Sugar, dental caries and acute rheumatic fever: what is the link?

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The hypothesis
How could sugar cause rheumatic fever?

- In Vitro microbiological evidence
  - Enhanced culture conditions for growth of Group A streptococci
    - Group A streptococci throat infection
      - Rheumatic fever

- Ethnic group

- Association in national dental survey; Consensus for sugar causing dental decay

- Dental caries

- Career case-series described by Weston A. Price
Statistical evidence of association?
The study
Compare children, by caries

\[ P(\text{ARF} \mid \text{Decayed teeth}) = P(\text{ARF} \mid \text{Good teeth}) \]
Other explanations...

- Age
- Gender
- Ethnic group
- Socioeconomic status

Spurious
Cohort study

- 20,033 Māori and Pacific children (ARDS)
- Aged 5 to 6 years
- Free of chronic disease at baseline
- Exposure: dental caries
- Outcome: rheumatic fever ($n = 96$)
Results

**Demographic factors**
- Gender (male vs. female)
  - Crude Hazard ratio: 1.37 (0.91 to 2.06)
  - Adjusted Hazard ratio: 1.35 (0.89 to 2.03)
- Ethnicity (Pacific vs. Maori)
  - Crude Hazard ratio: 1.47 (0.39 to 5.57)
  - Adjusted Hazard ratio: 1.17 (0.76 to 1.79)
- Deprivation (deciles 8 to 10 vs. other or missing)
  - Crude Hazard ratio: 2.54 (1.50 to 4.30)
  - Adjusted Hazard ratio: 2.26 (1.32 to 3.87)

**Caries (per 5 affected teeth)**

**Primary**
- decayed
  - Crude Hazard ratio: 1.83 (1.39 to 2.40)
  - Adjusted Hazard ratio: 1.83 (1.12 to 2.97)
- missing
  - Crude Hazard ratio: 0.86 (0.15 to 5.03)
  - Adjusted Hazard ratio: 0.60 (0.09 to 4.12)
- filled
  - Crude Hazard ratio: 1.22 (0.64 to 2.32)
  - Adjusted Hazard ratio: 1.37 (0.70 to 2.66)

**Permanent**
- DMF
  - Crude Hazard ratio: 2.52 (1.37 to 4.64)
  - Adjusted Hazard ratio: 2.70 (1.33 to 5.48)
Conclusion

- Teeth provide an indicator of cumulative exposure to sugar
- Caries strongly linked to ARF incidence
- Limiting sugar likely to reduce disease incidence
- Sugar intake
  - likely responsible for more poor health than we are currently aware of
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