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The Changing Epidemiology of Meningococcal Disease

Presented by

Professor Robert Booy

Moderated by

Dr Andrew Baird

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Housekeeping

Please type any questions throughout the meeting via the Q&A box (not Chat!)

To complete your evaluation form and provide feedback on this education, look for the “post-webinar survey” link in your browser when the meeting ends

The world has changed

And is changing…

Meningitis B cases rising sharply among students in England, study finds (pre-print, January 2022)

Men B Cases are exceeding pre-pandemic levels, particularly in UK university students, since Sept '21

The more things change, the more they stay the same…

UK risk factor study, late 1990s, 144 teen Meningococcal survivors, matched controls, BMJ 2006, *Tully J, Viner R, Booy R*

Flu-like illness, Uni/school student, multiple intimate kissing contacts, exposure to smokers rather than the smoke…

- During the pandemic, lockdowns used to curb the spread of Covid-19 also led to a decline in other infectious diseases – UK restrictions eased in July 21

- UK Meningococcal rates at *historic low until Sept 21*

- Stark increase in meningococcal B cases among adolescents and young adults “particularly in university students”, according to 2022 pre-print from UKHSA (UK Health Security agency)

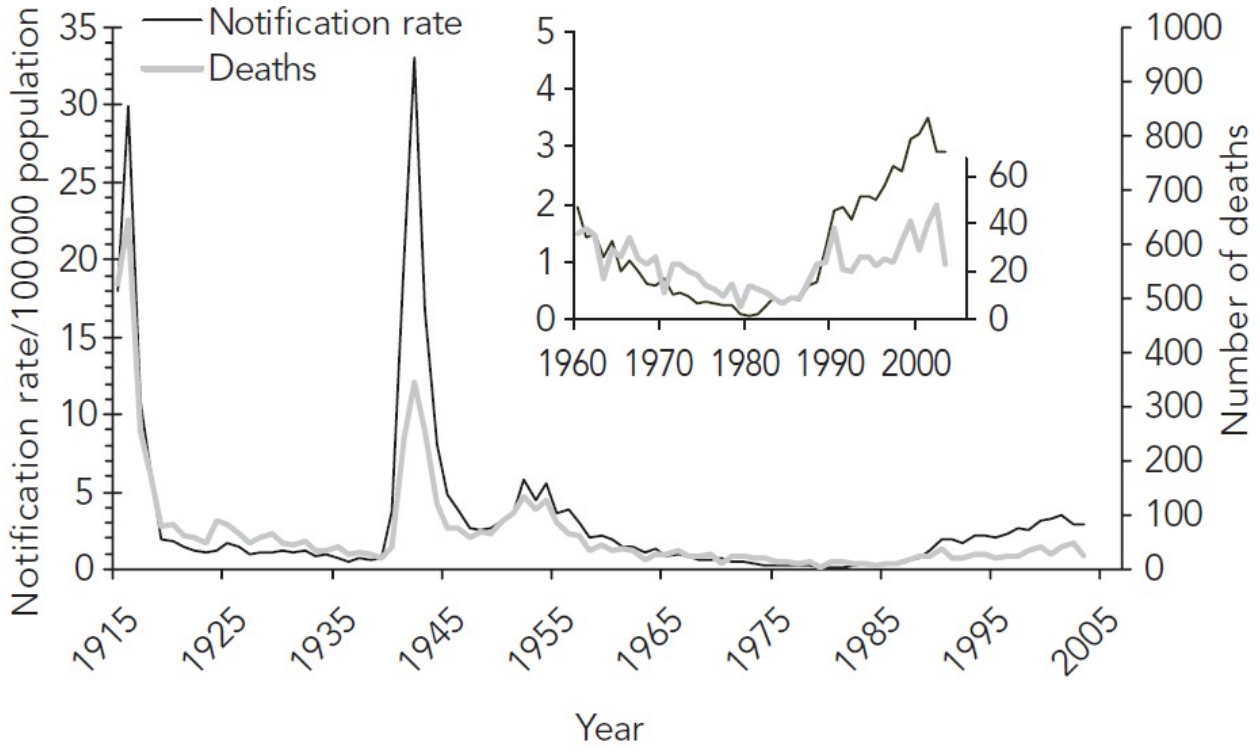
Some finer print

- The number of cases in teens during Sept-Nov in 2021 (22) was higher than corresponding periods in 2018 (16) & 2019 (19)

- Of the IMD cases confirmed among the 15- to 19-year-old and 20- to 24-year-old age groups in Sept to Nov 2021, 84.6% (22/26) were students registered at an education institution

- During that period, 41.5% of meningococcal cases occurred among those aged 15 to 19, compared with 11.8% and 14.3% during the same period in 2018 and 2019 respectively

2 Annual notification rates and deaths from meningococcal disease for all states/territories in Australia, 1915–2003



The annual number of deaths from meningococcal disease was obtained from the compilation of mortality data collected by the Australian Bureau of Statistics.[29]

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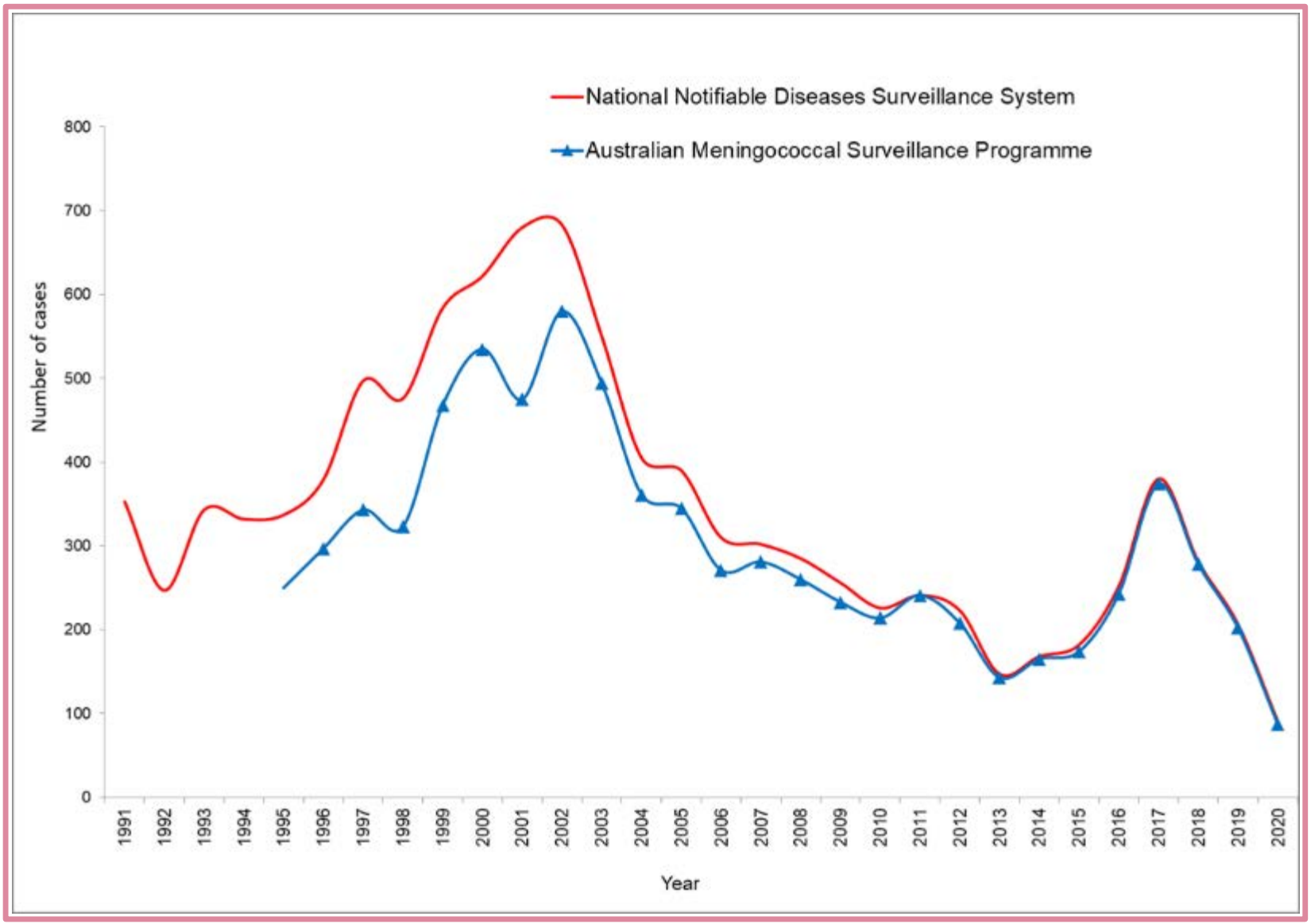
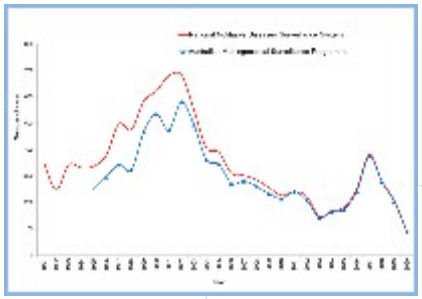
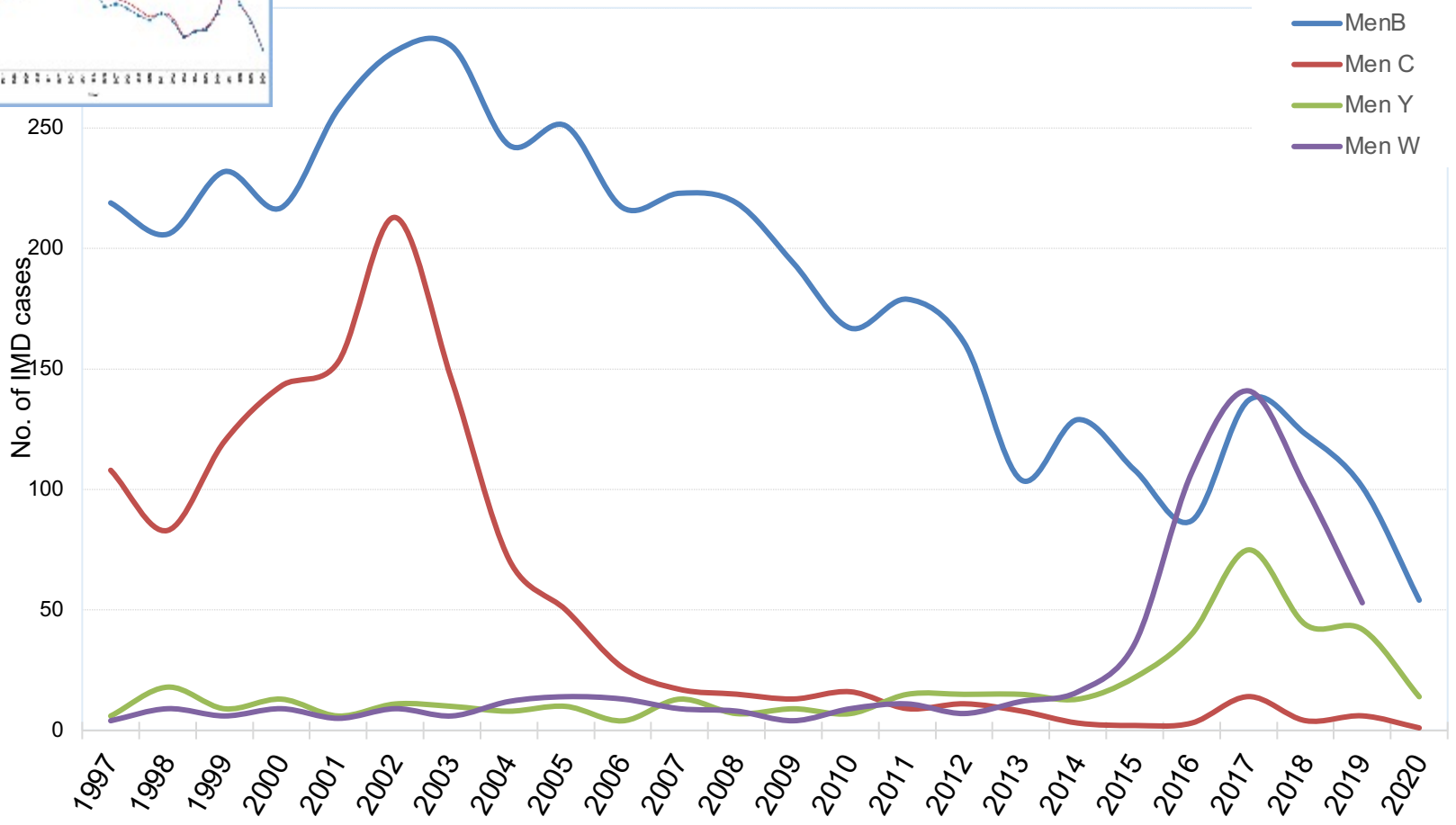
Notifications invasive meningococcal disease compared with laboratory data 1991-2020



Serogroups causing invasive meningococcal disease 1997-2020





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NNN AUSTRALIA

MJA 2022, in press

We explore reasons for this reduction, considering interventions targeting circulating meningococcal serogroups, influenza, and more recently coronavirus disease 2019 (COVID-19)..

The Silver Lining of the Pandemic Playbook: the fall of meningococcal disease and influenza in the time of COVID"
Rob George, Robert Booy, Michael Nissen, Monica Lahra

We explore reasons for this reduction, considering interventions targeting circulating meningococcal serogroups, influenza & COVID

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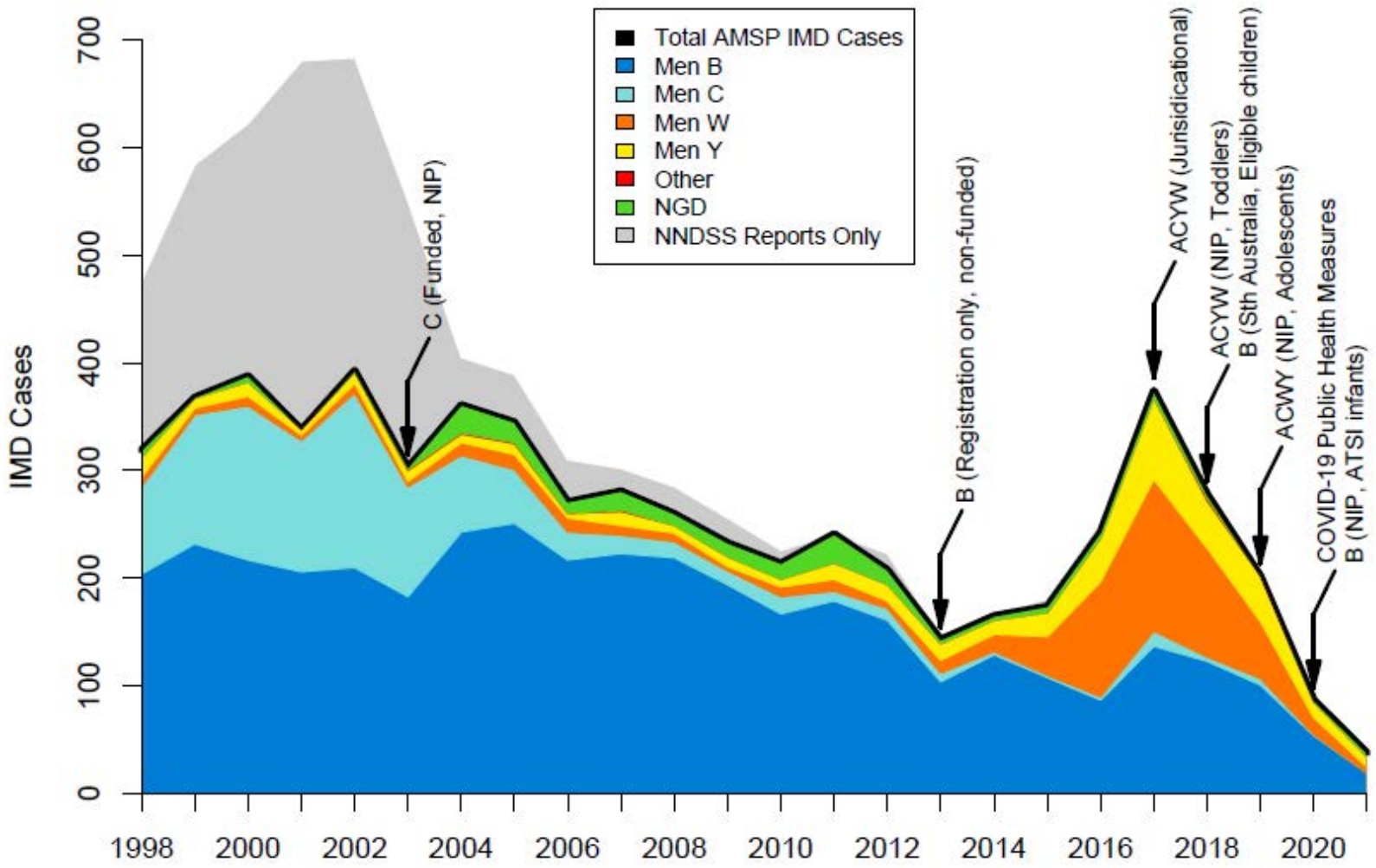
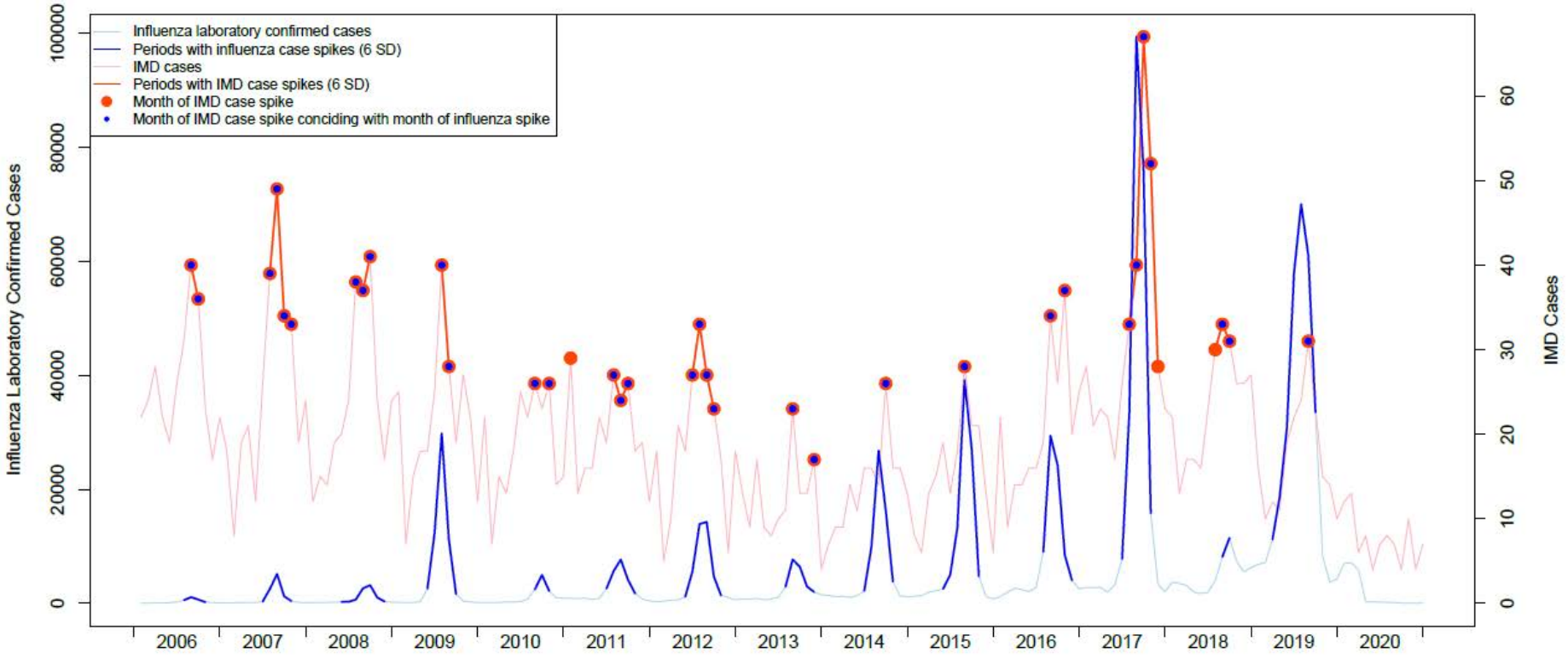


George CRR, Boor R, Nissen M, Lahra MM MJA In press 2022



George CRR, Boor R, Nissen M, Lahra MM MJA In press 2022

Both influenza and invasive meningococcal disease (IMD) are recognised as diseases of crowding

- a factor also identified as central to COVID-19 transmission
- Observations from military outbreaks published more than 100 years ago illustrate the impact of overcrowding on both meningococcal carriage and invasive disease, and the effects of simple public health strategies to improve hygiene
- Landmark paper 1918, six predisposing factors for IMD were observed: **season, severe weather, antecedent epidemics of influenza, temporarily lowered resistance, overcrowding, and high carriage rates**

Glover et al BMJ 1918

Impact of vaccination practices and policies in Australia on IMD rates

- Since 2003, progressive vaccine roll-outs in Australia have influenced IMD rates. Vaccination programmes targeting meningococcal serogroups and also those targeting influenza are relevant to IMD case reduction
- **From Oct 2018 Men B vaccination was funded for eligible children including those residing in South Australia where Men B disease rates were high**
- Aboriginal and Torres Strait Islander infants nationally via NIP Jul 2020

The constellation of practices and policies in Australia targeting IMD and influenza over the over the past two decades, culminated in the extensive COVID-19 public health measures commencing in 2020

The Result?

Coincided with the lowest rates of IMD and influenza since national records were kept!

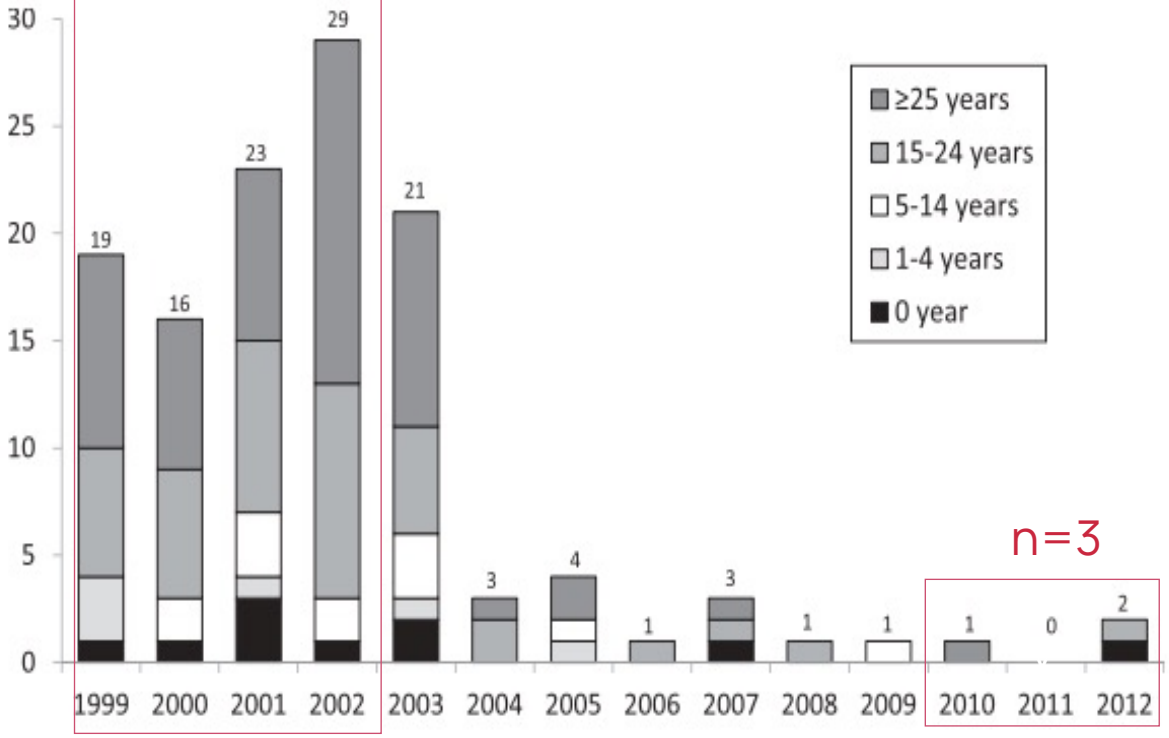
- The broad scale public education strategies aimed at disrupting transmission dynamics, including restricting travel, improving hand hygiene practices, physical distancing, improving ventilation of indoor space and mask wearing, have directly or indirectly influenced case numbers.
- There is little doubt that general awareness of infection control principles and practices has been raised in the population
- This reinforces recent findings that changing social behaviours might further reduce rates of IMD and is consistent with the historic findings from controlled defence settings,
- but also demonstrates that reductions in case numbers can be achieved in a broader social context and on a far greater scale

Epidemiol. Infect. (2016), **144**, 2382–2391. © Cambridge University Press 2016
doi:10.1017/S0950268816000704

Meningococcal disease epidemiology in Australia 10 years after implementation of a national conjugate meningococcal C immunization programme

G. L. LAWRENCE[1,2]*, H. WANG[2], M. LAHRA[3], R. BOOY[2,4] AND P. B. McINTYRE[2]

n=68

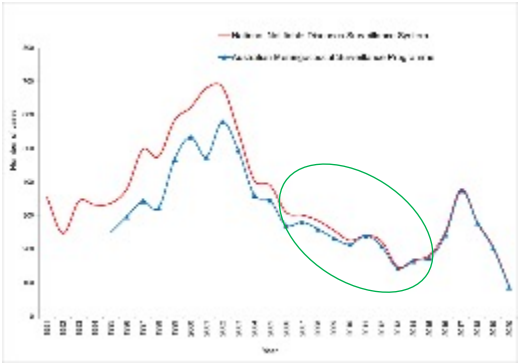


n=3

PROTECTIVE EFFECT DIRECT AND INDIRECT.

BY 2016:

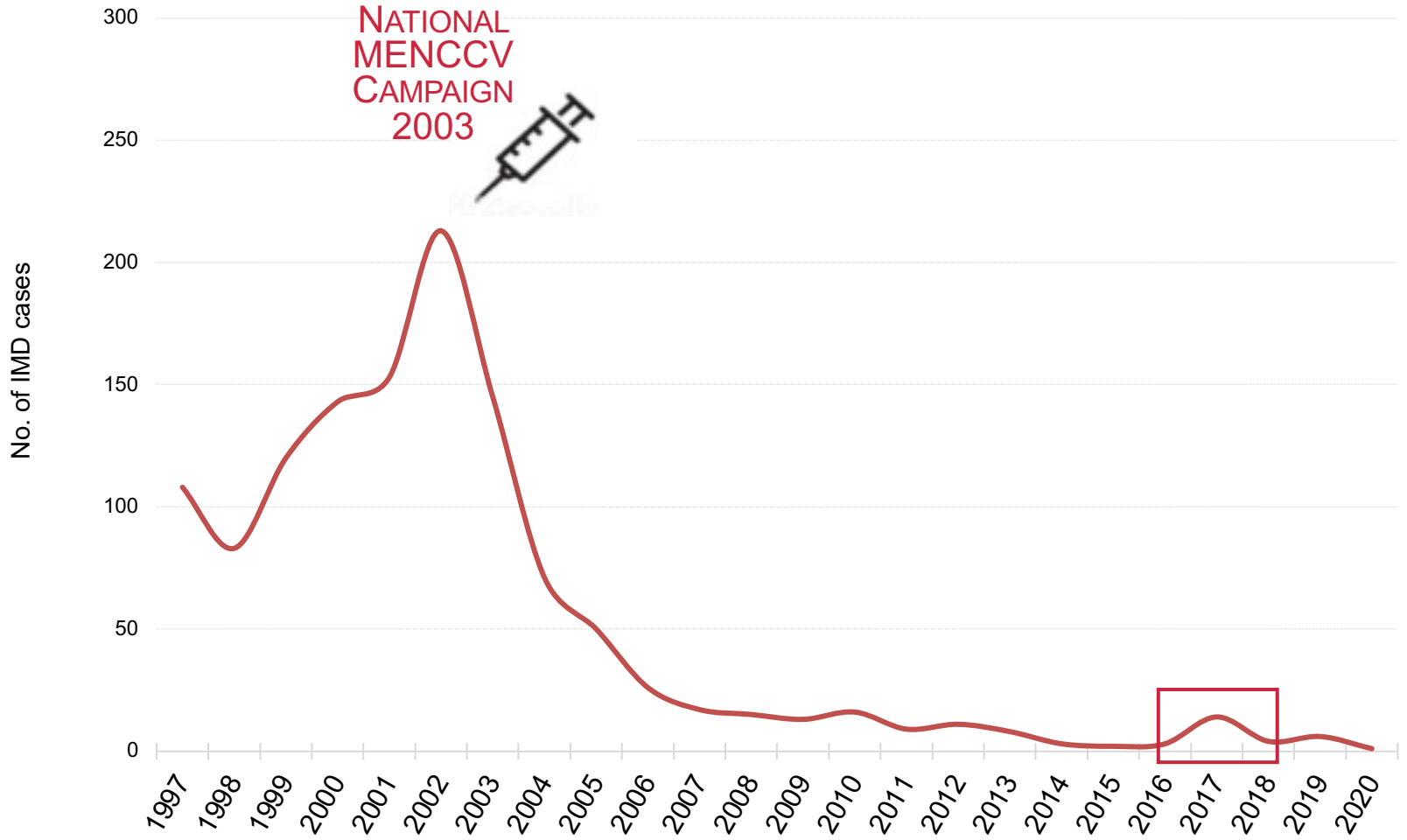
- 99% REDUCTION IN MENC IMD
- 55% CONCURRENT, INDEPENDENT REDUCTION IN MEN B IMD



Estimated deaths due to Men C IMD Australia by age group and year 1999-2012

https://www.cambridge.org/core/terms., https://doi.org/10.1017/S0950268816000704

MENC IMD AUSTRALIA 1997-2020



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MENB IMD AUSTRALIA 1997-2020

NATIONAL MENCCV CAMPAIGN 2003

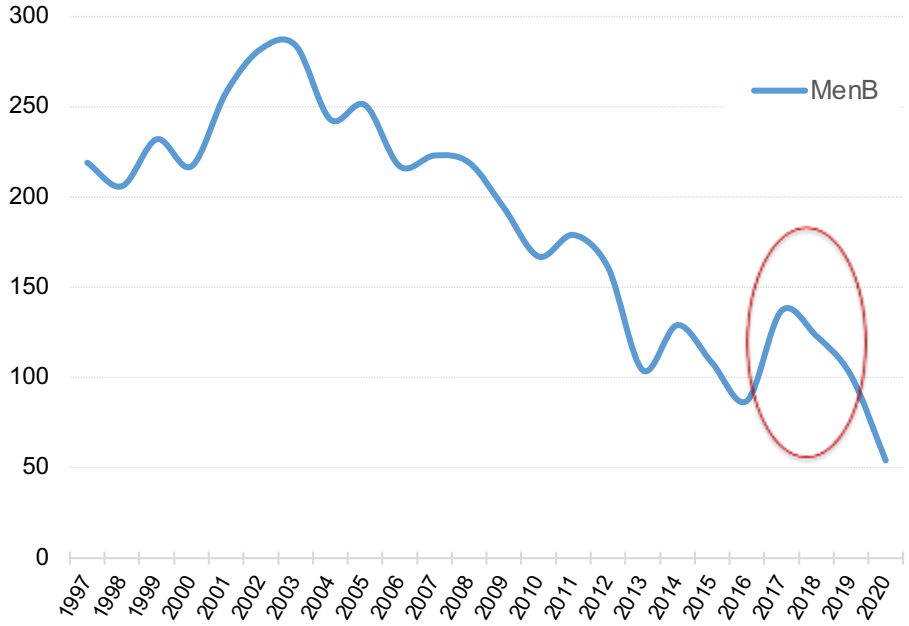
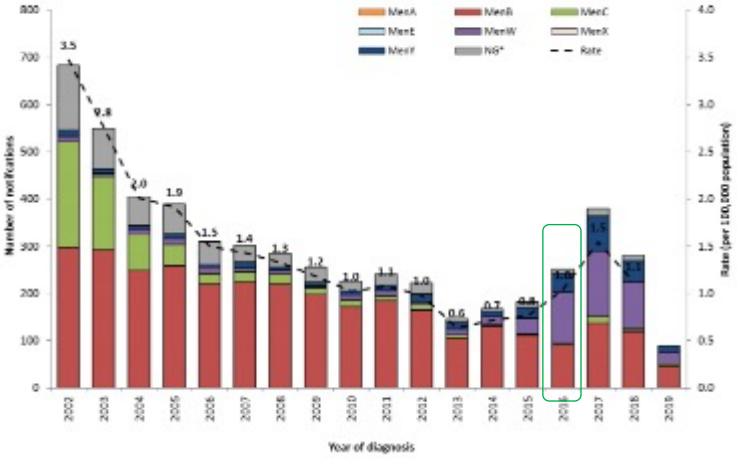


Figure 1. Annual cases and annual rate of IMD, Australia, 1 January 2002 to 30 June 2019 by serogroup



Men B in Australia

- 69% decline post Men CCV
- most common serogroup until 2015
  2016
- eclipsed by MenW
  2017
- spike in IMD
- ACWY vaccine
  2020
- most common serogroup, 62% IMD

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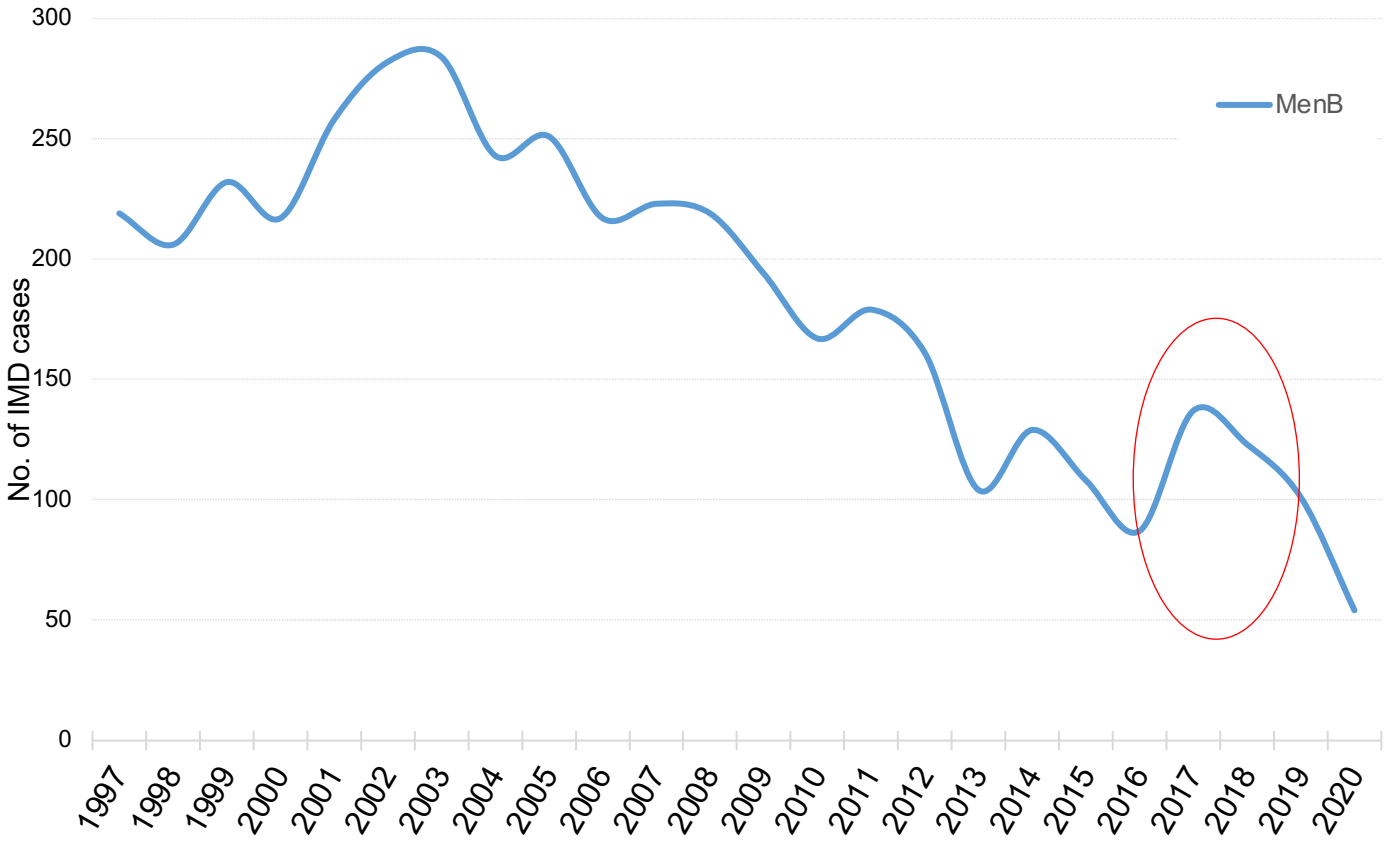
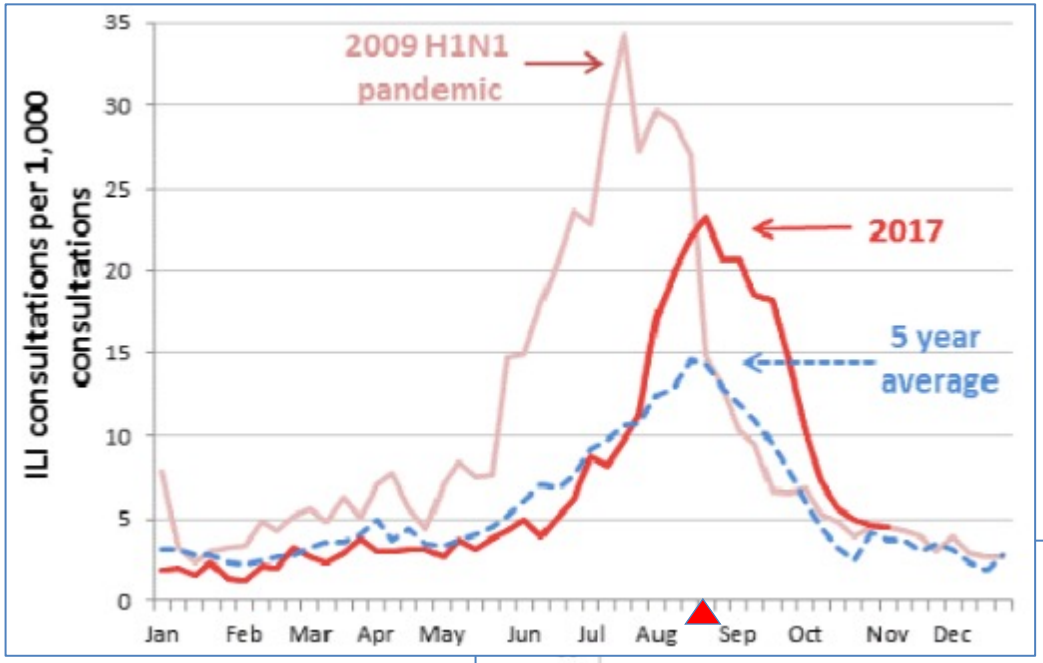
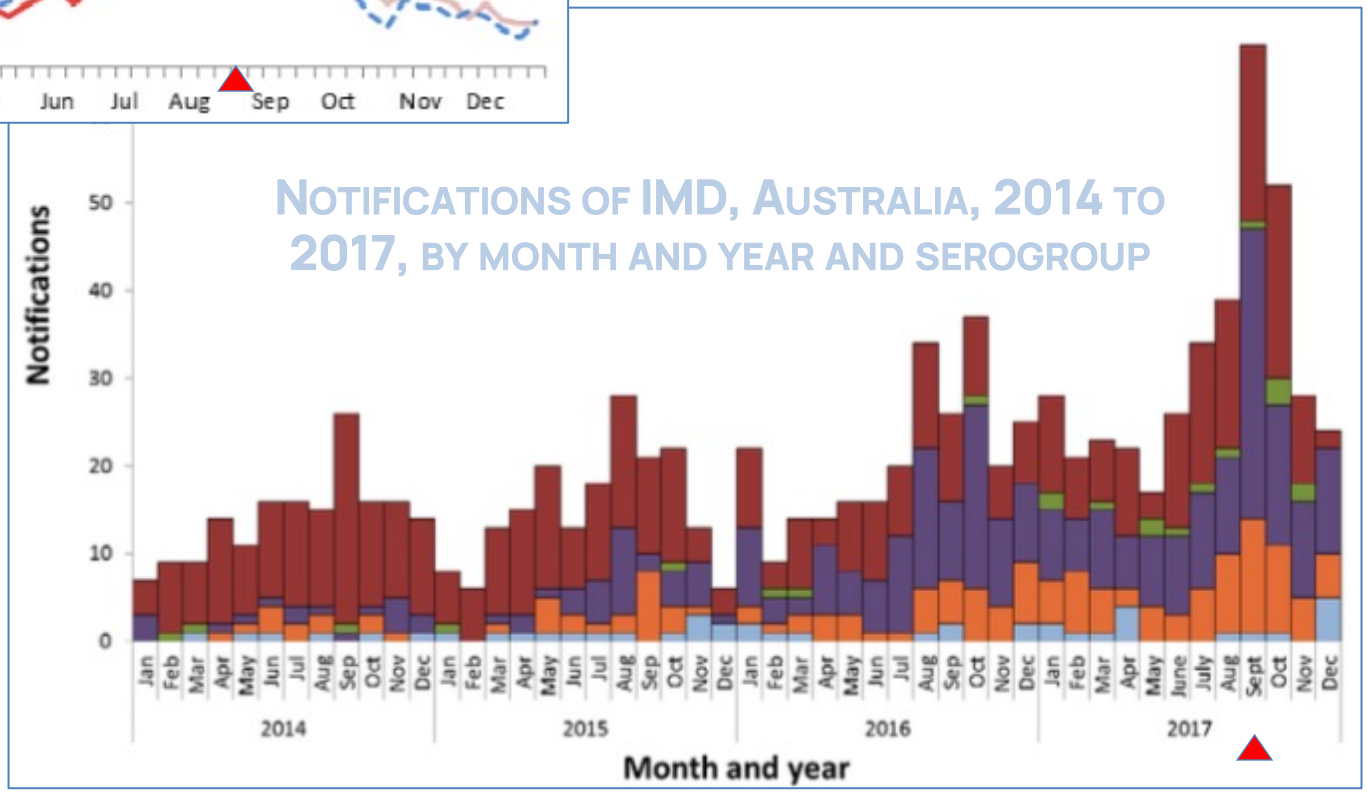
MEN B IMD AUSTRALIA 1997-2020



ILI presentations to sentinel GPs, by week 2009-2017 Australia



2017: most common influenza virus A(H3N2)



http://www.health.gov.au/internet/main/publishing.nsf/Content/cda-surveil-ozflu-flucurr.htm/$File/2017-season-summary-22112017.pdf

Multicomponent Recombinant MenB Vaccine

2013:

- Bexsero Novartis/GSK
- broad spectrum cover Men B strains
- registered in Australia for vaccinating people at least 2 mo.

2014:

- available in Australia by private prescription

Australian Technical Advisory Group on Immunisation (ATAGI):

- targeted use in <2 and 15-19 you and populations at increased risk

Pharmaceutical Benefits Advisory Committee:

- rejected applications for inclusion in National Immunisation Program

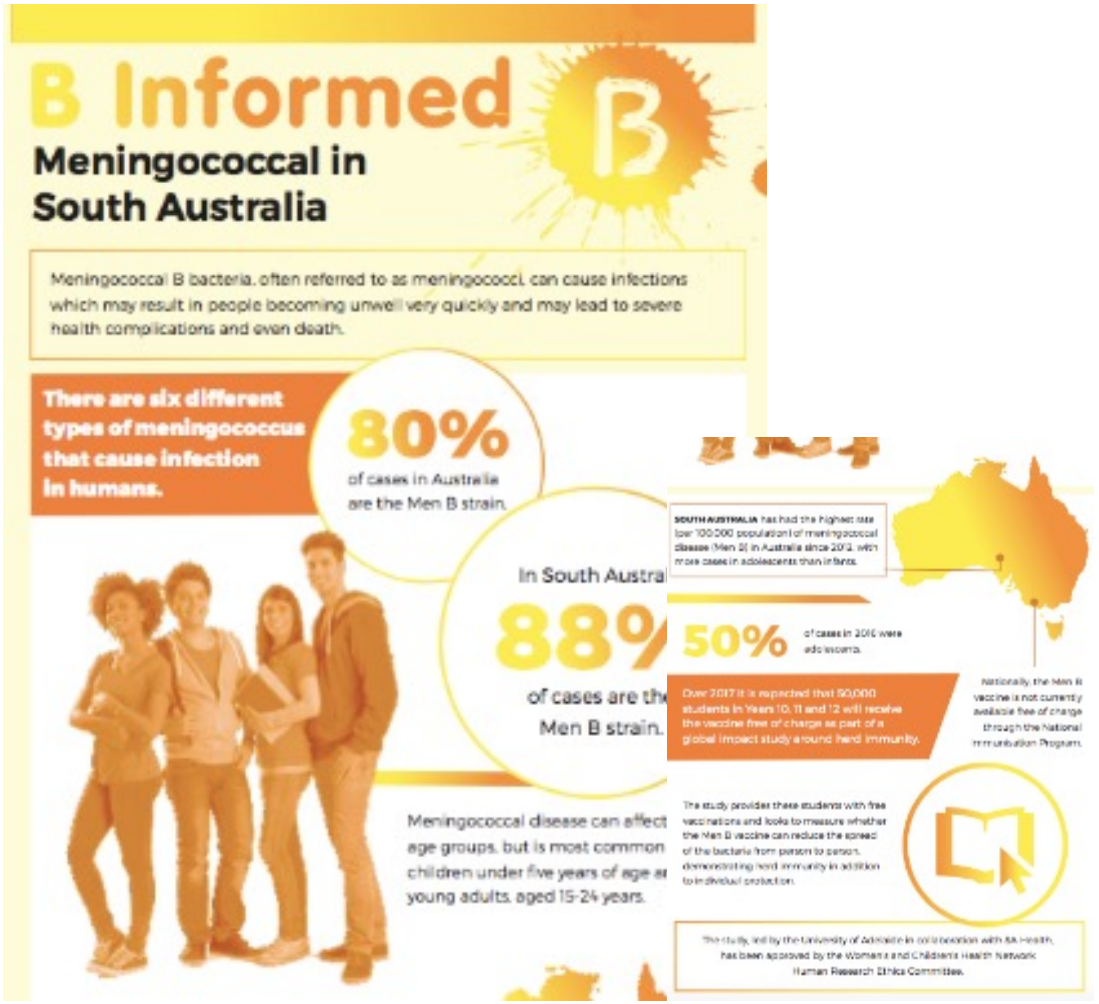
South Australia: B Part of It Study

2016 SA:

- highest IMD rate since 2012
- >80% IMD due to MenB
- 50% in adolescents

B PART of IT:

- cluster RCT
- impact of 4CMenB on nasopharyngeal carriage of N. meningitidis in adolescents in SA



www.bpartofit.com.au

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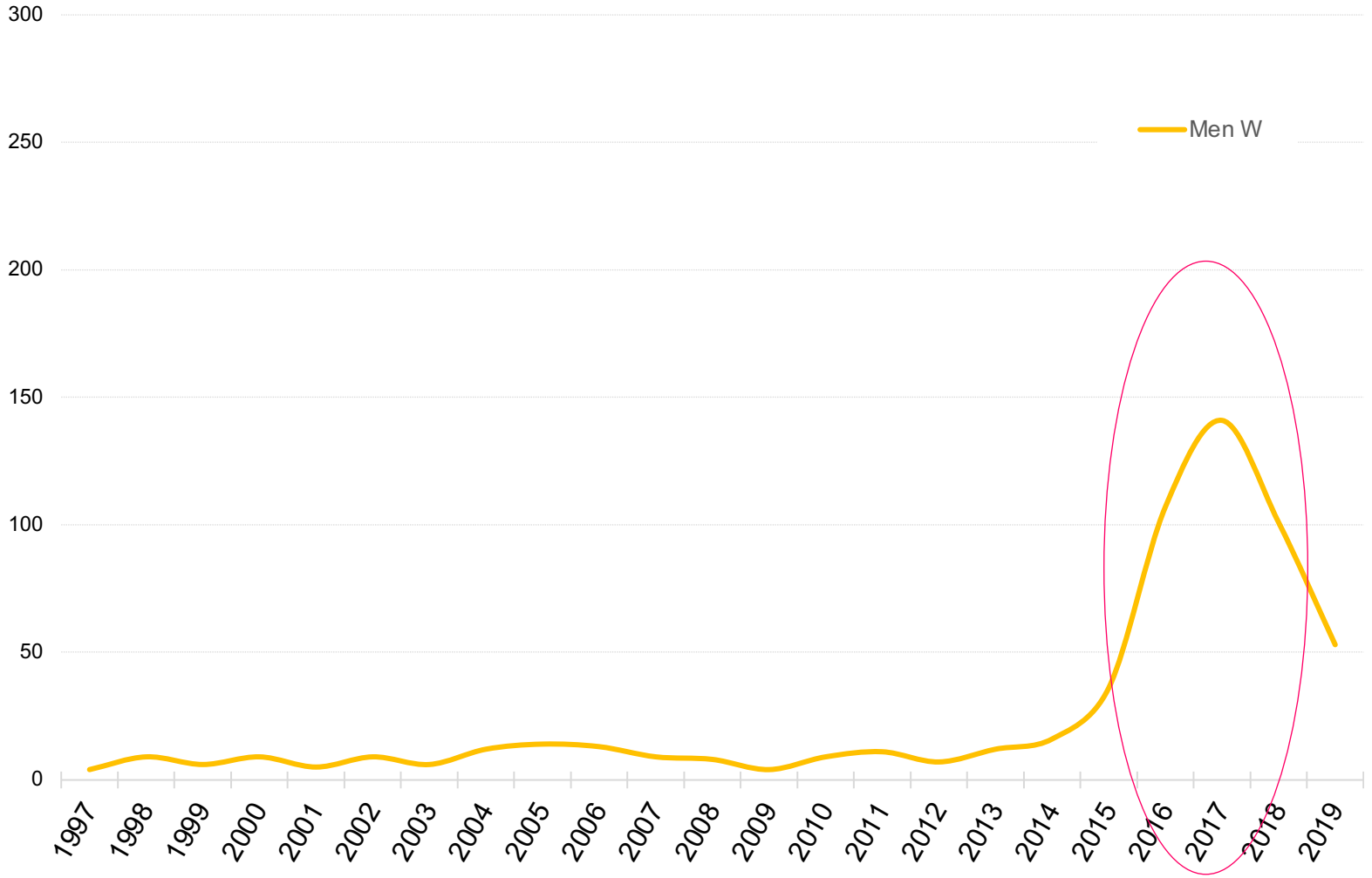
MENW IMD AUSTRALIA 1997-2020



Vaccine
Volume 34, Issue 13, 18 March 2016, Pages 1515-1523

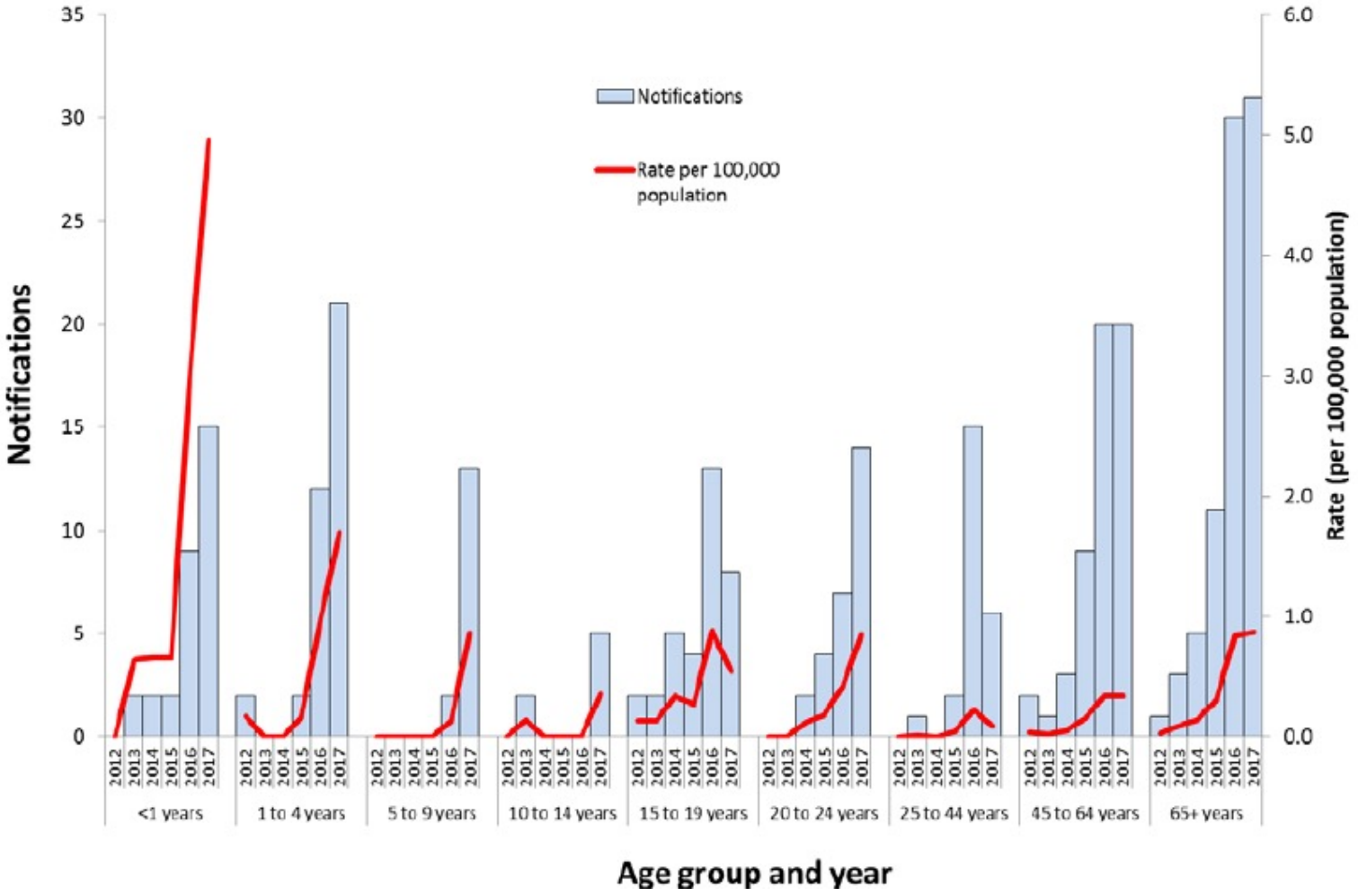
Global epidemiology of capsular group W meningococcal disease (1970–2015): Multifocal emergence and persistence of hypervirulent sequence type (ST)-11 clonal complex

Mustapha M. Mustapha, Jane W. Marsh, Lee H. Harrison

MEN W CC11

- occasional sporadic disease until 2000 > global multifocal emergence
- **2000-2001** epidemic: Hajj pilgrims, Saudi Arabia: 400 cases, 52 deaths
- **2002** epidemic in Burkina Faso: 12 000 cases, 1400 deaths
  - Hajj MenW cc11, PorA antigen gene type P1.5,2
  - other **geographically and genetically diverse lineages of W cc11**
  - lineages can co exist in the same country at the same time
  - multiple epidemics, clusters of MenW cc11
- USA, UK, Europe, Asia Pacific: genetically distinct from Hajj clone

Age-specific notifications and rates of Men W IMD Australia 2012 - 2017



http://www.health.gov.au/internet/main/publishing.nsf/Content/ohp-meningococcal-W.htm

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The Hon. Greg Hunt MP
Minister for Health

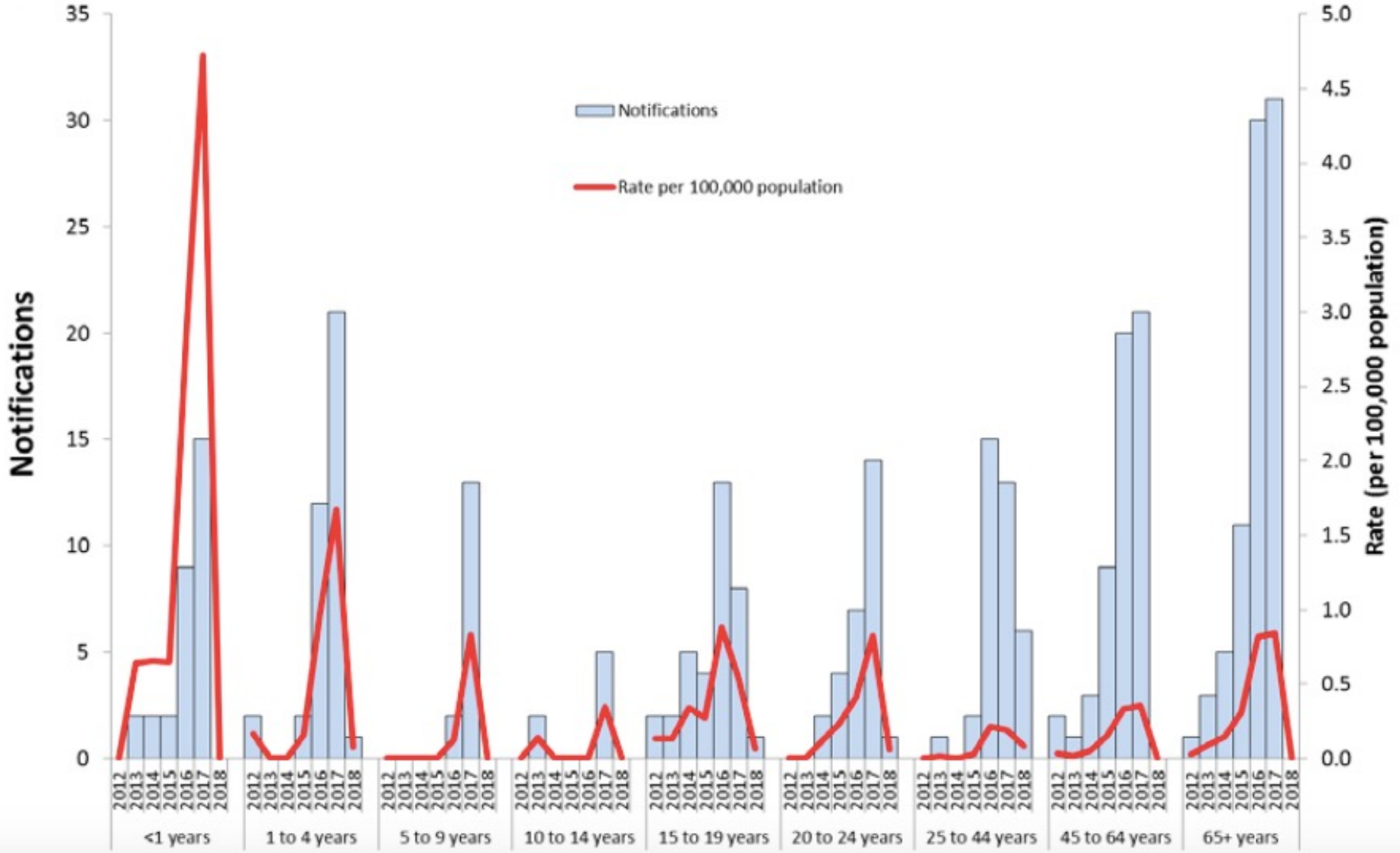
MEDIA RELEASE

2 February 2018

Quad-strain meningococcal vaccine to be added to National Immunisation Program

http://www.health.gov.au/internet/ministers/publishing.nsf

Age-specific notifications and rates of MenW, Australia, 2012 to 2018 YTD#



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Men Y IMD

AUSTRALIA:

increase in Men Y

2000- 2010:

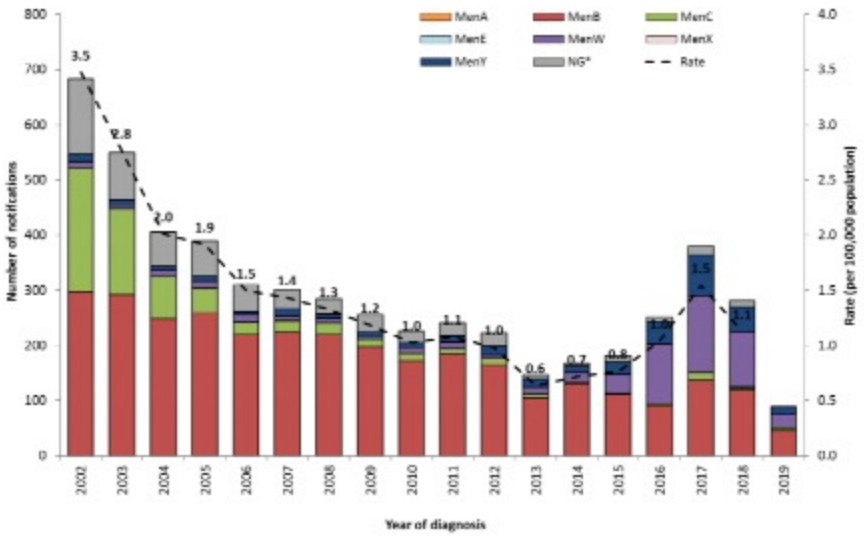
~ 3% of all IMD cases pa

(range 1.3%-4.6%)

2016-2020:

range 16-20%

Figure 1. Annual cases and annual rate of IMD, Australia, 1 January 2002 to 30 June 2019 by serogroup



WGS IMD 2017 MDU: MenY cc23 - tight clustering: local transmission, spread

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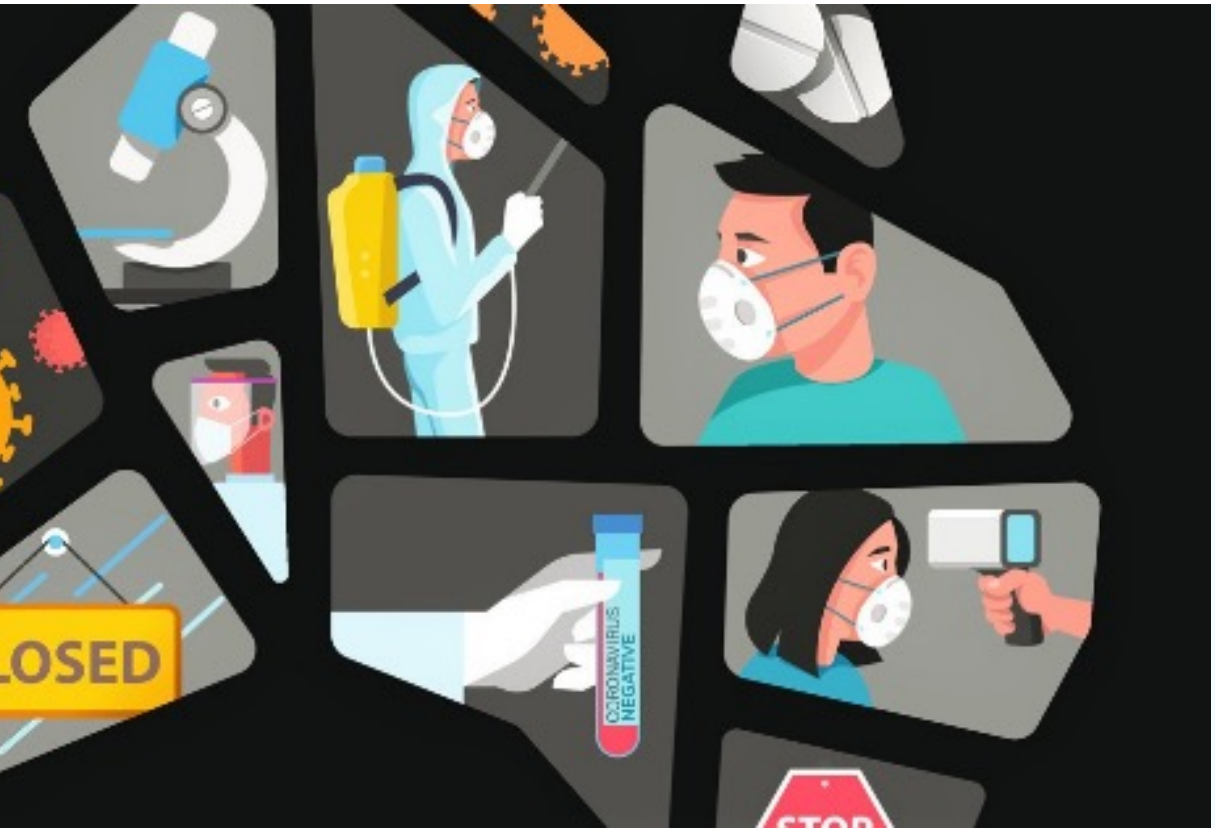
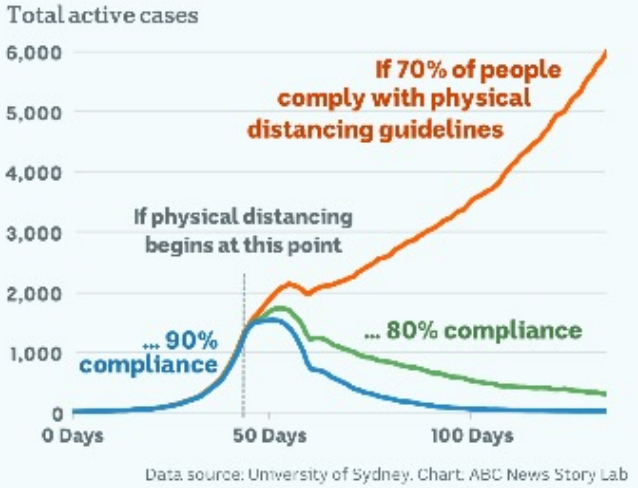


How every single Australian's actions affect the spread of coronavirus

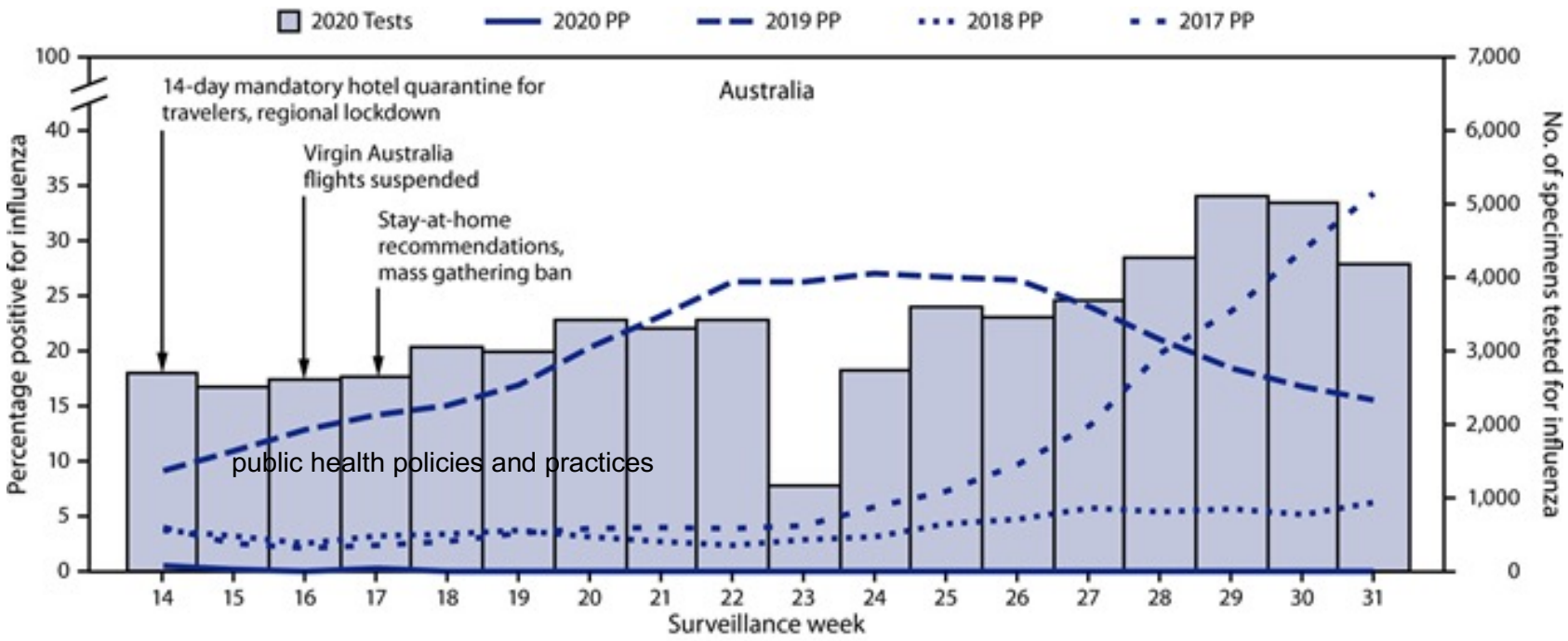
To effectively slow the spread of coronavirus, the vast majority of people will need to cut out nearly all their in-person social interactions, new University of Sydney modelling shows. That's on top of existing measures like travel restrictions.

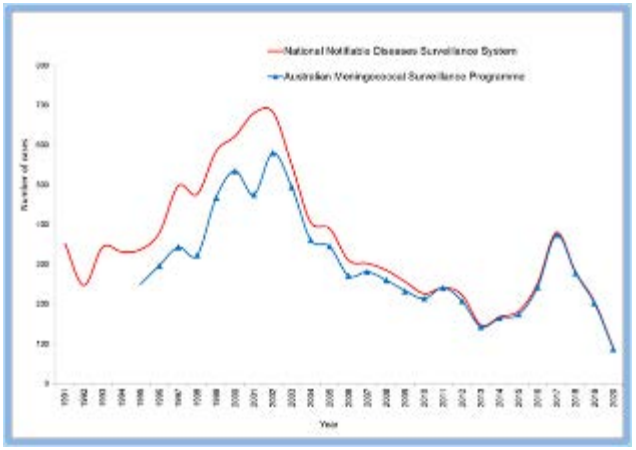


Data source: University of Sydney. Chart: ABC News Story Lab

IMD IN 2020

Decreased influenza activity during the COVID-19 pandemic: Australia 2020





2020 Australia:

IMD notifications n=90
lowest ever recorded

- widespread public health policies and practices
- higher influenza vaccination uptake
- decreased influenza
- NIP change for MenACWY

2021 Q1 IMD notifications down 45% from Q1 20

American Journal of Transplantation, Volume: 20, Issue: 12, Pages: 3681-3685, First published: 02 December 2020, DOI: (10.1111/ajt.16381) https://doi.org/10.1111/ajt.16381

The Sydney Morning Herald

National NSW Illness

‘This has never been seen before’: Common illnesses wiped out in fight against COVID-19

By Lucy Carroll
June 3, 2021 — 12.09pm

Save Share A A A

For our free coronavirus pandemic coverage, learn more here.

Cases of common illnesses have hit record lows as hygiene measures used to stop the spread of COVID-19 have put the brakes on the transmission of many childhood viruses and diseases.

Acknowledgements

National Neisseria Network, Australia

QLD: Amy Jennison, Helen Smith, Vicki Hicks
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ACT: Susan Bradbury
VIC: Kerrie Stevens, Samantha Tawil, Jason Kwong
SA: Andrew Lawrence, Judith Holds
WA: Jane Bew, Julie Pearson
NT: Kevin Freeman
UQ: David Whiley

Professor Robert Booy

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Office of Health Protection Australian Government Department of Health