

# Mortality Risk Factors in an Outbreak of Pandemic Influenza on a New Zealand Troop Ship in 1918

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## Background

The purpose of this study was to examine an outbreak of pandemic influenza on a troop ship in 1918 (His Majesty's New Zealand Transport (HMNZT) Tahiti), and to identify the risk factors for mortality from influenza among those onboard.

On the 10 July 1918, the Tahiti departed New Zealand with the 40<sup>th</sup> Reinforcements, a unit largely consisting of infantry replacements.



Image 1: The troop ship Tahiti in Wellington Harbour ca 1914-1919, by an unidentified photographer (3)

Upon reaching Freetown, Sierra Leone, reports of disease ashore resulted in all ships in the convoy being quarantined at port (1, 2), however this was not completely enforced.

The Tahiti left Freetown on 26 August 1918, and on this day, the first influenza cases were being admitted to the onboard hospital.

## Methods

Historical information was obtained from Archival sources held in Archives New Zealand (2, 5).

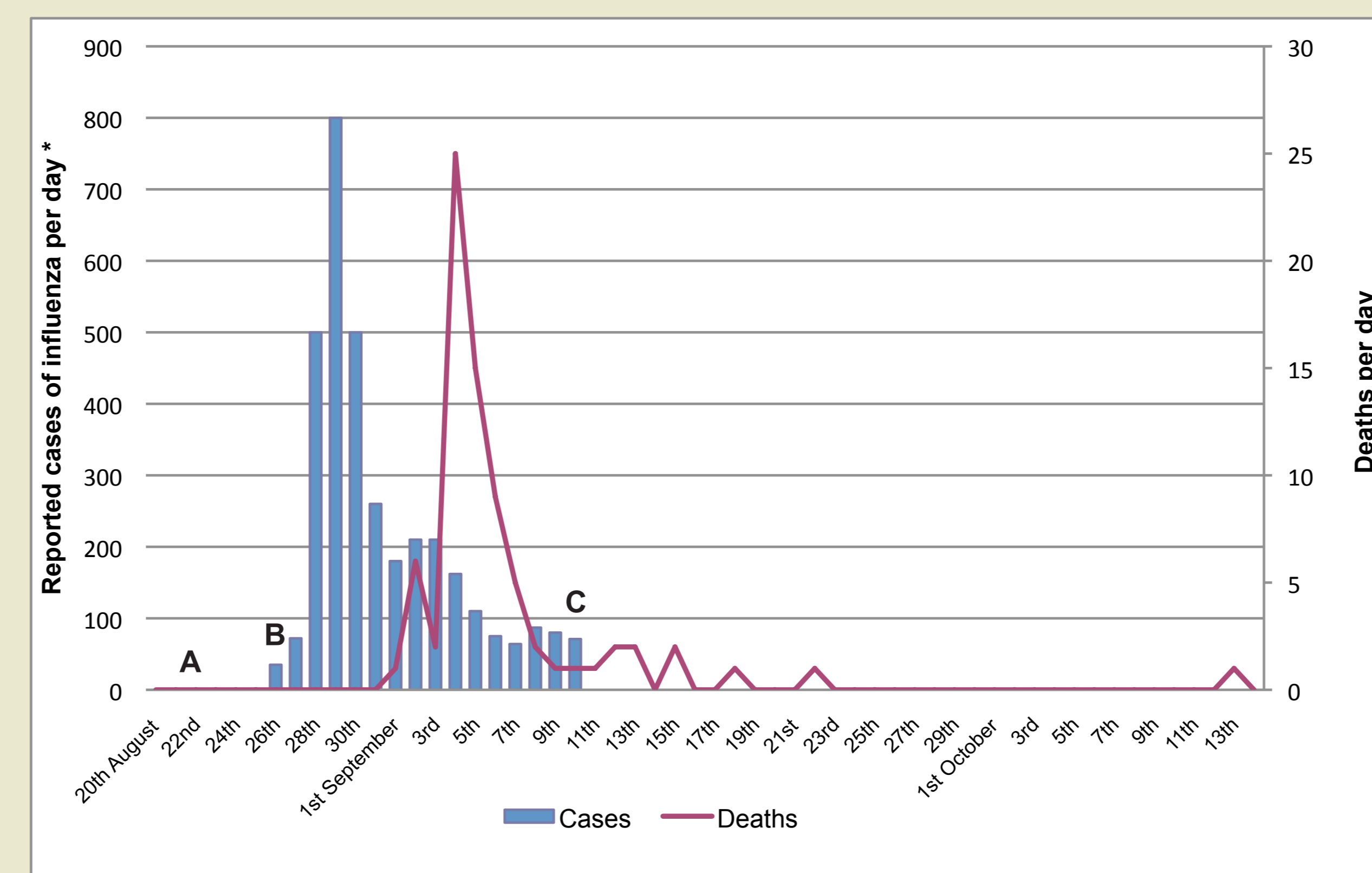
Mortality and descriptive data for military personnel from various data sets were analysed. These datasets contained individualised information on all troops onboard the Tahiti.

Extensive coding of demographic and military variables was undertaken to allow for descriptive analysis.

## Results of analyses

The military personnel onboard the Tahiti experienced a cumulative incidence of pandemic influenza of around 90%, with an overall mortality rate of 68.9 per 1,000 (see Figure). This specific outbreak was one of the worst worldwide for the 1918/19 pandemic in terms of both morbidity and mortality.

Figure: Mortality and morbidity for those aboard the troop ship Tahiti from the 1918 pandemic\*



\*Reported cases of influenza are approximate as the definition of a case was not precisely described. A = 22 August 1918, Tahiti arrives in Sierra Leone. B = 26 August 1918, Tahiti leaves Sierra Leone. C = 10 September 1918, Tahiti arrives in England (subsequent deaths occurred in English hospitals).

Accommodation in cabins versus other areas with hammocks was associated with increased mortality (rate ratio (RR) = 4.28, 95%CI = 2.69 – 6.81).

Assignment to a particular military unit, the Field Artillery (probably housed in cabins), was significantly associated with an increased risk of mortality (adjusted odds ratio in the logistic regression = 3.04, 95%CI = 1.59 – 5.82).

Individuals aged 25 to 34 years experienced the highest mortality rate (108.1 per 1,000) - which was statistically significantly higher than all the other age groups combined.

## Findings from the Archival documentation:

- Archival evidence suggests this outbreak resulted from the spread of infection to personnel on the Tahiti when the ship visited Sierra Leone. The dates coincide with the outbreak of the more severe second wave of the pandemic in Western Africa (6).
- A subsequent Court of Inquiry stated that one of the main reasons for the high mortality in this outbreak was the poor ventilation systems onboard the Tahiti (2). Anecdotal evidence also suggests that the cabins with bunks had poorer ventilation than other accommodation.

- The Inquiry found that the Tahiti was no more crowded than other similar troops ships, however, it was originally fitted for around 650 passengers and crew (7), which was many less than the 1,217 onboard the July 1918 sailing.
- The medical and nursing personnel were overwhelmed by the mass casualty event created by influenza; many of them incapacitated by illness when they were most needed.
- Isolation measures onboard the Tahiti, such as clearing out deck space for temporary hospitals proved insufficient with the number of cases exceeding the hospitals' capacity (2).



Image 2: HMNZT Tahiti with World War One troops, alongside a Wharf ca 1915, photograph taken by David James Aldersley (4)

## Conclusions

It is likely that the outbreak on the Tahiti represents a worst-case scenario with non-immune soldiers intensively exposed to a highly pathogenic virus, combined with crowding and ineffective isolation measures. Such closed and crowded settings may need special attention when designing pandemic plans.

Acknowledgments: The authors thank Professor Peter Dennis (University of New South Wales at the Australian Defence Force Academy) for providing an updated version of the NZEF Roll-of-Honor, and the staff of Auckland Museum for providing data from the Cenotaph Database.

Disclaimer: The opinions expressed are those of the authors and do not necessarily reflect those of any agency including the Australian Defence Force.

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