# ARF risk factors: Beyond a sore throat

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Acute rheumatic fever (ARF) is an immune-mediated disease preceded by a group A streptococcal infection, and in the most serious cases, can lead to rheumatic heart disease. A significant segment of the global population is affected by group A streptococcal mediated rheumatic heart disease.[1] The burden of group A streptococcal infections and ARF is higher in lower income countries but also occurs significantly in disadvantaged populations in higher income countries, such as among the indigenous groups in Australia and New Zealand.[2,3]

Prevention of ARF and rheumatic heart disease can occur through prevention of the preceding group A streptococcal infection. Group A streptococcal pharyngitis can, in some cases, lead to ARF, therefore, prevention of streptococcal pharyngitis should decrease the incidence of ARF in those populations most affected. Although less conclusive, evidence is also growing for the association of group A streptococcal skin infections with the development of ARF.[4–6] As commercial vaccines to protect against group A streptococcal infections do not yet exist, other measures such as infection prevention programs remain a primary strategy to stop disease development.[7] In 2011, New Zealand launched the Rheumatic Fever Prevention Programme, which focused primarily on sore throat detection among high-risk school children in areas of relative socioeconomic deprivation, as well as efforts to increase education about ARF and its connection to sore throats.[8] While there were noted decreases in the number of ARF cases following implementation of the program, this was likely due to a variety of factors and may not be sustained as evidenced by an increase in ARF rates near the end of the now discontinued program.[8] Other factors, such as overcrowding and socioeconomic status are strongly associated with ARF development and may prove to be more effective targets for prevention programs.[7] However, our overall knowledge of ARF risk factors, especially among those most highly impacted, is limited due a lack of powerful studies examining a full range of possible risk factors.[9] Consequently, there has been a need for additional research to elucidate the important risk factors on which prevention programs should focus.

Here, Baker *et al.*, performed a case-control study of individuals hospitalized for ARF in New Zealand to identify modifiable risk factors to inform policies and programs aimed at reducing ARF rates.[4,9] A strength of the study was the tight 3:1 ratio match of controls to cases for age, ethnicity, socioeconomic deprivation, location, sex, and recruitment month. Strong associations between ARF and the modifiable risk factors of household crowding, barriers to accessing primary healthcare, and sugary beverage intake were identified by multivariable analysis. The authors do caution more studies need to be done regarding the sugary beverage association and ARF. ARF risk was also found to be five-fold higher among individuals with a family history of the disease in the Māori and Pacific Islander populations. Elevated risk was also identified for preceding sore throat and/or skin infection. Concurrently, Bennett *et al.*, sought to identify risk factors for group A streptococcal pharyngitis and skin infections in Auckland, New Zealand and determine if those risk factors overlapped with ARF risk factors.[10] Analysis found significant associations for having group A streptococcal pharyngitis, group A streptococcal carriage, or group A streptococcal skin infections and the inability to obtain primary healthcare. In addition to problems related to primary healthcare, children with group A streptococcal skin infections had a greater likelihood of living in crowded housing conditions as defined by the WHO, having Māori or Pacific Islander grandparents, a family history of ARF or a previous diagnosis of eczema. These two studies together identified several overlapping risk factors for group A streptococcal infections and ARF that are modifiable, suggesting these infections can potentially be reduced through changes in the environment in which individuals at risk of infection live.

What does this mean for public health and clinical practice? The development of ARF prevention programs for indigenous people in New Zealand and other at-risk

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populations globally that focus on mitigatable risk factors (e.g., overcrowded housing and improved healthcare access) could be useful for the reduction of group A streptococcal skin and throat infections and subsequent ARF. The strong support for the association of ARF with skin infections presented by Baker *et al.*, coupled with the high levels of group A streptococcal skin infection and colonization among indigenous people in New Zealand, suggests that efforts to reduce skin infections will likely make significant impacts on ARF development.[5,9] However, mitigation strategies do not come without significant challenges, as cultural requirements of indigenous groups that are affected must be considered, especially when addressing a factor as personal as living situation.[7,10]

## Contributors

Dr. Ashley Williams contributed to the literature search, data interpretation and writing.
Dr. Gregory Tyrrell contributed to the literature search, conceptualization, data interpretation and writing.

## Declaration of interests

Both authors declare no conflicts of interest.

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