Atlas of Healthcare Variation
Methodology | Antibiotic dispensing

General points:
- Data is not presented where the number of people was less than 10. This is to preserve confidentiality.
- People were assigned to the district health board (DHB) where they live.
- Ethnicity data presented uses prioritised ethnic group (Māori, Pacific peoples, Asian and European/Other). For people reporting multiple ethnic groups, the most recent value was selected.

Underlying data
If you would like the MS Excel file of the underlying data, please email atlas@hqsc.govt.nz.

<table>
<thead>
<tr>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data is presented as standard deviation from the mean.</td>
</tr>
</tbody>
</table>

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. The two ‘middle’ shades will be within one standard deviation of the mean.

<table>
<thead>
<tr>
<th>Confidence intervals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data for each DHB is presented as rates. Upper and lower confidence intervals were calculated to 95 percent level of confidence.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Units reported and denominator used</th>
</tr>
</thead>
<tbody>
<tr>
<td>In developing this Atlas domain, different metrics were explored. We decided not to use defined daily doses (DDD) because they are based on adult doses so don’t apply well to children. We trialled reporting prescription items dispensed per 1,000 population per day but decided not to progress with this because it does not account for the duration of treatment. This means that an antibiotic dispensed for one day is counted the same as an antibiotic with a 90-day supply. Instead we chose to report people who were dispensed an antibiotic one or more times in a year.</td>
</tr>
</tbody>
</table>

We explored different denominator populations and elected to use one based on those who attended primary care in the year of interest. Our analysis found that using the denominator of people attending primary care in the year was the best measure for DHB variation, as it accounts for need. For example, a DHB with a younger or an older age structure is likely to have a greater proportion of its population attend primary care in a year. Other
denominators explored were the primary health organisation (PHO) enrolled population and the Statistics New Zealand DHB resident population.

**Practitioner supply order (PSO)**

Several antibiotics included in our analysis are also available on PSO. PHARMAC defines this as a written order made by a prescriber for the funded supply of pharmaceuticals for emergency use, teaching and demonstration purposes and for provision to certain patient groups where an individual prescription is not practicable.

Antibiotics given to people using a PSO cannot be included in this Atlas because they are not linked to an NHI number.

<table>
<thead>
<tr>
<th>Indicator #1:</th>
<th>People dispensed one or more systemic antibiotics in a year, rate per 100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numerator</td>
<td>People dispensed a systemic antibiotic in the community</td>
</tr>
<tr>
<td>Denominator</td>
<td>People who had a GP consultation date in the year</td>
</tr>
<tr>
<td>Data source</td>
<td>Pharmaceutical Collection, PHO enrolments</td>
</tr>
<tr>
<td>Analysis</td>
<td>By year: 2015, 2016, 2017</td>
</tr>
<tr>
<td></td>
<td>Ethnicity: Māori, Pacific peoples, Asian, European/Other</td>
</tr>
<tr>
<td></td>
<td>Age: 0–4, 5–9, 10–14, 15–24, 25–44, 45–64, 65–74, 75–84 and 85 and over</td>
</tr>
<tr>
<td></td>
<td>Sex: F, M</td>
</tr>
<tr>
<td>Rationale</td>
<td>This denominator focuses on antibiotic dispensing in those attending primary care.</td>
</tr>
</tbody>
</table>
| Antibiotics included, chemical ID—note fusidic acid only includes one formulation | **Cephalosporins and cephemycins:** cefaclor monohydrate 1228, cefazolin 1236, ceftriaxone 1232, cefuroxime axetil 1081, cefuroxime sodium 1233, cefalexin monohydrate 1234  
**Macrolides:** azithromycin 1178, clarithromycin 2809, erythromycin ethyl succinate 6026, erythromycin lactobionate 6028, erythromycin stearate 6027, roxithromycin 2790  
**Penicillins:** amoxicillin 1072, amoxicillin with clavulanic acid 1070, benzathine benzylpenicillin tetrahydrate 1120, benzylpenicillin sodium (penicillin G) 1136, flucloxacillin 1512, phenoxymethylpenicillin (penicillin V) 1970, procaine penicillin 2046  
**Tetracyclines:** doxycycline 2529, minocycline hydrochloride 1828, tetracycline 3999  
**Other antibiotics:** ciprofloxacin 2819, clindamycin 1303, colistin sulphomethate 1346, co-trimoxazole 1361, fusidic acid 1546 – formulation id 154601, gentamicin sulphate 1554, moxifloxacin 3925,
paromomycin 3998, pyrimethamine 3992, sulfadiazine sodium 3993, tobramycin 2274, vancomycin 2314

**Urinary tract infections:** hexamine hippurate 1594, nitrofurantoin 1867, norfloxacin 1874, trimethoprim 2300

**Exclude**
- Ciprofloxacin 2819 formulation id: 281904 (eye)
- Gentamicin sulphate 1554: 155405 (eye)
- Tobramycin 2274 formulation ids: 227425 (inhalation), 227404 (eye drops) and 227405 (eye ointment).

**Commentary**

**Description:** People dispensed one or more systemic antibiotics in a year, rate per 100.

Data for 2015–17 is presented by year, ethnicity, age group and sex. The denominator is those who had a primary care visit in a year.

**Why is this important?** Research in New Zealand has found high rates of community antibiotic use with up to 95 percent of all antibiotics dispensed in the community, compared with 5 percent in hospital [1]. This raises questions on the appropriateness of prescribing. See the paper below for further analysis of which antibiotics are dispensed by age group [2].

This indicator only counts one antibiotic dispensing per person per year and only includes people if they visited primary care in the year. Not all community antibiotics will have been prescribed through primary health care. Prescriptions dispensed in community pharmacies may have come from hospital outpatient clinics, emergency departments or on hospital discharge. Antibiotics supplied using PSO are not included.

**What questions might the data prompt?**

- Are rates increasing or decreasing over time?
- Why do rates vary between DHBs? How much can be explained by differences in patient population?
- How many of the prescriptions are generated in primary care?
- Does the pattern of prescribing seem appropriate? Is it consistent with guidelines and are these regularly reviewed?


<table>
<thead>
<tr>
<th>Indicator #1b:</th>
<th>All systemic antibiotic dispensings in a year, rate per 100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numerator</td>
<td>Number of systemic antibiotics dispensed in the community</td>
</tr>
<tr>
<td>Denominator</td>
<td>Number of GP consultations in the year</td>
</tr>
<tr>
<td>Data source</td>
<td>Pharmaceutical Collection, PHO enrolments</td>
</tr>
<tr>
<td>-------------</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td>Analysis</td>
<td>By year: 2015, 2016, 2017</td>
</tr>
<tr>
<td></td>
<td>Ethnicity: Māori, Pacific peoples, Asian, European/Other</td>
</tr>
<tr>
<td></td>
<td>Age: 0–4, 5–9, 10–14, 15–24, 25–44, 45–64, 65–74, 75–84 and 85 and over</td>
</tr>
<tr>
<td></td>
<td>Sex: F, M</td>
</tr>
<tr>
<td>Rationale</td>
<td>This indicator is intended to show which population groups receive multiple dispensings of an antibiotic in a year.</td>
</tr>
<tr>
<td>Chemicals</td>
<td>As per indicator 1, systemic antibiotics only included</td>
</tr>
</tbody>
</table>
| Commentary  | **Description:** Systemic antibiotics dispensed in a year, rate per 100.  
Data for 2015–17 is presented by year, ethnicity, age group and sex. The denominator is primary care visits in a year.  

**Why is this important?** Research in New Zealand has found high rates of community antibiotic use with up to 95 percent of all antibiotics dispensed in the community, compared with 5 percent in hospital [1]. This raises questions on the appropriateness of prescribing. See the paper below for further analysis of which antibiotics are dispensed by age group [2].  

This indicator used the PHO enrolments database to calculate the number of visits per year. This counts up to nine visits per year for individuals. Not all community antibiotics will have been prescribed through primary health care. Prescriptions may have come from hospital outpatient clinics, emergency departments and on hospital discharge. Antibiotics dispensed using PSO are not included.  

**What questions might the data prompt?**  
- Are rates increasing or decreasing over time?  
- Why do rates vary between DHBs? How much can be explained by differences in patient population?  
- How many of the prescriptions are generated in primary care?  
- Does the pattern of prescribing seem appropriate? Is it consistent with guidelines and are these regularly reviewed?  


**Indicator #2:** People listed in ARC dispensed one or more systemic antibiotics in a year, rate per 100
<table>
<thead>
<tr>
<th>Numerator</th>
<th>People aged 65 and over living in an aged residential care (ARC) facility dispensed one or more systemic antibiotics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denominator</td>
<td>People aged 65 and over who had a GP consultation in a year listed in the ARC database</td>
</tr>
<tr>
<td>Data source</td>
<td>Pharmaceutical Collection, ARC funding from Ministry of Health, PHO enrolments</td>
</tr>
</tbody>
</table>
| Analysis | By year: 2015, 2016, 2017  
Ethnicity: Māori, Pacific peoples, Asian, European/Other  
Age: 65–74, 75–84 and 85 and over  
Sex: F, M |
| Rationale | Are people living in ARC facilities dispensed more antibiotics than those living in the community?  
Does the dispensing vary by region? How much might be explained by differences in infection rates and how much represents overuse? |
| Chemicals | As indicator 1, systemic antibiotics only |
| Commentary | **Description:** People living in ARC dispensed one or more systemic antibiotics in a year, rate per 100.  
Data for 2015–17 is presented by year, ethnicity, age group and sex. The denominator is those living in ARC who had a primary care visit in a year.  
**Why is this important?** Research in New Zealand has found higher rates of community antibiotic use for older people in general and especially high rates for people living in ARC due to multi-morbidity and frailty [1, 2]. Higher rates of antibiotic-resistant organisms are also found in ARC residents [3].  
This indicator looks specifically at antibiotic use in people who were living in ARC. This indicator only counts one antibiotic dispensing per person per year and only includes people if they visited primary care in the year. Not all community antibiotics will have been prescribed through primary health care. Prescriptions may have come from hospital outpatient clinics, emergency departments and on hospital discharge. Antibiotics dispensed using practitioner supply orders are not included.  
**What questions might the data prompt?**  
- Are rates increasing or decreasing over time?  
- Why do rates vary between DHBs?  
- Does the pattern of prescribing seem appropriate? Is it consistent with guidelines and are these regularly reviewed?  
- What are the main indications for antibiotic use in ARC?  

<table>
<thead>
<tr>
<th>Indicator #3:</th>
<th>People dispensed a topical antibiotic in a year, rate per 100</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Numerator</strong></td>
<td>People dispensed a topical antibiotic in the community</td>
</tr>
<tr>
<td><strong>Denominator</strong></td>
<td>People who had a GP consultation date in the year</td>
</tr>
<tr>
<td><strong>Data source</strong></td>
<td>Pharmaceutical Collection, PHO enrolments</td>
</tr>
<tr>
<td><strong>Analysis</strong></td>
<td>By year: 2015, 2016, 2017</td>
</tr>
<tr>
<td></td>
<td>Ethnicity: Māori, Pacific peoples, Asian, European/Other</td>
</tr>
<tr>
<td></td>
<td>Age: 0–4, 5–9, 10–14, 15–24, 25–44, 45–64, 65–74, 75–84 and 85 and over</td>
</tr>
<tr>
<td></td>
<td>Sex: F, M</td>
</tr>
<tr>
<td><strong>Rationale</strong></td>
<td>This indicator focuses on topical antibiotics dispensed in those attending primary care. It is noted that topical antibiotics are more likely to be shared among family and whānau members or used again in a year.</td>
</tr>
<tr>
<td><strong>Topical antibiotics</strong></td>
<td>Fusidic acid 1546 formulation ID; 154608, 154609; mupirocin 1835</td>
</tr>
<tr>
<td><strong>Exclude</strong></td>
<td>Formulation ID for: fusidic acid 1546: 154604 (eye). Hydrogen peroxide and silver sulfadiazine 2114 are excluded as they are topical antiseptics.</td>
</tr>
<tr>
<td><strong>Commentary</strong></td>
<td><strong>Description:</strong> People dispensed a topical antibiotic in a year, rate per 100. Data for 2015–17 is presented by year, ethnicity, age group and sex. The denominator is those who had a primary care visit in a year. <strong>Why is this important?</strong> Topical antibiotics have few indications while good skin hygiene and topical antiseptics such as hydrogen peroxide or povidone iodine are recommended for treating localised or minor skin infections, including impetigo [1]. In New Zealand, increasing use of topical fusidic acid has occurred concurrently with increasing fusidic acid resistance [2]. For these reasons, it is recommended that the use of topical antibiotics is limited. <strong>What questions might the data prompt?</strong></td>
</tr>
<tr>
<td></td>
<td>• Why do rates vary between DHBs? How much can be explained by differences in patient population?</td>
</tr>
<tr>
<td></td>
<td>• How many of the prescriptions are generated in primary care?</td>
</tr>
</tbody>
</table>
- Does the pattern of prescribing seem appropriate?
- What is the impact of socio-economic factors on rates?
- What factors are contributing to variation in rates by ethnicity?


<table>
<thead>
<tr>
<th>Indicator #4:</th>
<th>Seasonal variation in community systemic antibiotic dispensing, percent</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Numerator</strong></td>
<td>Community antibiotic dispensing per day in the winter months (Apr–Sept)</td>
</tr>
<tr>
<td><strong>Denominator</strong></td>
<td>Community antibiotic dispensing per day in the summer months (Oct–Mar)</td>
</tr>
<tr>
<td><strong>Data source</strong></td>
<td>Pharmaceutical Collection, Statistics New Zealand resident, PHO enrolments</td>
</tr>
</tbody>
</table>
| **Analysis** | By year: 2015, 2016, 2017
Ethnicity: Māori, Pacific peoples, Asian, European/Other
Age: 0–4, 5–9, 10–14, 15–24, 25–44, 45–64, 65–74, 75–84 and 85 and over
Sex: F, M |
| **Source** | This indicator is adapted from European Centre for Disease Prevention and Control (ECDC) quality indicators. www.ecdc.europa.eu/en/antimicrobial-consumption/database/quality-indicators |
| **Antibiotics included (systemic only)** | Amoxicillin 1072, amoxicillin with clavulanic acid 1070, doxycycline 2529, roxithromycin 2790, trimethoprim 2300, erythromycin ethyl succinate 6026, co-trimoxazole 1361, cefaclor monohydrate 1228, phenoxymethylpenicillin (penicillin V) 1970 |
| **Rationale** | This indicator seeks to ask whether there are areas where antibiotics are overused in the winter months compared with the summer months of a one-year period.
This indicator shows the seasonal dispensing of the most dispensed antibiotics. Flucloxacillin and fusidic acid are excluded as their use increases in summer, reflecting their indication to treat infectious skin conditions. In order to present seasonal variation, flucloxacillin and fusidic acid were excluded from analysis to focus on the use of |
**Commentary**

**Description:** Seasonal variation in community systemic antibiotic dispensing.

Data for 2015–17 is presented by year, ethnicity, age group and sex.

**Why is this important?** While bacterial infections increase during winter, increased prescribing in winter may suggest antibiotics are also being used to treat viral respiratory infections. This may represent an opportunity to optimise antibiotic use.

This indicator reports the nine most dispensed antibiotics, which are known to be used inappropriately for the treatment of viral respiratory infections. To highlight seasonal variation, flucloxacillin and fusidic acid were excluded from the analysis as their use increases in summer, reflecting a seasonal increase in infectious skin conditions.

Monthly antibiotic dispensing data are available in the paper by Whyler et al [2].

**What questions might the data prompt?**
- Why does the variation differ between DHBs? How much can be explained by differences in patient population?
- Why is seasonal variation higher in children?
- Does the pattern of prescribing seem appropriate?


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**Indicator #5:** People dispensed a broad-spectrum penicillin as a percent of all people dispensed a penicillin

| Numerator | Number of people dispensed amoxicillin or amoxicillin with clavulanic acid in a community pharmacy, in a year |
| Denominator | Number of people dispensed a penicillin in a community pharmacy in a year |
| Data source | Pharmaceutical Collection, PHO enrolments |
| Analysis | By year: 2015, 2016, 2017 |
| Ethnicity: Māori, Pacific peoples, Asian, European/Other |
| Age: 0–4, 5–9, 10–14, 15–24, 25–44, 45–64, 65–74, 75–84 and 85 and over |
| Sex: F, M |
Wide regional variation in the use of amoxicillin or amoxicillin with clavulanic acid might highlight areas where improvement may be indicated.

**Chemicals**

**Penicillins:** amoxicillin 1072, amoxicillin with clavulanic acid 1070, benzathine benzylpenicillin tetrahydrate 1120, benzylpenicillin sodium (penicillin G) 1136, flucloxacillin 1512, phenoxymethylpenicillin (penicillin V) 1970, procaine benzylpenicillin 2046

**DANMAP**

**Broad-spectrum penicillins:**
- Amoxicillin 1072, amoxicillin with clavulanic acid 1070

**Narrow-spectrum penicillins:**
- Benzathine benzylpenicillin tetrahydrate 1120, benzylpenicillin sodium (penicillin G) 1136, phenoxymethylpenicillin (penicillin V) 1970, flucloxacillin 151, procaine benzylpenicillin 2046

**Commentary**

**Description:** People dispensed amoxicillin or amoxicillin with clavulanic acid as a percent of all people dispensed a penicillin.

Data for 2015–17 is presented by year, ethnicity, age group and sex.

**Why is this important?** The New Zealand Formulary classifies amoxicillin and amoxicillin with clavulanic acid as broad-spectrum penicillins. Broad-spectrum antibiotics are associated with antimicrobial resistance and are generally recommended only for certain indications [1]. The other penicillins are classed as narrow-spectrum. This indicator measures amoxicillin or amoxicillin with clavulanic acid use as a percent of total penicillins dispensing. Wide regional variation in the use of amoxicillin or amoxicillin with clavulanic acid might highlight areas where improvement may be indicated.

**What questions might the data prompt?**
- Are rates increasing or decreasing over time?
- Why do rates vary between DHBs? How much can be explained by differences in patient population?
- Does the pattern of prescribing seem appropriate?


**Indicator #6:** People dispensed amoxicillin with clavulanic acid one or more times in a year, rate per 100

<table>
<thead>
<tr>
<th>Numerator</th>
<th>People dispensed amoxicillin with clavulanic acid in a year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denominator</td>
<td>People who had a GP consultation in the year</td>
</tr>
<tr>
<td>Data source</td>
<td>Pharmaceutical Collection, PHO enrolments</td>
</tr>
</tbody>
</table>
Analysis

By year: 2015, 2016, 2017
Ethnicity: Māori, Pacific peoples, Asian, European/Other
Age: 0–4, 5–9, 10–14, 15–24, 25–44, 45–64, 65–74, 75–84 and 85 and over
Sex: F, M

Rationale

Amoxicillin with clavulanic acid is a broad-spectrum antibiotic. Broad-spectrum antibiotics are associated with antimicrobial resistance and are generally recommended only for specific indications [bpac\textsuperscript{nz}: www.bpac.org.nz/Report/2015/September/antibiotics.aspx]

Clavulanate possesses little antibacterial activity, but significantly extends the spectrum of activity of amoxicillin when given with it, leading to an increased risk of the development of antimicrobial resistance.

Exclusions

Chemicals

Amoxicillin with clavulanic acid 1070

Commentary

Description: People dispensed amoxicillin with clavulanic acid one or more times in a year, rate per 100.

Data for 2015–17 is presented by year, ethnicity, age group and sex.

Why is this important? Amoxicillin with clavulanic acid is a broad-spectrum antibiotic. Broad-spectrum antibiotics are associated with antimicrobial resistance and are generally recommended only for specific indications [1].

What questions might the data prompt?

• Are rates increasing or decreasing over time?
• Why do rates vary between DHBs? How much can be explained by differences in patient population?
• What is the main indication this antibiotic is being prescribed for?
• Does the pattern of prescribing seem appropriate?


Indicator #7: People dispensed an antibiotic specifically indicated for urinary tract infections (UTIs), rate per 100

Numerator

People dispensed an antibiotic for UTIs in a year

Denominator

People who had a GP consultation in a year

Data source

Pharmaceutical collection, PHO enrolments

Analysis

By year: 2015, 2016, 2017
Ethnicity: Māori, Pacific peoples, Asian, European/other
Age: 45–64, 65–74, 75–84 and 85 and over
Sex: F, M

**Rationale**

Nitrofurantoin or trimethoprim are recommended as first-line treatment for UTIs. Norfloxacin is second-line treatment.

The rationale for this indicator is to explore the use of antibiotics for UTIs, with a view identifying whether there are areas of high use of these antibiotics. A Cochrane Review (2015) concluded there was no clinical benefit from treating asymptomatic bacteriuria in the studies included (www.cochranelibrary.com/cdsr/doi/10.1002/14651858.CD009534.pub2/epdf/full).

**Exclusions**

Pharmacists can sell trimethoprim and methenamine hippurate over the counter and this use is not captured here. Nitrofurantoin is not usually indicated for use in children. Norfloxacin is not approved for use in children (www.nzfchildren.org.nz/nzf_3283) although the New Zealand Formulary notes there may be some specific circumstances when use may be justified in children. Norfloxacin use is associated with antibiotic resistance and isn’t recommended for first line treatment.

**Chemicals**

Methenamine hippurate 1594, nitrofurantoin 1867, norfloxacin 1874, trimethoprim 2300.

**Commentary**

**Description:** People dispensed an antibiotic specifically indicated for UTIs, rate per 100.

Data for 2015–17 is presented by year, ethnicity, age group and sex.

Trimethoprim, nitrofurantoin and norfloxacin are mainly used to treat UTIs, however some of the dispensing included in this Atlas domain may be for other indications.

**Why is this important?** Trimethoprim or nitrofurantoin are recommended as first-line treatment for a UTI. Norfloxacin is second-line treatment.

In people aged 65 and over, asymptomatic bacteriuria and UTIs can be common. A Cochrane Review (2015) concluded there was no clinical benefit from treating asymptomatic bacteriuria [1].

**What questions might the data prompt?**

- Are rates for your DHB increasing or decreasing over time?
- Why do rates vary between DHBs?
- How much can be explained by prevalence of UTIs?
- Are areas with high use of UTI antibiotics using them to treat asymptomatic bacteriuria?
- Does the pattern of prescribing seem appropriate?

**Indicator #8:** People listed in ARC dispensed an antibiotic specifically indicated for UTIs, rate per 100

<table>
<thead>
<tr>
<th>Numerator</th>
<th>People aged 65 and over living in an ARC facility dispensed an antibiotic for UTIs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denominator</td>
<td>People aged 65 and over who had a GP consultation in a year listed in the ARC database</td>
</tr>
<tr>
<td>Data source</td>
<td>Pharmaceutical Collection, PHO enrolments</td>
</tr>
</tbody>
</table>
| Analysis | By year: 2015, 2016, 2017  
Ethnicity: Māori, Pacific peoples, Asian, European/other  
Age: 65–74, 75–84 and 85 and over  
Sex: F, M |
| Rationale | Nitrofurantoin or trimethoprim are recommended as first-line treatment for UTIs. Norfloxacin is second-line treatment.  
The rationale for this indicator is to explore the use of antibiotics for UTIs, with a view identifying whether there are areas of high use of these antibiotics. A Cochrane Review (2015) concluded there was no clinical benefit from treating asymptomatic bacteriuria in the studies included (www.cochranelibrary.com/cdsr/doi/10.1002/14651858.CD009534.pub2 /epdf/full). |
| Exclusions | Pharmacists can sell trimethoprim and methenamine hippurate over the counter and this use is not captured here. Nitrofurantoin is not usually indicated for use in children. Norfloxacin is not approved for use in children (www.nzfchildren.org.nz/nzf_3283) although the New Zealand Formulary notes there may be some specific circumstances when use may be justified in children. Norfloxacin use is associated with antibiotic resistance and isn’t recommended for first-line treatment. |
| Chemicals | Methenamine hippurate 1594, nitrofurantoin 1867, norfloxacin 1874, trimethoprim 2300. |
| Commentary | **Description:** People listed in an ARC facility dispensed an antibiotic specifically indicated for UTIs, rate per 100.  
Data for 2015–17 is presented by year, ethnicity, age group and sex.  
Trimethoprim, nitrofurantoin and norfloxacin are mainly used to treat UTIs, however some of the dispensing included in this Atlas domain may be for other indications. |
**Why is this important?** Trimethoprim or nitrofurantoin are recommended as first-line treatment for a UTI. Norfloxacin is second-line treatment.

In people aged 65 and over, asymptomatic bacteriuria and UTIs can be common [1]. A Cochrane Review (2015) concluded there was no clinical benefit from treating asymptomatic bacteriuria [2].

**What questions might the data prompt?**

- Are rates for your DHB increasing or decreasing over time?
- Why do rates vary between DHBs?
- How much can be explained by prevalence of UTIs?
- Are areas with high use of UTI antibiotics using them to treat asymptomatic bacteriuria?
- Does the pattern of prescribing seem appropriate?


<table>
<thead>
<tr>
<th>Indicator #9:</th>
<th>Medical hospital admissions with an antibiotic dispensed within 30 days of discharge, rate per 100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numerator</td>
<td>Medical hospital admissions dispensed an antibiotic within 30 days of discharge</td>
</tr>
<tr>
<td>Denominator</td>
<td>Medical hospital admissions with a length of stay of at least one day.</td>
</tr>
<tr>
<td>Data source</td>
<td>Pharmaceutical Collection, National Minimum Dataset</td>
</tr>
</tbody>
</table>
| Analysis      | By year: 2015, 2016, 2017
Ethnicity: Māori, Pacific peoples, Asian, European/other
Age: 0–4, 5–9, 10–14, 15–24, 25–44, 45–64, 65–74, 75–84 and 85 and over
Sex: F, M
Admission type: medical diagnostic related groups (DRGs) only |
| Rationale     | As indicator #10 below, but comparing medical versus surgical DRGs. |
| Exclusions    | Exclude non-case-mix events, to remove events related to mental health, maternity and aged care. Events of less than one day were excluded to ensure only inpatient events were included.
Topical antibiotics were excluded. |
**Commentary**

**Description:** Medical hospital admissions with an antibiotic dispensed within 30 days of discharge.

Data for 2015–17 is presented by year, ethnicity, age group and sex. All events in a year were included.

**Why is this important?** It is recommended that, along with good infection control, antibiotics be prescribed only when needed, with the narrowest spectrum of antimicrobial activity. Previous research in New Zealand concluded a significant proportion of antibiotics prescribed to patients discharged following surgery was inappropriate and recommended enhanced antimicrobial stewardship in this area [1]. It appears there may be a similar pattern in medical patients.

**What questions might the data prompt?**

- How many prescriptions were ‘just in case’?
- How many prescriptions were generated in a follow-up appointment?
- What proportion of prescriptions were for infections that were present prior to admission?
- How does antibiotic use in this cohort compare with the general population and surgical admissions?


**Indicator #10:** Surgical hospital admissions with an antibiotic dispensed within 30 days of discharge, rate per 100

**Numerator**

Surgical hospital admissions dispensed an antibiotic within 30 days of discharge

**Denominator**

Surgical hospital admissions with a length of stay of at least 1 day.

**Data source**

Pharmaceutical Collection, National Minimum Dataset

**Analysis**

By year: 2015, 2016, 2017

Ethnicity: Māori, Pacific peoples, Asian, European/Other

Age: 0–4, 5–9, 10–14, 15–24, 25–44, 45–64, 65–74, 75–84 and 85 and over

Sex: F, M

Admission type: surgical DRGs only

**Rationale**

As indicator #9 above, but comparing surgical versus medical DRGs.

**Exclusions**

Exclude non-case-mix events to remove events related to mental health, maternity and aged care. Events of less than one day were excluded to ensure only inpatient events were included.
Topical antibiotics were excluded.

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| **Description:** Surgical hospital admissions with an antibiotic dispensed within 30 days of discharge.  

Data for 2015–17 is presented by year, ethnicity, age group and sex. All events in a year were included.  

**Why is this important?** It is recommended that, along with good infection control, antibiotics be prescribed only when needed, with the narrowest spectrum of antimicrobial activity. It is not best practice for antibiotics to be administered routinely postoperatively. NICE recommends antibiotics be used only in cases where infection is clinically evident [1]. Previous research in New Zealand concluded a significant proportion of antibiotics dispensed in patients discharged following surgery was inappropriate and recommended enhanced antimicrobial stewardship in this area [2].  

**What questions might the data prompt?**  
- How many prescriptions were ‘just in case’?  
- How many prescriptions were generated in a follow-up appointment?  
- What proportion of prescriptions were for infections unrelated to the surgery?  
- How does antibiotic use in this cohort compare with the general population and medical admissions?  