

Why don't owners improve their homes? Results from a survey following a housing warrant-of-fitness assessment for health and safety

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Substandard housing is a major issue affecting health in New Zealand. The 2014/2015 General Social Survey, which had 8,000 participants, showed that 63% of owner-occupiers and 67% of renters reported a need for maintenance and repairs on their home, while 15% of owner-occupiers and 35% of renters reported that their homes were often, or always, cold.¹ In the BRANZ 2015 House Condition Survey of 550 homes, which was designed to capture a representative sample of New Zealand dwellings, assessors found that 31% of rental dwellings and 11% of owner-occupied dwellings felt damp to some extent, 32% of rental dwellings and 14% of owner-occupied dwellings were poorly maintained,² and around 53% of New Zealand dwellings had no or suboptimal insulation in the ceiling and/or subfloor.³ Living in cold, damp, mouldy and hazardous housing is associated with poor cardiovascular and respiratory health outcomes and can increase the risk of injury.^{4–11}

Improving housing is associated with health improvements, especially when targeted at vulnerable populations and groups with particular health needs.¹² New Zealand research has shown that health can be improved by modifying housing conditions: providing more efficient and non-polluting heating, draught-stopping measures and insulation increases indoor temperature,^{13–15} which improves respiratory symptoms;^{10,14,15}

Abstract:

Objective: To assess homeowners' intentions to make voluntary improvements to their homes following a warrant-of-fitness (WOF) assessment to highlight health and safety issues.

Methods: We recruited 83 homeowners, including nine landlords, in Taranaki, New Zealand, who agreed to have a WOF assessment carried out on their homes. We interviewed 40 of the homeowners to ascertain what improvements they planned to make, and barriers to improving their homes.

Results: Of the 83 properties, 76 (92%) failed the WOF. Of the 40 interview participants, 31 (76%) had addressed or planned to address at least one of the identified issues with the home. Participants were least likely to address identified issues with security stays on windows, and absence of ground vapour barrier. Reasons for not addressing identified issues included cost, and a belief that making the improvement would not benefit health and safety.

Conclusions: Information about housing defects appears insufficient to encourage people to make improvements to their homes to meet a specified health and safety standard.

Implications for public health: Better understanding of how particular housing defects pose a risk for health and safety, and provision of funding support in some cases, may encourage people to invest in safer, healthier homes.

Key words: minimum housing standard, housing, health, safety, injury

and providing simple home modifications to improve safety, such as handrails and addressing slip and trip hazards, reduces the risk of fall injury.¹⁶ Cost-benefit analyses show that housing improvements save public money, largely due to health savings.^{17,18}

One measure to guarantee that housing supports health is through ensuring that dwellings meet minimum criteria for health and safety. The University of Otago's warrant-of-fitness (WOF) is a pass/fail tool that consists of 29 criteria that have a demonstrably important impact on health, safety and

energy efficiency.¹⁹ A home that passes the WOF reduces risk from important health and safety hazards in New Zealand housing. The WOF is practical for assessment and regulatory purposes as it can be completed by a trained assessor within an hour. The development of the WOF, and the results of a field trial that established its utility in the New Zealand context, have been outlined previously.²⁰

In 2017, Wellington City Council introduced a voluntary rental housing WOF.²¹ Advocates for a mandatory WOF for rental properties

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point out that existing standards for rental housing quality are insufficient and poorly enforced.²² *Residential Tenancies Act 1986* regulations were introduced in 2016 requiring smoke alarms and minimum insulation in rental housing, and *Healthy Homes Guarantee Act 2017* regulations will add requirements for ventilation, heating, moisture ingress, draught-stopping and drainage; but neither piece of legislation addresses injury hazards, and both rely on tenants to report infractions.^{19,23,24} Depending on how a rental WOF would be enforced, ranging from self-regulation to a mandatory independent assessment scheme, it is estimated that between 66% and 90% of landlords would make improvements to meet WOF standards.²⁵ To date, the focus has been on rental homes, but researchers envisage that a housing WOF would apply to all dwellings in future.²⁰

Due to the current absence of enforceable regulation on existing homes, and the extent of housing deficiencies in both the rental and owner-occupied stock, it is worthwhile considering what improvements owners are willing to make voluntarily and at their own cost. This study explores whether providing feedback from a housing WOF assessment makes a difference to owners' intentions to make housing improvements and discusses barriers and enablers to making these health and safety improvements.

Methods

Wise Better Homes, a non-profit charitable trust that installs insulation in the Taranaki region of New Zealand, recruited the participants through its existing networks. Staff contacted owners to ask whether they were interested in having a free WOF assessment conducted on their home. The 83 homes selected for the study were a convenience sample made up of people known to Wise Better Homes who agreed to have a WOF assessment conducted on their homes and were not representative of the New Zealand housing stock. Trained assessors carried out the WOF assessment on 83 homes (74 owner-occupied and nine rental) in May and June 2017. All items included in the WOF, including dry underfloor and no dampness in insulation, were inspected visually by assessors. Apart from the use of a thermometer to measure hot water temperature, no specialist equipment was used. In most cases, the

owner was present for the assessment and was aware of how their home fared. At the same time, the assessors gave participants an information sheet about the study and obtained their consent to be contacted for a brief telephone interview. The University of Otago Human Ethics Committee gave ethics approval for this study (reference DI 6/345). The WOF assessment checklists, cost estimates and consent forms were kept on computer files at WISE, emailed through to the University of Otago researchers and retained on a University of Otago secure server. The achieved sample of 83 houses was gauged in terms of the area-level measure of socioeconomic deprivation.

In November and December 2017, Wise Better Homes sent owners a copy of their WOF assessment, as well as an estimate of the cost of repairs and improvements that would be required to bring the home up to WOF standard. In December 2017, a University of Otago researcher telephoned participants. The researcher focused on contacting people who had been sent their assessment forms in November (to give participants time to consider their assessments prior to the interview), and people who had failed the WOF (to gain insight into motivations for carrying out improvements). The researcher contacted 53 individuals. Six people were uncontactable after several attempts, four declined to do an interview, one phone number was disconnected, and two people had died since the WOF assessment. Interviews were carried out with 40 people, including four landlords, during which the interviewer took notes. At the outset of the interview, participants were asked to verbally consent to the interview, and advised their participation was voluntary and anonymous. The telephone interviews lasted between 20 and 40 minutes, and covered information about the home and its occupants, the participants' responses to the inspection process, what repairs (if any) had been made or would be made, and barriers that prevented identified improvements from being carried out. Subsequently, we transferred the assessment and interview results to Excel spreadsheets for descriptive analysis.

Results

Sample distribution by NZDep

To gauge how representative our achieved sample might be in terms of the area-level

measure of socioeconomic deprivation,²⁶ we matched addresses to corresponding meshblocks (which are clusters of households, approximately the size of a city block) and classed these using relevant data from the 2013 Census. Figure 1 shows the distribution of the achieved sample according to NZDep decile. The solid line indicates the distribution across New Zealand as a whole. This figure shows that the lowest deciles are under-represented, with the highest level of representation at the higher range of deprivation (deciles 6-8).

WOF assessment results

Seven of the 83 homes (8%) passed the WOF overall. However, most properties passed most items. Regarding components related to safety, most properties passed the criteria for lighting, power outlets and light switches, and intact wall, ceiling and floor linings. Among injury hazards, it was most common for properties to fail the following criteria: having paths, decks and surfaces non-slippery and free of moss (30% failed/70% passed) and having window security stays where required in living area (21% failed/79% passed), see Table 1.

On items related to health outcomes, most homes passed criteria for having a living area free from mould, a potable water supply, and an operational toilet, shower and sewage connection. Among health-related items, it was most common for properties to fail the following criteria: having functional spouting and stormwater function (22% failed/78% passed) and bathroom surfaces clear of mould (15% failed/85% passed), see Table 2.

For components associated with multiple outcomes (energy efficiency, health and safety), most homes passed criteria relating to roof insulation and structural soundness. Among components related to multiple beneficial outcomes, it was most common for properties to fail the following criteria: having a ground vapour barrier (55% failed/45% passed) and a dry underfloor (20% failed/80% passed), see Table 3.

Interview results

A total of 40 people participated in interviews. Most people (39 people, 98%) had purchased rather than inherited the property, and the majority of participants (25 people, 63%) had a mortgage on the property. About one-third of people (13 people, 33%) owned other property besides

the property in question. Children (aged 15 and under) were present in 13 (33%) of the households. Ninety per cent (36 people) had already made changes to the home at some point prior to becoming involved in this study; most listed heating and insulation as improvements they had made to the home, reflecting the fact that participants had been recruited via the contact list of a community trust that installed insulation. Twenty-three of the participants (58%) stated they put money aside for maintaining the property. While the participants were provided with a WOF assessment free of charge, the market rate for a WOF to be conducted by an assessor has been estimated (as at 2016) at \$250.^{20,21} Seventeen participants (43%) said they would be willing to pay this sum for a WOF assessment in the future; a further six (15%) said they may be willing.

Most participants (33 people, or 83%) reported that the WOF assessment was useful. Reasons included: that they learned practical ways to improve the house; that the WOF assessed the quality of pre-existing home improvements; and reassurance that the house was in reasonable condition. Participants who did not find the WOF useful said this was because: they disagreed that acting on the failed items would improve the home; they already knew about the identified defects; or the WOF was no longer relevant as they had since undertaken renovation work. For 58% of participants, or 23 people, the WOF assessment had directed their attention to issues with the home of which they were previously unaware. Twenty-six participants (65%) agreed that addressing the issues identified in the WOF would improve the safety, warmth or dryness of the home. Many of those who disagreed felt the house was already warm, safe and dry.

When asked an open question about how they prioritised what improvements to make to their home, participants responded as follows (multiple response): heating, warmth or comfort (8 people, 20%); maintenance, including 'what breaks first' and what might cause further damage (5 people, 13%); safety (4 people, 10%); insulation (3 people, 8%); what affects their health (3 people, 8%); dryness (2 people, 5%); and appearance (1 person, 3%). Three people (8%) said they prioritised particular improvements because there were relevant subsidies or rates rebates available (i.e. for heating and insulation), and two people (5%) were motivated by cost – prioritising the lower-cost improvements.

Figure 1: Distribution of achieved sample according to area level of deprivation (NZDep) decile. The solid line indicates the distribution across NZ as a whole.

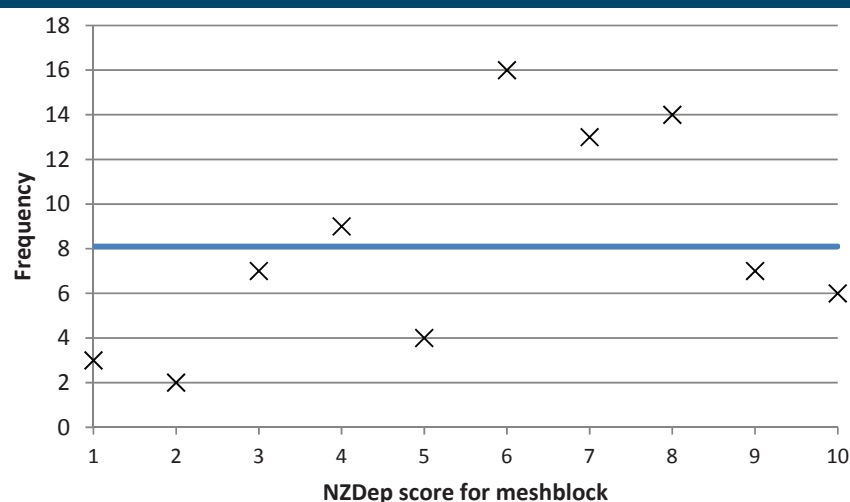


Table 1: Items assessed in the housing WOF associated with safety outcomes.

Item assessed	WOF assessment (83 properties assessed)		Issue addressed (40 owners interviewed)	
	No. of applicable properties	Pass rate	No. of fails in sample	Item had or would be addressed
Wall and ceiling linings, and floor intact – kitchen	83	98%	0	n/a
Working artificial lighting – kitchen	83	100%	0	n/a
Hot water temperature at tap (55°C ±5°C) – kitchen	81	93%	2	50%
Visibly safe power outlets and light switches – kitchen	82	98%	1	100%
Secure storage (1.2 m high or child-safe lock) – kitchen	83	48%*	19	11%
Wall and ceiling linings, and floor intact – bathroom	83	96%	1	100%
Working artificial lighting – bathroom	83	100%	0	n/a
Visibly safe power outlets and light switches – bathroom	83	98%	0	n/a
Wall and ceiling linings, and floor intact – living areas	83	99%	1	100%
Lighting – living, lounge, dining	83	99%	0	n/a
Lighting – hallway	75	99%	1	100%
Lighting – stairs	22	100%	0	n/a
Lighting – other	17	100%	0	n/a
Visibly safe power outlets and light switches – living areas	82	98%	1	100%
Opening window (each area) with secure latch – living areas	80	98%	2	0%
Window security stays (where required) – living areas	39	79%	5	20%
Opening window, with latch – bedrooms	83	92%	3	50%
Window stays (if required) – bedrooms	83	87%	8	34%
Wall/ceiling linings intact – bedrooms	83	95%	3	100%
Working artificial light – bedrooms	83	98%	1	n/a**
Safe power & light switches – bedrooms	83	94%	4	100%
Smoke alarm within 3m – bedrooms	83	80%	8	86%
Address clearly labelled and identifiable	82	96%	2	100%
Securely locking door(s)	83	99%	0	n/a
Working light	83	93%	3	67%
Two effective methods of egress	82	99%	0	n/a
Glass doors include visibility strips	75	93%	1	0%
Handrails and balustrades to code	60	92%	2	0%
Paths, decks and surfaces non-slippery, free from moss	80	70%	15	73%

Notes:

*This is likely to be inaccurate, as some assessors did not pass homes that had storage above 1.2 m metres, but did not have child-safe locks on storage, when these should have passed

**Answer not recorded by interviewer

We asked participants how they intended to respond to each failed item (see Tables 1–3). In the case of some WOF criteria, no sampled properties had failed; results are therefore not presented for those items and they are marked N/A in the tables. Thirty-one participants (76%) had addressed or planned to address at least one of the identified issues in the home. For example, all participants that failed items associated with lighting, mould, power outlets and light switches, linings and cabling had resolved or planned to resolve those issues. Areas where participants indicated a lack of action (either not

addressed or not planned to address after the WOF) included heating, underfloor insulation, and handrails and balustrades.

Reasons for choosing against making improvements

Items that most properties failed, and that most owners were unwilling to address, have implications for the successful implementation of standards. This was the case for window safety stays and ground vapour barriers, both of which are relatively inexpensive items to address.

The WOF requires that windows that have an outside drop of 2 m or higher, and where the sill is less than 1.5 m above the internal floor, have security stays – latches that limit how much a window can be opened. Safety stays are included in the WOF because they protect children from the risk of falling out of windows.^{27–29} It is also likely that partially open windows assist with ventilation, given that fully opening windows for ten to fifteen minutes is sufficient to replace the majority of wet air in a room.²⁹ Around one-fifth of properties failed the security stays item in the living area, and 13% failed the item in the bedrooms. Owners who failed the security stays item were told that security stays cost approximately \$50 for each window. Only 34% of participants with homes that had failed the security stays item in the bedrooms had installed, or planned to install, security stays, and 20% of those that failed the security stays item in the living area had installed, or planned to install, security stays. Reasons given for not installing security stays were: the cost; no one had fallen previously; it would be impossible to fall from windows; no young children lived in or visited the home; the home is in a safe area; security stays were dangerous because they prevented easy exit; and security stays make it easier for burglars to enter the house. People who reported an intention to install security stays said they would do so because safety is important, to help with ventilation, and that they may help the property sell.

The WOF specifies that homes with an accessible, fully-enclosed subfloor must have a ground vapour barrier: a thick polythene sheet installed under the dwelling. New Zealand evidence shows that even apparently dry ground under houses can release about 25 kg of water per day, which rises into people's homes,³⁰ and that ground vapour barriers are an effective means of controlling ground-sourced water;³¹ however, 45% of properties failed this item. Participants were told that it would cost about \$200 for the purchase and installation of a ground vapour barrier. Only two of the 22 people who failed this item in the interview sample (9%) said they had installed, or would install, a ground vapour barrier. Reasons given included: not understanding what a ground vapour barrier was; the subfloor and/or the home was dry; concern that the ground vapour barrier would 'sweat' and increase dampness; the cost; the belief that plastic should not be used unless it is essential; and the fact that

Table 2: Items assessed in the housing WOF associated with health outcomes.

Item assessed	WOF assessment (83 properties assessed)		Item addressed (40 owners interviewed)	
	No. of applicable properties	Pass rate	No. of fails in sample	Item had or would be addressed
Functioning stove and oven	83	92%	1	100%
Effective ventilation to the outside – kitchen	83	92%	1	0%
Adequate food preparation and storage	83	93%	4	0%
Potable water supply	83	99%	1	100%
Waste water drainage with sound connection – kitchen	72	99%	0	n/a
Surfaces clear of mould – bathroom	83	85%	7	86%
Operational toilet	83	100%	0	n/a
Sewage connection functional	81	100%	0	n/a
Functioning bath or shower	81	99%	1	0%
Effective ventilation to the outside – bathroom	82	90%	6	50%
Waste water drain connected – bathroom	81	99%	0	n/a
Surfaces clear of mould – living area	82	98%	2	100%
Heating, fixed, effective and safe	81	88%	3	0%
Curtains/drapes present – living area	82	93%	0	n/a
Surfaces clear of mould – bedrooms	83	92%	2	100%
Curtains/drapes present – bedrooms	83	92%	1	0%
Spouting and storm water functioning and not leaking	81	78%	8	75%
Non-potable water labelled	30	87%	2	50%

Table 3: Items assessed in the housing WOF associated with multiple outcomes (health, safety, energy efficiency).

Item assessed	WOF assessment (83 properties assessed)		Item addressed (40 owners interviewed)	
	No. of applicable properties	Pass rate	No. of fails in sample	Item had or would be addressed
Insulation to requirements – ceiling	68	90%	9	56%
No gaps, tucks, or folds in insulation – ceiling	78	86%	6	83%
No dampness in insulation – ceiling	78	100%	0	n/a
Insulation clearance from lights, ducts and roof – ceiling	78	100%	0	n/a
Thermoplastic insulated cabling	78	97%	1	100%
Insulation to requirements – underfloor	68	90%	5	0%
Dry underfloor	74	80%	2	50%
Ground vapour barrier	60	45%	22	9%
No ponding – underfloor	74	92%	3	67%
Envelope in reasonable repair and weather tight	83	92%	3	33%
No cracks, holes in roof	83	98%	1	100%
No cracks, holes in external cladding	83	89%	4	75%
No cracks, holes or missing panes in windows	83	89%	6	67%
Structurally sound	82	99%	0	n/a

the subfloor was insulated. Some participants commented that if a ground vapour barrier were necessary, they would have been informed of this when insulation was installed (and this had not occurred). Of the two people who said they would install a ground vapour barrier, one said this was because they saw evidence of ponding and that it had made a big difference in a previous home.

Of additional interest are participants who decided against making improvements that, while high cost, are closely connected to health improvements and energy efficiency. Most homes passed criteria relating to insulation and heating. Participants with homes that failed were supplied with cost estimates on rectifying issues related to heating and insulation specific to their home, for example, \$3,000 for installing a heat pump, \$2,000 for installing ceiling insulation, or \$350 for remedial work on underfloor insulation. However, none of the owners that were part of the interview sample whose homes failed the heating or the underfloor insulation item planned to address these issues. In the case of underfloor insulation, some participants disputed the result, saying that it was impossible to insulate further due to access issues, in which case the property should have passed this criterion. Others were happy with the current level of underfloor insulation and would prefer to spend money on other housing improvements. The WOF requires safe and effective space heating. Some participants failed this item as they had unflued gas heaters; those participants said they did not use or rarely used these heaters, as they had other heaters in the home. Other reasons given for not addressing heating were reluctance to install a heat pump due to cost, the argument that the dwelling was easily heated by standalone heaters due to its small size, or the perception that the dwelling was already sufficiently warm.

Discussion

In this study, we assessed residential properties against health and safety criteria and then interviewed the owners about what issues they planned to ameliorate. This study showed that there were few properties that were free of problems. Previous research has shown that many of the WOF items could be quickly and easily fixed for less than \$100.³² We ascertained that while there were some issues that almost all owners were willing

to rectify, there were other issues that many owners would not address.

There have been a range of studies on motivations for, and barriers to, making improvements to homes, in particular for energy-efficiency improvements. The literature shows that owners give a number of reasons for not improving housing, including cost, disruption, not benefitting from cost-savings connected to energy bills (in the case of landlords), and believing that the home was already in good condition, or lacking knowledge about how it could be improved.^{33–36} Our study is distinct in that it looks at people's responses to a specific housing assessment – one that focuses on health and safety. Study participants were provided with an information sheet indicating their property would be assessed against key health and safety-related criteria. When asked about motivations for making improvements to their home, relatively few people mentioned health (8%) or safety (10%) specifically, but they did mention upstream factors that affect health and safety such as heating, warmth or comfort (20%), insulation (8%), and dryness (5%). These preferences were reflected in the responses to questions about what issues participants had acted on or planned to act on. For example, high proportions of participants planned to wipe away mould and fix unsafe power outlets. These findings suggest that health and wellbeing can motivate housing improvements. This motivation fits alongside broader themes that have been identified in the literature: that home improvements are carried out to enable owners to enjoy particular lifestyles,³⁷ and to support people's sense of comfort and their idea of the role of home.³⁸ Framing measures that encourage health-supporting housing to be seen as an expectation and aspiration are therefore likely to support uptake of housing improvements.

Our study supports research showing that one of the barriers to making housing improvements is a lack of knowledge about the home's defects, or believing the property is in better condition than it objectively is.^{33–36} The willingness of participants to rectify a number of identified issues with the home indicates that the knowledge gained through the WOF assessment motivated them to act on those issues. An important contribution of our study is that knowledge of a dwelling's drawbacks is insufficient to prompt action: if people do not understand how addressing a

WOF requirement will improve their health and safety in the home, they are unlikely to make that improvement. For example, some participants decided against installing a ground vapour barrier, because they thought the ground beneath their homes was dry. This finding indicates that participants were not aware that even dry ground can release a substantial amount of moisture and contribute to dampness in the home.³⁰ While most participants were willing to wipe away mould – one of the symptoms of moisture in the home – most were unwilling to take preventative measures to help decrease moisture in the home, such as installing ground vapour barriers and installing security stays on windows, which helps to ventilate homes.

In some cases, cost prevented owners from making improvements to their homes. Several participants had previously addressed problems in their home using subsidies. This indicates that subsidies or other support for making housing improvements would be a useful policy initiative. Until the end of June 2018, low-income homeowners and landlords with low-income tenants in New Zealand were eligible for grants worth 50% of the cost of insulation.³⁹ Grants for low-income homeowners to cover the cost of floor and ceiling insulation and ground vapour barriers are available from July 2018; grants for heating for low-income homeowners will be available from July 2019.⁴⁰ In some parts of New Zealand, owners may be eligible for additional support. For example, in Taranaki, where this study was carried out, the local council provides loans for heating and insulation that people pay back over nine years through their rates.⁴¹ Our research indicates that funding support may be required to encourage uptake of a few other measures such as safety features.

One limitation of the study was that the majority of properties were owner-occupied (74, or 89%) and the majority of interview participants (36, or 90%) were owner-occupiers. This feature meant we were unable to consider whether occupying a home, versus renting it out, made a difference to the improvements that owners were willing to make. Second, due to workforce capacity, there was a 5–6-month delay between undertaking the WOF assessment and receiving the results and cost estimates. While the delay was advantageous in that participants were able to reflect on changes

they had made to their home since the WOF assessment, it may have resulted in some participants losing interest in acting on the recommendations. Third, this assessment was partly based on owners' stated intention to resolve defects identified by the WOF assessment so we cannot know the extent to which such actions took place. Fourth, the sample of participants was a convenience sample and therefore cannot be considered to be random or necessarily representative. Figure 1 shows that the sample did have representation across all deciles of deprivation but with the lowest deciles underrepresented, and the highest level of representation at the higher range of deprivation (deciles 6–8). This would be consistent with a set of respondents with higher than average socioeconomic deprivation, although this area-level measure limits such inference at the individual address level. Our interest is in the behaviour of this self-selected group, and in how they respond to new knowledge about the state of their properties. Finally, the assessments were carried out by different assessors, and in some cases, the owner was not present for the assessment. The different approaches individual assessors took to recording information on the WOF assessment form, and the differing levels of information about the WOF assessment that they were able to provide to participants, may have affected the likelihood that participants would improve properties. However, audits from a previous study using the WOF indicate that variation between assessments conducted by different people is minimal.²⁰

Implications for public health

The extant evidence on how rental regulation encourages owners to make improvements to their property suggests that a rental WOF needs to be mandatory to induce important improvements in housing and consequent health and safety outcomes.²⁵ This research gives a number of insights into non-regulatory measures that would encourage owners to make housing improvements. First, given that the accumulation of costs to pay for housing improvements was a factor preventing participants making improvements, governments should consider providing subsidies to support making housing improvements, including those addressing safety issues, to help achieve broader public health gains. Supporting

this approach, the benefits of some housing improvements have been shown to far outweigh the cost.^{17,18} Second, as many participants did not understand why some measures were required as part of the WOF, people who undergo a WOF assessment on their properties should be provided with more information on why the failed criteria are important to health and safety. People who currently assess their own properties using the WOF assessment tool (available as an app and as a spreadsheet from the Wellington City Council website⁴²) are linked to the online WOF Assessment Manual, which outlines the criteria in more detail, and provides some information on the benefits to the home of fulfilling the criteria. This information could be further supported by providing participants with information on the effects on health and safety of failing to rectify the issue, and the next step to take to ameliorate the issue.

Conclusion

This study indicates that people provided with a WOF assessment on their residential properties are often unwilling to ameliorate identified health and safety problems. Providing funding support to make improvements, as well as additional information to explain how improvements are likely to boost the health and safety of occupants and of visitors, could encourage owners to make improvements that have demonstrated health and safety benefits.

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References

1. Statistics New Zealand. *Perceptions of Housing Quality in 2014/15* [Internet]. Wellington (NZ): Government of New Zealand; 2015 [cited 2018 May 30]. Available from: http://archive.stats.govt.nz/browse_for_stats/people_and_communities/housing/perceptions-housing-quality-2014-15.aspx
2. White V, Jones M, Cowan V, Chun S. *BRANZ 2015 House Condition Survey: Condition of House Comparison by Tenure* [Internet]. Study Report No.: 370. Judgeford (NZ): BRANZ; 2017 [cited 2018 May 30]. Available from: http://www.branz.co.nz/cms_show_download.php?id=53af2b0c2e5ca5169a0176996bba7ee88de082c0
3. White V, Jones M. *Warm, Dry, Healthy? Insights from the 2015 House Condition Survey on Insulation, Ventilation, Heating and Mould in New Zealand Houses* [Internet]. Study Report No.: 372. Judgeford (NZ): BRANZ; 2017 [cited 2018 May 30]. Available from: https://www.branz.co.nz/cms_show_download.php?id=50335e67bb00f3e0464097be1d4d71ac8a85f6bf
4. Mendell MJ, Mirer AG, Cheung K, Tong M, Douwes J. Respiratory and allergic health effects of dampness, mold, and dampness-related agents: A review of the epidemiologic evidence. *Environ Health Perspect.* 2011;119(6):748–56.
5. Jevons R, Carmichael C, Crossley A, Bone A. Minimum indoor temperature threshold recommendations for English homes in winter: A systematic review. *Public Health.* 2015;64–12.
6. Batchelor FA, Hill KD, Mackintosh SF, Said CM, Whitehead CH. Effects of a multifactorial falls prevention program for people with stroke returning home after rehabilitation: A randomized controlled trial. *Arch Phys Med Rehabil.* 2012;93(9):1648–55.
7. Barcelos RS, Del-Ponte B, Santos IS. Interventions to reduce accidents in childhood: A systematic review. *J Pediatr (Rio J).* 2017;94(4):351–67.
8. Keall M, Baker M, Howden-Chapman P, Cunningham M. Association between the number of home injury hazards and home injury. *Accid Anal Prev.* 2008;40(3):887–93.
9. Oliver JR, Pierce N, Stefanogiannis N, Jackson C, Baker MG. Acute rheumatic fever and exposure to poor housing conditions in New Zealand: A descriptive study. *J Paediatr Child Health.* 2017;53(4):358–64.
10. Pierce N, Arnold R, Keall M, Howden-Chapman P, Crane J, Cunningham M, et al. Modelling the effects of low indoor temperatures on the lung function of children with asthma. *J Epidemiol Community Health.* 2013;67(11):918–25.
11. Shorter C, Crane J, Pierce N, Barnes P, Kang J, Wickens K, et al. Indoor visible mold and mold odour are associated with new-onset childhood wheeze in a dose dependent manner. *Indoor Air.* 2017;28(1):6–15.
12. Thomson H, Thomas S, Sellstrom E, Petticrew M. Housing improvements for health and associated socio-economic outcomes. *Cochrane Database Syst Rev.* 2013;(2):CD008657.
13. Rangiwetu L, Pierce N, Howden-Chapman P. Effects of minor household interventions to block draughts on social housing temperatures: A before and after study. *Kotuitui.* 2017;12(2):235–45.
14. Howden-Chapman P, Pierce N, Nicholls S, Gillespie-Bennett J, Viggers H, Cunningham M, et al. Effects of improved home heating on asthma in community dwelling children: Randomised community study. *Br Med J.* 2008;337(1411):852–5.
15. Howden-Chapman P, Matheson A, Crane J, Viggers H, Cunningham M, Blakely T, et al. Effect of insulating existing houses on health inequality: Cluster randomised study in the community. *Br Med J.* 2007;334(7591):460–4.
16. Keall M, Pierce N, Howden-Chapman P, Cunningham C, Cunningham M, Guria J, et al. Home modifications to reduce injuries from falls in the Home Injury Prevention Intervention (HIPI) study: A cluster-randomised controlled trial. *Lancet.* 2015;385(9964):231–8.
17. Keall MD, Pierce N, Howden-Chapman P, Guria J, Cunningham CW, Baker MG. Cost-benefit analysis of fall injuries prevented by a programme of home modifications: A cluster randomised controlled trial. *Inj Prev.* 2016;23(1):22–6.

18. Grimes A, Denne T, Howden-Chapman P, Arnold R, Telfar-Barnard L, Preval N, et al. *Cost benefit analysis of the Warm Up New Zealand Heat Smart Programme* [Internet]. Wellington (NZ): New Zealand Ministry of Economic Development; 2012 [cited 2018 May 30]. Available from: http://www.healthyhousing.org.nz/wp-content/uploads/2012/05/NZIF_CBA_report-Final-Revised-0612.pdf
19. Telfar-Barnard L, Bennett J, Howden-Chapman P, Jacobs DE, Ormandy D, Cutler-Welsh M, et al. Measuring the effect of housing quality interventions: The case of the New Zealand "rental warrant of fitness." *Int J Environ Res Public Health*. 2017;14(11):1352.
20. Bennett J, Howden-Chapman P, Chisholm E, Keall M, Baker M. Towards an agreed quality standard for rental housing: Field testing of a New Zealand housing WOF tool. *Aust N Z J Public Health*. 2016;40(5):405–11.
21. Wellington City Council. *Rental Warrant of Fitness for Wellington (Press release)* [Internet]. Wellington (NZ): The Council; 2017 [cited 2018 May 30]. Available from: <https://wellington.govt.nz/your-council/news/2017/08/rental-warrant-of-fitness>
22. Bierre S, Bennett M, Howden-Chapman P. Decent expectations? The use and interpretation of housing standards in tenancy tribunals in New Zealand. *N Z Univ Law Rev*. 2014;26(2):153–85.
23. Howden-Chapman P, Amore K, Bierre S, Chisholm E, Hamer-Adams A, Ombler J, et al. What effect will the 2015 budget have on housing? *Policy Q*. 2015;11(3):13–9.
24. Bierre S, Howden-Chapman P. Telling stories: The role of narratives in rental housing policy change in New Zealand. *Hous Stud*. 2017. <https://doi.org/10.1080/02673037.2017.136337>.
25. Blick G, Davies P. *Cost Benefit Analysis for a Minimum Standard for Rental Housing* [Internet]. Wellington (NZ): New Zealand Ministry of Business, Employment and Innovation; 2014 [cited 2018 May 30]. Available from: <https://www.hud.govt.nz/assets/Residential-Housing/Tenancy-and-Rentals/Cost-Benefit-Analysis-for-a-Minimum-Standard-for-Rental-Housing-Report.pdf>
26. Salmond C, Crampton P, Sutton F. NZDep91: A New Zealand index of deprivation. *Aust N Z J Public Health*. 1998;22(7):95–7.
27. Keall MD, Ormandy D, Baker MG. Injuries associated with housing conditions in Europe: A burden of disease study based on 2004 injury data. *Environ Health*. 2011;10:98.
28. Spiegel C, Lindaman F. Children can't fly: A program to prevent childhood morbidity and mortality from window falls. *Am J Public Health*. 1977;67(12):1143–7.
29. McDowall P. Open windows for dry home. *Build*. 2017;158:4–5.
30. Easton L. *Vapour Barrier or Underfloor Insulation?* [Internet]. Christchurch (NZ): Beacon Pathway; 2014 [cited 2018 May 9]. Available from: <http://beaconpathway.blogspot.co.nz/2014/01/vapour-barrier-or-underfloor-insulation.html>
31. McNeil S, Li Z, Cox-Smith I, Marston N. *Managing Subfloor Moisture, Corrosion and Insulation Performance*. Study Report No.: 354. Judgeford (NZ): BRANZ; 2016 [cited 2019 Feb 20]. Available from: https://www.branz.co.nz/cms_show_download.php?id=09c5e0976331eeb44c3e17a4a66a405fe43cb32c
32. Bennett J. Costs to reach minimum. *Build* [Internet]. 2016;157:77–8 [cited 2018 May 30]. Available from: <https://www.buildmagazine.org.nz/articles/show/costs-to-reach-minimum>
33. Hope J, Booth A. Attitudes and behaviours of private sector landlords towards the energy efficiency of tenanted homes. *Energy Policy*. 2014;75:369–78.
34. Ambrose A. Improving energy efficiency in private rented housing: What makes landlords act? *Indoor Built Environ*. 2015;24(7):913–24.
35. Stieß I, Dunkelberg E. Objectives, barriers and occasions for energy efficient refurbishment by private homeowners. *J Clean Prod*. 2013;48:250–9.
36. Wilson C, Crane L, Chryssochoidis G. Why do homeowners renovate energy efficiently? Contrasting perspectives and implications for policy. *Energy Res Soc Sci*. 2015;7:12–22.
37. Earl PE, Peng T. Home Improvements. In: Cameron S, editor. *Handbook on the Economics of Leisure*. Cheltenham (UK): Edward Elgar Publishing; 2011. p. 197–220.
38. Organ S, Proverbs D, Squires G. Motivations for energy efficiency refurbishment in owner-occupied housing. *Struct Surv*. 2013;31(2):101–20.
39. Energy Efficiency and Conservation Authority. *Funding for Insulation* [Internet]. Wellington (NZ): Government of New Zealand; 2018 [cited 2018 May 1]. Available from: <https://www.energywise.govt.nz/funding-and-support/funding-for-insulation/>
40. Energy Efficiency and Conservation Authority. *EECA Welcomes Government Investment in Warmer Kiwi Homes* [Internet]. Wellington (NZ): Government of New Zealand; 2018 [cited 2018 May 30]. Available from: <https://www.eeca.govt.nz/news-and-events/media-releases/eeca-welcomes-government-investment-in-warmer-kiwi-homes/>
41. South Taranaki District Council. *Warmer Homes Scheme* [Internet]. Hawera (NZ): STDC; 2018 [cited 2018 May 30]. Available from: <https://www.southtaranaki.com/Council/A-Z/W/Warmer-Homes-Scheme/>
42. Wellington City Council. *Rental Warrant of Fitness* [Internet]. Wellington (NZ): The Council; 2017 [cited 2018 May 8]. Available from: <https://wellington.govt.nz/services/rates-and-property/property/rental-warrant-of-fitness>