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## Projections of zoster incidence in Australia based on demographic and transmission models of varicella-zoster virus infection

Valentina Costantino<sup>1</sup>, Heather F Gidding<sup>1,2</sup> and James G Wood<sup>1</sup>

<sup>1</sup>University of New South Wales, Australia

<sup>2</sup>National Centre for Immunisation Research and Surveillance, Australia

Re-exposure to varicella infection is believed to delay the occurrence of herpes zoster (HZ), which has led to predictions of increased HZ following introduction of varicella vaccination programs. However, there is evidence of rising HZ rates before vaccination was introduced. Here, we explore a potential explanation for this effect through demographic change leading to reductions in varicella exposure and boosting in the context of Australia over the 20th century. To study this hypothesis, we integrated observed changes in Australian birth and age-specific death rates with a varicella transmission model. The model was then calibrated to age-specific prevaccination seroprevalence (1997–9) and hospitalization data (1993–2009). Model simulations predicted that declining birth rates led to a 50% reduction in varicella incidence over the 20th century. When combined with the impacts of an aging population, the simulations further suggested that HZ incidence should have increased by 50% over the 20<sup>th</sup> century. However, we found that after age-standardization, the residual increase in HZ due to reduced boosting was only about 8% over the 20<sup>th</sup> century. Results were also sensitive to the assumed duration of immunity to HZ and whether multiple HZ episodes were possible. Despite a strong predicted effect of demographic change on varicella incidence, our findings suggest that improved survival is the main contributor to any rise in HZ rates prior to vaccination in Australia. Removing survival effects through age-standardization is recommended when considering epidemiologic or model-based analysis of past trends in HZ.

v.costantino@unsw.edu.au

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