Atlas of Healthcare Variation Methodology | Asthma

General points:

- Data are not presented where the number of people was less than 10. This is to preserve confidentiality.
- People were assigned to their district health board (DHB) of domicile unless otherwise noted. Where more than one domicile was recorded, the most recent value was selected.
- Ethnicity data presented is prioritised ethnic group (Māori, Pacific peoples, Asian and European/Other). For people reporting multiple ethnic groups, the most recent value was selected.

Standard deviation
Data are presented as standard deviation from the mean. Standard deviation is a statistical measure of variation from a mean. Assuming that recorded instances are normally distributed (ie, they are in the usual 'bell-shaped curve'), 68 percent of all recorded instances would be expected to be within one standard deviation either side of the mean and 95 percent within two standard deviations.

Confidence intervals
Data for each DHB are presented as rate per 1,000 population. Upper and lower confidence intervals were calculated to 95 percent level of confidence.

Age groups	
Children	The age used in the Atlas for children is 0-14 years. This is in line with guidelines. Children aged 0-4 years were not included in indicators looking at medication use as they are a distinct group. Not all will respond to ICS therapy and of those who do, only some will have asthma at school age or as an adult. For these reasons, it was considered including preschool children in an indicator of regular ICS use would be difficult to interpret. Childhood admissions in this age group are included to show the burden of disease of asthma and wheeze, and a proportion of those admitted as pre-schoolers will have asthma as a school child and adult. The Expert Advisory Group developing this Atlas noted the issue of diagnosing asthma in those aged under 5. However, given both their high rate of admissions and that some will go on to develop asthma, it was considered both informative and appropriate to present these data.
Adults	For adults, the age presented in the Atlas was restricted to those aged less than 50 years. This is because the accuracy of the diagnosis of asthma of those aged 50 years and over is reduced because of the increasing likelihood of a diagnosis of COPD.

Prevalence
The New Zealand Health Survey presents indicators showing the percent of resident population who answered yes to the questions 'have you ever been told by a Doctor you have asthma' and 'do you use medication (inhalers, medicine, tablets or pills) for this condition?' A breakdown showing the percent of the population who answered yes by DHB is available for download on the Ministry's website: http://www.health.govt.nz/nz-health-statistics/national-collections-and-surveys/surveys/current-recent-surveys/new-zealand-health-survey These data should be interpreted with some caution as in smaller DHBs the sample size is low.

Hospital admissions due to asthma	
Admission type	Both acute (AC) and acute arranged (AA) admission types are included. An acute arranged admission is a non-acute admission with an admission less than seven days after the date the decision was made that the admission was necessary.
Emergency department admissions are included	ED attendances meeting the three-hour rule were included as admissions in this Atlas. This method is consistent with the New Zealand Child and Youth Epidemiology Service (www.otago.ac.nz/nzcyes). Counting all admissions (ED admission and hospital admissions) is considered the most robust way to ensure consistency between DHBs, particularly in children as different DHBs handle admissions differently. Some for example use an inpatient service to manage all their paediatric work, whereas others have short stay units.
Primary or secondary diagnoses	As part of this Atlas, we considered whether to include those with a primary diagnosis of asthma or a primary diagnosis of respiratory disease where there was a secondary diagnosis of asthma. Analysis showed the 49% of those with a secondary diagnosis of asthma had a primary diagnosis of respiratory disease, of which pneumonia was the most frequent. However, the inclusion of admissions with a secondary diagnosis of asthma and a primary diagnosis of respiratory disease did not have large impact on admission rates overall. By DHB, the increase was typically by 0.1 - 0.3/1000 population. For ease of interpretation and local replication, it was decided only to present those admitted with a primary diagnosis of asthma. It is suggested however that this group with a primary diagnosis of respiratory disease and a secondary diagnosis of asthma also be considered for further analysis locally.

Indicator #1:	Children admitted to hospital one or more times in a year with a primary diagnosis of asthma or wheeze
Numerator	The number of children aged 28 days to 14 years admitted one or more times in the calendar year with a primary diagnosis of asthma or wheeze.
Denominator	Children aged 0 to 14 years, Statistics NZ population projections
Data source	NMDS, Statistics New Zealand
Analysis	Code: J45-46, R06.2

	Total, by years (2012, 2013, 2014, 2015, 2016, 2017, 2018) and by age group: 0-4, 5-9, 10-14, by ethnicity (M, P, O) and gender Age at discharge. All admissions including ED admissions meeting the 3 hour rule.
Comment	This indicator shows the number of children admitted one or more times in the calendar year with a primary diagnosis of asthma or wheeze. It presents the number of children admitted in a year rather than the number of admission events, readmissions are looked at separately in another indicator.
Rationale	Hosptial admissions with asthma are considered to be potentially preventable by addressing exposure to risk factors eg, parental smoking, good access to primary healthcare and the appropriate use of preventer medication. OECD Health at Glance (2011) reported that New Zealand has a high rate of asthma admissions compared with other similar countries.
Further analysis	See Appendix One at the end of this document for an analysis comparing the use of codes for wheeze and asthma by DHB.

Indicator #2:	Adults aged 15 to 49 years admitted one or more times with a primary diagnosis of asthma
Numerator	The number of adults 15 - 49 years admitted to hospital one or more times with a primary diagnosis of asthma in the calendar year
Denominator	General population aged 15 years and over, Statistics New Zealand population projections
Data source	NMDS, Statistics New Zealand
Analysis	Code J45-46 Total, by years (2012, 2013, 2014, 2015, 2016, 2017, 2018), by age group: 15-24, 25-49, 50 and over, by ethnicity: (M, P, O) and by gender
Rationale	As for indicator 1.

Indicator #3:	People with at least two admissions with a primary diagnosis of asthma or wheeze for children within 90 days of each other
Numerator	The number of people with a hospital admission with a primary diagnosis of asthma within 90 days of discharge. Days were calculated by counting the number of days between the discharge date of the previous admission and the start date of the most recent admission (admit date). Admission could occur at any hospital.
Denominator	Those aged 1 year and over with an admission with a primary diagnosis of asthma
Data source	NMDS, Statistics New Zealand
Exclude	Exclude admissions that result in a transfer
Analysis	Code J45-46 Total, by years (2012, 2013, 2014, 2015, 2016, 2017, 2018), by age group: 1-4, 5-9, 10-14, 15-24, 25-49, 50 and over, by ethnicity: (M, P, O) and by gender

	Include acute and acute arranged admission types
Rationale	A high rate of admission within 90 days of discharge suggests there may be room for improvement in discharge planning or continuity of care.

Indicator #4:	People with at least two admissions with a primary diagnosis of asthma or wheeze in children within 91-365 days of each other
Numerator	The number of people with a hospital admission with a primary diagnosis of asthma in the previous 91 to 365 days. Days were calculated by counting the number of days between the discharge date of the previous admission and the start date of the most recent admission (admit date).
Denominator	Those aged 1 year and over with an admission with a primary diagnosis of asthma or wheeze in children in the year.
Data source	NMDS, Statistics New Zealand
Analysis	Code J45-46 Total, by years (2013, 2014, 2015, 2016, 2017, 2018), by age group: 1-4, 5-9, 10-14, 15-24, 25-49, 50 and over, by ethnicity (M, P, O) and by gender Include acute and acute arranged admission types
Rationale	High readmission rates in the 91-365 post the first admission highlight the potential for community follow-up of patients admitted with asthma.

Indicator #5:	People not dispensed ICS regularly in the year after admission.
Numerator	People not dispensed inhaled corticosteroid in two or more quarters in the year after discharge.
Denominator	Those admitted with a primary diagnosis of asthma (adults) or children admitted with a primary diagnosis of asthma or wheeze.
Data source	Pharms and NMDS
Analysis	Code: adults – J45-46. Children J45-46 and R06. By year (2013, 2014, 2015, 2016, 2017, 2018), by age group: 5-9, 10-14, 15-24, 25-49, 50 and over, by ethnicity, gender. The year presented is that of the dispensing, previously it was displayed as the year of discharge. For people with more than one admission in a year, if one admission met the criteria of two or more dispensing of ICS then they were excluded from the numerator.
Medicines included	Inhaled corticosteroids: fluticasone (1065), beclomethasone dipropionate (1108) and budesonide (1168) Inhaled corticosteroids with long-acting beta-adrenoceptor agonists: budesonide with eformoterol (3758) and fluticasone with salmeterol (3858).
Rationale	High rates not on regular ICS in the year post discharge highlight potential deficiencies in the ongoing chronic condition management. There is some evidence that ICS use following discharge can reduce readmissions[1].

	The NZ Adult Asthma guideline contains the following practice point: *'Most patients presenting with acute exacerbations of asthma should have a course of oral prednisone, 40mg daily for at least 5 days. All patients should have an ICS started, or current use reinforced.'* Analysis of the data shows that around 50% of those admitted were dispensed an ICS within 30 days of discharge, with ICS use reducing in the 31-365 days post-admission. For this reason, this indicator includes a dispensing in at least two quarters in the year. 1. Sadatsafavi M, Lynd LD, De Vera MA, Zafari Z, FitzGerald JM. One-year outcomes of inhaled controller therapies added to systemic corticosteroids after asthma-related hospital discharge. Respir Med. 2015 Mar;109(3):320-8.

Indicator #6:	People (0 - 49) not given a funded influenza vaccine in the year after admission
Numerator	People aged 0 – 49 years admitted in the previous year with a primary diagnosis of asthma who did not receive a funded influenza vaccine in the year following discharge
Denominator	Those admitted with a primary diagnosis of asthma (adults) or children admitted with a primary diagnosis of asthma or wheeze.
Data source	NMDS, Pharms
Analysis	Code: adults – J45-46. Children J45-46 and R06. Age group: 0-49 years. Pharmaceutical claims in the 365 days post-discharge are included. This includes claims occuring in 2016. The year presented is that of the dispensing, previously it was displayed as the year of discharge. Flu vaccinations that are administered in hospital, or self-funded or funded by another third party won't be included here. It is expected that self-funded/alternately funded is likely to biased towards working age groups. Vaccination in hospital may be biased towards children, depending on local practice.
Rationale	Those who have a hospital admission for asthma are recommended to receive regular ICS therapy to manage their asthma. Influenza vaccine is also considered part of their preventive care. Pharmac funds the influenza vaccine for this group. Pharmac's criteria for funded influenza vaccine are: The criteria for funding include (only relevant criteria are shown): a) people under 65 years who have asthma, if on a regular preventative therapy, or b) children aged four years and under who have been hospitalised for respiratory illness or have a history of significant respiratory illness. High rates of people not receiving free funded flu immunisation in the year post discharge highlight the potential for ongoing chronic condition management.

Indicator #7:	People regularly dispensed SABA who were not dispensed preventer during the year
Numerator	The number of people who were dispensed SABA in two or more quarters and who were not dispensed preventer in the year
Denominator	People dispensed SABA in two or more quarters in a year
Data source	Pharms
Analysis	By year, ethnicity (M, P, A, O), age (5-9, 10-14, 15-24, 25-49, 50+),
Medicines included	SABA (relievers): beta-adrenoceptor agonists – salbutamol (2096) and terbutaline (2404) Preventers: • Inhaled corticosteroids: fluticasone (1065), beclomethasone dipropionate (1108) and budesonide (1168) • Inhaled long-acting beta-adrenoceptor agonists: salmeterol (1066) and eformoterol fumarate (1083) • Inhaled corticosteroids with long-acting beta-adrenoceptor agonists: budesonide with eformoterol (3758) and fluticasone with salmeterol (3858). • Leukotriene antagonists: montelukast (3967) • Mast cell stabilisers: sodium cromoglycate (2144)
Rationale	High rates of people not receiving any preventer medication despite regular SABA use highlights the potential for ongoing chronic condition management. The NZ Adult Asthma guideline identifies that good control of asthma shows little use of reliever medication (less than two days per week). The guideline recommends that ICS therapy is introduced if patients have symptoms ≥2 times in the last week, but there is also evidence of benefit in patients with less frequent symptoms.

Table. Definition of levels of recent asthma symptom control in adults and adolescents (regardless of current treatment regimen)

Good control	*Partial control*	*Poor control*
All of: • Daytime symptoms ≤2 days per week • Need for reliever ≤2 days per week† • No limitation of activities • No symptoms during night or on waking	One or two of: • Daytime symptoms >2 days per week • Need for reliever >2 days per week† • Any limitation of activities • Any symptoms during night or on waking	Three or more of: • Daytime symptoms >2 days per week • Need for reliever >2 days per week† • Any limitation of activities • Any symptoms during night or on waking

† Not including SABA taken prophylactically before exercise. (Record this separately and take into account when assessing management.)

Note: Recent asthma symptom control is based on symptoms over the previous 4 weeks.

Source

Adapted from Global Initiative for Asthma (GINA). *Global strategy for asthma management and prevention*. GINA; 2012.

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Indicator #8:	People regularly dispensed SABA and not regularly dispensed preventer during the year
Numerator	The number of people who were dispensed SABA in two or more quarters and who were not dispensed preventer in two or more quarters in the year
Denominator	People dispensed SABA in two or more quarters in a year
Data source	Pharms
Analysis	By year, ethnicity (M, P, A, O), age (5-9, 10-14, 15-24, 25-49, 50+),
Medicines included	SABA (relievers): beta-adrenoceptor agonists – salbutamol (2096) and terbutaline (2404) Preventers: • Inhaled corticosteroids: fluticasone (1065), beclomethasone dipropionate (1108) and budesonide (1168) • Inhaled long-acting beta-adrenoceptor agonists: salmeterol (1066) and eformoterol fumarate (1083) • Inhaled corticosteroids with long-acting beta-adrenoceptor agonists: budesonide with eformoterol (3758) and fluticasone with salmeterol (3858). • Leukotriene antagonists: montelukast (3967) • Mast cell stabilisers: sodium cromoglycate (2144)
Rationale	High rates of people not receiving regular preventer therapy despite regular SABA use highlights the potential for ongoing chronic condition management. The NZ Adult Asthma guideline identifies that good control of asthma shows little use of reliever medication (less than two days per week). The guideline recommends that ICS therapy is introduced if patients have symptoms ≥2 times in the last week, but there is also evidence of benefit in patients with less frequent symptoms. This indicator replaces the previous indicator of reliever: preventer ratio.

Table. Definition of levels of recent asthma symptom control in adults and adolescents (regardless of current treatment regimen)

Good control	*Partial control*	*Poor control*
All of: • Daytime symptoms ≤2 days per week • Need for reliever ≤2 days per week† • No limitation of activities • No symptoms during night or on waking	One or two of: • Daytime symptoms >2 days per week • Need for reliever >2 days per week† • Any limitation of activities • Any symptoms during night or on waking	Three or more of: • Daytime symptoms >2 days per week • Need for reliever >2 days per week† • Any limitation of activities • Any symptoms during night or on waking

† Not including SABA taken prophylactically before exercise. (Record this separately and take into account when assessing management.)

Note: Recent asthma symptom control is based on symptoms over the previous 4 weeks.

Source

Adapted from Global Initiative for Asthma (GINA). *Global strategy for asthma management and prevention.* GINA; 2012.

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Appendix One: The use of wheeze code compared to asthma in children.

The table below shows variation between DHBs in the use of the code 'wheeze' particularly in those aged 0-4 years.

	Table: Breakdown of childhood admissions in 2013 and 2015 (1 Jan-31 Dec) with a primary diagnosis of asthma or wheeze by district health board.					
DHB name	Percent of total asthma and wheeze admissions coded as wheeze, by age (2013)			Percent of total asthma and wheeze admissions coded as wheeze, by age (2015)		
	00-04y	05-09y	10-14y	00-04y	05-09y	10-14y
Auckland	75.3	14.3	1.9	85.4	26.8	14.0
Bay of Plenty	41.6	4.3	5.3	36.4	4.0	0.0
Canterbury	73.0	15.8	6.9	67.0	10.9	4.8
Capital Coast	77.6	23.4	4.8	79.8	7.8	0.0
Counties Manukau Health	60.0	6.2	1.6	75.0	11.0	5.8
Hawkes Bay	13.5	0.0	0.0	3.0	0.0	0.0
Hutt	51.5	7.5	0.0	63.0	14.9	0.0
Lakes	9.0	0.0	0.0	25.0	0.0	0.0
Mid Central	24.2	0.0	8.3	46.0	5.1	0.0
Nelson Marlborough	23.9	0.0	< 10	62.2	7.7	< 10
Northland	53.8	8.9	0.0	72.7	10.2	5.0
South Canterbury	29.4	0.0	< 10	26.7	< 10	< 10
Southern	63.0	20.3	0.0	72.0	13.0	0.0
Haoura Tairāwhiti	21.9	14.3	< 10	32.3	0.0	< 10
Taranaki	43.9	0.0	< 10	77.0	8.3	10.0
Waikato	54.5	12.0	0.0	28.0	4.8	0.0
Wairarapa	46.7	< 10	< 10	33.3	0.0	< 10
Waitemata	57.9	9.9	3.9	74.0	15.3	8.7
West Coast	< 10	< 10	< 10	63.0	< 10	< 10
Whanganui	4.5	0.0	< 10	72.97	17.65	0.0
National mean	58.5	10.2	2.6	64.1	11.8	4.6

Data are suppressed where there is a count of less than 10 children.

Dispensing of asthma medications according to diagnosis – wheeze or asthma (2013)

Differences in the average number of asthma medications dispensed in the year following admission, depending on whether the diagnosis was wheeze or asthma is shown in the table below. The breakdown in dispensing is not shown by age, however those aged 0-4 years were the most likely to be diagnosed with wheeze and had a lower number of medications dispensed. The mean number of medications dispensed increased with each age group from 2.6 items in those aged 0-4 years, to 4.1 in those aged 5-9 years, up to average of 8.3 items in those aged 10-14.

The table below shows the impact of diagnosis on whether medications were dispensed.

DHB name	Average number of dispensed asthma medications in those diagnosed with wheeze (2013)	Average number of dispensed asthma medications in those diagnosed with asthma (2013)
Auckland	1.5	4.3
Bay of Plenty	1.2	4.2
Canterbury	1.2	4.7
Capital Coast	1.5	5.0
Counties Manukau Health	2.1	4.4
Hawkes Bay	1.0	5.4
Hutt	1.8	6.9
Lakes	0.8	3.6
Mid Central	1.0	5.8
Nelson Marlborough	0.5	5.4
Northland	1.2	5.2
South Canterbury	0.4	4.3
Southern	1.1	6.7
Haoura Tairāwhiti	1.9	6.0
Taranaki	0.8	5.9
Waikato	1.5	4.7
Wairarapa	0.9	5.0
Waitemata	1.3	4.7
West Coast	1.0	2.8
Whanganui	1.0	8.4
National mean	1.4	4.9