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Abstract

Housing problems, such as affordability, poor quality of condition, or damp are key determinants of health and wellbeing. Importantly though, a growing body of research has shown that unhealthy housing is the combined result of multiple housing problems acting together. Although the spatial distribution of discrete housing problems is well established, little is known of Australia's geography of unhealthy housing. We have previously defined and validated an Australian Index of Housing Insults, which captures the multiple ways in which housing adversely influences individual health—including, but not limited to, people's tenure security, affordability, quality, and neighbourhood characteristics. Using the Household Income and Labour Dynamics in Australia (HILDA) dataset, a nationally representative longitudinal survey of Australian households, this paper describes Australia's geography of unhealthy housing. The analysis examines the prevalence, characteristics, and distribution of the population who are vulnerable to unhealthy housing. Our findings reveal both a worsening landscape of households at risk because of their accommodation, and a changing pattern of unhealthy housing in Australia over time. The paper considers how these findings may impact future policy settings and the potential to improve the health of Australia's population through targeted housing interventions.

Keywords: *health; housing; population; longitudinal data; spatial patterns; Australia*

Introduction

Across the globe researchers and policy makers have acknowledged that housing can adversely impact the health of individuals, households, and communities (Baker *et al.*, 2014; Beer, *et al.* 2011) but it has received relatively little attention in Australia. This may be because our housing stock is considered to be comparatively youthful (Paris 1993) and in good condition. Our climate is also relatively mild, thereby minimising cold and damp problems across most of the country. Where poor housing conditions are recognised, the research is noticeably broad (Waters 2001) or focuses on a particular population subgroup. Herein lies the opportunity to acknowledge other at-risk groups and better understand the interplay between housing problems. Researchers and policy makers considering this issue can draw on the work of Ulrich Beck (1992) and his writings on risk within the era of modernity. Beck argued that in traditional societies individuals faced risks associated with their natural environment but in the modern era many of these risks are now controlled, and instead households are confronted by socially-derived risks—redundancy, absence of food, or housing deficit, through poverty, social unrest, and associated problems. This research therefore seeks to explore how unhealthy housing can be understood as an outcome of social and economic processes rather than of environmental conditions.

The impact of housing on the health of Aboriginal and Torres Strait Islanders is well acknowledged (for example McDonald *et al.*, 2010; Neutze, 2000; Torzillo *et al.*, 2008; Vos *et al.*, 2009). Importantly however, unhealthy housing is a problem that extends far beyond the Indigenous population. Recently, Professor Sir Michael Marmot drew attention to Australia's national myopia on this issue, using his Boyer Lecture to compellingly link the

health of Australians with the social conditions in which they are 'born, grow, live, work and age' (Marmot, 2016, np). Both Marmot and the World Health Organization (CSDH, 2008) champion the social determinants of health framework, insisting that we need to understand the upstream bundle of social conditions such as housing, geography, employment and education in order to respond effectively to health inequalities.

Housing markets have their own distinctive geography, which can exacerbate or reduce the influence of housing on health. There is a pressing need to better understand how housing interacts with local conditions to reshape the health of the population, as these impacts carry significant implications for public sector budgets, the planning for the nation's future housing stock, and for the delivery of public health programs. This paper sets out to shed light on these issues by focusing first on how we can both understand and measure the impact of housing on health. The paper then presents the results of the analysis of data from the Household Income and Labour Dynamics in Australia dataset (HILDA) and pays attention to the spatial impacts of adverse housing market conditions. Finally, the implications of spatial variation in housing conditions for state and national policy are discussed, as well as future research needs.

Conceptualising and measuring the impact of housing on health

While it is convenient to think of the social determinants of health as defined and measureable, too often they are not acknowledged as important because their role in adversely affecting health has not been widely accepted and readily measured. Housing, for example, may well be an 'important social determinant of health' (Mason *et al.*, 2013, p.91),

but any attempt to measure this determinant quickly leads to definitional problems. By housing, do we mean housing affordability (and how do we measure it?) or are we discussing the quality of the stock? Do we mean residential insecurity, and if so, is that determined by the number of mortgagee or tenant evictions each year (Berry *et al.*, 2010; Slatter & Beer 2003), the incidence of precarious housing (Beer *et al.*, 2015) or the number of persons using homelessness services (AIHW 2018)? Finally, should such measures focus on the role of housing in providing access to essential services and is this a key determinant of health? The answer is that it can be all of these things (and more), taken together, in an individualised and subjective "bundle" of unhealthy housing.

The concept of a housing bundle is not new. It has been used by geographers and other social scientists to describe the collection of housing components affecting individual lives, for at least five decades (for example Clark & Dieleman, 1996; Galster, 2001; Kain & Quigley, 1970). This concept aims to reflect the diverse roles of housing in our lives, providing shelter, but also as a conduit for employment and social relationships, alongside wealth creation and transfer, and a main household expenditure. It is an attempt to capture in theory, and sometimes methodology, the combined effect of the housing choices, history, resources, and limitations possessed by individuals and their households. Implicit in the idea of a housing bundle is the important notion that the components of each bundle act in combination (Baker & Lester, 2017). Households may be able to adjust to separate, isolated housing problems (for example, poor housing affordability may be addressed by adjustments to the household budget or rental costs) and have negligible health and wellbeing effects. Multiple problems however, are much more challenging: for example, households experiencing unaffordable

housing, in combination with residential insecurity, and poor internal dwelling conditions have a higher likelihood of experiencing negative effects on their health and wellbeing. Our previous work (Baker *et al.*, 2017) has shown a very significant association between the extent of multiple housing problems and poorer health outcomes. Here, even after accounting for confounding and compositional bias, we found evidence of a strong relationship between the extent of housing problems, and general health, mental health, and diagnosis of clinical depression.

The housing bundle conceptualisation is important to the way that we formulate responses to housing problems. Policy responses which focus on separate, distinct problems (for example housing affordability assistance alone) may often be inappropriate, targeting the bulk of assistance to households with very few housing problems. The concept of a housing bundle suggests a shifting focus for policy, from intervening on separate housing problems, to understanding that some households are at greater risk of experiencing compound housing problems and resultant adverse health effects. Addressing this complex situation of managing a risk that is evident over the long term and which finds expression in many ways, challenges both the existing policy settings and the broader Australian housing system (Paris, 1993). New, more comprehensive approaches to the management of Australia's housing have the potential to make a significant impact on the health and wellbeing of people in the lower end of the housing market where problems often accrue.

Our previous work proposed and tested a means by which to assess unhealthy housing within a population—one that captures the *combined and interrelated* influence of multiple (rather

than individual) housing-generated vulnerabilities. In this initial work, we developed an Index of Housing Insults, representing people's relative exposure to unhealthy housing (Baker *et al.*, 2017). In this current study, we build upon that earlier work.

Using 16 annual waves of a nationally representative dataset, the Household Income and Labour Dynamics in Australia dataset (HILDA), we first examine the geography and prevalence of unhealthy housing for the Australian population. We then explore which groups are most vulnerable, to answer the following questions: How many Australians live in unhealthy housing? Who lives in unhealthy housing? What is the geography of unhealthy housing in Australia? Where are the problems most acute? How has this distribution changed in the past two decades?

Materials and methods

The analysis described in this paper uses the Household, Income and Labour Dynamics in Australia (HILDA) Survey, a longitudinal and representative panel that has annually tracked approximately 18,000 Australians and their households since 2000. HILDA collects broad social and economic data, such as housing, employment, and family formation. The most recent published data were collected in 2016. The methodology and background are detailed in Summerfield *et al.* (2011) and Wooden & Watson (2007).

To explore our research questions, we examined the combined impact of multiple components of housing on individual Australian's health and wellbeing. We developed and

applied a new composite metric, which we have referred to as the Australian Index of Unhealthy Housing (AIUH). Previous work developed an Index of Housing Insults (IHI) to capture the extent and effect of multiple housing problems on the health and wellbeing of individuals. As described in Baker *et al.* (2017), that work was based on detailed data on housing conditions contained in an Australian survey of Housing and Wellbeing (HWS) (see also Beer *et al.*, 2011), from which we constructed a multi-dimension index of unhealthy housing. The index spanned five domains: affordability, security, quality, residential location, and, accessibility. While relatively large (n = 640), the HWS dataset was collected in South Australia, and available for just two consecutive waves (2008 and 2013).

Using the IHI index as a foundation, the current analysis applied weights estimated from the associations between population characteristics and likelihood of being in unhealthy housing from the HWS data to 16 annual longitudinal waves of the HILDA dataset. We undertook a linear regression model in the HWS with the Index as the dependent variable and a number of selected independent variables, and we then extracted regression coefficients (weights). Utilising the weights from the previous data, we generated a linear additive AIUH for the Australian population. The regression weights were then applied to individuals aged 18 to 89 in HILDA (on a wave by wave basis). Variables (that is, causal indicators) used for construction of the AIUH capture marital and household status, education and employment, general health, carer and disability status, education, English speaking background, residential mobility, and labour force status, alongside measures of housing tenure and dwelling type. In using two datasets to inform our analysis we assume that the relationship

between these socio-demographic factors and unhealthy housing in South Australia (HWS) is similar to rest of Australia (HILDA). The association between socio-demographic and economic factors and our outcome is unlikely to be confounded by the clear geographic variation across Australia in unhealthy housing. Geographical climatic differences for example, may be correlated with the distribution of unhealthy housing, but not the socio-demographic factors used to generate the weights (such as age or sex). The distribution of these factors by climate and other conditions that vary throughout Australia is captured, however, in the geographic distribution of people the HILDA sample (which is sampled to be nationally representative). The linear index therefore takes the form:

$$\eta = w_1 x_1 + w_2 x_2 + \ldots + w_p x_p \quad (1)$$

where x_1 to x_p are dummy variable for each categorical or ordinal indicator and w_1 to w_p are individual regression coefficients derived from the AIUH in the HWS. Finally, the AIUH was then normalised to a range of zero to one hundred [0,100]:

$$IHI_{new} = \left(IHI - min\left(IHI\right)\right) / \left(max\left(IHI\right) - min\left(IHI\right)\right) \quad (2)$$

In interpreting the index, a higher AIUH indicates to unhealthier housing. Correspondingly, a lower AIUH value represents comparatively healthier housing.

Finally, it is important to note that the composite nature of this index must be considered when examining the outcomes of this exercise. Each of the five domains documented above contributes to the index, and in some localities the outcomes may be reflective of the unaffordable nature of housing and its negative impact on mental health, elsewhere it will

highlight the poor state of the housing stock, while in other instances it may speak to concentrations of housing that is insecure or distant from employment and services.

Results

The methods and data outlined in this paper represent a significant departure from much of the analysis of housing in Australia which has often relied upon relatively simple cross-sectional analysis of Census data (Hulse, 2012), or has used more demanding longitudinal analyses to examine issues such as housing career, the number of households exiting homeownership (Smith *et al.*, 2017) or the determinants of investment in private rental housing (Ong *et al*., 2015). As discussed above, such single factor analyses are unlikely to generate meaningful insights into the impact of housing on health. The AIUH represents a more sophisticated and demonstrably robust approach to understanding the influence of housing on the health of Australia's population. As a composite index, it is reasonable to expect the insights it generates will be different from those derived from attempts to shed light on this issue using one or two measures in isolation. The following parts of this paper consider our findings on the four questions we have investigated.

The prevalence of unhealthy housing

In setting out to undertake this research, we began with the question how many Australians live in unhealthy housing? We estimated the prevalence of unhealthy housing in the Australian population using weights derived from the relationships observed between housing and health reported in prior research (Baker *et al.*, 2011, 2017). We assumed the outcomes from the previous survey in South Australia could be transferred to the national

population as a whole, and on that basis, we applied those findings to the socio-demographic profile of people in HILDA. In making that assumption, we noted that while the South Australian population is older than most other states, its key demographic and housing features reflect Australia-wide trends (ABS, 2016).

To explore prevalence, we summarised the AIUH as *low* (representing exposure to relatively healthy housing bundles), *medium* (representing exposure to roughly mean housing bundles), and *high* (representing exposure to relatively unhealthy housing bundles). These categories were derived by classifying the data around 1 plus or minus the mean AIUH score, where *low* = minimum to (mean - 1 SD); *medium* = (mean - 1SD) to (mean + 1 SD); *high* = (mean + 1 SD) to maximum. Our analysis suggests that the number of Australians aged 18 to 89 living in housing classified as unhealthy by the AIHU (high AIUH classification), stood at 2.5 million in 2016. As such, this figure was significantly greater than the 1.8 million Australians living in housing that could be considered healthy (low AIUH classification) or making a positive contribution to their health. Just under nine million adult Australians in 2016 lived in housing that was ranked as moderately impactful on their health by the AIHU—seven times the number living in unhealthy housing and approximately ten times the number resident in healthy accommodation according to this index. These data suggest that for most Australians, housing neither detracts from nor adds to their health status. However, for a substantial minority, housing may have a marked negative impact on their mental and physical health and wellbeing.

The populations resident in unhealthy housing

The second key question in this research was, who lives in unhealthy housing? The data presented in Table 1 shed light on this question, with characteristics of the sample population presented alongside mean AIUH scores.

The analysis found that gender in and of itself was not a significant determinant of living in unhealthy or healthy housing. Across the population, mean AIUH scores were similar for men and women. Similarly, residential mobility appears to be only slightly related to having unhealthier housing, although the fact that non-movers have slightly higher mean index scores reinforces earlier work (Baker *et al.*, 2016) suggesting those who were more vulnerable in the housing market moved more often, and often to slightly more disadvantaged places. Marital status appears to be related to the likelihood of healthy or unhealthy housing, and people who are divorced, or married (legally or de facto) have the healthiest mean index scores, and people who are widowed, separated or never married receiving the unhealthiest mean index scores.

Across many of the variables a strong apparent association was evident. Table 1 shows a relatively clear age patterning, where increasing age is broadly related to exposure to healthier housing from the 35 to 44 year age cohort onwards. This pattern is likely to reflect declining real housing costs from mid age, as many households enter home purchase and make smaller mortgage repayments over time. Across the age cohorts from 18 to 44 there is a relatively constant mean AIUH score of between 49 and 51. Looking to the peer reviewed literature, these patterns are unsurprising in the light of long established evidence (Beer *et al.*,

2011) of a life course trajectory of housing improvement, especially for those in owner occupation. Those in the sample aged 65 to 89 enjoyed the lowest AIUH scores, and this would reflect the high incidence of outright home ownership. Similarly, in younger age cohorts housing conditions may be of lower quality, as households gradually advance along a housing ladder aligned with household and family structure change. Some explanation for the slightly healthier housing conditions of those in the early adult age cohort (18 to 24) may be attributed to a proportion of these individuals still living at home in the (better quality) houses of their parents. They may also make little if any contribution to household accommodation costs.

Table 1: Summary Table of mean Australian Index of Unhealthy Housing (AIUH) by selected socio-demographic characteristics

Looking to employment characteristics, those individuals who were not in the labour force (NILF) had a lower mean AIUH score (45.7) than those who are part of the formal labour force. In part, this reflects the high proportion of older people classified as non-participants in the labour force, and their higher housing health scores. When we examined mean AIUH scores for participants in the labour force (unemployed/part time employed/full time employed) there is an interesting lack of variation (range = 48.1 to 49.8). Although the unemployed are, on average, shown to occupy the unhealthiest housing, their result is not markedly different from people who are employed full-time.

Importantly, we found a direct linear relationship between self-rated health and the apparent healthiness of the individual's housing. That is, our data found that persons who self-reported

their health status in a positive way were likely to live in healthier housing and, conversely, the most unhealthy people tended to live in the unhealthiest housing. This graded relationship between individual health and healthy housing is also apparent when we compare mean AIUH scores of people with and without a long-term disability or health condition. In this case, people with a disability or health conditions were much more likely to live in unhealthy housing. We would note that these outcomes add to the face validity of this metric and highlight the complex set of social determinants that shape an individual's physical and mental wellbeing.

Perhaps counterintuitively, especially considered well-documented housing deficits amongst the Indigenous population (Torzillo *et al.,* 2009), mean AHIU scores were similar for the Indigenous and non-Indigenous populations. Although the sample size for the Indigenous population is small (n = 338) in this dataset, there is a tight confidence interval, suggesting a level of reliability for the individuals included in this data set. We also need to acknowledge that the HILDA data set is likely to undercount Aboriginal Australians living in disadvantaged rural, remote, and very remote communities where the poorest quality housing is concentrated. On balance, we conclude the data show that Indigenous Australians living in major urban centres are no more and no less likely than other Australians in the same localities to live in deficient housing. However, a targeted data collection of remote and rural communities may find a high concentration of Aboriginal and Torres Strait Islanders in unhealthy housing.

The final variable presented in Table 1 is tenure. On average, home owners have the healthiest housing, and private renters have substantially unhealthier housing. It is worth noting that mean AIUH scores for public renters in Table 1 (mean = 45) are much more similar to home owners (mean = 44) than to private renters (mean = 52). This finding reinforces the conclusions of the broader literature (Beer *et al.*, 2011; Hulse & Burke, 2000) and underscores the value of public rental housing as an effective tool of social policy, and a capable form of social protection for vulnerable households, offering a degree of protection to public housing tenants that is not afforded to renters on the private sector. Private tenants were much more likely to be in unhealthy housing that home owners.

A changing spatial distribution of unhealthy housing?

Core questions in this research were what is the geography of unhealthy housing in Australia? Where are the problems of unhealthy housing most acute? How has this distribution changed over the past two decades? This section examines mean AIUH scores against a number of geographies in order to establish a national picture of the distribution of unhealthy housing. It considers these data in time series in order to establish a comprehensive account of change as localised housing markets move over time.

Between 2000 and 2016 the mean AIUH score for all of Australia rose by almost three per cent, from 46.9 to 48.2, suggesting that the average level of unhealthy housing increased. Individuals living in urban areas in 2016 recorded an index mean (AIUH = 48.6 compared to 46.2) higher than those living in areas that could be considered rural (Figure 1). In both instances the index score increased between 2000 and 2016, indicating a worsening of

housing conditions for the Australian population over this period. In broad terms, however, we can conclude that for both the year 2000 and 2016 the incidence of unhealthy housing is concentrated in the nation's major urban centres. A more nuanced understanding of patterns in the distribution of unhealthy housing emerges when settlement types are further disaggregated (Figure 2). There is an apparent gradient in unhealthy housing across settlement types. In 2016, major urban centres had the highest average rate of unhealthy housing, followed by inner regional centres, outer regional centres, and then remote localities. In the year 2000, outer regional centres appeared to have a greater incidence of unhealthy housing than inner regional centres, but this rank order reversed by 2016. Important patterns are evident also in change over the period 2000 to 2016. The major urban centres witnessed an appreciable increase in average level of unhealthy housing, while Inner regional settlements saw a modest rise, outer regional and remote localities, saw housing exert an impact on health less than that for 15 years previously.

Figure 1: AIUH Score, Rural and Urban Areas, 2000 and 2016

Note: per cent change 2000–2016, rural=3.02, urban =3.15

Figure 2: AIUH Score by Settlement Type, 2000 and 2016

Note: per cent change 2000–2016, major cities=4.05, inner regional areas =1.95, outer regional areas=-0.31, remote and very remote areas=-0.52

Across Australia's states and territories a complex pattern of unhealthy housing was evident in 2016 (Figure 3). The Australian Capital Territory recorded the highest rates of unhealthy housing, followed by the Northern Territory, Victoria, and New South Wales. The lowest

rates of unhealthy housing were evident in Tasmania, South Australia, Western Australia and Queensland. At face value, the high level of unhealthy housing in the Australian Capital Territory appears open to challenge, but we would note: the absence of non-metropolitan population in that jurisdiction; a history of very high housing costs; colder conditions, and a historical legacy of older, poor quality housing in some suburbs. The Northern Territory's prevalence of low quality housing is unsurprising, given that it is a small housing market that is subject to shifts in the broader economy, and has the combined challenges of a monsoonal climate, and high relative housing costs. The position of Victoria and New South Wales within the group of states with high levels of unaffordable housing is expected, and reflects their role in hosting the largest cities with high housing costs. The states with lower scores on the AIUH have historically had a history of more affordable housing, either as a result of government provision (South Australia, Tasmania) or through the promotion of affordable home ownership (Queensland, Western Australia).

Figure 3: AIUH Score by State, 2000 and 2016

Note: per cent change 2000–2016, New South Wales=2.28, Victoria =3.83, Queensland=3.89, South Australia=3.75, Western Australia=2.34, Tasmania=2.64, Northern Territory=4.46, Australian Capital Territory=1.35

When we compare the AIUH scores for each state and territory in 2000 and 2016 a convergence in outcomes is evident across the nation. That is, there is less variation in mean outcomes in 2016 when compared with the year 2000, and this is a consequence of states with low levels of unhealthy housing recording greater increases than those with already high scores. This pattern may reflect the impact of national policy settings, broader shifts in housing affordability, or trends in the economy.

Between 2000 and 2016, shifts in the distribution of unhealthy housing were not evenly spread across the population (Figure 4). Some of the most profound changes related to the growing impact on low income persons living in less secure tenures. Between 2000 and 2016 low income public tenants became substantially more likely to have unhealthy housing, with much of this change reflecting the ongoing sale of public housing (the national public housing stock fell by more almost 12 per cent over the period from 362,967 to 320,041 dwellings (Australian Government, 2017 and 2001)) and the targeting of new leases to those in the most pressing of circumstances (Groenhart & Burke, 2014). The pressure for state housing authorities to realise capital (Jacobs *et al.,* 2013) means in many cases that stock losses have been greatest in the higher quality dwellings and higher value, more accessible locations. At the same time, the targeting of social housing allocations to people with high levels of need means that the incomes of tenants are progressively more limited, and that tenants are increasingly likely to have a disability or long-term health condition (Groenhart & Burke, 2014). The findings of this analysis reinforces Groenhart & Burke's work, in that the mean score for unhealthy housing for low-income public tenants has increased over the 16-year period at a greater rate than for the general population (that is, six per cent versus three per cent). On the other hand, low income private renters appear to have experienced only a minor increase (less than 0.3 per cent) in their average unhealthy housing score over the period. Older female renters—a group for which there has been increasing concern—seem to have improved their mean housing health by just under two per cent on average (Baker & Tually, 2008; Colic-Peisker *et al.*, 2015; Hartman & Darab, 2017).

Figure 4: AIUH Score for Vulnerable Groups in the Housing Market, 2000 and 2016

Note: per cent change 2000–2016, low income private renters=0.29, low income public renters=5.94, older female private renters=-1.56, population average=2.66

Unhealthy housing in Australia

We began this paper by referring to the 2016 Boyer Lecture delivered by Sir Michael Marmot and by emphasising his compelling argument that the health of Australians is determined by the places in which they are born, live, and work. But it is also worthwhile reflecting on a much earlier Boyer Lecture delivered by Hugh Stretton in the 1970s. At that time, Stretton convincingly argued that Australians and their governments needed to value good housing and strong communities, because it was in such supportive environments that the generations are successfully raised and educated, that wellbeing is maintained, and that the productivity of society is sustained (Stretton, 1974). In his work, Stretton did not seek to quantify these propositions, which he considered to be self-evident, but instead he strove to articulate their meaning for society and governments. In the modern era, such bold assertions are more likely to be challenged than not, and in many ways this paper seeks to provide an additional piece of evidence on the contribution quality affordable housing makes to national wellbeing. Our ability to generate an index of the compound impact of housing on health reflects both the improved availability of relevant data and conceptual advances in the social sciences, nationally and internationally. Tellingly, it also reflects a growing need to identify, measure, and communicate the impacts of a neo-liberal economy and an increasingly unequal society (Beer *et al.*, 2007, 2015).

Critically, our analysis has shown that commentators (Paris, 1993) and government reports alike (for example ABS, 1999) consider Australia has a high-quality housing stock with limited impacts on human health outside the Indigenous population. Yet, the overwhelming majority of adult Australians aged 18 to 89 were classified as living in moderately unhealthy housing. When population estimates are derived, our analysis suggests that, of the estimated 14 million Australians aged between 18 and 89 years in 2016, around nine million are likely to experience some health costs associated with housing insecurity and high rents and mortgage payments relative to income. The size of this cohort challenges long held assumptions about Australia and its housing. Importantly, 2.5 million Australians occupied housing likely to exert an adverse impact on their health, and the subsequent analysis showed that many within this cohort were drawn from population groups who are already vulnerable in other ways—including persons living with a disability, the widowed and never married and younger people early in their housing and professional careers.

Our findings on tenure are particularly interesting. Outright homeowners lived in the healthiest housing, followed by public tenants as a group, home purchasers, and finally private tenants. However, a different pattern of tenure impact emerged when we focussed on low-income individuals—low-income public tenants occupied the unhealthiest housing and their circumstances deteriorated substantially over the period 2000 to 2016. This is a pattern of impact predicted by Judith Yates in a 1997 policy review. Yates (1997, p.277) envisaged a future housing landscape where, as part of a new policy focus, the redistribution of limited

housing assistance expenditure occurred from 'those most in need [social housing tenants] to those almost as much in need [all low income renters]'. The long-term decline in the healthiness of low-income public tenant dwellings we find in our analysis, appears to support Yates's prediction.

A major finding of this work is that the unhealthiest housing tends to be located in the major urban centres—no doubt a reflection of high housing costs and limited affordability. Put simply, the more urban the region, the greater the incidence of unhealthy housing. The strength of this impact was somewhat unexpected, as case study research has documented the poor quality of housing in many rural and regional areas (Beer, 1998, 2001; Beer *et al.*, 2011). It is likely that the strong relationship between unhealthy housing and large urban centres is a reflection of the nation's ongoing housing affordability crisis. Some 20-plus years of high housing costs have pushed many vulnerable individuals into poor quality homes—suburban garages, near-derelict dwellings, and sub-let flats or apartments accommodating many more individuals than ever intended (Beer, 2003; Beer *et al.*, 2016). We also found a complex state-by-state geography of unhealthy housing, which is likely to reflect the history of State and Territory housing markets over the past 30 years, economic shifts, current and past policy settings and, to a limited degree, local environmental conditions. We found an increasing incidence of unhealthy housing within Australia, with smaller urban centres experiencing improved conditions over the 15-year period, and larger urban centres recording higher rates of unhealthy housing. Between 2000 and 2016 the various states and territories

become more like each other with respect to the incidence of unhealthy housing, and this may be a product of nation-wide economic trends or policy settings.

Conclusion

The health of Australians is fundamental to the wellbeing of the nation. It is a major determinant of prosperity, and acute health costs represent a significant percentage of public sector outlay at both state and federal levels. Those factors that adversely affect population health need to be the subject of academic scrutiny and analysis. This paper has focused on one of those long-term determinants of health—housing—and it has found that the widely accepted assumption that housing in Australia is of high quality and health-enabling deserves to be challenged. Just over 10 per cent of adult Australians live in accommodation that is likely to reduce their physical and mental wellbeing, adding to the burden of public health expenditures and potentially increasing the incidence of disability and long-term ill health. Critically, those most likely to be affected by their housing were those already at risk within Australian society—for example, low income public tenants, young people establishing themselves, persons with a disability, the widowed, and the never married.

Finally, it is worth reflecting on the causes of unhealthy housing in Australia. In many nations—such as New Zealand, the United States, Canada, and the countries of Northern Europe—there is a well-developed literature on housing and health (for example, Bonnefoy *et al.*, 2003; Dunn & Hayes, 2000; Howden-Chapman *et al.*, 2012; Saegert *et al.*, 2003). In these places, the natural conditions of cold and damp—and often a stock of poor quality old

housing—has resulted in widespread awareness of the importance of housing for health and wellbeing. Many nations have well-developed and systematic programs to address these challenges. In Australia, by contrast, our relatively benign climate and youthful housing stock has resulted in a different narrative around housing—one that emphasises the *benefits* housing offers, without thought awarded to the potential risks. We conclude that this perspective reflects the fundamental causes of unhealthy housing in Australia: in damper, colder places the natural environment is a readily observed challenge to health, but in Australia the risk to health from housing is created by ourselves—a product of economic, social and political processes—rather than climatic conditions. In drawing this conclusion, we are reminded of the work of Ulrich Beck (1992) on manufactured uncertainty and his contention that in the contemporary era most risk facing individuals are a product of human action. Beck's concept appears especially apposite when discussing housing and health in Australia. There is, however, a positive note to this conclusion, a new academic awareness of the impact of housing and health, and the development of new tools such as the AIUH allows us to draw these issues to public attention, and begin to work towards a solution.

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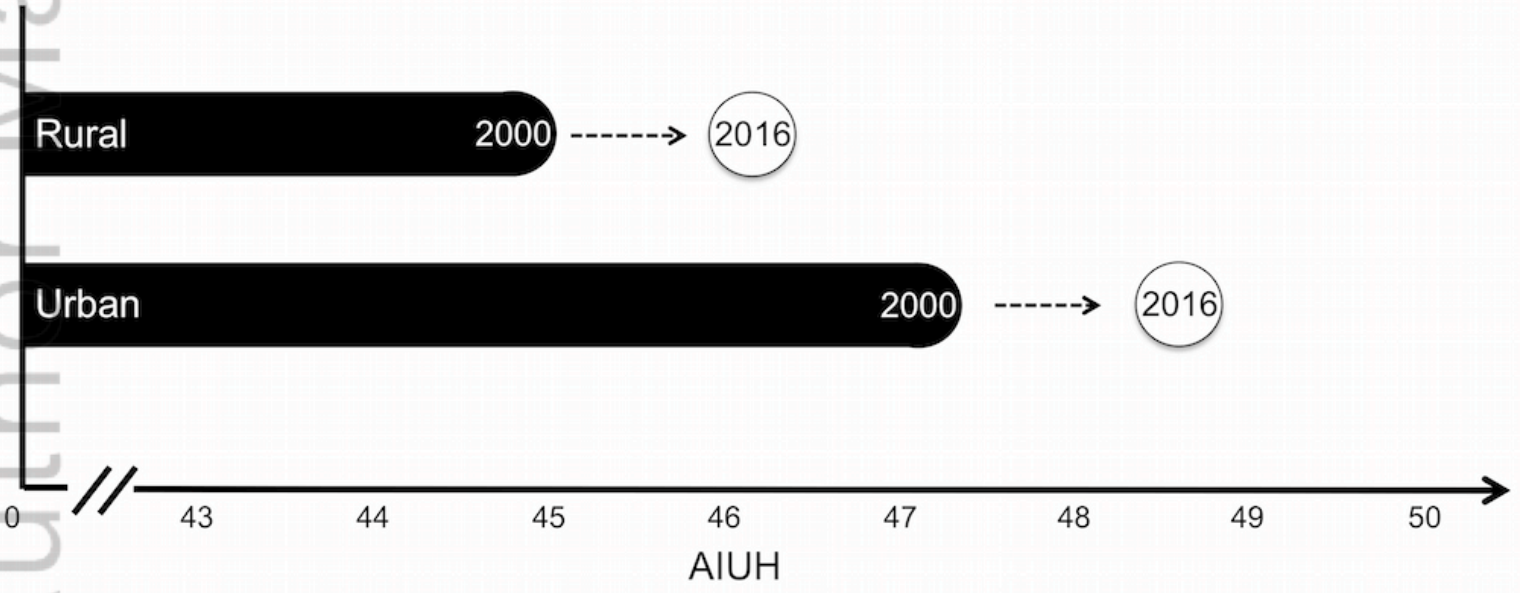

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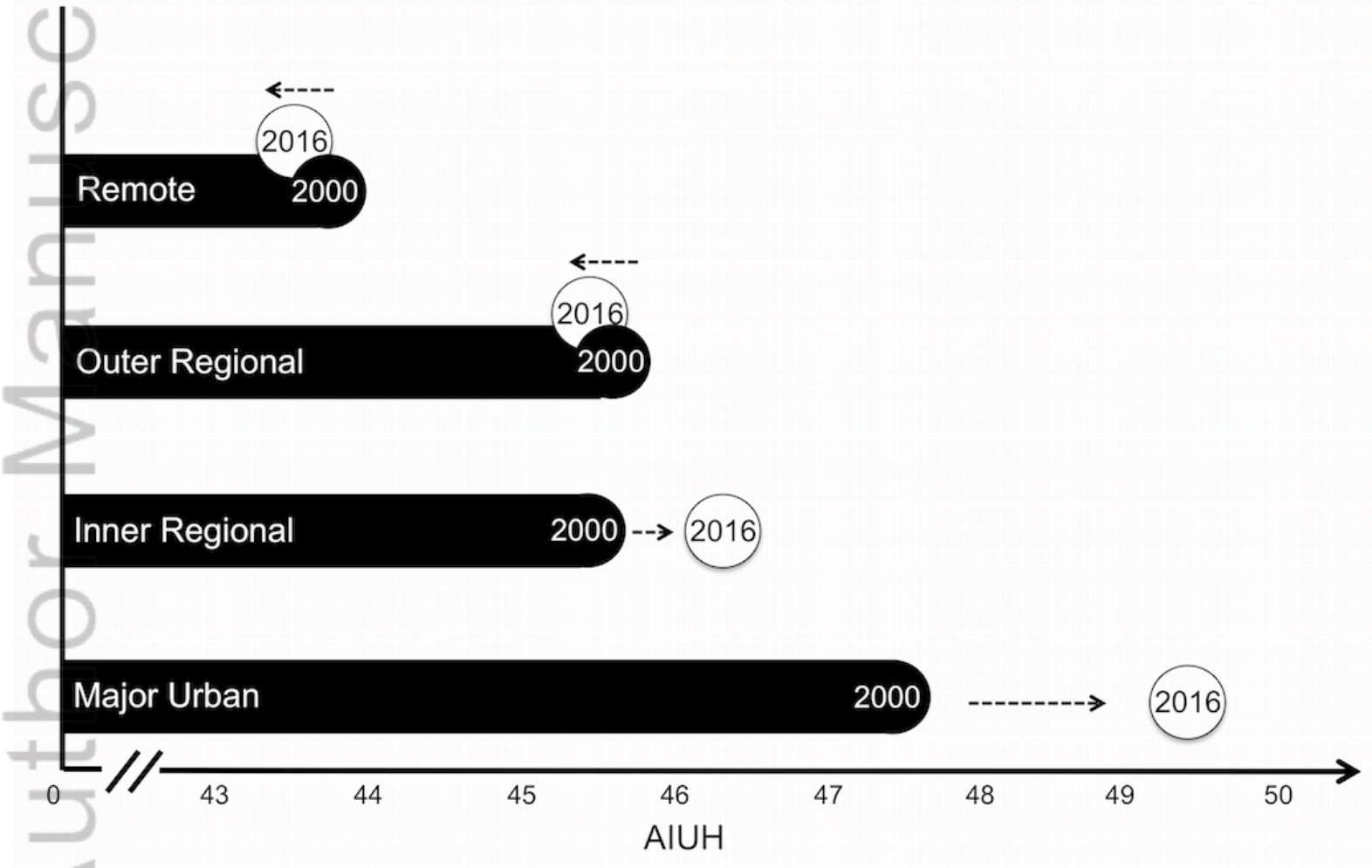

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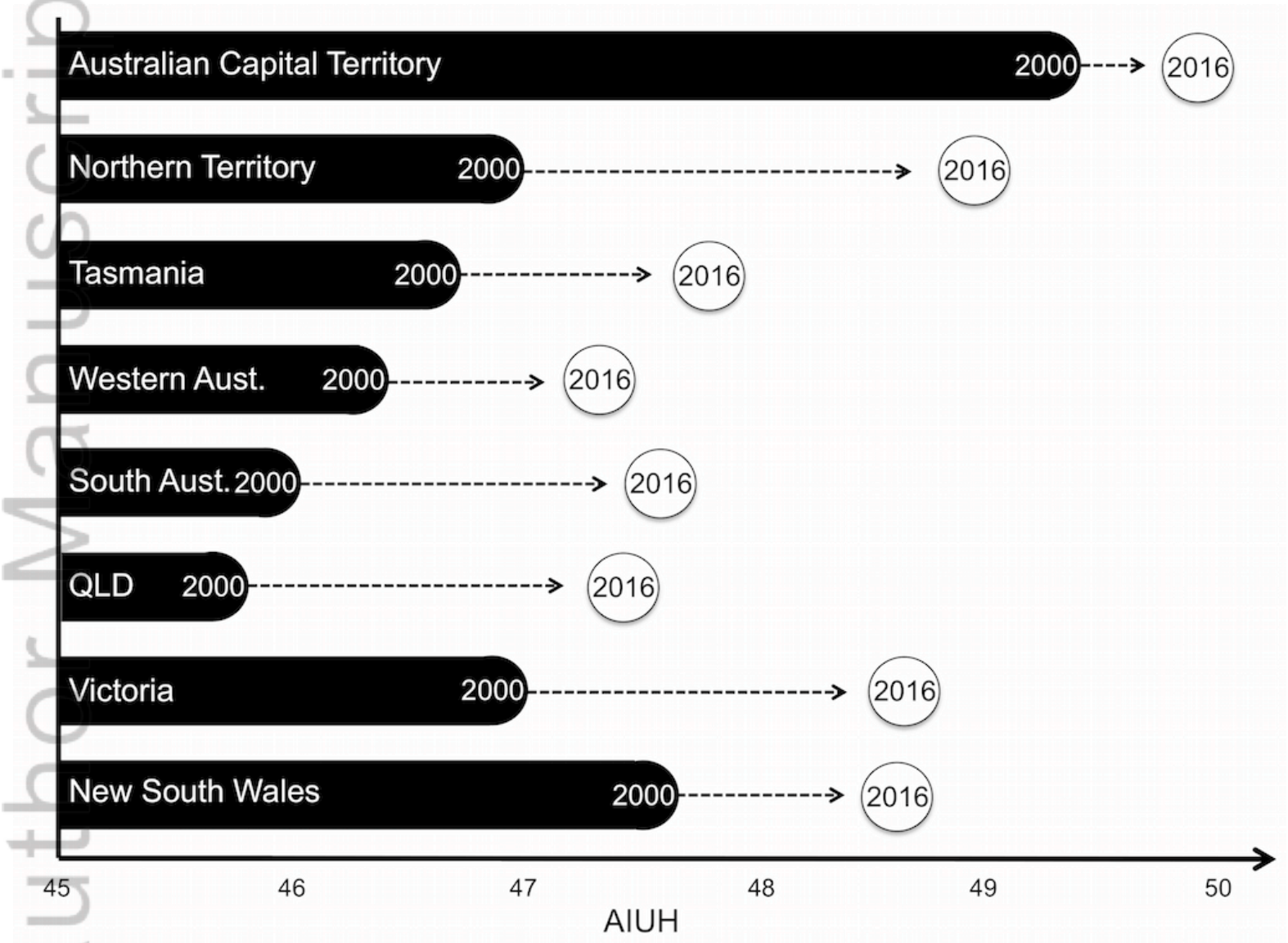

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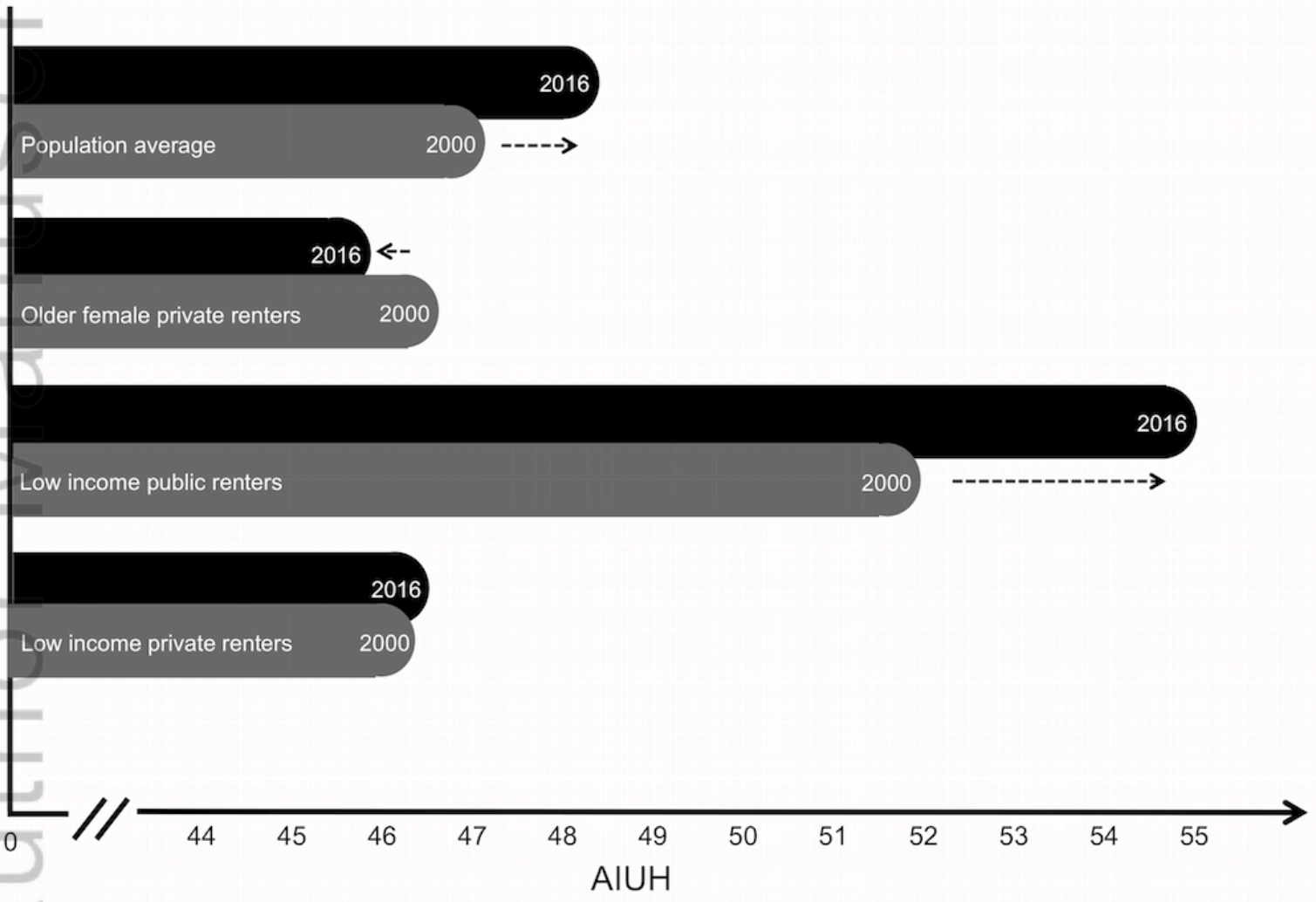

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