

Descriptive Study of Pandemic Influenza Amongst the New Zealand Expeditionary Forces, 1918 to 1919

Jennifer A Summers,* Nick Wilson, Michael G Baker

Department of Public Health, University of Otago, Wellington, New Zealand.

*Corresponding author: jenn.summers@gmail.com



Background: The impact of pandemic influenza on New Zealand (NZ) military personnel involved in World War One (WW1) (the NZ Expeditionary Forces (NZE)) has not been systematically studied. Therefore, we aimed to use individualized data combined with historical documents to describe the course and impact of the pandemic amongst the entire NZEF.

Methods: Mortality and descriptive data for military personnel from various data sets were analysed (Roll-of-Honor dataset, Cenotaph dataset and other individual-level archival information from military records). Extensive coding of demographic and military variables was undertaken. Pandemic influenza cases were identified by a combination of geographic and temporal features specific to the individual's death, and where possible, the specific death record for the individual.

Results:

- An estimated 830 to 1,113 deaths from pandemic influenza occurred in 1918-1919 amongst the NZEF. This greatly exceeds previous estimates and represents 4.5%-6.1% of NZEF deaths from all causes related to WW1.
- The epidemic curve was much more drawn out for disease spread in the Northern Hemisphere than the Southern (Figure 1). The former also showed clear evidence for experiencing an additional 'third' wave in February 1919.
- Mortality rates varied markedly by hemisphere, country and military camp (Figure 2).

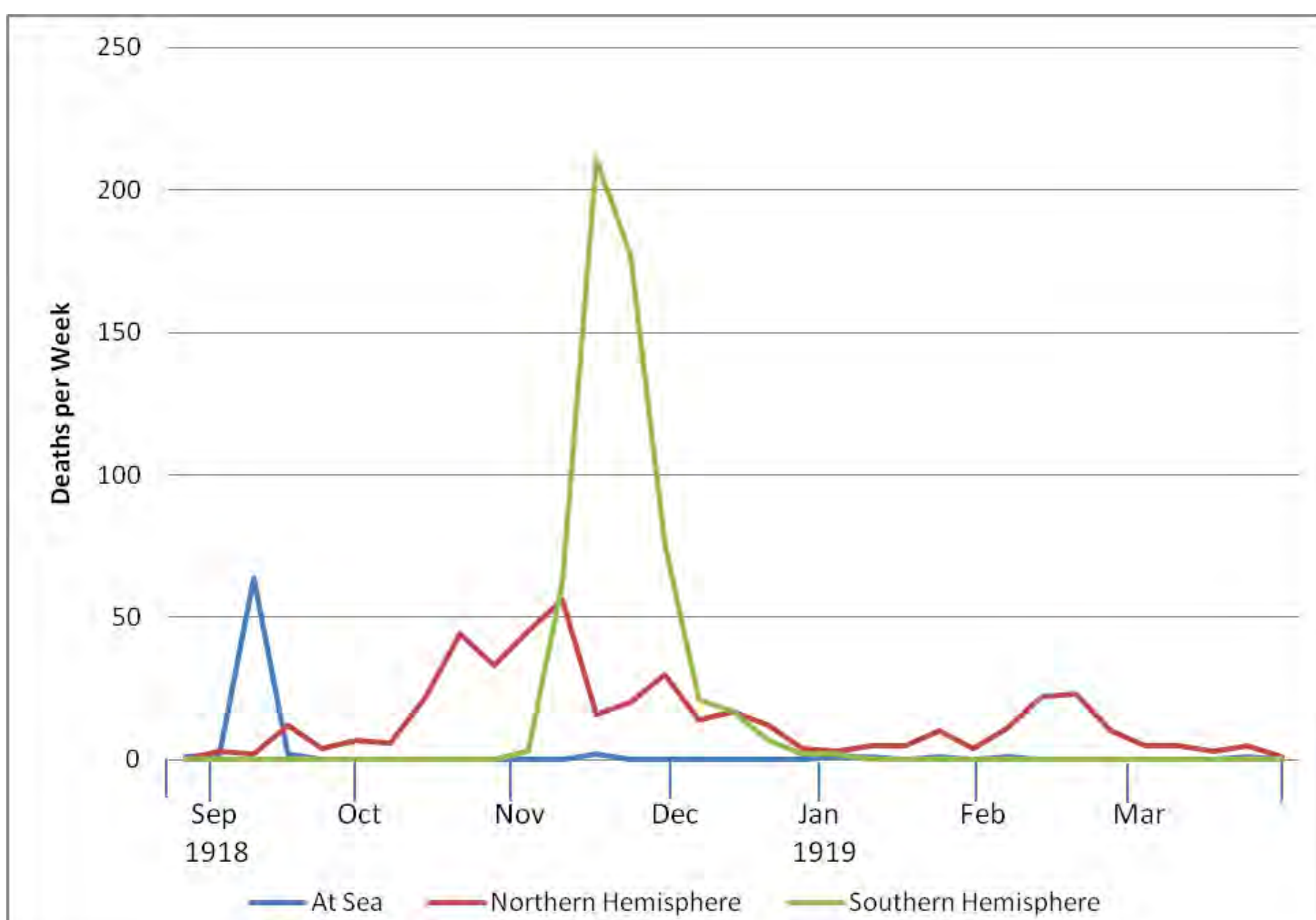


Figure 1: Pandemic influenza mortality amongst the NZEF in different regions

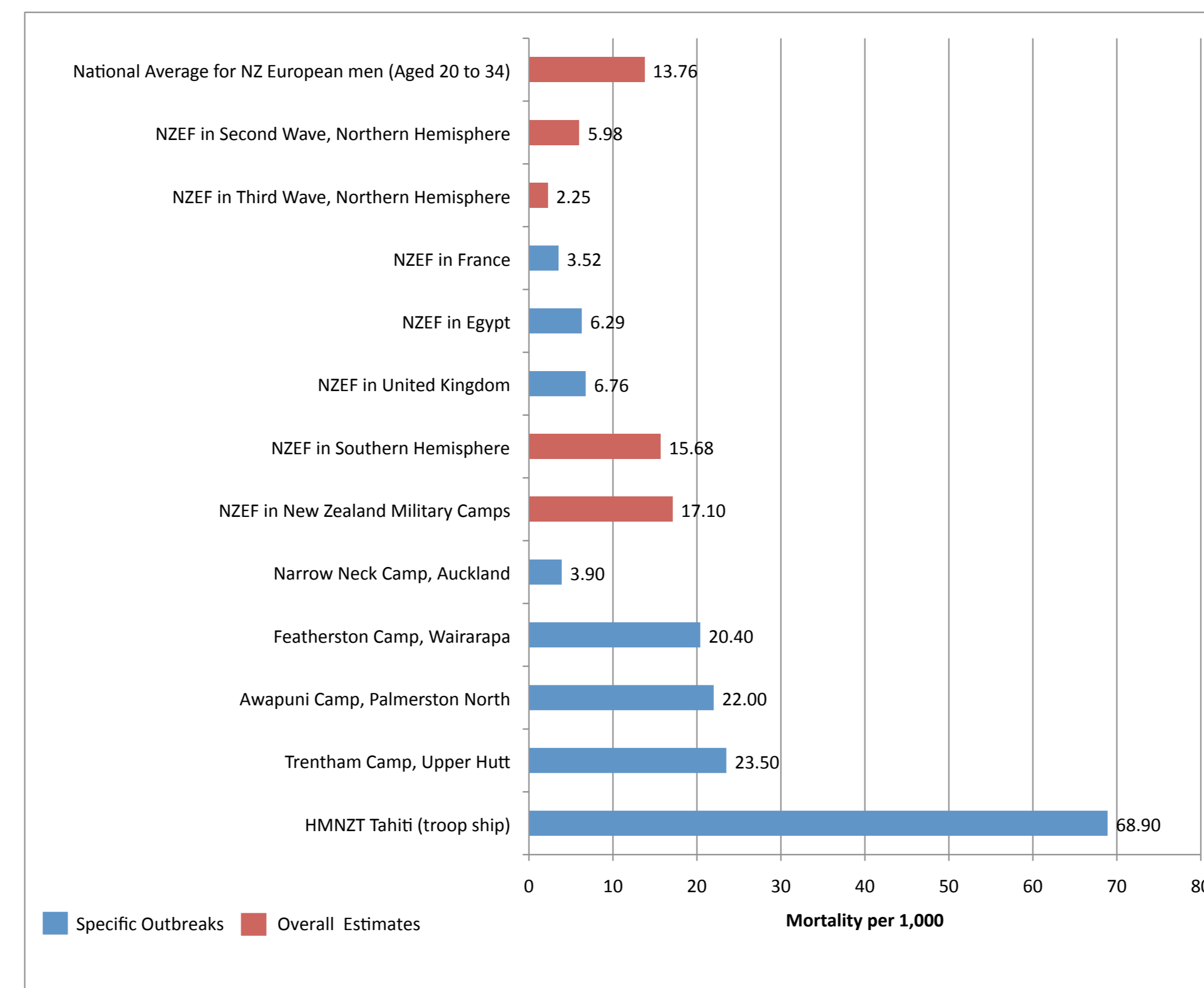


Figure 2: Pandemic influenza mortality amongst the NZEF by setting

- Age was also an important factor in determining mortality risk from pandemic influenza, with the highest mortality rate (16.1 per 1,000) experienced by '25 to 34' year olds.
- Higher mortality rates were also observed amongst Māori compared to European military personnel (25.0 vs 11.0 per 1,000) (relative risk (RR) = 2.3, 95%CI=1.6-3.1).
- NZE personnel with strong evidence of a rural background also experienced significantly higher pandemic influenza mortality compared to those from an urban background (12.8 vs 5.3 per 1,000) (RR = 2.4, 95%CI=1.9-3.1).
- NZE who first embarked on a troop ship in 1918, experienced the highest mortality rate (17.7 per 1,000), more than double that of troops who first embarked in previous years of the war (RR = 2.3, 95%CI=1.9-2.8).

Discussion: The estimated 830-1,113 pandemic deaths identified in this study indicates that previous estimates (1, 2), of the mortality burden amongst the NZEF were marked underestimates.

The Northern Hemisphere experienced a third wave of the pandemic in early 1919. Although this has been described amongst civilian populations across Europe, it has never been described before amongst the NZEF.

Military camps in New Zealand (where a large proportion of the troops could be classified as 'fresh recruits'), endured a high mortality rate compared to the Northern Hemisphere troops (which could be classified as 'seasoned troops').

The results are consistent with the ideas that the combination of an institutional population and perhaps little/no immunity to a highly virulent strain of pandemic influenza contributed to the high mortality rates.



*Image 1: Hospital at Featherston Military Camp. The camp's hospital was quickly overwhelmed with the influenza outbreak.

The high pandemic mortality experienced by individuals with a first embarkment date in 1918 (17.7 per 1,000), is also consistent with other research which suggests that 'fresh recruits' suffered disproportionately during the pandemic compared to 'seasoned troops' (3-5).

Conclusions: This work documents the heavy mortality burden from pandemic influenza in these military personnel and highlights large variations in mortality rates by pandemic wave, setting and demographic variables. Archival information from the WW1 era can usefully inform the descriptive epidemiology of pandemic influenza.

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