Towards an agreed quality standard for rental housing: field testing of a New Zealand housing WOF tool

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Abstract

Objective: Report on a field test of a rental housing warrant of fitness (WOF) to assess its practicality and utility for supporting improved quality of housing.

Methods: Five councils each recruited at least 25 rental houses to undergo a WOF assessment. The assessment included housing features that, based on a combination of research and practicality, were considered to have an important impact on health, safety and energy efficiency. Assessors were interviewed to get their feedback on the process. Landlords representing 81% of the rental properties were interviewed on their attitudes to the WOF.

Results: Of the sample of 144 houses, 94% failed at least one of 31 criteria. The most common reasons were: unsafe water temperature; no security stays; no smoke alarms; no fixed heating; and unsuitable handrails/balustrades. If items that required little (<NZ$100) or no financial cost were fixed, 44 extra houses (36%) would have passed.

Conclusions: All WOF items could be checked in a variety of dwellings. The houses had numerous health and safety defects, many of which could be rectified relatively easily at a low cost.

Implications: Implementing a rental housing WOF on a national scale has potential to improve the health and safety of tenants, as well as making energy efficiency gains. Future decisions on how to intervene to protect health and safety will be informed by data collected.

Key words: minimum housing standard, warrant of fitness, WOF, housing, health, safety, energy efficiency, injury

Substandard housing is a major public health issue in New Zealand.[1] According to the Energy Efficiency and Conservation Authority (EECA) about two-thirds of NZ dwellings are un-insulated and many are inadequately heated. As a result, many dwellings are colder than the minimum indoor temperature recommended by the World Health Organization (WHO).[2] The link between cold, damp and mouldy housing and poor health has been highlighted in several NZ studies.[3-5] Recently, a NZ coroner ruled for the first time that cold, damp conditions in a state-owned rental property could not be discounted as contributing to the death of a two-year-old child.[6] As well as contributing to ill health, poor quality housing increases injury rates.[7,8] Globally, around one-third of injuries occur in the home;[9] between June 2013 and June 2014, 46% of new claims to NZ's Accident Compensation Corporation (ACC) were as a result of injuries in the home.[10]

Several national surveys and research studies have shown that rental housing in NZ is in worse condition than owner-occupied housing.[11,12] This situation is mirrored in other countries; in 2012, the English Housing Survey reported that the private-rented sector had the highest proportion of non-decent homes (33%) while the social-rented sector had the lowest (15%). Meanwhile, 20% of English owner-occupied homes failed to meet the decent homes standard in 2012.[13]

NZ has seen a rapid rise in the number of people renting. The number of households living in a home they did not own increased from just over one-quarter in 1991 (26.2%) to more than one-third (35.2%) in 2013.[14] Households with low incomes are more likely to rent[15,16] and, of the 270,000 children who live in poverty, more than 70% live in rental accommodation.[17] Most rental accommodation in NZ is provided by private landlords. In 2006, 82% of all NZ households paying rent for the dwelling they occupied had private landlords.[18] In addition to private rentals, state housing offers low-cost rental housing to residents on low incomes. Housing New Zealand (HNZ), a Crown agent, manages around 69,000 state houses, and about 3,000 units are owned and managed by local councils or authorities.[19]

Current regulations regarding housing quality were last amended in 1947.[20] While tenants have a right to a dwelling in "a reasonable state of repair" that meets the 1947 regulations under the *Residential Tenancies Act 1986*, there are a number of disincentives to take cases to court, such as damaging the relationship with your landlord, possible rent increases and prohibitive court costs. Furthermore, cases on quality are inconsistently interpreted, as there is no exact definition for what a "reasonable sate of repair" means. In addition to these regulations, the *Health Act 1956* gives local authorities powers to require important housing-related illness and injury hazards to be remedied; however, these are not enforced and a definition of acceptable housing is not made explicit in the Act.[20] Newly built dwellings or upgrades to existing dwellings in NZ must comply with the Building Code, which is the first schedule to the Building Regulations 1992, but the Building Code does

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not apply to existing buildings and most rental properties are not new builds.

Many countries have already implemented minimum standards for housing. Historically, NZ has not had central government support to implement and enforce minimum standards for rental housing. However, in July 2015, the Government announced changes to the *Residential Tenancies Act* that will require all rental properties to retrofit ceiling and underfloor insulation (to 1978 standards) and install smoke alarms before July 2019 for private rentals and July 2016 for social housing.[37] One comprehensive system for managing private rental housing quality is the Housing Health and Safety Rating Scheme (HHSRS), which has been implemented in England and Wales.[21] This system applies across tenure types and seeks to raise standards of all housing by continually reducing risks to health and safety.

One approach to improve the quality of NZ rental housing is to introduce minimum standards for housing in the form of a rental warrant of fitness (WOF) that indicates the dwelling is suitable for occupancy prior to being rented. The WOF focuses on features that are supported by evidence to reduce unintentional injury in the home,[22] improve occupants' health status,[23,24] reduce school absences[25] and lead to greater household energy efficiency.[26] Furthermore, a rental housing WOF can be a source for collecting information on the quality of the rental housing stock, which NZ currently does not have. It is envisaged that if a WOF was to be implemented nationally, the assessments would be conducted by an independent trained assessor before a house was rented or, alternatively, every five years. The information would be held in a master database and could be made available to tenants through rental advertising sites, such as Trademe, or via Tenancy Services.

There is good evidence to support the introduction of rental housing standards to improve health, safety and energy efficiency. A NZ study reported that people who were classified as living in the poorest quality houses would have a 33% reduction in respiratory symptoms (relative risk 0.67 with 95%CI 0.53 to 0.85) if they lived in the best performing houses.[26] The NZ Housing, Insulation and Health Study of 1,350 houses showed that insulating houses improved the occupants' health and wellbeing, and household energy efficiency.[27] An evaluation of a large-scale insulation intervention found that the benefits of installing insulation exceeded the costs by a ratio of 5:1; the most significant contribution came from reduced mortality in older people.[28]

The relationship between injury and housing conditions is also well-established. An observational study of about 1,000 houses in NZ indicated that for each additional home injury hazard, there was a significant (22%) associated increase in the odds ratio of a home injury.[29] These results are consistent with reductions in fall rates of 26% found in a randomised controlled trial of NZ housing involving repairs to specified fall hazards.[22] This trial also identified the relatively modest repairs made to homes (averaging around NZ$560 per home) were highly cost effective according to WHO criteria.[22]

As a step towards improving the quality of existing housing in NZ, this paper reports on a field test of a rental housing WOF. The WOF was designed to be completed by an independent trained assessor in about one hour. To pass, a dwelling had to meet 31 criteria selected using evidence from a larger housing quality assessment tool – the Healthy Housing Index (HHI). The rental housing WOF aims to improve health and energy efficiency outcomes and reduce injuries in the home. Pragmatic decisions about the criteria included in the WOF were made by an advisory committee. While private and council-owned rental houses are the focus of this field test, it is envisaged that a housing WOF would apply to all dwellings in the future. This paper reports on the practicality and reliability of the WOF tool as well as discussing experiences of the assessors and landlords with the assessment process.

Table 1: Suggested sampling frame to ensure a variation in housing types.

	Auckland	Tauranga	Wellington	Christchurch	Dunedin
Pre 1920				Brick	Stone
1920-1949	Art deco		State house style	Arts and crafts	Roughcast
1950-1979	Lockwood	Tile roof	1970s or 1980s timber/ pole house	Brick and tile	Concrete unit
1980-present	2000s apartment	Fibre cement walls; "Quality" (Modern, high spec)	1990s Mediterranean		

Sample calculations prepared by Dr Lucy Telfar-Barnard, University of Otago, Wellington based on work that considered the typology of New Zealand housing.[12]

Methods

Fifty-four landlords volunteered to be part of the study, which involved having a WOF assessment of their rental properties. Each participating council was responsible for identifying and recruiting about 25 properties (to produce a sample of at least 125 homes) for the field test. As the aim was to test the practicality and utility of the WOF tool, recruitment was not intended to be representative of all NZ houses. Each council recruited at least 10 council-owned rentals and 15 private rentals. To ensure that the tool was tested on a range of housing types, a broad sampling frame based on previous research about the range of NZ housing types was used (see Table 1).[12] In each of the regions, the housing sample suggested was to include houses built prior to the 1920s, six built between 1920 and 1949, eight built from 1950 to 1979, and seven that had been built since 1980. Finally, each region was asked to include one each of three specific style or construction features (see Table 1).

Councils recruited landlords through property investor associations, property management companies, social housing providers and landlords known through personal networks. Each council was also responsible for identifying assessors with at least one year of experience in conducting house inspections to carry out the WOF assessments. Eight of the nine assessors attended training days run by the University of Otago, Wellington, and the New Zealand Green Building Council (NZGBC). The ninth received training in person on a different day. All nine assessors took part in a short recorded telephone survey to ascertain how practical they found the WOF tool and to get their feedback on the assessment process. Twenty-nine of the 54 landlords took part in a separate recorded telephone survey involving 27 open-ended questions to gauge their attitudes to having their house inspected, to gain their feedback on the WOF tool and assessment process and to determine their post-inspection intentions. These landlords represented 81% of the rental properties assessed.

Development of WOF

The WOF assessed 31 criteria (see the Supplementary file, available with the online version of this article) that are important for

the health and safety of the occupants and the energy efficiency of the dwelling. The HHI, which is a comprehensive housing quality assessment designed for NZ dwellings, was used as the basis for the development of the WOF. The HHI draws on the English and Welsh HHSRS. The HHI is a detailed research tool and, as such, is not practical for the routine inspection of houses. The rental housing WOF was developed by a committee including members from five collaborating city councils, the University of Otago, the NZGBC and the ACC. This group met numerous times over the period of a year to make pragmatic decisions about the rental housing WOF criteria. The interface between epidemiology and public policy required some trade-offs, with the importance of potential health and safety benefits being weighed against the acceptability and practicality of any remediation required to meet the criteria.

The rental housing WOF is more practical to implement than the HHI as it takes less time to conduct and there is less training involved. It also focuses more on housing features that can be remediated, rather than less-modifiable aspects. These were seen as important features for a rental housing WOF that could be rolled out nationally. In the same way as a car that has passed its roadworthiness inspection may not be perfect, but will be safe to drive, the rental housing WOF consists of a set of components which houses pass or fail, and which certify the health and safety of certain housing features. The WOF assessment was divided into eight areas: the kitchen and laundry; the bathroom and toilet; the living areas; the bedrooms; the entrance to the house; insulation (ceiling); insulation (underfloor); and general repair of the dwelling.

Criteria assessed that were important for health outcomes

The WOF required houses to have underfloor and ceiling insulation, as well as a ground vapour barrier. Insulated houses are warmer and have less mould than un-insulated homes.[2] Additionally, occupants of insulated dwellings report feeling warmer and healthier and have fewer days off school and work than people living in un-insulated homes.[30] The WOF also required surfaces inside the house to be clear of mould (a sign of inadequate ventilation and excess moisture). Mould is known to contribute to poor health; particularly respiratory illness for occupants.[30] A fixed form of heating was required in living rooms. Installing non-polluting, effective heating in the homes of children with asthma significantly reduces asthma symptoms, days off school, healthcare utilisation and visits to pharmacists.[23] While the WHO recommends a minimum temperature of 18°C to ensure healthy conditions, a study found that the average temperature in South Island living rooms was 17°C and nearly one-third of households had an average winter temperature in the living area below 16°C.[31]

Other criteria that were required for health reasons were adequate sanitation, a potable water supply and adequate drainage for waste water. To reduce dampness and moisture in the house, dwellings were required to be watertight and the ground under the dwelling to be free of ponding and surface water. Dwellings were required to be structurally sound, with no obvious indications of current or imminent movement or collapse. Some of the assessments, for example as to whether a house is structurally sound, could require additional expertise, such as from an engineer. The WOF assessment does not require a full structural analysis of a house. Rather, the assessor visually inspects the house to verify there are no obvious indications of movement, instability or collapse. This includes consideration of whether walls are straight (not bowed or sagging), the roof is straight (not sagging or collapsed), the floor is solid and level, and the dwelling has obvious damage, major degradation or missing joists. If the dwelling is considered structurally unsound the dwelling would fail the WOF and the assessor would recommend an inspection by a structural engineer.

Passing the WOF required windows to be able to be opened to provide ventilation. Adequate ventilation helps dwellings remain free of mould and damp. The oven and stove needed to function and there needed to be adequate food preparation and storage areas, so that occupants could prepare food safely and infestations of vermin could be minimised. Curtains were required for privacy and improved thermal performance. Water needed to be in a safe temperature range as water above 60°C can cause burns, and water below 50°C can harbour bacteria associated with legionnaires' disease.[32]

Criteria assessed that were important for safety outcomes

To evaluate the general state of repair of the dwelling, and to ensure no preventable trip hazards were present, assessors checked that the walls, ceilings and floor linings were intact. Dwellings required artificial lighting to reduce the incidence of falls and prevent the use of candles that introduce fire risks. Electrical fittings and lights were assessed for safety and functionality. To pass the WOF, dwellings had to have some form of secure storage to keep medicines and hazardous or toxic substances out of the reach of children. Windows that had an outside drop of 2 m or higher were required to have security stays (latches that limit how much a window can be opened) to prevent falls. Smoke alarms were required in each sleeping space or within 3 m of every sleeping space and at the escape route from any bedroom so that they were audible to sleeping occupants. As most NZ houses are constructed of wood, deaths from fires remain a serious problem; in the year to 30 June 2013, 38 people died in 34 fatal fires.[36]

Dwellings were required to have addresses clearly labelled so that emergency services would be able to locate and access the dwelling if needed. Handrails were required for all internal stairs and all outdoor steps that accessed the house, and all balconies and decks 1 m or more above ground level were required to have balustrade to the current NZ Building Code. Dwellings were required to have two forms of egress. Assessors checked for any obvious slip hazards, including moss or slippery surfaces on decks and pathways immediately adjacent to the dwelling.

Data collection and analysis

Assessors collected the rental housing WOF field test data on a paper form that was divided into eight sections, which matched a typical walk around a house. These forms were sent electronically to the first author and entered into an excel database. Data (assessment forms) were cleaned and analysed using R version 3.0.3 (www.r-project.org).

Ethics

Ethics approval was gained from the Department of Public Health, University of Otago's Human Ethics Committee. This ethics approval is required if the research involves human participants, but does not require personal information, involve minors, or inflict any form of physical or psychological stress. As part of the approved protocol, landlords and tenants were required to sign informed consent forms.

Results

Five councils took part in the rental housing WOF field test. A total of 144 dwellings, owned by 54 landlords, were assessed: 34 in Auckland, 25 in Tauranga, 39 in Wellington, 22 in Christchurch, and 24 in Dunedin (Table 2). While the field test did not aim to be representative of all NZ rental housing, each council included a mixture of construction ages – from those built in 1880 to those built in 2013 – to ensure the sample included a range of dwelling styles. The average year the dwellings were built was 1968. The dwellings sampled in Tauranga were significantly newer than the other regions.

Dwelling sizes ranged from 30 m^2 to 220 m^2 with an average dwelling size of 91 m^2. The average size of a dwelling in NZ is 149 m^2.[33] Dwelling sizes were likely to be smaller than the average NZ dwelling as almost one-third (31%) of the sample had one bedroom. This may be because rental houses tend to have fewer bedrooms than housing that is owner-occupied or in a family trust.[34] However, 22% of the sample had more than three bedrooms, 27% had three bedrooms and one-fifth (20%) had two bedrooms.

Most dwellings (78%) were single-storey buildings, but the sample included two-storey (20%) and three-storey (2%) dwellings. The majority (46%) were standalone dwellings (detached); 35% were duplex, 10% were terraced and 9% were apartments. The time spent undertaking the WOF assessment ranged from 15 minutes to 200 minutes (this was an outlier), with an average of 51 minutes and median of 45 minutes. There were no significant differences between the inspection times in the different regions.

Variations between assessors

It was important to test whether the WOF was able to be applied consistently by assessors. WOF assessments were conducted by a number of different assessors in a sub-sample of 10 dwellings. In the sample of 10 houses, all assessors had 100% agreement on whether the dwelling passed or failed. Overall, there was 95% agreement on whether particular checklist items passed or failed between the different assessors doing the multiple assessments. The Fleiss kappa-statistic measure of agreement shows that houses 1, 3, 5, 6, and 8 had a substantial agreement between the three assessments conducted by three different assessors, while house 4 had a moderate agreement and the remaining houses 2, 7, 9 and 10 had almost perfect agreement. The overall inter-rater reliability between each item assessed was 0.89. This indicated that the consistency across the assessors was in strong agreement (Table 3).

Experience of assessors

All nine assessors were interviewed by telephone to gain their feedback on the WOF training, content, and assessment process. The recorded interview involved a set of 18 open-ended questions. Six of the eight assessors who attended the training day felt that the training prepared them well to conduct the housing WOF assessments. The one who felt they needed additional training did not have as much previous building inspection experience as the other assessors. Most assessors felt comfortable about explaining the rationale behind the inclusion of criteria in the WOF.

About half the assessors stated that the WOF included all that was needed; other assessors suggested a wide variety of additional criteria. Two felt that all criteria of the WOF were appropriate, we noted that there needed to be qualifications/details around each criteria to help the assessors understand the need for inclusion. The criteria most noted as being problematic for inspection were security stays, with five of nine assessors saying that they were not appropriate for all windows. Individual assessors also questioned the inclusion of curtains, light-bulbs, smoke-alarm batteries and water temperature in the WOF. Some assessors had difficulty deciding whether checklist items should pass or fail due to the lack of detail in the assessment manual. Half the assessors thought that the WOF assessment gave a "fair and accurate assessment" of the quality of the houses.

Assessors for the most part were happy with the inspection form and found it easy to fill out. However, they saw many advantages in an iPad version. Estimates of costs for WOF assessments ranged from NZ$200 to NZ$300, including a re-inspection that would be required if the dwelling failed. Most assessors reported that they would be happy to change smoke alarm batteries and light bulbs or adjust the hot water temperature if this was required for a dwelling to pass a WOF. Most assessors gave landlords additional information on housing and health services available to them, such as insulation subsidies. All the assessors said they supported the idea of a housing WOF to assess housing quality and said that it should be mandatory.

Landlord feedback

Twenty-nine of the 54 landlords who took part in the field test were interviewed by telephone to obtain their feedback on the rental housing WOF. The interviews revealed that the dwellings in the field test sample had been substantially improved prior to the WOF assessment; almost half (49%) of the landlords interviewed had installed insulation or heating.

More than three-quarters (76%) of landlords thought that the WOF provided a clear and accurate assessment of the quality of their rental property. Landlords disagreed with some of the components of the WOF. The least popular criteria assessed in the rental housing WOF for landlords were window stays, balustrades and smoke alarms. Most landlords (83%) intended to make

Table 2: Demographics.

Region	Number of dwellings	Dwelling age mean (range) years	Dwelling size mean (range) m^2	Length of time to conduct assessment mean (range) minutes
Auckland	34	1973 (1950-2013)	77 (30- 150)	41 (15-95)
Christchurch	22	1967 (1930-1993)	71 (40-200)	43 (15-200)
Dunedin	24	1959 (1880-2009)	109 (50-200)	60 (25-130)
Tauranga	25	1992 (1960-2013)	109 (35-200)	59 (25-160)
Wellington	39	1957 (1900-1998)	93 (40-220)	52 (15-100)
Total sample	144	1968 (1880- 2013)	91 (30- 220)	51 (15-200)

Table 3: Multiple WOF assessments on the same houses by different assessors.

House number	Number of assessments conducted by different assessors	% agreement	Fleiss kappa
1	3	95%	0.79
2	3	96%	0.84
3	3	97%	0.62
4	3	95%	0.59
5	3	92%	0.73
6	3	95%	0.80
7	3	100%	0.98
8	3	96%	0.71
9	2	92%	0.90
10	3	96%	0.89

improvements to the house/s after the WOF assessment; however, for more than one-third of landlords, these improvements were already planned prior to the WOF assessment. Some (12%) of the private landlords said that they would put up the rent as a result of improvements made to the dwelling.

Checklist items that passed or failed the rental housing WOF field test

Of the 144 dwellings assessed in this rental housing WOF field test, eight passed (6%) and 136 dwellings (94%) failed. This high fail rate was expected. We would predict it to be even higher in other rental houses in NZ. As this was a voluntary study, it is likely that the landlords involved were interested in rental housing quality issues and therefore more likely to maintain their rental properties than other landlords. The high fail rate is an indication of the poor quality of rental housing in NZ. To pass the WOF, a dwelling had to meet 31 criteria; these criteria were divided into 63 possible checklist items. For example, the ceiling insulation criteria were assessed using five checklist items, including adequacy of coverage and thickness. Not all dwellings were required to pass all the checklist items, as some items were not applicable. Dwellings assessed failed five of the 63 possible items most often. Some dwellings failed up to 27 checklist items. The results in Tables 4, 5 and 6 are sorted by health, safety and energy efficiency outcomes.

Checklist items assessed in the WOF related to health outcomes

Fourteen per cent of dwellings failed at least one component of the ceiling insulation inspection. The most common reasons for failing were not having insulation to the 120 mm requirements (29%) or having gaps, tucks or folds in the insulation (22%). Twenty-two per cent of houses failed one or more checklist items within the underfloor insulation component. The most common reason was the absence of a ground vapour barrier (61%) in those dwellings that required one (61 dwellings out of the 144 sample), see Table 4.

More than one-third of dwellings (37%) did not have a fixed form of heating. Eight dwellings (6%) of the houses that failed the rental housing WOF field test (136 houses) did so exclusively because they had inadequate fixed heating. Suitable curtains or drapes were present in the living areas of almost all dwellings (94%). Almost all houses were clear of mould in the kitchen (99%) and the living room (99%). The large majority of houses had bathrooms (92%) and bedrooms (93%) free of mould. All houses had a potable water supply, most had a functioning stove and oven (96%), and almost all (99%) had adequate food preparation and storage areas. The large majority of houses had effective ventilation to the outside of the kitchen (92%) and the bathroom (93%). All dwellings had functional sewerage disposal and almost all dwellings had appropriate waste water drainage with a sound connection (99%). Almost all dwellings had an operational toilet (99%) and a functioning bath or shower (99%).

Checklist items assessed in the WOF related to safety outcomes

One of the most common reasons for a house to fail the WOF was that it had water that was too hot or cold with 40% of houses failing the kitchen water temperature check. Of the 136 houses that failed the WOF, 4% did so solely because the water was too hot or too cold. Water temperatures ranged from zero (those houses without power) to 70°C. The average temperature of hot water in the houses was 54°C, which was within the passable range of 55±5°C. Visibly safe power outlets and light switches were present in 98% of bathrooms and kitchens; 99% of living rooms and 100% of bedrooms. All kitchens inspected had wall, ceiling and floor linings intact, while 99% of living rooms, bathrooms, and bedrooms had intact walls, ceilings and floors (Table 5).

The majority of houses had opening windows with secure latches in the living rooms (97%), bedrooms (98%) and bathrooms (97%). Thirty-eight per cent (38%) of dwellings failed for not having security stays where required in the living area. However, fewer than 1% failed the housing WOF solely because they lacked adequate security stays. Almost all had working artificial lighting – living rooms (100%), bedrooms (100%), bathrooms (100%), and kitchens (99%) – however, 26% of stairwells did not have working artificial lighting. Thirty-one per cent of dwellings did not have adequate handrails and balustrades and 63% of dwellings did not have a suitably placed working smoke alarm. All dwellings assessed had securely locking doors and 86% of dwellings had their address clearly labelled and the dwelling was easily identifiable. A total of 87% of dwellings had working outdoor lighting at their front doors.

Checklist items assessed by the WOF related to improved energy efficiency

Some of the criteria in the WOF were associated with multiple benefits, such as improving the health outcomes of the occupants as well as the dwelling's energy efficiency. Therefore, some of the 63 checklist items associated with improved energy efficiency are reported above in the health and safety outcomes. The houses in this sample were in generally good repair, with 99% having the house envelope in reasonable repair and weather tight; 98% had no cracks or holes in the roof or windows (Table 6).

Discussion

This field test of a proposed rental housing WOF showed that the 63 checklist items included could be practically checked in a variety of NZ dwellings. In this sample, there were large numbers of health and safety defects. The five most common failures were: unsafe water temperature; lack of security stays; no smoke alarms near bedrooms; handrails or balustrades not up to the current Building Code Standards; and not having a fixed efficient form of heating. However, many of these items could be easily rectified

Table 4: Checklist items assessed in the housing WOF associated with health outcomes.

Component assessed	Number of houses (144)	Pass
Heating, fixed, effective and safe – lounge	143	63%
Surfaces clear of mould – kitchen	144	99%
Surfaces clear of mould- bathroom	144	92%
Surfaces clear of mould – lounge	144	99%
Surfaces clear of mould – bedroom	135	93%
Functioning stove and oven	140	96%
Effective ventilation to the outside – kitchen	144	92%
Effective ventilation to the outside - bathroom	144	93%
Adequate food preparation and storage	144	99%
Potable water supply	144	100%
Waste water drain with sound connection – bathroom	144	99%
Waste water drainage with sound connection – kitchen	144	99%
Operational toilet	144	99%
Sewage connection functional	144	100%
Functioning bath or shower	144	99%
Curtains/drapes present – bedroom	132	94%
Curtains/drapes present – lounge	144	94%
Spouting and storm-water functioning and not leaking	135	93%
Non-potable water labelled	59	100%

at a relatively low-cost (<NZ$100), for example, by correctly installing smoke alarms and security stays on windows, and adjusting water temperatures to a safe range.

Implementing a rental housing WOF on a wide scale has great potential to improve the health and safety of the occupants as well as making energy efficiency gains in NZ housing. The low-cost fixes involving smoke alarms, window stays and water temperature could prevent house fires, injuries caused by children falling out of windows and burns caused by hot water.[32] Other criteria, such as insulation, fixed forms of effective heating and handrails/balustrade, are higher-cost (>NZ$1,000) but have multiple long-term benefits.

Table 5: Checklist items assessed in the housing WOF associated with safety outcomes.

Component assessed	Number of houses (144)	Pass
Working artificial lighting:		
Living, lounge, dining	136	100%
Hallway	104	96%
Stairs (switch at each end)	32	84%
Other	15	100%
Working artificial lighting- bathroom	140	100%
Working artificial light – bedroom	133	100%
Working artificial lighting – kitchen	139	99%
Working artificial lighting - entrance	135	87%
Visibly safe power outlets and light switches – kitchen	144	98%
Visibly safe power outlets and light switches – bathroom	139	98%
Visibly safe power outlets and light switches – lounge	136	99%
Visibly safe power outlets and light switches – bedroom	135	100%
Wall and ceiling linings, and floor intact – lounge	144	99%
Wall and ceiling linings, and floor intact - bathroom	144	99%
Wall and ceiling linings, and floor intact – bedroom	134	99%
Wall and ceiling linings, and floor intact – kitchen	142	100%
Opening window, with latch – bedroom	141	98%
Opening window (each area) with secure latch - lounge	143	97%
Opening window (each area) with secure latch - kitchen	143	97%
Glass doors include visibility strips	108	93%
Handrails and balustrades to code	101	69%
Paths, decks and surfaces non-slippery/free from moss	141	99%
Secure storage (1.2 m high or child-safe lock)	144	98%
Two effective methods of egress	139	94%
Address clearly labelled	140	86%
Secure locking front door	143	100%
Smoke alarm within 3m – bedroom	135	63%
Window security stays (if required) – bedroom	125	62%
Window security stays (if required) – lounge	125	62%
Hot water temperature at tap (55±5ºC)	135	60%

Strengths and limitations

A major strength of this research was assessing the practicality and utility of a housing WOF tool, which has not been done in NZ before. This translational research had a high level of engagement with the end-users (assessors and landlords). It also combined evidence-based tools developed by the University of Otago with the more operational expertise of the NZGBC, ACC and councils. While NZ has some mechanisms to improve the quality of housing, such as the *Residential Tenancies Act 1947*, the Building Code and the *Health Act 1956*, these regulatory approaches have a number of limitations to improving the quality of existing rental housing, as they are out-dated, not enforced or only apply to 'new builds'. A housing WOF would address the quality of rental dwellings and in time could be extended to include owner-occupied dwellings.

This field test had a number of limitations. This was a relatively small field test and the properties that were included were deliberately selected to provide a range of settings rather than a representative sample. Furthermore, landlords who volunteered were likely to be the most motivated and responsible landlords, which may mean that the rental houses in this sample were of a higher quality than many rental houses in NZ. More than half (63%) of the landlords involved in the study reported that they had already made improvements to their rental homes prior to the field test. Consequently, it is not possible to generalise these findings to the state of rental properties in NZ as a whole. The WOF is a concise checklist focussed on minimal standards across a fairly limited but scientifically and functionally important set of housing features. It is not intended to act as a substitute for the kind of comprehensive housing condition assessment that is usually required for research studies, such as the Healthy Housing Index[35] and the House Conditions Survey.[11]

Table 6: Checklist items assessed in the housing WOF associated with multiple outcomes (energy efficiency, health and safety).

Component assessed	N	Pass
Envelope in reasonable repair and weather tight	143	99%
No cracks, holes in roof	136	98%
No cracks, holes in external cladding	141	95%
No cracks, holes or missing panes in windows	144	99%
Structurally sound	141	99%
Ceiling insulation to requirements (120 mm)	123	71%
No gaps, tucks, or folds – ceiling	113	78%
No dampness in insulation – ceiling	113	98%
Clearance from lights, ducts and roof – ceiling	114	90%
Thermoplastic insulated cabling	115	95%
Underfloor insulation to requirements	79	72%
Dry underfloor	74	93%
Ground vapour barrier	61	39%
No ponding – underfloor	71	97%

Implications/next steps

As a result of feedback from assessors about the practicality of the rental housing WOF assessment, some elements of the assessment – such as security stays – have been changed. Further information has been added to the assessors' manual to better explain and clarify some items.

The next step is to conduct a quasi-experimental implementation trial, for which funding has been obtained from the New Zealand Health Research Council. Such a policy trial will measure both intended and unintended consequences, such as effects on rental supply and prices, landlord behaviour and tenant mobility. The proposed design involves comparing a region in which the rental housing WOF has been rolled out with a similar region where the WOF has not yet been introduced. Comparisons will be made of rental movements before and after the introduction of the WOF, the effect on the quality of the rental stock and the extent this is reflected in the value of the property. The effect on the tenants will be measured by comparing changes to average tenancy duration, and analysing data on hospitalisations and pharmacy visits.

Future decisions about how to best intervene to protect the health and safety of New Zealanders in their homes could use the information gathered on housing quality through the implementation of a housing WOF and enable a cost/benefit analysis of this policy. It is envisaged that once a housing WOF is implemented, it would evolve over time as dwellings are brought up to a minimum health and safety standard.

Conclusion

This field test has shown that a rental housing WOF is a practical tool that enables assessors

to establish in less than an hour whether houses are essentially safe and suitable to be occupied. The 31-criteria assessment covers the most important health, safety and energy efficiency features that establish whether a dwelling is habitable. By using this rental housing WOF tool landlords can be made aware of improvements that are required to bring a dwelling up to a safe and healthy standard. A roll-out of the WOF has great potential to lift the standard of NZ's private rental housing stock and improve health and safety outcomes for occupants. Given that such upgrades have been shown to be highly cost-effective, implementing such a tool makes sense for economic as well as health, safety, and sustainability reasons. As we have noted previously, there are no major technical barriers to implementing an effective quality rating scheme for NZ rental housing.[35] The main elements needed now are high-level policy commitment and resources to coordinate its implementation.

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References

1. Howden-Chapman P, Carroll P, editors. *Housing and Health: Research, Policy and Innovation*. Wellington (NZ): Roger Steele; 2004
2. Howden-Chapman P, Crane J, Matheson A, Viggers H, Cunningham M, Blakely T, et al. Retrofitting houses with insulation to reduce health inequalities: Aims and methods of a clustered, randomised community-based trial. *Soc Sci Med*. 2005;61:2600-10.
3. Jaakkola JJK, Hwang B-F, Jaakkola MS. Home dampness and moulds as determinants of allergic rhinitis in childhood: A 6-year, population-based cohort study. *Am J Epidemiol*. 2010;172(4):451-9.
4. Howden-Chapman P, Pierse N, Nicholls S, Gillespie-Bennett J, Viggers J, Cunningham M, et al. Effects of improved home heating on asthma in community dwelling children: Randomised community study. *Br Med J*. 2008;337:852-5.
5. Bonnefoy X, Braubach M, Moissonnier B, Monolbaey K, Robbel N. Housing and health in Europe: Preliminary results of a pan-European study. *Am J Public Health*. 2003;93:9:1559–63.
6. Miller C. Damp House Lead to Toddler's Death. *NZ Herald* [Internet]. 2015 [cited 2015 Jun12];June 4. Available from: http://www.nzherald.co.nz/nz/news/article.cfm?c_id=1&objectid=11459813
7. Phelan KJ, Khoury J, Xu Y, Liddy S, Hornung R, Lanphear BP. A randomized controlled trial of home injury hazard reduction: The HOME Injury Study. *Arch Pediatr Adolesc Med*. 2011;165(4):339-45.
8. 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.
9. Turner S, Arthur G, Lyons RA, Weightman AL, Mann MK, Jones SJ, et al. Modification of the home environment for the reduction of injuries (Cochrane review). In: *The Cochrane Database of Systematic Reviews;* Issue 2, 2011. Chichester (UK): John Wiley; 2011.
10. Accident Compensation Corporation. *Injury Statistics Tool* [Internet]. Wellington (NZ): ACC; [cited 2015 Jun 15]. Available from: http://www.acc.co.nz/about-acc/statistics/injury-statistics/index.htm#results
11. Buckett NR, Marston NJ, Saville-Smith K, Jowett JH, Jones MS. Preliminary BRANZ 2010 House Condition Survey Report – Second Edition. BRANZ Study Report 240. Judgeford (NZ): BRANZ; 2011.
12. Telfar-Barnard L. *Home Truths and Cool Admissions: New Zealand Housing Traits and Excess Winter Hospitalisation* [PhD Thesis]. Dunedin (NZ): University of Otago; 2010.
13. Department for Communities and Local Government. *English Housing Survey Deadline Report, 2012-2013*. London (UK): Government of United Kingdom; 2014.
14. Statistics New Zealand. *2013 Census Map, Tenure of Household* [Internet]. Wellington (NZ): Government of New Zealand; 2013 [cited 2015 Jan 25]. Available from: http://www.stats.govt.nz/statsmaps/home.aspx
15. Baxter J, McDonald P. *Trends in Home Ownership Rates in Australia: The Relative Importance of Affordability Trends and Changes in Population Composition*. Melbourne (AUST): Australian Housing and Urban Research Institute; 2004.
16. Morrison P. *On the Falling Rate of Home Ownership in New Zealand*. Wellington (NZ): Centre of Housing Research Aotearoa New Zealand; 2008.
17. Bryan Perry. *Household Incomes in New Zealand; Trends in Indicators of Inequality and Hardship*. Wellington (NZ): Ministry of Social Development; 2014.
18. Statistics New Zealand. *Housing Indicators, Indicator 14, Landlords* [Internet]. Wellington (NZ): Government of New Zealand; 2008 [cited 2015 Jan 28]. Available from: http://www.stats.govt.nz/browse_for_stats/people_and_communities/housing/housing-indicators/14-landlords.aspx
19. Statistics New Zealand. *Housing Indicators, Indicator 15: Landlords.* [Internet]. Wellington (NZ): Government of New Zealand; [cited 2016 Mar 4]. Available from: http://www2.stats.govt.nz/domino/external/web/prod_serv.nsf/Response/Indicator+15:+Landlords
20. Bierre S, Bennett M, Howden-Chapman P. Decent expectations? The interpretation of housing quality standards in tenancy tribunals in New Zealand. *N Z Univ Law Rev*. 2014;26(2):153-85.
21. Ormandy DA. Health Based Approach to the Assessment of Unsatisfactory Housing - the UK's Housing Health & Safety Rating System. *Proceedings of the World Health Organisation Housing and Health Symposium*; 2002; Forli, Italy.
22. Keall M, Pierse 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.
23. Howden-Chapman P, Pierse 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;337:852-5.
24. Gillespie-Bennett J, Pierse N, Wickens K, Crane J, Howden-Chapman P, Housing Heating and Health Study Research Team. The respiratory health effects of nitrogen dioxide (NO_2) in children with asthma. *Eur Respir J*. 2011;38(2):303-9.
25. Free S, Howden-Chapman P, Pierse N, Viggers H, Housing Heating and Health Study Research Team. More effective home heating reduces school absences for children with asthma. *J Epidemiol Community Health*. 2010;64(5):379-86.
26. Keall MD, Crane J, Baker MG, et al. A measure for quantifying the impact of housing quality on respiratory health: A cross-sectional study. *Environ Health*. 2012;11:33.
27. Howden-Chapman P, Crane J, Chapman R, Fougere G. Improving health and energy efficiency through community-based housing interventions. *Int J Public Health*. 2011;56(6):583-8.
28. 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* [Report]. Wellington (NZ): Motu Economic and Public Policy Research; 2011.
29. Keall MD, Baker M, Howden-Chapman P, et al. Association between the number of home injury hazards and home injury. *Accid Anal Prev*. 2008;40(3):887-93.
30. Howden-Chapman P, Matheson A, Crane J, Viggers H, Cunningham M, Blakely T, et al. Retrofitting houses with insulation to reduce health inequalities: Results of a clustered, randomised trial in community settings. *Br Med J*. 2007;334:460-4.
31. Isaacs N, Camilleri M, Burrough L, Pollard A, Saville-Smith K, Fraser R, et al. *Energy Use in New Zealand Households: Final Report on the Household Energy End-use Project (HEEP)* Judgeford (NZ): BRANZ; 2010.
32. Stanwick RS. Balancing the risks: Legionella pneumophila pneumonia and tap water scalds in the home. *CMAJ*. 1986;135(11):1251-2.
33. QV.co.nz. *Average House Size by Area* [Internet]. Auckland (NZ): Quotable Value Limited; 2015 [cited 2015 Jun 17]. Available from: https://www.qv.co.nz/resources/news/article?blogId=61
34. Statistics New Zealand. *Census QuickStats about Housing* [Internet]. Wellington (NZ): Government of New Zealand; 2013 [cited 2015 Jun 10]. Available from: http://www.stats.govt.nz/Census/2013-census/profile-and-summary-reports/quickstats-about-housing/households-who-rent.aspx
35. Gillespie-Bennett J, Keall M, Howden-Chapman P, Baker MG. Improving health, safety and energy efficiency in New Zealand through measuring and applying basic housing standards. *N Z Med J*. 126:74-85.
36. The New Zealand Fire Service. *Emergency Incident Statistics: 2012-2013*. Wellington (N): Government of New Zealand; 2014.
37. Beehive.govt.nz. *Tenancy Law Changes to Include Insulation and Smoke Alarm Requirements* [Internet]. Wellington (NZ): Government of New Zealand; 2015 [cited 2015 Aug 19]. Available from: https://www.beehive.govt.nz/release/tenancy-law-changes-include-insulation-and-smoke-alarm-requirements.

Supporting Information

Additional supporting information may be found in the online version of this article:

Supplementary Appendix 1: Rental Housing WOF checklist.