AUTISM SPECTRUM DISORDER (ASD)

Introduction

Autism spectrum disorder (ASD) comprises a cluster of childhood onset neurodevelopmental conditions characterised by delays or difficulties in social communication and social interactions, and restricted and repetitive patterns of behaviour, interests or activities.[1] The diagnostic criteria in the DSM-5 for ASD[1] list two dimensions which must be present. The first is a persistent impairment in reciprocal social communication and interaction, for example, the failure to engage in reciprocal conversations, lack of eye contact, and not understanding social context such as nonverbal communication. The second is inflexibility in thinking and behaviour, characterised by repetitive or stereotyped movements and ritualised patterns of behaviour.

Prevalence studies across developed countries have identified individuals with ASD with an average prevalence of between 1% and 2% but there is considerable variation between countries and studies.[2] There has been much less research on the prevalence of autism in adults but it appears to be similar to that in children.[3] The ratio of males to females is around 3:1 among those with the most severe forms of ASD and around 8:1 among those with less severe forms of ASD.[4] According to the World Health Organization, the prevalence of ASD is increasing.[5] Changes in the diagnostic criteria, development in services, and greater awareness of the condition may explain the increase that is being seen worldwide, although other factors, as yet unknown, may contribute.[6]

The manifestations of ASD vary considerably, in severity, and by developmental stage and age.[1,7] Among young children aged 1–3 years, a lack of development in language and play can become more obvious with increasing age and there can be a gradual or rapid deterioration of social behaviours or language.[8] Increased social and educational demands can increase difficulties in these areas for children aged 5–8 years and feeling socially isolated or having relationship difficulties is likely to be experienced by adolescents and adults with ASD.[7]

There are a number of genetic conditions associated with autism including Down syndrome, fragile X, muscular dystrophy, neurofibromatosis, and tuberous sclerosis.[9] Other conditions associated with autism include birth defects associated with central nervous system malformation and/or dysfunction, such as cerebral palsy, and premature birth.[9,10] Research has indicated that around 70% of people with ASD met the criteria for one or more other psychiatric disorders, for example ADHD or anxiety, although they may not have received a formal diagnosis of such a disorder.[9] About half of the children with autism have an intellectual disability with an IQ below 70.[9] Epilepsy is substantially more common in people with autism than in the general population. especially in those who also have intellectual disability.[11]

Experiencing discrimination and stigmatisation, including unjust deprivation of health, education and opportunities to participate in community, is common for people with ASD.[5] Increased rates of diagnosis are putting greater demands on diagnostic services and on services providing care and support. Caring for people with ASD can be a very heavy emotional and economic burden for their families, particularly for families caring for people with severe ASD where access to services and support are inadequate.[5]

The following section reviews ASD in children and young people using information from the New Zealand Health Survey and National Minimum Dataset. The section concludes with a brief overview of evidence for good practice in caring for children and young people with ASD.

Data sources and methods

Indicators

> *Prevalence of autism spectrum disorder (ASD)*
>
> *Hospitalisations for ASD*

Definition

Prevalence of autism spectrum disorder (ASD)
Diagnosed Autism Spectrum Disorder (including Asperger's Syndrome) (2–14 years) [12] Child respondents (aged 2–14 years) are defined as having autism spectrum disorder if the child's parents or caregivers had ever been told by a doctor that the child has autism spectrum disorder*

Hospitalisations for ASD
Hospitalisations of 0–24 year olds with a diagnosis of autism spectrum disorder per 100,000 population

National trends and distribution

There were fewer than five deaths of 0–24 year olds with autism as the underlying cause of death in New Zealand from 2000 to 2013, as documented within the National Mortality Collection.

About one in a hundred children aged 2–14 years were reported to have received a diagnosis of ASD in the NZ Health Survey 2014/15.[12] **Figure 1** shows the percentage of children reported as having ever been diagnosed with ASD over the year of the NZ Health Surveys from 2006/07 to 2014/15. A greater percentage of children aged 5–9 years and 10–14 years were reported than those aged 2–4 years. The percentage for males was significantly higher than that for females (**Figure 2**).

Figure 1. Autism Spectrum Disorder (diagnosed) in 2–14 year olds, by age group and survey year, NZ Health Surveys 2006/07–2014/15
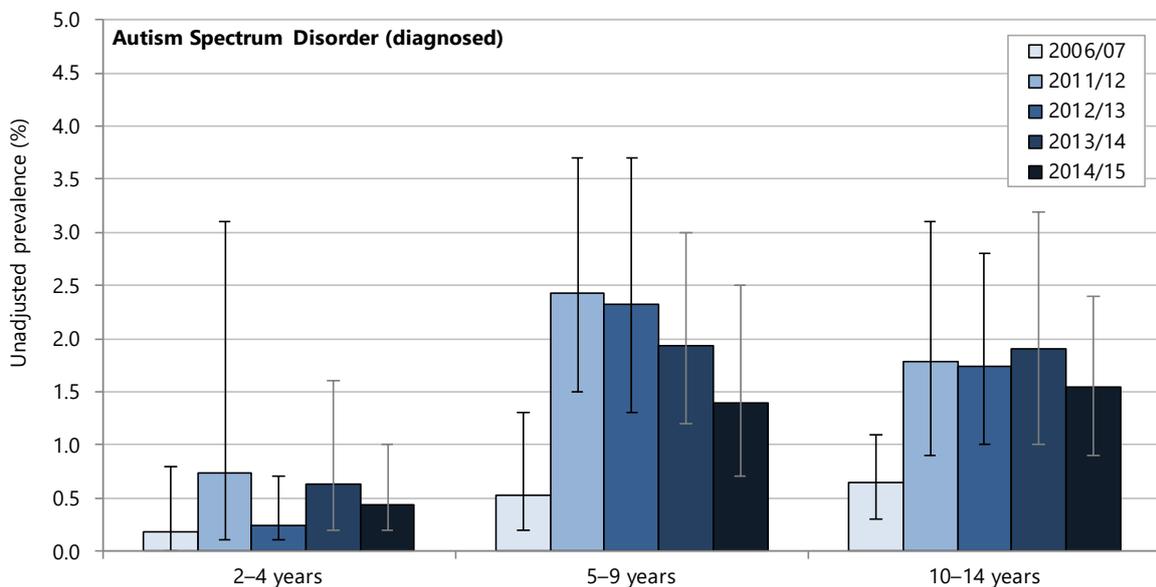
Source: NZ Health Survey; Diagnosed Autism Spectrum Disorder (including Asperger's Syndrome) (2–14 years); Percent of children (among children aged 2–14 years, by sex (unadjusted prevalence, 95% confidence intervals)

Figure 2. Autism Spectrum Disorder (diagnosed) in 2–14 year olds, by sex and survey year, NZ Health Surveys 2006/07–2014/15
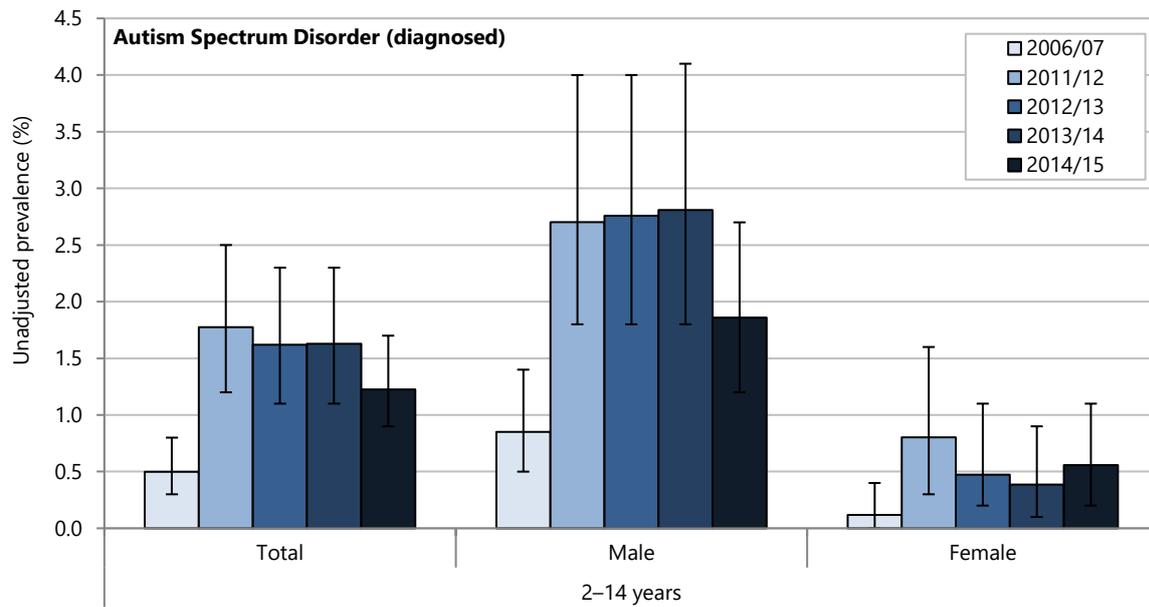
Source: NZ Health Survey; Diagnosed Autism Spectrum Disorder (including Asperger's Syndrome) (2–14 years); Percent of children (among children aged 2–14 years, by sex; (unadjusted prevalence, 95% confidence intervals)

Children aged 5–9 years and 10–14 years had higher rate of diagnosis than those aged 2–4 years, and European/Other children had higher rates than Māori, and both had higher rates than other ethnicities. There was little difference between the NZDep 2013 index quintile scores (**Figure 3**).

Males were more likely to be diagnosed with ASD than females (**Figure 4**) and of all the demographic factors collected, sex was the only factor that was statistically significantly different (**Figure 5**).

Figure 3. Autism Spectrum Disorder (diagnosed), by demographic factor, Health Survey 2014/15 NZ
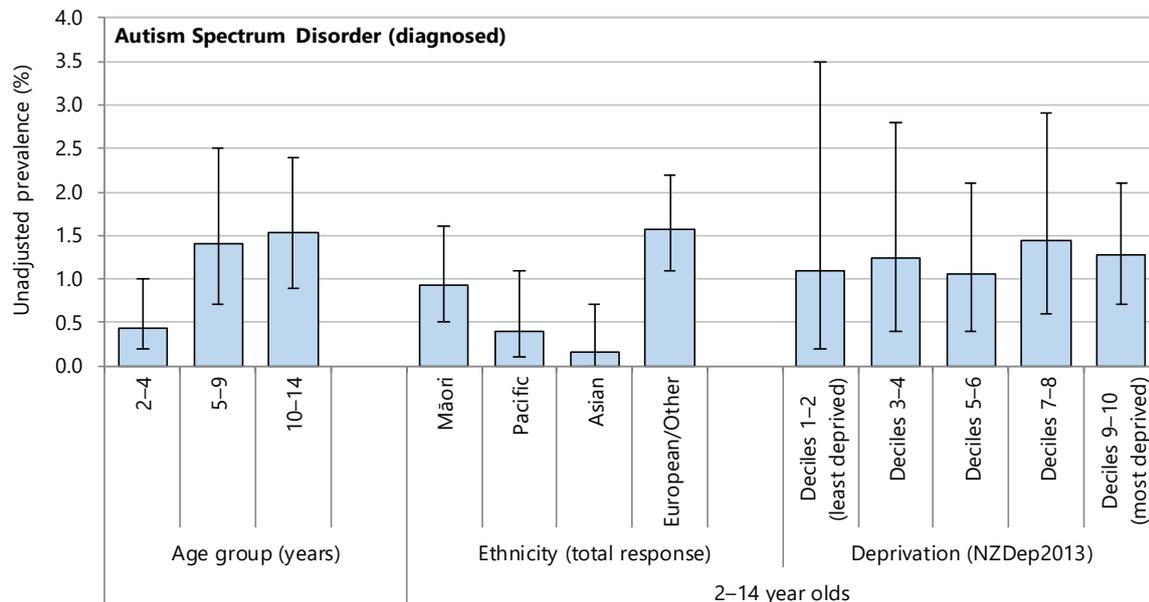

Source: NZ Health Survey; Diagnosed Autism Spectrum Disorder (including Asperger's Syndrome) (2–14 years); Percent of children (among children aged 2–14 years, by sex (unadjusted prevalence, 95% confidence intervals)

Figure 4. Autism Spectrum Disorder (diagnosed) in 2–14 year olds, by ethnicity and sex, NZ Health Survey 2014/15
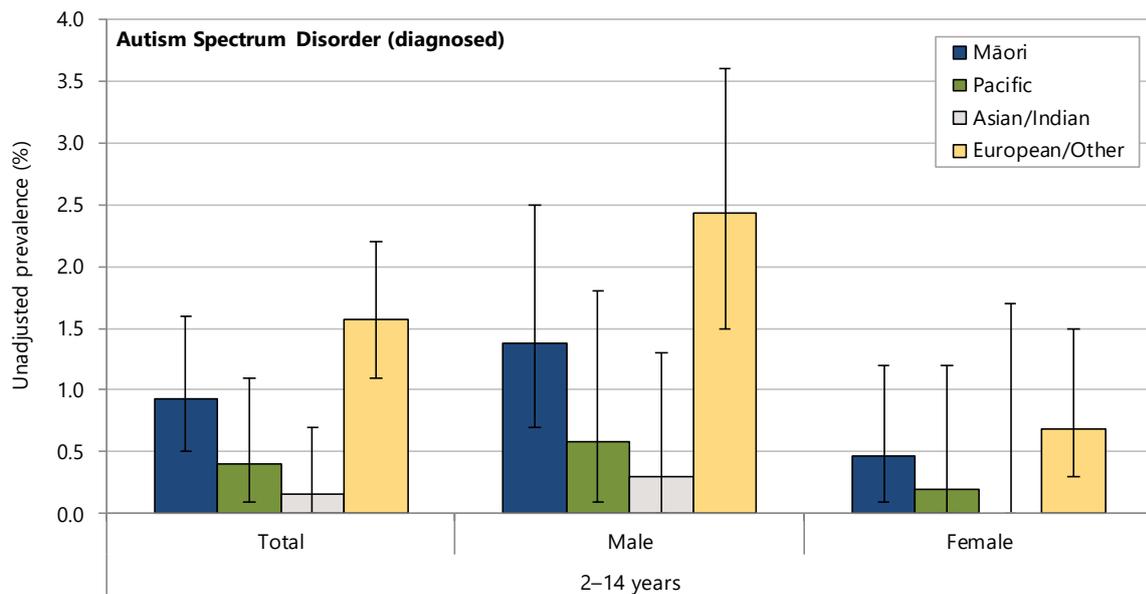
Source: NZ Health Survey; Diagnosed Autism Spectrum Disorder (including Asperger's Syndrome) (2–14 years); Ethnicity is total response

Figure 5. Comparisons for 2–14 year olds diagnosed with ASD, by demographic factor, NZ Health Survey 2014/15

Source: NZ Health Survey; Diagnosed Autism Spectrum Disorder (including Asperger's Syndrome) (2–14 years); Comparisons for children (among children aged 2–14 years) by sex, ethnic group, neighbourhood deprivation, 2014/15 (adjusted rate ratios, 95% confidence intervals). Ethnicity is total response

The number of 0–24 year olds hospitalised with autism or other pervasive developmental disorders (autism) between 2011 a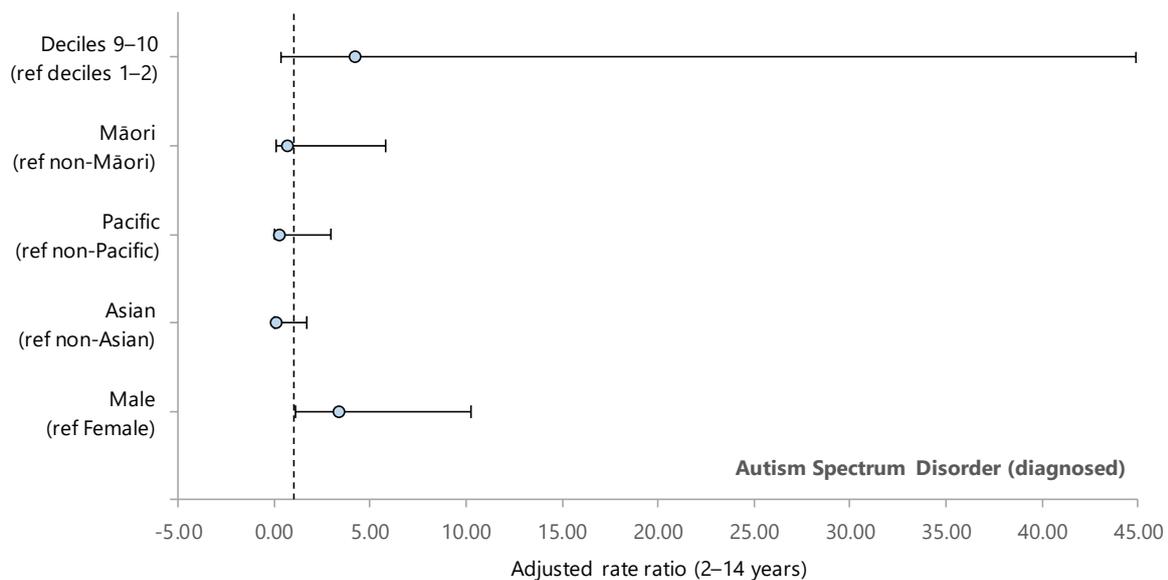nd 2015 is presented in **Table 1** together with the number of hospital discharges in which autism was documented as the primary diagnosis or as any diagnosis.

The rate of hospitalisations for autism has increased overall since 2000, particularly for 5–14 and 15–24 year olds. In all age groups the hospitalisation rate was consistently much higher where autism was documented within the first 15 diagnoses than for autism as the primary diagnosis (**Figure 6**).

Table 1. Individuals hospitalised with autism, 0–24 year olds, New Zealand 2011–2015

Age group	Unique individuals (n)	Hospitalisations (n)		Ratio All:Primary
		Primary diagnosis	All cases	
Autism				
Hospitalisation				
0–24 years	1,853	485	3,015	6.22
0–14 years	1,228	250	1,816	7.26
15–24 years	674	235	1,199	5.10

Source: National Minimum Dataset. 'All cases' corresponds to hospitalisations with autism or other pervasive developmental disorder listed in any of the first 15 diagnoses; Note: The sum of the age groups may total to more than the 0–24 year old total

Figure 6. Hospitalisations for autism in 0–24 year olds, by age group, New Zealand 2000–2015
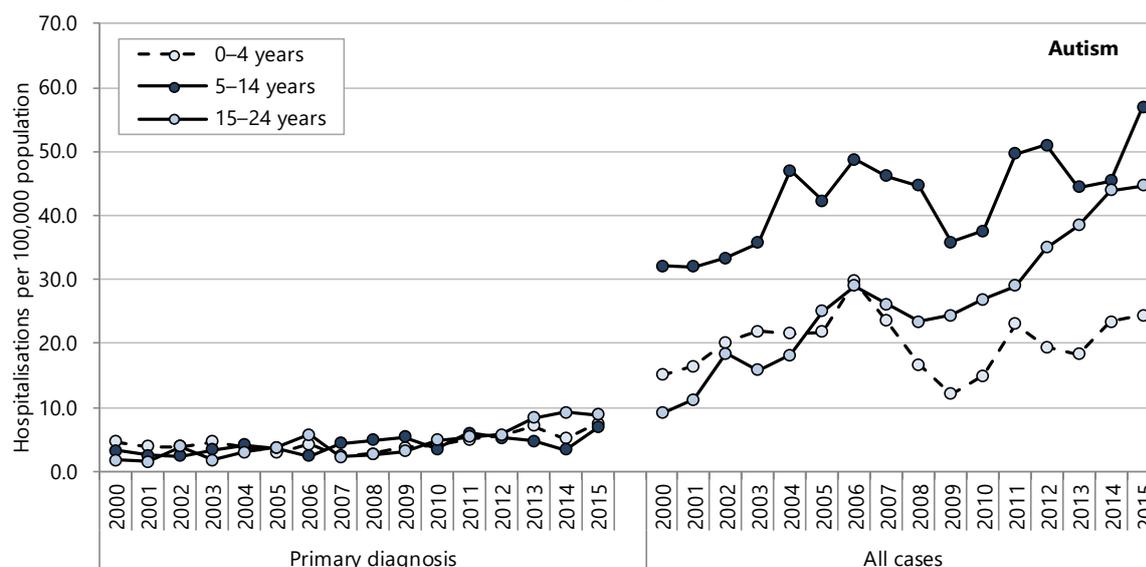
Numerator: National Minimum Dataset; Denominator: Statistics NZ Estimated Resident Population. 'All cases' corresponds to hospitalisations with autism or other pervasive developmental disorder listed in any of the first 15 diagnoses

Diagnosis

The most frequent primary diagnosis for 0–24 year olds hospitalised with any diagnosis of autism was dental caries. Only 16% of hospitalisations involving autism had autism or other pervasive developmental disorders as the primary diagnosis (**Table 2**).

Table 2. Hospitalisations involving autism in 0–24 year olds, by primary diagnosis, New Zealand 2011–2015

Primary diagnosis	2011–2015 (n)	Annual average	Rate per 100,000 0–	95% CI	%
Autism in 0–24 year olds					
New Zealand					
Childhood autism	340	68	4.43	3.98–4.92	11.3
Atypical autism	17	3	0.22	0.14–0.35	0.6
Rett syndrome	16	3	0.21	0.13–0.34	0.5
Asperger syndrome	83	17	1.08	0.87–1.34	2.8
Pervasive developmental disorders, other or unspecified	29	6	0.38	0.26–0.54	1.0
Total autism or other pervasive developmental disorders	485	97	6.31	5.78–6.90	16.1
Other mental and behavioural disorders	387	77	5.04	4.56–5.57	12.8
Dental caries	586	117	7.63	7.04–8.27	19.4
Other diseases of the digestive system	258	52	3.36	2.97–3.79	8.6
Other diagnoses	1,299	260	16.91	16.02–17.86	43.1
Total	3,015	603	39.25	37.88–40.68	100.0

Numerator: National Minimum Dataset; Denominator: Statistics NZ Estimated Resident Population. Autism = autism or other pervasive developmental disorder in any of the first 15 diagnoses

Demographic distribution

Table 3 presents the demographic distribution of individuals with autism hospitalised in New Zealand between 2011 and 2015. There was a social gradient among these individuals with significantly higher hospitalisation rates in areas with higher NZDep2013 scores (NZDep deciles 3–4 to 9–10) compared with those living in areas with the lowest scores (deciles 1–2). Hospitalisation rates for autism was significantly higher among males compared with females, and significantly lower for Māori, Pacific and Asian/Indian than for European/Other ethnic groups. Compared with 15–24 year olds, hospitalisation prevalence rates were significantly higher for 5–14 year olds and lower for 0–4 year olds.

Table 3. Individuals aged 0–24 years hospitalised with autism, by demographic factor, New Zealand 2011–2015

Variable	Unique individuals 2011–2015 (n)	Rate per 100,000 population	Rate ratio	95% CI
Autism in 0–24 year olds				
New Zealand				
NZ Deprivation Index quintile				
Deciles 1–2	278	19.59	1.00	
Deciles 3–4	335	25.05	1.28	1.09–1.50
Deciles 5–6	355	24.63	1.26	1.07–1.47
Deciles 7–8	448	27.58	1.41	1.21–1.63
Deciles 9–10	574	30.89	1.58	1.37–1.82
Prioritised ethnicity				
Māori	391	21.68	0.82	0.73–0.92
Pacific	131	18.49	0.70	0.58–0.84
Asian/Indian	220	22.95	0.87	0.75–1.00
MELAA	35	34.71	1.31	0.94–1.84
European/Other	1,086	26.43	1.00	
Gender				
Female	465	12.38	1.00	
Male	1,388	35.35	2.85	2.57–3.17
Age group (years)				
0–4	275	17.63	0.82	0.71–0.94
5–14	998	33.44	1.56	1.41–1.72
15–24	674	21.49	1.00	

Numerator: National Minimum Dataset; Denominator: Statistics NZ Estimated Resident Population. Autism = autism or other pervasive developmental disorder in any of the first 15 diagnoses; Rate ratios are unadjusted; Ethnicity is Level 1 prioritised; Decile is NZDep2013; Summation of components may equal more than the 0–24 year old unique total

Regional trends and distribution

While there was variation between DHBs in the prevalence of diagnosed autism in the New Zealand Health Surveys for 2011–2014 the small numbers of children with autism that were included in the survey samples means that differences between DHBs should be interpreted with caution (**Figure 7**).

Autism hospitalisation rates in South Island DHBs showed year-on-year variability, often due to relatively small numbers, with an overall rise from 2000 to 2015 particularly for all cases (**Figure 8**).

Figure 7. Autism Spectrum Disorder (diagnosed) in 2–14 year olds, by district health board, NZ Health Survey 2011–2014
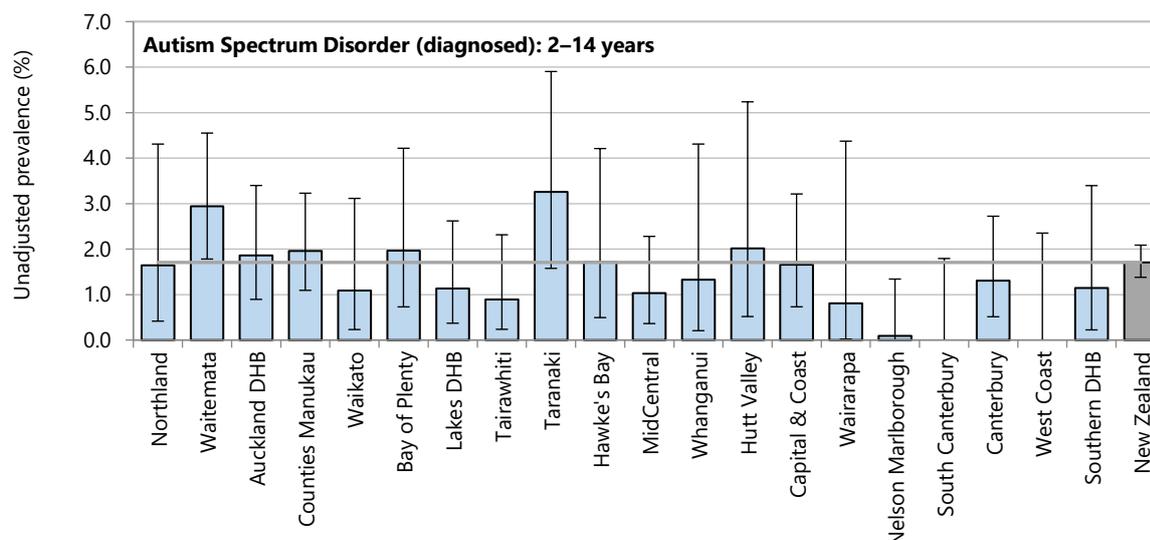
Source: NZ Health Survey

Table 4 presents the number of hospitalised individuals resident in each district health board that had a diagnosis of autism or other pervasive developmental disorder (autism) during 2011 to 2015. It also presents the number of hospital discharges in which autism was documented as the primary diagnosis or any diagnosis. The All:Primary diagnosis ratio reflects the extent to which hospitalisations of 0–24 year olds with autism occur when this condition is not the primary diagnosis and it provides an indication of the extent to which using only the primary diagnosis undercounts autism related hospitalisations. A high ratio may be associated with more thorough documentation and it may also indicate that children with autism are often hospitalised for other conditions. The high All:Primary diagnosis ratio for autism nationally and in the South Island DHBs with large enough numbers indicates that counting only hospitalisations with autism as a primary diagnosis will underestimate considerably the number and rate of hospitalisations of children and young people with this condition.

Table 4. Hospitalisations for autism in 0–24 year olds, South Island DHBs vs New Zealand 2011–2015

DHB	Unique individuals (n)	Hospitalisations (n)		Ratio All:Primary
		Principal diagnosis	All cases	
Autism in 0–24 year olds				
Nelson Marlborough	71	18	137	7.61
South Canterbury	14	<5	29	s
Canterbury	140	69	277	4.01
West Coast	12	<5	15	s
Southern	91	34	180	5.29
New Zealand	1,853	485	3,015	6.22

Source: National Minimum Dataset. Autism = autism or other pervasive developmental disorder. All cases = autism in any of the first 15 diagnoses; s = data suppressed due to small numbers
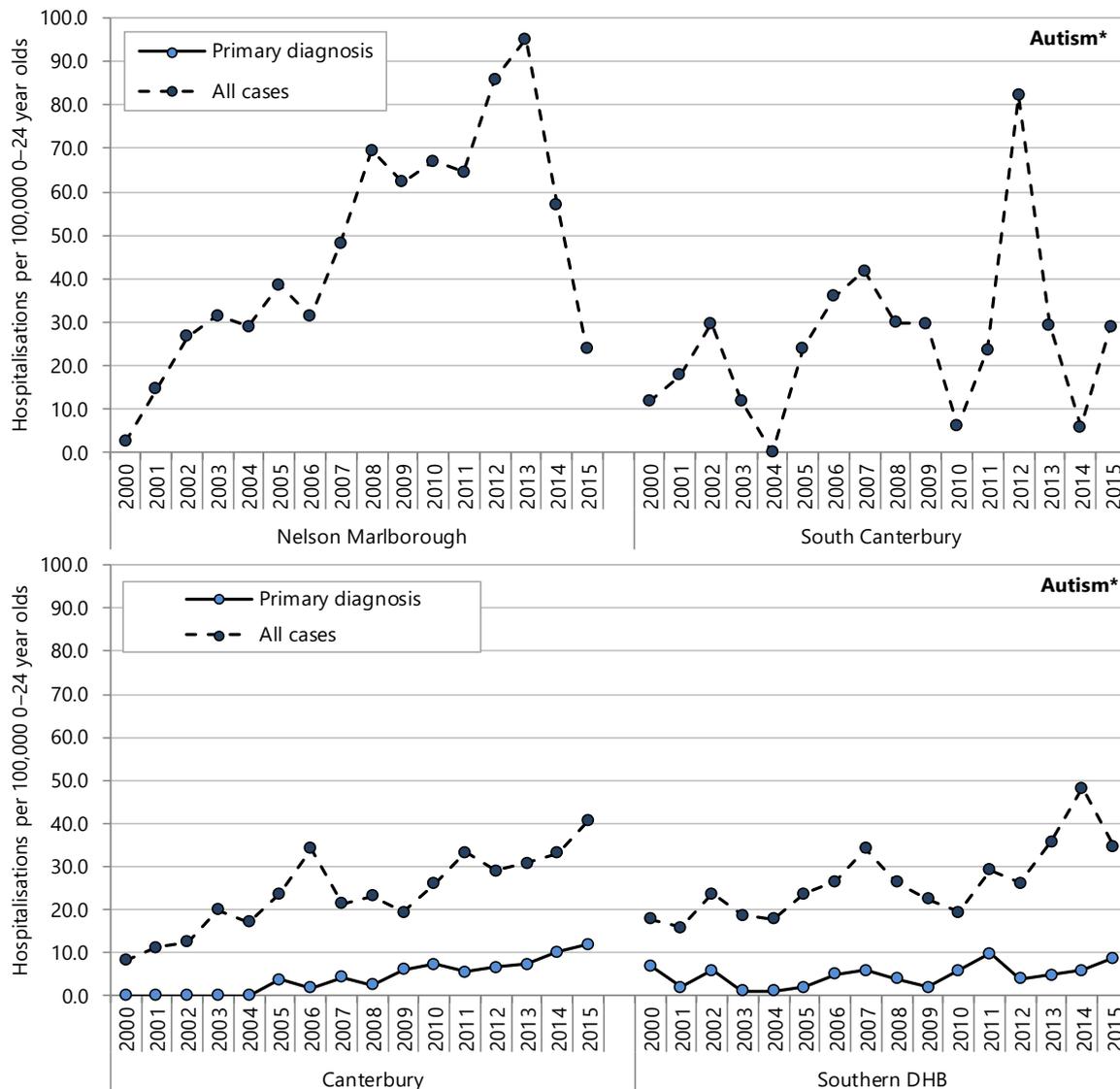
Figure 8. Hospitalisations for autism in 0–24 year olds, South Island DHBs 2000–2015

Numerator: National Minimum Dataset; Denominator: Statistics NZ Estimated Resident Population. 'All cases' corresponds to hospitalisations with autism or other pervasive developmental disorder (autism*) listed in any of the first 15 diagnoses. Note rates for South Canterbury are based on small numbers and suppressed for primary diagnosis, and all rates suppressed for the West Coast

Evidence for good practice

Possibilities for prevention

Currently there is no evidence that any intervention can prevent ASD in the general population. It is thought that interaction between complex genetic and environmental factors is the cause of ASD as parents have a greater likelihood of having a subsequent child with ASD if a previous child has this condition and it is common for identical twins to both develop ASD.[10] Increasing maternal and paternal age is associated with increased autism risk.[13,14]

Maternal use of sodium valproate for the treatment of epilepsy and other neuropsychological disorders is associated with a significantly increased rate of autism in offspring, even after adjusting for the increased risk associated with maternal epilepsy.[15] The absolute risk is still small, however, so women need to weigh the benefits of treatment to control their epilepsy against the potential risks for their unborn child.[15]

Current research is exploring factors that may potentially increase the risk of ASD in offspring, such as maternal infection,[16] mitochondrial dysfunction,[17] and possible overlap between risk genes for ASD, schizophrenia and bipolar disorder.[18]

Evidence-based care for children and young people with ASD

While there is no cure for ASD, interventions can help improve the quality of life for children with ASD in relation to some of the features, symptoms, behaviours and problems commonly associated with the condition.[19] Due to the heterogeneous nature of ASD no single intervention can be expected to work for all people with ASD.[5] Programmes that may be effective include behavioural therapy, educational interventions, speech therapy, occupational therapy, social skills therapy, and medication (for problems like attention, hyperactivity and sleep).[5]

Early diagnosis is important for children with ASD because early intervention may improve prognosis and because families can then be linked to information and support services.[20] Although the clinical diagnosis of ASD is based on behavioural criteria, a thorough diagnostic evaluation may detect comorbidities that have implications for the diagnosis, treatment and prognosis not only of the child himself or herself, but, in the event a genetic disorder such as fragile X is identified, for other family members including future siblings.[20]

Early intervention for communication, care and support

The quality of life for children with ASD is improved by early interventions to promote optimal development and wellbeing.[5] Efficacious interventions that address communication, social behaviour and behaviour inflexibility through psycho-educational, developmental, and behavioural methods are very labour intensive and therefore costly.[21]

Interventions should support both the individual with ASD and their family and carers.[5] A recent Cochrane review reported sufficient evidence of the effectiveness of parent-mediated interventions in treatment of ASD in young children. Child outcomes such as language improved when individual or groups of parents or carers were trained by professionals to be more observant and responsive during interactions with their child and improved communication skills decreased some of their other ASD related difficulties.[22]

It is good practice for local service providers to use approaches that facilitate parent participation in therapies.[22] Combining parent-mediated interventions with other locally available services can reduce the burden on parents. Non-specialists in school, family and community settings should task-share to deliver psychosocial interventions as this can increase access to care in low-resource settings. Changes that make the physical, social, and attitudinal environments more accessible, inclusive and enabling complement interventions for individuals with ASD.[21]

Music therapy

Music therapy has been shown to be better than a placebo, or standard care, for social interaction, non-verbal and verbal communication skills, initiating behaviour and social emotional reciprocity.[23] It is also better for social adaptation, joy, and quality of parent-child relationships.[23] There were no negative side effects. It is best delivered by specialists with academic and clinical training.[23]

Early intensive behavioural intervention (EIBI)

Early intensive behavioural intervention (EIBI) is widely used for increasing functional behaviours and skills in young children with ASD. It is based on the principles of applied behaviour analysis and delivered over multiple years at an intensity of 20 to 40 hours per week. There have been very few RCTs of EIBI but limited low-quality evidence suggests that children who received EIBI performed better than control children after 1-3 years of treatment on tests of adaptive behaviour, intelligence, social skills, communication and language, autism symptoms and quality of life.[24]

Assessment of ASD

A systematic review of tools used for measuring outcomes in anxiety interventions studies for children with ASD examined studies in which at least half the participants were aged 8–14 years.[25] Most studies were with children with high functioning ASD. The studies had small sample sizes but the review authors concluded that there is encouraging evidence that cognitive behavioural therapy (CBT) can be efficacious for children with ASD and anxiety disorder. Three questionnaires were considered to be robust: Spence Children's Anxiety Scale (revised), the Revised Children's Anxiety and Depression Scale and the Screen for Child Anxiety Related Emotional Disorders.

Assessment tools for anxiety are designed for typically developing children and young people, and there has been little discussion about whether these are appropriate for young people with ASD.[26] Based on available research, and a clinical consensus process where data were lacking, a set of recommendations has been developed to assist primary care providers with the assessment and treatment of anxiety in children with ASD.[27] This research has resulted in two sets of recommendations, the first for the assessment of anxiety as a systematic approach is needed to evaluate symptoms and factors such as the stage of development of the child. The second set of recommendations address the treatment of ASD associated anxiety, including coordination of care, education, modified cognitive behavioural therapy, and with care, possibly medication.

Childhood IQ is a reliable predictor of cognitive functioning in mid to later adulthood.[28,29] In people with higher IQ childhood scores, there appears to be greater IQ stability over time, however, even with an IQ that is above average, social outcomes in later life are generally poor.[28] A review of tools to measure outcomes for young children with ASD has recently been published.[30] It found that it is not yet possible to recommend fully robust tools and that there are gaps in outcome measurement tools for assessing the results of intervention studies, wellbeing and participation outcomes, and family quality of life outcomes, which are domains particularly valued by the review's informants (young people with ASD and parents).

Treatment for anxiety
It has been estimated that about 50% of children with ASD meet the criteria for at least one anxiety disorder. [31] A number of systematic reviews of treatments for anxiety in children and young people with ASD have been undertaken in recent years[26,31,32] yet there is a paucity of evidence for effective short and long term treatments.[26] The lack of large RCTs examining psychopharmacological treatment is of concern particularly given the concerns regarding adverse effects associated with certain selective serotonin reuptake inhibitors (a class of anti-depressant commonly used to treat anxiety). These include agitation, impulsivity, insomnia and disinhibition without manic symptoms.[26] There is potentially a problem with over prescribing, given the level of adverse effects.[26]

There is evidence that CBT is efficacious in achieving moderate improvements in a range of outcome measures in youth with high functioning ASD and anxiety.[31,32] In the absence of manuals specific to anxiety in ASD, the standard CBT treatment manuals for typically developing young people may be used if adapted according to the recommendations for ASD-specific content modifications that have been developed by the UK's National Institute for Clinical Excellence (NICE).[19,32] Cognitive behavioural therapy can be delivered in individual or group sessions, with or without parents.[31] Most studies of CBT have found it to be to be at least promising.[26] Although around 70% of youth with ASD and anxiety responded to CBT in research studies, the same success rate may not be achieved in clinical practice where compliance may be lower and individuals miss sessions thereby interrupting skill acquisition.[26] It is important that CBT is delivered by trained and experienced practitioners. There are limitations to the evidence base, especially related to small sample sizes and heterogeneity and there is a need for further research on a range of issues relating to the use of CBT in people with ASD.[33]

Interventions to reduce problem behaviours such as irritability and aggression
Mental health and behavioural problems are more prevalent in children with ASD than typically developing children.[34] Tantrums and rages may become chronic and disabling and limit opportunities for education and recreation.[34] They may also result in inpatient psychiatric care or residential placement.[34] Early intervention to reduce disruptive, aggressive and self-injurious behaviour is likely to improve cognitive functioning as an adult.[29] CBT does not appear to be an effective intervention for outwardly-directed aggression in children with intellectual disabilities.[35]

A multidisciplinary team sponsored by the Autism Intervention Research Network on Physical Health and Autism Speaks Autism Treatment Network have developed a practice irritability and aggression pathway for primary care practitioners caring for children with ASD.[34] It has not yet been tested in primary health care settings.

The atypical antipsychotics, particularly risperidone and aripiprazole, are effective in reducing irritability, stereotypical behaviours and hyperactivity.[36,37] They are the only two medications approved by the US FDA for treating aggression, self-injury and tantrums in children with ASD.[37] They are commonly associated with metabolic adverse events, including weight gain and dyslipidaemia.[37] Methylphenidate is effective in reducing attention-deficit hyperactivity disorder (ADHD) symptoms in children with ASD and ADHD.[37] Atomoxetine and alpha-2 agonists appear effective in reducing ADHD symptoms.[37] Selective serotonin reuptake inhibitors do not reduce repetitive behaviours in children with ASD, and often cause adverse events.[37] The efficacy of

antiepileptic drugs is inconclusive.[37] The efficacy and tolerability of pharmacotherapy in children with ASD are generally less favourable than in typically developing children with similar symptoms. Newer agents, including glutamatergic agents and oxytocin, appear promising but results from trials have been mixed. [37]

Behavioural interventions combined with anti-psychotic medication may be more effective in treating aggression in people with ASD than either intervention alone.[38,39]

ASD and sleep
The prevalence of sleep difficulties among children with ASD has been estimated to be from 50% to 80%. Medications for sleep problems that are commonly used in children with ASD include melatonin, α-agonists, anticonvulsants, antidepressants, atypical antipsychotics, and benzodiazepines.[40] Although medication may improve sleep in the short term this can be at the cost of worsening daytime behaviour.[40] Further research is needed to develop evidence-based interventions for promoting night time sleep in children with ASD.[40]

Evidence-based health care for children and young people with autism

These national and international guidelines, systematic reviews, other publications and websites relevant to the prevention and management of autism are provided for further reading.

New Zealand guidelines
- Ministries of Health and Education 2016 New Zealand Autism Spectrum Disorder Guideline (2nd edn) Wellington: Ministry of Health. http://www.health.govt.nz/publication/new-zealand-autism-spectrum-disorder-guideline]

International guidelines
The National Institute for Health and Care Excellence (NICE)

- NICE Pathway – Autism spectrum disorder: https://pathways.nice.org.uk/pathways/autism-spectrum-disorder
- NICE: Recognition, referral and diagnosis of autism in children and young people from birth to 19 years (clinical guideline 128): https://www.nice.org.uk/guidance/cg128
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- Kidshealth (New Zealand site) http://kidshealth.org/en/teens/autism.html#

- Ministry of Health. How is ASD diagnosed? http://www.health.govt.nz/publication/how-asd-diagnosed

- Ministry of Education: ASD information supporting children and young people with ASD and resources for working with students who have ASD http://www.education.govt.nz/school/student-support/special-education/supporting-children-and-young-people-with-autism-spectrum-disorder-asd/

- Altogether Autism (A free, nationwide ASD information and advisory service in New Zealand) http://www.altogetherautism.org.nz/

- Mental Health Foundation of New Zealand https://www.mentalhealth.org.nz/get-help/a-z/resource/8/autism-spectrum-disorders

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