Housing, health and acute rheumatic fever

Jane Oliver
University of Otago Wellington
Outline

• The determinants of health
• Inequity in housing and health
• Diseases of poor housing
• Acute rheumatic fever
• ARF case study
• Rheumatic fever RISK Study
The determinants of health

Personal, social, economic, and environmental factors that influence health

• **Social**: eg. Availability of resources, socioeconomic conditions, social support
• **Physical**: eg. Environment, housing, toxins
• **Health Services**: eg. accessibility
• **Individual Behavior**: eg. smoking
• **Biology and Genetics**: eg. predisposition to disease
Equality is not the same as Equity

Inequitable distribution of the determinants of health

-> health inequity
Ethnic inequity in New Zealand

- **Tangata whenua** are affected by inequity
  - Rapid loss of land, fisheries
  - Failure to implement protections under **Te Tiriti o Waitangi**
  - Loss of economic power and socioeconomic status
  - Marginalised in Parliament
  - Worse housing + health outcomes

Inequality continues to affect Māori and Pacifica
Where are we now?

• 2013: Māori median income is 73% of Pākehā income, Pacifica 64%

• 2008 Children Commissioner: 22% NZ children in unacceptable poverty, 27% Māori

• Māori and Pacifica more likely to be unemployed, lack high school qualifications

• Lower rates of home ownership in 2013: Pākehā: 57%, Māori: 28%, Pacifica: 19%
Where are we now?

• Māori & Pacific homes more crowded
  – 38% Pacific homes crowded, 20% Maori, 4% Pākehā
  – Increased risk of ID, stress

• Housing poorly designed for needs + cultural traditions

• Cold, damp + mould widespread
  – Impairs respiratory health

• Māori & Pacifica have higher morbidity and mortality across many health outcomes
Māori mortality 2-3x higher in middle age

Lower SES explains ~ ½ ethnic difference

7-8 year difference in life expectancy
Overview of NZ Housing

• NZ houses are:
  old, cold, damp, mouldy, poorly built with inadequate insulation & heating

• Average winter temperature 14.5°C
  (WHO: 18°C – 21°C)

• 1600 excess winter deaths from respiratory and circulatory ~8000 hospitalisations

• Crowding -> infectious diseases

• Private dwellings; public consequences
## Where do we spend our time?

The following chart illustrates the percentage of time spent in various activities across different age groups. The data is from the New Zealand Travel Survey, 1997-98.

### Percentage of Time Spent

<table>
<thead>
<tr>
<th>Activity</th>
<th>&lt;1</th>
<th>1-4</th>
<th>5-9</th>
<th>10-14</th>
<th>15-19</th>
<th>20-29</th>
<th>30-39</th>
<th>40-49</th>
<th>50-59</th>
<th>60-69</th>
<th>70+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unspecified</td>
<td>5%</td>
<td>10%</td>
<td>15%</td>
<td>20%</td>
<td>25%</td>
<td>30%</td>
<td>35%</td>
<td>40%</td>
<td>45%</td>
<td>50%</td>
<td>55%</td>
</tr>
<tr>
<td>Other</td>
<td>2%</td>
<td>4%</td>
<td>6%</td>
<td>8%</td>
<td>10%</td>
<td>12%</td>
<td>14%</td>
<td>16%</td>
<td>18%</td>
<td>20%</td>
<td>22%</td>
</tr>
<tr>
<td>Travel</td>
<td>2%</td>
<td>4%</td>
<td>6%</td>
<td>8%</td>
<td>10%</td>
<td>12%</td>
<td>14%</td>
<td>16%</td>
<td>18%</td>
<td>20%</td>
<td>22%</td>
</tr>
<tr>
<td>Recreation</td>
<td>1%</td>
<td>2%</td>
<td>3%</td>
<td>4%</td>
<td>5%</td>
<td>6%</td>
<td>7%</td>
<td>8%</td>
<td>9%</td>
<td>10%</td>
<td>11%</td>
</tr>
<tr>
<td>Work and Education</td>
<td>1%</td>
<td>2%</td>
<td>3%</td>
<td>4%</td>
<td>5%</td>
<td>6%</td>
<td>7%</td>
<td>8%</td>
<td>9%</td>
<td>10%</td>
<td>11%</td>
</tr>
<tr>
<td>Home</td>
<td>88%</td>
<td>86%</td>
<td>84%</td>
<td>82%</td>
<td>80%</td>
<td>78%</td>
<td>76%</td>
<td>74%</td>
<td>72%</td>
<td>70%</td>
<td>68%</td>
</tr>
</tbody>
</table>

New Zealand Travel Survey, 1997-98
## Diseases of poor housing

<table>
<thead>
<tr>
<th>Condition</th>
<th>Housing &amp; physical environment</th>
<th>Crowding related</th>
<th>Ministry of Health Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute bronchiolitis</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Acute rheumatic fever</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Bacterial meningitis</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Bacterial/ Unspecified pneumonia</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Bronchiectasis</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>GAS sepsis</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Meningococcal disease</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Viral / other / unspecified meningitis</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Viral pneumonia</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Post Strep Glomerulonephritis</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Acute upper respiratory tract infection</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Asthma</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Croup, acute laryngitis, tracheitis</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Gastroenteritis</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Otitis media</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Skin infection</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Tuberculosis</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Viral infection of unspecified site</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>
# Re-hospitalisation risk

<table>
<thead>
<tr>
<th>Hospitalisation Criteria</th>
<th>Adjusted HR (95% CI) for re-hosp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing &amp; Physical Environment</td>
<td>2.25 (2.23, 2.27)</td>
</tr>
<tr>
<td>Crowding</td>
<td>2.32 (2.30, 2.34)</td>
</tr>
<tr>
<td>Ministry of Health</td>
<td>3.11 (3.06, 3.15)</td>
</tr>
</tbody>
</table>

![Graph showing the proportion not readmitted over time for different criteria](image)

The graph illustrates the proportion of patients not readmitted over time, comparing non-housing related hospitalisations, housing & physical environment hospitalisations, crowding related hospitalisations, and Ministry of Health (MoH) criteria hospitalisations.
## Mortality risk

<table>
<thead>
<tr>
<th>Hospitalisation Criteria</th>
<th>Adjusted HR (95% CI) for death</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing &amp; Phy. Env</td>
<td>2.9 (2.6-3.2)</td>
</tr>
<tr>
<td>Crowding</td>
<td>3.4 (3.1-3.8)</td>
</tr>
<tr>
<td>Ministry of Health</td>
<td>8.9 (7.9-10.4)</td>
</tr>
</tbody>
</table>

![Survival curve graph showing the proportion surviving over time for different hospitalisation criteria.](image)
Top 10 actions to reduce inequity

1. Equitable and fair fiscal and social welfare policy
2. Maintain and enhance social cohesion
3. Maintaining and enhancing investment in early childhood
4. Aligning climate change, sustainability and pro-equity policies
5. Health equity needs to be widely understood
6. Ill-health prevention that addresses risk factors contributing to health inequities
7. Ensuring fair employment and safe and healthy workplaces
8. Maintaining and enhancing Māori, Pacific and Asian policies and programmes
9. Ensuring health services are equitable
10. Health equity research needs to continue and focus on ‘what works’
Acute rheumatic fever (ARF)

• An autoimmune-like inflammatory disease
• Triggered in 0.03-0.3% of people in response to Group A *Strep.* (GAS) infection: pharyngitis and skin infections (probably)
• Antibodies ‘misfire’ - attack patient’s own tissues
• Can produce chronic rheumatic heart disease (RHD)
Epidemiology of ARF

• Peaks in 5-14 year old children

• Declined in most developed countries
  – Improved living conditions, nutrition, household crowding, medical care, increased use of antibiotics to treat GAS infections

• Indigenous Australians, Māori and Pacific NZers have highest rates in the world (500/100,000 children)

• NZ Govt invested $32 million into ARF prevention strategies, aiming to reduce rates by 2/3 (2012-17)
Prevention

• Reducing population risk of GAS infection
  • “Primordial prevention”

• Treating GAS pharyngitis with antibiotics to decrease risk of ARF
  • “1° prevention” NZ RFPP

• Long-term treatment of ARF to prevent RHD
  • “2° prevention”

• Treatment of RHD complications
  • “3° prevention”
Māori and Pacific

First episode ARF hospitalisation rate

Some progress, *but*

Knowledge of ARF risk factors is limited

-> Inability to effectively deliver prevention interventions to the people who need them the most

  -> ‘Sledgehammer approach’
Poor housing and deprivation preceding rheumatic fever: A descriptive NZ case study

Jane Oliver, Nevil Pierse, Niki Stefanogiannis, Catherine Jackson, Michael Baker
Descriptive case study

• 1/3 ARF cases arise in HNZ homes
• Where are the rest?

Aims:
1. Investigate housing tenure of ARF cases at the time of diagnosis
2. Investigate the housing conditions, crowding & exposure to tobacco smoke at diagnosis
Methods

• PHU staff contacted recent cases

• Questionnaire based on pre-existing surveys
  Covers demographics, housing circumstances, conditions, heating, crowding and smoking

• 41 Questions

• Anonymous telephone interviews offered

• Comparison data presented where possible
Results

160 initial ARF notifications: Jan 2012 - Mar 2013

73 contact details received
- 55 interviewed

Study pop. representative of notified cases

Interview & notification data linked

• 35 Māori, 19 Pacific, 1 NZ Euro.
• 82% NZ Dep >6
• 80% 5-14 years, 20% 15-30
Results

Lower rates of home ownership
• 25% owner occ., 40% private rental, 35% HNZ

• 76% experienced ≥1 indicator of damp housing
  • 50% owner-occ., 90% in HNZ and private rental sectors

• Dampness or mould on walls/ceiling
• Musty smell in bdrms/living areas
Results

- **82% experienced ≥1 indicators of cold housing**
  - 43% in owner-occ. 91% private rental, 100% HNZ
  - Feeling colder than comfortable inside
  - Feeling cold to save $
  - Sleep in same room as others just to keep warm

- 17% did not heat living room in Winter, 75% did not heat bedroom

- 65% ‘acceptable’ heating in living rooms
  Electric heaters, heat pumps, central heating, flued gas, enclosed fire

  16% used unflued gas heaters
Results

- **83.6% experienced ≥1 indicator of deprivation**
  - Owner-occ., 85% ≥1 indicator, 36% ≥ 2
  - HNZ: 95% ≥2 indicators
  - Private rental: 91% ≥1 indicator, 82% ≥2
Results

Exposure to household crowding common
60% had ≥1 bedroom deficit, 35% ≥2

Owner-occ: 42% ≥1 deficit, Private rental: 50%, HNZ: 69%

Mean 2.1 deficit; IRQ: 1-3

• 69% shared bedroom;
  • mean 2.3 others
• 49% shared bed;
  • mean 1.8 other people

71% lived with smoker/s,
Fewer older cases smoked than in Youth ‘12 survey
Conclusions & Implications

Need for **warm, dry, non-crowded** homes, esp. **Māori and Pacific** children

Small sample size, consistent themes
No control pop. -> case-control study

Policy change: ARF whānau fast-tracked on HNZ waiting lists
The RF RISK Study

Understanding the risk factors that drive RF development in New Zealand will both explain an appalling ethnic inequity, and contribute to international RF knowledge.
The RF RISK Team

Investigators
• Michael Baker (PI; University of Otago, Wellington)
• Diana Lennon (University of Auckland/Counties-Manukau District Health Board)
• Jason Gurney (University of Otago, Wellington)
• Jane Oliver (University of Otago, Wellington)
• Teuila Percival (University of Auckland/Counties-Manukau District Health Board)
• Nevil Pierse (University of Otago, Wellington)
• Tony Merriman (University of Otago, Dunedin)
• Deborah Williamson (University of Otago/ESR)
• Nikki Moreland (University of Auckland)
• Colleen Murray (University of Otago, Dunedin)
• Nigel Wilson (Auckland District Health Board)
• Catherine Jackson (Auckland District Health Board, Auckland Regional Public Health Service)
• Richard Edwards (University of Otago, Wellington)
• Florina Chan Mow (Counties-Manukau District Health Board)

Māori Steering Group
• Jason Gurney (convenor, University of Otago, Wellington)
• Christine Campbell (Regional Public Health, Wellington)
• Matire Harwood (National Hauora Coalition/Te Kupenga Hauora Māori, University of Auckland)
• Helen Herbert (Ngati Hine Health Trust, Northland)
• Pauline Koopu (Auckland District Health Board)
• Renee Muru (Turuki Health Care, Auckland)
• Bridget Robson (Eru Pomare Health Research Centre, University of Otago, Wellington)
• Rose Ikimau (Te Kaahui Ora, Counties-Manukau District Health Board)
• Ronald Apiti (Te Kaahui Ora, Counties-Manukau District Health Board)

Pacific Steering Group
• Teuila Percival (convenor, Counties-Manukau District Health Board/University of Auckland)
• Metua Faasisila-Bates (Health Promotion Agency),
• Flo Chan Mow (Counties-Manukau District Health Board/South Seas HealthCare)
• Aumea Herman (Ex DOH Cook Is)
• Malakai Ofanoa (University of Auckland, Langimalie Tongan Health Trust)
• Ben Taufua (Massey University)
• Meia Schmidt-Uili (Waitemata District Health Board)

Research Study Staff
• Angela Chong (CBG Health Research Ltd.)
• Barry Gribben (CBG Health Research Ltd.)
Our Aims

1. Identify potentially modifiable **environmental risk factors** for RF, (e.g. household crowding).
2. Identify potentially modifiable **host factors** for RF, such as vitamin D deficiency and anaemia.
3. Establish whether current or recent **skin infection** is associated with an increased risk of RF.
4. Establish whether **access to healthcare**, including pharyngitis treatment, is protective for RF.
5. Establish whether **poor oral health** is associated with an increased risk of RF.
6. Establish whether specific **group A streptococcus** (GAS) organisms are associated with RF.
7. Contribute to identifying **immunological factors** associated with an increased risk of RF.
8. Establish whether certain **genetic factors** (the HLA-DRB1 locus) are associated with RF.
Questions We Could Answer

Is RF associated with risk factors that are potentially modifiable such as:

• Household crowding, bed sharing
• Household cold, damp, mould & fuel poverty
• Environmental Tobacco Smoke (incl. hair nicotine)
• Limited resources for personal hygiene (e.g. hot water for washing)
• Poor diets & vitamin D deficiency
• Skin infections & insect bites
• Limited health services (incl. sore throat treatment)
• Poor oral health
Methods

• **Design:** Case-control study

• **Interview team:** CBG Health Research

• **Location:** National (North Island)

• **Time period:** 3 years, from mid-2014

• **Cases:** 150 RF cases meeting NZ case definition (confirmed, probable)

• **Controls:** 2 groups
  - Matched controls (300)
  - NZ Health Survey controls (4000)
Methods

Data gathering:

• Interview with questionnaire.
• Blood testing for immune function, vitamin D, iron stores and genetics.
• Throat & nasal swabs for GAS, Staph, microbiome.
• Hair sample for nicotine.
• Linked records: NHI (hospitalisations etc), dental records, school-based throat-swabbing programme.
Our Progress

Since Sep 2014, we have recruited and interviewed

70 RF cases (= around 60% of all RF cases notified to ESR)

(...as well as 140 matched controls.)
Our Progress

That’s less than we anticipated based on disease incidence rates before the study began...

...as such, we need all the help we can get regarding recruitment of RF cases.

We believe a number of cases (and their whānau) aren’t being given the chance to participate in the study.
What we need:

1. **Take a throat swab** at admission.

2. **Gain consent to contact** the case or caregiver.

3. **Call 0800 RH FEVER** (0800 743 383) if consent gained.
Conclusions: Action Needed

• Old, cold, damp, mouldy, crowded homes are making people sick
• It is not okay to send people back to environments that make them sick
• Effects are far wider than ARF
• Prioritise healthy housing action!
Summary

• Deprived groups have high reliance on rental housing
• ⇒ Need to Improve private rental and social housing
• Govt sector can deliver effective interventions (eg HHP, Warm Up NZ)
• Minimum enforceable standards (WoF)
• Explore interventions more widely in NZ
• Potential for widespread benefits

Improved health, well-being, equity, social justice
Acknowledgements

Funders – HRC Research Partnerships:
- Heart Foundation
- Cure Kids
- Te Puni Kōkiri
- Ministry of Health

Supporters
- Paediatricians and other Medical and Nursing staff
- Medical Officers of Health and other Public health service
- Laboratory staff, ESR
- Toi Te Ora - Public Health Service

Participants
- Children and their whānau

Tēnā koutou katoa