

# Bacteriophage profile is associated with ear & nose health status of Indigenous children.



## Introduction

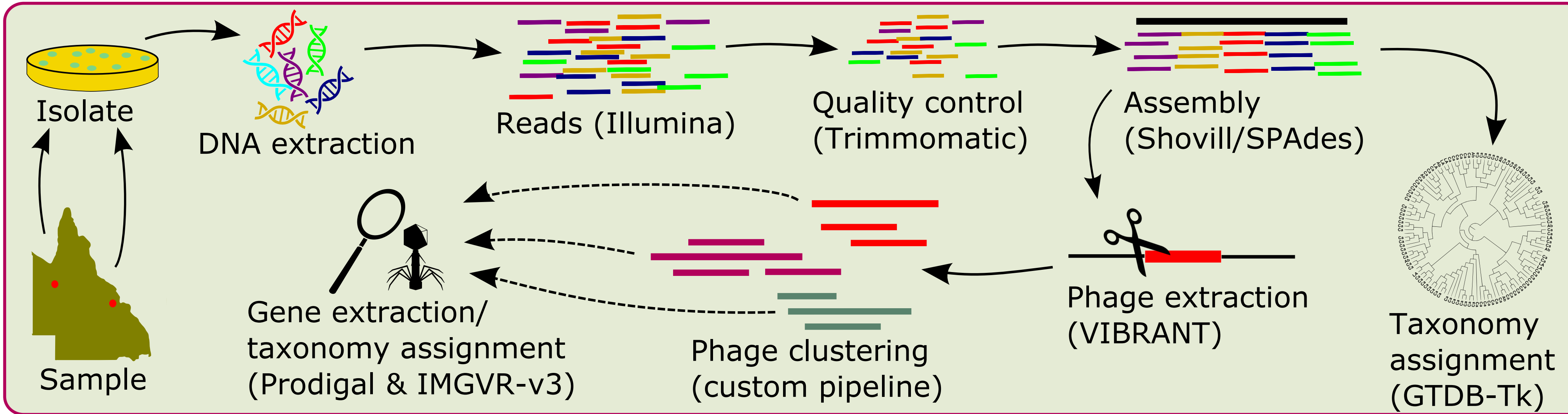
- Otitis media is a "massive public health problem" for Indigenous children<sup>1</sup>, with future knock-on effects<sup>2</sup>:
  - Education
  - Employment
  - Incarceration

- Haemophilus influenzae is one of the key pathogens that cause OM<sup>3</sup>
  - Haemophilus sp. are often infected by bacteriophages which integrate themselves into the genome

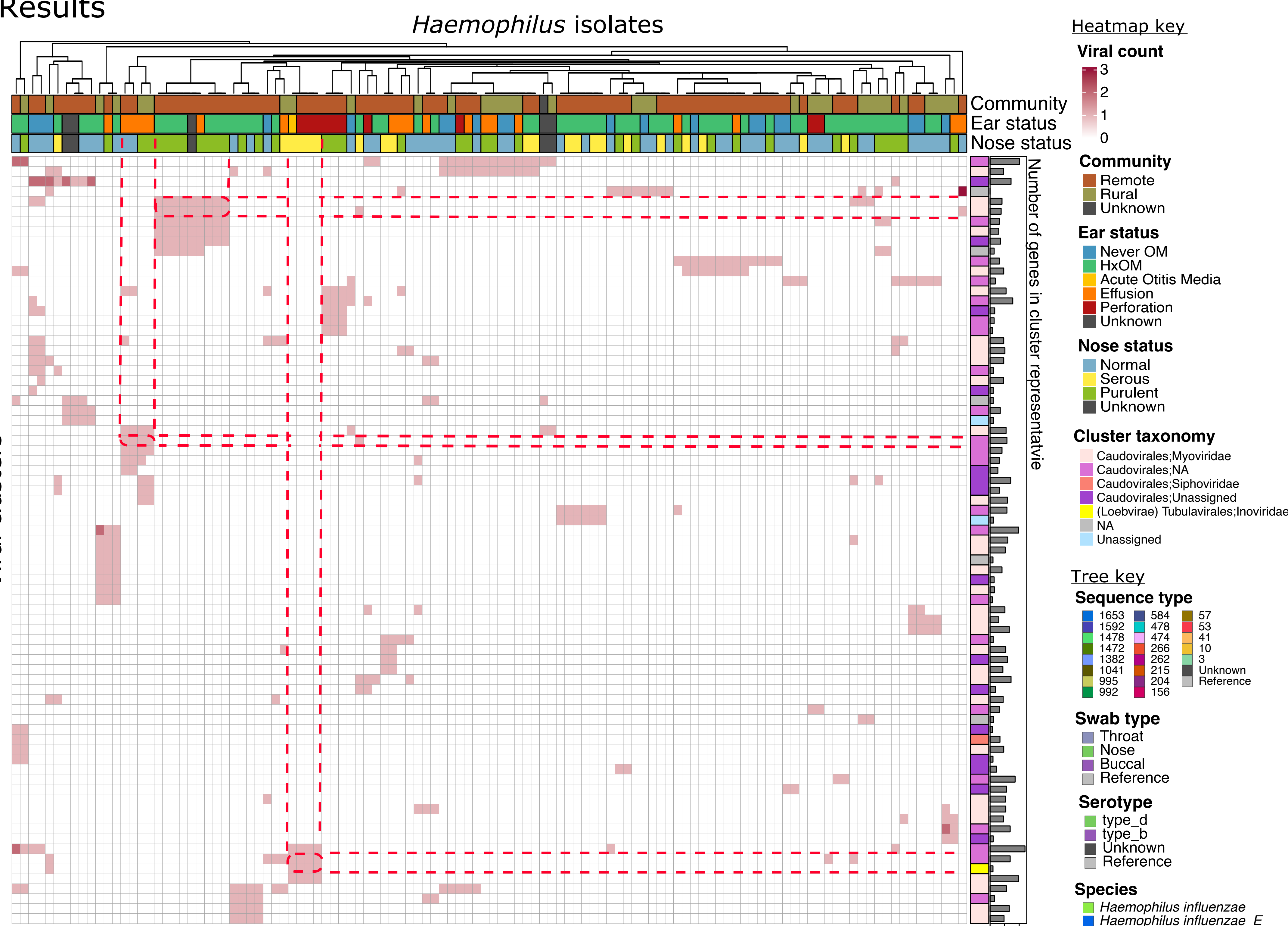
- These particular phages have often been found to increase virulence/survival of their bacterial host

**We demonstrate associations between viral presence and relevant sample metadata**

## Methods



## Results



**Figure 2** Heatmap visualisation of the presence of viral clusters within each *Haemophilus* isolate. Column annotations indicate sample metadata, row annotation indicate taxonomy/gene count of cluster representatives (red highlights indicate selection of significant associations of clusters with ear/nose health outcomes)

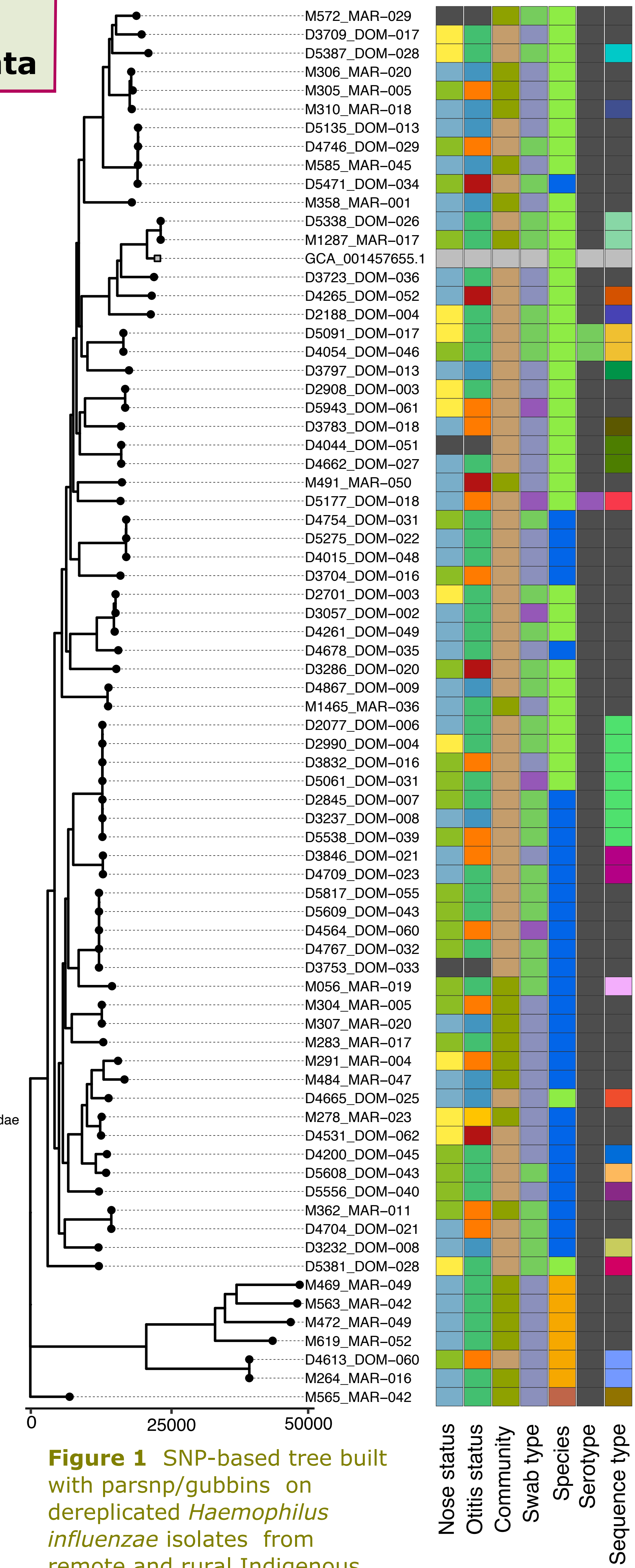
## Discussion

- Our main finding was that *Haemophilus influenzae* isolate prophage profiles are dominated by the order Caudovirales
- We also identified one cluster of Inoviridae, which has been found to promote virulence in cystic fibrosis<sup>3</sup>

**Conclusion: Phages may well play a role in improving or worsening ear/nose health outcomes - but specific effects and mechanisms will require further research!**

Via multinomial logistic regression, we identified:

- 4 viral clusters significantly associated with worse ear health outcomes (all Caudovirales:NA/Unassigned) 🙄👂
- 4 viral clusters significantly associated with worse nose health outcomes (Caudovirales:Myoviridae/NA + Inoviridae) 🙄👃
- 1 cluster significantly associated with better in ear health outcome (Caudovirales: Myoviridae) 😊👂



**Figure 1** SNP-based tree built with parsnp/gubbins on dereplicated *Haemophilus influenzae* isolates from remote and rural Indigenous children

## References:

- Burns JT, Neill; 2013. Review of ear health and hearing among Indigenous Australians. Australian Indigenous HealthBulletin 13.
- DeLacy J, Dune T, Macdonald JJ. 2020. The social determinants of otitis media in aboriginal children in Australia: are we addressing the primary causes? A systematic content review. BMC Public Health 20:492.B
- Coleman A, Wood A, Bialasiewicz S, Ware RS, Marsh RL, Cervin A. 2018. The unsolved problem of otitis media in indigenous populations: a systematic review of upper respiratory and middle ear microbiology in indigenous children with otitis media. Microbiome 6:199.
- Burgener, E.B., et al., Filamentous bacteriophages are associated with chronic Pseudomonas lung infections and antibiotic resistance in cystic fibrosis. Science translational medicine, 2019. 11(488): p. eaau9748.

**Authors:** Maximillian Kirsch<sup>1</sup>, Julian Zaugg<sup>1</sup>, Seweryn Bialasiewicz<sup>1</sup>, Robert Ware<sup>2</sup>

<sup>1</sup>Australian Centre for Ecogenomics, The University of Queensland, St Lucia, Australia

<sup>2</sup>Menzies Health Institute Queensland, Griffith University, Southport, Australia



THE UNIVERSITY OF QUEENSLAND AUSTRALIA

