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Housing condition and occupant wellbeing: Findings from the Pilot Housing Survey and General Social Survey 2018/19

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Stats NZ disclaimer

Access to the data used in this study was provided by Stats NZ under conditions designed to give effect to the security and confidentiality provisions of the Statistics Act 1975. The results presented in this study are the work of the author, not Stats NZ or individual data suppliers.

Survey timing

The surveys used in this analysis were undertaken in 2018 and 2019 before the coronavirus pandemic arrived in New Zealand. We recognise that circumstances may have changed for many New Zealand households over this period. However, key results presented here relating to housing condition, as assessed by BRANZ-trained surveyors, are unlikely to have changed significantly over that period.

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Authors

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Reference

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Abstract

This report presents findings from a national dataset that combines information collected by BRANZ in the 2018/19 Pilot Housing Survey (PHS) and Stats NZ 2018 General Social Survey (GSS). The combined PHS-GSS dataset contains objective, independent assessments of housing condition alongside information collected from the occupants, about their households, health and wellbeing. The PHS and GSS datasets are available to researchers through Stats NZ's Integrated Data Infrastructure (IDI). This study report is the first time this information has been analysed together and reported publicly.

The aim of the analysis was to determine any links between independently rated housing conditions from the PHS and the occupants' self-reported levels of health and wellbeing from the GSS. It also looks at housing conditions across different population subgroups.

The PHS collects data on a range of housing features and their condition. Key indicators analysed here include the overall state of repair of the dwelling, the average condition of the interior and exterior, presence of visible mould in the house and presence of heating appliances and insulation. All of these elements contribute to an objective view of housing quality. A selection of sociodemographic and health and wellbeing variables from the GSS are explored alongside these housing indicators. The wellbeing measures are the same as those reported by Stats NZ. They include the home feeling colder than the occupant would like in winter, the occupant's rating of their overall health, a derived mental wellbeing score, overall levels of life satisfaction and feeling that life is worthwhile.

The bivariate analysis of sociodemographic and housing condition variables suggested some groups were more likely to live in a dwelling in poorer condition and/or with

higher prevalence of visible mould. These included single-parent households, households on a lower income and households where the respondent identified as Māori and/or Pacific peoples.

Bivariate analysis of housing condition parameters and self-reported measures of occupant wellbeing showed that occupants living in houses in poorer condition and/or with worse levels of mould were more likely to report feeling cold in their home in winter, have lower levels of life satisfaction and score lower on the mental wellbeing index. Feeling cold in the home was more common amongst households without a fixed heating source in the home.

Housing condition, sociodemographics and wellbeing are complex and multifaceted. Household income, tenure (rented versus owner-occupied) and housing condition, for example, are known to be interrelated, with lower-income households more likely to be renting and rental dwellings more likely to be in poorer condition. Multivariate analysis was undertaken to explore some of these more complex relationships. ANOVA and linear regression were used to look at which, if any, housing condition variables were related to the occupants' overall sense of emotional wellbeing. The results showed that interior housing condition had the strongest relationship with the mental wellbeing measure of three housing condition measures analysed. However, when other factors relating to occupant characteristics were considered, house condition became less prominent. Household income, living in a single-parent household and feeling cold in the house in winter proved to be more significant factors in relation to the mental wellbeing index.

Overall, the results support and align with previous research, which has shown a relationship between poorer housing condition and occupant health and wellbeing. Further analysis could be undertaken using this PHS-GSS linked dataset to build on this research and explore housing parameters, occupancy and wellbeing in more detail.

Keywords

Housing condition, wellbeing, Pilot Housing Survey, General Social Survey.

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1. About this report

This report presents findings from a national survey dataset that combines information collected by BRANZ and Stats NZ. The dataset, held securely in Stats NZ's IDI,[1] contains information about the state of housing and the amenities available linked with data collected from the occupants about their health and wellbeing. The availability of this unique dataset provides opportunities for researchers to further explore and understand the relationship between housing quality, occupancy and occupant wellbeing in New Zealand households.

This is the first time this information has been analysed and reported together publicly. Stats NZ has previously reported on the links between physical and mental wellbeing and housing problems based on the self-reported information from the 2018 General Social Survey (GSS) (Stats NZ, 2021, pp. 68–69). This report analyses data from a subset of the GSS population that took part in the 2018 Pilot Housing Survey (PHS) (832 households). It uses the physical housing assessment data collected by BRANZ-trained building surveyors in the PHS alongside the findings from the participants in the GSS.[2]

This analysis has three broad sections. It analyses:

- the housing conditions observed for different sociodemographic groups
- whether there are any links between house condition and the occupants' self-reported levels of health and wellbeing
- whether those links are significant – that is, the extent to which housing measures contribute to occupant health and wellbeing.

1.1 About the surveys analysed here

In 2018/19, BRANZ partnered with Stats NZ and the Ministry of Business, Innovation and Employment to trial a new approach to collecting information on the condition of our housing stock. The PHS was a nationwide housing assessment survey that ran from August 2018 to June 2019. The PHS involved a physical assessment of the house undertaken by an independent, BRANZ-trained building surveyor. Overall, 832 surveys were completed throughout all regions of New Zealand, with 505 owner-occupied and 327 non-owner-occupied houses assessed.

Households were recruited to take part in the PHS through the 2018 GSS. The GSS is a national survey conducted every 2 years by Stats NZ. Interviewing around 8,500 people nationwide, the GSS provides key information on the wellbeing of New Zealanders on a range of social and economic outcomes. The 2018 GSS included a supplement on housing and the physical environment. This supplement contained new questions on housing such as suitability, healthy housing behaviours and home maintenance. Healthy housing behaviours include things like using mechanical ventilation and opening windows in the bathroom or in the kitchen while cooking and use of heating in living areas and bedrooms during winter.

[1] For more information on accessing and using this data, see the Stats NZ website: https://www.stats.govt.nz/integrated-data/integrated-data-infrastructure/

[2] For further details about the survey method, content and findings, see White (2020) and White, Ferguson, Goodyear and Saville-Smith (2021).

Data from the PHS sample was linked to the GSS by Stats NZ. The result is a rich source of information combining data on housing condition with household demographics, indicators of material hardship and wellbeing, and healthy housing behaviours.

The dataset has been weighted to adjust for sampling bias and to account for the whole population of 1.75 million New Zealand households. Despite the weighting, the PHS is still based on a small sample of houses/households (832). This small sample was intended to cover the breadth of the population and is necessarily diverse. The sample therefore contains a range of household and housing types, some in small numbers. Some results are subject to large margins of error and should be interpreted with appropriate caution. These are presented on graphs throughout this report with 95% confidence intervals.

1.2 Measuring housing condition

The PHS included a visual assessment of the physical characteristics and condition of different features of a house's interior and exterior. Assessment of housing condition used a descriptive scale from serious through to excellent. The assessment was based on the visual appearance, functionality and need for repair or maintenance.

The analysis presented here uses derived measures of average exterior condition and average interior condition of the house. These are quite basic measures. No adjustment has been made for the difference between the condition ratings in the scale (i.e. the difference between excellent and good is assumed to be the same as between poor and serious). That said, the variation in condition of different components within an individual house tends to be relatively minor. For example, if one exterior component was rated good, the other exterior components were likely to be in the same or adjacent level on the scale. Exterior and interior averages are considered separately as there is evidence of variation within houses between these components.

1.3 Measuring mould

BRANZ surveyors looked for visible signs of mould. Levels were assessed based on visual appearance using a scale of extent and severity (none, small, moderate, large, or extensive). Each room was assessed individually, and all surfaces were considered (walls, ceiling, floor, windows, and curtains).

In this analysis, the worst level recorded for the high use areas (living areas and bedrooms) is presented. If a house had a small amount of mould in the living area and two bedrooms but another bedroom had a moderate amount of mould, this house would be classified as having moderate mould in this analysis.

2. Housing condition and sociodemographics analysis

This section presents findings from bivariate analysis of house condition measures by a range of sociodemographic and household factors. It also presents information collected from participants about their healthy housing behaviours in the GSS.

2.1 Housing condition and household composition

By working with Stats NZ to determine the PHS sample, a broadly representative cross-section of households with different family/household structures was achieved.[3] Of particular interest in these results is the contrast between single-parent and two-parent households.

One in five single-parent households were living in houses with an interior and/or exterior in poor or serious condition compared to one in 10 for couples with children (Figure 1).

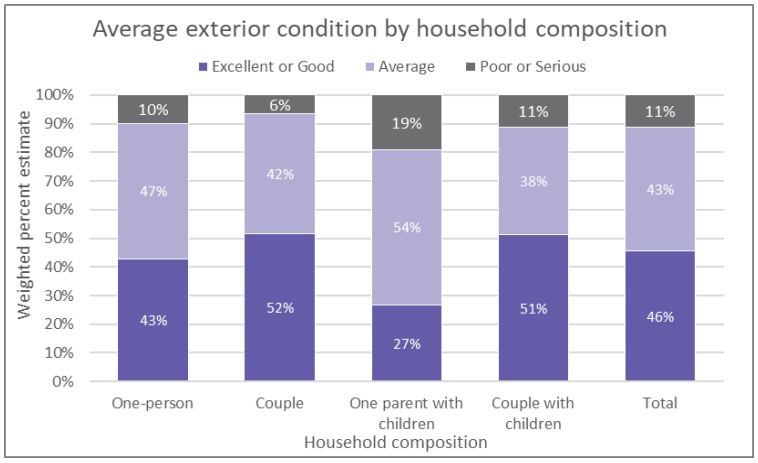

Figure 1. Average exterior condition by household composition.

Single-parent households were more likely to live in houses with a moderate or worse level of visible mould in living areas and/or bedrooms compared to households overall (54% compared to 37%) (Figure 2).[4]

Single-parent households were more likely to live in houses with a moderate or worse level of visible mould compared to households overall.

This aligns with findings from Stats NZ's analysis of the GSS showing that participants from single-parent families were the most likely to report experiencing issues with housing quality and affordability (Stats NZ, 2021, pp. 54–55).

[3] A slightly lower proportion of 'non-family' households were covered by the PHS such as people living alone and groups in a shared flat arrangement than are in the general population.
[4] A small number of multi-family and other households have been excluded from this chart.

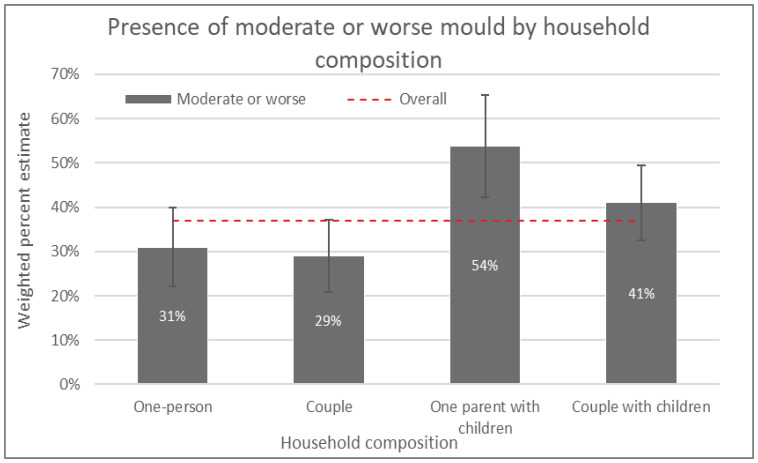

Figure 2. Presence of moderate or worse visible mould in living areas and bedrooms by household composition.

2.2 Housing condition and dependent children

Just over a third of houses surveyed in the PHS had dependent children living in the home (36%), about the same proportion as in the population overall according to the 2018 Census (33%). Mould was more frequently observed inside houses with dependent children (Figure 3), though there was little difference in the average condition of the exterior and interior of houses with and without dependent children. One-third of households without dependent children had moderate or worse mould, 33% compared to 44% of households with dependent children. Further analysis showed a moderate positive correlation between the number of people in the household and the presence of mould.

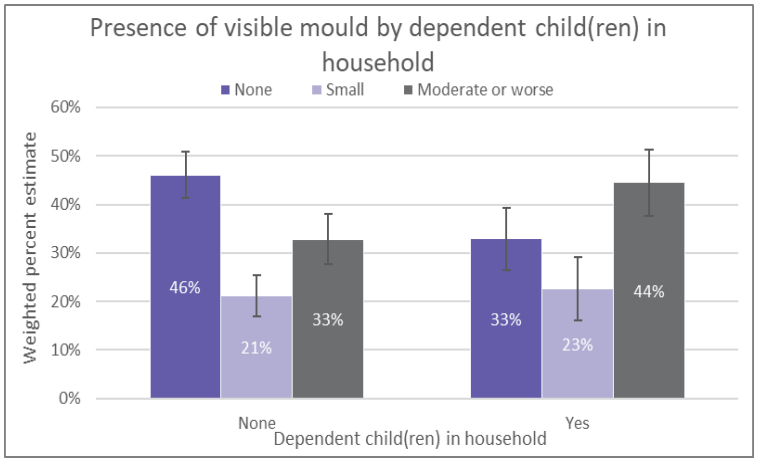

Figure 3. Presence of visible mould by dependent children in household.

For context, in the PHS surveyed households, those with no dependent children were more likely to own their house (71%) than those with dependent children (59%). However, households with dependent children were more likely to be on higher incomes than those with no dependent children, which tended to be people living alone and therefore on a single income.

Most of the self-reported healthy housing behaviours relating to ventilation and airing out rooms showed little difference between households with and without dependent children. Differences were reported when it came to heating behaviours. Households

with dependent children were more likely to heat bedrooms every night in winter (21%) compared to households without dependent children (13%). Amongst households with dependent children, 38% reported heating the bedroom of the youngest child every night throughout winter.

2.3 Housing condition and household income

Stats NZ has reported that those on higher incomes and couples were more likely to own their own home (Stats NZ, 2021, p. 35). The households surveyed in the PHS and GSS mirror these results. Couples and couples with children surveyed were more likely to own their own home and to be in the highest income bracket. As we might expect, these factors are linked with better exterior and interior housing condition. Households in the highest income bracket (more than $100,000 a year) were more likely to live in a house with an exterior and interior condition rated as good or excellent compared to households on lower incomes (Figures 4 and 5). Of those in the $30,001–70,000 annual income bracket, 16% lived in houses rated to be in poor or serious exterior condition (higher than the average of 11% of households).

Households in the highest income bracket were more likely to live in a house in good or excellent condition inside and out compared to households on lower incomes.

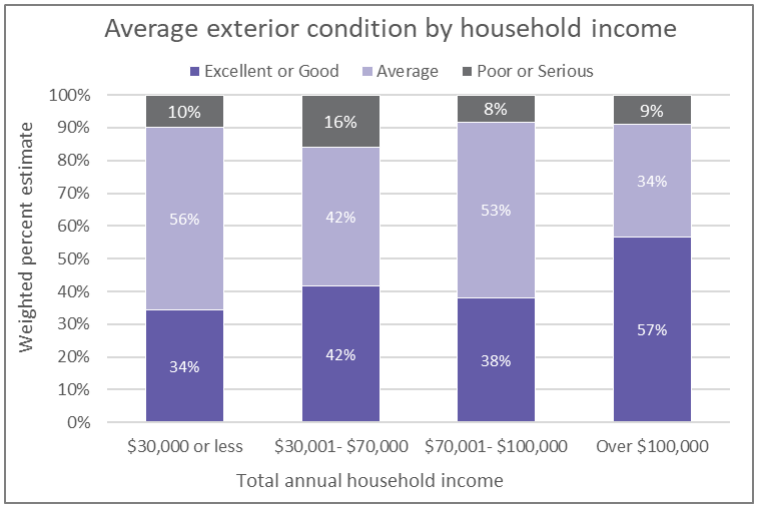

Figure 4. Average exterior condition by household income.

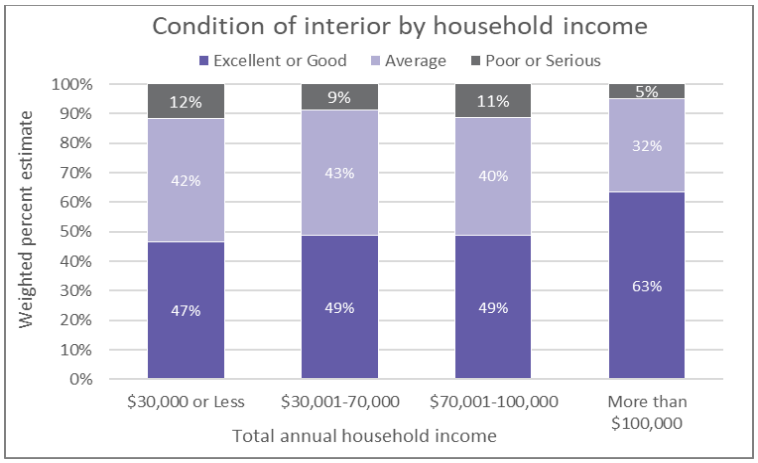

Figure 5. Average interior condition by household income.

Figure 6 shows the proportion of households in each income bracket with moderate or worse levels of visible mould in living rooms and/or bedrooms. Those in the lowest and highest income brackets had lower levels of visible mould in their houses.

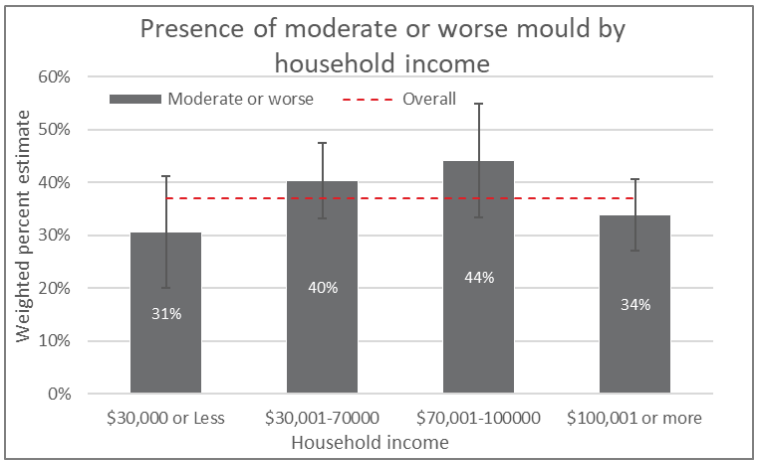

Figure 6. Presence of moderate or worse visible mould in living areas and bedrooms by household income.

This appears to reflect some of their healthy housing behaviours, with those earning $30,000 or less per year being the most likely to report airing out bedrooms, bathrooms, and kitchens every time they were used. This may also relate to the fact that people in the older age groups (55–64 and 65 and over) were the most likely to report airing out these rooms every day/time they were used.

Those on lower incomes tended to rely on portable heating methods more than those in higher-income groups. Although less expensive to purchase upfront, portable heating methods can be less effective, particularly if trying to heat a larger area, and more expensive to run than a fixed heating appliance like a heat pump. Those on lower incomes were the least likely to have a fixed heating appliance in their main living area. The likelihood of having a fixed heater, such as a heat pump, enclosed wood burner or fixed flued gas heater, increased with household income. 68% of those in the lowest income bracket had fixed heating in the main living area compared to 81% of those earning more than $150,000.

Lower-income households tended to rely on portable heating methods more than those in higher-income groups.

The likelihood of heating living rooms and bedrooms during winter also increased with household income. Those in the highest income brackets were most likely to report heating bedrooms every night in winter, though many households in all income groups reported hardly ever or never heating bedrooms in winter. Overall, 46% of households reported hardly ever or never heating their bedroom at night, ranging from 57% for households with an income of $30,000 or less to 40% for households in the highest income bracket (over $150,000). When asked why rooms were not heated, most households considered heating was simply not needed. This was higher amongst higher-income households (59% compared to 42% of households with an income of $30,000 or less). Cost was a reason for not heating bedrooms for 20% of households in the lowest income group compared to 11% in the highest income group.

Higher-income households were more likely to report heating bedrooms in winter.

2.4 Housing condition and ethnicity[5]

In this section, Māori and Pacific peoples households are contrasted with results for the non-Māori/Pacific peoples and the whole survey population since these ethnic groups showed the biggest differences when compared to the general population for some key measures. There are many complex sociodemographic and economic factors contributing to these differences – some are discussed in other sections of this report.

In some parts of the analysis, Māori and Pacific peoples households were combined because only a small number of Pacific peoples households were surveyed. Together they account for about 17% of the surveyed population in the PHS. In total, 108 of the 832 households that took part in the PHS were classified as Māori (13% of the surveyed population, slightly lower than the 17% in the general New Zealand population at that time), and 30 surveyed households were classified as Pacific peoples (making up 4% of the survey population compared to around 8% of the total population in 2018).

Results of this analysis show that households where the respondent identified as Māori were more likely than non-Māori to live in a house with an overall exterior condition rating of poor or serious (18% compared to 11% of households overall) (Figure 7).

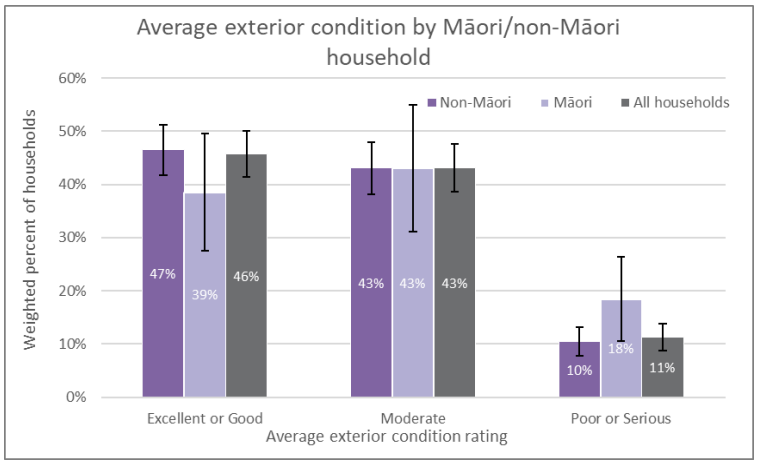

Figure 7. Average condition rating of the exterior of the house for Māori and non-Māori households.

Māori households were more likely to live in a house in poorer condition inside and out compared to the overall survey population.

Māori households were also more likely to live in a house with an average interior condition rating of poor or serious (21% compared to 8% of households overall), and less likely to live in a house with an overall interior condition rating of excellent or good (29% compared to 54%) (Figure 8).

Māori and Pacific peoples households combined were more likely to live in a house with moderate or worse visible mould in living areas and/or bedrooms (Figure 9). This may relate to the fact that Māori and Pacific peoples households surveyed were more likely

[5] This analysis represents the ethnic group(s) of the person who completed the personal questionnaire (PQ) in the GSS on behalf of the household. This means the ethnicity applies to one person, not the whole household. For example, if the person completing the PQ identified as Māori but other people in the household did not, this would be identified as a Māori household in this analysis.

to have dependent children living in the home (54% compared to 36% overall), which, as discussed earlier, had a relationship with the levels of visible mould. When asked about their habits in ventilating and airing out those rooms, there was little difference reported between different ethnicities.

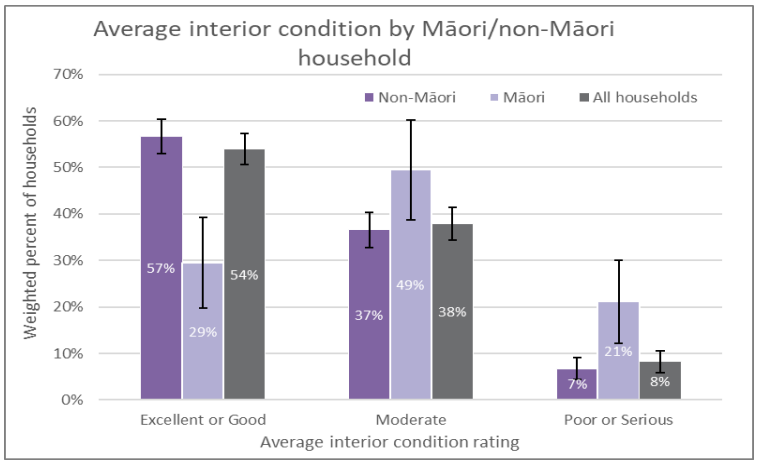

Figure 8. Average condition rating of the interior of the house for Māori and non-Māori households.

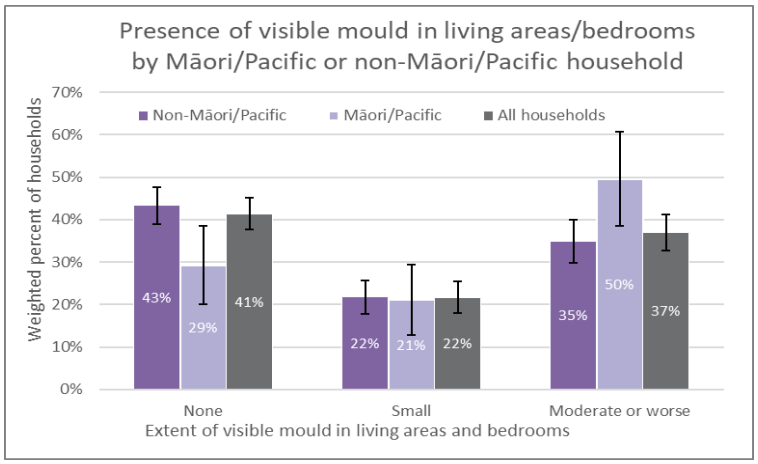

Figure 9. Extent of visible mould in living areas and bedrooms for Māori/Pacific peoples and non-Māori/Pacific peoples households.

Māori/Pacific peoples households were less likely to have working mechanical extract ventilation in the kitchen (43% compared to 57% for non-Māori/Pacific peoples households). Pacific peoples households were the most likely ethnic group to report airing out their kitchen every time they cooked (either with mechanical extraction or by opening a window).

Māori/Pacific peoples households surveyed were much less likely to own their homes (31% owned their home compared to 67% of the overall surveyed population). This aligns with 2018 Census data showing that fewer Māori and/or Pacific peoples households owned or partly owned their home (28%) compared to the total population (52%). We know from previous BRANZ research that rented houses tend to be in poorer condition than owner-occupied houses (White, Jones, Cowan & Chun, 2017).

Māori/Pacific peoples households were less likely to have a fixed heating source in the main living area (64% compared to 80% for non-Māori/Pacific peoples households). Pacific peoples households were more likely than other households to state that they

did not heat these areas regularly during winter due to cost (46% compared to 32% overall). These findings align with those reported by Stats NZ (2023) that Pacific peoples were disproportionately affected by inadequate and unaffordable housing. It was also reported that these housing issues had a negative impact on their health and wellbeing, as stated by the occupants themselves.

In this study, there was no notable difference between Māori/Pacific peoples households and the rest of the population in the presence of roof space insulation, subfloor insulation or mechanical extraction in bathrooms. This is a positive indication that programmes such as Warm Up New Zealand and Warmer Kiwi Homes (which fund insulation in low-income households) and the new requirements for insulation and ventilation in rental properties may be beginning to have an impact.

2.5 Housing condition and NZ Deprivation Index

Through partnering with Stats NZ's GSS, the PHS reached houses across all regions of New Zealand. Sociodemographics vary widely within regions. The NZ Deprivation Index provides a useful means to look at housing variation within a region. It is an area-based measure of socioeconomic deprivation based on a set of census variables, including income, qualifications, home ownership and access to the internet. Reflecting the results by household income, houses in the least-deprived areas were more likely to be in good or excellent condition for both the exterior and interior (Figure 10). There was a less clear relationship between levels of mould and the NZ Deprivation Index, with analysis showing only a weak correlation between the two.

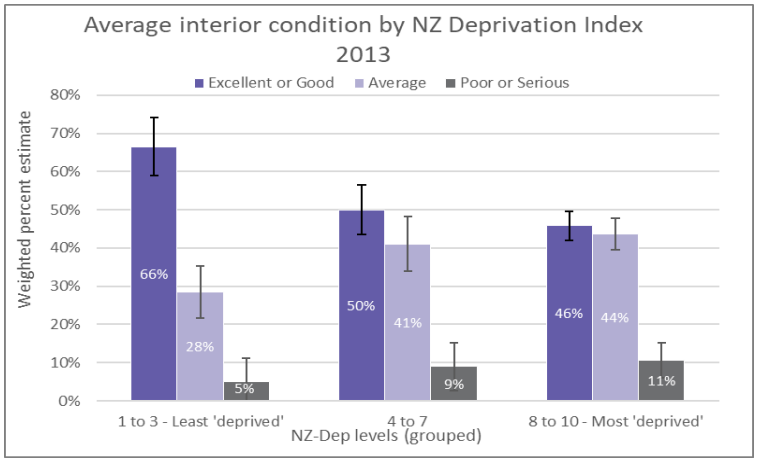

Figure 10. Average interior condition by NZ Deprivation Index 2013.

2.6 Conclusions for this section

Previous analyses by BRANZ, Stats NZ and others have shown a gap in housing condition between those who own and those who rent their homes. Several of the trends observed here are consistent with those analyses.

The findings in this section suggest Māori and/or Pacific peoples and single-parent households are more likely to be living in a house in poorer condition inside and out and with a higher incidence of visible mould. Given that Māori and Pacific peoples households surveyed were more likely to rent their home, some findings observed will likely relate to tenure. Furthermore, rather than being a function of ethnicity or family structure, the condition of housing and presence of mould are linked to incomes and the affordability of living in and maintaining a warm, dry, healthy home.

3. Housing condition and health and wellbeing analysis

This section presents bivariate analysis of house condition ratings and several other housing measures by the occupants' self-reported levels of health and wellbeing.

3.1 Housing condition and feeling cold

The GSS asks participants if their house or flat is colder than they would like in winter.[6] Respondents in around half of households surveyed in the PHS (52%) reported that their house felt colder than they would like at least some of the time in winter, and one in 10 stated it always felt colder than they would like. One in five households stated that it was cold enough in their house in winter to see their breath. Stats NZ has reported that those in younger age groups and occupants in Māori and Pacific peoples households were more likely to always feel colder than they would like in winter (Stats NZ, 2019).

3.1.1 Feeling cold and condition and maintenance

Better house condition was linked with being less likely to feel cold in winter. Figure 11 shows that those who always or often felt cold in winter were more likely to live in a house with poor or serious exterior condition. 40% of households in poor/serious condition reported always/often feeling colder than they would like in winter compared to 17% of households in dwellings with excellent/good exterior condition. In contrast, those that reported their house was never colder than they would like in winter were much more likely to live in a house with an excellent or good exterior condition rating. More than half of households in dwellings in good/excellent condition reported never feeling colder than they would like compared to only one in five for households in dwellings in poor or serious exterior condition.

Over twice the proportion of households living in dwellings in poor or serious exterior condition reported always or often feeling cold in winter compared to households in dwellings in good/excellent condition.

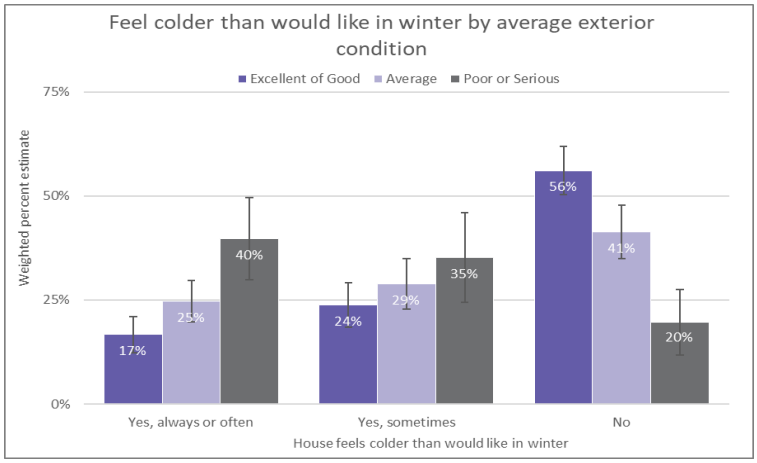

Figure 11. House feels colder than would like in winter by average exterior condition rating [7]

[6] This section excludes a small proportion of households who either did not answer this question or had not yet spent a winter in the house (about 4%).
[7] Percentages do not always add to 100 due to excluding a small number of non-responses.

Figure 12 shows that households living in a dwelling requiring moderate or major repairs were twice as likely to report feeling cold in winter compared to households living in a dwelling requiring no maintenance or repair. Housing defects and issues noted in the assessments of these houses often related to the thermal performance of a dwelling (its ability to retain heat) such as holes, cracks or gaps in the exterior wall cladding and window seals decayed, cracked or missing (seen in 42% of houses) (see White, 2020).

Households were more likely to report feeling cold in winter if their home needed moderate or major repairs.

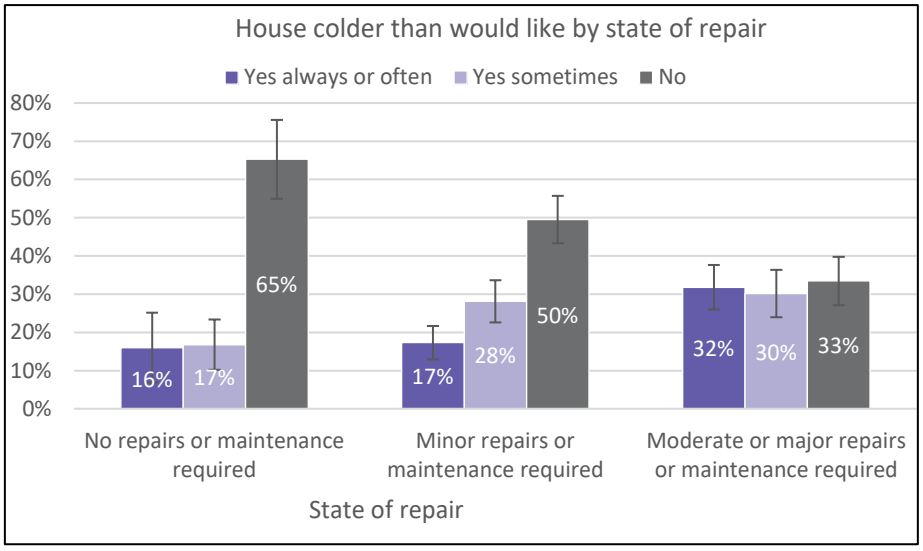

Figure 12. House feels colder than would like in winter by level of maintenance required.

Mental wellbeing was related to feeling cold. Participants who reported always or often feeling colder than they would like in winter were more likely to provide lower ratings in the overall life satisfaction and feel life is worthwhile measures. They also tended to score lower in the mental wellbeing index.[8]

Feeling colder than one would like in winter was found to be moderately correlated with the presence of mould. This tends to follow the pattern we would expect, with houses in better condition being less likely to have extensive levels of visible mould, and their occupants less likely to feel colder than they would like in winter.

As well as the extent of mould measured by surveyors, occupants were asked to rate the extent of mould in their houses. Surveyors were more likely than the occupants to state that visible mould was present (though the questions asked were slightly different). This aligns with previous findings from the BRANZ House Condition Survey (HCS) showing that householders generally rate their houses in better condition than the independent experts (White et al., 2017).

3.1.2 Feeling cold and heating appliances

The presence of heating appliances was recorded by surveyors in the PHS, and as part of the 2018 GSS, participants were asked about their usage of heating appliances.

[8] More has been written about this by Stats NZ (2021, pp. 68–69) from findings based specifically on GSS data rather than measures from the PHS.

PHS results showed that most houses (78%) had some form of fixed heating source in their main living area, most commonly a heat pump (44%) or a wood burner (31%).[9] Fixed heating sources are typically more efficient and cost-effective than portable heating methods for heating living spaces. A fixed heating source in the main living area is a requirement in rental properties under the New Zealand healthy homes standards.

Households with a fixed heating source in the PHS were less likely to report feeling colder than they would like in winter (Figure 13). Houses with fixed heating sources in the living area were also more likely to be in better overall condition in the exterior and, to a lesser extent, the interior than those without.

Households with a fixed heating source were less likely to report feeling colder than they would like in winter compared to households without fixed heating.

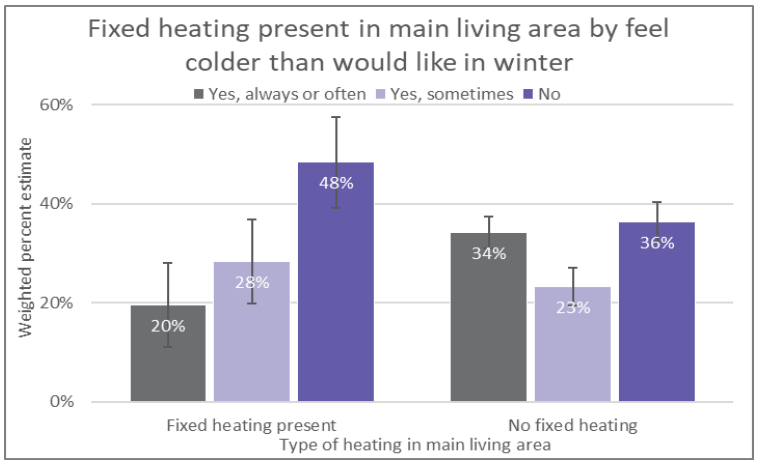

Figure 13. Fixed heating present in main living area by feeling colder than would like in winter.

Those who reported always feeling colder than they would like in winter were slightly less likely to heat their living rooms most nights or every night in winter. Those who reported never feeling cold in winter were the least likely to heat bedrooms during winter. As we know from previous sections, these occupants were more likely to live in houses in better exterior and interior condition and report heating was not needed.

3.1.3 Feeling cold and insulation

Under the healthy homes standards, New Zealand rental houses are required to have at least 120 mm of insulation in the roof space to help prevent heat loss. Just under half of all houses surveyed met the criteria (49%) (where the roof space was able to be accessed). Those who reported always or often feeling colder than they would like in winter were only slightly less likely to meet the criteria (43%).

The presence of subfloor insulation did not appear to have a strong relationship with feeling cold in winter. However, those with a concrete slab or another dwelling below their houses (and therefore no subfloor insulation requirement) were less likely to report feeling colder than they would like during winter. Concrete slabs tend to be more common in newer houses, which we would expect to be in better overall condition and/or built to more recent Building Code standards. These houses are also more likely to be owner-occupied than rentals.

[9] See White (2020) for detailed findings on heating sources.

3.2 Housing condition and overall health

The GSS asks participants to rate their overall physical health on a 5-point scale from excellent to poor. Just over half of participants in the PHS sample rated their health as very good or excellent (53%, comparable to the complete GSS sample of 55%). Analysis shows that those who rated their health as fair or poor were the least likely to be living in a house with an exterior in excellent or good condition – 34% compared to 49% for those who rated their health as excellent (Figure 14). Those rating their health as fair or poor in the GSS tended to be in the older age groups.

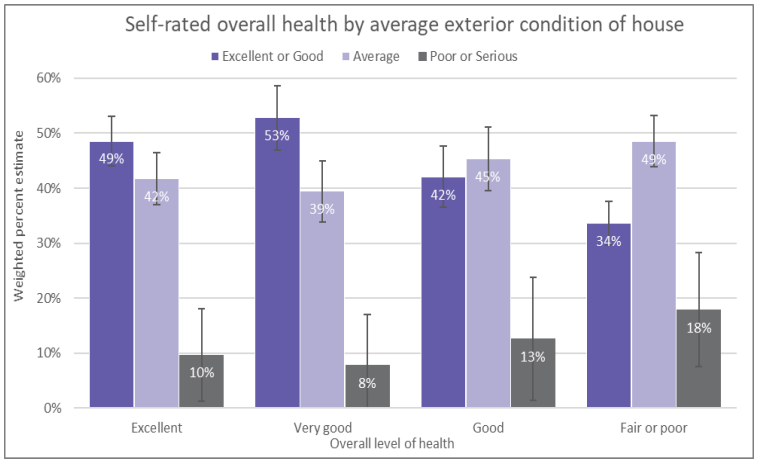

Figure 14. Self-rated level of overall health by average exterior house condition.

On the other hand, those who rated their health as excellent or very good were the most likely to be living in a house with excellent or good interior condition (Figure 15).[10] They were also more likely to be living in a house that did not require any maintenance or repairs.

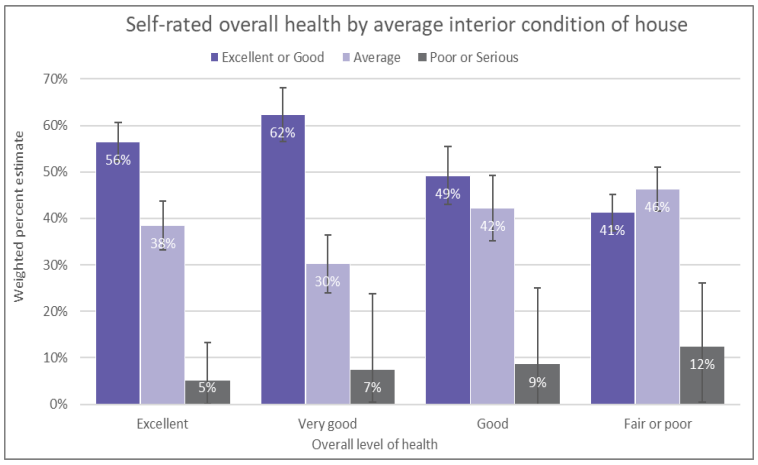

Figure 15. Self-rated level of overall health by average interior house condition.

3.3 Housing condition and mental wellbeing

Three measures of wellbeing from the GSS dataset are used in this analysis:

[10] Note that the number of houses in poor or serious condition in this section is subject to a higher standard error.

- A derived **mental wellbeing index score** based on occupants' answers to a series of questions about their emotional wellbeing over the past 2 weeks. It is based on a WHO wellbeing index often used to screen for symptoms of depression.
- **Overall life satisfaction** where participants rated satisfaction with life out of 10.
- **Feel life is worthwhile**, which measures to what extent participants felt that things they do in their lives were worthwhile, also a 1–10 scale.

Each of these measures is interrelated, with the mental wellbeing and overall life satisfaction measures being most closely correlated.

Stats NZ has reported findings relating to housing condition and wellbeing from the GSS and the Census:

> The four key housing problems measured in the 2018 GSS – living in a home that: was always damp; was always or often too cold; had mould that was always larger than an A4 sheet of paper; required major repairs or maintenance – appear to have a strong relationship with overall life satisfaction. (Stats NZ, 2021, p. 68).

3.3.1 Wellbeing by level of maintenance required

83% of participants in the PHS sample rated their overall satisfaction with life as 7 or more out of 10 (similar to the complete GSS of 81%), with the average rating in 2018 being 7.7 out of 10. Figure 16 shows the overall life satisfaction ratings by the level of repairs or maintenance required at the property, as assessed by surveyors in the PHS.

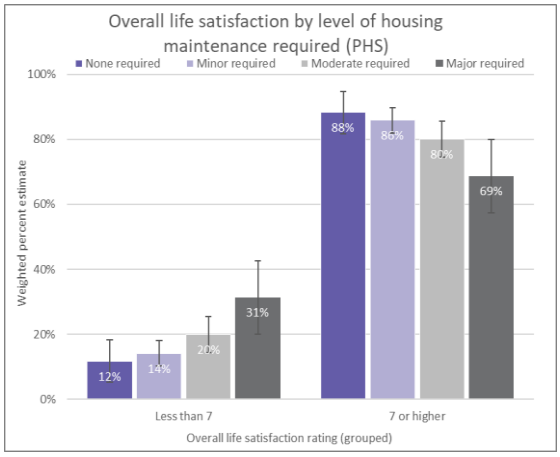

Figure 16. Overall life satisfaction by level of maintenance required (PHS).

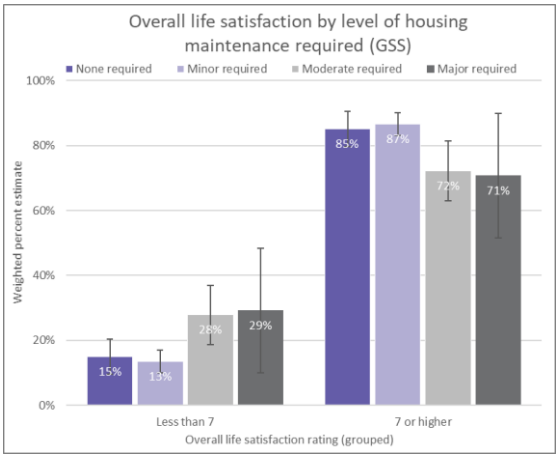

Figure 17. Overall life satisfaction by level of maintenance required (GSS).

The proportion of households rating their overall satisfaction with life lower than 7 increases as the need for repairs or maintenance increases. 31% of occupants living in a house requiring major repairs rated their overall satisfaction with life less than 7 out of 10 compared to 12% of households living in a house requiring no repairs or maintenance. Those rating their overall satisfaction with life as 7 or more out of 10 were more likely to live in a house requiring no repairs or maintenance.

Households living in a dwelling requiring major repairs or maintenance had a lower overall satisfaction with life.

A similar result can be seen in Figure 17, where GSS participants gave their own ratings of the level of repairs or maintenance required in their house. Those who rated their overall satisfaction with life lower than 7 were more likely to state that their

house needed moderate or major repairs. Despite a relatively high standard error, the difference between those rating their houses as needing no or minor repairs and moderate or major repairs is still significant. Participants were more likely to rate their house as not requiring any repairs or maintenance than the PHS building surveyors.

3.3.2 Wellbeing and house condition

Respondents with a higher mental wellbeing score were more likely to live in dwellings in better condition.

Figure 18 and Figure 19 show the mental wellbeing index by the average exterior and interior condition ratings of houses, as assessed in the PHS.[11] Those with mental wellbeing scores of 60 or higher were marginally more likely to live in a house with an exterior rated excellent or good – 50% compared to 42% with scores less than 60. Interior condition ratings in Figure 19 show a slightly clearer distinction. 60% of those with mental wellbeing scores of 60 or higher lived in houses with excellent or good interior condition compared to 47% of those scoring less than 60 in the mental wellbeing index.

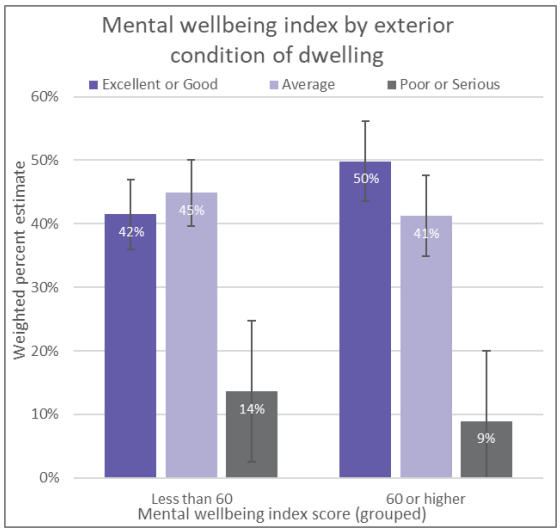

Figure 18. Mental wellbeing index score by average exterior condition rating.

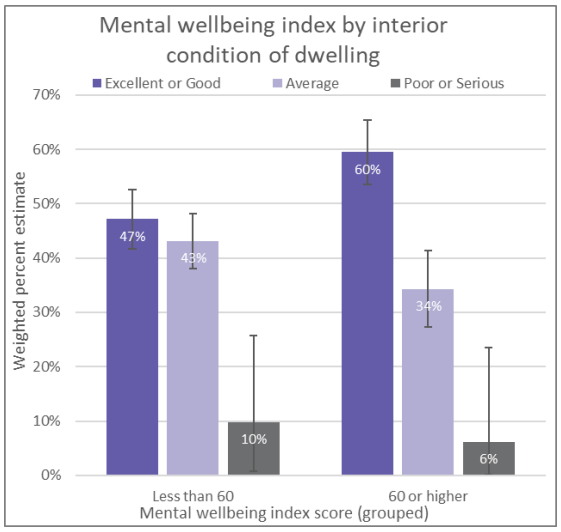

Figure 19. Mental wellbeing index score by average interior condition rating.

Further analysis showed a statistically significant relationship between the mental wellbeing index score and both the interior and exterior condition ratings of houses in the PHS. The average mental wellbeing score was significantly higher for those living in houses with excellent or good exterior condition ratings than those living in houses with average condition ratings of poor or serious.

A similar pattern emerges when looking at the other wellbeing-related measures – overall life satisfaction and feeling that life is worthwhile. Figure 20 and Figure 21 show that those who rated their overall satisfaction with life lower than 7 out of 10 were more likely to be living in a house in poor or serious exterior and/or interior condition. Again, a clearer pattern is seen in the interior condition as compared to the exterior. Those with an overall life satisfaction rating of 7 or higher were more likely to live in a house with an excellent or good interior condition rating.

[11] Around 10% of households have been excluded from this section. Mental wellbeing index scores were unable to be calculated for them due to non-response. The number of houses in poor or serious condition in this section is subject to a high standard error, as displayed by the 95% confidence interval bars on the charts.

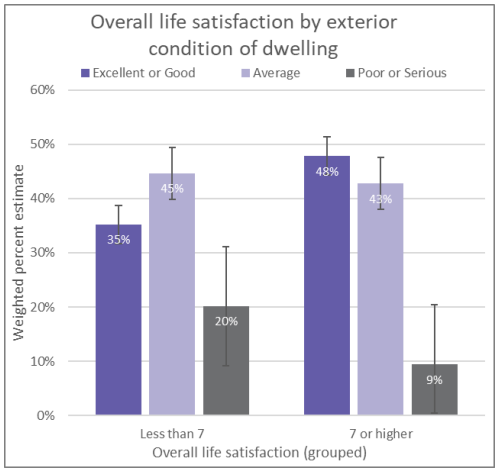

Figure 20. Overall life satisfaction rating by exterior condition of house.

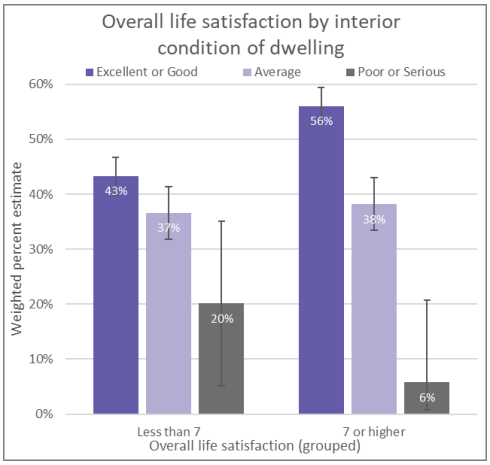

Figure 21. Overall life satisfaction rating by interior condition of house.

Looking at it another way, 87% of those living in a house with an excellent or good interior rated their overall life satisfaction as 7 or higher. This compares with 69% of those living in a house with a poor or serious interior. These differences were statistically significant. Those living in houses rated as having excellent or good exterior or interior had significantly higher overall satisfaction with life ratings than those living in houses in average condition or poor or serious condition. 60% of people who rated the things they do in life as worthwhile 7 or higher lived in a house with an interior condition rating of excellent or good. This compared to 44% of those who rated things in life worthwhile lower than 7.

3.3.3 Wellbeing and levels of mould

Figure 22 shows the participants' overall level of life satisfaction by the worst level of mould observed in living spaces and bedrooms from the PHS. It shows that those rating their overall life satisfaction lower than 7 out of 10 were more likely to live in a house with moderate or worse levels of mould. Similarly, those rating things in life worthwhile lower than 7 were more likely to live in a house with moderate or worse levels of mould and less likely to live in a house with no mould (Figure 23).

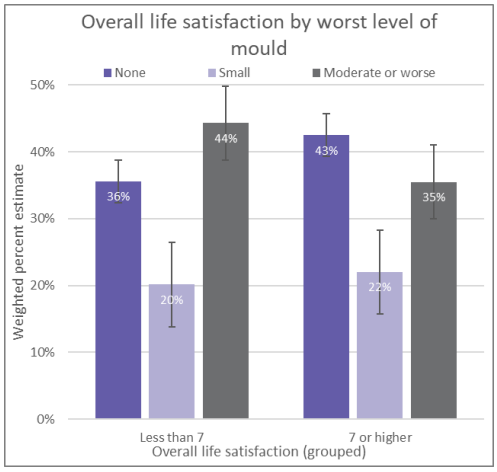

Figure 22. Overall life satisfaction by worst level of mould in living room/bedrooms.

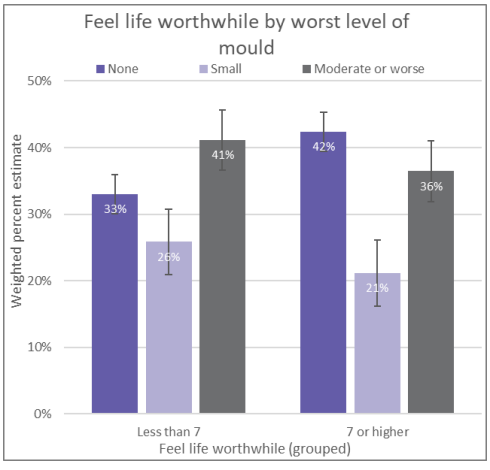

Figure 23. Feel things in life are worthwhile by worst level of mould in living room/bedrooms.

3.4 Conclusions for this section

Occupants of houses in poor interior and exterior condition had lower life satisfaction and scored lower on the mental wellbeing index.

Occupants of houses in poor interior and exterior condition were more likely to rate their own life satisfaction lower than those living in houses in better condition. They also scored lower on the mental wellbeing index. Furthermore, people living in houses requiring more repairs or maintenance had significantly lower mental wellbeing scores and self-reported life satisfaction ratings.

These findings, combined with analysis in the previous section, show that those living in poorer condition housing tend to be affected by a range of issues, including lower self-ratings of physical and mental health and lower incomes.

Analysis also showed that occupants and PHS surveyors provided different ratings of house condition, including levels of visible mould and maintenance required. Despite the differences, both sets of measures showed similar relationships with the occupants' ratings of overall health and mental wellbeing.

4. Statistical analysis of the relationship between housing condition and occupant mental wellbeing

This section delves deeper into findings from the previous sections. The aim of the analysis was to determine which, if any, housing condition variables were significantly related to the occupants' overall sense of wellbeing. This analysis used the mental wellbeing index measure to represent the occupants' wellbeing and look at its relationship with the independently rated housing quality measures.

Based on what we know from analysis described in this report and by Stats NZ (2021) using the same data, several variables were tested for their potential relationship to mental wellbeing. To keep the analysis straightforward, we only used a few variables from the PHS to represent house condition. Some potential explanatory variables are highly correlated with each other, particularly sociodemographic factors, which is an important consideration when interpreting findings.

The selected variables included average exterior condition rating, average interior condition rating, level of repairs or maintenance required, tenure (rented or owner-occupied), ethnicity (Māori and/or Pacific peoples or not), household composition, household income, NZ Deprivation Index 2013 and feeling cold in winter.

4.1 Statistical methods

The first part of the analysis ran a series of analyses of variance (ANOVAs) to test whether there were significant variations in mental wellbeing scores based on our key house condition measures. Some of these findings have also been described briefly in earlier sections of this report.

Once relationships between variables were confirmed or otherwise using the ANOVA and subsequent Tukey tests of significance, a series of simple linear regressions were run. The regressions determined which, if any, housing condition or other factors were related to mental wellbeing when all were considered together. A simple linear regression shows how any changes in the mean of our continuous response variable – a score on the mental wellbeing index – may be explained by our explanatory variables. It also shows which variables contribute the most to these changes. There are many other methods that would show useful results that could be tested in future.

4.2 Analysis of variance and Tukey test results

In the ANOVAs, housing condition was represented by measures of average exterior condition, average interior condition and level of repairs/maintenance required. Results showed that there was a statistically significant difference in means (the average mental wellbeing score) within each of the PHS measures, with significance levels less than 0.01. In other words, mental wellbeing scores vary significantly by average exterior condition, average interior condition and the level of repairs/maintenance required.

The ANOVA results do not show where the significant differences occur – just that means within each of the measures are significantly different. The Tukey test results in Table 1 show where the differences exist (between which subcategories). These show

that statistically significant differences exist between the means in each of the three subcategories of average interior condition but at different significance levels.

The biggest difference can be seen in the average mental wellbeing scores between those living in houses rated as excellent or good compared to those living in houses rated poor or serious. Results show that those in houses rated as having poor or serious interiors have, on average, a mental wellbeing score 10 points lower than those in houses with excellent or good interiors.

For average exterior condition, the difference in the average mental wellbeing score is most significant between those living in houses rated as excellent or good compared to those living in houses rated poor or serious – a difference of 7 points. The difference between average and poor or serious exterior condition categories is not statistically significant. A similar pattern is seen for the level of repairs or maintenance measure. The most significant difference in the average mental wellbeing score is seen between those living in houses requiring no repairs or maintenance and those living in houses requiring moderate or major repairs or maintenance.

A significant difference is also seen between those living in houses requiring minor repairs and moderate or major repairs or maintenance.

These results show that there are statistically significant differences between average mental wellbeing scores for those living in houses in better condition compared to those in houses in poorer condition. We know from previous analysis that other household and individual factors are strongly associated with people's mental wellbeing. The next section puts some of these significant factors into a regression model to determine whether the housing condition factors are still significant when other factors are considered.

Table 1. Tukey test (multiple comparison of means) results – differences in average mental wellbeing.

Measure	Test comparison	Difference between means	p adjusted/ significance level
Average exterior condition	Excellent or good – average	-3.7	0.02
	Poor or serious – excellent or good	-7.3	<0.01
	Poor or serious – average	-3.7	0.19
Average interior condition	Excellent or good – average	-4.2	0.01
	Poor or serious – excellent or good	-10.3	0.00
	Poor or serious – average	-6.0	0.05
Level of repairs/ maintenance required (PHS measure)	No repairs or maintenance – minor repairs or maintenance	-3.1	0.25
	No repairs or maintenance – moderate or major repairs or maintenance	-6.6	<0.01
	Minor repairs or maintenance – moderate or major repairs or maintenance	-3.5	0.04

4.3 Regression analysis results

4.3.1 Which is the most significant house condition factor?

The ANOVAs showed that, of the three house condition measures analysed, interior condition had the strongest relationship with the mental wellbeing measure. A multiple linear regression with each of the three house condition measures together confirmed this relationship between interior condition and mental wellbeing. Results indicated that a good or excellent interior had a positive and statistically significant relationship with the mental wellbeing score.

4.3.2 Is interior condition still significant when household and individual factors are taken into account?

Tenure, which has been shown to be a significant factor in house condition (White, 2020; White et al., 2017), was not a significant contributor to mental wellbeing scores when included in a model with interior condition. This analysis also showed that some of the factors that, in previous analyses showed a strong relationship with house condition and mental wellbeing (namely ethnicity – being Māori and/or Pacific peoples – and the NZ Deprivation index) were not significantly related to mental wellbeing when other factors were considered. These were removed from the final iteration of the analysis. The final variables in the linear regression model included average interior condition rating, household composition, household income and feeling cold in winter.

Results in Table 2 show that, when the household factors were taken into account, the interior condition of the house is less significant. The most significant factor of those we analysed was the household composition of one parent with children. This had a significantly negative impact on the mental wellbeing score of around 9 points. On the other hand, household income had a positive relationship with the mental wellbeing score. This analysis shows a strong negative relationship between wellbeing and feeling colder than one would like in winter.

Table 2. Linear regression results – mental wellbeing and selected variables.

Measure	Test variable	Estimate	Std error	t-value	p-value
Intercept		58.14	3.02	19.25	<0.01
Average interior condition	Excellent or good	2.62	1.55	1.69	0.10
	Poor or serious	-2.78	4.08	-0.68	0.50
Household composition	Couple with children	-2.51	1.76	-1.42	0.16
	One parent with children	-9.11	2.73	-3.33	<0.01
	One-person household	0.54	2.04	0.27	0.79
	Two or more families	-0.57	6.44	-0.09	0.93
	Other	-7.46	4.78	-1.56	0.12
Household income	$30,000–$70,000	8.28	2.60	3.19	<0.01
	$70,001–$100,000	9.09	3.07	2.96	<0.01
	More than $100,000	6.59	2.97	2.22	0.03
Feel colder than would like in winter	Yes, always or often	-6.12	1.82	-3.36	<0.01
	Yes, sometimes	-2.97	1.89	-1.57	0.12
	Residual (non-response)	1.37	4.87	0.28	0.78

5. Discussion and conclusions

Results from this study show that several housing quality and sociodemographic factors are related. When considered in isolation, house condition is related to occupant wellbeing – specifically, the average interior condition rating. However, when other factors relating to the household are considered, house condition becomes less prominent. Household income, living in a single-parent household and feeling cold in the house in winter proved to be more significant factors in relation to the mental wellbeing index score. This echoes findings from Stats NZ's analysis of the wellbeing data from the GSS, which showed that participants from single-parent families had the lowest wellbeing scores (Stats NZ, 2021, pp. 68–69).

Feeling cold in winter was shown here to contribute to a lower mental wellbeing score. Analysis in this study report showed feeling cold to be related to number of factors that are social, demographic and housing related. Further analysis using the PHS and GSS data could look at the relationship between feeling cold, overall health and wellbeing in more detail as well as housing factors and occupant behaviours that may cause the occupants to feel cold. Household income proved to be significantly related to an increase in mental wellbeing scores. Higher disposable income is likely to be an enabling factor in maintaining and heating homes and in supporting other behaviours that improve quality of life. Further analysis could explore the complex relationships touched on here and the potential multicollinearity that may exist between some factors.

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