1,000, 95% CI 3.1–3.8, n = 351), and Pacific Peoples (3.6 per 1,000, 95% CI 3.2–4.1, n = 287), apart from Asian children, who had a lower period prevalence (2.3 per 1,000, 95% CI 2.0–2.6, n = 200).

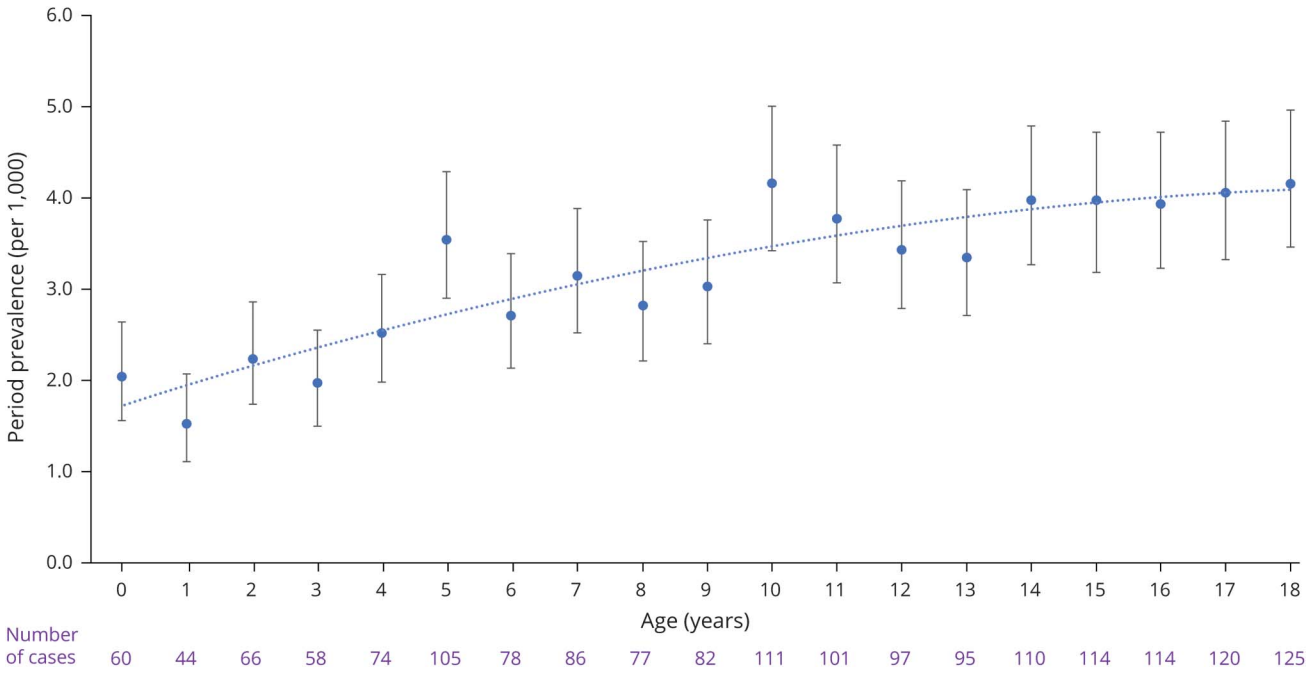
The period prevalence of treated epilepsy was associated with socioeconomic deprivation, with a higher prevalence of epilepsy in the more deprived quintiles (quintile 1: 2.7, 95% CI 2.4–3.0; quintile 2: 2.8, 95% CI 2.5–3.2; quintile 3: 3.1, 95% CI 2.7–3.5; quintile 4: 3.7, 95% CI 3.3–4.2; quintile 5: 4.4, 95% CI 4.0–4.7 per 1,000 children; Figure 2A). The Poisson regression analysis that adjusted for ethnicity was consistent with this difference being independent of ethnicity (Figure 2B). Individuals in the highest deprivation quintile (quintile 5) had almost twice the prevalence (rate ratio = 1.9, 95% CI 1.6–2.2; Figure 2B) of treated epilepsy than those in the least deprived group (quintile 1). There was a gradient in prevalence of diagnosed epilepsy with deprivation quintile: children from the least deprived backgrounds (quintile 1 and 2) were less likely to have diagnosed epilepsy than those from the most deprived backgrounds (quintile 4 and 5).

The period prevalence of treated epilepsy, unadjusted for socioeconomic deprivation, was similar for 3 ethnic groups (European/other: 3.7, 95% CI 3.4–3.9; Pacific Peoples: 3.6, 95% CI 3.2–4.1; Māori: 3.4, 95% CI 3.1–3.8), and significantly lower for Asian children (2.3 per 1,000, 95% CI 2.0–2.6; rate ratio 0.6, 95% CI 0.5–0.7 relative to European/other; Figure 3A). However, when adjusted for deprivation levels, the Poisson regression analysis by ethnic group showed a lower prevalence of treated epilepsy in Māori, Pacific Peoples, and Asian compared to the European/other group (Figure 3B).

Incidence

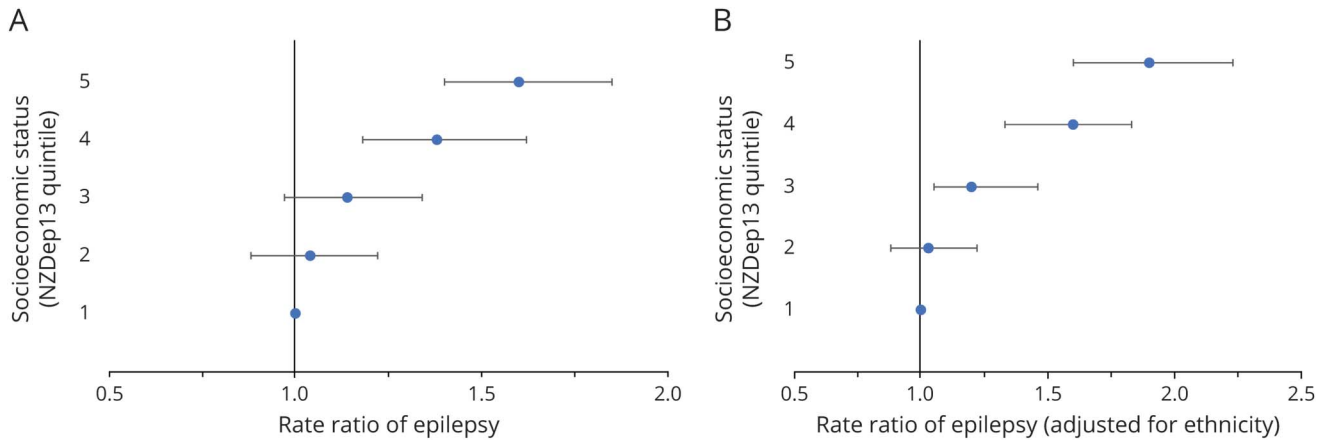
The incidence of newly treated epilepsy in children aged ≤18 years was 65.8 (95% CI 58.9–73.1) per 100,000 (n = 335; 57% male). The incidence was highest in the under 1-year-olds (144 per 100,000 person-years; 95% CI 105–195) compared

Figure 1 Period Prevalence of Treated Epilepsy in New Zealand Reported by Age



The number of children with newly treated epilepsy per 1,000 in a 1-year period is reported for each year of age. 95% confidence intervals and an order 2 polynomial trendline are shown.

Figure 2 Risk Ratio of Treated Epilepsy Reported by Socioeconomic Status



(A) Unadjusted rate ratio of epilepsy in different New Zealand index of deprivation (NZDep13) quintiles. (B) Rate ratio adjusted for the differences in ethnicity within the socioeconomic status NZDep13 quintiles. Using prevalence data, the risk of epilepsy in each quintile is presented relative to quintile 1 (the least deprived 20% of the New Zealand population). Risk ratios are presented with 95% confidence intervals.

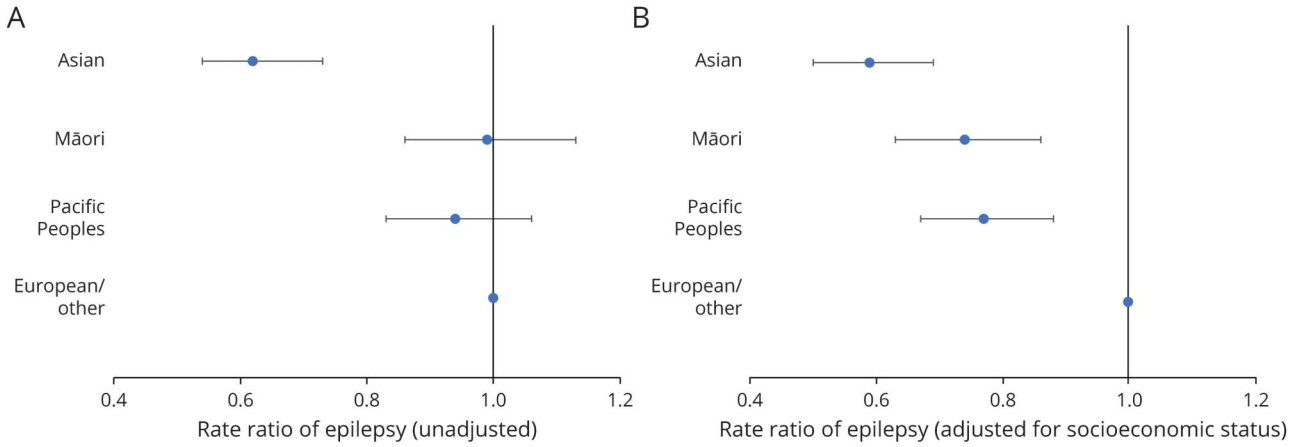
with older children (Figure 4). The Table summarizes incidence by sex, ethnicity, and socioeconomic deprivation.

Discussion

The period prevalence of treated epilepsy in New Zealand children was 3.4 per 1,000, with an incidence of newly treated epilepsy of 65.8 per 100,000 children (Figures 1 and 4 and Table). For the first time, we have determined the period prevalence in children of Māori and Pacific ethnicities. We compared this with the New Zealand European population and found a similar period prevalence across these 3 ethnic groups, which was significantly higher than for New Zealand children of Asian ethnicity. Interestingly, once we accounted for socioeconomic deprivation, the Māori and Pacific children had a significantly lower period prevalence than the European children, approaching that of Asian children (Figure 3B).

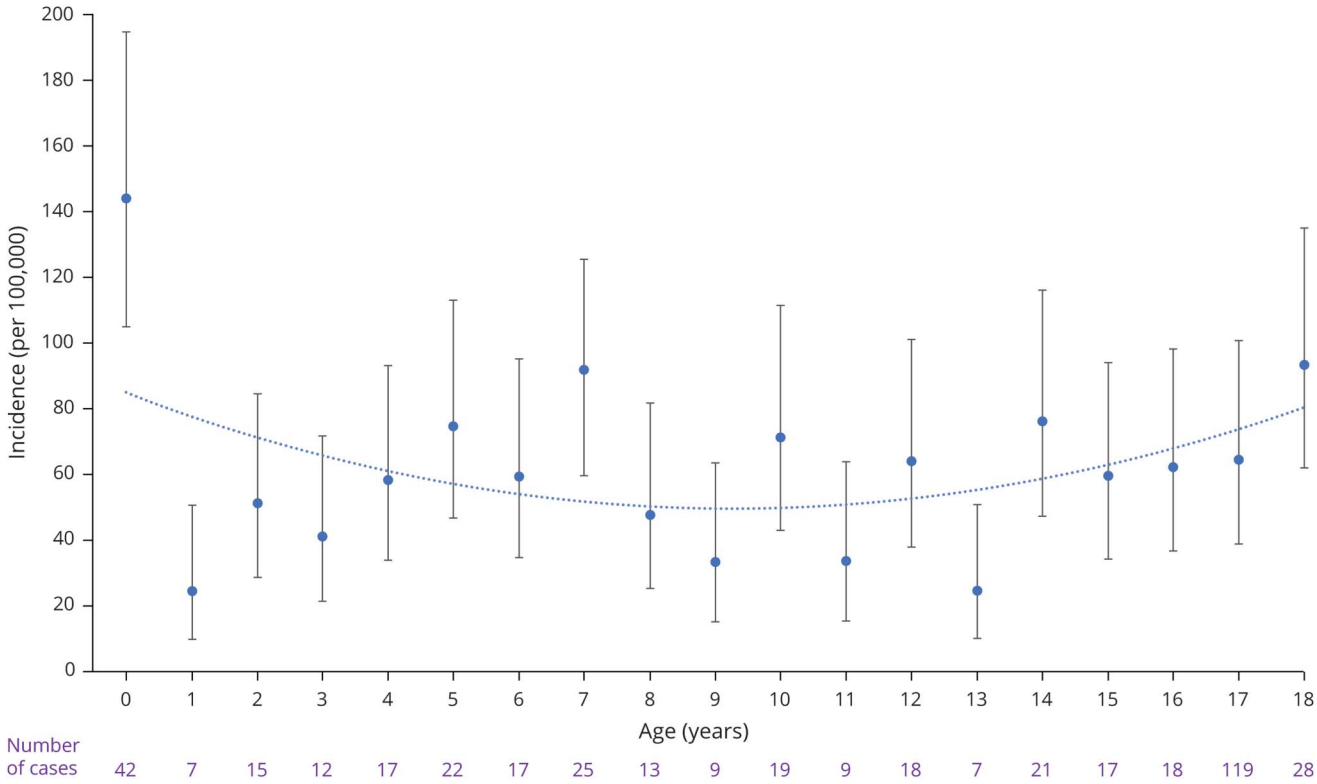
Polynesia is a region in Oceania defined by the triangle formed by New Zealand, Hawaii, and Easter Island. It includes New Zealand, the Cook Islands, French Polynesia, Niue, Samoa, Tonga, Norfolk Island, Pitcairn Islands, Tokelau, Tuvalu, Rotuma, Wallis, and Futuna. The indigenous peoples, Polynesians, share common ancestry demonstrated by their linguistic, cultural, and genetic similarities.[9] The New Zealand census gathers data on 2 Polynesian ethnic groups: Māori, the "tangata whenua" (people of the land) of New Zealand, and Pacific Peoples. The Pacific Peoples ethnic category includes

Figure 3 Risk Ratio of Treated Epilepsy Reported by Socioeconomic Status



(A) Unadjusted rate ratio of epilepsy in different ethnic groups. (B) Rate ratio adjusted for the differences in socioeconomic deprivation within different ethnic groups. Using prevalence data, the risk of epilepsy in each ethnic group is presented relative to the European/other group. Other includes Middle Eastern, Latin American, African, and residual responses. Risk ratios are presented with 95% confidence intervals.

Figure 4 Incidence of Treated Epilepsy in New Zealand Reported by Age



The number of children with newly treated epilepsy per 100,000 children in a 1-year period is reported for each year of age. 95% confidence intervals and an order 2 polynomial trendline are shown.

Samoan, Cook Island Māori, Tongan, Niuean, Tokelauan, Fijian, and indigenous people from other Pacific islands. Our study included 638 Polynesian children (351 Māori, 287 Pacific Peoples) with treated epilepsy, representing 37% of our epilepsy cohort.

As Māori and Pacific Peoples are overrepresented in the lower socioeconomic groups (quintiles 4 and 5) in New Zealand, we investigated whether the period prevalence of epilepsy in children of Māori and Pacific ethnicity was influenced by socioeconomic deprivation. Across our entire New Zealand cohort, children from the most deprived areas had twice the rate of treated epilepsy compared to the least deprived children (Figure 2B), consistent with previous studies examining socioeconomic factors.[10,11] In adults, the association of epilepsy prevalence with socioeconomic status can be partially explained by the negative effect of epilepsy on employment, a point that is of less relevance to children.[12] Another explanation may be that, in deprived populations, there is an increased frequency of acquired disorders associated with epilepsy, such as traumatic brain injury, brain infections, perinatal hypoxic ischemic encephalopathy, and other acquired neurologic insults.[13-16]

Focusing on the Māori and Pacific Peoples cohort, we adjusted for socioeconomic deprivation and found a lower period prevalence compared with the New Zealand European children. This is in striking contrast to 2 New Zealand studies of adults and children that, combined with New Zealand Ministry of Health data, show that more Māori and Pacific Peoples present with episodes of status epilepticus, more epilepsy-related emergency department visits, and a higher mortality rate compared to other ethnic groups.[17,18] This discrepancy is likely explained by their socioeconomic deprivation leading to poorer health outcomes more generally.[19]

The prevalence and incidence outcomes of our New Zealand cohort were consistent with those from high-income countries.[2,20,21] The interesting finding of lower period prevalence of epilepsy in affluent South-East Asian countries has been previously described[2,20-22] (Figures 1 and 3, A and B). Asian children represent 11.2% of the New Zealand pediatric population.[3] Although 70.4% of Asian children under age 15 years are born in New Zealand, more than 90% of their parents were not born in New Zealand.[23] Therefore, there may be some degree of "healthy migrant effect,"[24] in which immigrants are less likely to have chronic disorders than those who are native-born. After adjusting for socioeconomic deprivation, the prevalence of treated epilepsy in the Māori and Pacific children was similar to children of Asian ethnicity (Figure 3B). Genetic association studies provide evidence that Polynesian Peoples may have descended from South East

Table Incidence of Newly Treated Epilepsy in New Zealand Children and Adolescents in 2015

	Children/youth with newly treated epilepsy, n	Incidence per 100,000 person-years (95% CI)
Overall	335	65.8 (58.9–73.1)
Sex		
Male	191	73.4 (63.3–84.5)
Female	144	57.8 (48.8–68.1)
Ethnicity		
European/other[a]	153	63.7 (54.0–74.6)
Māori	77	75.5 (59.6–94.3)
Pacific Peoples	68	85.6 (66.5–108.6)
Asian	37	42.2 (29.7–58.1)
Quintile		
1	69	61.2 (47.6–77.4)
2	57	57.3 (43.4–74.3)
3	44	50.7 (36.8–68.0)
4	66	78.2 (60.5–99.4)
5	99	78.7 (63.9–95.8)

Abbreviation: CI = confidence interval.
[a] Other includes Middle Eastern, Latin American, and African groups.

Asians.[25,26] Our finding of a similar prevalence of epilepsy in Asian and Polynesian populations is intriguing and may be a reflection of their shared genetic ancestry.

Estimates of prevalence and incidence for pediatric epilepsy vary considerably.[2,27,28] This is not only due to actual differences between countries, but also due to differences in cohort ascertainment, epilepsy definitions, and analysis methods.[33] In prevalence studies it is crucial that the sample is representative of the target population and captures all cases.[29] Many countries have comprehensive databases that can be cross-referenced and searched for codes to identify children with epilepsy.[20,21,30-32] However, their results may be limited by both coder and system issues. These include the accuracy of the entered coding data and whether the available codes accurately identify the population of people with epilepsy. To improve big database methodology, validation of the epilepsy diagnosis is required. This needs to be done by clinicians with expertise in epilepsy who either perform a medical evaluation or undertake careful medical record case review. As this case definition approach is time intensive, accurate large sample sizes are challenging to acquire.[21,33-37] Our study had 1,717 children with epilepsy, making this the largest study of pediatric epilepsy where cases were diagnostically confirmed by individual case review.[2]

Our study is also notable for its inclusivity. As our cohort was derived from the Pharmaceutical Collections database, we captured every child resident in 3 regions of New Zealand who was dispensed an ASM over a 1-year period. These regions make up 48% of the entire New Zealand pediatric population. New Zealand has a subsidized pediatric public health system in which consultations and EEG studies are free and ASMs are free or low cost. Although this does not completely eliminate social and financial barriers to epilepsy diagnosis and therapy, it means that our study is likely to have detected almost all of the children with treated epilepsy during the study period. Given that we identified children dispensed an ASM at any time in a 12-month period, even individuals with relatively poor ASM adherence would be ascertained.

Following review of medical records, we were able to find an indication for 94% of the ASMs dispensed. Of the 225 ASMs in which the indication for the prescription was unknown, 39 were for a single prescription of acetazolamide from a family doctor, which was most likely for the prevention of altitude sickness during overseas travel.[38] Acetazolamide is not first-line choice for epilepsy and these children were not seen by a pediatrician or pediatric neurologist, and so are highly unlikely to have epilepsy. For the remaining ASM prescriptions with unknown indication, these children had no record of having an EEG so were unlikely to have epilepsy. They are therefore more likely to have had an ASM prescribed for headache, pain, or mood disorder.

In epidemiology, it is crucial that the target population is clearly defined. The data need to be a valid and useful measurement of the condition as it is used to inform health resource allocation.[29] Traditionally epilepsy epidemiologic studies have focused on cohorts of individuals with "active epilepsy," defined as an individual taking ASMs or having had a seizure within the past 5 years.[39] Our epidemiologic study differs in that our target population is children with treated epilepsy based on ASM dispensing. Therefore, we do not capture children who only ever have a single seizure, children with mild epilepsy syndromes such as self-limited epilepsy with centrotemporal spikes who are often not treated in New Zealand unless they have frequent seizures, children whose parents have opted for no therapy, and children who have weaned their ASM. For the pediatric population, data on "active epilepsy" will include many children who have weaned their ASMs after 2 years seizure freedom. These children no longer have seizures as they have outgrown their epilepsy and no longer actively require health resources. Our epidemiologic study provides complementary information about the impact of epilepsy, focusing on the prevalence of children with treated epilepsy who are likely utilizing health resources to manage their disease.

A potential limitation of the study is that we may have underascertained children in the lower socioeconomic groups. Although doctor visits and ASMs are free in New

Zealand, there are other financial barriers for these families such as transport and obtaining time off work for parents to attend appointments. This may affect Māori and Pacific children more as they tend to be in the lower socioeconomic groups and to live rurally where family doctors are scarce. For Māori and Pacific children with epilepsy, it is also possible there are potential differences in treatment decisions made by clinicians due to a child's ethnicity or by the families due to Māori and Pacific cultural beliefs. Engagement of clinicians with macron and Pacific families, and vice versa, may also affect the receiving and fulfilling of prescriptions. Little is known about attitudes towards epilepsy in these ethnic groups. A single study, interviewing 8 Māori people with epilepsy in 1999, noted that some Māori may hold traditional views that seizures are caused by spiritual events triggered by breaking "tapu" (sacred).[40] Another limitation of our study is that the aggregated nature of the census data by ethnicity means we are unable to determine differential rates of epilepsy for specific groups, such as for Chinese ethnicity. This also applies to individuals who identify with the MELAA category, who were grouped with the European ethnicity, as is standard in the New Zealand setting.

We ascertained the period prevalence for children with treated epilepsy in New Zealand and identify an association, independent of ethnicity, between socioeconomic deprivation and higher prevalence rates of children with treated epilepsy. We provide the first prevalence and incidence of treated epilepsy in Māori and Pacific children and show it is similar to New Zealand children of Asian ethnicity. This is the largest pediatric epidemiology study where the diagnosis of epilepsy has been confirmed by case review. Our results will help service providers understand the burden of pediatric epilepsy and inform decisions regarding equitable health resource allocation.

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Disclosure

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Appendix Authors

Name	Location	Contribution
Shayma Ali, BSc	University of Otago, Wellington, New Zealand	Designed and conceptualized study; acquisition of data; analyzed data; drafted the manuscript for intellectual content
James Stanley, PhD	University of Otago, Wellington, New Zealand	Statistical analysis of the data; drafted the manuscript for intellectual content
Suzanne Davis, MBChB, PhD	University of Otago, Wellington, New Zealand	Acquisition of data; drafted the manuscript for intellectual content
Ngaire Keenan, MBChB	University of Otago, Wellington, New Zealand	Acquisition of data; drafted the manuscript for intellectual content
Ingrid Eileen Scheffer, MBChB, PhD	University of Melbourne, Melbourne, Australia	Designed and conceptualized study; drafted the manuscript for intellectual content
Lynette G. Sadleir, MBChB, MD	University of Otago, Wellington, New Zealand	Designed and conceptualized study; acquisition of data; analyzed data; drafted the manuscript for intellectual content

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