Australian Government
Australian Institute of Health and Welfare

The burden of vaccine preventable diseases in Australia

Tracy Dixon
Head, Indigenous Burden of Disease Unit
Australian Institute of Health and Welfare

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The BVPD project

Aims

1. To estimate the burden of vaccine preventable diseases in Australia and how it has changed over time
2. To describe how the current burden varies by sex, age, state/territory and between Aboriginal and Torres Strait Islander people and other Australians.

Which diseases did we include?

Under the Australian Government's National Immunisation Program, certain key vaccines are provided free of charge at specified ages and for at-risk groups. In 2018, the program included vaccines for 17 diseases.

The BVPD study estimated burden for these 17 diseases, plus 2 others not covered under the NIP but of policy interest.

Diseases for which vaccines are available under the NIP schedule (as in 2018)		
Chickenpox (varicella)	Diphtheria	*Haemophilus influenzae* type b (Hib)
Hepatitis A[(a)]	Hepatitis B	Human papillomavirus (HPV)
Influenza	Measles	Meningococcal disease (invasive)
Mumps	Pneumococcal disease (invasive)	Poliomyelitis
Rotavirus	Rubella	Shingles (herpes zoster)
Tetanus	Whooping cough (pertussis)	
Additional diseases of interest		
Q fever	Respiratory syncytial virus (RSV)	

(a) Hep A vaccine is available under the NIP for Indigenous children living in Queensland, Western Australia, South Australia and the Northern Territory

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Methods

Incidence-based approach

- Different to the hybrid approach used by ABDS and GBD
- Allows results to reflect current and future burden associated with new cases only, so can see the effect of vaccination introduction
- Consistent with other infectious disease based studies such as BCoDE and ONBOIDS

Model building

- BCoDE study models used as a starting point
- Literature reviews and expert consultation undertaken to specify models that were suitable in the Australian context
- BCoDE study software tool used to generate DALY estimates based on Australian models

Data sources

- Notifiable disease records
- Hospital records
- GP survey data
- Death records
- Epi studies

Methods

- Estimates of fatal (YLL), non-fatal (YLD) and total burden (DALY) generated for each disease by sex and 5-year age group

- Where case numbers were sufficient, estimates also produced:
  - for each state and territory
  - for Aboriginal and Torres Strait Islander people.

- Estimates relate to reference years 2005 and 2015.

- Relevant changes in NIP vaccine availability:
  - Pneumococcal various infant and older adult groups 1999-2005
  - Hep B infants 2000 (with adolescent ‘catch-up’ until 2013)
  - Men C infants 2003
  - Varicella young children 2005
  - Hep A Indigenous young children 2005 (at-risk areas only)
  - Rotavirus infants 2007
  - HPV adolescents 2007 girls, 2013 boys

Challenges

- Need to estimate case numbers and Australian relevant transitional probabilities for sequelae for each disease model

- Issues with data availability
  - some diseases nationally notifiable with good capture (e.g. diphtheria, Hib, measles, IMD)
  - some known to be under-reported (e.g. Hepatitis A and B, rotavirus, influenza, varicella, pertussis)
  - some not notifiable in all states and territories (e.g. varicella)
  - some not notifiable and no good data source for incidence (e.g. HPV)
  - issues of reporting in death records – e.g. infections may not be lab confirmed
  - national data in most cases are for acute infection only, no reporting of complications/sequelae

- Adjustments for under-reporting applied to notifications data if available
- Case estimation based on combination of general practice and hospital data
- Enhanced pneumococcal surveillance data used to estimate case-fatality rates for IPD
- Information from other national data sources, epi studies or expert advice used to generate transitional probabilities

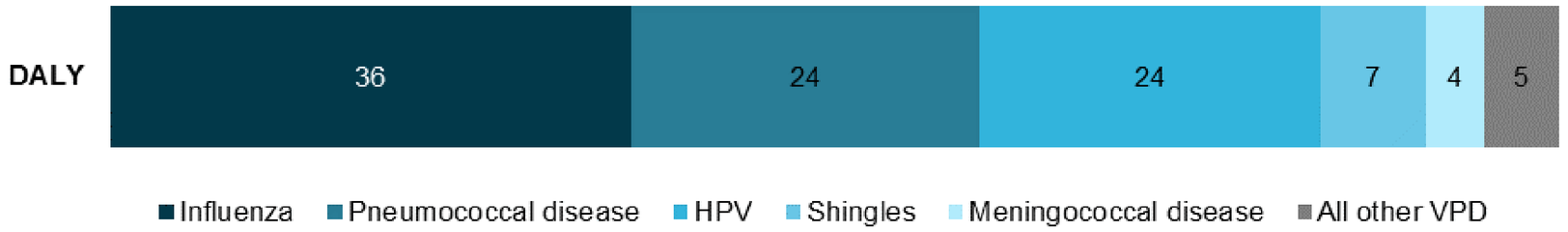
Main contributors changed over time

In 2005:

- 18,000 total DALY – 90 per 100,000 Australians
- Top 3 contributors HPV, pneumococcal disease and meningococcal disease
- These plus influenza and shingles accounted for 92% of the burden

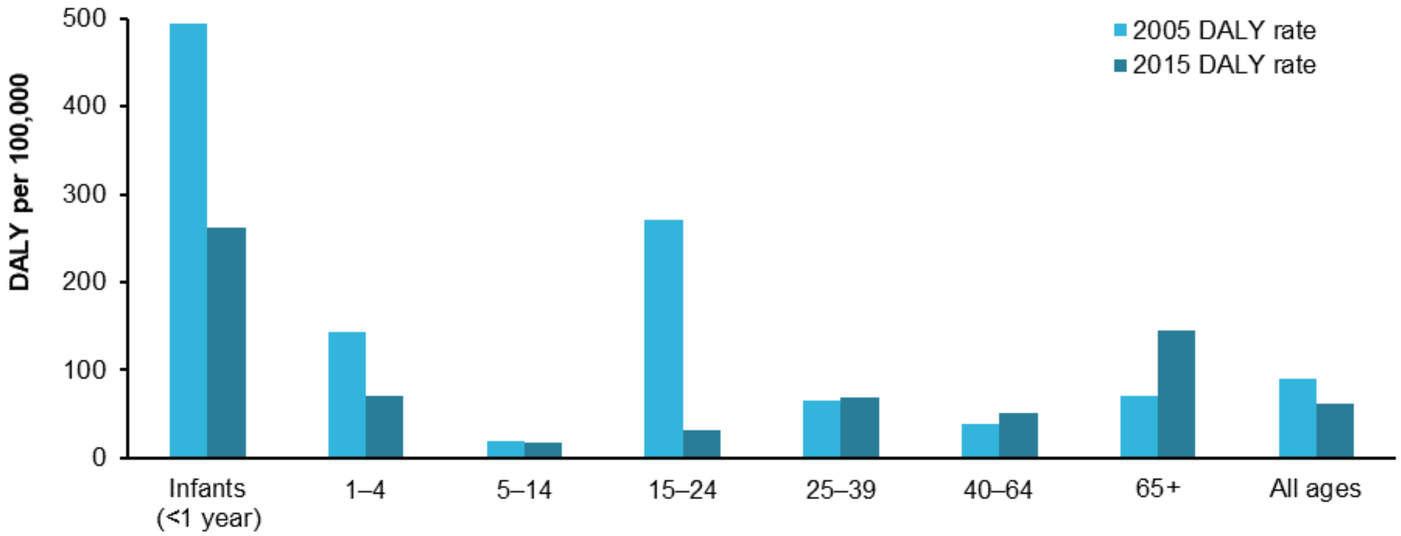
In 2015:

- 15,800 total DALY – 62 per 100,000 Australians
- Top 3 contributors were influenza, pneumococcal disease and HPV
- These plus shingles and IMD accounted for 95% of the burden

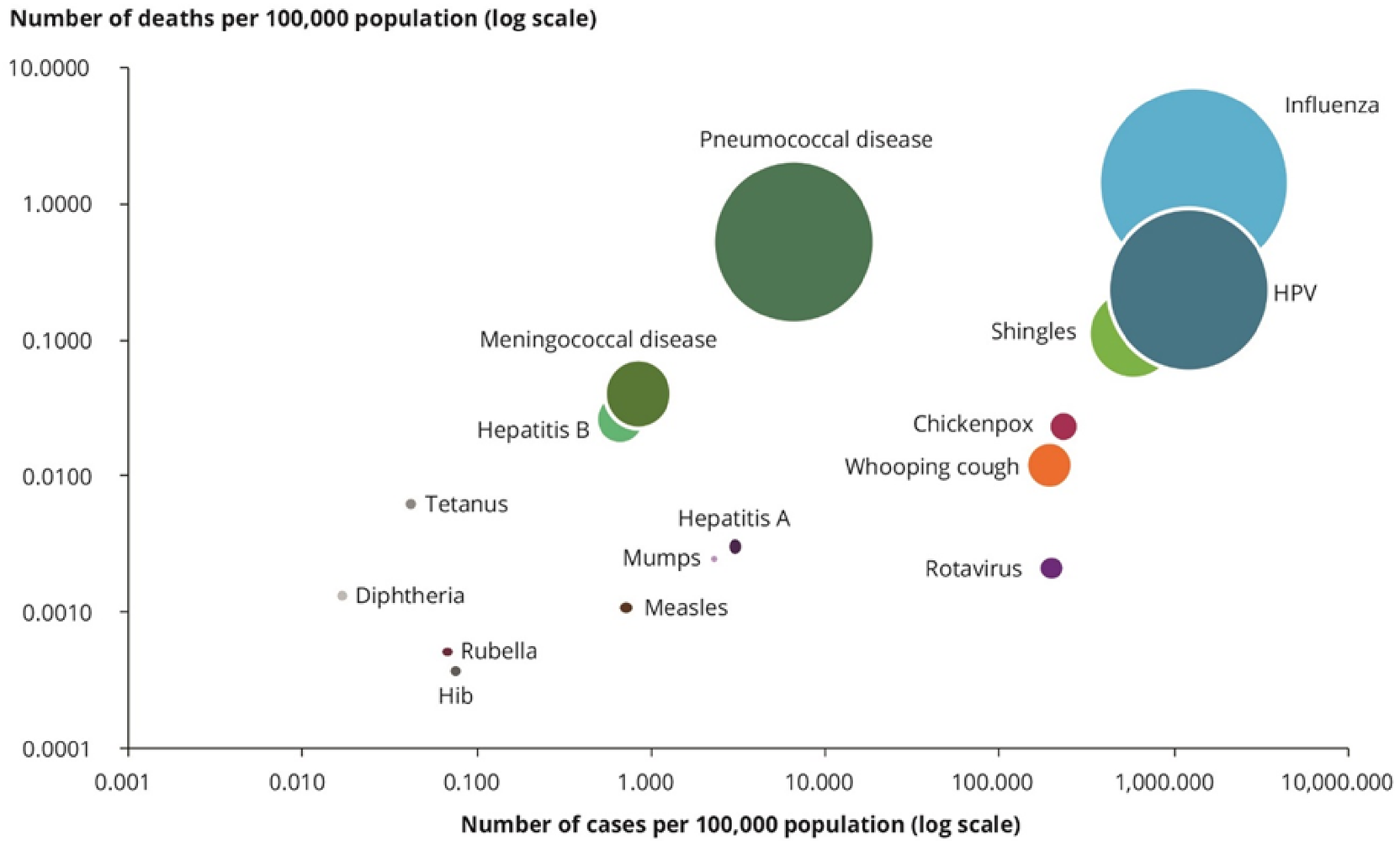


Change in burden by age

- Burden rate in 2015 relatively high in infants, lower in school-aged children then generally increasing with age
- Peak in adolescents/young adults due to HPV in 2005 – much smaller in 2015
- Drop in infant/young child burden driven by decline in incidence of rotavirus, IPD and IMD
- Increase in burden among older people relates to influenza and shingles
- Around 80% of DALY in 2015 were in people aged 20 and over – most of this is fatal burden



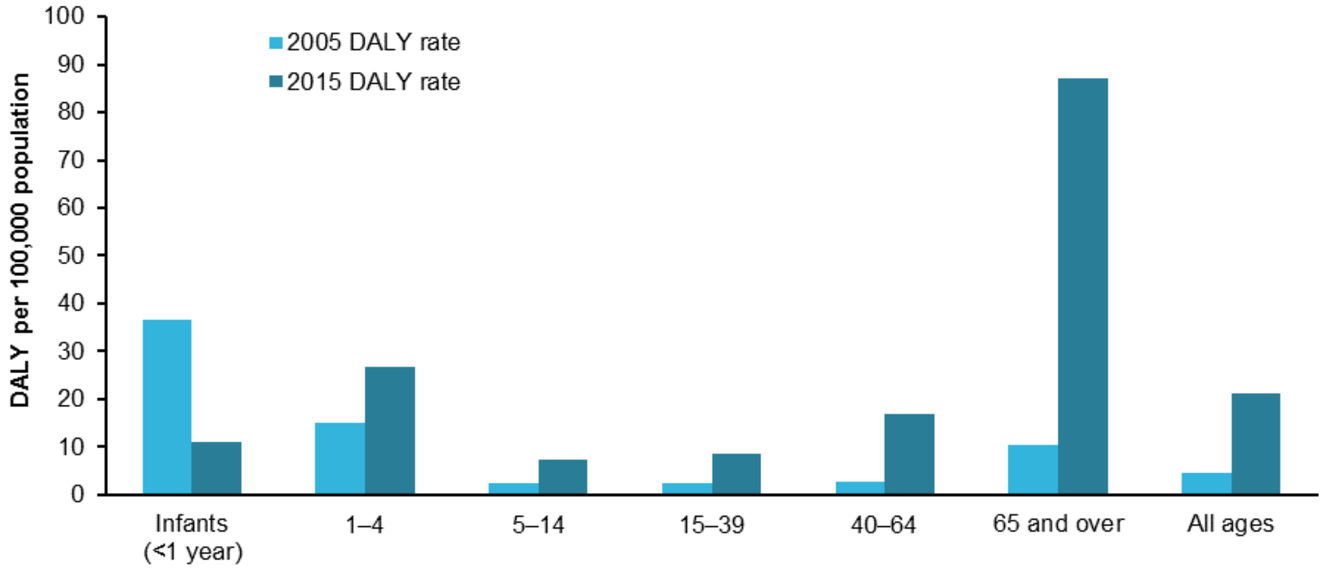
Relative population-level burden, 2015



Size of bubbles indicates population-level burden (DALY per 100,000 population).

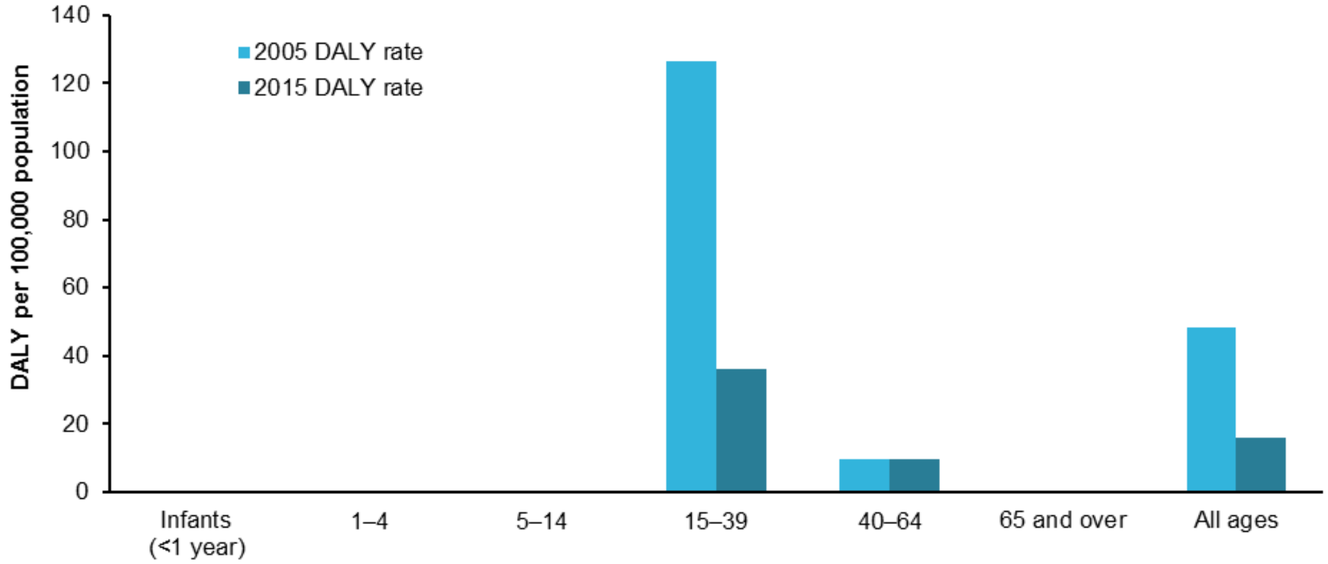
Influenza burden

- Burden varies substantially from year to year depending on seasonal subtypes
- In 2015, estimated 313,000 cases, 10,600 hospitalisations and 330 deaths
- Greater burden in 2015 than in 2005, due to larger number of cases and higher case-fatality rate
- Increased awareness following swine flu and MERS/SARS outbreaks along with greater availability of PCR testing means likely increase in detection and reporting since 2009
- NIP schedule currently provides for annual influenza vaccinations for people aged 65+, children aged 6 months to <5 years, Aboriginal and Torres Strait Islander people aged 6 months and over, pregnant women, and people aged 6 months and over with medical risk factors



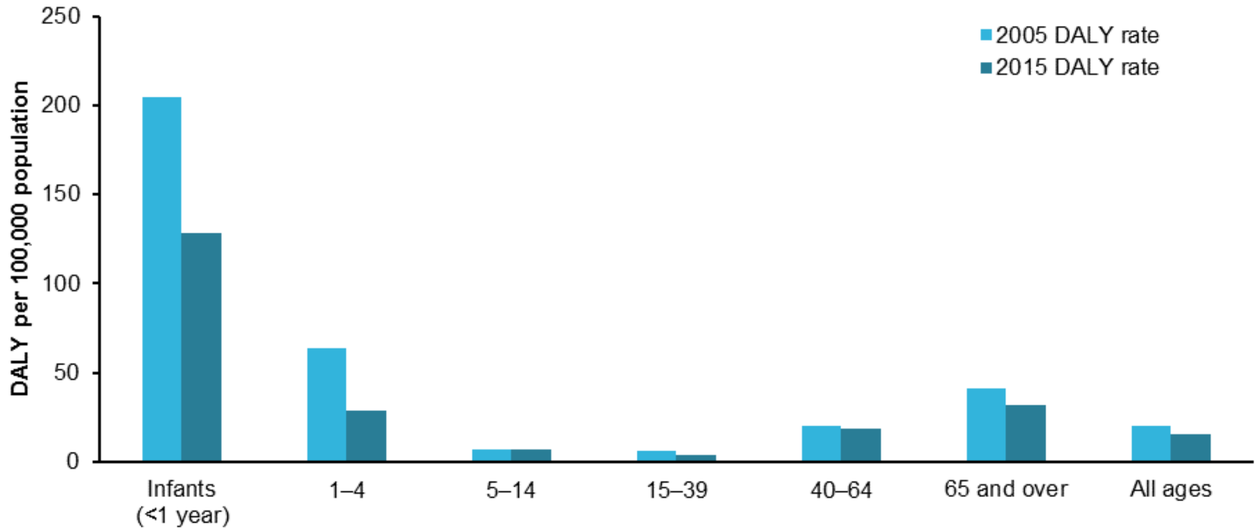
HPV burden

- In 2015, estimated 291,000 new infections, projected to lead to 15,000 high-grade cervical abnormalities, 400 cervical cancer diagnoses and 56 deaths.
- Considerably reduced burden compared with 2005 associated with almost 50% reduction in new infections
- HPV vaccination for females first included under NIP in 2007, extended to males in 2013.
- NIP schedule currently provides for HPV vaccination for all young adolescents at age 12-13, mostly delivered via school programs



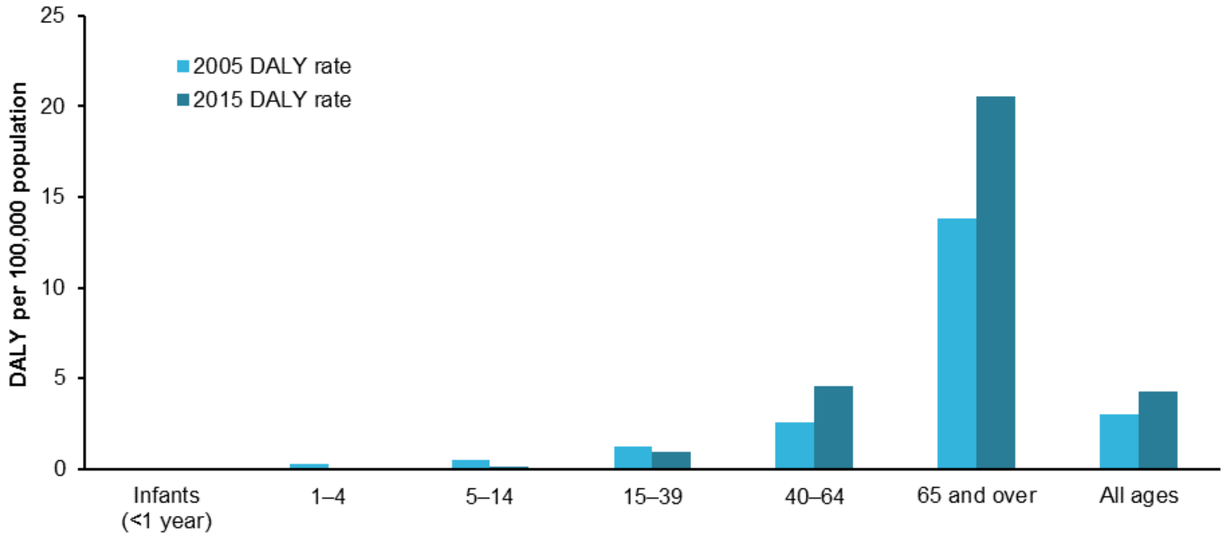
IPD burden

- In 2015, estimated 1,500 notified cases, 2,200 hospitalisations and 120 deaths
- Burden decreased over time with main falls in young children and older people
- Subsidised vaccinations available for older people since 1997. NIP funded vaccinations for at-risk Indigenous adults in 1999, at-risk infants in 2001, and all infants and people aged 65+ in 2005.
- NIP schedule currently provides pneumococcal vaccinations for infants, people aged 70+, Aboriginal and Torres Strait Islander people aged 50+, and people aged 12 months and over with medical risk factors



Shingles burden

- In 2015, estimated 140,000 cases, 2,400 hospitalisations and 28 deaths
- Burden increased since 2005 with majority seen in older people
- Vaccination for people aged 70 (with catchup for people aged 71-79) added to NIP schedule in late 2016



Summary

- Use of incidence-based method in this study showed clearly the impact of changes associated with vaccination programs
- The burden of vaccine-preventable diseases in Australia decreased by 31% between 2005 and 2015
- Substantial falls in burden for several diseases for which vaccines were introduced or eligibility expanded
- Rate of burden increased among older people, mainly due to influenza and shingles
- Increase in influenza burden at least partly associated with increased awareness and testing in later period
- Shingles burden in older people expected to drop following vaccination for people aged 70-79 introduced in late 2016

The burden of vaccine preventable diseases in Australia

https://www.aihw.gov.au/reports/immunisation/the-burden-of-vaccine-preventable-diseases/summary

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