A 100 years ago this month: Public health reflections on the 1918 influenza pandemic (NZ perspective)

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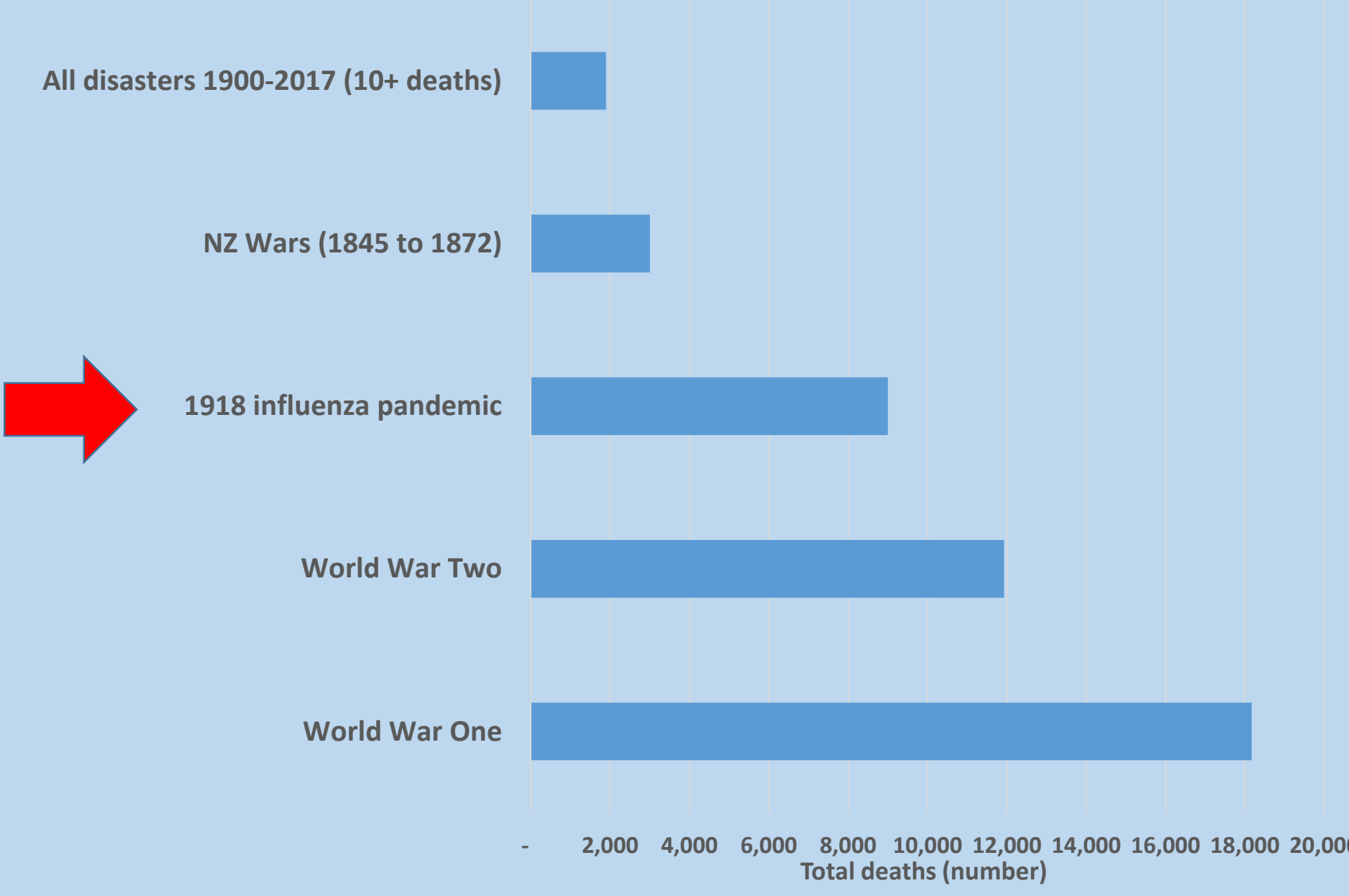
Why research pandemics?

- Influenza pandemics – several a century
- Other pandemics also arise (eg, SARS) – possibly increasing risks (factory farming, rainforest habitat intrusions)
- Risks of synthetic bioweapons (lab accidents; use by terrorists; use in war)

NZ disasters & the 1918 Pandemic (9000 dead in 2 months)



Key parameters: timing of Kiwi deaths

[Summers et al 2013, *NZMJ*; Wilson & Baker 2008, *NZMJ*]

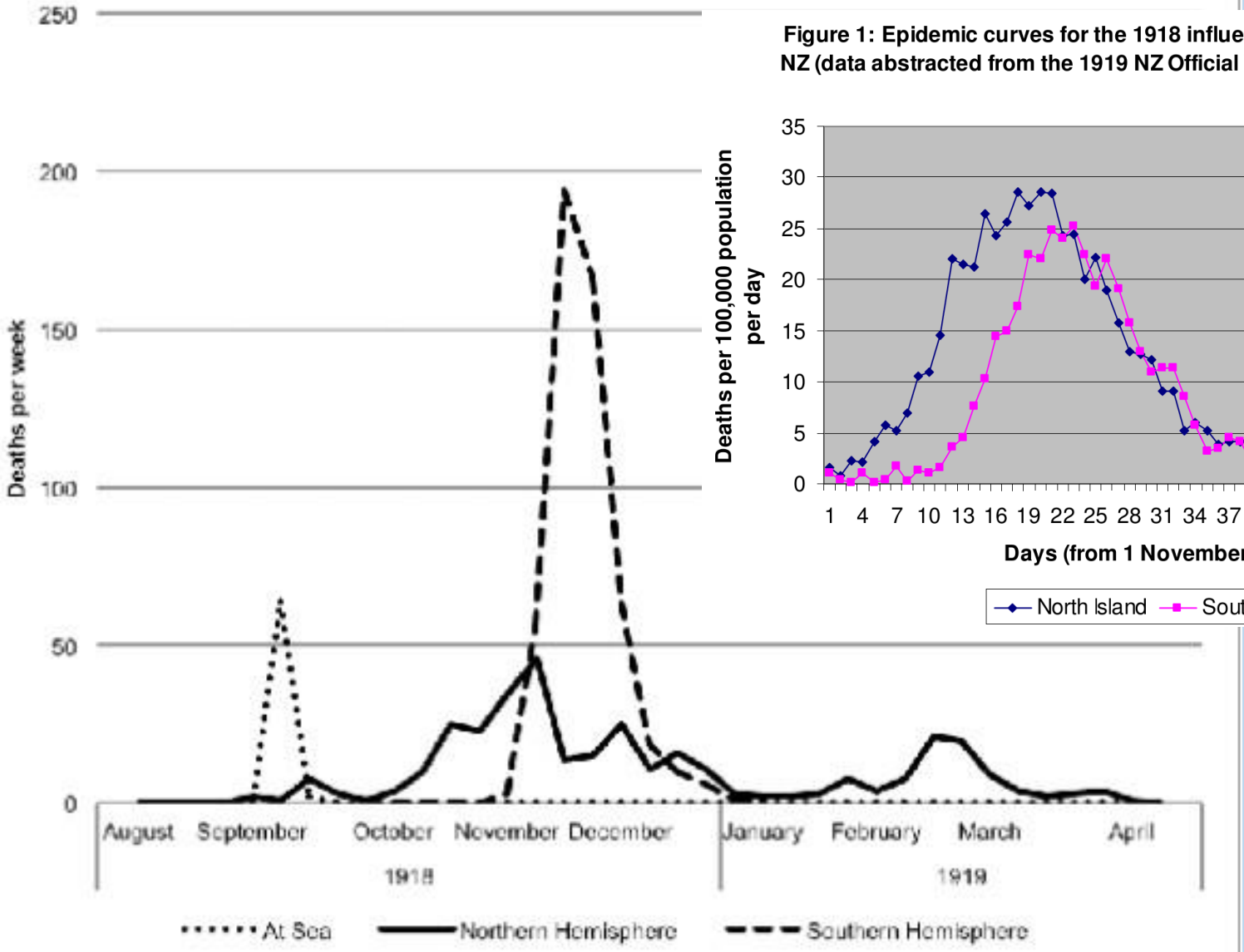
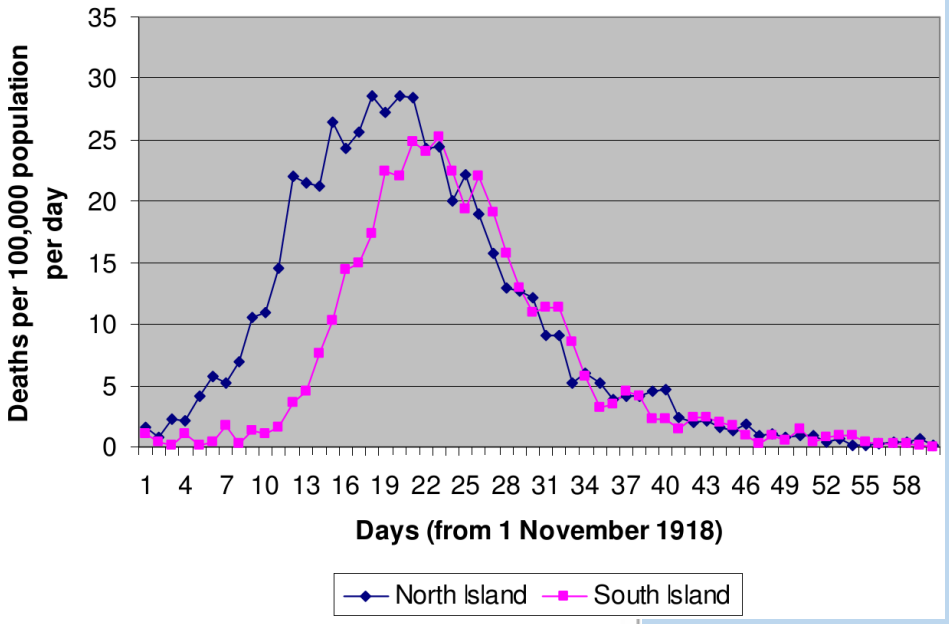
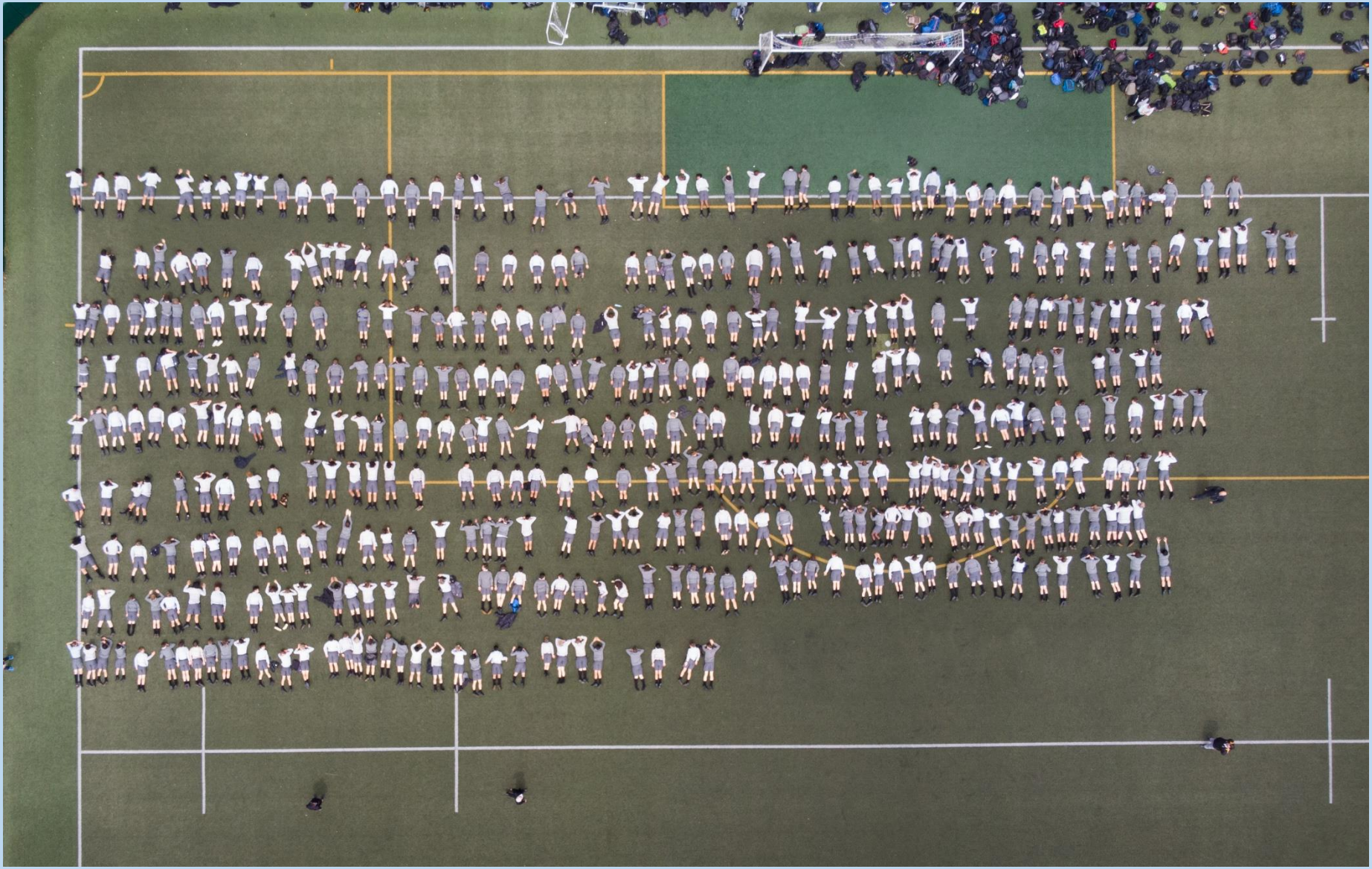


Figure 1: Epidemic curves for the 1918 influenza pandemic in NZ (data abstracted from the 1919 NZ Official Year-Book p169)



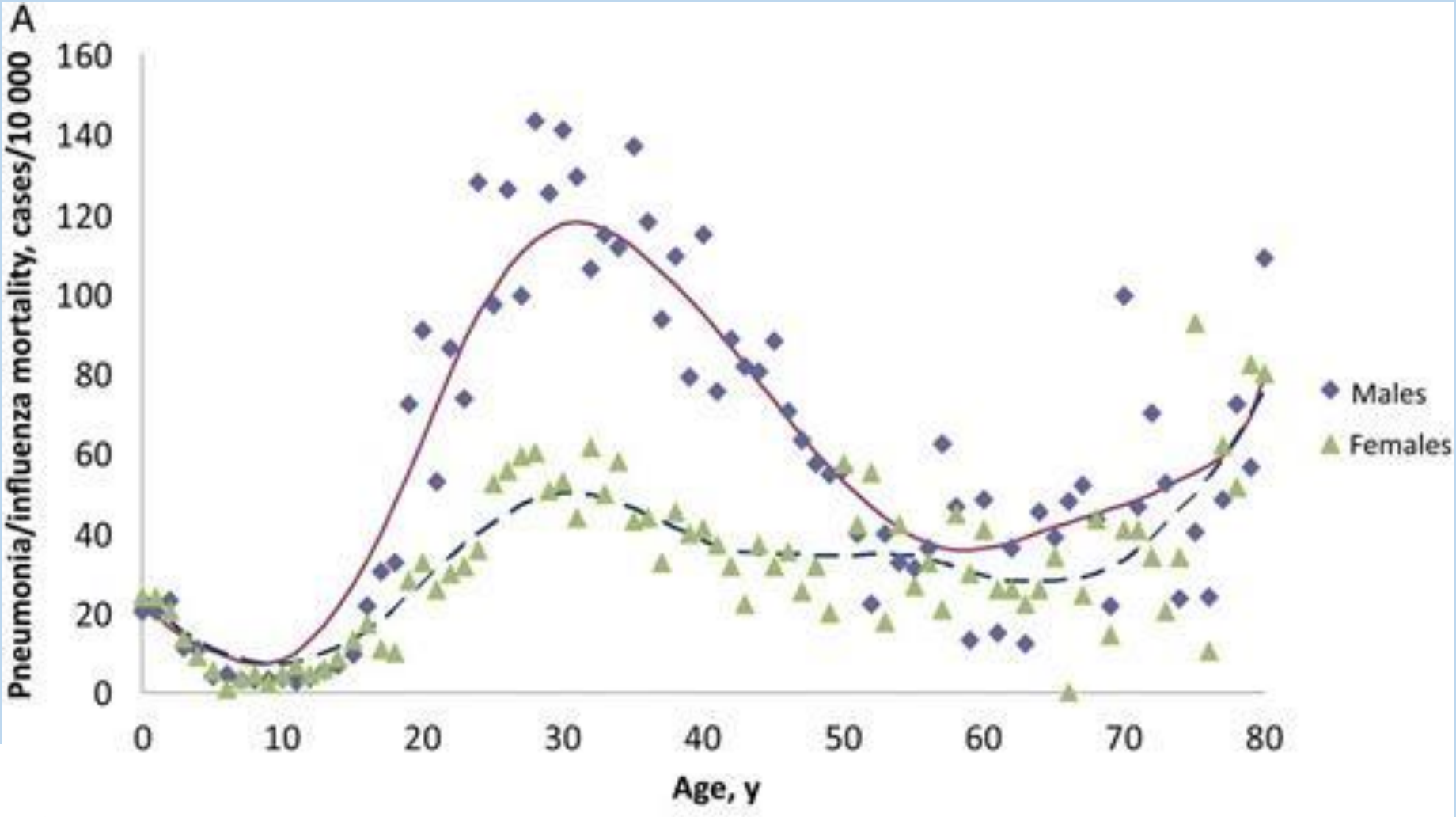
On the peak day: 440 deaths (thanks to Wellington College pupils and staff)



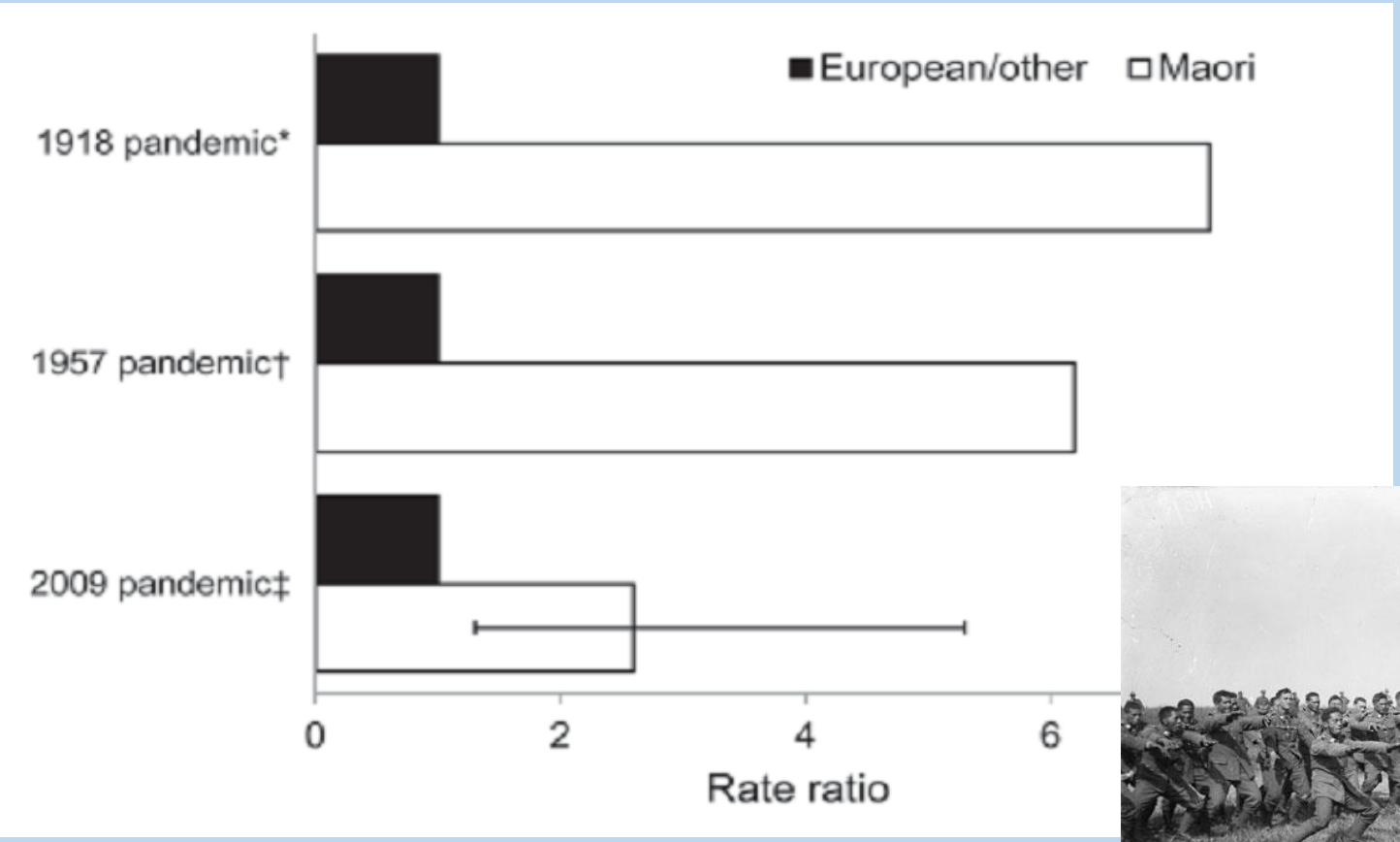
Risk factors for death

- Age (late 20s)
- Sex (male; but equal within Māori)
- Ethnicity (Māori; Pacific)
- Urban living (rurality protective)
- Crowding
- Various others from case-control study: chronic disease (eg, TB)

Age of peak death rate: 28y (birth cohort at time of previous pandemic in 1889-92) [Wilson et al 2014, *JID*]

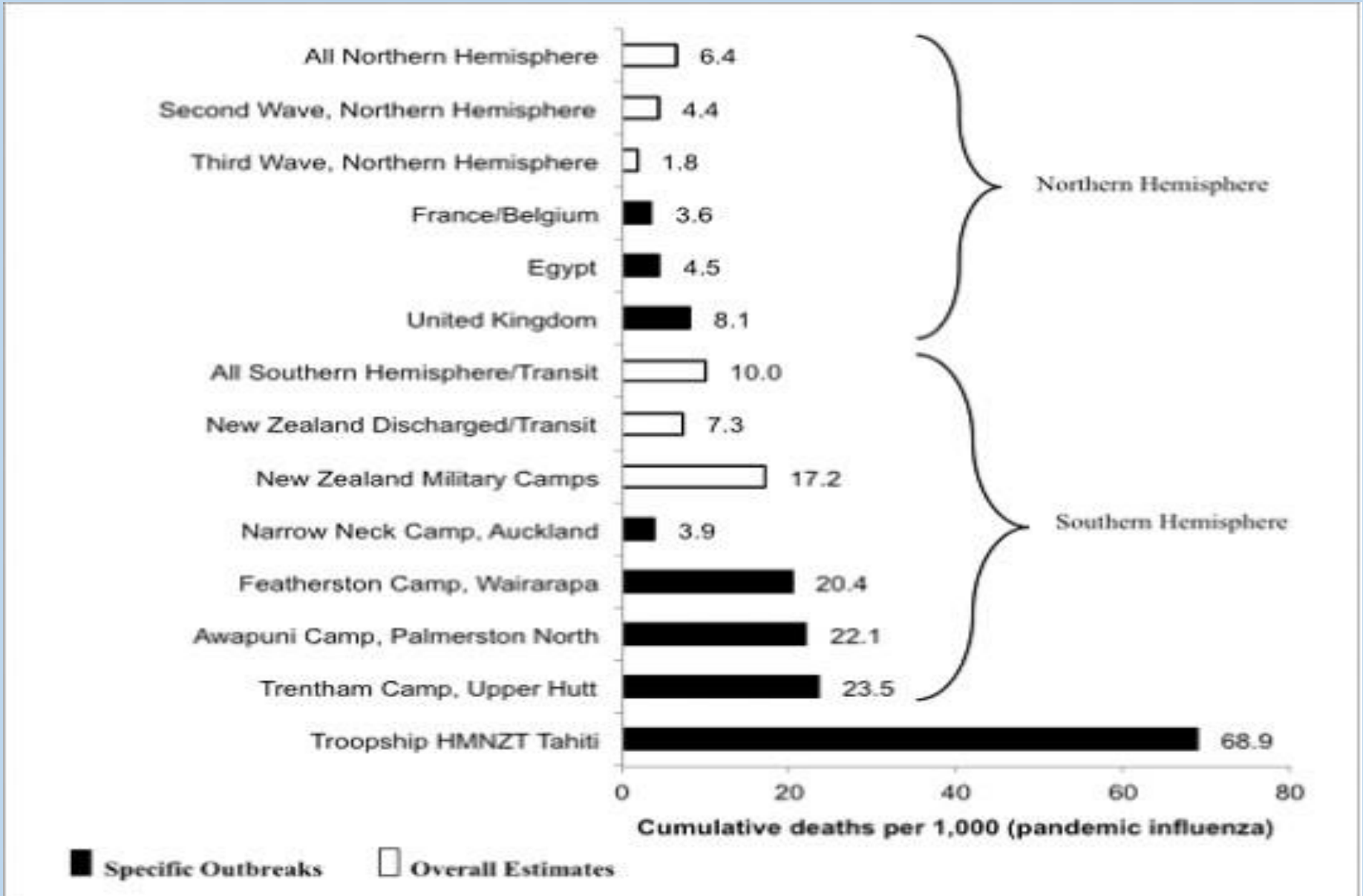


Mortality rates for Māori vs non-Māori in successive influenza pandemics [Wilson et al 2012, *Emerg Infect Dis*]



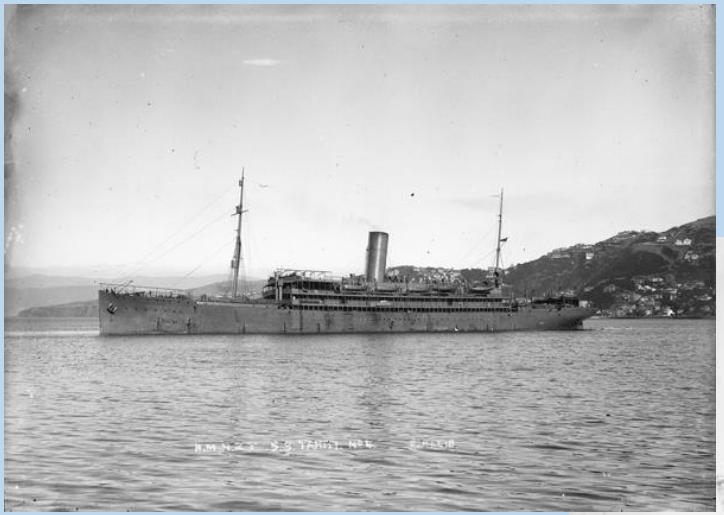
Mortality rates by military settings

[Summers et al 2013, *NZMJ*]

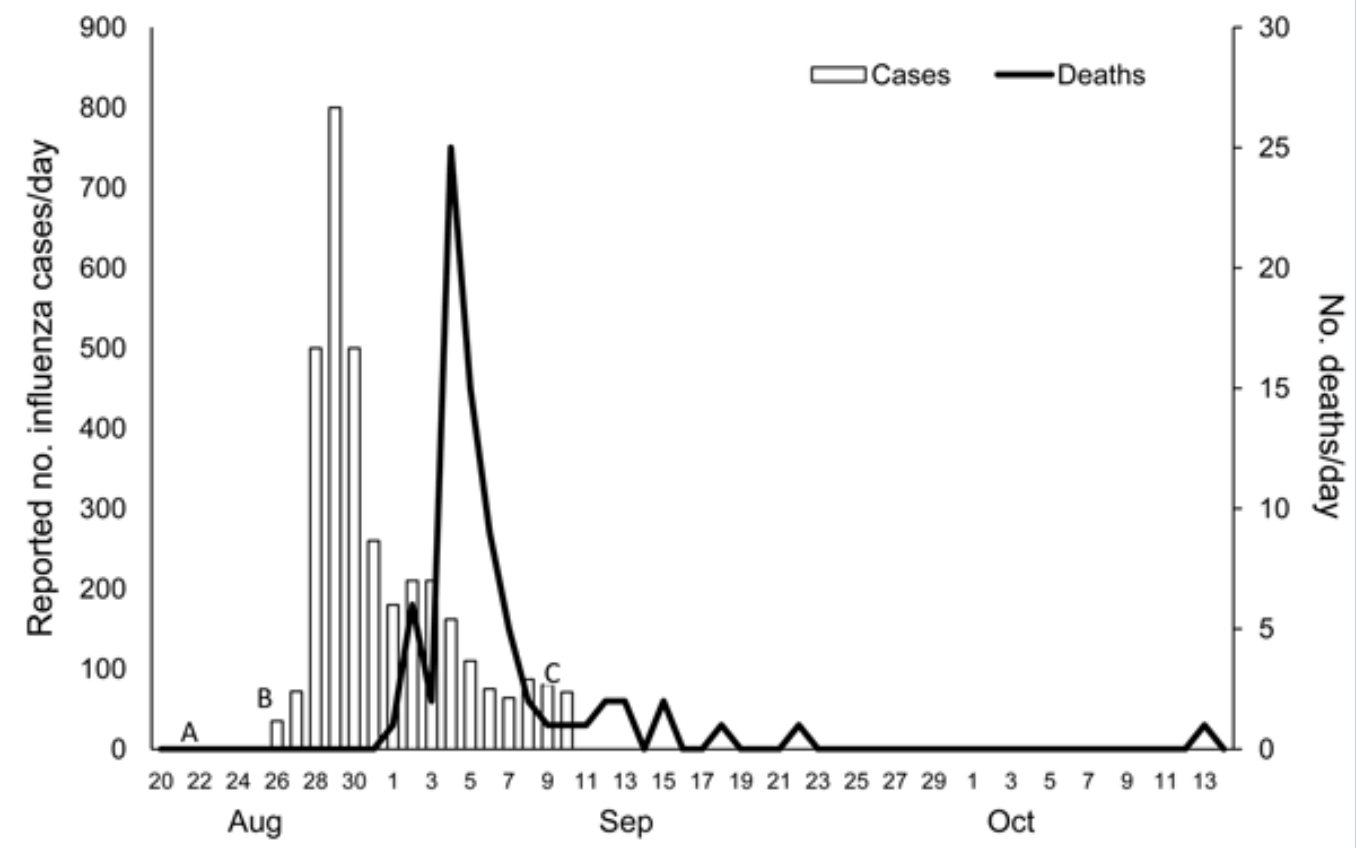


NZ Troopship Outbreak in 1918 (*HMNZT Tahiti*)

[Summers et al 2010 & Summers 2012, *Emerg Infect Dis*]

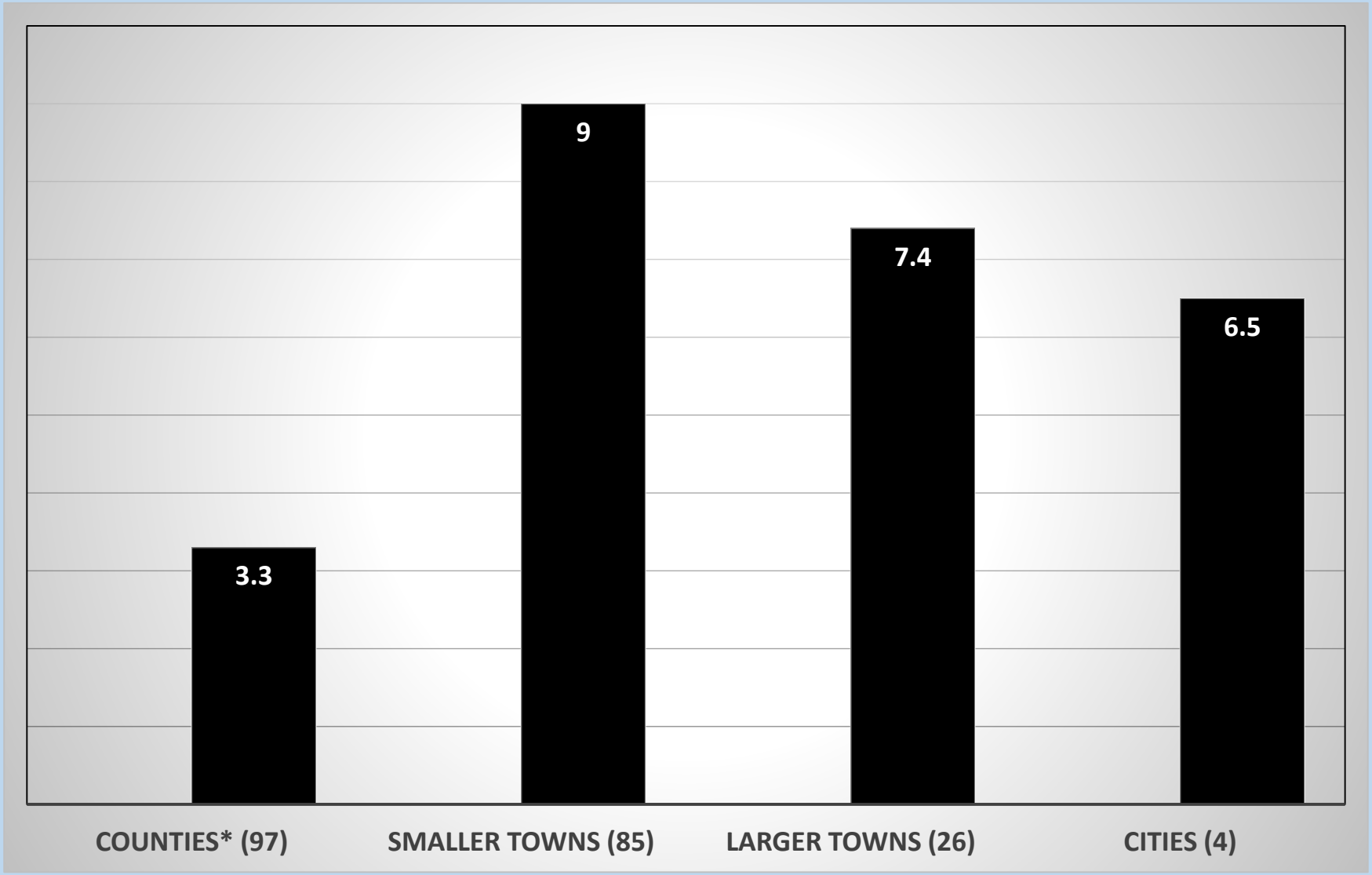


NZ Troopship Outbreak – Risk factors for death



- Accommodations in cabins vs hammocks in other areas, RR = 4.3, 95%CI: 2.7–6.8
- Assignment to a specific unit (probably housed in cabins), aOR = 3.0, 95%CI: 1.6–5.8.

Rurality – protective (mortality rates per 1000 popn. over 3 months) [McSweeny et al 2007, *NZMJ*]

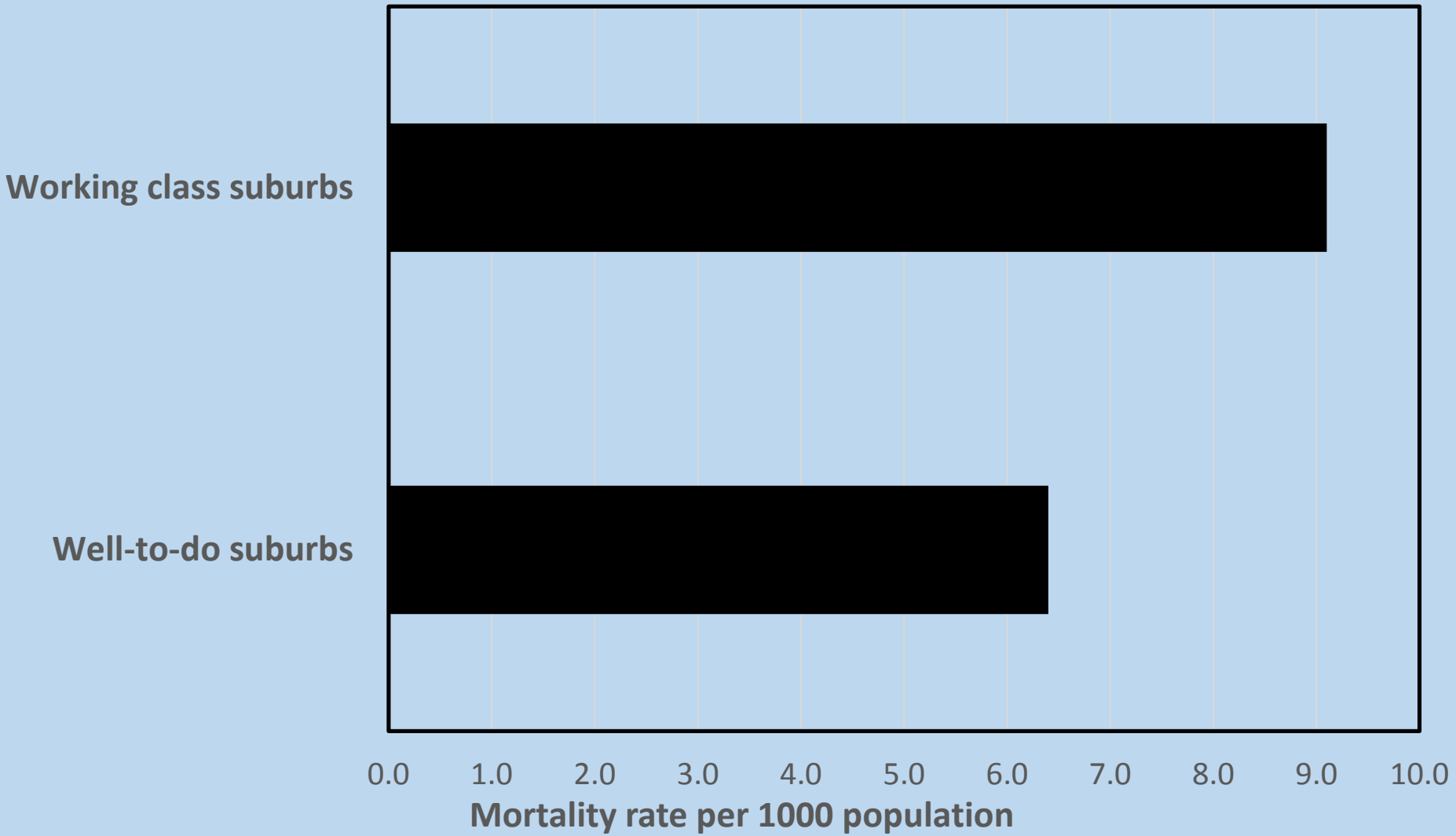


Other risk factors for death: case-control study of NZ military personnel [Summers et al 2014, *Influenza Other Respir Viruses*]

- Pre-pandemic hospitalisations for a chronic condition (eg, TB)
- Early year of military deployment
- Short time from enlistment to foreign service
- Larger chest size (eg, aOR for 90-99 cm vs <90 cm = 2·45; 95%CI=1·47-4·10)

SES gradient for Auckland suburbs

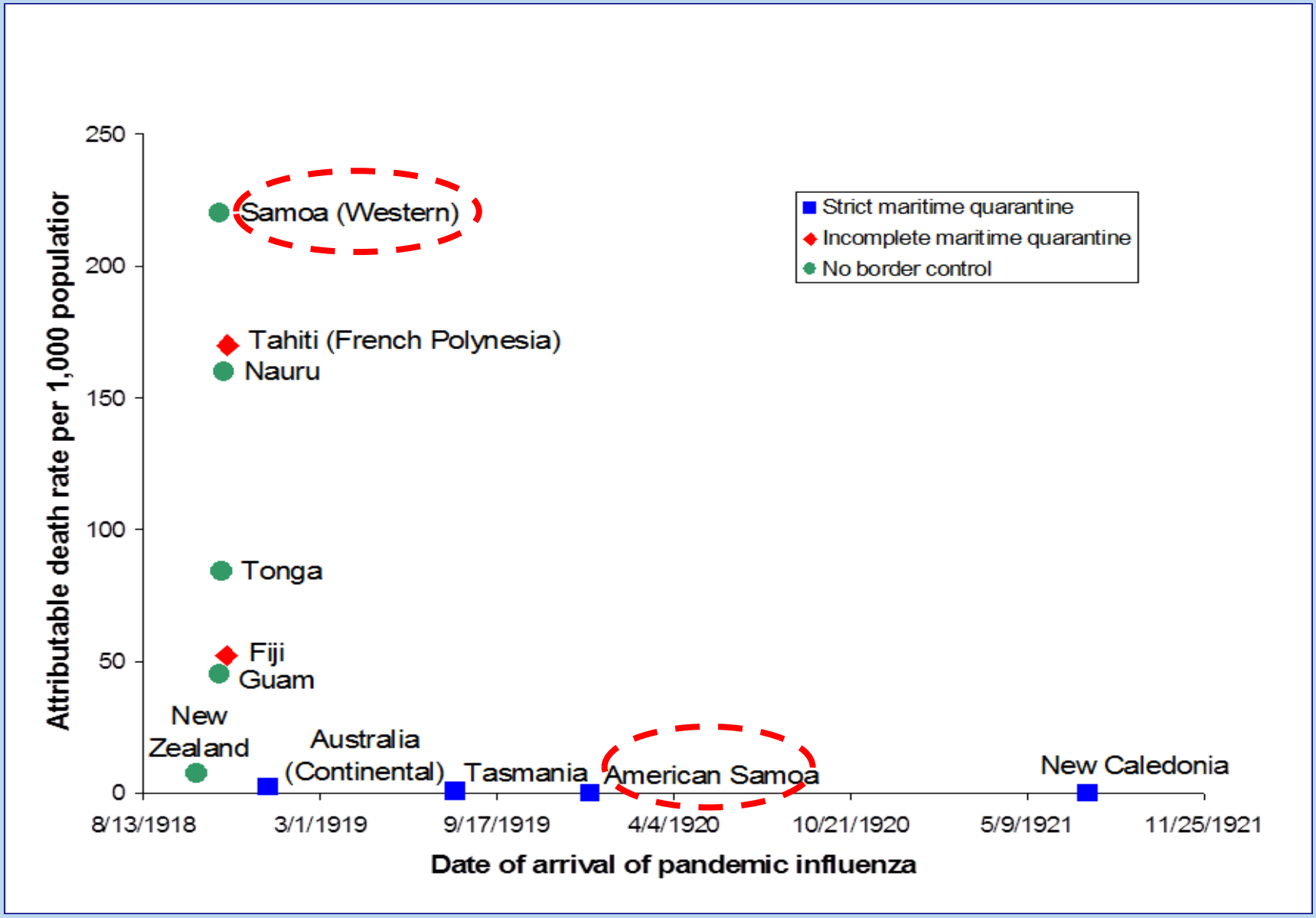
RR=1.42 (95%CI: 1.10 to 1.82, p=0.008) [Wilson et al, 2018, *NZMJ*]



Control measures used

- **Quarantine** in the Pacific [McLeod et al 2008, *EID*]
- **Travel restrictions:** Comparison of NZ vs Iceland: Iceland's use of travel restrictions and ship quarantining, appeared to protect 36% of the population [Summers et al 2013, *NZMJ*].
- **Local quarantine:** Incoming travellers to Coromandel – associated with lower death rate in this County [Wilson et al 2005, *NZMJ*]

Protective effect of maritime quarantine on South Pacific Islands in 1918-19 [McLeod et al 2008, *EID*]



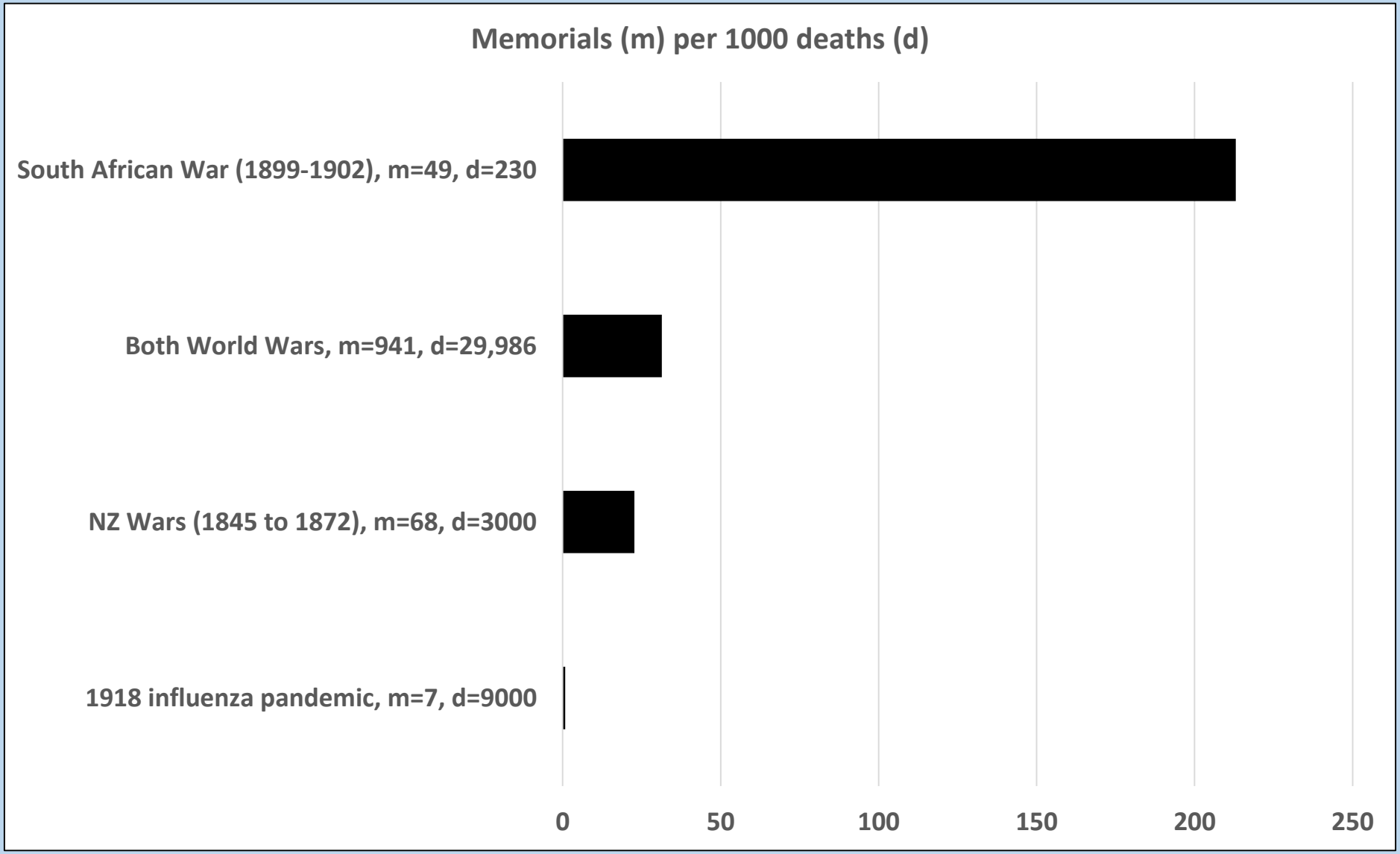
Public memorials to the pandemic are rare

Statue of Dr Margaret Cruickshank, Waimate

Te Aute Urupā (cemetery), Te Tii Mangonui, Bay of Islands, Northland (with permission of the kaumātua at Te Tii)

Wars get nearly all the public memorials in NZ

[Wilson et al 2017, *NZMJ*]



Implications for further research?

[Review article: Summers et al, *NZMJ in press for 14/12/18*]

- Better understand impact on **Māori** :
  - Burden
  - Risk / protective factors
  - Reasons for no sex difference in mortality

- More on **SES gradient** (mixed picture internationally)

Implications for further research?

- **Demographic impacts** eg, 9% drop in birth rates in 1918 & 17% in 1919, vs 1917)
- Were there long-term impacts from **fetal exposure** to the pandemic virus in 1918 (as suggested in some international literature)?

Implications for pandemic preparations & planning?

- Border control / internal travel restrictions may have potential in island nations → investigate further
  - Modelling border control & islands (Eichner et al 2009, *BMC Infect Dis*)
  - Modelling border closure in NZ – severe pandemic threats (Boyd et al 2017, 2018)

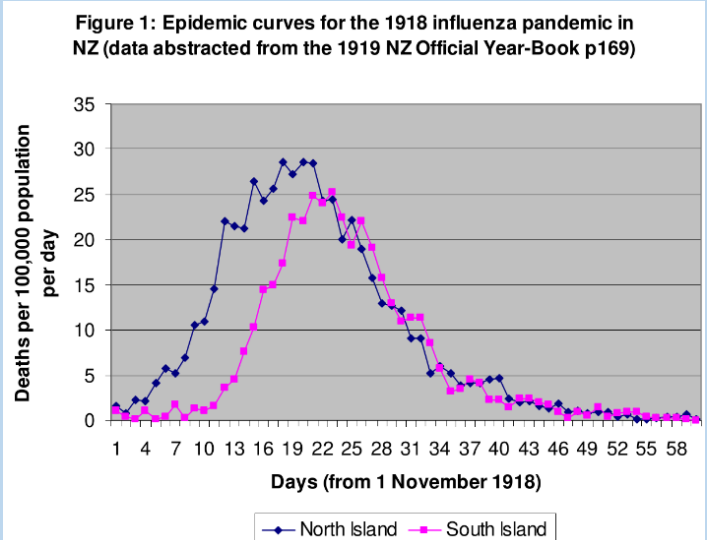
Implications for pandemic preparations & planning?

- Enhanced strategies to reduce future impact & ethnic health inequalities
  - Reduce chronic disease burdens (eg, Smokefree NZ 2025, control obesogenic environments)
  - Address crowding (housing interventions)
  - Reduce deprivation

Implications Continued

Given the speed of pandemic spread:

- Enhance public health capacity in the NZ health sector now – particularly MoH
- Enhance pandemic planning & use of simulation exercises



More speculative implications

- Enhance **social capital** – linked to other civil defence preparations (a national disaster preparation day?, support for everyone to have a smartphone & internet access?)
- Use **memorials for public education** on pandemic threats?

Conclusions

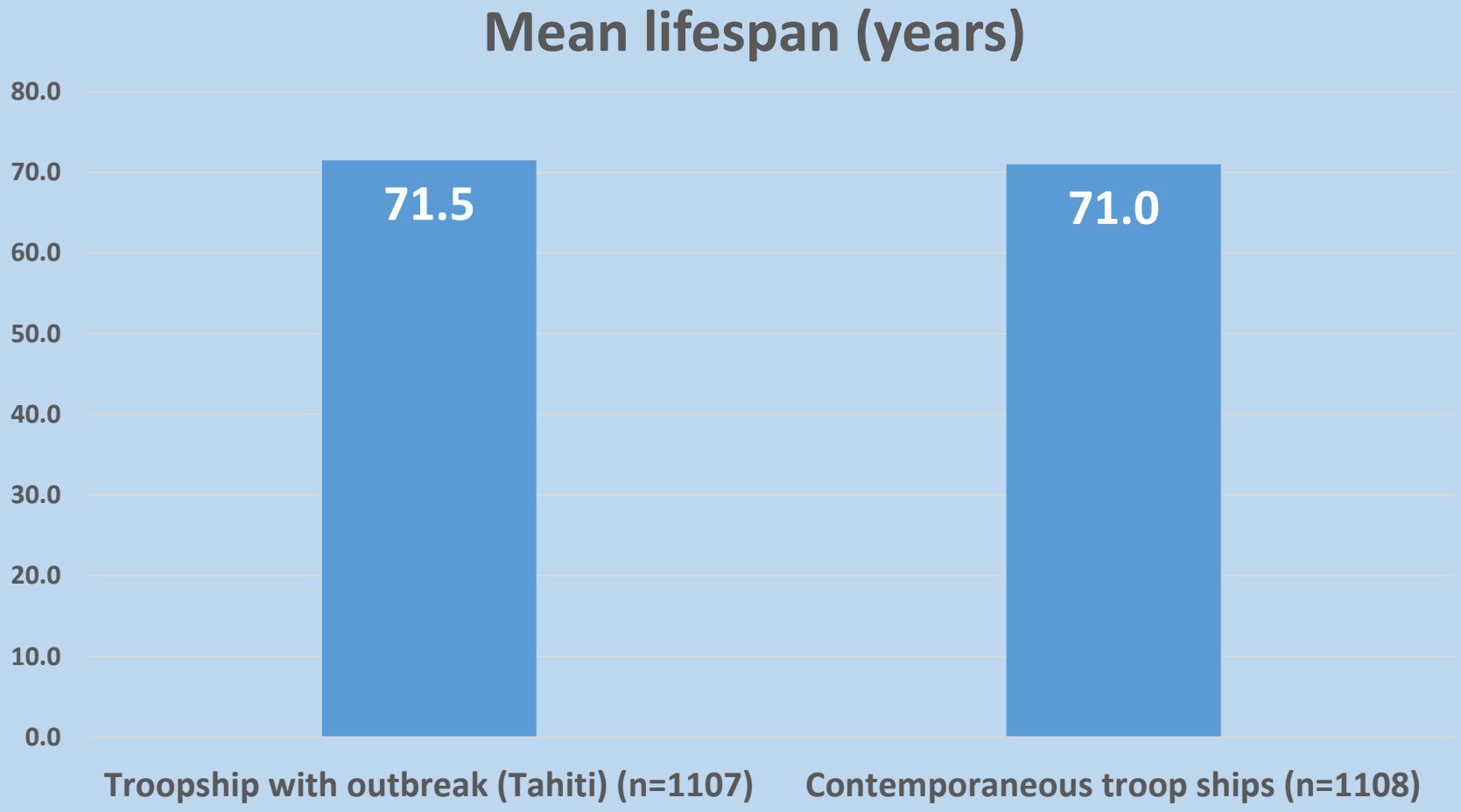
- The 1918 influenza pandemic in NZ – relatively well described epidemiology
- But still potential for further research
- Plenty of potential for improved pandemic preparations & planning (border control to social capital)

Back up slides from here on

Key parameters: Reproduction Number

Location	Reproduction number (95%CI)	Reference
North Island	1.60 (1.47 to 1.78)	Nishiura & Wilson 2009, *NZMJ*
South Island	1.47 (1.33 to 1.68)	
Auckland	1.44 (1.33 to 1.61)	
Wellington	1.55 (1.42 to 1.76)	
Christchurch	1.33 (1.22 to 1.50)	
Featherston military camp	Range: 1.3 to 3.1 (3 scenarios)	Sertsou et al 2006, *Theor Biol Med Model*

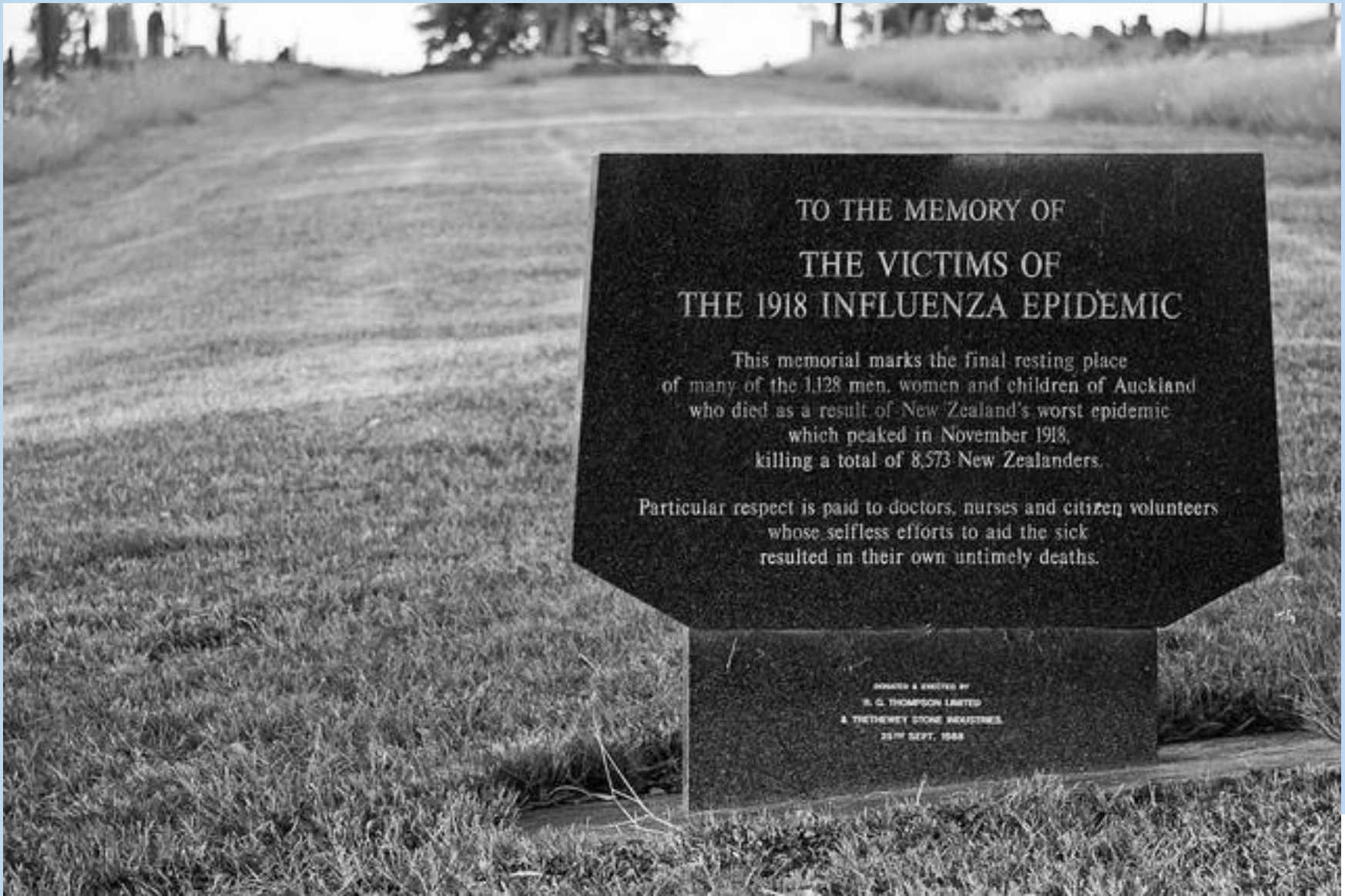
Long term sequelae of infection?: Probably no [Wilson et al 2016, *Epidemiol Infect*]



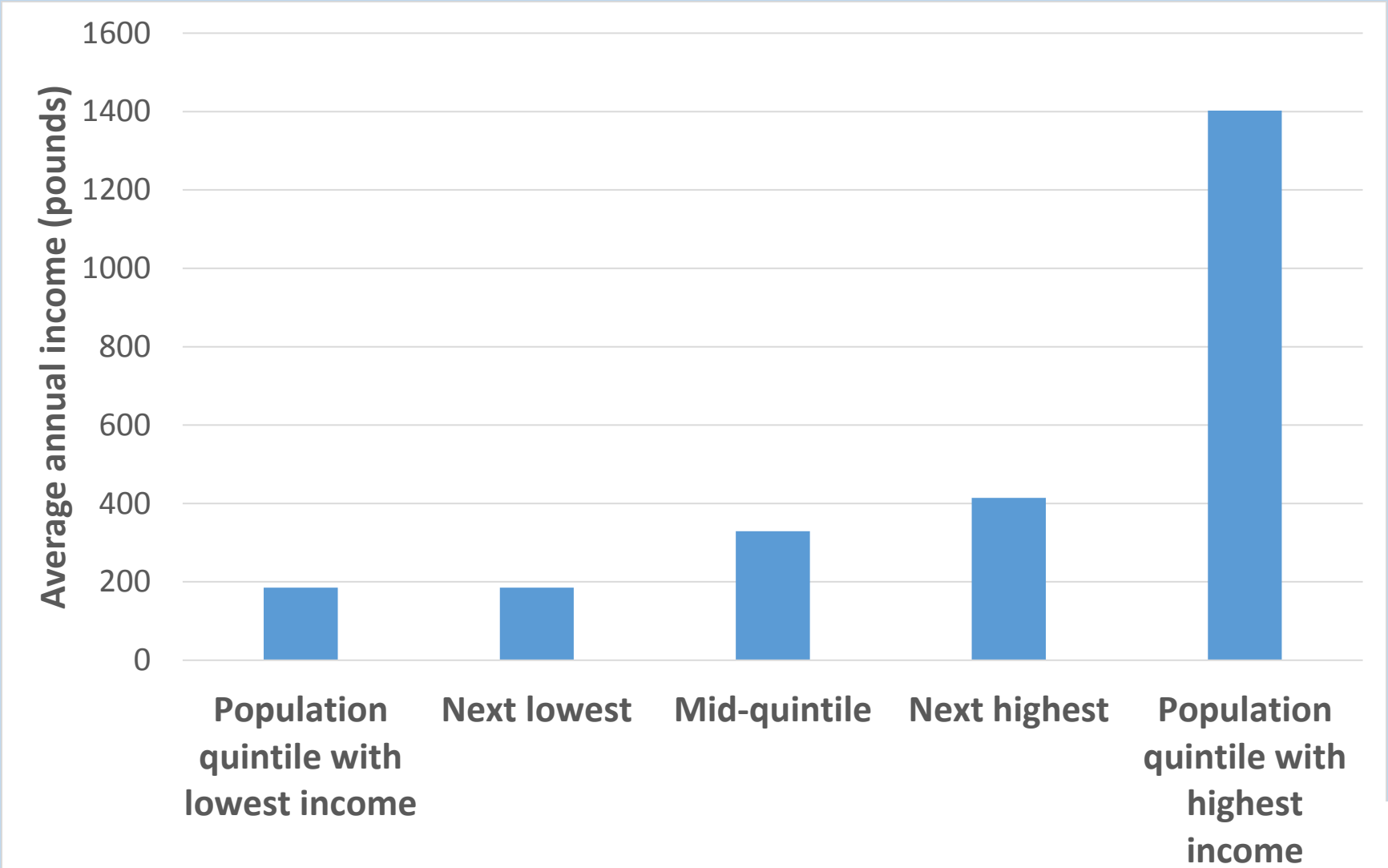
How the pandemic was (not) remembered in NZ

- Only 7 public memorials identified & no national memorial [Wilson et al 2017, *NZMJ*]
- 11 memorials in private settings (9 for Māori)
- Very rare compared to war memorials
- Erebus disaster has more memorials
- Of the 7 public memorials:
  - Nil have signage leading to them
  - Nil have links to online educational resources

Memorial to 1128 Aucklanders who died (and acknowledging the health workers) at Waikumete Cemetery, Glen Eden, Auckland



Average annual assessed income in NZ (in £) by population quintile for tax returns for the 1922-1923 period (calculated from Yearbook data, Wilson et al 2018 *ANZJPH*)



Small but statistically significant differences in mean lifespans of 2046 non-combat male NZ military personnel by occupational class in 1918, Wilson et al, in press *ANZJPH*)