

1 **Indigenous Australian household structure:**  
2 **a simple data collection tool and**  
3 **implications for close contact transmission**  
4 **of communicable diseases**

5 **Thiripura Vino<sup>1</sup>, Gurmeet Singh<sup>2,3</sup>, Belinda Davison<sup>2</sup>, Patricia Therese**  
6 **Campbell<sup>5,8</sup>, Michael Lydeamore<sup>1,5</sup>, Andrew Robinson<sup>1,6,7</sup>, Jodie**  
7 **McVernon<sup>8</sup>, Steven Y. C. Tong<sup>2,9</sup>, and Nicholas Geard<sup>4,10</sup>**

8 <sup>1</sup>**School of Mathematics and Statistics, University of Melbourne, Victoria, Australia**

9 <sup>2</sup>**Menzies School of Health Research, Charles Darwin University, Darwin, Northern**  
10 **Territory, Australia**

11 <sup>3</sup>**NT medical Program of Flinders and James Cook Universities**

12 <sup>4</sup>**Melbourne School of Population and Global Health, University of Melbourne, Victoria,**  
13 **Australia**

14 <sup>5</sup>**Murdoch Childrens Research Institute, The Royal Children's Hospital, Melbourne,**  
15 **Victoria, Australia**

16 <sup>6</sup>**School of BioSciences, University of Melbourne, Victoria, Australia**

17 <sup>7</sup>**Centre of Excellence for Biosecurity Risk Analysis, Victoria, Australia**

18 <sup>8</sup>**Victorian Infectious Diseases Reference Laboratory, The Royal Melbourne Hospital**  
19 **and The University of Melbourne, at the Peter Doherty Institute for Infection and**  
20 **Immunity, Victoria, 3000, Australia**

21 <sup>9</sup>**Victorian Infectious Disease Service, The Royal Melbourne Hospital, and The**  
22 **University of Melbourne, at the Peter Doherty Institute for Infection and Immunity,**  
23 **Victoria, Australia**

24 <sup>10</sup>**School of Computing and Information Systems, University of Melbourne, Victoria,**  
25 **Australia**

26 Corresponding author:

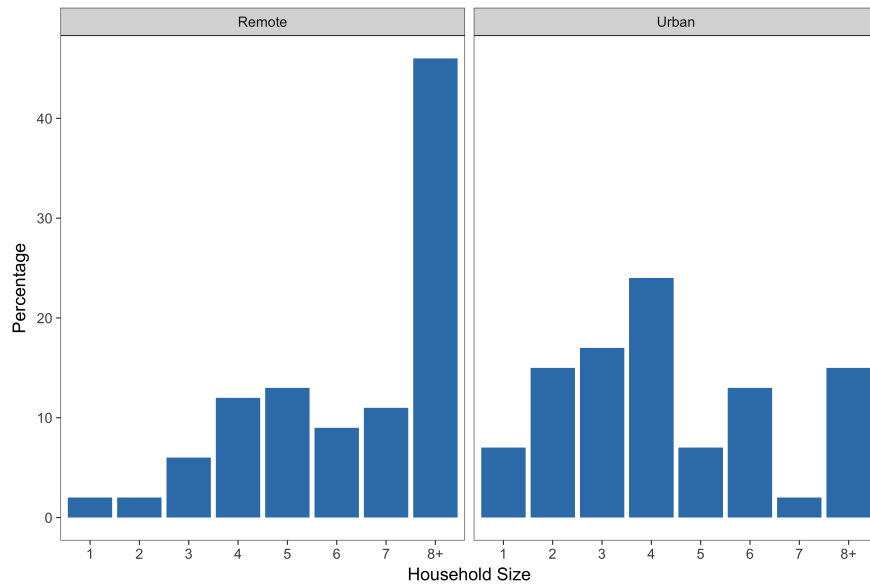
27 Steven Y. C. Tong

28 Email address: [Steven.Tong@mh.org.au](mailto:Steven.Tong@mh.org.au)

29 **ABSTRACT**

30 Households are an important location for the transmission of communicable diseases. Social contact  
31 between household members is typically more frequent, of greater intensity, and is more likely to involve  
32 people of different age groups than contact occurring in the general community. Understanding household  
33 structure in different populations is therefore fundamental to explaining patterns of disease transmission  
34 in these populations. Indigenous populations in Australia tend to live in larger households than non-  
35 Indigenous populations, but limited data is available on the structure of these households, and how they  
36 differ between remote and urban communities. We have developed a novel approach to the collection of  
37 household structure data, suitable for use in a variety of contexts, which provides a detailed view of age,  
38 gender, and room occupancy patterns in remote and urban Australian Indigenous households. Here we  
39 report analysis of data collected using this tool, which quantifies the extent of crowding in Indigenous  
40 households, particularly in remote areas. We use this data to generate matrices of age-specific contact  
41 rates, as used by mathematical models of infectious disease transmission. To demonstrate the impact  
42 of household structure, we use a mathematical model to simulate an influenza-like illness in different  
43 populations. Our simulations suggest that outbreaks in remote populations are likely to spread more  
44 rapidly and to a greater extent than outbreaks in non-Indigenous populations.

45 1. Household Size distribution for Australian Bureau of Statistics Census data (2011) for the towns  
46 selected in ABC study



**Figure 1. Household Size distribution for Census data**

2. Contact matrices for each shire

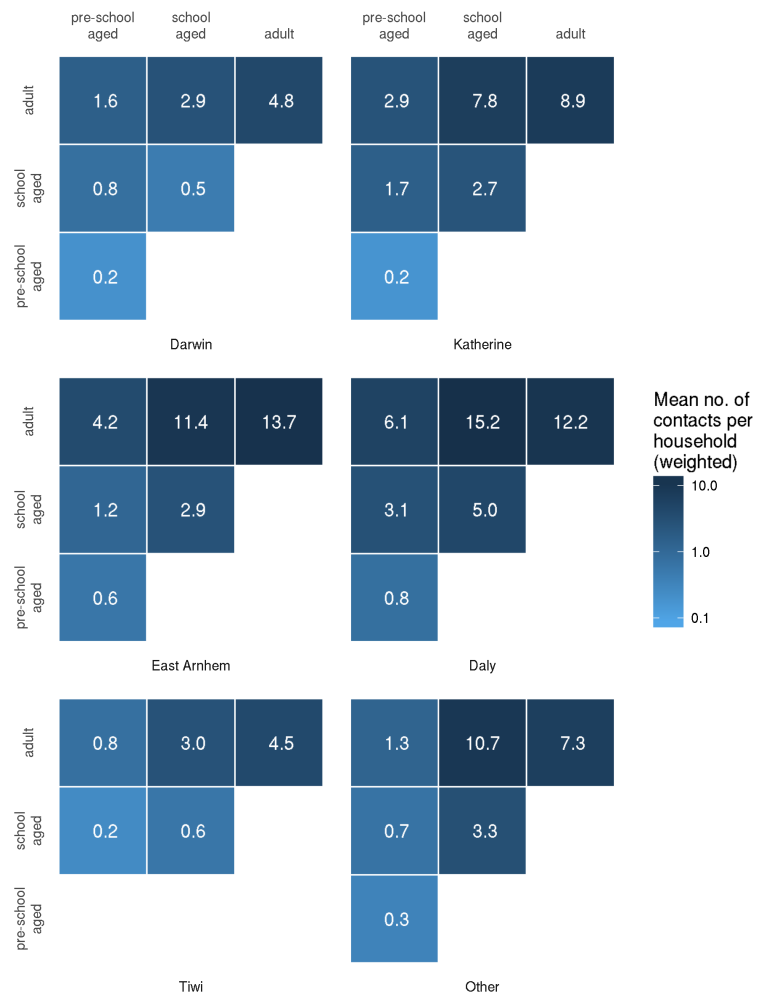
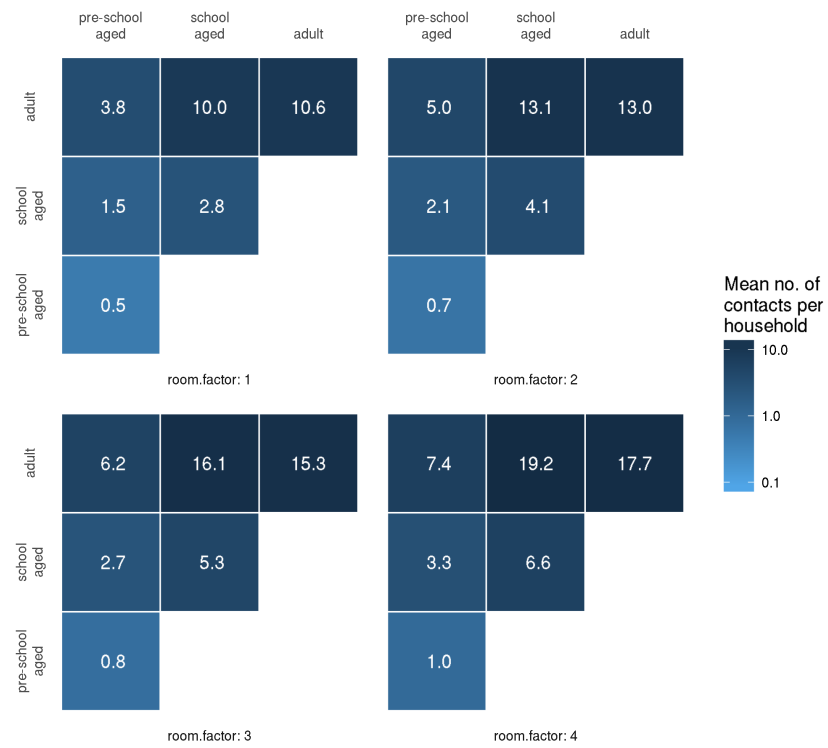


Figure 2. Household Contact matrices for shires

## 3. Effect of weighting by rooms on contact matrices



**Figure 3. Effect of weighting by rooms on contact matrices**