

Media Release

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Children “scientists” in world-first study looking at health and indoor climate

Pioneering new research with more than 2,000 children acting as “young scientists” has identified the ideal indoor temperature and humidity range for good child health and recommends changes to the Building Code.

The research is a joint project, between BRANZ and the University of Auckland longitudinal study *Growing Up in New Zealand*.

It involved children in the *Growing Up in New Zealand* study collecting temperature and humidity data at home and school over two days.

This new detailed indoor environment information was linked to the multiple pieces of health information collected from the children directly when they were eight years old.

The linked information showed that an indoor temperature of between 19-25°C, with a relative humidity of 50%, measured at the children’s bedtime, was associated with the best health and wellbeing outcomes.

It adds robust, child-specific data to the evidence supporting World Health Organisation guidance on safe indoor temperatures (18-24°C).

However, the study also found that around 60% of children lived in homes where they recorded temperatures and humidity outside of this optimal range.

Nearly half slept in a bedroom that was too cold (19°C or less) and children sleeping in these environments had a greater likelihood of reported poorer overall health, regardless of the humidity level.

A further 13% slept in a bedroom that was both too warm and too humid (greater than 25°C with higher relative humidity) and they also had greater likelihood of reported poorer overall health.

Growing Up in New Zealand spokesperson Professor Susan Morton says the research is ground-breaking.

“This study is the first in the world to gather actual temperature and humidity readings from the homes of thousands of children and then link the data to reported measures of child health and wellbeing.

“Most New Zealand children spend nearly three quarters of their time indoors and this study gives us a deep insight into the quality of their indoor environments across the day and night.

“Unfortunately, this research confirms that many children who live in poor quality indoor environments, where it’s too cold or too humid, do experience poorer overall health as a result,” Professor Morton says.

BRANZ General Manager of Research, Dr Chris Litten, says the link between cold and damp indoor temperatures and poorer health is clear.

Dr Litten says that the study reflects previous research which shows that children experiencing the greatest disadvantage are more likely to experience poor quality indoor environments and subsequently poorer overall general health.

“It provides important evidence to support legislation changes designed to improve the indoor environment of New Zealand buildings, such as the current energy efficiency revisions to the Building Code.

“Keeping buildings warm is complicated but changes to insulation and glazing requirements, and reducing energy consumption, all contribute to the health and wellbeing of New Zealanders” he says.

BRANZ is looking forward to continuing its work with *Growing Up in New Zealand* and is keen to gather more data to learn more about the impact of climate change on New Zealand’s indoor environments.

The study

The research project involved children in the *Growing Up in New Zealand* study collecting temperature and humidity data at several timepoints over two days.

The children were provided with a small digital temperature and humidity gauge so they could record the indoor measurements in 2016 and 2017.

This data was then cross-referenced with National Institute of Water and Atmospheric Research (NIWA) outdoor temperature records for the same period and mother-reported data on the children’s health so that researchers could identify associations between the indoor climate and child health.

This information revealed:

- The optimal bedtime temperature under an ideal relative humidity level of 50% was determined to be between 19-25°C for good child health and wellbeing.
- Children who experienced bedtime temperatures outside this optimal temperature and humidity ranges were more likely to experience poorer general health.
- Nearly one in seven children, who experienced an indoor bedtime temperature outside of the optimal temperature and relative humidity range, had poorer overall health.
- Lower indoor temperatures tended to be associated with increased anxiety and depression symptoms in children.

ENDS

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About *Growing Up in New Zealand*

- *Growing Up in New Zealand* is a University of Auckland study, managed by UniServices Limited.
- The study is funded by the New Zealand Government, through a contract with the Ministry for Social Development.
- It is the country's largest contemporary longitudinal study of child development.
- It follows more than 6,000 children born in the Auckland, Counties Manukau, and Waikato District Health Board areas.
- The study has followed these children from before birth and intends to continue until the children are at least 21 years old.
- The study has been specifically designed to reflect the diverse lives of children growing up in the complex world of 21st century New Zealand.
- It is especially focused on what works to optimise child development and wellbeing.
- Children and families generously give their time to the study for free, with face-to-face data collection waves taking place every two to three years.
- Find out more about *Growing Up in New Zealand's* research at www.growingup.co.nz

About BRANZ

BRANZ is an independent research organisation providing impartial, evidence-based advice to industry and government on critical issues in building and construction in New Zealand.

Supplementary information sheet

Key findings about the optimal indoor temperature and humidity:

- The optimal bedtime temperature in homes was found to be 19–25°C with a relative humidity of 50%. At other relative humidity levels, the optimal temperature ranged from 19°C to 28 in Humidex (a measure involving temperature and humidity). Children experiencing temperatures or humidity outside these ranges had increased odds of experiencing poorer general health.
- An indoor bedtime temperature of 19°C or less was associated with a 75% [95% CI: 32% - 133%] increased risk of poorer child health regardless of the humidity level.
- Children who experienced an indoor Humidex level of 28, generally refers to higher temperature and higher relative humidity (see green area on the right in the figure below), had 112% [95%CI: 38% - 226%] increased risk of poorer health.

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|-------|-----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|
| RH(%) | 100 | 22 | 24 | 25 | 27 | 29 | 31 | 33 | 35 | 37 | 39 | 41 | 43 | 45 | 47 | 50 | 52 | 54 | 57 |
| 95 | 22 | 23 | 25 | 27 | 28 | 30 | 32 | 34 | 36 | 38 | 40 | 42 | 44 | 46 | 48 | 51 | 53 | 55 | |
| 90 | 21 | 23 | 24 | 26 | 28 | 29 | 31 | 33 | 35 | 37 | 39 | 41 | 43 | 45 | 47 | 49 | 52 | 54 | |
| 85 | 20 | 22 | 24 | 25 | 27 | 29 | 30 | 32 | 34 | 36 | 38 | 40 | 42 | 44 | 46 | 48 | 50 | 53 | |
| 80 | 20 | 22 | 23 | 25 | 26 | 28 | 30 | 31 | 33 | 35 | 37 | 39 | 41 | 43 | 45 | 47 | 49 | 51 | |
| 75 | 19 | 21 | 22 | 24 | 26 | 27 | 29 | 31 | 32 | 34 | 36 | 38 | 40 | 42 | 44 | 46 | 48 | 50 | |
| 70 | 19 | 20 | 22 | 23 | 25 | 27 | 28 | 30 | 31 | 33 | 35 | 37 | 39 | 40 | 42 | 44 | 46 | 48 | |
| 65 | 18 | 20 | 21 | 23 | 24 | 26 | 27 | 29 | 31 | 32 | 34 | 36 | 37 | 39 | 41 | 43 | 45 | 47 | |
| 60 | 18 | 19 | 21 | 22 | 24 | 25 | 27 | 28 | 30 | 31 | 33 | 35 | 36 | 38 | 40 | 42 | 44 | 45 | |
| 55 | 17 | 19 | 20 | 21 | 23 | 24 | 26 | 27 | 29 | 30 | 32 | 34 | 35 | 37 | 39 | 40 | 42 | 44 | |
| 50 | 17 | 18 | 19 | 21 | 22 | 24 | 25 | 27 | 28 | 30 | 31 | 33 | 34 | 36 | 38 | 39 | 41 | 43 | |
| 45 | 16 | 18 | 19 | 20 | 22 | 23 | 24 | 26 | 27 | 29 | 30 | 32 | 33 | 35 | 36 | 38 | 40 | 41 | |
| 40 | 16 | 17 | 18 | 20 | 21 | 22 | 24 | 25 | 26 | 28 | 29 | 31 | 32 | 34 | 35 | 37 | 38 | 40 | |
| 35 | 15 | 16 | 18 | 19 | 20 | 21 | 23 | 24 | 25 | 27 | 28 | 30 | 31 | 32 | 34 | 35 | 37 | 38 | |
| 30 | 15 | 16 | 17 | 18 | 20 | 21 | 22 | 23 | 25 | 26 | 27 | 29 | 30 | 31 | 33 | 34 | 36 | 37 | |
| 25 | 14 | 15 | 16 | 18 | 19 | 20 | 21 | 23 | 24 | 25 | 26 | 28 | 29 | 30 | 31 | 33 | 34 | 36 | |
| 20 | 14 | 15 | 16 | 17 | 18 | 19 | 21 | 22 | 23 | 24 | 25 | 27 | 28 | 29 | 30 | 32 | 33 | 34 | |
| 15 | 13 | 14 | 15 | 16 | 17 | 19 | 20 | 21 | 22 | 23 | 24 | 26 | 27 | 28 | 29 | 30 | 31 | 33 | |
| 10 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 26 | 27 | 28 | 29 | 30 | 31 | |
| 5 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 25 | 26 | 27 | 28 | 29 | 30 | |
| | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | T(°C) |

Key findings around indoor temperature at home and school:

- The mean of the average indoor temperature of the six measurements at home was 20.2°C (range of the averages of the six measurements: 10.3– 29.5°C).
- The mean of the average indoor temperature of the two measurements at school was 20.2°C (range of the averages of the two measurements: 4.0– 34.6°C).
- The corresponding means of the average values of NIWA outdoor temperatures were 13.4°C for home (-1.7–24.5°C) and 14.9°C for school (-0.8–30.9°C).
- The wake-up (mean 18.5°C) and bedtime (mean 21.1°C) temperatures were similar for weekday and weekend measurements.
- The mean school indoor temperature in the morning and at lunch were 18.9°C and 21.4°C.