housing & health

Housing, Heating and Health Study: results

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Collaboration between

Researchers at universities of Otago, Massey Maori Studies & Building Science, Victoria, Auckland School of Population Health,BRANZ Ltd

Recent funders:HRC, Contact, MfE, DHBs (Hutt and Capital & Coast)…

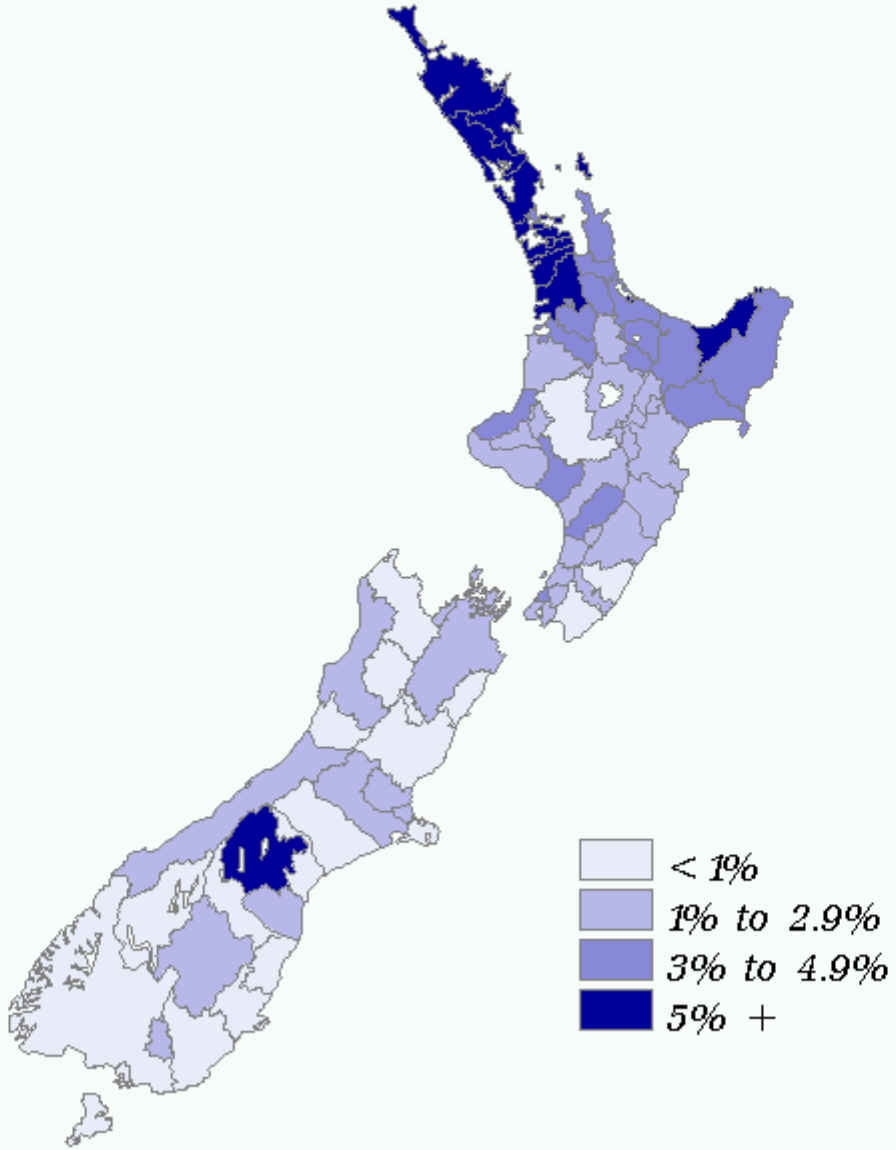
Community groups, PHOs, Schools…

Housing

- NZ houses are cold and damp, with inadequate heating
- Average winter temperature is 16^{o}C (WHO recommends 18^{o}C – 21^{o}C)
- 1600 excess winter deaths from respiratory and circulatory problems compared to 900 deaths attributable annusal to traffic pollution
- 1,000x rule

Use of No heating

Single parent with dependant children, 2001



Problem of asthma

- Asthma and allergies are the most prevalent childhood chronic diseases
- In NZ, a quarter of the population have asthma ~ 200,000 children
- Asthma rates are higher in Maori children (31.7%) than in European (25.9%) or Pacific children (21.25%)

LPG heaters

- Third of NZ households have UFGHs
- Exposure to NO_2 can reduce immunity to lung infections and increase the severity and duration of a flu episode
- NO_2 inflames the lining of the lungs, which can cause problems such as wheezing, coughing, colds, flu and bronchitis.
- NO_2 also increases the health risks from particulates
- As well as gases released during combustion, water vapour is produced at a rate of 1.6 kg per LPG kg consumed, dependent on the proportion of butane and propane in the bottle.

Housing & Heating Study

- Community-based, random control trial
- 2005, 409 households enrolled
  - Child, 6-12, with doctor-diagnosed asthma
  - Inefficient heaters
- 2005, houses insulated and baseline measures taken
- Intervention, household's choice of more effective heating installed
- 2006, follow-up measures taken
- 2007, control group heaters installed

Study Aim

- This study aimed to see whether non-polluting, more effective, home heating reduced children's asthma symptoms over winter.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Intervention

Previous:

X electric heaters (2kW)

X unflued gas heaters (4kW)

Replaced with:

√ 320 heat pumps (4-7kW)

√ 55 wood pellet burners (10kW

√ 11 flued gas heaters

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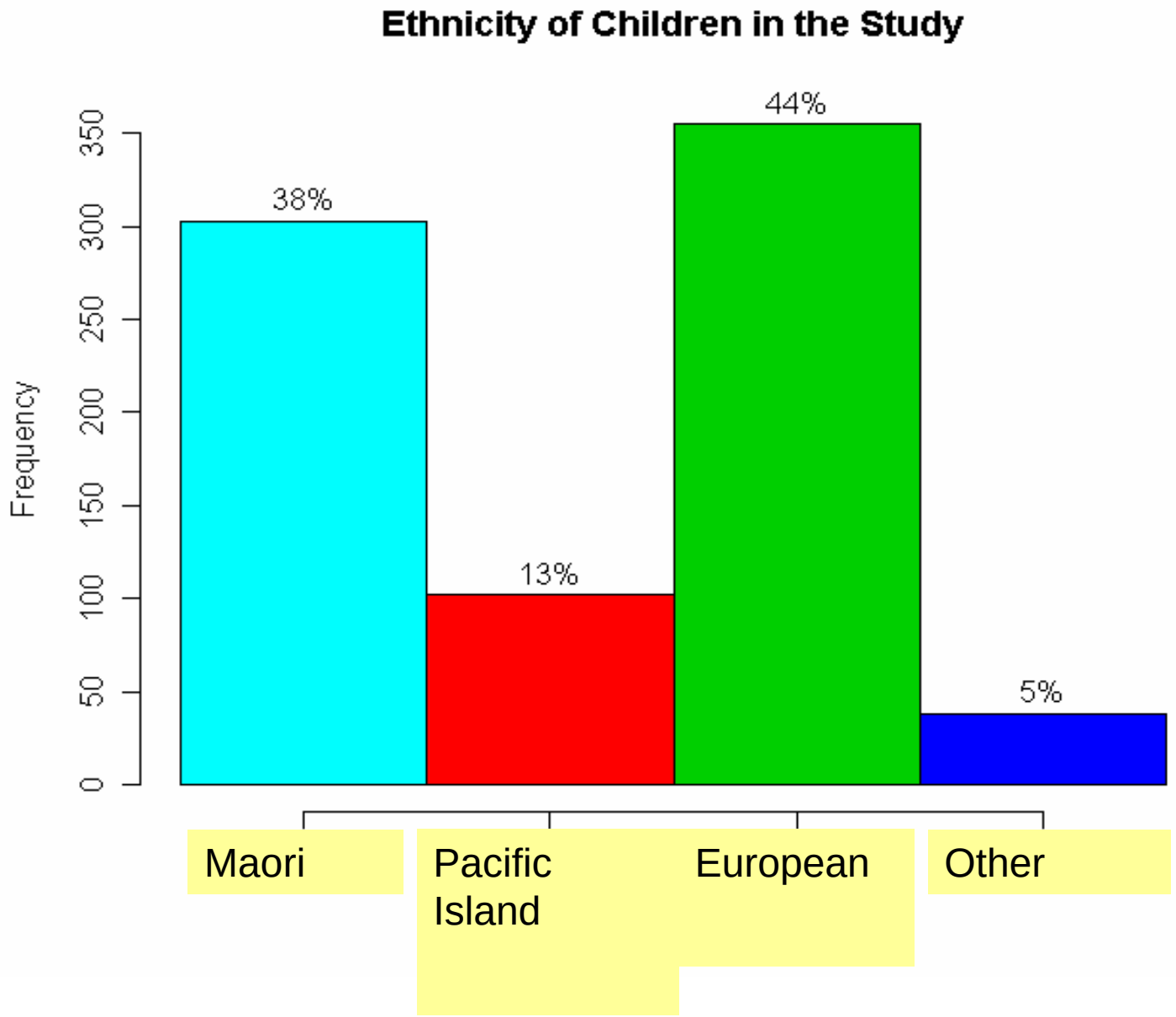
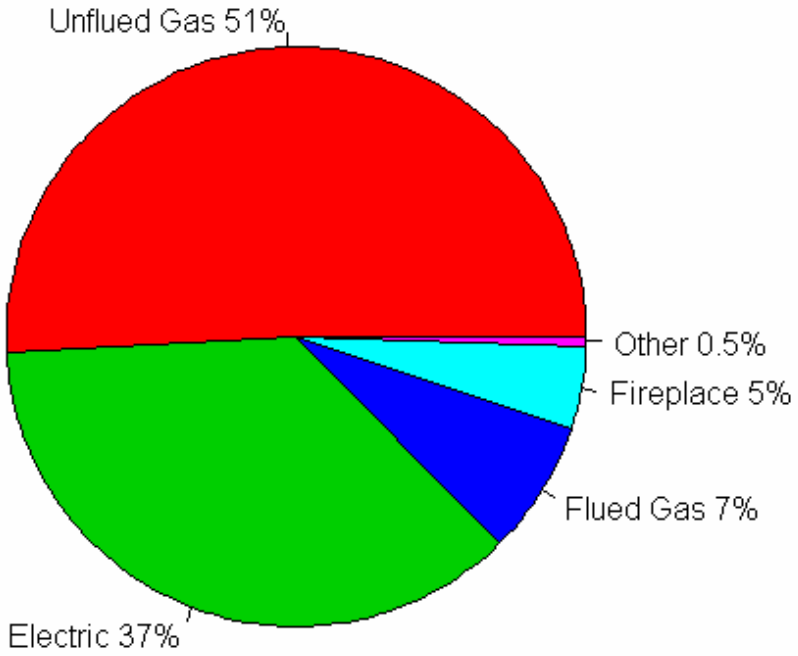
Outcome measures

- Peak Flow Diaries – for the child with asthma (PEV and FEV)
- Symptom diaries for whole family
- Indoor environment measured (temperature, relative humidity,$N0_{2,}$)
- Intensive monitoring in 69 homes (temperature, RH, HCHO, CO, CO_2, NO_2, fungi (air and dust) heater use)
- School + GP + fuel/energy records
- Hospital records

Baseline

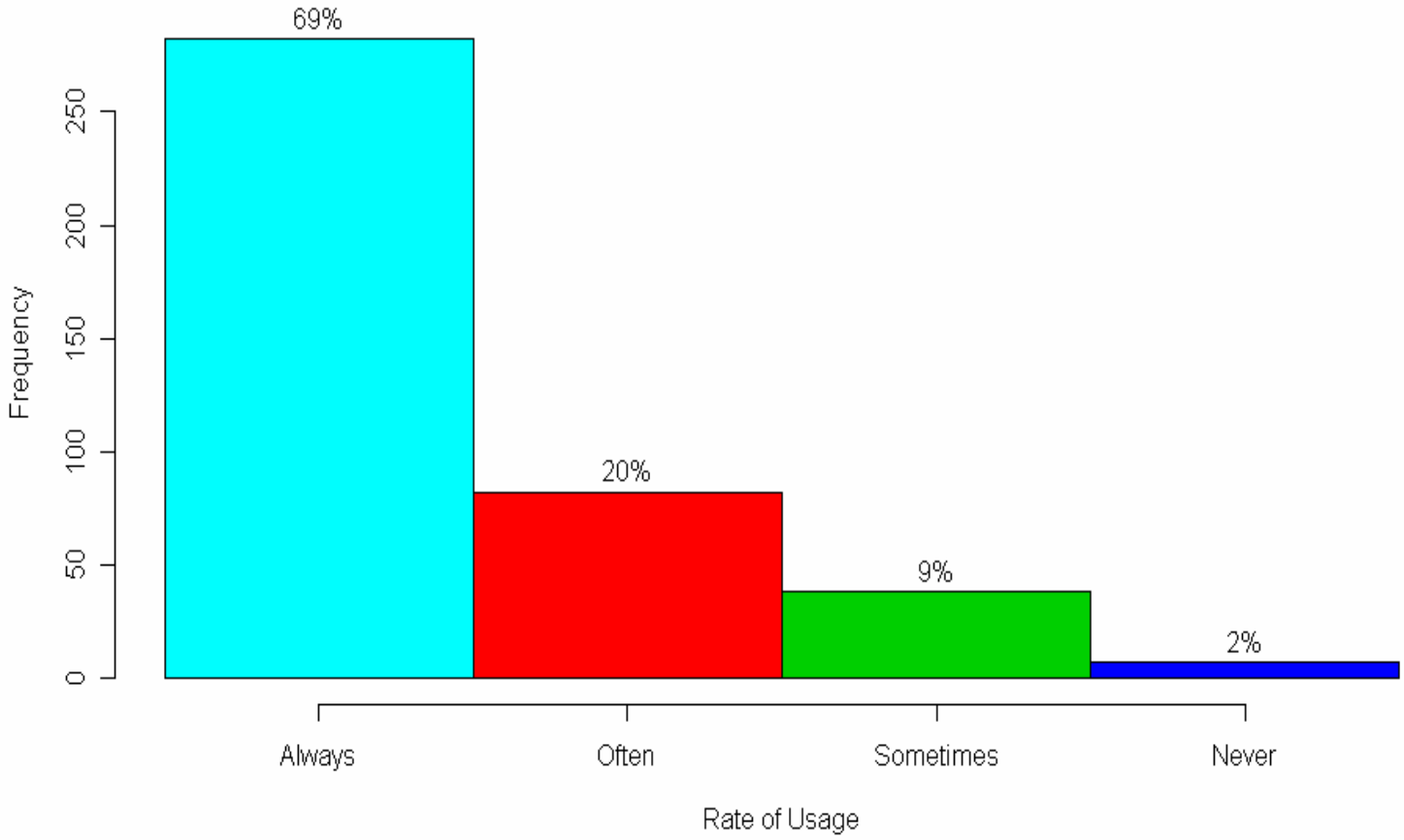

Ethnicity of Children in the Study
Frequency
0
50
100
150
200
250
300
350
38%
13%
44%
5%
Maori
Pacific Island
European
Other

Baseline form of heating



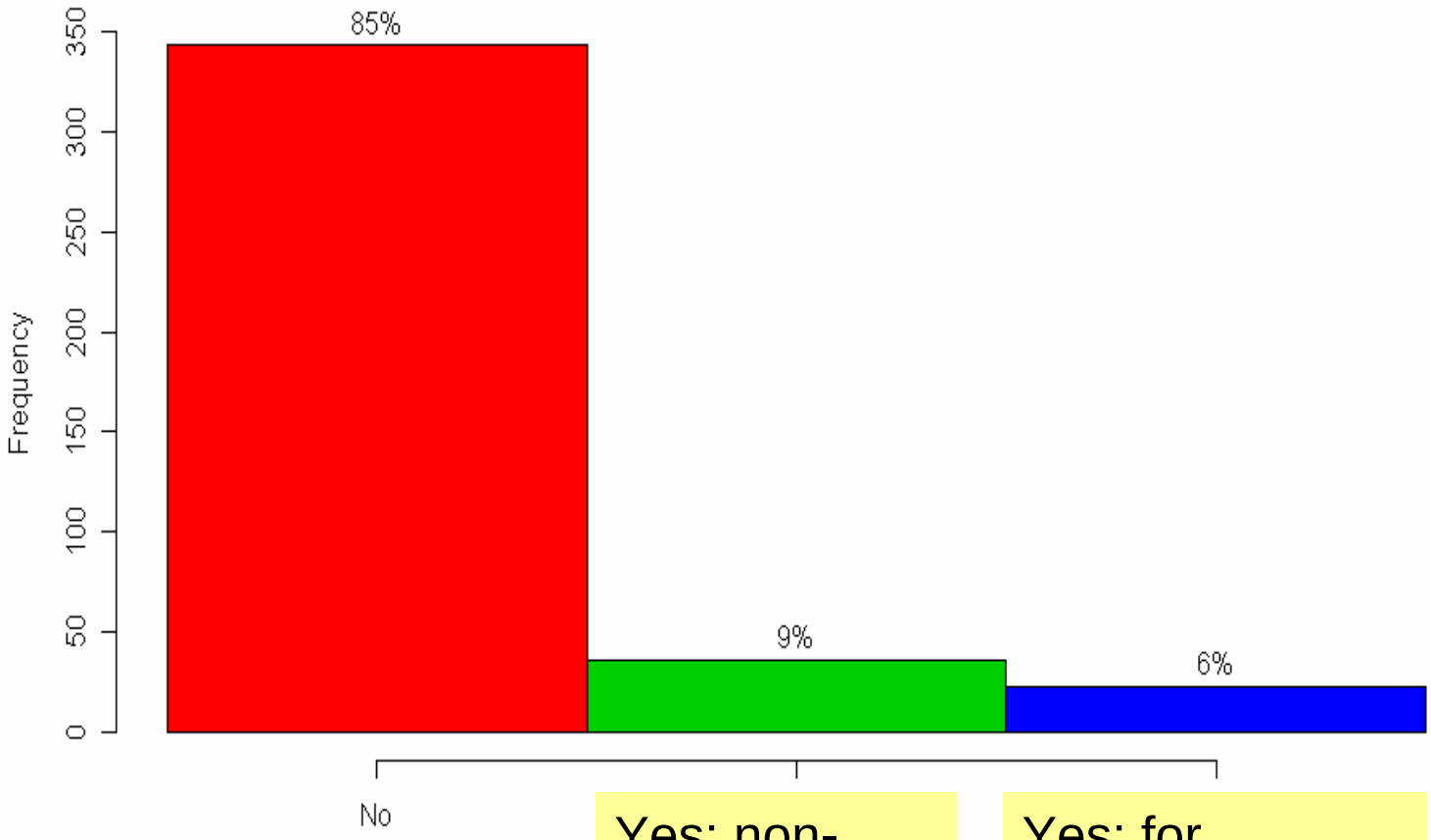
Baseline

How often was heating used?



Baseline

Has your power been cut off in the last year?

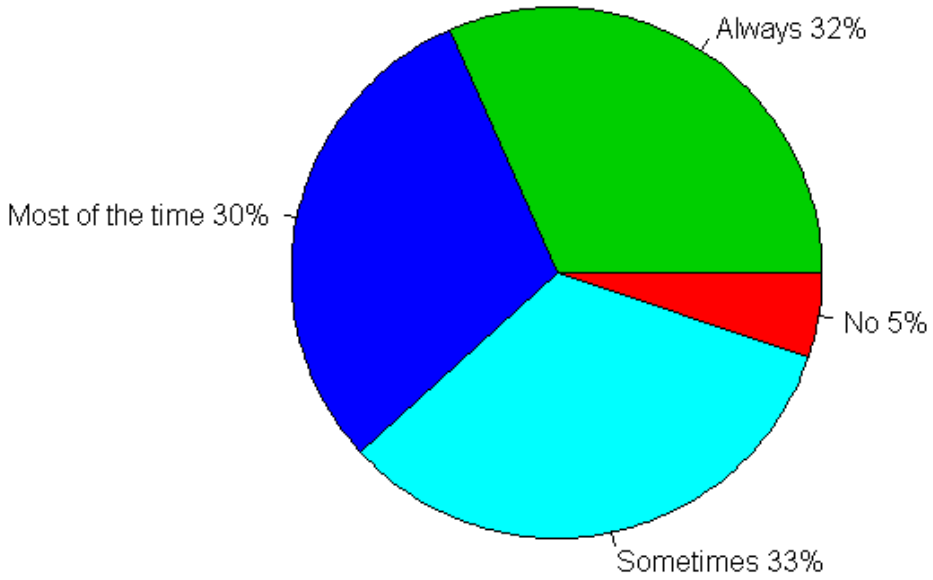


Yes: non-financial reasons

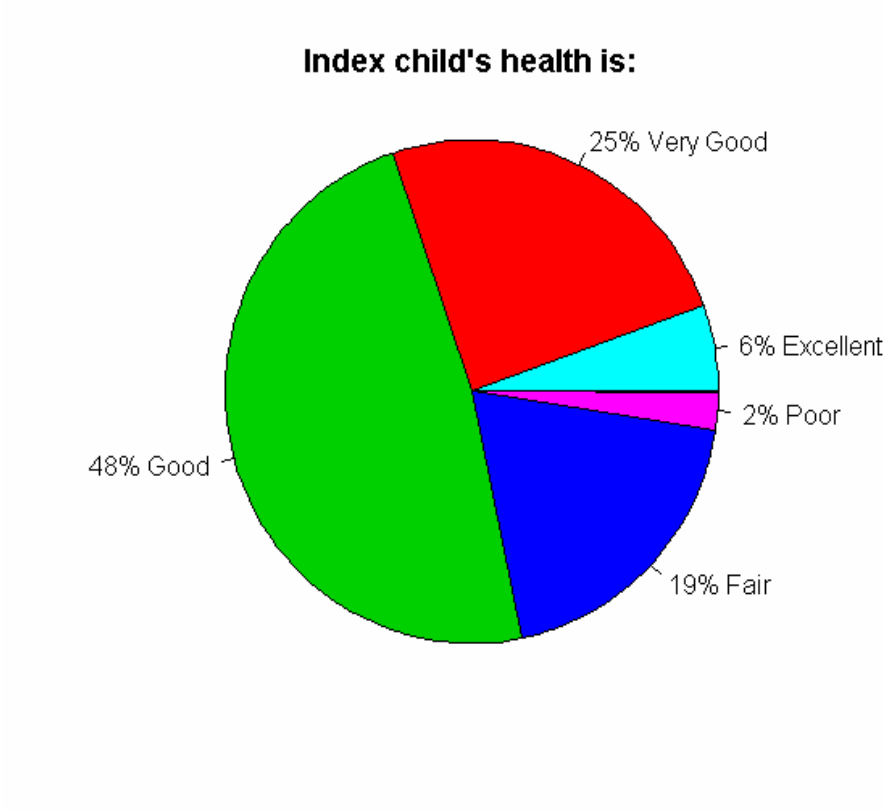
Yes: for financial reasons

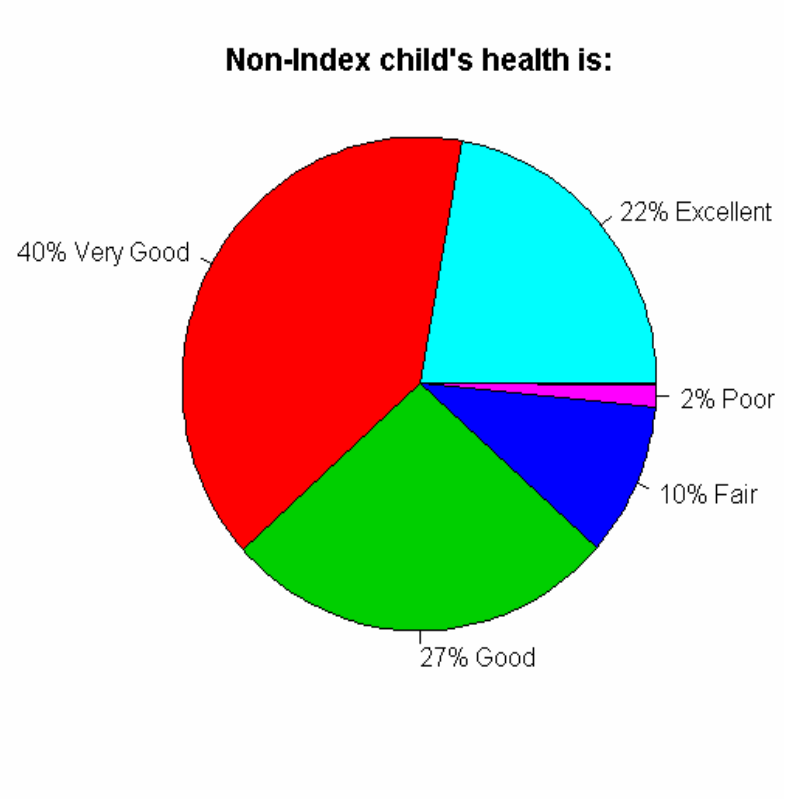
Baseline

Do you feel your house has been cold this winter?



Baseline


Index child's health is:
25% Very Good
6% Excellent
2% Poor
48% Good
19% Fair


Non-Index child's health is:
22% Excellent
40% Very Good
2% Poor
10% Fair
27% Good

Results (1)

Household retention rate was 85% (349/409).

In **intervention** compared to the control group

- Average living room temperatures were 1.1°C warmer than the control houses* (t=5.63;CI:16.82-17.32, p=0.000)
- Mean difference of 0. 53°C in the index's child's bedroom temperature* (t=2.87;CI: 14.60-15.08, p=0.002).
- Exposure to hours per day weighted for degrees less than 10°C, 50% less in both the living room (t=2.75;CI:0.88-1.37, p=0.000) and the child's bedroom* (t=4.94;CI:1.65-2.40, p=0.000).

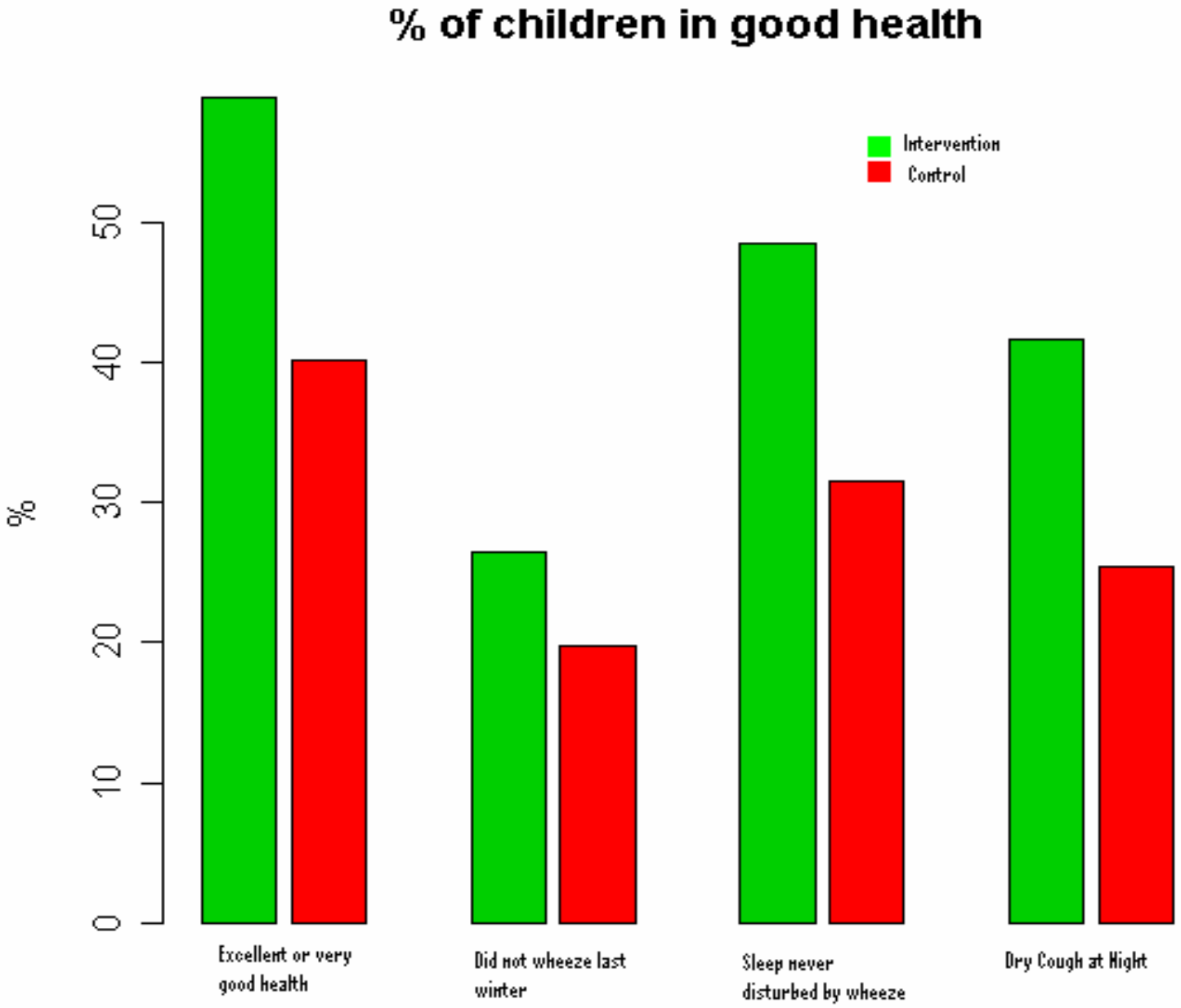
* statistically significant

Results (2)

In **intervention** compared to the control group

- People felt warmer*
- Condensation reduced*
- Less mould and mouldy smells reported*
- Levels of nitrogen dioxide halved in the children's bedrooms 4.2* (1.18-17.41) µg/m^3 vs 9.08 (0.87-64.27) µg/m^3.

* statistically significant


% of children in good health
Intervention
Control
%
0
10
20
30
40
50
Excellent or very good health
Did not wheeze last winter
Sleep never disturbed by wheeze
Dry Cough at Night

Results (3)

In **intervention** group

Less poor health (aO.R. 0.45; CI 0.27-0.73, p=0.00) *

Children with asthma had less coughing during the night and on waking (aO.R. 0.51; CI 0.31-0.84, p=0.01)*

Less wheezing (aO.R. O.51; CI 0.32-0.81, p=0.00) *

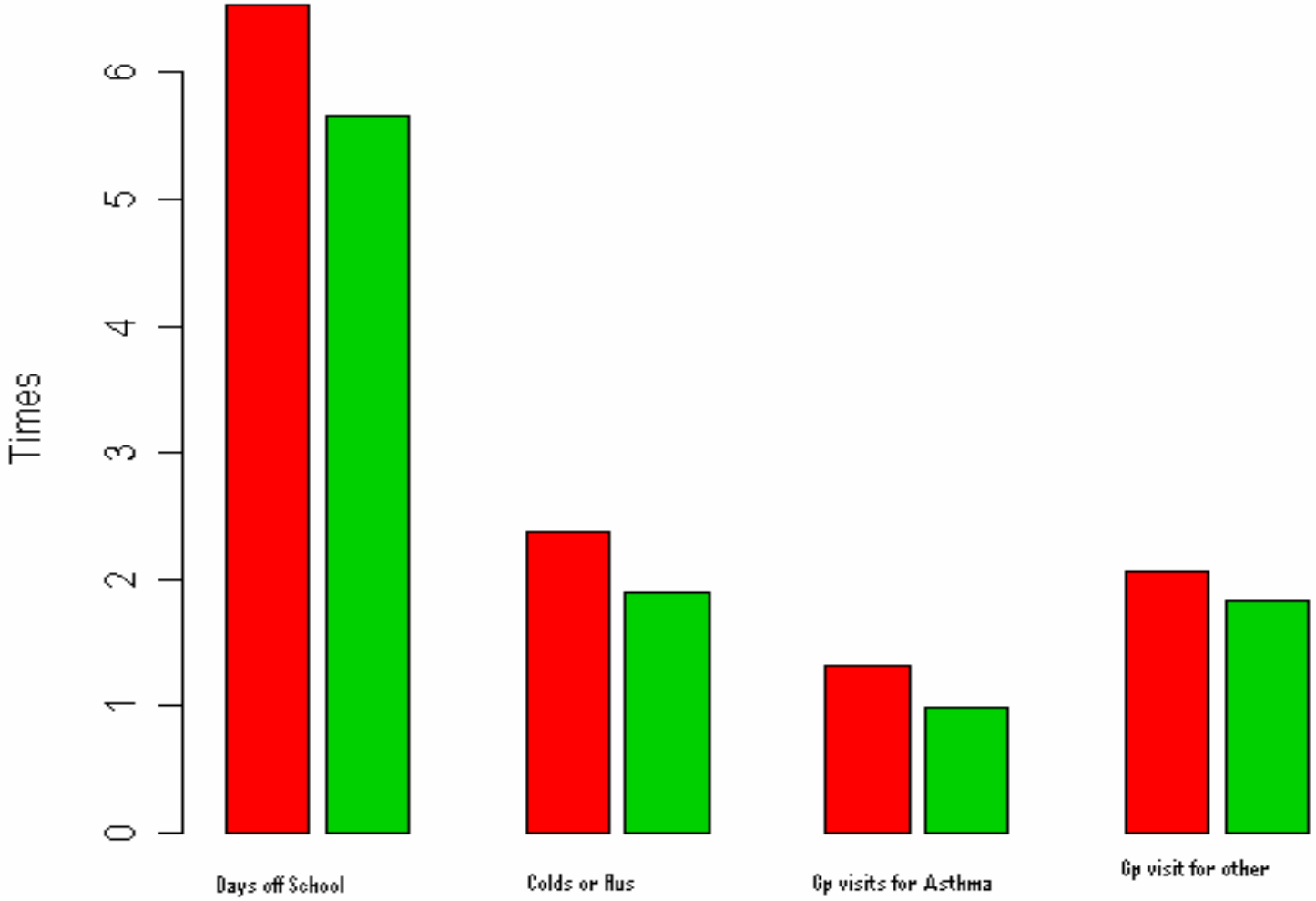
Children had fewer episodes of cold and flu.*

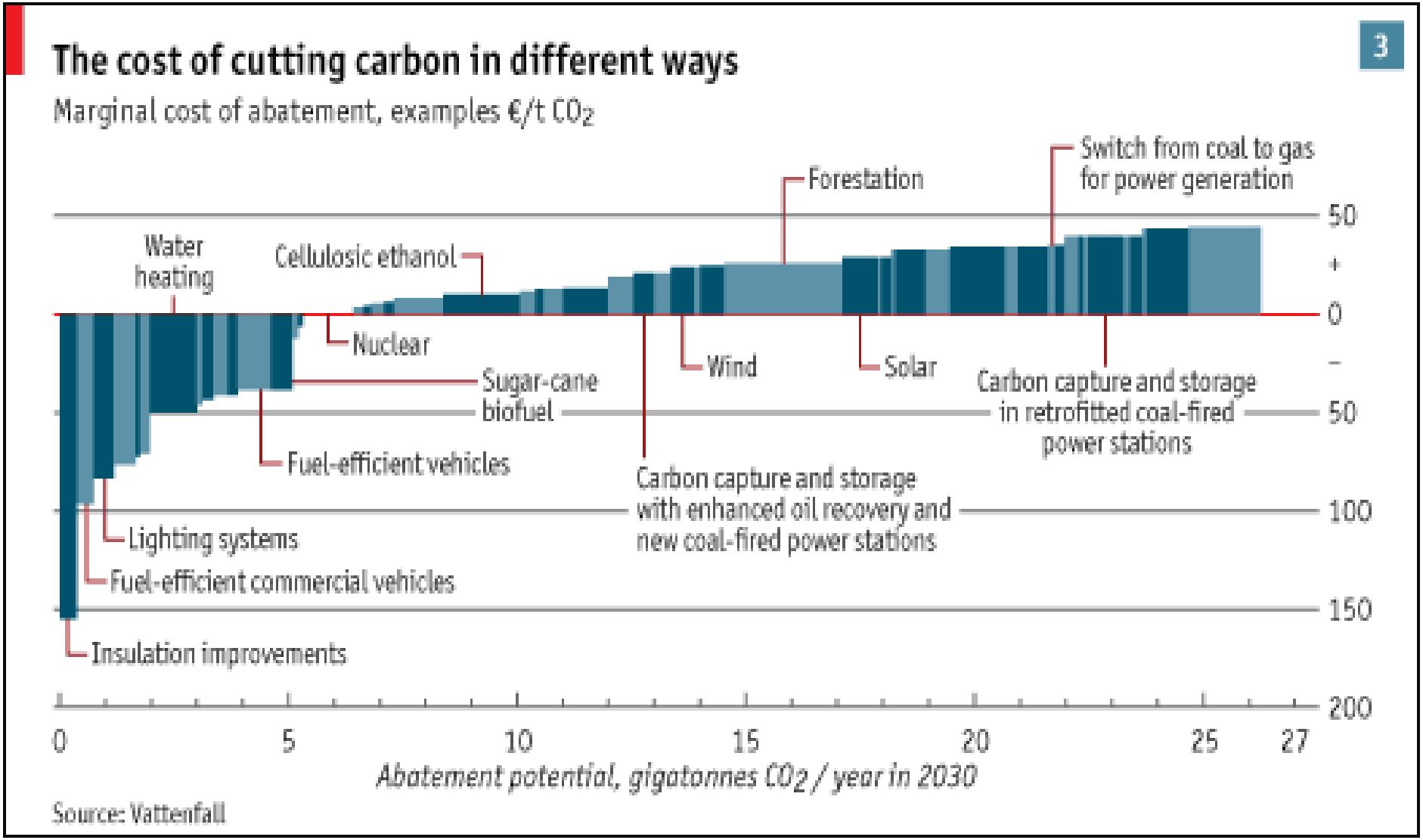
Children had 2.3 days less off school (aR.R.0.88; CI 0.8-0.98; p=0.02) *

Children had fewer visits to the GP (aR.R.0.66, CI 0.52-0.83, p=0.00) *

* statistically significant

Effect of intervention on children with asthma





http://www.economist.com/surveys/displaystory.cfm?story_id=9217972

Summary of results

- More effective heaters increased the indoor temperature
- Improved the symptoms of children with asthma
- Led to fewer days off school and fewer visits to GPs.

Conclusions

- Reframe health problems to focus on solutions
- Learn from policy changes
- Reduce inequalities in causes of ill-health
- Inter-sectoral approaches are very time consuming, but potentially great benefits
- Process is as important as outcome
- More effective to prevent people getting ill
- Academics can be catalysts for public health action

See www:wnmeds.ac.nz/healthyhousing.html