Fiscal costs of different housing tenure groups

Social renting to housing security independence

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Making sense of the numbers

The purpose of our research was to estimate the impact on government fiscal costs and revenues of transitioning households along the housing continuum; from social renting towards owner-occupancy.

We hypothesised that there would be benefits in helping households in making this shift, based on the outcomes experienced by the individuals living in those households. We estimated per capita costs for people residing in Auckland under the three different tenure groups of social renting, renting, and owner-occupancy. Our data was sourced from a variety of Statistics New Zealand IDI datasets and covered the 4-year period from July 2011 to June 2015. These per capita costs were based on a series of outcomes for individuals on hospitalisations, corrections, benefits (including accommodation supplement), and PAYE.

We found that per capita costs across these categories for those with Renters were higher than those with Owner-Occupier tenure status. Further, per capita PAYE revenue from Renters were lower than from Owner-Occupiers.

We applied our per capita costs to conclude that there are potential net savings to the government, in transitioning people from a (any) renting situation, to an owner-occupier situation.

There are net savings of shifting people from both renting and social renting dwellings, to owner-occupied dwellings. However, the magnitude of net savings to the government is more pronounced when shifting people from social renting situations to owner-occupied tenure.

Our scenarios model the transition of 1,000 individuals from renters to owner occupier tenure status. We posit that these individuals gradually transition to hospitalisation, corrections and benefit behaviours that mirror those currently with owner occupier tenure status. We further posit that this transition in behaviours and outcomes is 90% complete by the end of the 15-year time horizon. In addition, the transition in income (and hence PAYE revenues) is more conservatively assumed to be only 45% complete over this 15-year horizon.

In the scenario where 1,000 individual renters are transitioned to owner-occupiers, the potential **net fiscal saving over the 15-year horizon, discounted at 3% per annum, accrues to a present value of $6.4 million**.

In the scenario where 1,000 individual social renters (i.e. those renting from government or social agencies) are transitioned to owner-occupiers, , the potential **net fiscal saving over the 15-year horizon, discounted at 3% per annum, accrues to a present value of $11.1 million.**

Both of these estimates include an annual (but declining) cost of transition advisory and support services to assist these individuals during their transition process. The figures do not, however, include any equity or capital contribution to purchasing a home.

An alternative perspective suggests that the $11.1 million in the latter scenario could be available to further assist in any transition programme (e.g. deposit and/or equity assistance or suspensory loans). Such a use of these funds (up to this $11.1m or $38,380 per household maximum in this latter scenario) would still leave the government fiscal position in a better net position than in the baseline.

Given our conservative transition assumptions and the lack of data for other relevant components of fiscal expenditure, we believe we would have under-estimated the potential net fiscal savings to government.

Essentially, what this indicates, is that there would be a net savings in the government's fiscal accounts as a result of shifting people along the home ownership continuum.[1] While this is a gross simplification of the range of

[1] This net savings is calculated as the extra PAYE revenue collected less the change in costs incurred as a result of changing renters to owner occupiers.

outcomes that households would experience, it strongly implies that it would be beneficial from a fiscal point of view, but also from a household point of view, to move people from renting (and, in particular social renting) towards owner-occupation.

Our findings are supported by our replication of a similar study by Manturuk. Our simulation of Manturuk's modelling, using data from the IDI came to the conclusion that there is a relationship between government fiscal expenditure on health, and tenure type. Essentially, that owner-occupation yields lower fiscal health costs compared to renters overall, and renters in financial hardship.

Overall, we find that there is indeed a link between tenure and outcomes across the health, corrections, and benefits payments components of fiscal expenditure, and also for PAYE revenue. The associated benefits of moving people towards housing independence can indeed provide better outcomes for the individuals in question which we show affects the fiscal accounts as well.

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1 Introduction

This report details our estimations comparing the fiscal impact to the New Zealand government of people who live in a rented dwelling versus people who live in a dwelling that is owned by that household. Our estimations are focused on those living in Auckland.

We make an additional distinction within the renters group and identify a sub-group depending on their landlord – i.e. Social renters, those who rent from a government agency such as Housing New Zealand or local government. We look at this group separately as the characteristics, demographics and so behavioural outcomes are noticeably different for the social renting sub-group.

Our look at the fiscal impact focuses on three main costs to the government: corrections, health (hospitalisations) and benefit payments. We also examine the only source of revenue for which we have data: PAYE tax paid.

Ministry of Social Development (MSD) Benefit payments impact included the unemployment/jobseeker, sole parent, and sickness/supported living categories, as well as accommodation supplement payments. Further detail as to health costs by tenure was also difficult to access, so we limited our analysis to the costs associated with hospital admissions.[2] Similarly, we investigated corrections related costs by tenure, but were unable to source associate police costs.

It is hypothesised that rental homes are of a poorer quality than owned home, and that this poorer quality leads to undesirable outcomes for tenants, which then imposes a fiscal cost on the government. Further distinctions could be seen between the two different types of renters as well.[3]

Identifying and quantifying any differences between the tenure groups' outcomes, and the resulting fiscal impact on the government of shifting people from one tenure type to another, could lead to potential changes or adjustments in policies and actions around renting versus ownership, or different renting types. This would require another level of detailed investigation but could potentially lead to significant impacts on tenure distribution across not only Auckland, but New Zealand.

[2] There are multiple and disparate measures of health outcomes within the MoH dataset in the IDI. Details are available on www.stats.govt.nz.

[3] Additional possible mechanisms for how tenure status may affect health outcomes are: tenure certainty, attachment to a location, and financial hardship.

2 Rationale for investigation

Our modelling estimating the fiscal impacts of Renters versus Owner-Occupiers was preceded by a literature review. This literature looked to identify candidate factors that would form the key variables in our subsequent econometric modelling.

The literature has a broad focus on the impacts of home ownership, on different cohorts. The impacts of home ownership measured include health, educational, behavioural, social cohesion, and employment outcomes. The cohorts included home owners, sub-components of households such as the children of home owners, and tenants of rented accommodation. These spanned individual, family (i.e. household), neighbourhood, and community level effects.

The methodologies varied between the various studies, and covered a wide range of research questions and countries. The impacts of home ownership have been studied for some time now, and many studies are posited on a common perception that home ownership is desirable, because of supposed associated benefits that result from owning a house. The studies test this perception and the degree of influence that home ownership and to a lesser degree, housing tenure (as the vast majority of the studies are focused on home ownership), have on outcomes such as crime, health, and education.

Common factors that were controlled for in quantitative studies include income, age, race, gender, education, and marital status. These are fairly similar to the dimensions of the New Zealand Deprivation index, which covers communication, income, employment, qualifications, home ownership, support, living space, and transport.

Our own modelling is based on measuring the impact on government fiscal expenditure of selected impacts of homeownership on households. These selected outcome impacts were on households' interaction with the health system, the corrections and justice system, social benefits, and Pay As You Earn (PAYE) tax paid to the government.

We acknowledge that there are limitations to the selection of these impacts to measure, but emphasise that the aim of this research is to provide a high level analysis rather than a detailed focus on what variables should be included. Our analysis is limited by the type of and availability of data, within a constrained timeframe. In terms of the availability of data, our key constraint was being able to identify a set of measurable outcomes linked to tenure, which could then be linked to government fiscal expenditure. That is, be able to identify a list of outcomes that were measureable, were historic, and provided at least a rough proxy for the level of government expenditure within the fiscal accounts. In the New Zealand context, this is represented by the different 'Vote' appropriations within the government fiscal accounts, for example 'Vote Health' or 'Vote Corrections'.

This is where the literature review provided a starting point. As we expected, the literature review showed that the impacts of tenure type are broad and very much subject to a wide range of influencing factors. It did however present some consistent themes, which became our candidate factors and the platform variables for our econometric modelling. The literature to date provides a rationale for us to examine the relationship between housing tenure and the associated 'bad outcomes' that would result, and the subsequent impact on government expenditure. The findings of the literature are such that we would expect there to be a relatively weak, if any, relationship between tenure and 'bad outcomes'.

Our econometric modelling then provided a set of projections of the potential impact on government fiscal accounts, based on two scenarios.

Our findings were then tested by simulating the modelling of a selected relevant study from our literature review, using the data we sourced from the IDI. We tested whether the results of our modelling were similar to those of the selected study. The results of this are reported in 10.

3 Headline results

This section summarises the results of the fiscal estimates and the scenarios modelled.

3.1 Fiscal impact estimates

Table 3.1 provides an overview of the per capita costs of the different tenure groups we studied. The first column refers to the areas of government fiscal accounts that the data relates to.

There are three main areas that we cover

- health – namely, hospitalisation costs
- corrections
- MSD benefits.

The Corrections account has been further split into Prison and Community components, to reflect the two broad types of sentences issued. This generally covers sentences involving incarceration (Prison), and other types of sentencing (Community).

The second column identifies the specific sub-components of the three main areas of focus. For example, there are three types of benefits under MSD, in addition to accommodation supplement payments.

The third column summarises the average annual per capita cost estimates for people who live in a home that is owned by themselves or their family (Owner-Occupiers).

The fourth column summarises the average annual per capita cost estimates for all people who live in rental accommodation[4].

The fifth column separately provides estimates for the Social renters sub-group.

We measure these costs on a per capita basis: i.e. the total cost divided by the number of people in that tenure group. This measure takes into account the different incidence rates of outcomes, such as going to hospital or prison, for each sub population (social renters, renters or owner-occupiers).

Again, we note that the data in this report focuses on Auckland only.

The key points to notice from this table are that

- the total average annual per capita cost of renters (aggregated) is significantly higher than for Owner-Occupiers
- the total PAYE revenue that government receives from renters (aggregated) is approximately three quarters of that received from Owner-Occupiers
- the average annual per capita costs of renters (at both the aggregated and disaggregated levels) are consistently higher than for Owner-Occupiers. This difference is more marked when comparing Social renters to Owner-Occupiers.

Overall, our findings make it clear that there was a definite and quite significant higher burden on government's fiscal accounts from Social renters, compared to both Private renters and Owner-Occupiers, on a per capita basis. The difference between the Social renters and Owner-Occupier tenure groups in particular is substantial. Later sections of this report will explore why these differences arise.

[4] Note that people renting from social housing providers are not eligible for accommodation supplement payments.

Table 3.1 Fiscal impact of different tenure groups, per capita

Annual per capita* costs ($)				
		Tenure		
Area	Fiscal account	Owner-Occupier	Renters	Social Renters
Health: Public Hospital admissions				
	for 0 to 15 year olds	305	388	446
	for 16 to 35 year olds	403	467	703
	for 36 to 55 year olds	436	647	1,052
	for 56 to 75 year olds	1,083	1,601	2,184
	for 75 plus	3,033	3,134	3,428
Corrections (PRISON)	Prison sentences	39	222	444
	Home detention sentences	2	10	22
	Time spent on Parole	7	10	15
	Time spent Released on Conditions	0	1	3
	Time spent Remanded in custody	4	20	48
Corrections (COMMUNITY)	Community detention sentences	1	4	9
	Community work sentences	1	6	13
MSD benefits	Unemployment/Jobseeker	101	333	658
	Sole Parent	45	268	515
	Sickness/Supported living	57	141	307
Accommodation supplement		99	1,168	na
Total PAYE revenue		8,532	6,569	3,052

* per person aged 15 plus (except for health which is for total population in stated age group)

3.2 Scenarios modelled

We constructed two scenarios by applying the above per capita costs to model the transition of

- 1,000 individuals from renters to owner occupier tenure status.
- 1,000 individuals from social renters to owner occupier tenure status.

We posit that these individuals gradually transition to hospitalisation, corrections and benefit behaviours that mirror those currently with owner occupier tenure status. We further posit that this transition in behaviours and outcomes is 90% complete by the end of the 15-year time horizon. In addition, the transition in income (and hence PAYE revenues) is more conservatively assumed to be 45% complete over this 15-year horizon.

As listed in Table 3.2, the scenario where 1,000 individual renters are transitioned to owner-occupiers, the potential net fiscal saving over the 15-year horizon, discounted at 3% per annum, accrues to a present value of $6.4 million. Alternatively, transitioning 1,000 individual social renters to owner-occupiers, the potential net fiscal saving over the 15-year horizon, discounted at 3% per annum, accrues to a present value of $11.1 million.

Table 3.2 Scenario summary results

Result (current $s, PV over 15 years, discounted at 3%pa)	Renters to Owner Occupiers	Social renters to Owner-Occupiers
Potential fiscal savings	9,848,000	14,001,000
Potential fiscal savings **per hhd**	28,980	48,540
number of hhds	*340*	*288*
Transition advisory and support costs	3,453,000	2,931,000
Net savings total	6,395,000	11,070,000

Both of these estimates include an annual (but declining) cost of advisory and support services to assist these individuals during their transition process. The figures do not, however, include any equity or capital contribution to purchasing a home.

An alternative perspective suggests that the $11.1 million in the latter scenario could be available to further assist in any transition programme (e.g. deposit and/or equity assistance or suspensory loans). Such a use of these funds (up to the $11.1m or $38,380 per household maximum in the latter scenario) would still leave the government fiscal position in a better net position than in the baseline.

The largest component of fiscal cost in our analysis is health. It is unsurprising that this area also represents the largest fiscal savings when people are transitioned from renting to owning their own home. In Appendix B - Detailed tables, we have provided the cross tabulations of health costs per capita by age group at a detailed level. This shows how health costs vary by tenure status, but also how they vary as people age. In section 9 we use this data in our scenario projections to account for the family life course effects that impact fiscal costs.

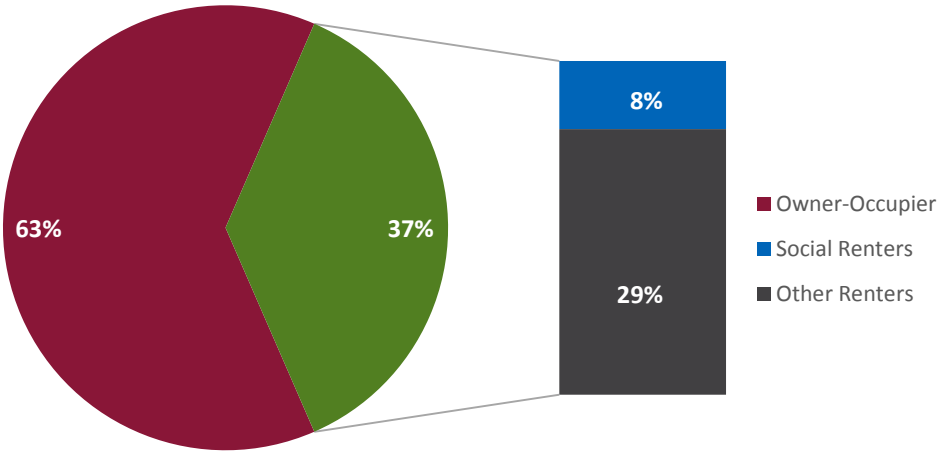
PAYE revenue also changes significantly as a household ages. Older people (up to the zenith of one's working life around age 55) tend to earn more, and thus pay more in PAYE. Renters on average earn less and pay less PAYE than owner-occupiers. And social renters tend to earn the least and pay the least PAYE. This detailed life course information is contained in Appendix B - Detailed tables. It also feeds into our scenario analysis in section 9.

4 Summary of methodology

The aim of this report was to estimate the fiscal impact to the New Zealand government of people who live in a rented dwelling versus people who live in a dwelling that is owned by that household. In order to estimate the fiscal impact to the government, we needed to be able to firstly separate the population into the three different tenure groups of owner occupiers, renters, and social renters (a sub-group of renters).

In total there are around 760,000 owner-occupiers and 440,000 renters, of which 90,000 are social renters in our study population.

Figure 4.1 Breakdown of study population by tenure type



Secondly, we would then need to be able to link the interactions of these people within the three key areas of government fiscal accounts. These three areas are: the public health system (via public hospital admissions); the corrections systems (i.e. whether they were given a prison or community sentence); and benefits payment systems (i.e. whether they received one or more of three types of benefit payments from the government).

This requires identifying and tracking individuals across multiple datasets. This is where we used linking in the Integrated Data Infrastructure (IDI) which is hosted by Statistics New Zealand.

Thirdly, once we were able to link individuals across these datasets, we were able to identify the level of frequency of incidences (e.g. the number of public hospital admissions, the type and length of prison sentence if any, the type of benefit received) of each individual. We then applied costweight multipliers and costweight numbers to calculate for example, the healthcare cost of all these individuals, and then aggregated these to find the total fiscal cost by tenure group. In some cases we were also able to break this down by age cohort as well.

We were then able to calculate the average annual cost per capita across the health, corrections, and benefit payments areas, for each of the different tenure groups. This allowed us to compare the relative per capita costs between the different tenure groups.

Using these per capita costs enabled us to make projections on the fiscal impact to government of shifting some people from one tenure group to another.

Finally, using the data from the IDI, we simulated the econometric modelling from a selected paper from our literature review. This would, hypothetically, yield similar results from our own modelling, and provide further evidence towards proving the hypothesis that rental homes are of a poorer quality than owned home, and that

this poorer quality leads to undesirable outcomes for tenants, which then imposes a fiscal cost on the government.

4.1 Linking in the IDI

In order to track individuals' outcomes and their tenure in the Integrated Data Infrastructure (IDI) we needed to link multiple IDI tables together. Statistics New Zealand (SNZ) have derived a variable called snz_uid for each individual to track or match that individual across datasets (matching).

For all variables except tenure we used this ID number to find individuals across multiple tables.

Additionally, we are concerned in the project with people who live in Auckland only. In order to track the address and type of tenure for each individual we joined the household census with the individual census. This was done by linking the dwelling ID from the dwelling table to the household table and then to the individual.

We were then able to refine our search to include only those people who were living in Auckland at the time of the 2013 Census and who were Usually Resident in Auckland at that time.

4.2 Note on terminology

Specific definitions of data and variable terms are provided in the appendix.

For health fiscal costs all per capita numbers relate to total costs divided by the total number of people in the relevant population.

For all other fiscal costs and for PAYE fiscal revenue all per capita numbers relate the relevant total divided by the number of people aged 15 plus in the relevant population.

All data is for the Auckland area, with annual averages calculated from data for the four fiscal years 2012-2015

5 Health

This section discusses our Health outcomes findings using Ministry of Health data from the IDI.

There are a multitude of variables which impact on health outcomes. Health outcomes could be physical or mental. Within the IDI, there are multiple variables that are reported, such as laboratory claims data, mental health and addiction service use, and pharmaceutical claims data. This data is wide-ranging and complex, and again we emphasise that our analysis is based on the availability of data within a constrained timeframe.

For the sake of simplicity, we selected hospital admissions as our indicator of health outcomes. We believe that this provides a proxy for the prevalence (i.e. level of incidence) of bad health outcomes. That is, a higher frequency of hospital admissions indicates a lower health outcome. We found that this held true across most age cohorts, with the exceptions being the very young and the elderly. In these two instances incidence rates were relatively higher.

5.1 Approach

The health data used was of records of admissions to public funded hospitals. This data counted how many people usually resident in Auckland at the time of the 2013 census had been admitted to a publicly funded hospital in the period between 30/06/2011 and 01/07/2015.

We applied the Costweight estimation method in this instance. This Costweight estimation method takes into account the length of time a person was in hospital, the type of treatment they received and other primary drivers of healthcare costs[5]. For each of these people, on each of their visits (as some had multiple visits), we extracted a Costweight Multiplier which was then multiplied by a Costweight Number to give an estimate of the cost of their healthcare.

Using the IDI matching approach described previously we were able to match individual people to tenure types and their health sector interaction in terms of public hospital admissions, to get an estimate of the healthcare demand behaviour and total costs of each tenure type.

5.1.1 Key findings

We found that Owner-Occupiers accounted for the highest total costs of public hospital admissions. However, on a per capita basis, and comparing those with similar ages Renters had the higher admission rate or incidence (i.e. higher proportion of that tenure group were admitted to a public hospital) and more notably, a higher cost per capita. Further, within the Renter group, the Social renter sub-group had a higher cost per capita than the average Renter (again, comparing those with similar ages).

[5] For further reading on the Costweight method please see http://www.health.govt.nz/publication/new-zealand-casemix-system-overview-0

5.2 Detailed results

Table 5.1 Hospital admissions by tenure type, 2011-2015, annual average

Tenure	Age group	Owner-Occupier	Renters	Social Renters
Admissions		55,445	34,640	8,451
Admission rate (%)		7%	8%	9%
Total cost ($millions)		504	290	88
Cost per person ($)	0 to 15 year olds	9,318	10,154	11,228
	16 to 35 year olds	12,454	13,329	16,201
	36 to 55 year olds	14,699	18,015	22,952
	56 to 75 yerar olds	24,540	30,244	35,089
	75 plus	19,317	20,166	21,442
Cost per capita ($)	0 to 15 year olds	305	388	446
	16 to 35 year olds	403	467	703
	36 to 55 year olds	436	647	1,052
	56 to 75 yerar olds	1,083	1,601	2,184
	75 plus	3,033	3,134	3,428

Table 5.1 details the total public hospital admission costs across the tenure groups, for the period 2011-2015. The figures are expressed on an annual average basis. The total number of admissions appears to be significantly higher for the Owner-Occupiers. This reflects the relatively higher Costweight Multiplier and Costweight Number for the typically older demographic of Owner-Occupiers. In other words, there were more admissions for Owner-Occupiers, largely because of the simple fact that a significant portion of Owner-Occupiers are older cohorts. However, the admission rate, which shows the proportion of all people in the tenure group that were admitted to a public hospital, was the lowest amongst the Owner-Occupiers. So while the nominal value of admissions is highest for Owner-Occupiers, this was a relatively smaller proportion of the whole Owner-Occupier tenure group, compared to the Renters.

Conversely, while by count the Social renters had the lowest number of admissions, they had the highest admission rate across the tenure groups. This reflects the higher proportion of children in the Social renters group, who had an associated higher frequency of admissions.

An appropriate reflection of the average annual Health (hospitalisation) cost is found in the cost per capita figures for similar age groups. Comparing such similar age groups, the per capita cost for those with Owner-Occupier tenure status is lower than for Renters. This reflects both the lower overall rate of admissions, as well as lower Costweight (encompassing length of stay and type of treatment factors) for Owner-Occupiers compared to Renters.

Further, the Social renter sub-group are estimated to incur the highest per capita hospitalisation costs.

These tables paint a picture consistent with the hypothesis that renters incur higher government expenditure due to poorer housing conditions. We argue that poorer housing conditions lead to illnesses and additional stress that result in illnesses and an increased use of publicly funded hospitals. In addition, social renters are clearly a sub-group incurring even higher government expenditure.

Next, we analyse the relative distributions of incidence and cost of healthcare over age groups by tenure type.

Figure 5.1 Incidence of public hospital admission by age and tenure

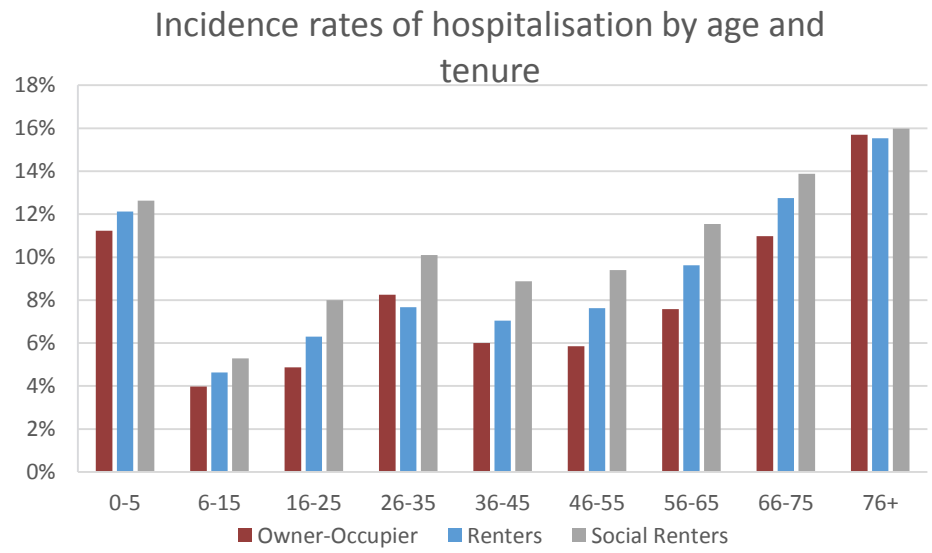


Figure 5.1 shows the proportion of each tenure and age group that were admitted to a public hospital at least once. It shows that the highest rate of public hospital admissions was seen in the 76+ age group, and this applied across all the tenure groups. This was followed by the 66-75 age group, with the 0-5 age group close behind. This implied that the greatest rate of hospital admissions was by the age groups at either end of the age spectrum, i.e. the elderly and very young children.

Noticeably, within each age group the admissions rates were higher for the Renter tenure group (with only one exception) and higher still for the Social renter sub-group. The exception to this was the lower admission rate for Renters in the 26-35 year old age group, compared to Owner-Occupiers.

Figure 5.2 Distribution of age groups by tenure type

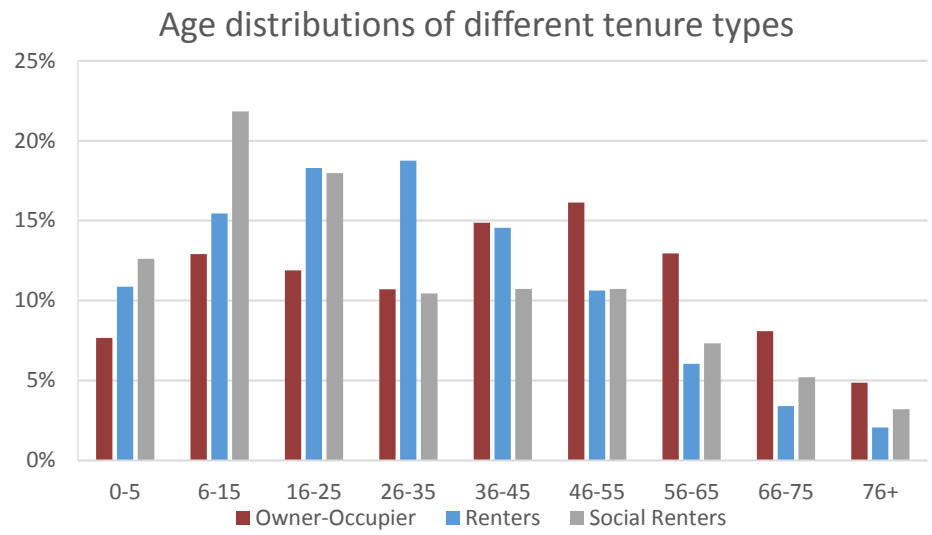
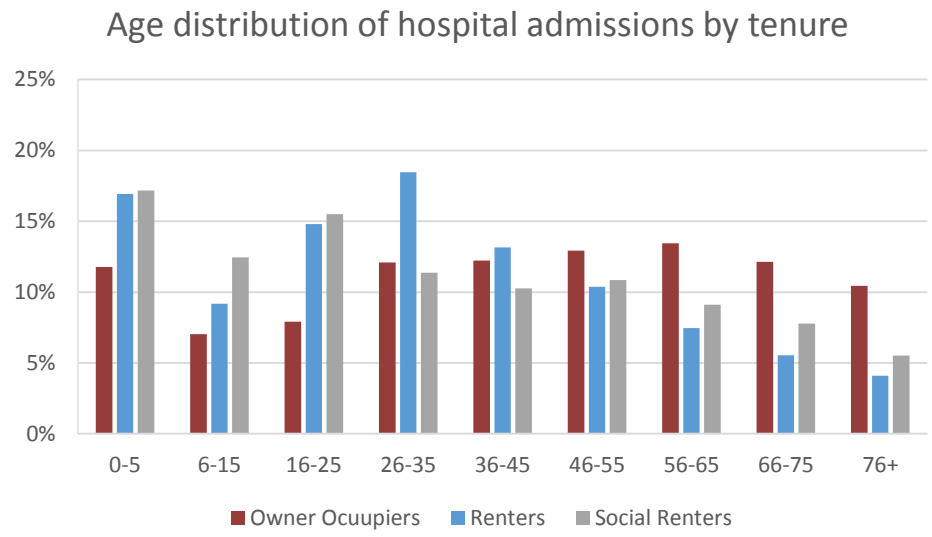


Figure 5.2 shows the age distribution of each of the different tenure groups. We were interested here in how the incidence of hospitalisation and total cost of healthcare differed by age groups.

The Social renters had the youngest composition, with the highest proportion of its individuals being aged 6-15 years old. For renters the highest proportion were aged between 26-35 years old, (arguably characterised by young professionals who are likely to have had no children). Meanwhile Owner-Occupiers had the 'oldest' demographic composition, with the highest proportion being aged 46-55 years old, but also noticeably proportionately more (than Renters) in the 56+ age groups.

This agrees with our standard model of tenure – younger people are more likely to rent because they may have recently left home while older people are more likely to be owner occupiers because they have had longer to earn and save.

Figure 5.3 Age distribution of hospital admissions



The age distribution shown in Figure 5.3 helps explain the differing levels of incidence of public hospital admissions and the subsequent costs per capita of each tenure group, with higher costs per capita for both the

older and very young demographics. Older homeowners tend to account for a much larger percentage of total hospitalisation costs of Owner-Occupiers. While for Renters the young-middle age groups of 26 to 55 seem to account for the larger share of health costs attributed to this population.

Figure 5.4 Age distribution of hospital cost

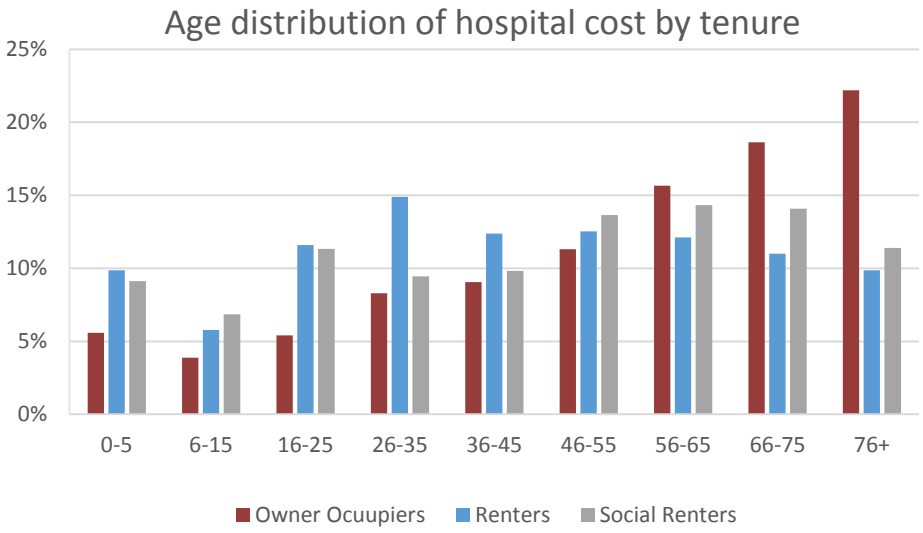


Figure 5.4 shows that the highest proportion of those who incurred public hospital admissions in the Owner-Occupiers were 76+ year olds. For Social renters it was those aged between 56-65 years old. For Renters it was those 26-35 years old.

The greatest costs of healthcare for an individual are incurred at either ends of the age spectrum – when one is very young and may need specialist treatment such as a Neonatal Intensive Care Unit. Conversely, when one is very old one might require more frequent operations and there is a greater likelihood of complications. We observe that owner occupiers seem more concentrated at the tails of the age spectrum than renters, this helps explain why in our data owner occupiers are incurring a greater healthcare cost per person than renters.

Figure 5.5 Cost per capita of public hospital admissions, by age and tenure

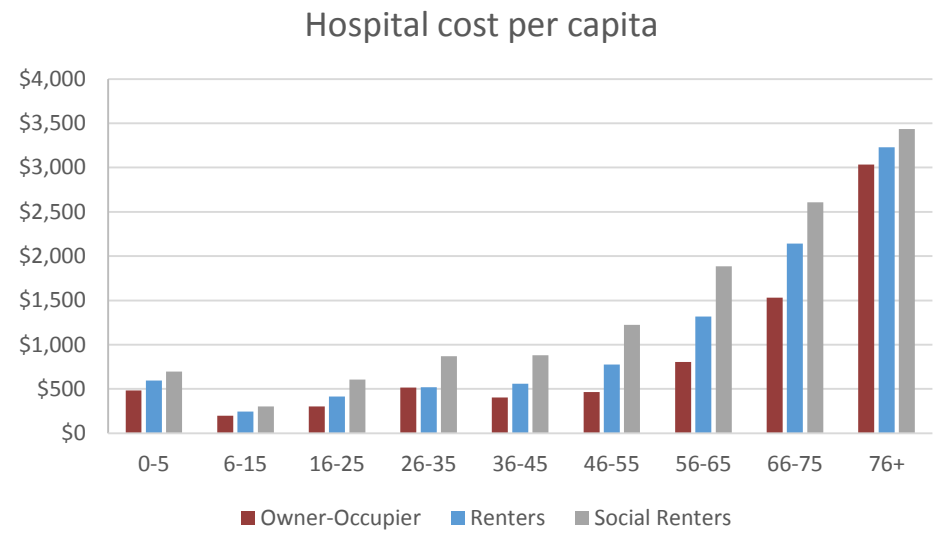


Figure 5.5 shows the cost per capita of public hospital admissions, by age group and tenure. The highest cost per capita was for the 76+ age group, across the three tenure groups. There was a progressive increase in cost per capita moving upwards through the age groups, across the tenure groups as well. The only exception to this was the 0-5 year old age group, which had relatively higher costs per capita than both the 6-15 and 16-25 year old cohorts. This reflects the relatively higher level of hospitalisation incidence in this age group

6 Corrections & Justice

In this section we explore the incidence and costs to the government through corrections outcomes.

We hypothesised that due to market imperfections, renters may be unlikely to feel secure enough in their tenure to make the social investments in the community to feel a part of/more a part of, it. Therefore they may have a stronger tendency to commit crimes, compared to Owner-Occupiers.

6.1 Approach

We collected data from the IDI on sentences managed under PRISON and COMMUNITY. Using our matching technology we are able to match the snz_uid from the corrections data to those of the census. This allowed us to count how many people usually resident in Auckland at the time of the 2013 Census were sentenced to a PRISON or a COMMUNITY sentence during the fiscal years between 30/06/2011 and 01/07/2015 and how long this sentence was. Additionally, we acquired cost information for sentence types and calculated the total cost of sentences for each tenure group. Thus we were able to calculate an annual estimate of costs to the government.

We note that the incidence of corrections outcomes can flow two ways: renters can be more likely to commit crimes as per the above hypothesis. However, people that are sentenced to a crime are also more likely to be renters due to income constraints that arise from being convicted and sentenced. Our analysis in this section makes no attempt to separate these two mechanisms.

We also note that people who are convicted of a crime and sentenced are less desirable for private landlords and tend to be users of social renting services. Additionally, due to the nature of retrieving data from the IDI we are unable to provide an age group breakdown of corrections data.

To provide some evidence for our hypotheses we calculated the incidence rates of PRISON sentences by tenure type. These were calculated by dividing the number of people who were sentenced to each sentence type by the number of people in that tenure group aged over 15.

6.1.1 Key findings

We found that overall, Renters tended to account for the highest count in terms of people with some form of corrections sentence, and also by count of days and total cost. The Social renters sub-group consistently generated the highest cost per capita across all the different types of corrections sentences. This reflects the higher proportion of individuals within Social renters who had some sort of sentencing whether prison or community related. Owner-occupiers were the opposite, with the lowest cost per capita across all sentence types.

6.2 Detailed results

6.2.1 Prison related sentences

Table 6.1 Prison sentence costs by tenure type

	Prison sentences				
Household Tenure	Count of people sentenced	Count of days	Total cost ($millions)	Cost per person sentenced ($)	Cost per capita ($)
Owner-Occupier	67	83,225	23.4	350,259	39
Renters	167	259,675	72.9	435,882	222
Social Renters	71	94,475	26.5	376,370	444

Figure 6.1 shows that both the incidence of prison sentences and the total cost of these sentences is highest amongst Renters. However, the indicator which provides the most relevant comparison amongst the tenure groups, the cost per capita (Table 6.1), is not only the highest for Social renters, but it is more significantly so compared to the other tenure groups. It is more than 11 times higher, at $444 per capita, than the cost per capita for Owner-Occupiers of $39.

Table 6.2 Home detention sentence costs by tenure type

	Home detention sentences				
Household Tenure	Count of people sentenced	Count of days	Total cost ($millions)	Cost per person sentenced ($)	Cost per capita ($)
Owner-Occupier	95	21,500	1.4	14,701	2
Renters	212	49,825	3.2	15,185	10
Social Renters	86	19,975	1.3	15,068	22

Table 6.2 shows that for home detention sentences, the highest number of people by count was in the Renters group. This group also accounted for the greatest number of days in this type of sentencing and the highest total cost, but when broken down to cost per capita the highest was for Social renters at $22 per person.

Table 6.3 Parole sentence costs by tenure type

	Time on parole				
Household Tenure	Count of people sentenced	Count of days	Total cost ($millions)	Cost per person sentenced ($)	Cost per capita ($)
Owner-Occupier	30	214,525	4.0	132,765	7
Renters	49	176,600	3.4	69,256	10
Social Renters	16	47,350	0.9	58,164	15

Table 6.3 shows that Social renters had the lowest count of people on parole, yet still had the highest cost per capita due to the a higher proportion of that tenure group being on parole compared to the Owner-Occupiers and Renters.

Table 6.4 Released on conditions sentences by tenure type

	Released on conditions				
Household Tenure	Count of people sentenced	Count of days	Total cost ($millions)	Cost per person sentenced ($)	Cost per capita ($)
Owner-Occupier	34	14,575	0.1	4,112	0
Renters	102	42,900	0.4	4,010	1
Social Renters	49	20,250	0.2	3,963	3

Owner-occupiers had the lowest proportion of its individuals released on conditions, though still accounted for the highest cost per person across the tenure groups, as shown in Table 6.4. Again, though it did not have the highest count of people released on conditions or count of days, and with the lowest cost per person, Social renters still had the highest cost per capita under this type of sentencing.

Table 6.5 Remanded in custody by tenure type

	Remanded in custody				
Household Tenure	Count of people sentenced	Count of days	Total cost ($millions)	Cost per person sentenced ($)	Cost per capita ($)
Owner-Occupier	119	9,025	2.3	18,935	4
Renters	320	26,000	6.5	20,229	20
Social Renters	140	11,625	2.9	20,733	48

The highest count of people remanded in custody were those who were Renters. However, as Table 6.5 shows, the highest cost per capita was for Social renters. Again, this is due to a higher proportion of Social renters, relative to the other tenure groups, remanded in custody. Notably, the cost per capita for Social renters was 12 times greater than that of Owner-Occupiers.

Figure 6.1 PRISON incidence rates in total by tenure

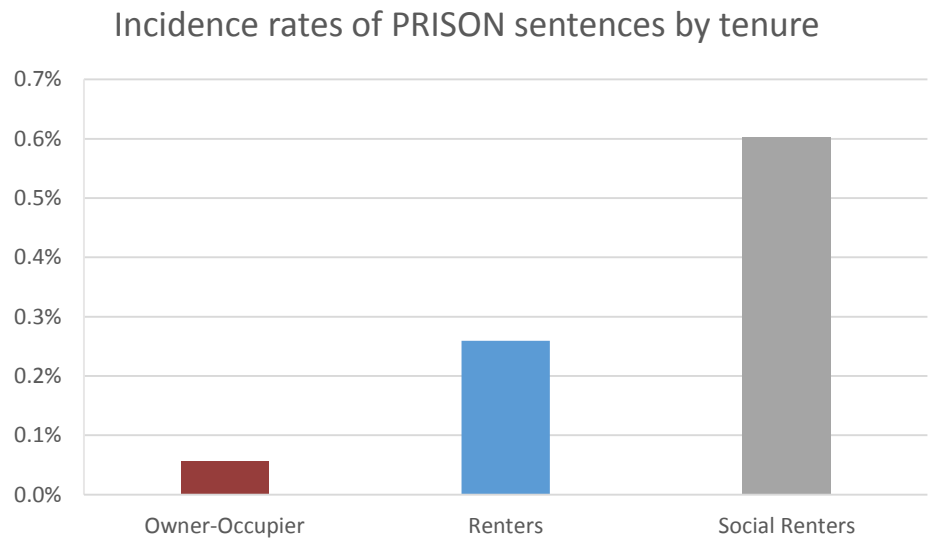
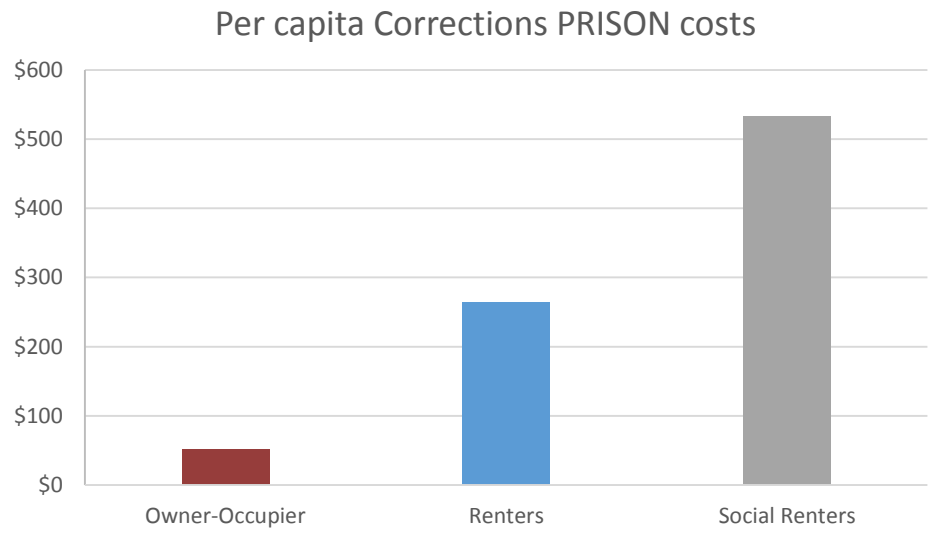


Figure 6.1 shows the incidence rate of prison sentences total, by tenure. By prison sentences in total, we have taken the weighted average of incidences across all five prison related sentences. Again, this is equal to the number of people who were sentenced to any (prison related) sentence divided by the number of people over 15 in that tenure group. It shows that Social renters had a substantially higher probability of having a prison related sentence compared to Renters and Owner-occupiers.

Figure 6.2 Cost per capita of PRISON sentences



The pattern of higher probability of having a prison related sentence for Social renters is mirrored in their per capita corrections prison costs. Figure 6.2 shows that the average annual per capita corrections prison related sentence cost is approximately $50 for Owner-occupiers, $260 for Renters, and over $500 for Social renters.

Examining Figure 6.1 and Figure 6.2 we see that the pattern of sentencing matches the expected pattern if our hypothesis is correct. We emphasise, however, that this analysis does not indicate the direction of causality: we cannot conclude that renters are more likely to be sentenced than owner occupiers.

6.2.2 Community service related sentences

Next, we analyse data on sentences managed under COMMUNITY: these include community detention and community work sentences. We obtained data on how long each person's sentence was and what their tenure status was at the time of the 2013 Census. This allowed us to calculate an estimate of the annual cost of COMMUNITY sentences for people in Auckland in 2013 who were usually resident in Auckland at that time.

Table 6.6 Community detention sentences by tenure type

	Community detention sentences				
Household Tenure	Count of people sentenced	Count of hours	Total cost ($millions)	Cost per person sentenced ($)	Cost per capita ($)
Owner-Occupier	155	20,300	0.63	4,085	1.0
Renters	344	45,150	1.41	4,086	4.3
Social Renters	129	16,900	0.53	4,075	8.8

Table 6.6 shows that the count of people sentenced to community detention was relatively similar across the tenure groups, as were the total costs and cost per person sentence. Owner-occupiers had the lowest cost per capita while Social renters had the highest.

Table 6.7 Community work sentences by tenure type

	Community work sentences				
Household Tenure	Count of people sentenced	Count of hours	Total cost ($millions)	Cost per person sentenced ($)	Cost per capita ($)
Owner-Occupier	560	77,700	0.82	1,460	1.4
Renters	1,294	185,050	1.94	1,499	5.9
Social Renters	517	75,725	0.79	1,523	13.2

Table 6.7 continues the trend seen with community detention sentences, with Social renters having a cost per capita significantly higher than Renters, and more so than Owner-occupiers. This is despite there being a lower count of people with community work sentences in the Social renters group, which implies that a greater proportion of Social renters had community work sentences relative to the other tenure groups.

Figure 6.3 COMMUNITY incidence rates in total by type and tenure

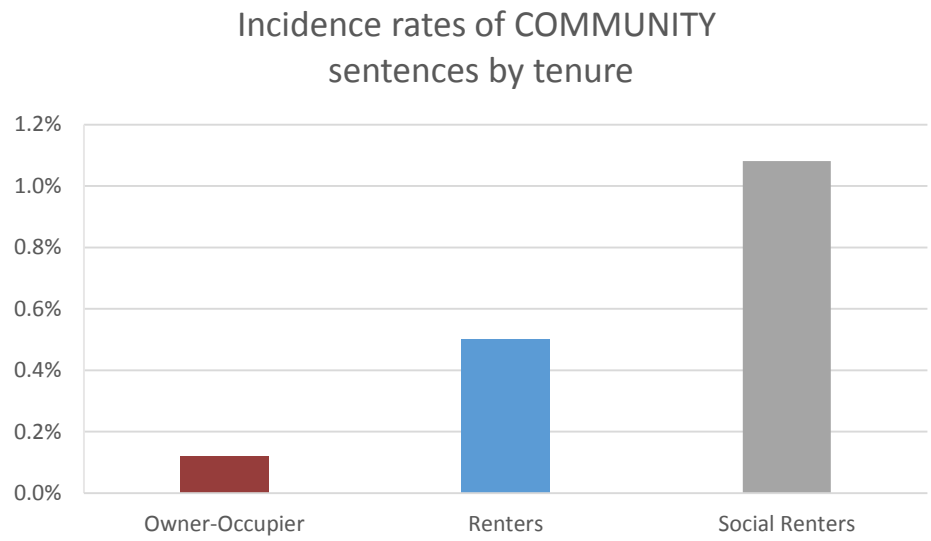
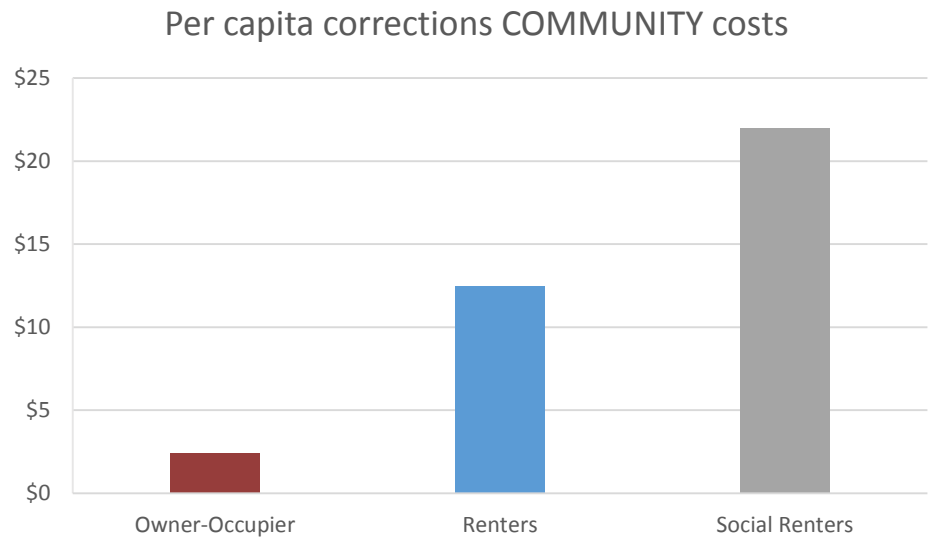


Figure 6.3 mirrors the pattern of incidence levels across the tenure groups as seen with total prison related sentences. Social renters have the highest proportion of probability of having a community service related sentence relative to Renters and Owner-occupiers.

Figure 6.4 Per capita costs of COMMUNITY sentences by tenure



Again, the same pattern observed in incidence rates of community service related sentences is seen in the per capita corrections community service related costs. Owner-occupiers with community service related costs had the lowest per capita cost of approximately $2.50; for Renters the per capita cost was approximately $12.50, while it was highest for Social renters at approximately $22.00.

The overall pattern we observed in the PRISON sentences data is repeated in the COMMUNITY sentences data. Social renters were more likely to be sentenced and owner occupiers were the least likely to be sentenced to a COMMUNITY managed sentence.

Comparing these figures with the corresponding figures for PRISON sentences we note that COMMUNITY sentences are the more common sentences with the incidence rates being higher for all tenure types.

We acknowledge the role that demographics such as age, ethnicity and income level might play in affecting corrections outcomes. However we are unable to provide an appropriately detailed level of cross tabulation due to the counts being suppressed by Statistics NZ's rules regarding the rounding of counts to protect privacy.

7 MSD benefit payments

In this section we analyse the data available in the IDI on benefits provided by the Ministry of Social Development. We are able to link individual people to what benefits they are on, for how long, and what their daily rate is. By doing so we are able to arrive at a very good estimate of the average annual cost of benefits by tenure type to people in Auckland in 2013 who were usually resident in Auckland at that time.

Note that the type and title of benefits have changed over recent periods. Hence, we grouping benefits into three main categories.

- Unemployment/jobseeker benefits
- Sole parent benefits (including the former domestic purposes benefit)
- Sickness/supported living benefits (including the former widows, and invalids benefits)

We provide a separate table of results for each group.

Table 7.1 Unemployment/jobseeker beneficiaries by tenure

Unemployment/Jobseeker benefits					
Household Tenure	Count of people receiving benefits	Count of days	Total cost ($millions)	Cost per person receiving benefit ($)	Cost per capita ($)
Owner-Occupier	7,520	2,265,000	60.9	8,093	101
Renters	11,158	3,838,750	109.1	9,781	333
Social Renters	3,463	1,378,000	39.3	11,356	658

Table 7.2 Sole parent beneficiaries by tenure

Sole parent benefits					
Household Tenure	Count of people receiving benefits	Count of days	Total cost ($millions)	Cost per person receiving benefit ($)	Cost per capita ($)
Owner-Occupier	1,547	749,675	27.3	17,639	45
Renters	4,030	2,346,500	87.9	21,819	268
Social Renters	1,407	843,775	30.8	21,862	515

Table 7.3 Sickness/Supported living beneficiaries by tenure

Household Tenure	Sickness/Supported living				
	Count of people receiving benefits	Count of days	Total cost ($millions)	Cost per person receiving benefit ($)	Cost per capita ($)
Owner-Occupier	2,679	1,128,875	34.1	12,726	57
Renters	3,713	1,447,000	46.1	12,411	141
Social Renters	1,340	566,725	18.3	13,678	307

These tables indicate that the per capita fiscal cost in terms of social welfare benefits is greater for those in Rental properties compared to owner-occupiers. Noticeably, within the group of renters those renting from government agencies have a higher per capita fiscal cost compared to the overall renters group.

As for previous sections, we provide both estimates of costs per person as well as costs per capita. In this instance, the estimated costs per person reflect the total fiscal cost of the benefit divided by the number of people receiving that benefit. The estimate costs per capita reflect the total fiscal cost of the benefit divided by the total number of people in the specified tenure group (or sub-group).

The largest category, in terms of people count, number of days and overall cost, is clearly the unemployment/jobseeker related benefit payments. This category (see Table 7.1) comprised nearly 19,000 people accounting for 6 million days of payments at a total cost of $170 million. However, this cost was disproportionately associated with those in rental tenure. We note that the cost per person was also higher for those in rental tenure, indicating that the average length (in days) receiving this benefit was also higher for this group of the Auckland population.

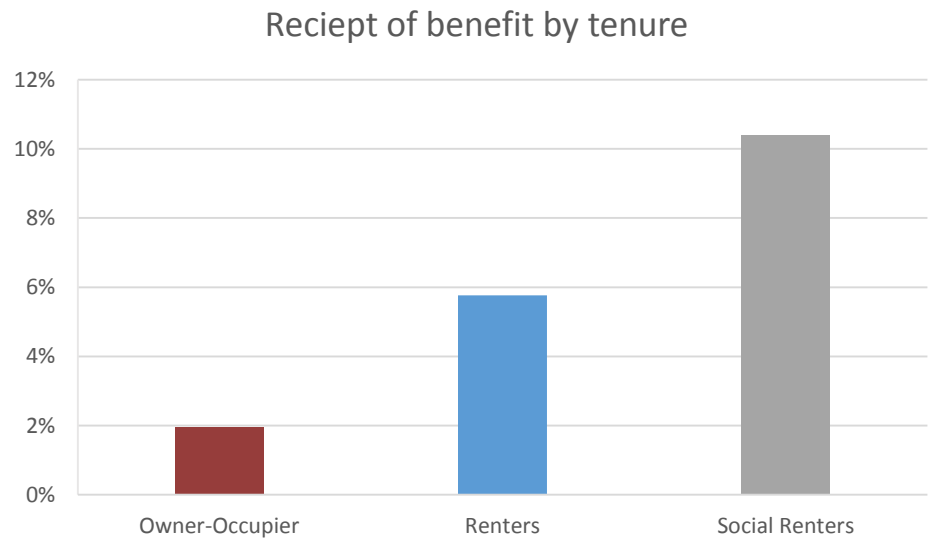
This pattern also holds for the other two categories of social welfare benefits.

7.1 Benefit incidence and costs by tenure

Grouping the three benefit categories together, we can estimate an overall incidence rate for each tenure group. That is, calculating the number of people receiving at least one of the benefits and dividing by the number of people in each tenure group. The results are depicted in Figure 7.1.

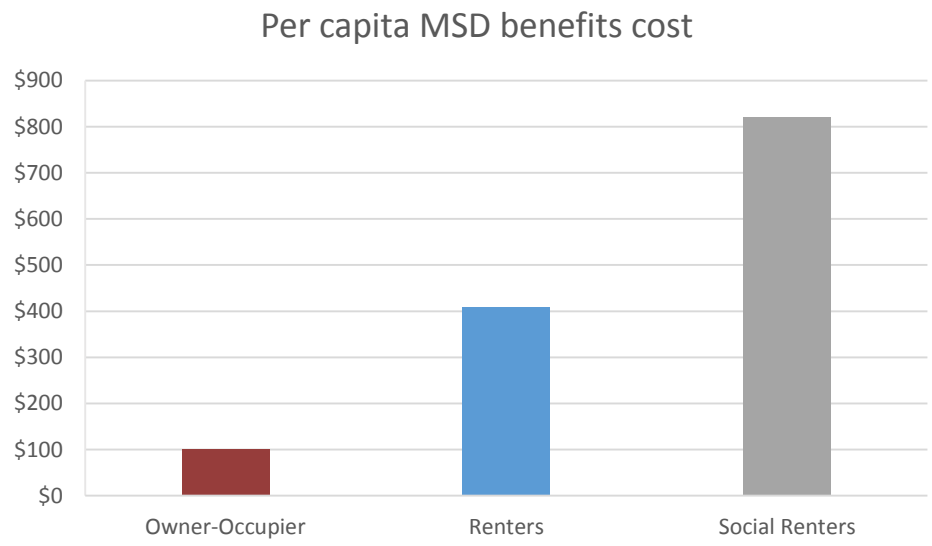
These estimates indicate more than 10% of all Social renters received at least one of the benefits captured by our data. In contrast, 2% of those living in owner-occupier households received a benefit.

Figure 7.1 Receipt of any benefit by tenure



The consequent overall social welfare benefit fiscal costs per capita are depicted in Figure 7.1

Figure 7.2 Per capita cost of benefits by tenure



Overall, as with health and corrections outcomes, social renters appear to have a higher incidence rate of receiving benefits. This translates to a higher fiscal cost (on a per capita basis) for those living in social rental accommodation.

7.2 Accommodation supplement

The accommodation supplement is paid to home owners and renters who meet income, assets, and rent/mortgage criteria.

From MSD data we find a total so $442m in accommodation supplement was paid in the 2015 fiscal year to residents in the Auckland area. However, the criteria for accommodation supplement explicitly excludes payments to those renting from social housing providers (including Housing New Zealand and approved

community housing providers). Consequently, the $442m is split between owner-occupiers and those living in rented accommodation as listed in Table 7.4.

Table 7.4 Accommodation supplement by tenure

Household Tenure	Accomodation supplement				
	Count of people receiving benefits	Average weekly rate of payments ($)	Total cost ($millions)	Cost per person receiving benefit ($)	Cost per capita ($)
Owner occupier	10,886	105	60	5,485	99
Renters	63,994	115	383	5,979	1,168

We acknowledge the role that demographics such as age, ethnicity and income level might play in affecting MSD benefits outcomes. However we are unable to provide an appropriately detailed level of cross tabulation due to the counts being suppressed by Statistics NZ's rules regarding the rounding of counts to protect privacy.

8 PAYE

In calculating the fiscal cost of renters versus owner-occupiers we also need to account for how much revenue each group contributes to the government. This is approximated using the Pay As You Earn (PAYE) revenue generated by the government. Our figures below are for the year 2015, for our Auckland population, across the different tenure groups.

Table 8.1 Gross income and PAYE by tenure type

	Gross Income and PAYE			
Household Tenure	Gross Income ($millions)	PAYE paid ($millions)	Effective PAYE rate (%)	PAYE paid per capita ($)
Owner-Occupier	22,957	5,148	22.4%	8,532
Renters	9,467	2,153	22.7%	6,569
Social Renters	1,139	182	16.0%	3,052

We expected to see that PAYE would be higher for Owner-Occupiers, compared to Renters overall, and that there would be a pronounced difference between Owner-Occupiers and Social Renters in particular.

Table 8.1 confirms that Owner-Occupiers earn more gross income, and so contribute more to total tax revenue than renters do. Within the renters group it is clear that the Social renters sub-group earn proportionately less and so contribute less PAYE than the overall Renters group. This largely reflects the case where a proportionately larger number of people who are Social Renters, receive social benefits from the government, and effectively pay a lower tax rate as a result. So Social Renters earn significantly less gross income compared to the other tenure types, pay a lower effective PAYE rate, and subsequently generate the lowest PAYE per capita.

This conclusion holds when dividing by the number in each tenure group, leading to the PAYE per capita fiscal contribution of owner-occupiers being more than twice that of those living in social rental accommodation ($8,532 compared with $3,052).

9 Cost impact of scenarios of tenure changes

Using the calculations of per capita costs and outcomes across the health, corrections and justice, and social benefits outcomes, we are able to estimate the potential impact on the government's fiscal accounts. That is, we estimate the impact of fiscal accounts across - the three cost categories as well on PAYE revenue – of postulated changes in tenure.

This scenario modelling is the key outcome of our analysis and the results are intended to be used as a baseline to feed into policy considerations.

The two scenarios that we model are:

- **Scenario 1** – changing 1,000 people from being Renters to becoming Owner-Occupiers
- **Scenario 2** – changing 1,000 people from being Social Renters to becoming Owner-Occupiers

We note that this is a simplified modelling approach given the restrictions faced in terms of the data available. In particular, there are potentially other elements of fiscal costs and revenues that we have not included in the model. Our results are also relatively high level (capturing only the fiscal costs and income categories discussed) and are based on average costs and revenues, as derived from IDI data.

In each scenario we firstly estimate baseline, or business as usual (BAU), figures of fiscal costs and revenues arising from the individuals in the event there is no change to their tenure status.

Thereafter we estimate new figures for costs and revenues arising from these individuals consistent with their changed tenure status.

In making comparisons between the baseline fiscal impact and each scenario, the greater the difference between the scenario (net) figures and the BAU implies a higher or 'better' outcome on the government's fiscal accounts.

There are two ways of interpreting the results of these scenarios.

The first way of interpreting the difference between the BAU and scenario outcomes is in terms of the **net savings that government can make** (i.e. fiscal expenditure that would not have to be made).

The second way of interpreting the net result is that this is **the financial contribution that government could make available towards assisting (or facilitating) people to move along the housing continuum**, i.e. from renting to owner-occupancy. This could be for example, in the form of an equity stake (or deposit assistance) provided by government towards home ownership. However, how or what form this financial contribution may take is outside the scope of this analysis.

9.1 Constructing the scenarios

The specific assumptions underlying each of the scenarios are outlined in sections 9.2 and 9.4. The structure and assumptions that apply to both scenarios follow.

- We choose a 15-year time horizon for our scenario cost and income estimates. There are no hard-and-fast rules about the appropriate timeframe for scenarios. Traditional scenario methods tend to look 10-15 years ahead, and will reflect the question being examined.[6]
- **Transition rates** - starting from year '0', we have made conservative assumptions as to the rate of change in achieving the outcomes (in terms of reducing costs or improving revenues) when moving along the housing

[6] http://webarchive.nationalarchives.gov.uk/20140108140803/www.bis.gov.uk/assets/foresight/docs/horizon-scanning-centre/foresight_scenario_planning.pdf for further description

continuum, i.e. the rate of cumulative change at which the age cohorts within each sample of 1,000 people transitions towards the outcomes (or implied behaviour) consistent with their new tenure status.

  - That is, we would not expect the health, corrections and justice, benefits, and PAYE outcomes of those who are currently renters, to equal or achieve the outcomes of private renters instantly. Rather, they will transition towards those outcomes of the owner-occupiers gradually.
  - For example, we assume that in the first year renters move 5% of the way towards achieving the health (corrections and social benefit) outcomes of owner-occupiers; by year 10 they are assumed to be 75% of the way there; by year 15 they are assumed to have completed 90% of this transition.
  - An alternative way of considering this transition is in terms of the count of people as a proportion of the 1,000 people 'changing' from one tenure to another. For example, using the same transition rates as above, in the first year, 5% of the 1,000 people, or 50 people, will have transitioned from the outcomes profile of a renter, to the outcomes profile of an owner-occupier.
  - We have conservatively assumed that the rate of PAYE (i.e. income) transition is half the rate of that for the behavioural outcomes of health, corrections, and benefit payments.
  - Note that our assumptions imply that not all of the 1,000 people will have completely shifted from one tenure outcomes profile to another within this 15-year period, i.e. there are some people who don't reach the outcomes profile of the 'target' tenure group at all, or at least not within a 15-year time horizon.

- The discount rate used to calculate the Net Present Value (NPV) of the cost and income changes is 3% per annum, in real terms. Consequently, all estimates are expressed in $s adjusted back to their present value.
- The age distribution of the 1,000 people in each of the scenarios mirrors that of the original tenure group in the existing year. However, over the 15-year time horizon we account for people (and their respective behaviour, costs, and income) to have shifted to reflect different age bands. In this way the scenario modelling captures family life course effects.

9.2 Cost of shifting people along the housing continuum

In both scenarios, we also include some of the costs associated with shifting people along the housing continuum. These are based on estimates provided by the New Zealand Housing Foundation and comprises an initial $6,000 per household in terms of advisory services like budgeting support and associated support to assist a household become ready to own. In addition there is an annual cost for ongoing support throughout the transition period. This begins at approximately $1,170 per household. Further, we applied the same rate of transition along our 15-year time horizon for this cost of support. This assumes that the annual cost of assisting households of making the tenure change decreases each year i.e. that less assistance is needed the closer to owner-occupancy a household becomes.

At the discount rate used was 3% per annum, the NPV of this total amount over our 15-year time horizon amounts to $10,160 per household. This is effectively the cost of advisory and support services to assist individuals in changing their tenure status from being Renters, to being Owner-Occupiers.

Note that this is the potential cost to a housing support agency (or government) of helping people make this shift in tenure. It is not from a household cost perspective, which would take into account additional factors such as interest payments and servicing fees for mortgages etc.

Of course, there are wider impacts that would need to be taken into consideration in order to assess the overall costs and benefits of making these shifts in tenure type. The relative benefits of each scenario would need to be balanced against the costs of shifting people along this housing continuum. Our approach has been targeted

rather than comprehensive – focusing on selected outcomes which can be linked relatively directly to fiscal component expenditure, but more importantly, which are currently and historically measurable.

9.3 Scenario 1 – Transitioning 1,000 Renters to Owner-Occupiers

Scenario 1 examines the impact of hypothetically transitioning a random selection of 1,000 individuals from our Auckland population who currently have a tenure status of Renters, to being Owner-Occupiers. By Renters we refer to social renters and private renters combined.

9.3.1 Specific Assumptions

- The age composition of the 1,000 people who 'shift' mirrors that of the existing renting population. However, their incidence (and so costs) of hospitalisation, crime, and benefit outcomes profiles are assumed to move towards those of the existing Owner-Occupiers (for the relevant age cohorts) over a 15-year period.
- We also assume that their income earning profiles will transition to mirror those of the Owner-Occupiers. However, as noted earlier, the rate of transition is assumed to be half the rate of that for hospitalisation, crime and benefit behaviours.
- Based on sample population in Auckland, renters have approximately 2.9 people per household. For a sample population of 1,000 people this equates to roughly 340 households.
- We allow for the population in our model to age over the course of the 15 year window, we capture the life course effects of families.

9.3.2 Fiscal impact results

The BAU fiscal costs and revenuers for Year 0 and Year 15 arising from this shift is tabulated in Table 9.1.

Table 9.1 Scenario 1 – Fiscal impact of 1,000 people transitioning from Renters to Owner-Occupiers

Scenario: fiscal impact of 1,000 renters transitioning to owner occupiers ($m)				
		Baseline (BAU)		Scenario
		Year 0	Year 15	Year 15
Revenue	PAYE revenue	4.84	6.44	7.20
Expenses	Health	0.64	0.95	0.79
	Corrections	0.10	0.13	0.05
	Benefit payments	0.51	0.62	0.21
	Accomm supplement	0.80	0.97	0.17
Net		2.79	3.77	5.97

This suggests that by Year 15 the net fiscal impact arising from these individuals will change from a net $3.77m to a net 5.97m. That is a net gain of the order to $2.2m by Year 15. Note that a large component of this gain arises from the estimated $0.75m in increased PAYE revenues (despite our relatively conservative transition assumptions associated with this category).

9.3.3 15-year summary for scenario 1

Over the whole 15-year horizon, discounted at 3%pa, the potential **net fiscal saving accrues to be of the order of $9.8 million**, as listed in Table 9.2. The alternative interpretation of this is that there would be $9.8 million available that could be used for services in assisting people transition along the housing continuum, (or approximately $28,980 per household for this scenario). Taking the earlier indicative $10,160 per household NPV of costs such services, leaves a net savings to government of $18,820 per household – or a total of $6.4m.

Table 9.2 Scenario 1 – 15-year fiscal impact summary

Result (current $s, PV over 15 years, discounted at 3%pa)	
Potential fiscal savings	9,848,000
Potential fiscal savings **per hhd**	28,980
Transition advisory and support costs	10,160
Savings net of costs **per hhd**	18,820
Net savings total	6,395,000

That is, there are potential fiscal savings of $6.4 million to government, in terms of expenditure that would not have to be made. This is because, as illustrated in our breakdown of the components of government expenses in Sections 5, 6, and 7, there would lower rates of 'inferior' outcomes across the fiscal account components of Owner-Occupiers, compared to Renters.

9.3.4 Scenario 1 components

Figure 9.1 Change in PAYE fiscal revenue, BAU versus Scenario 1

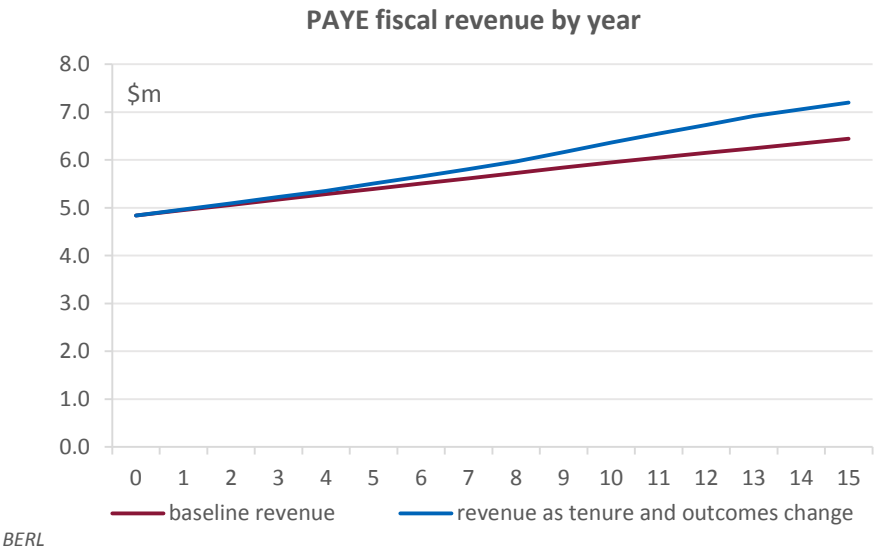


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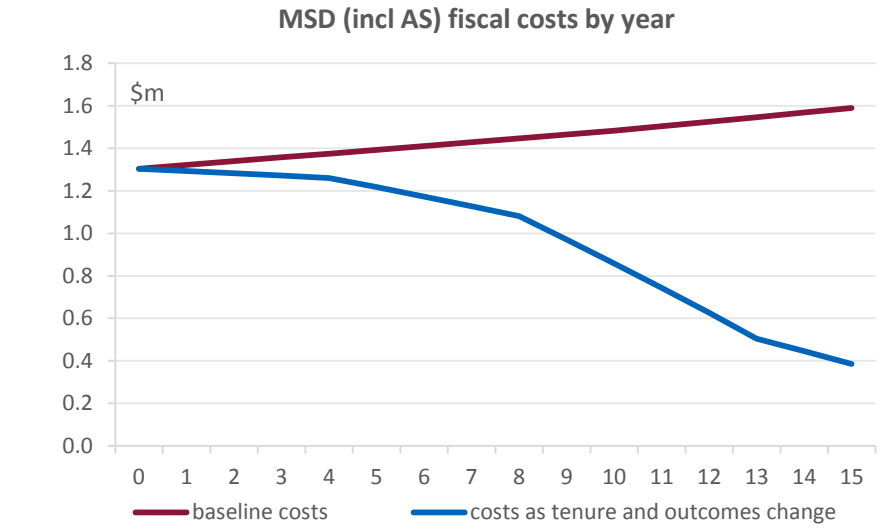
Figure 9.1 shows the transition path in terms of the PAYE generated that would be made by shifting 1,000 people from being Renters to being Owner-Occupiers. The baseline revenue shows a fairly steady but marginal increase each year over the 15-year period. This is due to the higher proportion of the 1,000 moving into prime income earning (and, so, PAYE paying) age groups.

The impact of shifting the 1,000 people from being Renters to being Owner-Occupiers is slightly more pronounced, particularly from about year eight onwards as the transition process intensifies. This shows that shifting towards owner-occupancy generates greater PAYE revenue for government.

Conversely, Figure 9.2 shows that there is a decrease in benefit payments made with the tenure shift. Note, though, that the scales of the vertical axes in these figures differ.

Figure 9.2 Change in MSD benefit (incl. accommodation supplement) fiscal expenditure, BAU versus Scenario 1



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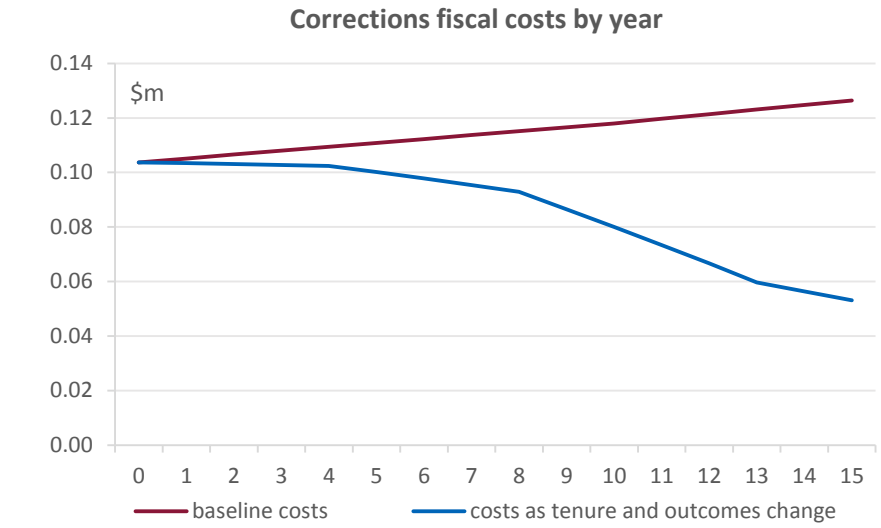
The fiscal costs across the health and corrections categories also decline, with the gap from the baseline growing progressively over the 15-year time horizon.

Figure 9.3 Change in corrections fiscal costs, BAU versus Scenario 1



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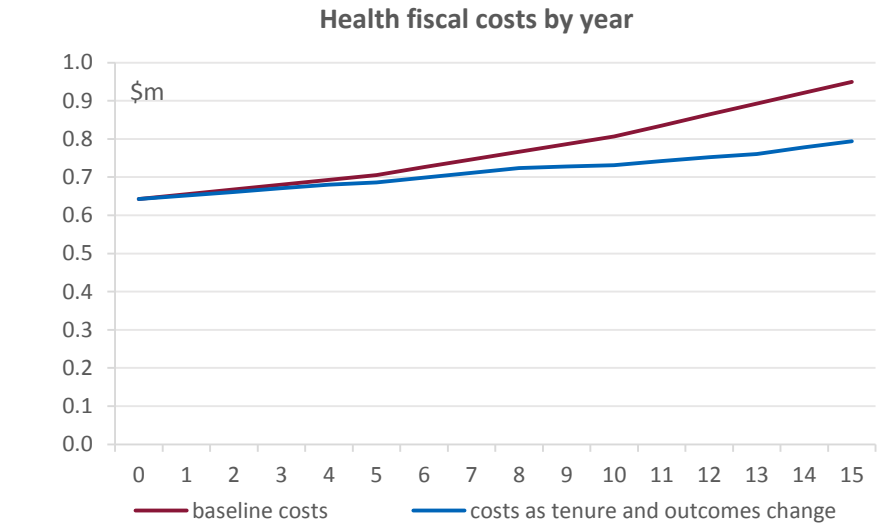
Corrections fiscal costs decrease steadily over the 15-year time horizon. While nominally small over each each year, the rate of fall in costs is noticeably sharp from about year eight onwards, as shown in Figure 9.3. Similarly, Figure 9.4 shows that health fiscal costs decrease under Scenario 1 compared the baseline, but at a more marginal rate.

Figure 9.4 Change in health fiscal costs, BAU versus Scenario 1



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9.4 Scenario 2 – Transitioning 1,000 Social Renters to Owner-Occupiers

For our second scenario, we postulate transitioning 1,000 Auckland individuals from their current Social Renters tenure status to being Owner-Occupiers.

9.4.1 Assumptions

- As with Scenario 1, the age composition of the 1,000 people who 'shift' mirrors that of the existing social renting population. The outcome profiles across health, corrections, and benefits, are assumed to move towards those of the existing Owner-Occupiers (for the relevant age cohorts), over a 15-year time period.
- Based on our sample population in Auckland, Social Renters have approximately 3.5 people per household. For a sample population of 1,000 people this equates to roughly 288 households.

9.4.2 Fiscal impact results

The BAU fiscal costs and revenuers for Year 0 and Year 15 arising from this shift is tabulated in Table 9.1.

Table 9.3 Scenario 2 – Fiscal impact of 1,000 people transitioning from Social Renters to Owner-Occupiers

Scenario: fiscal impact of 1,000 social renters transitioning to owner occupiers ($m)				
		Baseline (BAU)		Scenario
		Year 0	Year 15	Year 15
Revenue	PAYE revenue	2.00	2.97	4.87
Expenses	Health	0.93	1.30	0.91
	Corrections	0.10	0.14	0.05
	Benefit payments	0.85	1.17	0.26
	Accomm supplement	0.00	0.00	0.07
Net		0.11	0.36	3.58

This suggests that by Year 15 the net fiscal impact arising from these individuals will change from a net $0.36m to a net 3.58m. That is a net gain of the order to $3.2m by Year 15. Note that a large component of this gain arises from the estimated $1.9m in increased PAYE revenues (despite our relatively conservative transition assumptions associated with this category).

9.4.3 15-year summary for scenario 2

Over the whole 15-year horizon, discounted at 3%pa, the potential **net fiscal saving accrues to be of the order of $14.0 million**, as listed in Table 9.4. Similarly to that for scenario 1, this implies there would be $14.0 million available that could be used for services in assisting people transition along the housing continuum, (or

approximately $48,540 per household for this scenario). Taking the earlier indicative $10,160 per household NPV of costs such services, leaves a net savings to government of $38,380 per household – or a total of $11.1m.

Table 9.4 Scenario 2 – 15-year fiscal impact summary

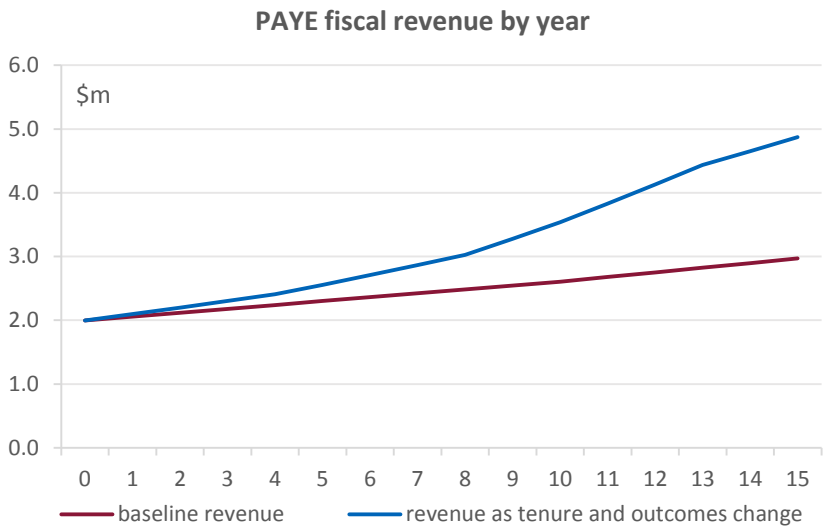
Result (current $s, PV over 15 years, discounted at 3%pa)	
Potential fiscal savings	14,001,000
Potential fiscal savings **per hhd**	48,540
Transition advisory and support costs	10,160
Savings net of costs **per hhd**	38,380
Net savings total	11,070,000

That is, there are potential fiscal savings accruing over a 15-year horizon in this scenario equal to the present value of $11.1 million to government. An alternative perspective suggests that these funds would be available to further assist in any transition programme (e.g. deposit and/or equity assistance or suspensory loans). Such a use of these funds (up to this $11.1m or $38,380 per household maximum) would still leave the government fiscal position in a better net position than in the baseline.

9.4.4 Scenario 2 components

The components of the changes in fiscal revenues and costs for this scenario are depicted below.

Figure 9.5 Change in fiscal revenue, BAU versus Scenario 2



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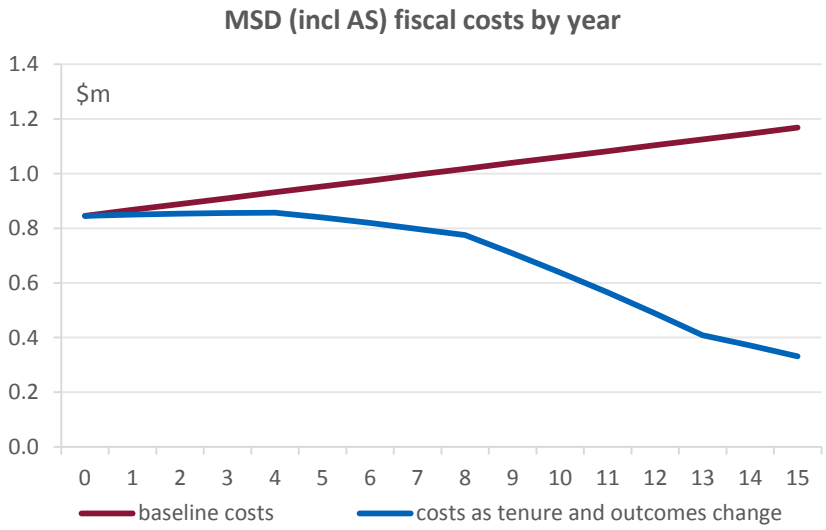
9.4.5 Scenario 2 components

The components of the changes in fiscal revenues and costs for this scenario are depicted below.

Figure 9.5 shows the difference between PAYE fiscal revenue under the BAU versus Scenario 2. There is an improvement in terms of greater PAYE fiscal revenue for government in Scenario 2. To a large extent, this is explained by the much larger per-capita PAYE arising from those with a tenure status of owner-occupiers.

Figure 9.6 Change in MSD benefits (incl. accommodation supplement) fiscal expenditure, BAU versus Scenario 2



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There is also a significant downward trend in benefit payments fiscal expenditure over the 15-year time horizon. The rate of decrease becomes sharper from year eight onwards as shown in Figure 9.6, and by year 15 has become approximately a quarter of the size of the expenditure under the BAU baseline.

Figure 9.7 Change in corrections fiscal costs, BAU versus Scenario 2

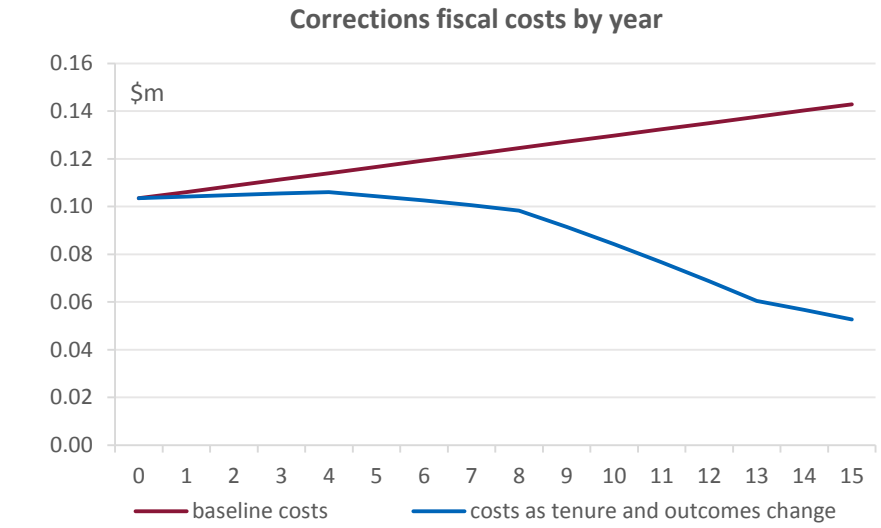

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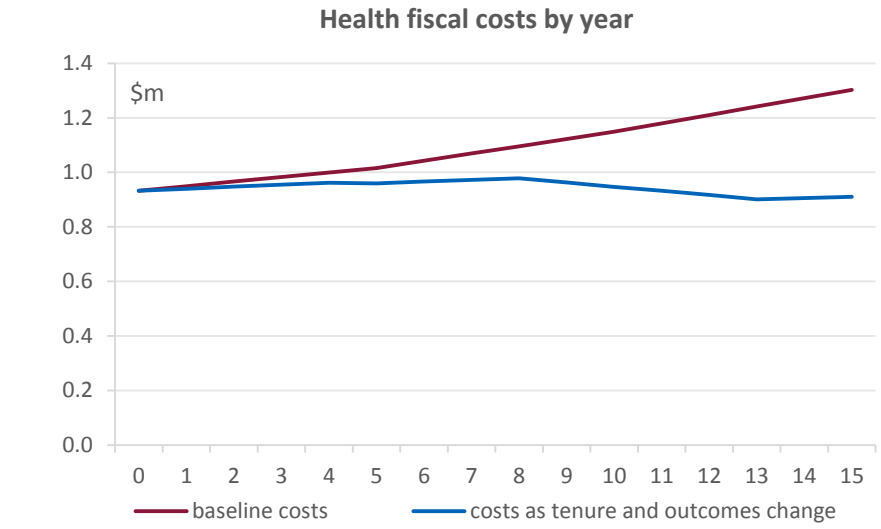
Figure 9.7 shows that under Scenario 2 there is a marked fall in corrections fiscal costs by government as result of shifting people form Social Renting to Owner-Occupation. In the latter half of the 15-year time horizon the gap between the BAU and Scenario 2 corrections fiscal expenditure widens.

Figure 9.8 Change in health fiscal costs, BAU versus Scenario 2



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Health costs were relatively flat in comparison, staying steady in the $900,000 to $1,000,000 range annually over the 15-year time horizon, as seen in Figure 9.8. This is a comparatively higher and flatter rate trend than under Scenario 1. As with the marginal change in PAYE revenue, this reflects to a large extent the relatively young demographic profile of the Social Renting tenure group in general. The higher proportion of children within the tenure group comes with a corresponding higher health expenditure compared to older cohorts.

10 Replicating literature findings

We decided to test our findings in our econometric modelling above, by simulating the econometric modelling of a selected study from our literature review. This would be done using the data we sourced from the IDI. The idea was to test whether our hypothesis and modelling would hold against similar modelling used for similar research questions. Given that over 100 studies were covered in the literature review, it was important that we selected a study that would come as close as possible to our research question, our hypothesis, but more importantly, was replicable in terms of closeness of match of the data available to us in a New Zealand context.

10.1 Study selection

The study which we selected was that called 'Erasing the advantage: Home ownership and the impact of financial hardship on health for lower income Americans', by Kim Manturuk (Manturuk 2013)) of the University of North Carolina, published in 2013.[7]We selected this study for replication, from the over 100 studies covered by the accompanying literature review for this project, based on a number of factors. Firstly, based on the closeness of fit of the research question to our own; secondly, on the methodology and econometric modelling used and the feasibility of our being able to replicate that given the data available to us from the IDI; and thirdly, whether the results of that study were akin to what we had hypothesised. The ability to use variables the same or as close to those used in any of the studies was a key limiting factor which we had to account for.

The largest component of fiscal costs hypothesised to be affected by tenure status is health spending. Therefore, it was important to identify a study in the literature that specifically modelled health outcomes as a function of housing tenure. This analysis forms a cross validation of our earlier modelling and is intended to be supplementary to the main findings.

10.1.1 Methodology

Manturuk's study used propensity score analysis to compare the health outcomes of homeowners and renters. The results from the study showed that there is a reduced risk of health problems associated with homeownership. However, financial hardship increases that risk. We emphasise that this study and thus our replication of it, is focused on health outcomes and its link to housing tenure. It does not model the interaction or impact of/link between housing tenure and corrections and justice outcomes, social benefits outcomes, or on PAYE.

Our choice of modelling was based on answering a set of key questions (again emphasising that the study and our replication of its approach is focused on health outcomes).

- The nature (i.e. sign – whether positive or negative) of the relationship between housing tenure and public hospital *use* (i.e. incidence) – after controlling for age and income;
- The nature (i.e. sign – whether positive or negative) of the relationship between housing tenure and public hospital *cost* – after controlling for age and income;
- The magnitude (i.e. size) of the difference between the different tenure groups, in public hospital *use* (i.e. incidence) – after controlling for age and income; and
- The magnitude (i.e. size) of the difference between the different tenure groups, in public hospital use *costs* – after controlling for age and income.

[7] Manturuk, K. (2013). *Erasing the Advantage: Homeownership and the Impact of Financial Hardship on Health for Lower-Income Americans*. Working Paper, UNC Center for Community Capital.

Our approach to simulating Manturuk's econometric modelling was to run three different models:

- a linear Ordinary Least Squares (OLS) based on the total cost per person;
- a Generalised Linear Model (GML) logistic based on the probability of a person going to hospital or not; and
- a negative binomial model, based on the length of a person's stay if they had been admitted to hospital.

For each of these three models we ran three regressions, each time controlling for a different mix of variables. The range of variables we controlled for were age, income, tenure (i.e. whether renting or owner-occupied), financial hardship, and an interaction term between tenure and financial hardship.

The three regressions that we ran were:

- Controlling for age, income, and tenure;
- Controlling for age, income, tenure, and financial hardship; and
- Controlling for age, income, tenure, financial hardship, and an interaction term taking into account the covariance between the tenure and hardship variables.

The specifics of the econometric modelling that we undertook can be found in Appendix C – Technical steps to replicating Manturuk (2013).

10.2 Assumptions

In simulating Manturuk's modelling, our proxy for financial hardship was to introduce a threshold. Our definition of those classified as experiencing financial hardship were those who earned less than 50% of the median income of those within the sample population.[8]

Our sample population was effectively the same as that of the BAU base line, but restricted to those aged 15 years and over. Again, our sampling is restricted to those living in Auckland.

Terms used

Tenure – type of housing tenure, i.e. whether someone is a social renter or private renter, or an owner-occupier of their own dwelling.

Incidence – frequency of public hospital use/admission

Cost – the impact on government's fiscal accounts

Nature – whether the modelling result was positive or negative

Magnitude – size of the difference between tenures in relation to incidence and cost.

Renters – refers to both social and private renters combined

10.3 Modelling results

The three models were: linear OLS; GLM logistic; and a negative binomial. The three regressions for each model controlled for a different range or combination of variables. The key summary points are in bold below.

[8] Figure, A. Measuring and monitoring material hardship for New Zealand children: MSD research and analysis used in advice for the Budget 2015 child hardship package. Available from https://www.msd.govt.nz/documents/about-msd-and-our-work/publications-resources/monitoring/child-material-hardship-2015.docx

10.3.1 The three models, each controlling for age, income, and tenure

The nature of the relationship between tenure and incidence was positive across all three models, and was statistically significant.

- Incidence - this implies that renters are more likely than owner-occupiers to be admitted to hospital.

The nature of the relationship between tenure and cost was positive across all three models, and was statistically significant.

- Costs - **renters are 3.3% greater probability of incurring public hospital costs than owner-occupiers**, when age and income have been controlled for. I.e. if we had two identical people with the only difference between them being their tenure, the person who was a renter would be 3.3% more likely to be admitted to a public hospital.
- Costs - renters have a higher average cost of hospital admission compared to owner-occupiers. The **per capita cost of hospital admissions for renters is $614 higher than for owner-occupiers**.

10.3.2 The three models, each controlling for age, income, tenure, and financial hardship status

Again, our proxy for financial hardship was earning less 50% of the median income of those within the sample population.

The nature of the relationship between tenure and incidence, and also tenure and cost, was both positive and statistically significant.

- Incidence - **renters who are *not* in financial hardship are 3.3% more likely to be admitted to hospital than owner-occupiers who are *not* in financial hardship**. That is, all renters regardless of whether they are in financial hardship or not, are 3.3% more likely to be admitted to hospital, than those who are owner-occupiers who are *not* in financial hardship.
- Costs – on a per capita basis **hospital admission costs for renters who are *not* in financial hardship are $595 higher than for owner-occupiers who are *not* in financial hardship**.

10.3.3 The three models, each controlling for age, income, tenure, hardship status, and the interaction between renters who are in financial hardship

This model included an interaction term. Essentially this interaction term takes into account the covariance or level of impact or interdependence that financial hardship and tenure status have on each other.

- Incidence – Renters are 1.3% more likely to incur hospital costs than Owner-Occupiers.
- Further, Renters in financial hardship are 5.1% more likely to incur hospital costs than Owner-Occupiers in financial hardship.
- Costs – **Renters cost $362 more than Owner-Occupiers *not* in financial hardship. Renters who *are* in financial hardship cost $616 more than Owner-Occupiers *not* in financial hardship.**
- The relationships are all individually statistically significant.
- The variables are jointly significant.
- The renters in hardship interaction variable is statistically significant in a likelihood ratio test over the model containing no financial hardship model, and also the model including the financial hardship variable.

11 Appendix A - Variable definitions and construction

11.1 Household Tenure

Household Tenure refers to the ownership structure of the household. It can take on four broad levels: Home-Owner, Trust, Private-renter, and Social-renter.

A Home-Owner we define as someone who lives in a household that is under the present control of the household members and is the result of a past transaction. This definition also requires that a Home-Owner has undisturbed tenure of that home.

To determine the Home-Owners in our sample population we used the tenure codes from the household census.

The codes that were used to determine a Home-Owner were:

10 – dwelling owned or partly owned, mortgage payments not defined.

11 – dwelling owned or partly owned, mortgage payments made.

12 – dwelling owned or partly owned, mortgage payments not made.

If a person answered any of these in the household census they are deemed to be a Home-Owner.

When a person owns their dwelling under a trust they have present control of that dwelling conferred by the terms of the trust.

To determine households who are in control of their dwelling under a trust we used the household Census codes:

30 – held in family trust, mortgage payments not further defined.

31 – held in family trust, mortgage payments made.

32 – held in family trust, mortgage payments not made.

If a person answered any of these in their household census they are deemed to have present control over their dwelling through a family trust.

The last type of Tenure is people who rent. A rented dwelling is under present control of the tenant for as long as the lease exists but does not imply undisturbed tenure.

Rented dwellings fall into two broad categories based on the attributes and intentions of their owner. A rented dwelling is either rented Privately or rented Socially.

A private rental is a dwelling that is rented out as part of a business with the primary purpose of generating income for the owner.

To determine the people living in rented dwellings we used the tenure codes from the household Census.

21 – dwelling not owned, not held in a family trust, rent payments made.

22 - dwelling not owned, not held in a family trust, rent payments not made.

Then to determine the nature of the rental we used the landlord codes from the Census.

11 – private person, trust or business.

Social landlords differ from private landlords in their intentions. Social landlords intend to provide a dwelling at a reduced cost, or with less strict tenant requirements in order to house people who would otherwise be homeless.

To capture people living in such dwellings we used the landlord code.

21 – Local authority or city council

31 – Housing New Zealand Corporation.

32 – Other state owned enterprise or government department or ministry.

Finally, if the response to these questions was don't know, unidentifiable or not stated then they are coded as undefined tenure or undefined rent.

11.2 Tax Paid and Gross income

The source of revenue to the government we can trace to individuals, and thus to tenure is PAYE tax paid.

To calculate this variable we joined the IRD data to the census data for each individual and extracted all gross income and PAYE tax deductions for the period 01/07/2011 to 30/06/2015 (henceforth the Study Period). The period to which the income and tax relate was defined using the return date.

The gross income and tax deductions during this period were added up for each person to produce a total gross income and total tax paid for that period.

11.3 MSD benefits

The benefits provided by MSD have been the subject of much reform since their inception. Consequently the raw data (before it gets into the IDI) is coded with up to 48 different types of benefits. In the IDI these have been aggregated to (insert number here) different types of benefits based on broad categories of undesirable outcomes.

For our analysis we have further aggregated these into three broad groups:

- Family related, for example the Domestic Purposes Benefit
- Personal sickness, for example the Invalids Benefit
- Labour market related, for example Jobseeker Support

We were able to extract the daily rate for each benefit a person was paid during the Study Period and how long they were paid this rate. By multiplying the average payment rate by how many days a person was on a benefit we were able to arrive at an estimate of the total amount paid to each person through MSD benefits for the Study Period. Then by dividing the result by four we were able to calculate an annual estimate for MSD benefit costs for each tenure type.

11.3.1 Family Related

The codes from the IDI we used to calculate the family related benefits are:

030 – widow's benefit overseas

040, 044, 340, 344 – orphans and unsupported child benefit

330 – widow's benefit

365 – sole parent support

367 – DPB related

603 – youth payment young parent

665 – sole parent support overseas

030 and 665 do not return any matches for the current analysis because we are concerned with people living in Auckland but they are included for completeness.

These benefits are measured in days by calculating the number of days a person spent on any of these benefits during the Study Period by calculating the number of days between the start of the benefit and the end of the benefit. And adding these for each person.

11.3.2 Personal sickness

The codes from the IDI we used to construct the personal sickness benefit are:

020, 370 – supported living payments related

340 – invalid's benefit

600, 601 - sickness payment related

611 – emergency benefit

11.3.3 Labour market related

The codes from the IDI we used to construct the labour market benefit are:

115, 610 – unemployment benefit related

125, 608 – unemployment benefit training related

500 – work bonus

607 – jobseeker student hardship

175 – jobseeker related

11.4 Corrections

We have calculated the length of sentences for individuals living in Auckland at the time of the Census in 2013 and usually resident in Auckland. These sentences were given during the Study Period but their length is greater than the study period. This is because, by sentencing these people, the government has effectively committed to paying these costs. So in the interests of proper accounting they are included.

We extracted sentence length for the following types of corrections outcome:

11.4.1 Prison

This is a broad category which corrections uses to define the management type of these offenders. These sentences are measured in days but have different cost structures.

Prison sentence

Days sentenced to prison during the Study Period

Entry cost: $1000

Exit cost: $150

Daily cost: $280

Remanded in custody

Days sentenced to be remanded in custody during the Study Period

Entry cost: $1000

Exit cost: $150

Daily cost: $235

Extended supervision order (ESO)

Length of ESO days

Entry cost: $4000

Exit cost: $150

Daily cost: $100

Home detention

Length sentenced to home detention during the Study Period in days

Entry cost: $900

Exit cost: $150

Daily cost: $60

Parole

Length paroled in days sentenced during Study Period

Entry cost: $4000

Exit cost: $50

Daily cost: $18

Released on conditions

Length in days ROC

Entry cost: $175

Daily cost: $18

Exit cost: $50

11.4.2 Community sentences

These are sentences measured in hours managed under COMMUNITY by Corrections.

Community detention

Hours sentenced to community detention during the Study Period

Entry cost: $700

Exit cost: $100

Daily cost (seeking clarification on this measurement from the Corrections team): $25

Community work and community service

We aggregated these sentence types because their cost structure was similar

Length sentenced in hours

Entry cost: $300

Exit cost: $50

Daily cost (seeking clarification on this measurement from the Corrections team): $7.5 = ($8 + $7)/2

11.5 Ministry of Health costs

For each person in Auckland at the time of the 2013 Census who was usually resident in Auckland we extracted the cost weight code and the cost weight amount for each health event during the Study Period.

We then used a lookup function to match the costweight code with a costweight measure provided by the MoH. This was then multiplied to give an estimated cost for each health event for each person during the Study Period which was further aggregated to give an estimated cost of each person during the Study Period.

This measures: the estimated cost to the public hospital system of every person in the sample population during the Study Period.

12 Appendix B - Detailed tables

Table 12.1 Healthcare costs by age and tenure over study period

		Hospital Admissions				
Age group	Household Tenure	Count of people admitted	Total cost ($millions)	Cost per person admitted ($)		Cost per capita ($)
0-5	Owner-Occupier	6,532	$28.2	$4,311	58,131	$484
	Renters	5,860	$28.7	$4,891	48,348	$594
0-5	Social Renters	1,451	$8.0	$5,511	11,493	$696
6-15	Owner-Occupier	3,900	$19.5	$5,007	97,983	$199
6-15	Renters	3,182	$16.7	$5,263	68,685	$244
	Social Renters	1,052	$6.0	$5,717	19,908	$302
16-25	Owner-Occupier	4,386	$27.2	$6,211	90,189	$302
	Renters	5,129	$33.6	$6,561	81,372	$414
16-25	Social Renters	1,310	$9.9	$7,584	16,377	$607
26-35	Owner-Occupier	6,704	$41.9	$6,242	81,282	$515
26-35	Renters	6,392	$43.3	$6,768	83,409	$520
	Social Renters	961	$8.3	$8,617	9,516	$871
36-45	Owner-Occupier	6,782	$45.7	$6,737	112,899	$405
	Renters	4,558	$36.0	$7,888	64,647	$558
36-45	Social Renters	868	$8.6	$9,918	9,777	$881
46-55	Owner-Occupier	7,161	$57.0	$7,963	122,418	$466
46-55	Renters	3,597	$36.4	$10,127	47,208	$774
	Social Renters	917	$12.0	$13,034	9,765	$1,225

Table 12.2 Healthcare costs by age and tenure over study period (continued)

		Hospital Admissions				
Age group	Household Tenure	Count of people admitted	Total cost ($millions)	Cost per person admitted ($)		Cost per capita ($)
56-65	Owner-Occupier	7,457	$78.9	$10,585	98,286	$803
	Renters	2,581	$35.2	$13,629	26,832	$1,318
56-65	Social Renters	770	$12.6	$16,312	6,663	$1,886
66-75	Owner-Occupier	6,731	$93.9	$13,955	61,353	$1,531
66-75	Renters	1,922	$31.9	$16,615	15,081	$2,143
	Social Renters	658	$12.4	$18,777	4,740	$2,607
76+	Owner-Occupier	5,793	$111.9	$19,317	36,891	$3,033
	Renters	1,420	$28.6	$20,166	9,135	$3,229
76+	Social Renters	466	$10.0	$21,442	2,913	$3,435
Total	Owner-Occupier	55,445	$504.2	$9,095	759,432	$664
Total	Renters	34,640	$290.4	$8,384	444,717	$655
	Social Renters	8,451	$87.7	$10,374	91,152	$962

Table 12.3 Healthcare costs by age, tenure status and income group

Hospital Admissions					
Age group	Income	Household Tenure	Total cost ($millions)	Population count	Cost per capita ($)
16-25	Low	Owner-Occupier	$10.7	43,467	$246
		Renters	$12.2	34,596	$353
		Social Renters	$4.4	8,352	$532
	Non-low	Owner-Occupier	$16.5	46,722	$354
		Renters	$21.5	46,770	$459
		Social Renters	$5.5	8,019	$685
26-35	Low	Owner-Occupier	$8.9	18,138	$493
		Renters	$9.4	18,312	$515
		Social Renters	$1.6	2,400	$678
	Non-low	Owner-Occupier	$32.9	63,144	$521
		Renters	$34.0	65,091	$522
		Social Renters	$6.7	7,110	$936
36-45	Low	Owner-Occupier	$10.8	29,418	$368
		Renters	$7.0	15,870	$442
		Social Renters	$1.6	2,436	$666
	Non-low	Owner-Occupier	$34.9	83,481	$418
		Renters	$29.0	48,771	$595
		Social Renters	$7.0	7,335	$952

Table 12.4 Healthcare costs by age, tenure status and income group (continued)

Hospital Admissions					
Age group	Income	Household Tenure	Total cost ($millions)	Population count	Cost per capita ($)
46-55	Low	Owner-Occupier	$15.3	36,528	$420
		Renters	$7.8	12,924	$600
		Social Renters	$2.7	2,427	$1,109
	Non-low	Owner-Occupier	$41.7	85,890	$485
		Renters	$28.8	34,278	$841
		Social Renters	$9.3	7,332	$1,264
56-65	Low	Owner-Occupier	$24.9	35,268	$706
		Renters	$8.2	8,271	$986
		Social Renters	$2.4	1,446	$1,668
	Non-low	Owner-Occupier	$54.0	63,018	$857
		Renters	$27.1	18,552	$1,463
		Social Renters	$10.2	5,208	$1,952
66-75	Low	Owner-Occupier	$9.8	7,215	$1,352
		Renters	$4.5	2,889	$1,563
		Social Renters	$1.3	714	$1,768
	Non-low	Owner-Occupier	$84.2	54,138	$1,555
		Renters	$27.8	12,189	$2,279
		Social Renters	$11.1	4,023	$2,759

Table 12.5 Healthcare costs by age, tenure status and income group (continued)

Hospital Admissions					
Age group	Income	Household Tenure	Total cost ($millions)	Population count	Cost per capita ($)
76+	Low	Owner-Occupier	$11.8	4,461	$2,635
		Renters	$3.3	1,572	$2,069
		Social Renters	$0.8	474	$1,774
	Non-low	Owner-Occupier	$100.2	32,430	$3,090
		Renters	$26.4	7,557	$3,496
		Social Renters	$9.2	2,433	$3,774
15+	Low	Owner-Occupier	$92.2	174,495	$528
		Renters	$52.3	94,434	$554
		Social Renters	$14.9	18,249	$816
	Non-low	Owner-Occupier	$364.4	428,823	$850
		Renters	$194.6	233,208	$835
		Social Renters	$58.8	41,460	$1,419

Table 12.6 PAYE revenue by age group and tenure status

		PAYE revenue (annual)		
Age group	Household Tenure	Total revenue ($millions)	Population count	Revenue per capita ($)
16-25	Owner-Occupier	$242.4	90,189	$2,688
	Renters	$243.2	81,372	$2,988
	Private Renters	$209.8	64,995	$3,227
	Social Renters	$33.4	16,377	$2,040
26-35	Owner-Occupier	$746.9	81,282	$9,189
	Renters	$580.4	83,409	$6,958
	Private Renters	$544.2	73,893	$7,365
	Social Renters	$36.2	9,516	$3,801
36-45	Owner-Occupier	$1,480.5	112,899	$13,114
	Renters	$505.3	64,647	$7,816
	Private Renters	$467.0	54,870	$8,511
	Social Renters	$38.2	9,777	$3,910
46-55	Owner-Occupier	$1,469.3	122,418	$12,003
	Renters	$618.5	47,208	$13,101
	Private Renters	$581.6	37,443	$15,532
	Social Renters	$36.9	9,765	$3,779
56-65	Owner-Occupier	$840.1	98,286	$8,548
	Renters	$135.7	26,832	$5,059
	Private Renters	$115.6	20,169	$5,732
	Social Renters	$20.1	6,663	$3,021

Table 12.7 PAYE revenue by age group and tenure status (continued)

		PAYE revenue (annual)		
Age group	Household Tenure	Total revenue ($millions)	Population count	Revenue per capita ($)
66-75	Owner-Occupier	$280.3	61,353	$4,569
	Renters	$48.8	15,081	$3,237
	Private Renters	$37.6	10,341	$3,639
	Social Renters	$11.2	4,740	$2,362
76+	Owner-Occupier	$84.4	36,891	$2,287
	Renters	$19.0	9,135	$2,080
	Private Renters	$13.2	6,222	$2,116
	Social Renters	$5.8	2,913	$2,004

13 Appendix C – Technical steps to replicating Manturuk (2013)

We surveyed the relevant literature and identified eight papers that had the potential to be replicated using our data. For this we considered papers that were both interesting and that used similar data to what we extracted from the IDI.

We subsequently decided to replicate, as close as possible, the work of Kim Manturuk in a 2013 paper titled *Erasing the Advantage: Homeownership and the Impact of Financial Hardship on Health for Lower-Income Americans.*

This paper (as discussed in the literature review) analyses the impact of financial hardship on low income people. It makes a distinction between different tenure types – Renters and Homeowners.

This section provides a brief description of the technical steps we took in replicating Manturuk (2013). We avoid a formal rigorous description of our methodology in the interests of intended audience. For a rigorous description the reader is encouraged to read Rosenbaum & Rubin (1983, 1985).[9,10]

Manturuk (2013) uses data on 2,225 households and 915 renters from a survey called the Community Advantage Panel Study. This survey includes a comprehensive measure of financial hardship, which is made up of 12 variables. These variables range from respondents postponing the payment of bills and seeking medical care to delaying starting a family. Our data (from the 2013 Census, Ministry of Health, Inland Revenue, and Corrections) does not include these measures. Instead, we use an income of below 50% of the median income of our sample to indicate a person is in hardship.

We constructed a population using data described in this report of people living in Auckland, usually resident in Auckland as at the 2013 Census. This population was around 1.2 million people. We examined the data set and determined that for replicating Manturuk (2013) we would exclude all people who were under 12 years old as at 2013. This was done because the age a person is allowed to sign an employment contract is 15, if a person is under 12 as at the Census 2013 they will not be 15 by the time our Study Period (2011 – 2015) ends and thus will, by our definition, be in financial hardship. We also excluded people who earned above $0 but less than $4,000 over the four year Study Period.

The final subpopulation from which we replicate Manturuk (2013) was around 800,000 people. From this sample we calculated the median gross income and constructed our measure of hardship.

This hardship measure was constructed as a binary variable equal to 1 if the person had an income less than 50% of the median and 0 otherwise. This construction of a dichotomous variable has become standard practise in econometrics.

International comparisons of material wellbeing at the household level are traditionally done by using household incomes, with poverty lines set at 50% or 60% of the median household income. For the purposes of this study we chose a conservative 50% threshold.[11] We consider the main contribution of Manturuk to be his attempt at

[9] Rosenbaum, P. R., & Rubin, D. B. (1983). The central role of the propensity score in observational studies for causal effects. *Biometrika*, *70*(1), 41-55.

Rosenbaum, P. R., & Rubin, D. B. (1985). Constructing a control group using multivariate matched sampling methods that incorporate the propensity score. *The American Statistician*, *39*(1), 33-38.

[10] For a very thorough treatment of this issue see Dehejia, R. H., & Wahba, S. (2002). Propensity score-matching methods for nonexperimental causal studies. *Review of Economics and statistics*, *84*(1), 151-161.

[11] For further description of comparisons please see https://www.msd.govt.nz/documents/...msd-and.../child-material-hardship-2015.docx

controlling for causality in his study. This was achieved using a matching algorithm based on propensity score matching. In order to be able to robustly conclude that a treatment has an effect we need to be able to say the treatment is randomly assigned. In the social sciences it is usually highly unethical if not impossible to randomly assign some treatment on people.

In our study, the treatment is a person is renting versus the untreated group being homeowners. Therefore we also construct a dichotomous "treatment" variable which equals 1 if a person rents their home, and 0 otherwise. This variable is a replica of Manturuk's variable measuring tenure, except he considers the variable to equal 1 when a person is a homeowner and 0 otherwise.

The probability of someone going to hospital is affected by their tenure status and also their demographic information. Additionally, the probability someone is a renter is also affected by going to hospital and the demographic information. People self-select into tenure types based on their preferences. To control for this self-selection we follow Manturuk's lead by fitting a logistic regression of the treatment variable regressed on a set of explanatory variables. Our response variable was our treatment variable dichotomous indicating whether a person rents their house or not. The set of demographic information we used includes age, gender, gross income and ethnicity.

We found, using t – tests, that all our variables except ethnicity were strong predictors of visiting a publicly funded hospital. From this, it can be concluded that all our demographic information helps explain self-selection into tenure types.

Therefore, we used the method described by Manturuk to calculate the probability that someone was treated (i.e. was a renter) given their age, ethnicity and gross income. Our chosen approach was to fit a logistic model of tenure status on the demographic variables.

This probability is also called a propensity score with which we measured how "close" people in the sample were to each other (in terms of probability of being treated). We then found matching pairs of people who were within a quarter of a standard deviation of each other. The precise model and functional form for this analysis can be found by consulting the literature on Mahalanobis distance and matching.

This final "matched" sample was just over 600,000 people. Everybody in this sample has sufficiently similar age, gross income and ethnicity information that makes their probability of being a renter (being treated) roughly equal. Thus the treatment can be said to have been randomly assigned.

In Manturuk's paper he describes that despite using the propensity score matching method it is still best practise to include demographic information in the regressions. Using the matched sample we ran regressions including all of: age, gender, gross income, ethnicity, and renting on a binary variable measuring if a person went to publicly funded hospital over our Study Period. We found that after matching, ethnicity and gender did not have a statistically significant effect on health outcomes. Therefore, in our subsequent models (and tables presented in this report) we control only for age, income and renting.

After this diagnostic and matching phase we ran three types of models: a linear model, a logistic GLM, and finally a negative binomial model. These models differ fundamentally in their treatment of both the errors and the response variable.

The linear model is estimated under OLS, and the response variable used was the total cost of hospital visits for each person in the sample. This is a continuous variable.

The logistic model assumes the errors are drawn from a logistic distribution and uses a dichotomous variable that equals 1 if the person went to hospital and 0 otherwise. It measures the probability of a person going to hospital, given a set of predictors.

The third and final model was a negative binomial. This is a generalised form of the Poisson model. The response variable was a count of days spent in hospital. We chose this generalised form because it allows the count to be weighted at 0 or low numbers.

We used these models to calculate the marginal effect that being a renter had on health outcomes, as well as the marginal effect of hardship and the marginal effect of being in hardship and being a renter. Further, we conducted likelihood ratio tests to determine the significance of the hardship variable, and its interaction with tenure status. Our results compare with Manturuk's. We find that people who rent are more likely than people who own their home to suffer negative health outcomes. Additionally, we find that financial hardship (or low income in our study) results in an increased likelihood of incurring health costs. Furthermore, there is a positive and statistically significant interaction effect between renting one's home and being in financial hardship on the incidence of health costs.

Appendix D – Disclaimer

Disclaimer

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

The results in this report are not official statistics, they have been created for research purposes from the Integrated Data Infrastructure (IDI), managed by Statistics New Zealand.

The opinions, findings, recommendations, and conclusions expressed in this report are those of the author(s), not Statistics NZ, [Department XY, or Organisation Z].

Access to the anonymised data used in this study was provided by Statistics NZ in accordance with 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 have been confidentialised to protect these groups from identification.

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.

The results are based in part on tax data supplied by Inland Revenue to Statistics NZ under the Tax Administration Act 1994. This tax data must be used only for statistical purposes, and no individual information may be published or disclosed in any other form, or provided to Inland Revenue for administrative or regulatory purposes.

Any person who has had access to the unit record data has certified that they have been shown, have read, and have understood section 81 of the Tax Administration Act 1994, which relates to secrecy. Any discussion of data limitations or weaknesses is in the context of using the IDI for statistical purposes, and is not related to the data's ability to support Inland Revenue's core operational requirements.