

Does the proportion of public housing tenants in a community affect their wellbeing? Results from New Zealand: A retrospective cohort study using linked administrative data

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ABSTRACT

A concern that living in concentrated public housing could worsen outcomes for public housing tenants has underpinned policy for decades in New Zealand; most recently, in decision-making around how much public housing to provide in new, mixed-tenure communities. Our research examines the degree to which public housing is concentrated in New Zealand, and analyses the association between the proportion of public housing where public housing tenants live in 2013, and their health outcomes five years later. Most public housing tenants are living in areas with low numbers of public housing tenants. As the proportion of public housing tenants in the local population increases, their hospitalisation rate decreases, as does the chance they would utilise mental health outpatient services and the number of prescriptions they receive, although in most cases this reversed for very high densities of public housing tenants. Our study indicates that higher densities of public housing than often assumed may be beneficial to public housing tenants.

1. Introduction

One of the operating principles of the public housing and urban development agency in New Zealand (NZ) is “ensuring that the housing it develops is appropriately mixed (with public, affordable and market housing)” ([Kāinga Ora–Homes and Communities Act, 2019](#)). However, what constitutes an appropriate mix of housing tenures is an open question. NZ’s public housing agency previously aimed to reduce the proportion of public housing to 15 % in order to “produce better social outcomes” ([Housing New Zealand \(HNZ\), 2013](#), 10). More recently, 20–30 % public housing has been recommended by a network of community housing providers ([Simonsen, 2018](#)), Auckland Council’s development agency ([Panuku, 2019](#), 10), the public partners of a major regeneration ([Te Rūnanga O Toa Rangatira, Porirua City Council, Treasury, Ministry of Social Development, & Housing New Zealand \(HNZ\), 2018](#), 31), as well as people involved in developing and providing housing in mixed-tenure communities (see [Chisholm, Pierse, and Howden-Chapman 2021](#), 7). The aim of this article is to consider whether the concentration of public housing affects social outcomes, specifically, health. To do this, we first describe the extent to which public housing is concentrated in NZ, and secondly, we analyse whether

the health outcomes of public tenants are associated with the proportion of public housing in their community.

The debate about limiting the concentration of public or low-income housing draws on the theory of ‘neighbourhood effects’: that living in concentrated poverty compounds the disadvantages of being poor ([Galster, 2012](#)). Despite the lack of evidence for this, the idea that housing mix promotes social cohesion and provides superior outcomes for low-income people is pervasive ([Kwan, 2018](#)). Policymakers have addressed these concerns by ensuring a more balanced mix of socio-economic groups through mandating that developers provide a range of housing typologies, or include a certain proportion of subsidised or public housing; through housing a mix of groups within public housing; or through situating public housing among market housing. In NZ, neighbourhood effects have been addressed through developing a mix of market and public housing, often on land previously occupied by concentrated public housing; recent small developments contain 13–40 % public housing ([Chisholm, Pierse, and Howden-Chapman 2020](#)). NZ’s efforts are in line with major policy initiatives in other countries (e.g. [Costarelli, Kleinhans, & Mugnano, 2019](#); [Keene & Geronimus, 2011](#); [Sautkina, Bond, & Kearns, 2012](#)). However, the effects of living in concentrated public housing on health have not been analysed in the NZ

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context.

Our article proceeds as follows. First, we introduce the mechanisms by which living in an area with a lower proportion of public housing is posited to benefit public tenants. We summarise the evidence on the health effects of living in communities with different proportions of public housing, and the history of policy attention to socio-economic mix in NZ. We then outline our data and methods. Subsequently, we present the results: first, to what extent public housing tenants are residentially concentrated, and what effect living in different degrees of concentration has on health outcomes as measured by hospitalisations, mental health outpatient visits and pharmaceutical dispensing. We conclude with a discussion of our results in light of the international evidence base and NZ housing policy.

2. Literature review

Sarkissian (1976) has traced the idea that residential class or socio-economic mix is beneficial back to the mid-19th century. In the British context, developments such as Bourneville in the late 1800s were planned to intended to recreate idealized visions of harmonious village life; later, social mix was seen as a key outcome by planners involved in post-war regeneration (Sarkissian, 1976). Income- or tenure-mixing continues to be a popular planning tool today, often as part of efforts to regenerate public housing. Kearns and Mason (2007) identify four mechanisms potentially at work in mixed-tenure communities that could bring about benefits to public housing tenants. *Resource effects* signify that the entire community benefits when high-income people live there, due to their spending power and public advocacy skills. *Role model effects* relate to public housing tenants adopting the behaviour of high-income people, through, for example, observing school attendance and adopting less-risky health behaviours (Graham, Manley, Hiscock, Boyle, & Doherty, 2009). *Community effects* are benefits low-income people could experience through access to the social networks of high-income people, and through living in a safer community as a result of the informal social control exercised by high-income people. Finally, the *transformation effects* of a mixed-tenure community replacing public housing could result in better service provision (including better health services), and improve neighbourhood reputation, which may reduce stress and promote community pride (Graham et al., 2009; Kearns & Mason, 2007).

In general, these theoretical links have not been borne out by research. While some studies have identified benefits occurring as a result of poverty deconcentration and tenure mix policies, others have identified negative side effects. Researchers have studied both organic mix – where a mix of tenures happens to be present in a community – and deliberate mix – where a development is built in order to house both public housing tenants and private housing residents; the latter can be compared with similar developments that only house public housing tenants (Morris, Jamieson, & Patulny, 2012). They have sought to understand whether tenure mix results in social interaction between different groups, and how the mix of tenures affects a range of outcomes including wellbeing, education, employment, residential stigma, and the quality of the environment and services. The most recent reviews of this literature have concluded that there is limited evidence supporting policies to reduce public housing concentration and increase tenure mix (Bolt & van Kempen, 2013; Kelly & Porter, 2019; Morris et al., 2012; Sautkina et al., 2012; Saville-Smith, Saville-Smith, & James, 2015); moreover, earlier reviews overstated the strength of the evidence for mixed tenure, perhaps in order to please policymakers eager for evidence that supported the existing policy thrust (Bond, Sautkina, & Kearns, 2011). This critical literature concludes that rather than addressing the mix of tenures where public housing tenants live, policymakers should focus on better supporting public housing tenants (Cheshire, Overman, & Nathan, 2014; van Ham & Manley, 2010).

There is a small literature that is particularly relevant to our study. Like ours, these studies draw on routinely collected data to consider the

connections between organic tenure mix and health outcomes. In the UK, Graham et al. (2009) studied tenure mix and health and educational outcomes at the ward level (i.e. for all residents, not only public housing tenants) using Census data from 1991 and 2001; wards had an average population of 5800 and a maximum of 35,100 in 2001. They examined the relationship between the degree of tenure mix and integration within wards, and three health and one social outcome limiting long-term illness, mortality, premature death, and unemployment. The between-area analysis showed that areas with between 10 and 30 % social housing showed the best results for all three health outcomes, but only limiting long-term illness was statistically significant. In 1991, within-area analysis showed that higher levels of integration (defined using a within-ward index of dissimilarity) were associated with lower mortality and lower premature death rates, but with higher rates of limiting long-term illness. In 2001, the findings reversed; higher levels of tenure mix were associated with higher mortality and higher premature death rates, but with lower rates of limiting long-term illness. The authors concluded that they were “unable to demonstrate a consistent mixed-tenure advantage for our four measures of social well-being and two definitions of tenure mix” (Graham et al., 2009, 161).

In another study, carried out on across four cities in Scotland, Lawder, Walsh, Kearns, and Livingston (2014) examined self-reported health outcomes and hospital records, and drew on census data to measure public housing concentration at the scale of the datazone (between 500 and 1000 residents). After controlling for area deprivation and individual risk factors, associations were apparent between tenure mix and three of nine measured outcomes. People living in neighbourhoods with more than two-thirds social housing were more likely to be admitted to hospital for an alcohol-related condition (odds ratio of 2.0–3.0); people living in neighbourhoods with more than 25 % social housing were more likely to rate their health as poor (odds ratio of nearly 4.0); people who lived in an area where there were more social or private renters than owner-occupiers were more likely to be admitted to hospital for accidents (odds ratio of 2.0–3.0). The authors concluded that “the effects of tenure mix on health are therefore variable in terms of the outcomes affected and the mechanisms in operation” (Lawder et al., 2014, 280).

A third study, also carried out in Scotland, measured tenure mix by the number of adult residents living in social housing in the lower super output area (typically containing about 600 homes and 1500 residents). This showed that children of families who socially rented in neighbourhoods with a low proportion of social renters were more likely to experience emotional problems (Flouri, Midouhas, & Tzatzaki, 2015). Finally, in Australia, Parkinson, Ong, Cigdem, and Taylor (2014) examined tenure mix and health outcomes in areas housing a median of 6900 people (2600 dwellings). For all tenure groups, mental wellbeing was worse in areas with higher proportions of social housing. However, social renters had the greatest wellbeing when they lived in areas where neither homeownership nor social renting predominated. In sum, different studies, in different contexts and using different methods, have quite different results as to how the concentration of public housing affects health. In this research, we draw on NZ's uniquely rich dataset to build the knowledge base on wellbeing and tenure mix.

3. Approach to housing mix in New Zealand

Like other countries, NZ has long had an ideal of mixed communities. Edward Gibbon Wakefield proposed that a mix of classes among the new settlers would provide leadership which would increase the community's efficiency (Sarkissian, 1976).¹ Certainly, the small size of NZ's early settlements ensured little spatial segregation between classes (Schrader, 2016). As the population increased into the twentieth century, developers and thinkers retained an interest in mixed communities, as a tool for assimilation and to relieve social tension (Competitions, 1919; Ferguson, 1995, 34). This opportunity came when public housing on a large scale commenced under the 1935 first Labour Government, and accelerated after the end of World War II (Ferguson, 1994; Schrader, 2005). One of the original architects of the scheme, John Lee, proposed that public housing should not be targeted at any particular group, but rather be distributed by ballot (Ferguson, 1995, 84; Lee, 1973, 131); in this way, the new public housing communities would not contain "streets of people of a uniform income" (Lee, 1937, quoted in Schrader, 2005, 37). However, political pressures and the high demand for housing meant that public housing was rented by working families first, and over the decades, became increasingly targeted at those with highest needs (Ferguson, 1994; Schrader, 2005).

Post-war governments planned to provide for socio-economic mix in new suburbs through providing sections for private builders (McMurray, 1973, 98). Both Otara and Porirua, new suburbs developed from the early 1960s on, were planned at their construction to be a third public housing, a third group housing² and a third market housing (Lane, 1966; Walker, 1970). This policy was abandoned due to the urgent need for public housing, and the fact that land development could only just keep pace with construction (McMurray, 1973; Walker, 1970). The principle of the benefits of mix was retained through the pepper-potting of "problem families" throughout public housing communities "in the hope that their neighbours would model appropriate behaviour for them to emulate" (Duff, 1998, 149). Commentators argued that residential socio-economic mix was superior (Commission of Inquiry, 1971, p. 37; McGee, 1969, p. 156; Walker, 1971); others dissented: "preference for a mixed-class community has come to be almost an article of faith among certain planners and politicians though often for reasons not supported by social investigation" (Gilson, 1969, 47). Subsequently, governments focused on building smaller clusters of public housing alongside private homes in existing communities (Keeble, 1976; Duff, 1998, 153).³ This, according to Minister for Housing Roger Douglas in 1974, would create "a desirable social mix and avoid concentrations of rental housing" (quoted in Davidson, 1994, 142). The state stepped back from involvement in housing planning from the mid-1980s during radical market restructuring. The sale of public housing to both tenants and investors, especially during the 1990s, transformed the tenure mix, although not necessarily the income mix, of some areas (Murphy & Kearns, 1994; Schrader, 2005; Thorsnes, Alexander, & Kidson, 2011).

In recent years, interest in mixed-tenure development by both

community and government housing providers has ramped up. The Labour Government (1999–2008) commissioned research on poverty deconcentration and housing mix (Gravitas, 2008a, 2008b) and announced plans for mixed-tenure development on both greenfield sites and in existing public housing areas (Glucina, 2008; Johnson, 2012); some of these continued under subsequent National (2009–2017) and Labour (2017–present) governments. These developments, ranging from 150 to 10,500 units, contain between 13 and 50 % public housing (Chisholm, Pierse, and Howden-Chapman 2020). The public housing authority and government representatives have variously argued that such communities leads to: better social outcomes (Orsman, 2008; Smith, 2014; Chisholm, Pierse, and Howden-Chapman 2020); provides local housing for those moving out of public housing (Collins, 2010); improves and increases the public housing stock (Beehive, 2018; Te Rūnanga O Toa Rangatira et al., 2018); helps fund building more public housing (HNZC, 2015, 5; Chisholm, Pierse, and Howden-Chapman 2021); and addresses the market housing shortage (Key, 2015; Te Rūnanga O Toa Rangatira et al., 2018). In 2009, the public housing agency announced its plan to reduce public housing numbers in areas of high concentration (Housing New Zealand, 2009, 18); several years later, it stated that limiting public housing to a maximum of 15 % of any "community" would "produce better social outcomes" (Housing New Zealand (HNZ), 2013, 10). However, a review of evidence commissioned by the Minister of Social Housing found that the harm for public housing tenants of living in areas of concentrated public housing had been overstated (Saville-Smith et al., 2015). By 2014, the public housing authority had no specific target for the proportion of public housing (Kelly, 2018); today, the approach is "focussed on community outcomes rather than a hard-lined concentration level" (Travis, 2017). Eke Panuku, Auckland Council's development agency, initially adopted a 'housing mix policy' that developments they lead provide a third market housing, a third 'affordable' market housing, and a third public housing (Panuku, 2019). Ngai Tai Waipareira Housing Ltd., which sought to provide 69 % public housing on one site, argued that the policy was discriminatory and pursued the case at the Human Rights Review Tribunal (Forbes, 2020); subsequently, Eke Panuku announced that the housing mix policy is "no longer operative" (Kilgallon, 2021).

Determining whether public housing concentration makes a difference to social outcomes is important, especially considering the socio-economic status of NZ's public housing tenants. Given the long waiting list for public housing, there are strict criteria for being housed: tenants have low incomes, and other needs that make it difficult to find housing in the private market; once housed, they pay a maximum of 25 % of their income in rent. A representative survey showed that in 2018, compared to the general population, public housing tenants had lower average incomes (less than half), were more likely to be female, had higher average household sizes, and were less likely to have completed high school (Smith & Davies, 2020, 22). Public housing tenants have worse health than other New Zealanders; for example, among the 65–74 year old age group, public housing tenants were more likely to experience high levels of psychological stress than other tenures, and 32 % had diabetes (compared to 18 % of private renters and 13 % of owner-occupiers) (Pledger, McDonald, Dunn, Cumming, & Saville-Smith, 2019).

Socio-economic mix in housing has long been an aspiration in New Zealand. Over the years, different public housing policies – building whole public housing suburbs, or building pockets of public housing among private housing, selling public housing units to private interests, and most recently, building mixed-tenure communities in place of concentrated public housing – has resulted in housing in neighbourhoods of varying public housing density. Our research sought to understand how public housing is distributed across neighbourhoods, and the extent to which living near many or few other public housing tenants affected public housing tenants' health.

¹ Wakefield also thought that urban planning should encourage mix between Māori (indigenous people) and other New Zealanders. His ideas that every tenth section should be reserved for chiefly Māori, in order to enable them to "become civilized", has something in common with ideas about the "role-modelling effects" of tenure diversification (section 3), as well as policies in the 1940s and 1950s to encourage 'pepper-potting', or dispersal of Māori households (owned or rented from the state) among other households (Olssen, 1997; Williams, 2001).

² Under the Group Building Scheme, set up in the early 1950s to encourage the building of new homes, the government promised to buy any unsold houses (Ferguson, 1994).

³ This idea was not new; a 1954 government report suggested that juvenile delinquency would be reduced 'if, in future, state houses were not erected in extensive blocks, but were built in such smaller numbers as could be more easily integrated into existing communities of people' (Mazengarb, 1954, 34).

4. Methods

The research drew on the Integrated Data Infrastructure (IDI), through which we gained access to the number of public housing tenants versus the total population in different areas, and the health outcomes of those tenants. The IDI is a collection of linked NZ whole-population administrative data sources from government agencies, surveys, and the census. All data are de-identified and linked by Statistics NZ, allowing us to combine data from all available sources without breaking any individual's confidentiality. Access to these data are only available to approved researchers in a restricted data-lab environment. The output relating to this project was externally assessed by Statistics NZ to ensure confidentiality for all individuals is maintained. We received ethics approval from the University of Otago (ref: HD18/007).

We analysed the proportion of public housing tenants in the meshblocks and census area units where public housing tenants lived on the night of the 2013 Census.⁴ Meshblocks housed a median of 78 people in 2013. A typical meshblock may be an apartment building or (more commonly given NZ's typical urban form), a street, or a small section of several streets alongside each other. Census area units housed a median of 1863 people. One or two census area units may make up a typical suburb, which would often contain local shops and a school. By drawing on two spatial scales, we are able to capture different types of effect (Darcy, 2010; Groenhart, 2013; Kwan, 2012; van Ham & Manley, 2015). The strongest evidence for neighbourhood effects has been found in studies using very small area units (van Ham & Manley, 2015); theorists suggest that small units – an apartment building, a block, or the dwellings within a five-minute walk – would capture the kind of interactions between different socio-economic groups that could potentially lead to benefits for low-income people or public housing tenants (Tunstall & Fenton, 2006). Nevertheless, large areas such as census area units are also important to consider, to take into account that people draw on services and facilities, and have many social interactions, in this larger neighbourhood (Darcy, 2010; van Ham & Manley, 2015).

For each area unit and meshblock, we found the proportion of the population that resided in public housing in 2013 (the tenure mix). We then analysed health outcomes for those individuals in 2018. This allowed us to estimate how the concentration of public housing to outcomes five years later. As noted by van Ham and Manley (2015, 314), a lengthy period of observation is necessary because underlying processes that could affect outcomes are likely to take some time to have an effect (see also Musterd, Galster, & Andersson, 2012).

On the night of the 2013 Census, 159,123 people (3.8 % of the population) identified themselves as living in public housing. By 2018 6555 of the tenants present in 2013 were deceased, leaving us with a sample of 152,568 people. This population was largely Māori (36 %) or Pacific (42 %) and had a mean income of NZD \$11,473 (USD \$9440) in 2013. We measured 2018 health outcomes, enabling us to compare long-term outcomes by tenure mix in 2013. Note that the findings concern only public housing tenants; the vast majority of meshblocks and census area units have no public housing and so are not represented in this analysis.

We use three measures of health outcome as our dependent variables: publicly-funded hospital discharges, which measures

hospitalisations, attending one or more mental health outpatient visits, and publicly-subsidised pharmaceutical dispensing (Pierce et al., 2019). We used linear regression to estimate our models, and controlled for age, ethnicity, gender, and the percentage of the population in the meshblock, or area unit, who lived in public housing. We also included a quadratic term for the percentage living in public housing, allowing it to have a non-linear impact on each of the outcome variables. The model results can be seen in the Appendix.

5. Distribution of public housing tenants

Fig. 1 shows that a large proportion of our sample lived in areas with low- or medium- levels of other public housing tenants; very few lived in areas that predominantly housed other public housing tenants. Approximately 70 % of the sample lived in a meshblock where 50 % or less of the population lived in public housing. Eleven percent lived in a meshblock where 80 % or more of the population lived in public housing. Meshblocks, as noted earlier, housed a median of 89 people. Densities of public housing were even lower for census area units with 65 % living in areas where under 20 % of the population lived in public housing.

While there are meshblocks with every level of tenure mix, there are very few public housing tenants living in census area units that are largely comprised of public tenants. There are no area units with 65–85 % public tenants, and from our sample only 111 (0.1 %) of the individuals live in census area units with a tenure mix greater than 65 % public tenants. Census area units, as noted earlier, housed a median of 1863 people.

6. Association between residential concentration of public housing tenants and health outcomes for public housing tenants

Figs. 2–7 show the relationship between the percentage of public housing tenants in meshblocks, or census area units, where public housing tenants live, and their outcomes five years later. The different levels of the proportion of public housing tenants in the population are grouped together in one-percent-point groups; i.e. the leftmost point in Fig. 3 shows the mean number of hospitalisations for all public housing tenants living in meshblocks where between 0 and 1 % of the population were public housing tenants. The size of each point reflects the sample size living in areas with that level of public housing tenants. Model results can be viewed in the online supplementary material.

Fig. 2 shows that as the proportion of public housing tenants in the population increases, the hospitalisation rate generally decreases slightly, with our model results implying there is a minimum at 49 %. Those living in areas with fewer than 15 % public housing tenants had 20 % more hospitalisations on average five years later than those living in areas with 15 % to 70 % public housing tenants.

The highest rates of hospitalisation occur in people living in meshblocks with very low, or very high proportions of public housing tenants. While statistically significant, the effect size is modest, with our model predicting that those living in meshblocks with 49 % public housing tenants five years earlier would have on average 0.05 fewer hospitalisations than those living in meshblocks with 10 % public housing tenants.

Fig. 3 shows that the larger census area unit analysis has broadly the same pattern as the meshblock analysis. As the proportion of public housing tenants increases, the rate at which public housing tenants are hospitalised five years later decreases slightly. When we modelled this association, we saw that the minimum hospitalisation rate occurred when 38 % of an area unit are public housing tenants. The impact is relatively small, with 0.06 fewer hospitalisations when comparing those living in areas with 38 % public housing tenants to those that lived in an area with 10 % public tenants five years earlier.

Fig. 4 shows the association between the percentage of public housing tenants in meshblocks where public tenants live and the fraction

⁴ In the time-frame of this paper, public housing is defined as Housing New Zealand (HNZ) properties. HNZ, which has been incorporated into Kāinga Ora – Homes and Communities since 2019, is by far the largest public housing provider in NZ. In 2013, it housed about 200,000 public housing tenants in 68,710 properties, both owned and leased (Housing New Zealand, 2013). Approximately 9700 public tenants lived in 4201 properties owned and leased by community housing providers, at the time of the most recent survey of providers in 2014 (Saville-Smith, Fraser, & Saville-Smith, 2014). Community and council provided housing is not distinguished from private rental housing in the IDI.

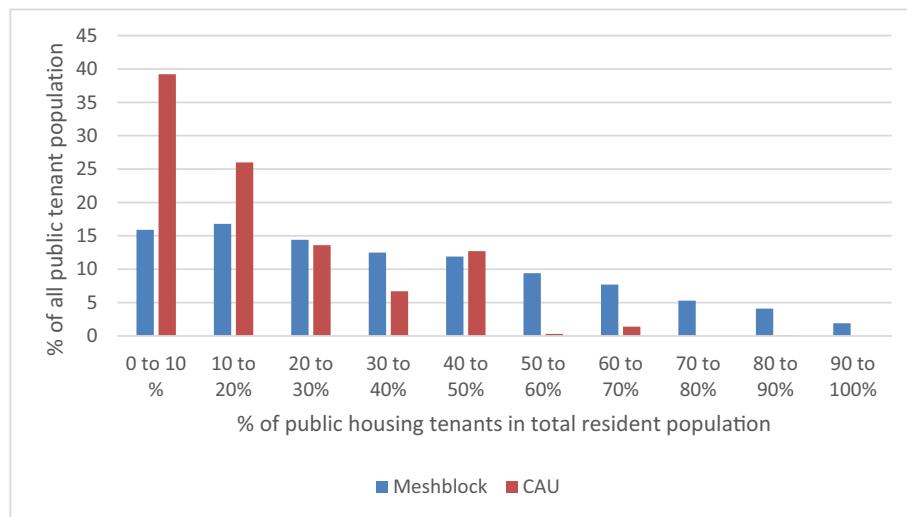


Fig. 1. Proportion of public housing tenants in meshblocks and census area units (during 2013 census).

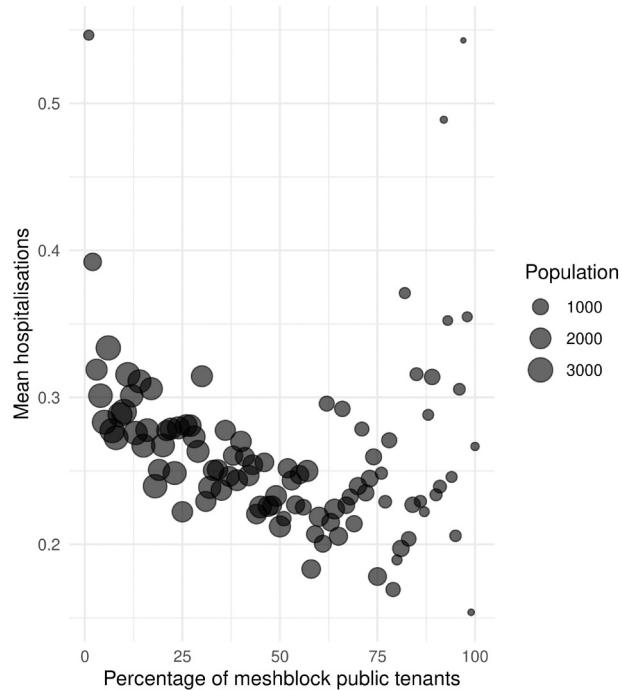


Fig. 2. Association between the percentage of public housing tenants in the population in the meshblocks where public housing tenants lived in 2013 and mean rates of hospitalisation in 2018.

of the population using mental health outpatient services five years later. Those living in meshblocks with very high (more than 70 %) or very low percentages (more than 10 %) of public tenants have the highest rates of mental health outpatient use five years later. The lowest rates of mental health outpatient use were for those public tenants that lived in meshblocks with 58 % public housing. This effect was again small with 2 % less mental health events on average for each 10 % increase in the density of public housing.

The census area unit analysis (Fig. 5) shows the same broad pattern as the meshblock analysis. Initially as the proportion of public housing increases, the rate in which public housing tenants are hospitalised for mental health reduces, with a minimum reached at 53 %. From there the rate of mental health hospitalisation increases as the proportion of public housing tenants in the census area unit where they lived five years

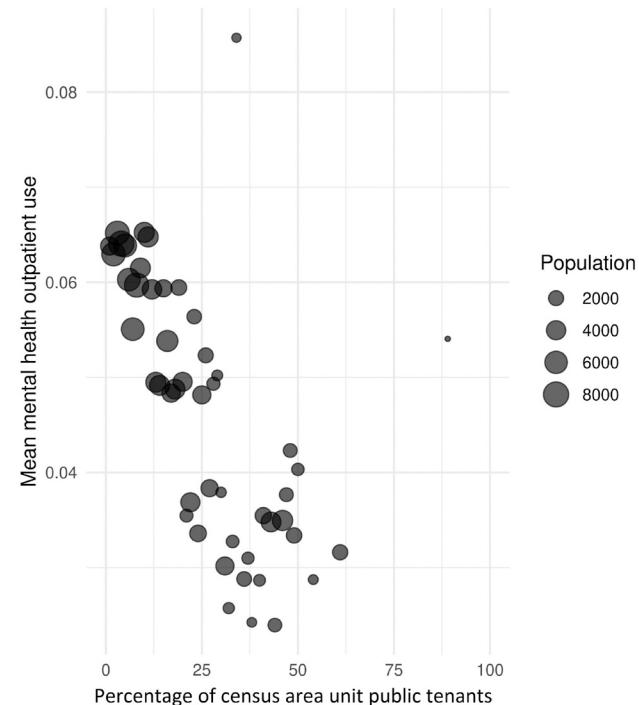


Fig. 3. Association between the percentage of public housing tenants in the census area units where public housing tenants lived in 2013 and their mean rates of hospitalisation in 2018.

earlier increases.

Fig. 6 shows the association between the percentage of a meshblock that consists of public housing tenants in 2013, and their dispensed prescriptions in 2018. A similar pattern is observed here to the two previous health outcomes, in that prescriptions are high for public housing tenants that lived meshblocks with very low and very high percentages of public housing tenants five years earlier.

Fig. 7 shows the analysis for census area units and dispensed prescriptions. This looks very similar to the results for the previous health outcomes discussed, with mean prescriptions appearing to decrease as the percentage of public housing tenants increases.

In both the meshblock and census area unit models of prescriptions, the linear and quadratic components of the percentage of public housing

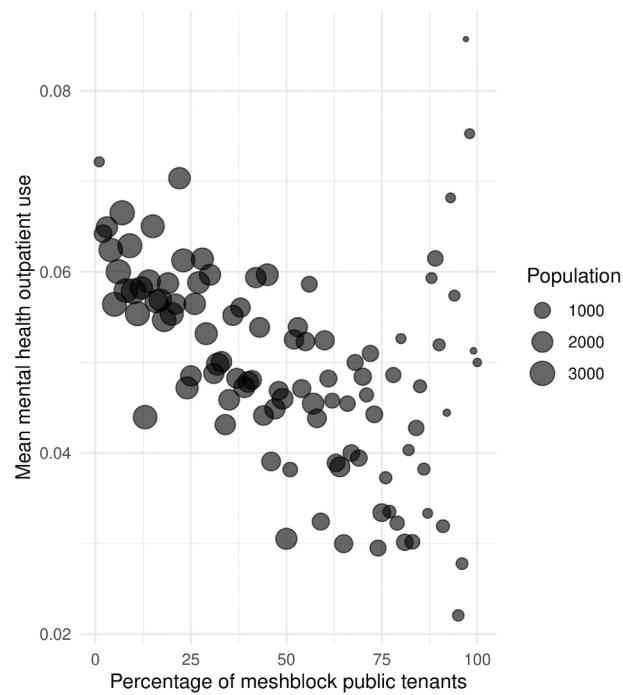


Fig. 4. Association between the percentage of public housing in the meshblocks where public housing tenants lived in 2013 and the fraction of the population using mental health outpatient services in 2018.

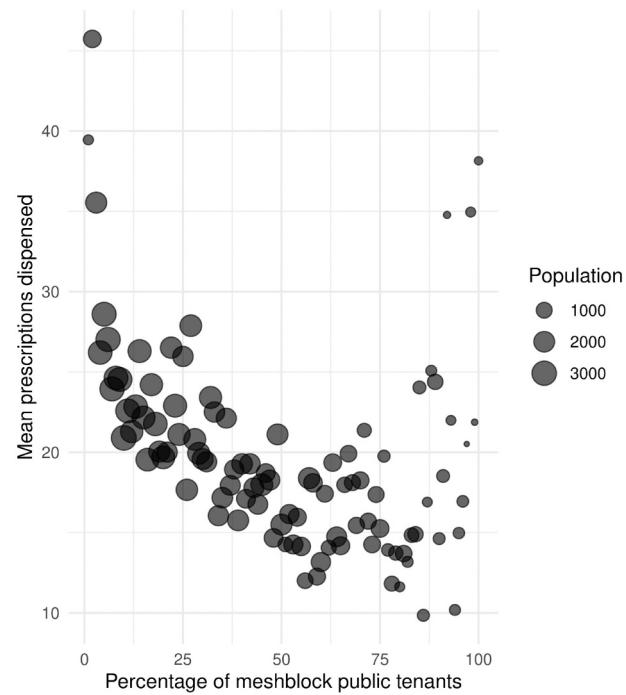


Fig. 6. Association between the percentage of public housing tenants in the meshblocks where public housing tenants lived in 2013 and mean receipt of subsidised pharmaceutical dispensing in 2018.

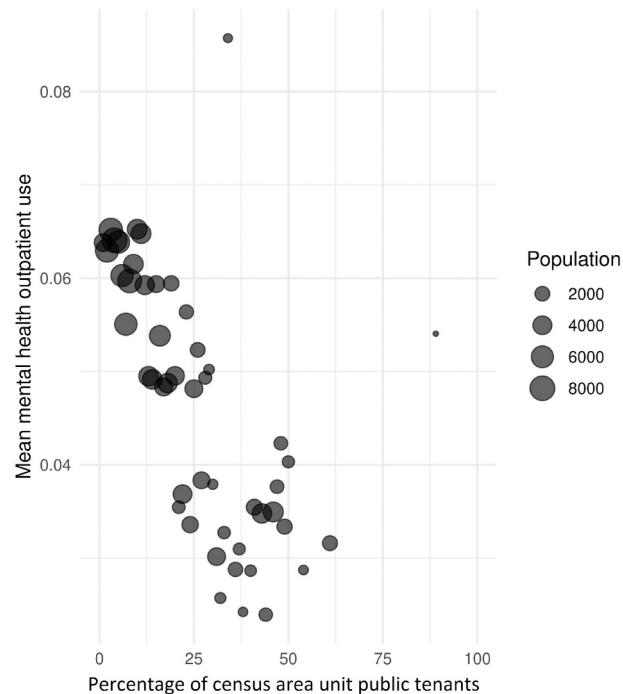


Fig. 5. Association between the percentage of public housing tenants in the census area units where public housing tenants lived in 2013 and the fraction of the population using mental health outpatient services in 2018.

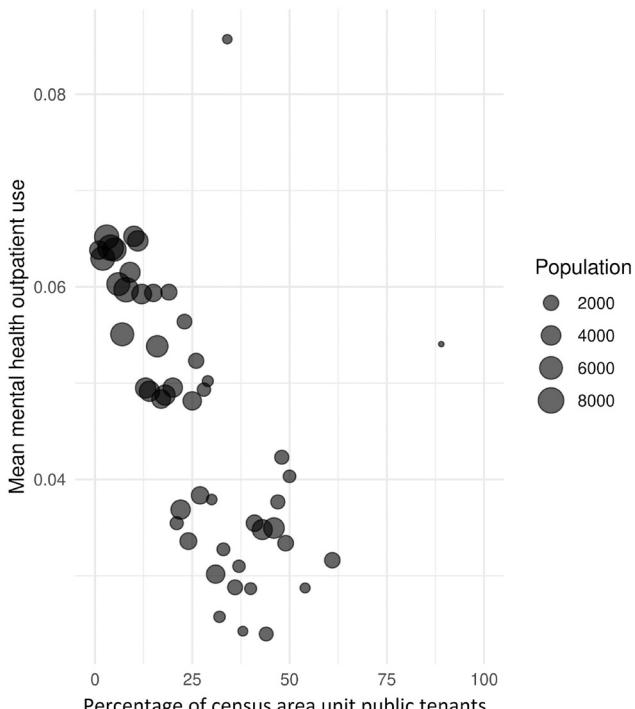


Fig. 7. Association between the percentage of public housing tenants in the census area units where public housing tenants lived in 2013 and mean receipt of subsidised pharmaceutical dispensing in 2018.

tenants are statistically significant. In the meshblock model both components are negative, so there is no minimum point.

7. Discussion

Our historical review showed that NZ thinkers and policymakers

have had an enduring interest in promoting residential socio-economic and tenure mix in order to improve social conditions and individual outcomes. This interest is evident in the early days of colonisation and remains a key motivation for housing providers and developers. Yet the international evidence that tenure mix leads to positive outcomes is

weak and mixed (Morris et al., 2012; Sautkina et al., 2012; Saville-Smith et al., 2015). Differences in welfare context and urban form between countries mean that local evidence is important (Chisholm et al., 2020; Galster, 2007; Saville-Smith et al., 2015; Stevenson, Pearce, Blakely, Ivory, & Witten, 2009). Our paper is a step towards building the NZ evidence base, and makes a significant contribution to the international literature.

Our focus in this paper is firstly on the concentration of public housing, and secondly on how this relates to the health outcomes for public housing tenants. Given the policy concern for public housing concentration, it is notable that most public housing tenants live in areas where public housing tenants were a medium or low proportion of total residents. The majority (65 %) of public housing tenants live in census area units where public tenants are less than 20 % of the population. The vast majority of (89 %) of public tenants live in meshblocks where public tenants are less than 20 % of the population. This is important context for interpreting our results, as well as the international evidence-base. As one evidence review noted, “much of the research concerned with deconcentrating social housing relates to very high concentrations – well in excess of two thirds” (Saville-Smith et al., 2015, 4).

Overall, we found that living in an area with a greater proportion of public housing tenants had a minimal effect, or a small positive effect, on tenants' wellbeing five years later. In the models which found that there was a minimum point (beyond which public housing tenant concentration led to negative outcomes), the minimum point was a proportion of public housing far higher than the places where most public housing tenants live (Figs. 2-5; 7).

Public housing tenants were less likely to be hospitalised when they had lived in places with higher proportions of public housing tenants five years earlier; the effect size was small. The hospitalisation rate is a good measure of the health of the population in general. The models showed that the minimum point for the proportion of public housing tenants in the population (beyond which health outcomes start to worsen) was rather high. The lowest rate of hospitalisation would be for a hypothetical public housing tenant living in a meshblock with 49 % public housing tenants, and a census area unit with 38 % public housing tenants (Figs. 2 and 3). In contrast with our finding that living in place with high proportions of public housing tenants seem to reduce the hospitalisation rate for those tenants, Lawder et al. (2014) found that serious-alcohol-related health problems, self-reported health, and accidental injuries were twice as likely in neighbourhoods with higher levels of social housing, even after taking levels of area deprivation and individual health-risk factors into account.

Public housing tenants were also less likely to visit mental health outpatients' units when they had lived in places with higher proportions of public housing five years earlier; the effect size was small. According to the models, the lowest levels of mental health outpatients' usage would be for a hypothetical public tenant living in a meshblock where 58 % of the population was public housing tenants, and a census area unit where 53 % of the population was public housing tenants (Figs. 4 and 5). Other studies have drawn on self-reported data, and thus include a range of mental health outcomes that are less serious than those implied by a mental health outpatients' visit. Flouri et al.'s (2015) measure (emotional problems of children in public housing) and our own (mental health outpatients usage) are quite different; however, both studies found that outcomes were worse in areas with lower concentrations of public housing. The authors had hypothesised this would be the case as the children of social tenants would be more likely to be bullied if they were the minority. Our findings contrast with Parkinson et al. (2014), who found that the median mental wellbeing of social tenants decreased as the proportion of social housing increased, and Lawder et al. (2014), who found that mental health was not patterned by tenure mix after taking levels of area deprivation and individual health-risk factors into account.

Public tenants received fewer pharmaceutical prescriptions when they lived in places with higher proportions of public housing five years

earlier; the effect size was small. At the meshblock level, there is no minimum point for this effect; i.e. according to the model, a hypothetical tenant that had lived in a meshblock with 100 % public housing accessed the least pharmaceutical prescriptions (Fig. 6). At the census area unit level, the minimum point was 85 % public housing (Fig. 7). Shifting from a meshblock with 10 % public housing tenants to one with 50 % implies an average reduction in prescriptions dispensed of 0.04 for the average tenant 5 years later. NZ is well-served by pharmacies; 86 % of the population live within 5 km of a pharmacy, and those living in the most deprived areas are slightly more likely to live close to a pharmacy (Norris, Horsburgh, Sides, Ram, & Fraser, 2014). Prescriptions are heavily subsidised (free, or NZD \$5 for those aged 14 or over). Therefore it is likely that low uptake of pharmaceutical prescriptions indicates better health, rather than inability to access prescriptions. Pharmaceutical dispensing is a useful general measurement as it is an indication of both minor and serious health conditions; we know no other study that has used this as a measure.

As Fig. 1 makes clear, the minimum points in the models (i.e. above which health outcomes for public tenants are worse) are much higher than the level of public housing tenant concentration where most tenants lived in 2013. For example, for the measure of mental health outpatients visits, 70 % of public housing tenants lived in meshblocks that have a lower concentration of public housing tenants. Ninety-eight per cent of public housing tenants lived in census area units with a lower concentration of public housing tenants. This implies that, for these health measures, most public housing tenants would not be disadvantaged by an increase in the proportion of public housing tenants living in their locality. This finding contrasts with the views outlined in the introduction and literature review, that argue that public housing tenants benefit from living in places with lower densities of public housing concentration; as one mixed-tenure developer put it in an interview, that “you really should try and keep social housing to at the absolute maximum, about 30% of a neighbourhood” (Chisholm, Pierse, and Howden-Chapman 2021, 7).

The observed benefit of greater public housing concentration may be for several reasons. First, a number of studies have found that people prefer to live near others like them (Cheshire, 2012; Markovich, 2015). Research, including from NZ, suggests that low-income people or renters can feel stigmatised in communities developed as mixed-tenure (Witten, Opit, Ferguson, & Kearns, 2018). Sharing common experiences of living on low incomes enables neighbours to support each other and has been associated with higher social capital (Middleton, Murie, & Groves, 2005; Ruming, Mee, & McGuirk, 2004). The result may also be the result of the ethnic density effects observed in a number of settings. For Māori, living in an area with a higher concentration of Māori is associated with decreased odds of some health problems and experience of racial discrimination (Bécares, Cormack, & Harris, 2013). Māori (as well as Pacific people) are disproportionately represented in public housing (Housing New Zealand (HNZ), 2019) and so living in a locality with less public housing may mean living alongside fewer other Māori and Pacific people. Second, areas with more concentrated public housing may have more accessible social services. US research showed that for public housing tenants, improved housing and access to social programmes, rather than interactions with high-income neighbours, supported their upward mobility (Fraser, DeFilippis, & Bazuin, 2012). Third, the positive effects of living alongside other public housing tenants may reflect research on inequality, which shows that having wealthy neighbours is associated with reduced levels of subjective wellbeing (Cheung & Lucas, 2016).

There were over 25,524 people on the Housing Register (public housing waiting list) for public housing in December 2021 (Ministry of Social Development, n.d.). The government is committed to building more housing and is on track to deliver more than 18,000 public housing places by 2024 (Ministry of Housing and Urban Development, 2021). However, until recently demand has been increasing exponentially (Ministry of Social Development, n.d.). The evidence presented in this

paper supports increasing the number of public houses in public housing communities currently under redevelopment into mixed-tenure communities.

The present study has a number of methodological strengths. Our analysis is based on individualised data, not aggregated data. The sample size is large. The five-year gap between the initial observation of tenure mix and the measurement of health outcomes enables us to monitor long-term effects and takes into account that context is likely to take some time to influence outcomes (van Ham & Manley, 2010). The use of two spatial units allows us to consider effects of tenure mix that may take place at a smaller street-level or larger neighbourhood-level. Unlike several of the studies reviewed, we are able to report on health outcomes for public housing tenants specifically, rather than residents as a whole. However, the study also has a number of limitations. We do not consider the effects of moving in and out of public housing, nor how long people lived in public housing. Both the duration of exposure to neighbourhood, and extent of residential mobility are likely to impact on neighbourhood effects (Hedman, 2011; Musterd et al., 2012). We do not consider difference in the quality of the community, which makes a difference to people's lives that is unlikely to be captured by our data. In NZ, socio-economically deprived communities, such as those with large amounts of public housing, are more likely to be exposed to contaminated sites and poor water quality (Pearce, Witten, Hiscock, & Blakely, 2007; Salmon et al., 1999). Third, we are unable to distinguish whether there were differences for public housing tenants who lived among low or high proportions of private residents with low or high incomes. As such, like other researchers, we conflate two questions: whether mixed tenure leads to socio-economic mix, and whether socio-economic mix leads to better social outcomes (Musterd & Andersson, 2005; Amcoff, 2021). Considering incomes of other people in the meshblock and census area unit in future research would undoubtedly provide additional insight. Nevertheless, our evidence makes a strong case that public housing concentration itself is not the problem policymakers have presumed.

8. Conclusion

Contrary to common assumptions, the proportion of public housing in meshblocks and census area units had only a minimal effect on the health outcomes of the public housing tenants who lived there five years later. Living in a community where more public housing tenants were resident had a minor, but positive impact on health outcomes for public housing tenants. Planning for larger proportions of public housing in streets and neighbourhoods would therefore not only be beneficial for public housing tenants, it would result in more public housing overall, in a time where public housing is in great demand. The issue of public housing concentration and residential mix has received considerable attention in NZ's history, especially in recent years; we would argue that the question of providing adequate housing, incomes and health and other social services to enable public housing tenants and other low-income people to live a life of dignity is of much greater importance.

Data availability statement

Our data are deidentified administrative data stored within the Integrated Data Infrastructure. This database is managed by Statistics New Zealand, and can be accessed from within datalabs run by them. Access is provided by Statistics New Zealand after an application process.

For information on how to access this data see: <https://www.stats.govt.nz/integrated-data/integrated-data-infrastructure/> or email access2microdata@stats.govt.nz

The results in this paper are not official statistics. They have been created for research purposes from the Integrated Data Infrastructure (IDI), managed by Statistics NZ. The opinions, findings, recommendations, and conclusions expressed in this paper are those of the authors, not Statistics NZ, or Ministry of Health or Kāinga Ora- Homes and

Communities. Access to the anonymised data used in this study was provided by Statistics NZ under the security and confidentiality provisions of the Statistics Act 1975. Only people authorised by the Statistics Act 1975 are allowed to see data about a particular person, household, business, or organisation, and the results in this [report, paper] have been confidentialised to protect these groups from identification and to keep their data safe. Careful consideration has been given to the privacy, security, and confidentiality issues associated with using administrative and survey data in the IDI. Further detail can be found in the Privacy impact assessment for the Integrated Data Infrastructure available from www.stats.govt.nz.

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CRediT authorship contribution statement

Elinor Chisholm: Conceptualization, Writing – original draft, Project administration, Funding acquisition. **Oliver Robertson:** Methodology, Formal analysis, Investigation, Data curation, Writing – original draft, Visualization. **Philippa Howden-Chapman:** Conceptualization, Writing – review & editing, Supervision, Funding acquisition. **Nevil Pierse:** Conceptualization, Methodology, Writing – review & editing, Supervision, Funding acquisition.

Declaration of competing interest

Philippa Howden-Chapman is currently on the board of Kāinga Ora (formerly Housing New Zealand), the public housing authority. Since the research considers a period prior to Howden-Chapman's appointment to the board in July 2018, we do not believe that this constitutes a conflict of interest.

Appendix A. Supplementary data: regression results for models

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.cities.2022.103916>.

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