Atlas of Healthcare Variation:
Methodology | Polypharmacy in older people

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General points

- A ‘long-term’ medicine was defined as the same medicine dispensed in two consecutive quarters.
- Data was analysed by quarter and the average over a year is presented.
- Data is 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; where more than one domicile was recorded, the most recent value was selected.
- Ethnicity data presented is prioritised ethnic group (Māori, Pacific peoples peoples, Asian, European/Other). For people reporting multiple ethnic groups, the most recent value was selected.

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Disclaimer

The Commission is responsible for the content of the polypharmacy in older people Atlas domain and methodology; any errors of fact or interpretation are ours alone.

Data source

Pharmaceutical Collection, Ministry of Health.

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

Confidence intervals
Data for each DHB is presented as rate per 100 population. Upper and lower confidence intervals were calculated to 95 percent level of confidence.

Rationale for indicators measuring the number of long term medicines

Polypharmacy is associated with:

- reduced adherence to therapies
- significant costs to patients and health services
- poor health outcomes, such as adverse drug events, drug interactions, admissions to hospital and death.

Older people (defined here as those aged 65 and over) are more susceptible to medicine-related morbidity and mortality, especially those who are frail or have multiple co-morbid conditions.

The frequency of adverse drug events increases with the number of medicines taken: from 13 percent with two medicines and 58 percent with five medicines to 82 percent when seven or more medicines are taken (Patterson et al 2012).

Polypharmacy is more likely to be appropriate in the robust 'young elderly' while problematic polypharmacy is more likely to occur in the frail 'old elderly'. Hence a focus on the 85 year and over age group may be most appropriate, where the doses used may be as important as the number of medicines.

The goal of this Atlas domain is to identify whether there is wide variation in rates, which may highlight areas for further local investigation.

Rationale for measuring the rate of antipsychotic and benzodiazepine use

In older people, certain classes of medicines carry a substantially higher risk of adverse effects. Two examples presented in this Atlas domain are antipsychotics and benzodiazepine or zopiclone. Common adverse effects include impaired functional ability, agitation, confusion, blurred vision, urinary retention, constipation, postural hypotension and falls. These increase if both classes of medicine are taken together. This indicator cannot assess inappropriate use of these medicines, however, high rates of prescribing may indicate misuse or overuse.

The combination of a benzodiazepine or zopiclone and a strong opioid is one that carries an increased risk of over-sedation. The FDA in the USA issued an alert in 2018 warning against prescribing this combination due to the risk of serious side effects, including slowed or difficult breathing and deaths. It should be only used in patients for whom alternative treatment options are inadequate.

Rationale for ‘triple whammy’

Triple whammy is the combination of an angiotensin converting enzyme inhibitor (ACEI)/ angiotensin receptor blocker (ARB), a diuretic and a non-steroidal anti-inflammatory (NSAID). Medsafe notes an increased risk of acute kidney injury with this combination, especially in those with risk factors for renal failure and in older adults. It is recommended this combination should be avoided if possible.

Indicator #1:	**People aged 65 years and over dispensed five or more unique long-term medicines**
Numerator	Average number of people in a quarter. Age at end of quarter ≥ 65 years. Number of distinct chemicals (excluding those below) dispensed in quarter that were also dispensed in previous quarter = 5 or more.
Denominator	New Zealand population, using Stats NZ population projections for the relevant years.
Analysis	Analysis by: • Year: 2012–19 • Ethnicity: Māori, Pacific peoples, Asian and European/other • Age: 65–74 years; 75–84 years; 85 years and over • Gender
Exclusions	• Therapeutic group 1: dermatologicals • Therapeutic group 1: special foods • Therapeutic group 1: sensory organs • Therapeutic group 1, section C – extemporaneously compounded preparations and galenicals • Therapeutic group 2: respiratory devices • Therapeutic group 2: unknown (eg, header rows, named patient authority) • Therapeutic group 2: various (eg, brand switch fee) • Therapeutic group 2: diabetes management: ketone testing, blood glucose testing, insulin syringes and needles, insulin pumps, insulin pump consumables

Indicator #2:	**People aged 65 years and over dispensed five, six or seven unique long-term medicines**
Numerator	Average number of people in a quarter. Age at end of quarter ≥ 65 years. Number of distinct chemicals (excluding those below) dispensed in quarter that were also dispensed in previous quarter = 5, 6 or 7.
Denominator	New Zealand population, using Stats NZ population projections for the relevant years.
Analysis	Analysis by: • Year: 2012–19 • Ethnicity: Māori, Pacific peoples, Asian and European/other • Age: 65–74 years; 75–84 years; 85 years and over • Gender

Exclusions	• Therapeutic group 1: dermatologicals • Therapeutic group 1: special foods • Therapeutic group 1: sensory organs • Therapeutic group 1, section C – extemporaneously compounded preparations and galenicals • Therapeutic group 2: respiratory devices • Therapeutic group 2: unknown (eg, header rows, named patient authority) • Therapeutic group 2: various (eg, brand switch fee) • Therapeutic group 2: diabetes management: ketone testing, blood glucose testing, insulin syringes and needles, insulin pumps, insulin pump consumables

Indicator #3:	**People aged 65 years and over dispensed eight, nine or ten unique long-term medicines**
Numerator	Average number of people in a quarter. Number of distinct chemical IDs (excluding those below) dispensed in quarter that were also dispensed in previous quarter = 8, 9 or 10.
Denominator	New Zealand population, using Stats NZ population projections for the relevant years.
Analysis	Analysis by: • Year: 2012–19 • Ethnicity: Māori, Pacific peoples, Asian and European/other • Age: 65–74 years; 75–84 years; 85 years and over • Gender
Exclusions	• Therapeutic group 1: dermatologicals • Therapeutic group 1: special foods • Therapeutic group 1: sensory organs • Therapeutic group 1, section C – extemporaneously compounded preparations and galenicals • Therapeutic group 2: respiratory devices • Therapeutic group 2: unknown (eg, header rows, named patient authority) • Therapeutic group 2: various (eg, brand switch fee) • Therapeutic group 2: diabetes management: ketone testing, blood glucose testing, insulin syringes and needles, insulin pumps, insulin pump consumables

Indicator #4:	**People aged 65 years and over dispensed 11 or more unique long-term medicines**
Numerator	Average number of people in a quarter. Age at end of quarter ≥ 65 years. Number of distinct chemical IDs (excluding those below) dispensed in quarter that were also dispensed in previous quarter ≥ 11.
Denominator	New Zealand population, using Stats NZ population projections for the relevant years.
Analysis	Analysis by: • Year: 2012–19 • Ethnicity: Māori, Pacific peoples, Asian and European/other • Age: 65–74 years; 75–84 years; 85 years and over • Gender
Exclusions	• Therapeutic group 1: dermatologicals • Therapeutic group 1: special foods • Therapeutic group 1: sensory organs • Therapeutic group 1, section C – extemporaneously compounded preparations and galenicals • Therapeutic group 2: respiratory devices. • Therapeutic group 2: unknown (eg, header rows, named patient authority) • Therapeutic group 2: various eg, brand switch fee • Therapeutic group 2: diabetes management: ketone testing, blood glucose testing, insulin syringes and needles, insulin pumps, insulin pump consumables

Indicator #5:	**People aged 65 years and over who received the 'triple whammy'**
Numerator	People who received an antipsychotic per year. Dispensing of all three medicines to be within the same 90-day period.
Denominator	New Zealand population, using Stats NZ population projections for the relevant years.
Analysis	Analysis by: • Year: 2012–19 • Ethnicity: Māori, Pacific peoples, Asian and European/other • Age: 65–74 years; 75–84 years; 85 years and over • Gender

Medicines included	• ACEI: cilazapril 2770, enalapril maleate 2711, lisinopril 2797, perindopril 2806, quinapril 2772, trandolapril 1031, captopril 2841, enalapril maleate with hydrochlorothiazide 2708, sacubitril 4105 • ACEI with diuretics: cilazapril with hydrochlorothiazide 1127, quinapril with hydrochlorothiazide 3749 • ARB: candesartan cilexetil 1254, losartan potassium 1061 • ARB with diuretic: losartan potassium with hydrochlorothiazide 1068, losartan with hydrochlorothiazide 3788 • Diuretic: bumetanide 1171, furosemide 1544, amiloride hydrochloride 1050, metolazone 4006, spironolactone 2176, amiloride hydrochloride with furosemide 1051, amiloride hydrochloride with hydrochlorothiazide 1053, bendrofluazide 1116, chlorothiazide 1282, chlortalidone 1290, indapamide 1643, eplerenone 4100 • NSAID: diclofenac sodium 1401, ibuprofen 2798, ketoprofen 1697, mefenamic acid 1769, naproxen 2782, naproxen sodium 2783, sulindac 2193, tenoxicam 2536, celecoxib 1271 and 4081, meloxicam 3912
Rationale	Medsafe notes 'triple whammy' as a risk: A recent nested case-control study found that current use of triple therapy (ACE inhibitor/ ARB, diuretic and an NSAID) was associated with an increased rate of acute kidney injury (Rate Ratio 1.31, 95% CI 1.12–1.53) compared to double therapy (diuretic plus ACE inhibitor/ARB). See: Lapi F, Azoulay L, Yin H, et al. 2013. Concurrent use of diuretics, angiotensin converting enzyme inhibitors, and angiotensin receptor blockers with non-steroidal anti-inflammatory drugs and risk of acute kidney injury: nested case-control study. *BMJ* 346: e8525. SafeRx recommends this combination should be avoided if possible, especially in those with risk factors for renal failure and in older adults. Patients prescribed ACEI and diuretics should be advised not to use NSAIDs.
Note	Aspirin was not included in this indicator due to the difficulties of differentiating between high dose aspirin for pain relief and low dose use for primary prevention of heart problems.

Indicator #6:	**Quarters per year in which people aged 65 years and over who received an antipsychotic**
Numerator	Quarters per year in which people who received an antipsychotic. Age at end of quarter ≥ 65 years. A dispensing of chemical grouping = antipsychotics.
Denominator	New Zealand population, using Stats NZ population projections for the relevant years.

Analysis	Analysis by: • Year: 2012–19 • Ethnicity: Māori, Pacific peoples, Asian and European/other • Age: 65–74 years; 75–84 years; 85 years and over • Gender
Medicines included	Amisulpride, aripiprazole, chlorpromazine hydrochloride, clozapine, flupenthixol decanoate, fluphenazine decanoate, haloperidol, haloperidol decanoate, levomepromazine, levomepromazine hydrochloride, olanzapine, olanzapine pamoate monohydrate, paliperidone, pericyazine, pimozide, pipothiazide palmitate, quetiapine, quetiapine fumarate, risperidone, thiothixene, trifluoperazine hydrochloride, ziprasidone, zuclopenthixol decanoate, zuclopenthixol dihydrochloride, zuclopenthixol hydrochloride

Indicator #7:	**Quarters per year in which people aged 65 years and over who received a benzodiazepine or zopiclone**
Numerator	Quarters per year in which people who received a benzodiazepine or zopiclone. Age at end of quarter ≥ 65 years. A dispensing of chemical grouping = benzodiazepine or zopiclone.
Denominator	New Zealand population, using Stats NZ population projections for the relevant years.
Analysis	Analysis by: • Year: 2012–19 • Ethnicity: Māori, Pacific peoples, Asian and European/other • Age: 65–74 years; 75–84 years; 85 years and over • Gender
Medicines included	Alprazolam, clonazepam, diazepam, lorazepam, lormetazepam, midazolam, nitrazepam, oxazepam, temazepam, triazolam, zopiclone

Indicator #8:	**People aged 65 years and over who received both a benzodiazepine or zopiclone and an antipsychotic in the same quarter**
Numerator	People who received an antipsychotic and either a benzodiazepine or a zopiclone in the same quarter per year. Age at end of quarter ≥ 65 years. A dispensing of chemical group = benzodiazepine or zopiclone. A dispensing of chemical group = antipsychotic.
Denominator	New Zealand population, using Stats NZ population projections for the relevant years.

Analysis	Analysis by: • Year: 2012–19 • Ethnicity: Māori, Pacific peoples, Asian and European/other • Age: 65–74 years; 75–84 years; 85 years and over • Gender
Medicines included	• Antipsychotic: amisulpride, aripiprazole, chlorpromazine hydrochloride, clozapine, flupenthixol decanoate, fluphenazine decanoate, haloperidol, haloperidol decanoate, levomepromazine, levomepromazine hydrochloride, olanzapine, olanzapine pamoate monohydrate, paliperidone, pericyazine, pimozide, pipothiazide palmitate, quetiapine, quetiapine fumarate, risperidone, thiothixene, trifluoperazine hydrochloride, ziprasidone, zuclopenthixol decanoate, zuclopenthixol dihydrochloride, zuclopenthixol hydrochloride • Benzodiazepine: alprazolam, clonazepam, diazepam, lorazepam, lormetazepam, melatonin, midazolam, nitrazepam, oxazepam, temazepam, triazolam, zopiclone

Indicator #9:	**People who received both a benzodiazepine or zopiclone and a strong opioid following a public hospital event**
Numerator	People having a 'trigger event' in National Minimum Dataset or National Non-Admitted Patient Collection in the eight days prior to dispensing of a strong opioid and a benzodiazepine or zopiclone, excluding people dispensed a benzodiazepine or zopiclone in the three months prior to admission.
Denominator	People dispensed both a strong opioid and a benzodiazepine/zopiclone. Dispensing of both medicines to be on the same day.
Data sources	Pharmaceutical Collection, National Minimum Dataset, National Non-Admitted Patient Collection
Analysis	Analysis by: • Year: 2012–19 • Ethnicity: Māori, Pacific peoples, Asian and European/other • Age: 65–74 years; 75–84 years; 85 years and over • Gender
Medicines included	• Strong opioid: 1274 fentanyl citrate, 1830 morphine hydrochloride, 1831 morphine sulphate, 1915 oxycodone pectinate, 2383 morphine tartrate, 3801 fentanyl, 3822 oxycodone hydrochloride, 3896 fentanyl citrate, 1953 pethidine hydrochloride • Benzodiazepine: alprazolam, clonazepam, diazepam, lorazepam, lormetazepam, melatonin, midazolam, nitrazepam, oxazepam, temazepam, triazolam, zopiclone
Exclusions	• People dispensed a benzodiazepine or zopiclone in the three months prior to admission • Methadone hydrochloride was not included as a strong opioid

Rationale	All people starting these medicines will have a medical reason for doing so, and it is likely that many have a hospital event related to that reason. This indicator identifies those who appear to have had the combination of a benzodiazepine or zopiclone and a strong opioid commenced during their hospital stay. This combination increases the risk of over-sedation and serious side effects, including slowed or difficult breathing and deaths. The FDA has issued an alert warning against this combination and recommends prescribing should be limited to patients for whom alternative treatment options are inadequate. People already receiving a benzodiazepine or zopiclone prior to admission are excluded on the basis that it may not be appropriate to withdraw treatment as part of a hospital event requiring a strong opioid.
Note	We have corrected a technical error in which dispensing of both medicines on the same day was not accounted for correctly in previous publications of this Atlas domain. This means the number of people in 2017 dispensed both a strong opioid and a benzodiazepine or zopiclone on the same day has changed from 800,000 to 15,000.

Reference

Patterson S et al. Interventions to improve the appropriate use of polypharmacy for older people. *Cochrane Database Syst Rev* 2012, Issue 5, Art. No. CD008165.