Recent work on the NZ epidemiology of the 1918 pandemic & relevance to pandemic planning

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Outline

- Key pandemic parameters
- Risk factors for death
- Control measures used
- How pandemic was remembered in NZ
- Implications for further research?
- Implications for pandemic planning?

Key parameters: timing

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

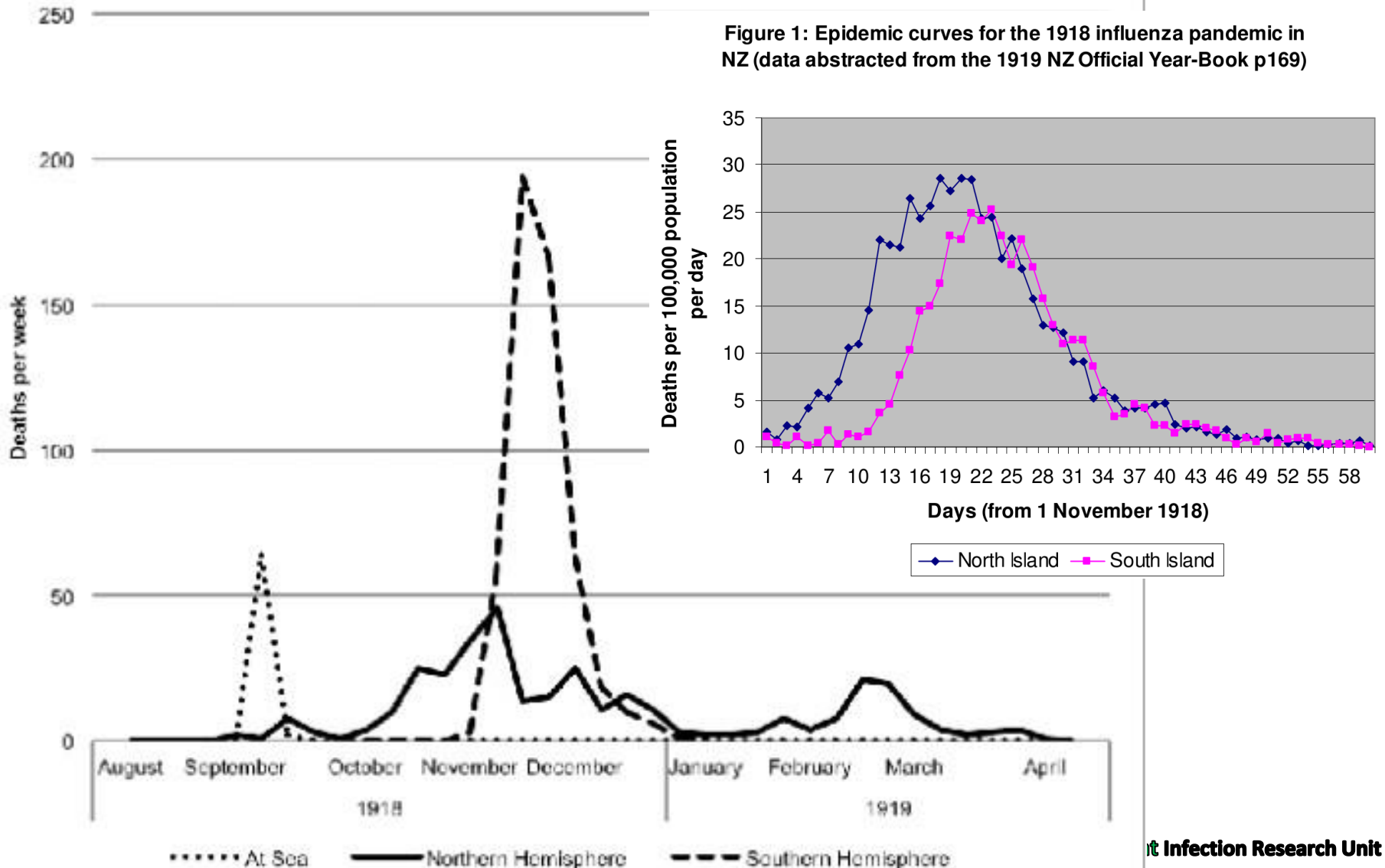


Figure 1: Epidemic curves for the 1918 influenza pandemic in NZ (data abstracted from the 1919 NZ Official Year-Book p169)

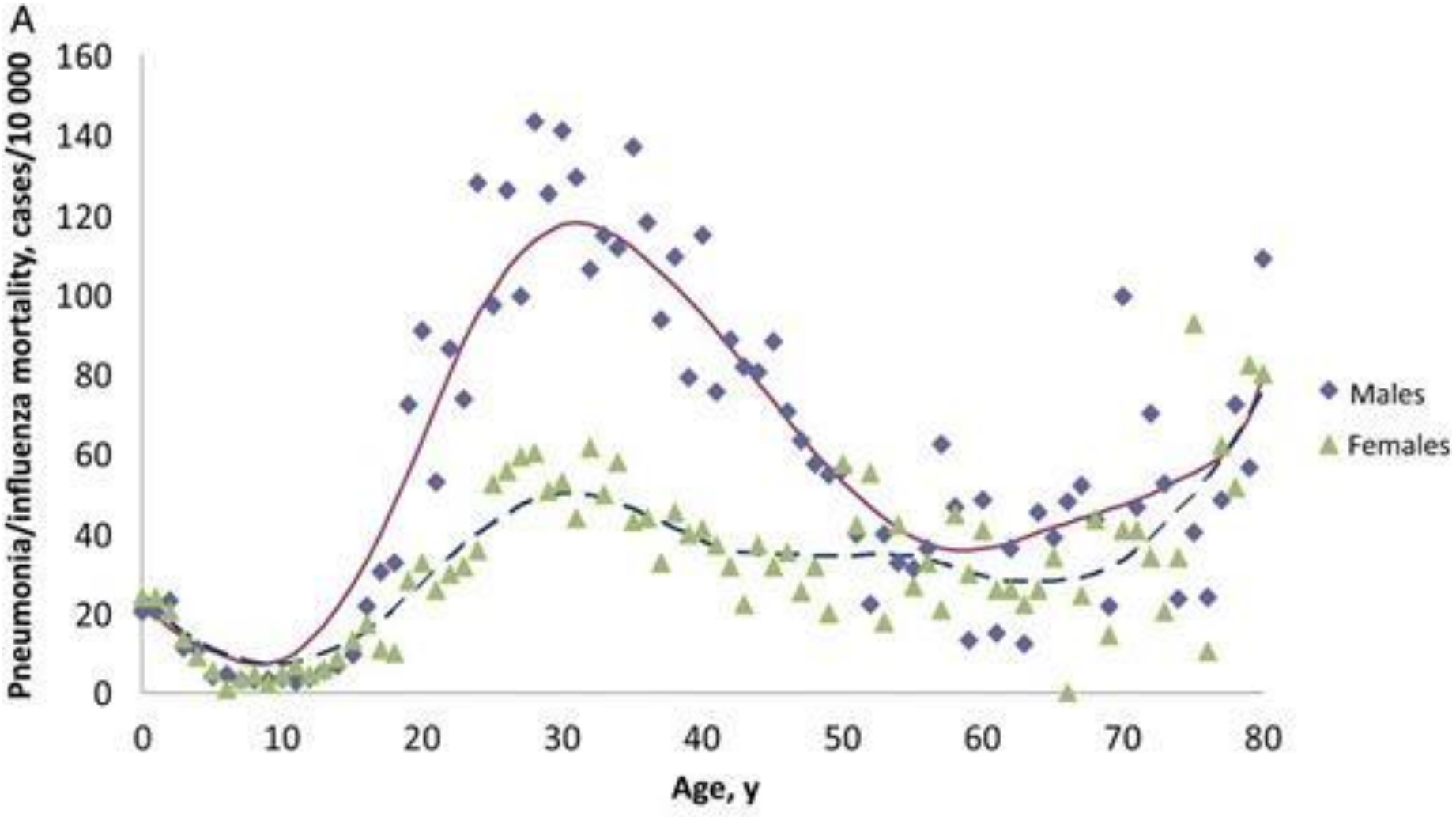
Key parameters: Reproduction Number

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*

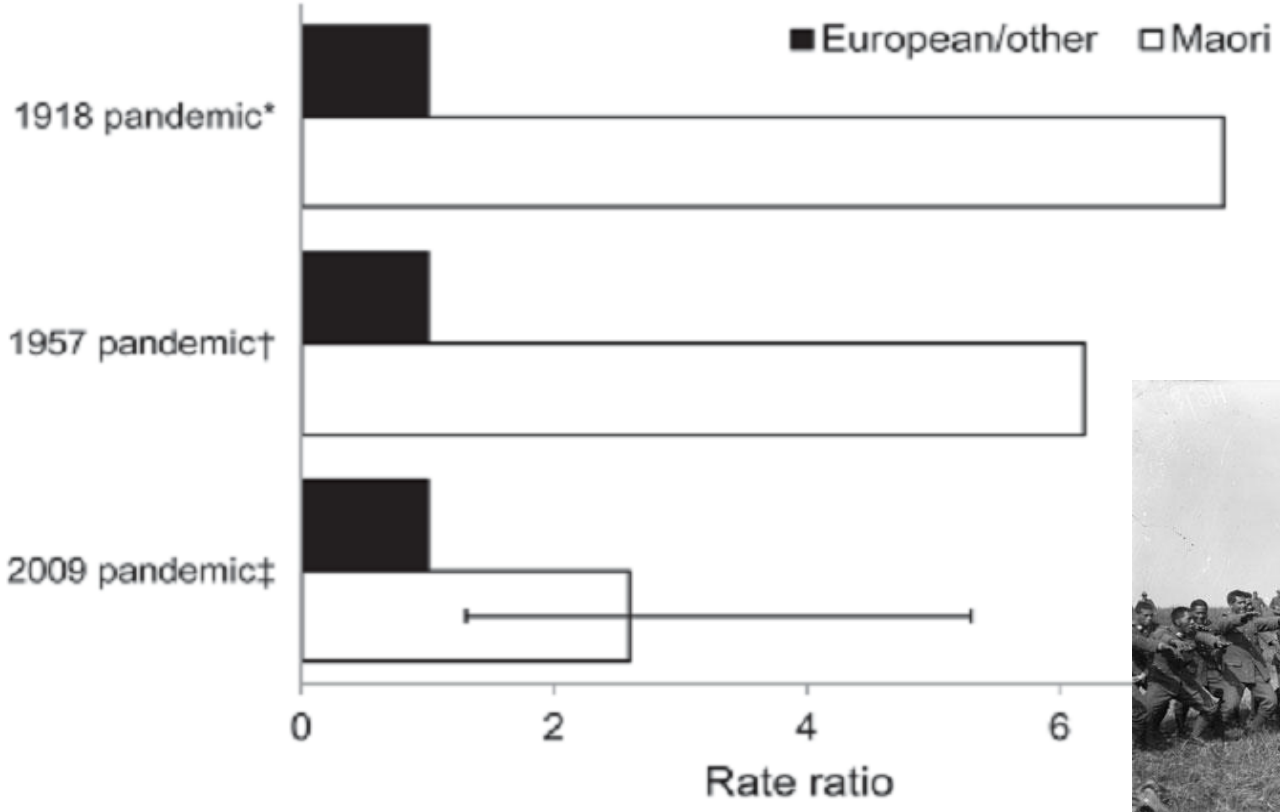
Risk factors for death

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

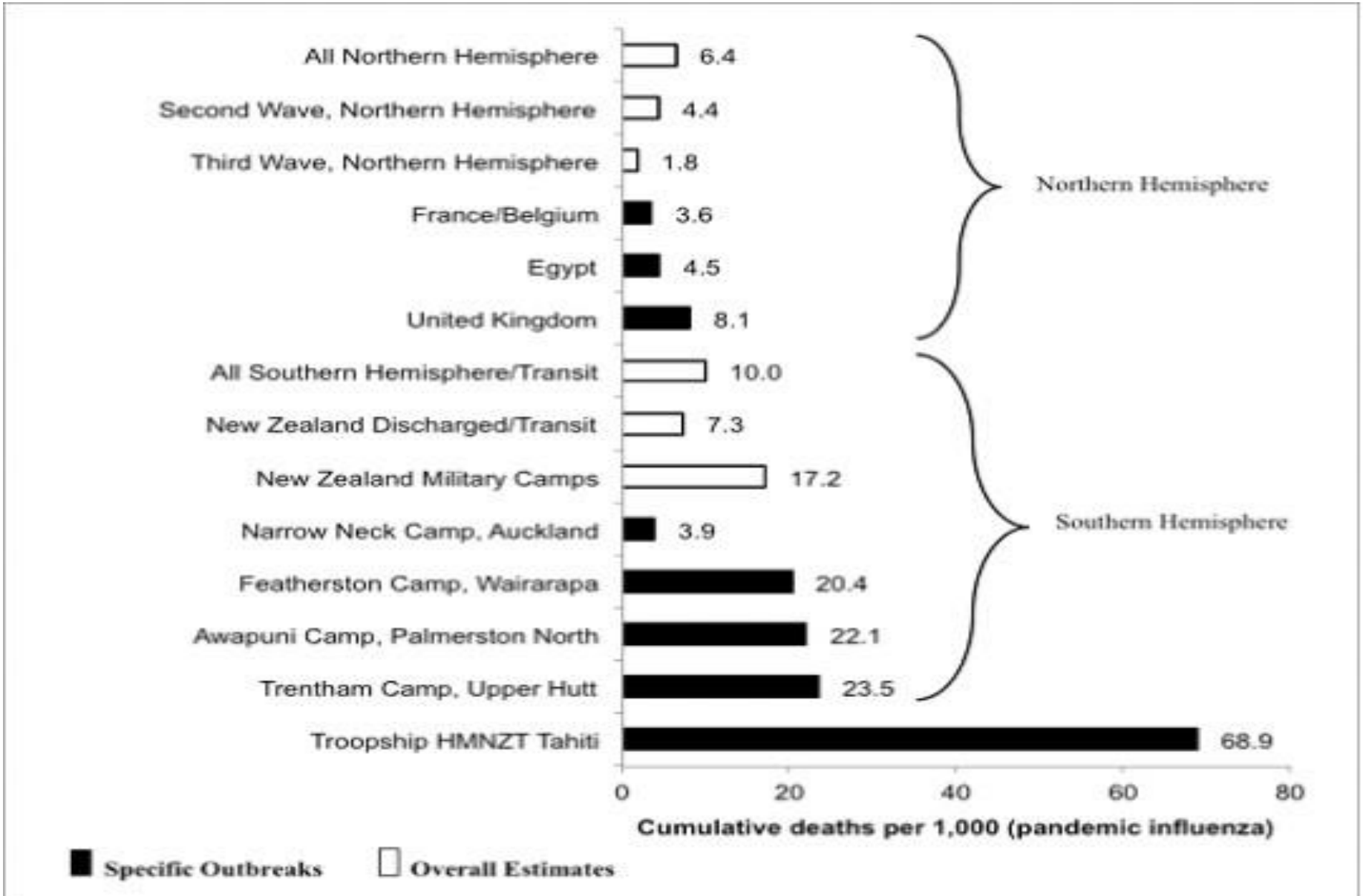
Age of peak death rate: 28y (birth cohort at time of previous pandemic in 1889-92) [Wilson et al 2014, *JID*]



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

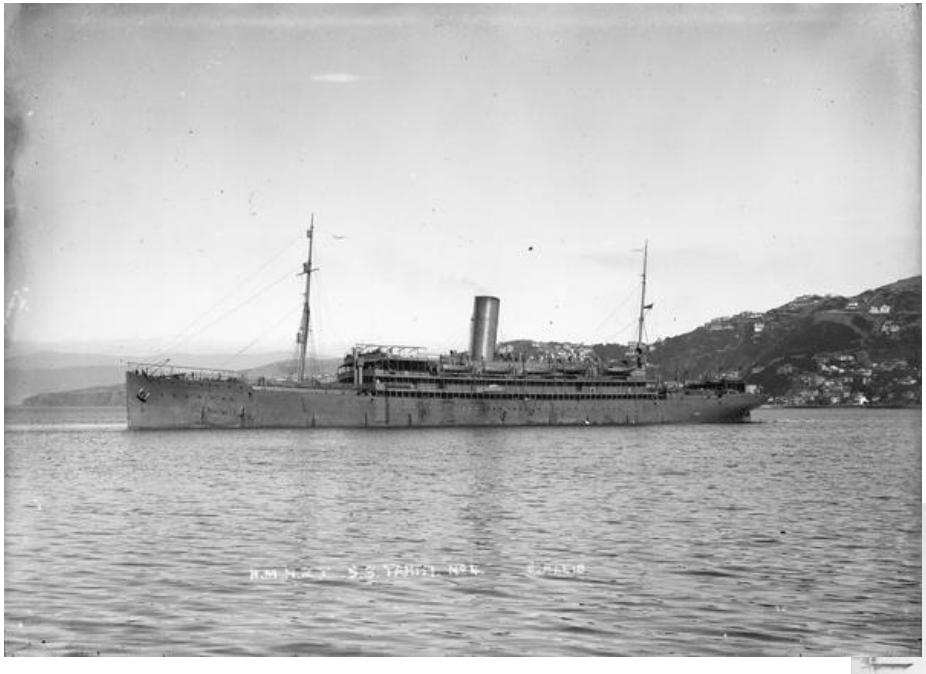


Mortality rates by military settings
[Summers et al 2013, *NZMJ*]



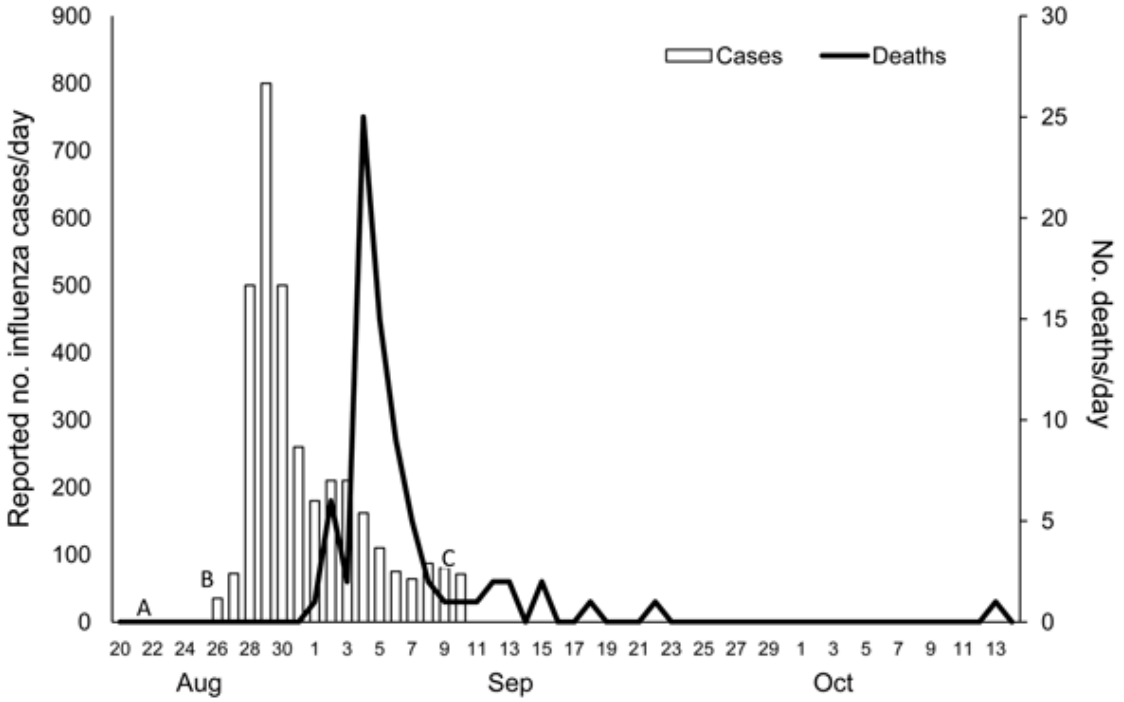
NZ Troopship Outbreak in 1918 (*HMNZT Tahiti*)

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



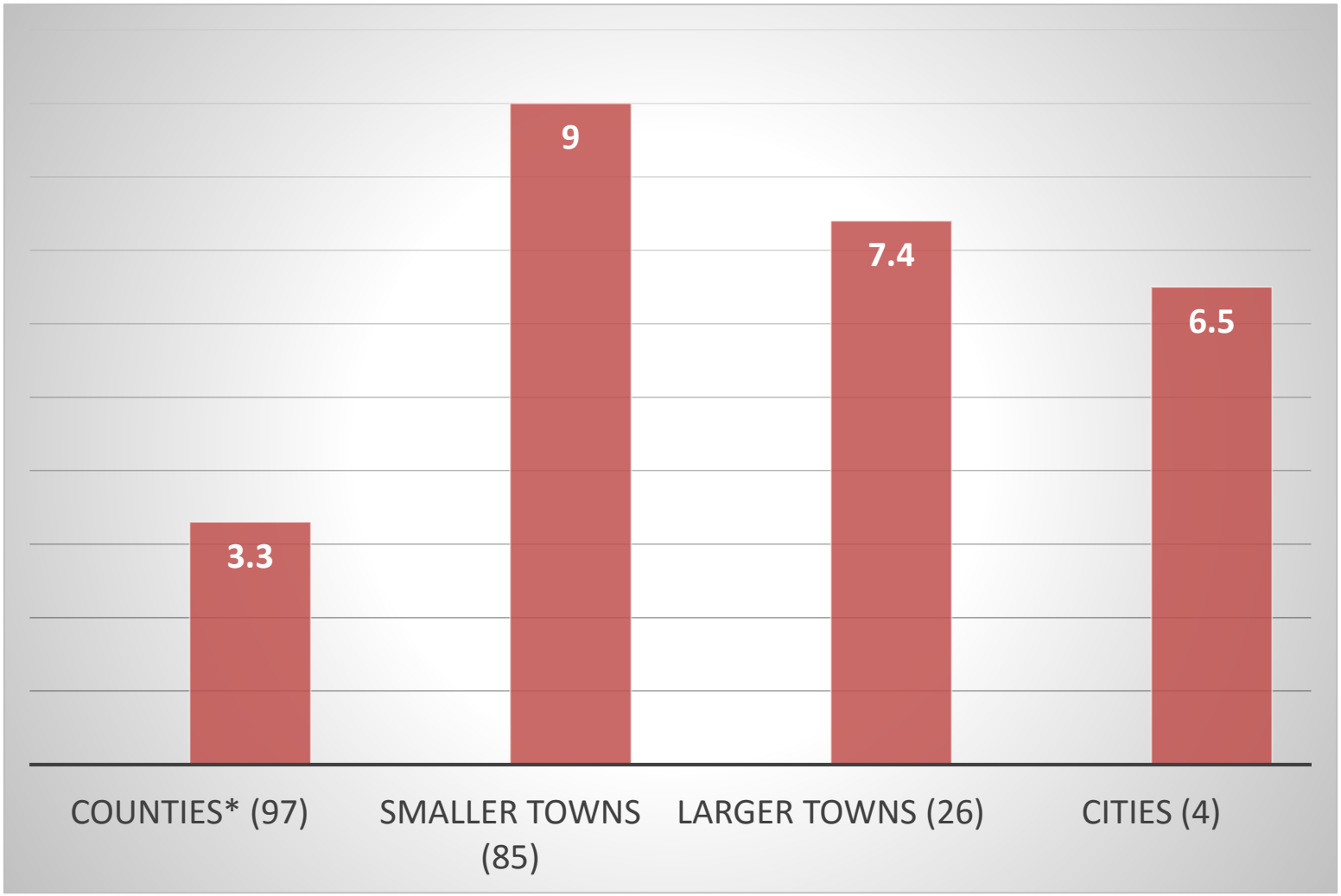
Dr Jennifer Summers

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*]



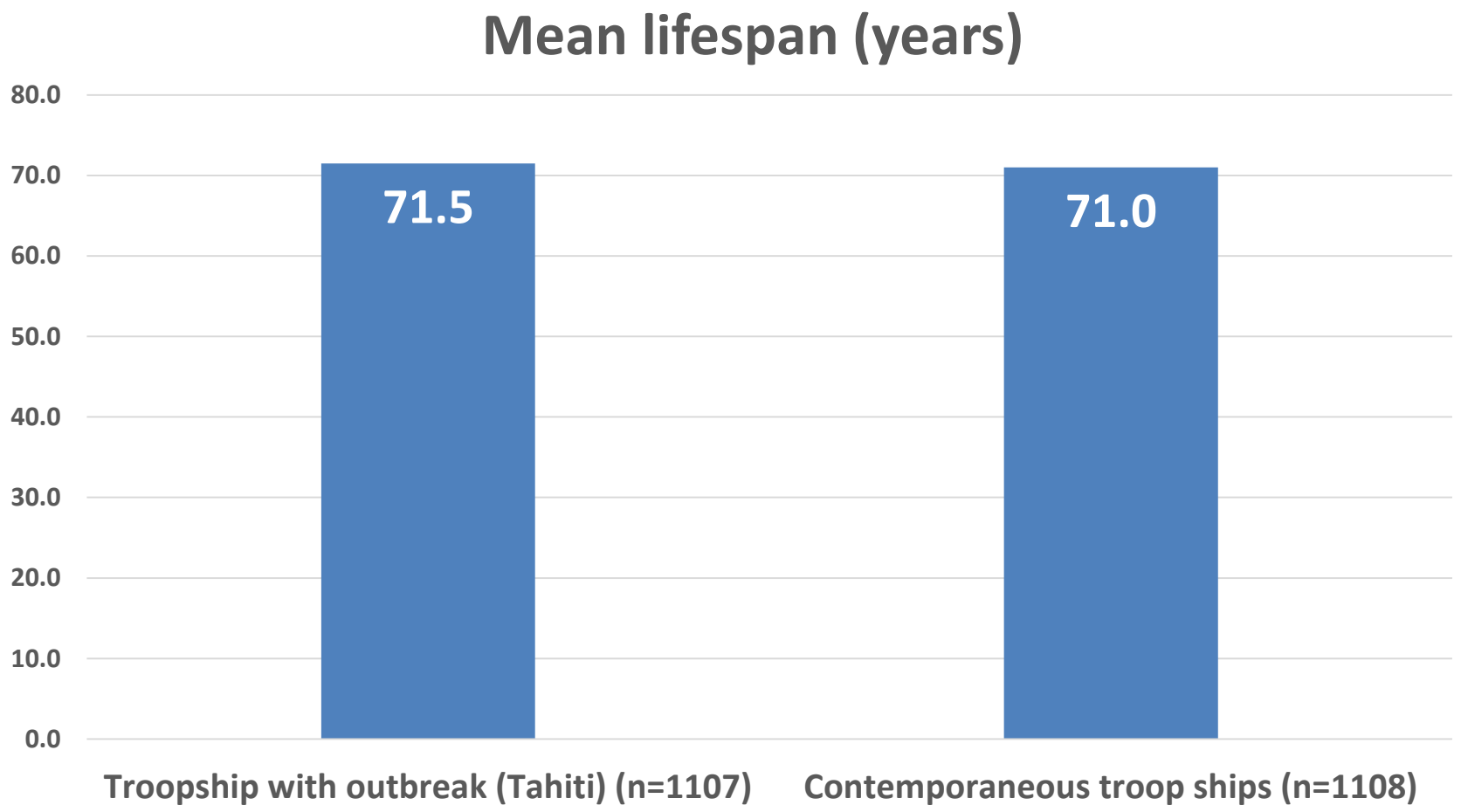
Risk factors for death: case-control study of NZ military personnel

[Summers et al 2014, *Influenza Other Respir Viruses*]

- Age-group: 25-29y
- Pre-pandemic hospitalisations for a chronic condition (eg, tuberculosis)
- 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).
- **Nil associations:** military rank, occupational class at enlistment, and rurality at enlistment

Long term sequelae of infection?: Probably no

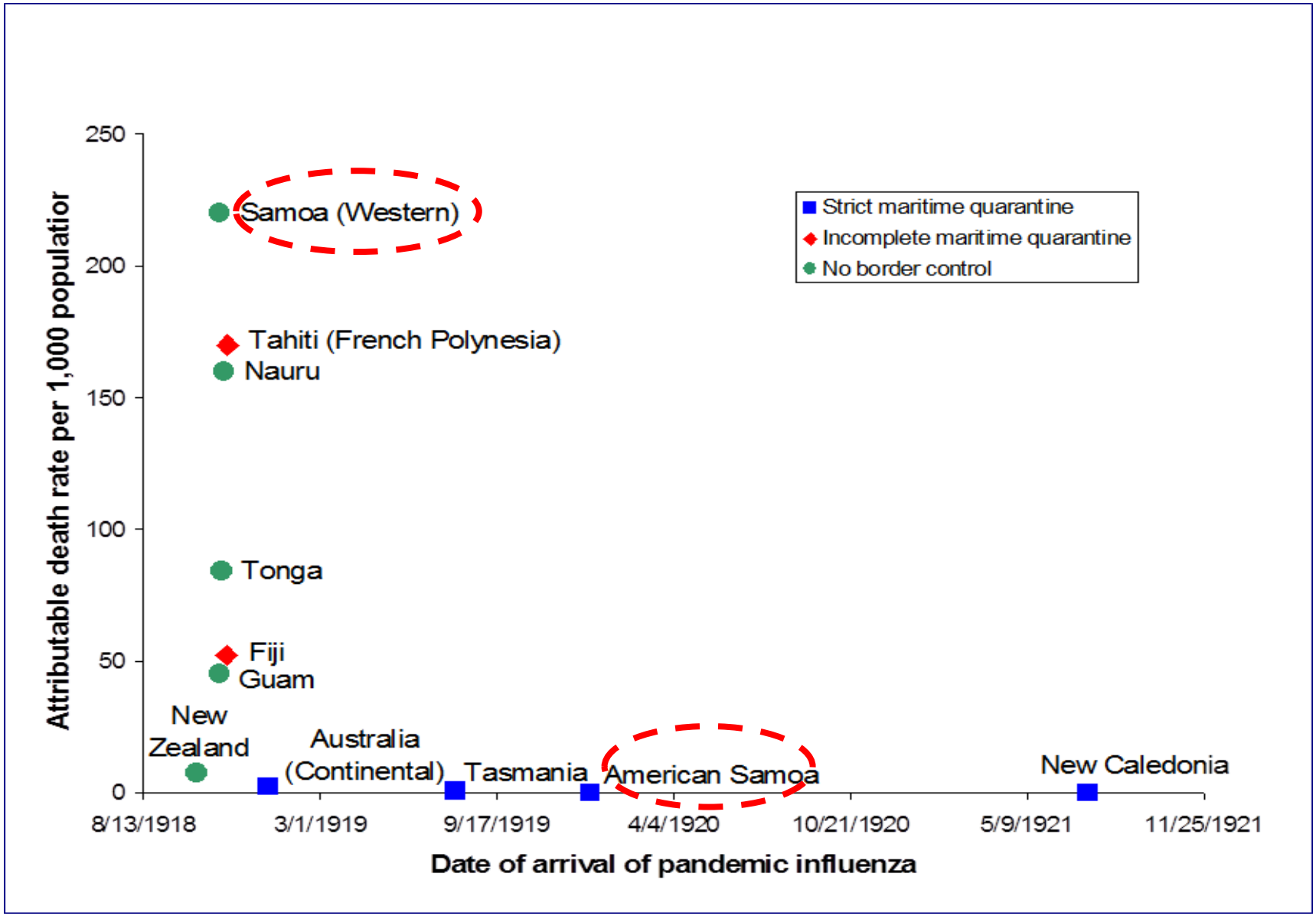
[Wilson et al 2016, *Epidemiol Infect*]



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, Wilson, Baker, Gottfredsson 2013, *NZMJ*].
- **Local quarantine:** Incoming travellers to Coromandel – associated with lower death rate in this County [Wilson et al 2005, *NZMJ*]

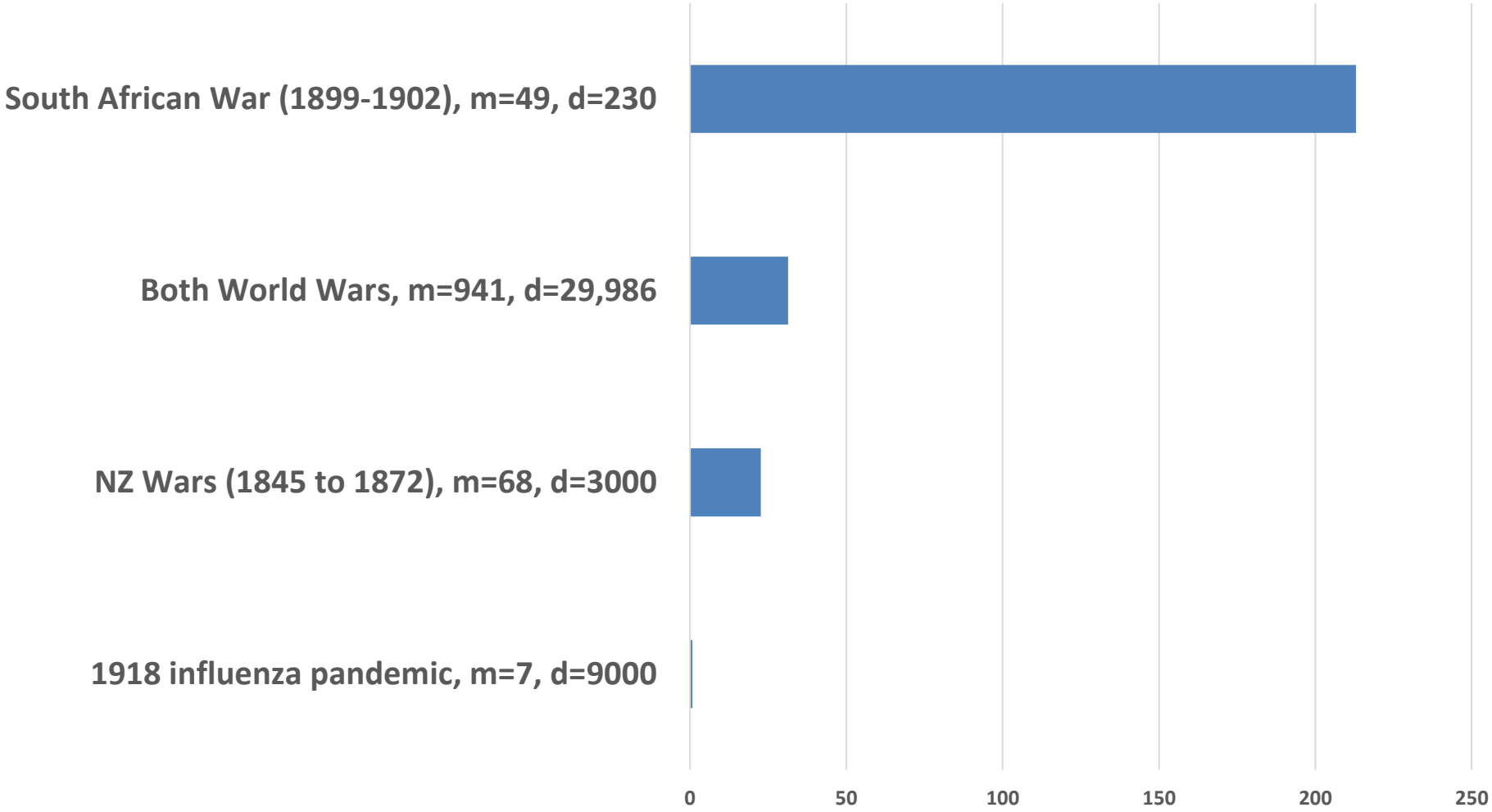
Protective effect of maritime quarantine on South Pacific Islands in 1918-19 [McLeod et al 2008, *EID*]



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

Memorials (m) per 1000 deaths (d)



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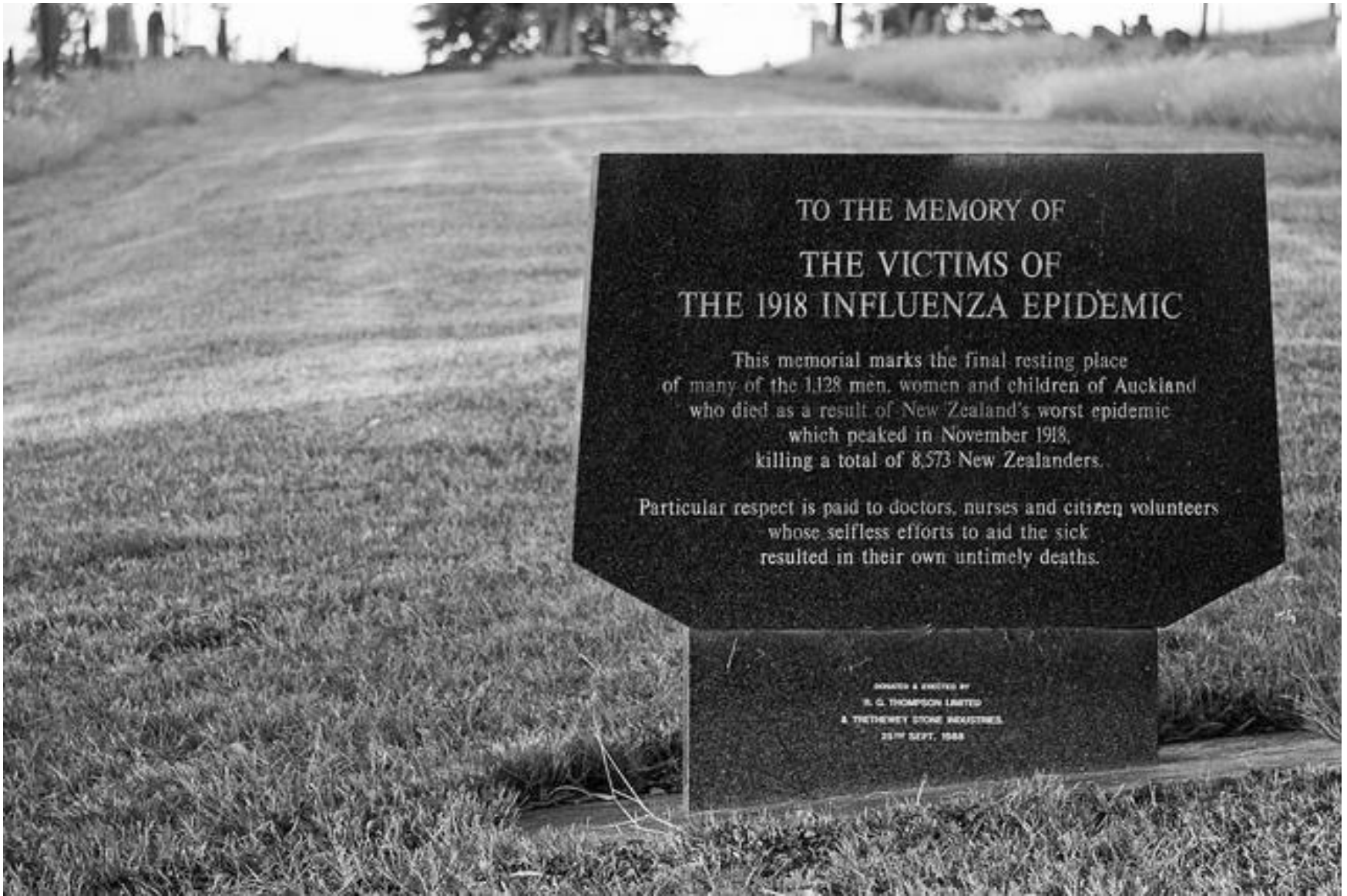
Statue of Dr Margaret Cruickshank (Waimate) – died caring for her patients during the pandemic

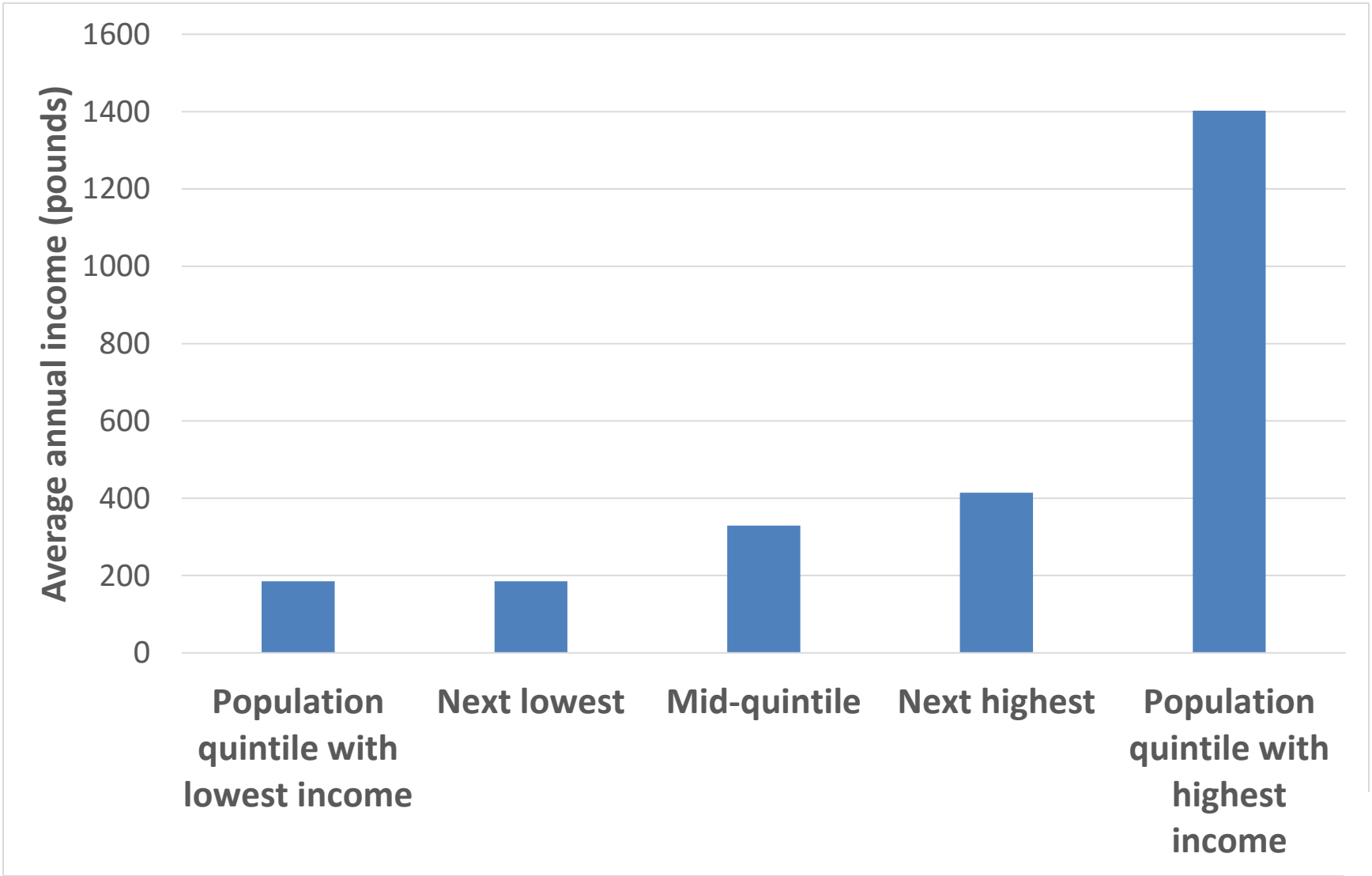
Memorial to 1128 Aucklanders who died (and acknowledging the health workers) at Waikumete Cemetery, Glen Eden, Auckland



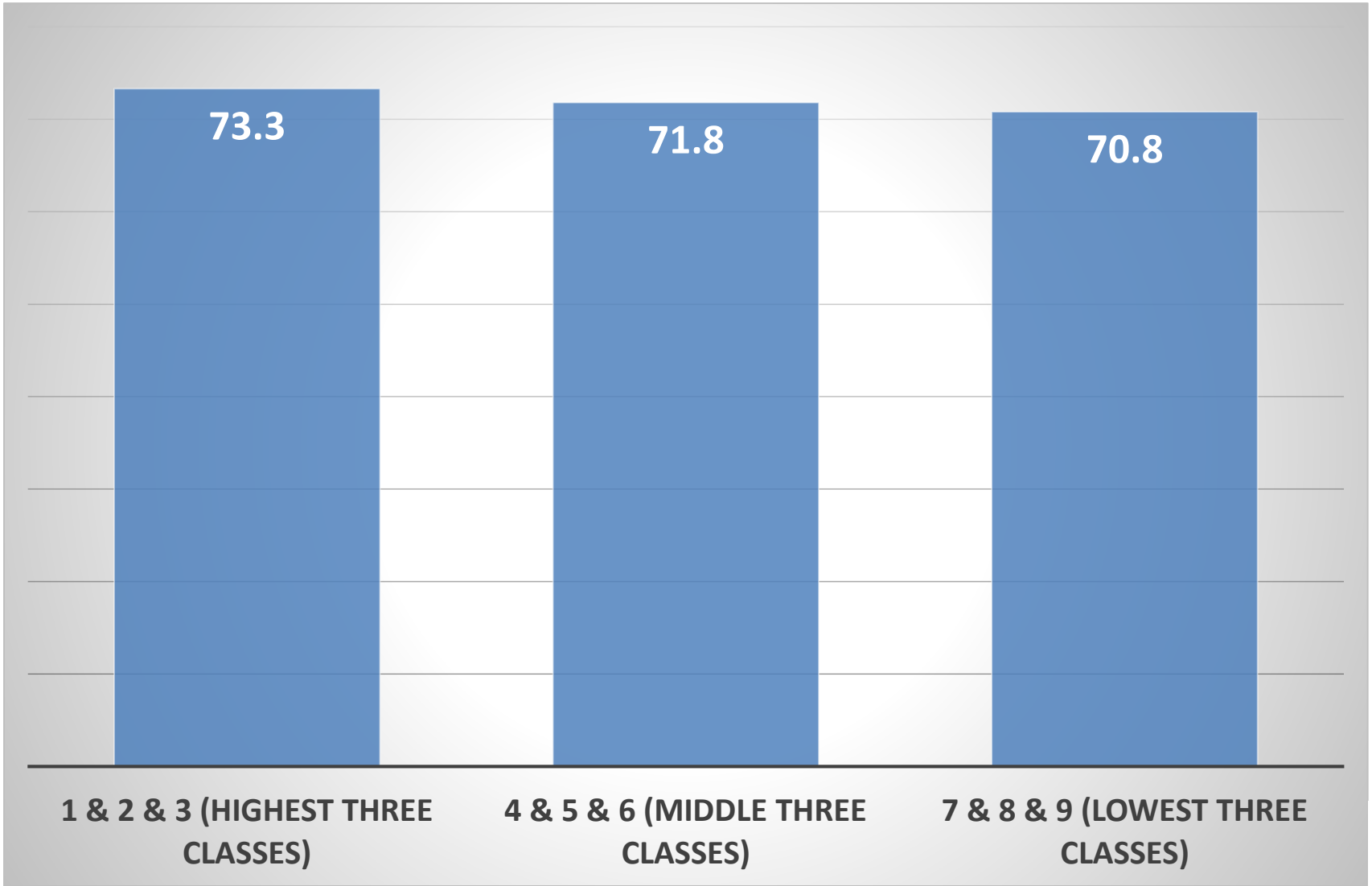
Implications for further research?

- Why ethnic inequalities but no apparent socio-economic gradient in contrast with some international studies?
  - Better understand impact of social class on health at this time [work *in press*]
  - Further use of the occupational class system developed by Olssen et al for this period?
  - Consider modern statistical analysis of Auckland suburb mortality data (eg, in Linda Bryder's 1980 thesis)

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, in press *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*)



Implications for further research?

- What were the overall **demographic impacts** (eg, the 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?

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

Implications Continued

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

Implications Continued

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

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

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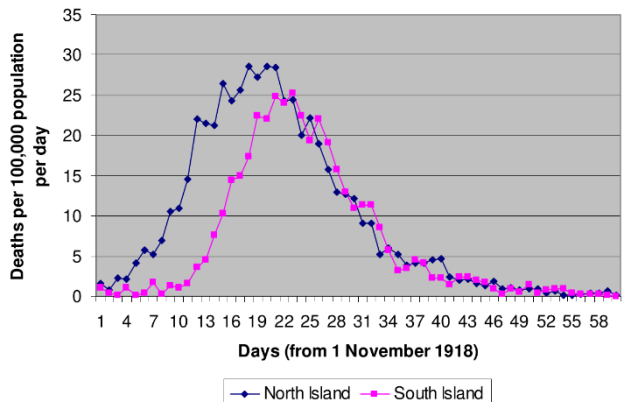

Conclusions

- The 1918 influenza pandemic in NZ – relatively well described
- But still much potential for further research (SES issues, natality etc)
- Some implications for pandemic preparations & planning (eg, addressing ethnic inequalities in health)

Questions?