CENTRE FOR HOUSING, URBAN AND REGIONAL PLANNING

THE UNIVERSITY of ADELAIDE

Scoping Study on Household Responses to Declining Affordability

Final Report

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Executive Summary

This report is a scoping study, highlighting current knowledge, existing research gaps, and key research required to fill those gaps. It investigates individual and household responses to declining housing affordability in Australia across three areas:

1. Affordability constraints and trade-offs.
2. Population changes that might occur in response to poor housing affordability.
3. The extent to which the housing needs of the population unable or unwilling to access the private housing market are met in the non-private housing market.

Declining housing affordability in the 21st Century has had a significant impact on both households and the operations of the housing market. In responding to these three areas of focus, we recommend a **'roadmap'** of future research and investigations. The key steps are:

1. Investigate the affordability constraints faced by Australian households by using the analysis of longitudinal data – specifically HILDA – to better distinguish those households and cohorts most affected by poor housing affordability;
2. Undertake a large scale, qualitative study that retrospectively investigates the housing and non-housing trade-offs undertaken by key household groups. Such analysis will allow the identification of generalised groups or typologies of affordability decisions;
3. Undertake Discrete Choice Experiment (DCE) modelling in order to quantify the likelihood of different trade-offs in the major typology cohorts. This type of analysis would provide statistically representative evidence of the pattern and strength of the typology pathways for each of the focus populations. The DCE analysis would enable the production of a series of statistically weighted profiles to be produced representing the trade-offs of each of the focus cohorts;
4. Estimate the number of people whose needs are not met by the traditional housing market. This would require targeted analysis of the 2011 Census

data to further investigate the nexus between homelessness, non private housing and the inability of the housing market to meet the needs of all who seek accommodation.

Fifteen discrete findings can be found at the conclusion of the report.

Glossary

ABS	Australian Bureau of Statistics
AHURI	Australian Housing and Urban Research Institute
AIHW	Australian Institute for Health and Welfare
CHURP	Centre for Housing, Urban and Regional Planning
CPI	Consumer Price Index
CRA	Commonwealth Rent Assistance
DCE	Discrete Choice Experiments
DIAC	Department of Immigration and Citizenship
DIDO	Drive-in-drive-out
FaHCSIA	Dept. of Families, Housing, Community Services & Indigenous Affairs
FIFO	Fly-in-fly-out
GSS	General Social Survey
HAS	Housing Affordability Stress
HILDA	Housing, Income and Labour Dynamics in Australia
HUD	US Department of Housing and Urban Development
NHSC	National Housing Supply Council
NZ	New Zealand
OECD	Organisation of Economic Co-operation and Development
RBA	Reserve Bank Australia
SAAP	Supported Accommodation Assistance Program.

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The report uses unit record data from the Household, Income and Labour Dynamics in Australia (HILDA) Survey. The HILDA Project was initiated and is funded by the Australian Government Department of Families, Housing, Community Services and Indigenous Affairs (FaHCSIA) and is managed by the Melbourne Institute of Applied Economic and Social Research (Melbourne Institute). The findings and views reported in this paper, however, are those of the authors and should not be attributed to either FaHCSIA or the Melbourne Institute.

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Section 1: Introduction

The purpose of this project is to enable the National Housing Supply Council (NHSC) to better understand issues around housing affordability currently evident in the Australian housing market. This is essentially a scoping study, highlighting current knowledge, existing research gaps, and key research required to fill those gaps. It investigates individual and household responses to declining housing affordability in Australia, and focuses on:

- Affordability constraints and trade-offs.
- Population changes that might occur in response to poor housing affordability.
- The extent to which the housing needs of the population unable or unwilling to access the private housing market are met in the non-private housing market.

We examine housing affordability in broad terms, beyond the conventional measure of housing costs relative to income, and considering housing-related living costs. This includes those costs that are affected by location and tenure choice. Some of these choices may represent a trade off vis-á-vis the direct cost of acquiring a home, with the direct cost of access to employment inversely related to the cost of housing.

The project considers the availability of information that would allow an assessment of how individuals and families in varying circumstances respond to housing affordability pressures. The project examines whether and how these households trade-off the achievement of other aspirations such as:

- consumption choices;
- types and styles of housing;
- employment participation; and
- locational choice, lifecycle stage and family formation (including the birth of children, propensity to live in group households, and whether children leave home to live in a new household).

Finally, the project also considers the extent to which people are accommodated in ‘non private’ dwellings and whether the proportion and/or type of household which resides in non-private dwellings is changing over time. The project will examine

whether, and to what extent, people who are unable or unwilling to access private dwellings may seek, or be compelled to seek, accommodation in hotels, short-term caravan parks, health facilities or other forms of accommodation that do not conform with the ABS definition of ‘private occupied dwellings’.

1.1 Context

Housing affordability in Australia has declined over the past several decades and this has contributed to an apparent decline in access to home ownership amongst younger households and higher levels of housing stress amongst households that have entered the home purchase market. There has also been increased pressure within the private rental market.

One outcome of these processes is that many lower income households have restricted housing choices available to them. Many pay relatively large proportions of their income to meet rental costs and this can result in them having inadequate resources to meet broader living costs. Some households may be forced to make other housing trade-offs, such as locating further from essential services. Others may be forced out of the housing market and resort to short term accommodation options, including caravans, camping and rooming houses.

The NHSC’s (2011) State of Supply Report listed a number of ways in which housing needs not met by the available stock may find expression in the housing market. These included:

- A reduced rate of household formation, including increased retention of offspring in the family home, older persons living with their children and more or large group housing;
- Greater use of non-private housing such as boarding houses and supported accommodation;
- Greater use of non-permanent accommodation, such as caravans, and
- An increase in the number of homeless persons.

The NHSC has noted that not all of these outcomes are socially undesirable and not all are a consequence of a shortage of adequate, affordable and appropriate

housing. However, the NHSC does believe that many of the less desirable outcomes of the current affordability pressures could be addressed by an increase in the supply of affordable housing that better meets the needs of modest income marginal home buyers and lower income households in the private rental market. It also believes it is important to take broader costs of living into account when defining or assessing housing affordability

The following sections of this report address these overarching issues through an examination of each of the research themes. Section 2 focuses upon the trade-offs households make when confronted by rising housing costs and a limited budget. It notes that while there is agreement that Australia has a very high cost housing market and that many households are in a position of housing affordability stress, different methods are used to assess the level of housing stress, sometimes resulting in conceptual confusion and measurement error. The section goes on to consider the sorts of decisions confronting low cost households and notes that there is a shortage of hard evidence on the nature and direction of these decisions within Australia. It concludes that there is a need for discrete choice experiment models to statistically measure likely housing choices under constraint.

Section 3 examines whether housing affordability problems are a cause of population and economic change. It suggests that such changes are likely to have affected population processes and have (perhaps in greater measure), been affected by them. However, there is little existing causal evidence about this relationship. The section concludes that the modelling of longitudinal data is needed, and that such analysis is possible using HILDA. The section specifies two example models.

Section 4 examines the housing needs of the population unable to access the conventional housing market. The section works its way through the enumeration of both persons living in non private dwellings and the count of the homeless population. It notes that some, but not all, persons in non private dwellings are living under such arrangements because they could not have their housing needs met by the conventional housing market. The section then reviews the count of homeless persons and what that enumeration can tell us about the level of unmet need within the housing market.

Section 5 offers a conclusion to the report and draws out the key, detailed findings of the project.

Section 2: Housing Stress and Affordability Trade-offs

This section focuses on the trade-offs that individuals and their households make in response to housing affordability problems. This section addresses the question:

How can we understand affordability constraints and trade-offs?

We begin by examining the estimated prevalence of Housing Affordability Stress (HAS) and highlight the influence of the measurement approach used on such estimates. **We suggest that regardless of which existing measure is used, similar population groups are highlighted as being 'at risk'.** We also note that existing measures are constrained in their inability to capture HAS as a longitudinal process, and that future work is needed to examine housing stress beyond a point in time snapshot. The section proposes a housing affordability trade-off model, and discusses an example scenario. Two major evidence gaps are highlighted in this section, and the section concludes with a suggestion for further analysis required to address these gaps.

2.1 Affordability

In approaching the question of affordability constraint and trade-offs, this report begins by looking briefly at the prevalence of affordability constraint. Though the existence of affordability constraint is well acknowledged (and uncontested) in Australia, the depth and spread of (measured) unaffordable housing is significantly influenced by the approach to its measurement, and the parameters used. Importantly, housing affordability is potentially measured in strikingly different ways, and is almost always reported using interchangeable terminology. This means that estimates of housing stress (and discussion of the characteristics of those in unaffordable housing) can be markedly different when assessed side by side. It also means that comparison can be mistakenly undertaken based upon measures calculated in different ways.

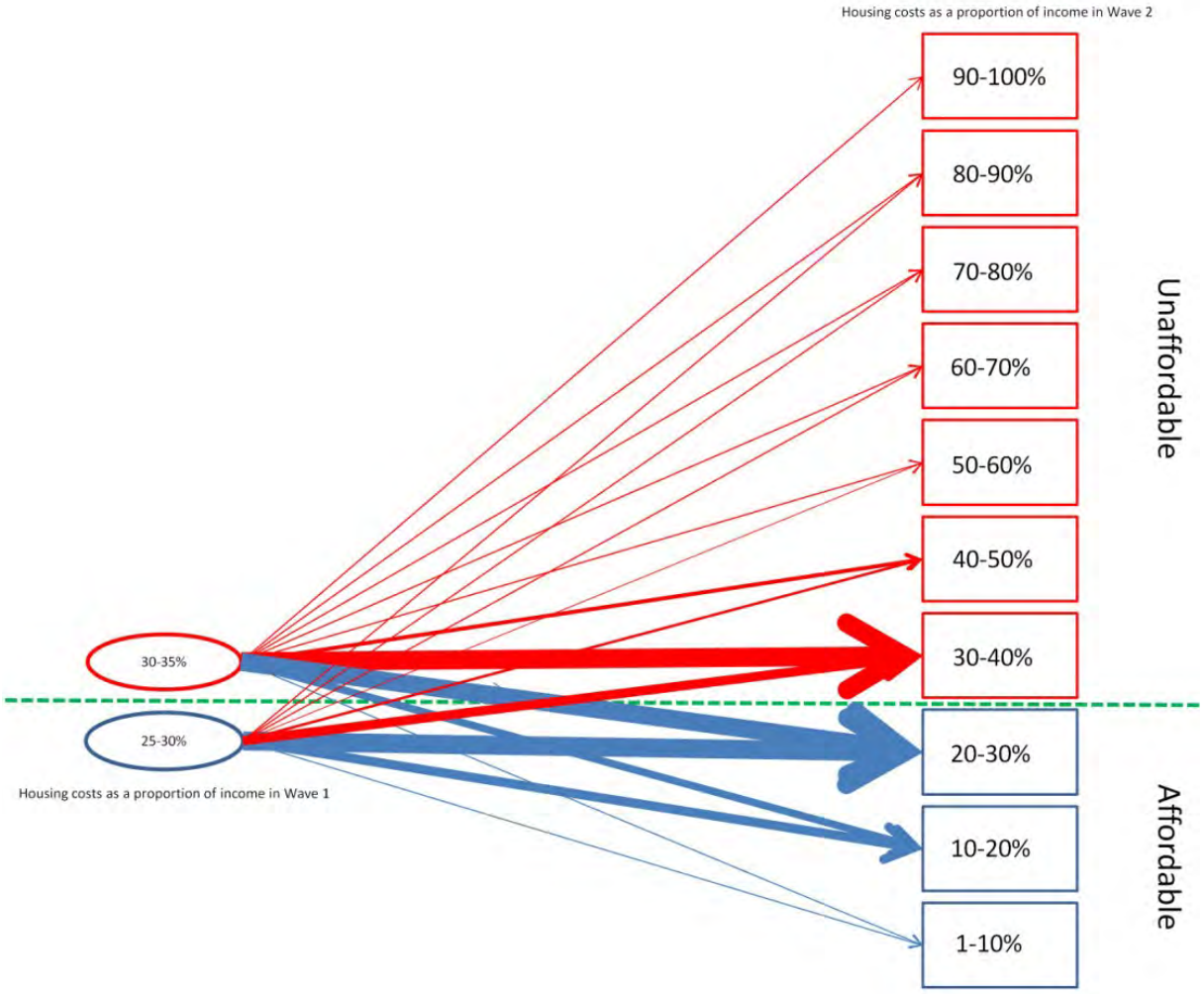
Before discussing the measurement of housing affordability stress we first draw attention to a major and under-acknowledged conceptual flaw implicit within both of the major housing affordability measures – the inability to capture its temporal dimension. We have shown in previous work that because the 30/40 approach looks

at only a point in time, it is likely to hide some of the most vulnerable groups, as well as incorrectly classify some (potentially large numbers of) individuals who temporarily slip above and below the cut-off. Figure 2.1 provides an example of individuals whose housing costs were on the margins of affordability: that is, the population who were classified in 2009 as having housing costs of between 25 and 35 per cent of household equivalised disposable income. It shows the relative proportions of this population who were classified in the following year as having housing costs above and below the 30 per cent benchmark. The figure highlights substantial variation for this group over time, especially around the 30 per cent benchmark. Some 28 per cent of those who paid less than 30 per cent of their income for housing in 2009 paid more than 30 per cent in 2010. Similarly, 51 per cent of those who paid more than 30 per cent income for housing in 2009 paid less than 30 per cent in 2010 (Baker, Mason and Bentley, 2012). **Clearly a single point in time measure carries significant shortcomings, especially in its inability to distinguish individuals experiencing brief affordability problems from those with more serious longer housing affordability stress.** We acknowledge this gap and now turn to a discussion of existing measures before suggesting an alternative productive approach.

Currently, the only widely applied robust method for estimating the prevalence of HAS in Australia at the population level is the ratio method. There are many variations to this method and its application, all of which affect the resulting estimate of Australians experiencing housing affordability problems. The most significant recent investigation of the measurement of housing affordability in Australia was the *National Research Venture 3: Housing Affordability for Lower Income Australians,* commissioned by the Australian Housing and Urban Research Institute (AHURI). The research papers associated with this investigation provide a valuable background to the topic and an estimate of the number of Australian households classified using the 30/40 rule as being in HAS. Within this work, it is estimated (based on analysis of 2002-3 data) that 862,000 lower income Australian households were in housing affordability stress[1] (Yates and Milligan, 2007).

[1] Paying more than 30 per cent of equivalised disposable household income for housing costs.

Figure 2.1: Transitions of Individuals in the Marginal Affordability Group (paying 25%-35% of household equivalised income for housing costs in year 1).



Source: Baker, Mason and Bentley, 2012
Data source: HILDA 2009, 2010.

While the 30/40 rule is probably the most commonly used approach to measuring affordability in Australia, the residual approach is perhaps the most theorised approach. At its core, the residual approach tries to move beyond basic ratios, and acknowledges that housing is only one (though a major one) of the necessities that a household needs to live life to a minimum standard. It effectively reverses the direction of the assumption contained in the ratio method - that households pay for housing first and whatever is left can be spent on non-shelter necessities. The residual method subtracts housing costs from household disposable income and benchmarks the remaining amount against accepted poverty indicators to establish if

households can be categorised as being in housing stress.[2] The recent work by Burke, Stone and Ralston (2011) suggests that the incidence of housing affordability problems is much higher in Australia when measured using the residual approach. Overall, they estimate that 2.3 million lower income households have affordability problems using this approach.

While it is important to understand the source of differences between these measurement approaches and know the resulting prevalence on each measure, the principle usefulness of these measures to an investigation of trade-offs is in highlighting the cohorts most vulnerable to HAS. In this respect the ratio and residual methods converge. Both highlight similar population groups as being 'at risk' of HAS. While it is clear that under housing affordability stress households must make trade-offs, little is known of the detail of those trade-offs beyond the fact that they are likely to be distinct between these population groups.

Low income renters are shown, using the ratio and residual methods, to be especially vulnerable, as are low income purchasers. Interestingly, though public renters are often systematically removed from analyses of housing affordability stress (because by definition their rents are capped at below the unaffordability cut-off) they are shown by residual method analyses to be particularly vulnerable. Burke, Stone and Ralston (2011) find that almost 70 per cent of low income public renters have affordability problems when assessed against, even a low cost budget standard. While outright homeowners may have broader financial buffers to protect them from more extreme housing affordability trade-offs, low income renters and home purchasers generally have less resilience.

Any measurement of housing affordability trade-offs should necessarily focus on a number of these key groups separately, and aim to derive a 'typical' trade-off scenario for each. The Burke et al (2011) work, for example examined seven different renter and homeowner typologies. **Any future work to understand the mechanisms and likely choice paths involved in affordability related trade-off decisions should focus on characterising typical trade-off decisions for low income renters (private and public) and home purchasers.**

[2] Note that in some literature the examination is reversed: authors take non-housing costs for the 'appropriate bundle of goods and services' from income and see if there is enough left to afford satisfactory housing.

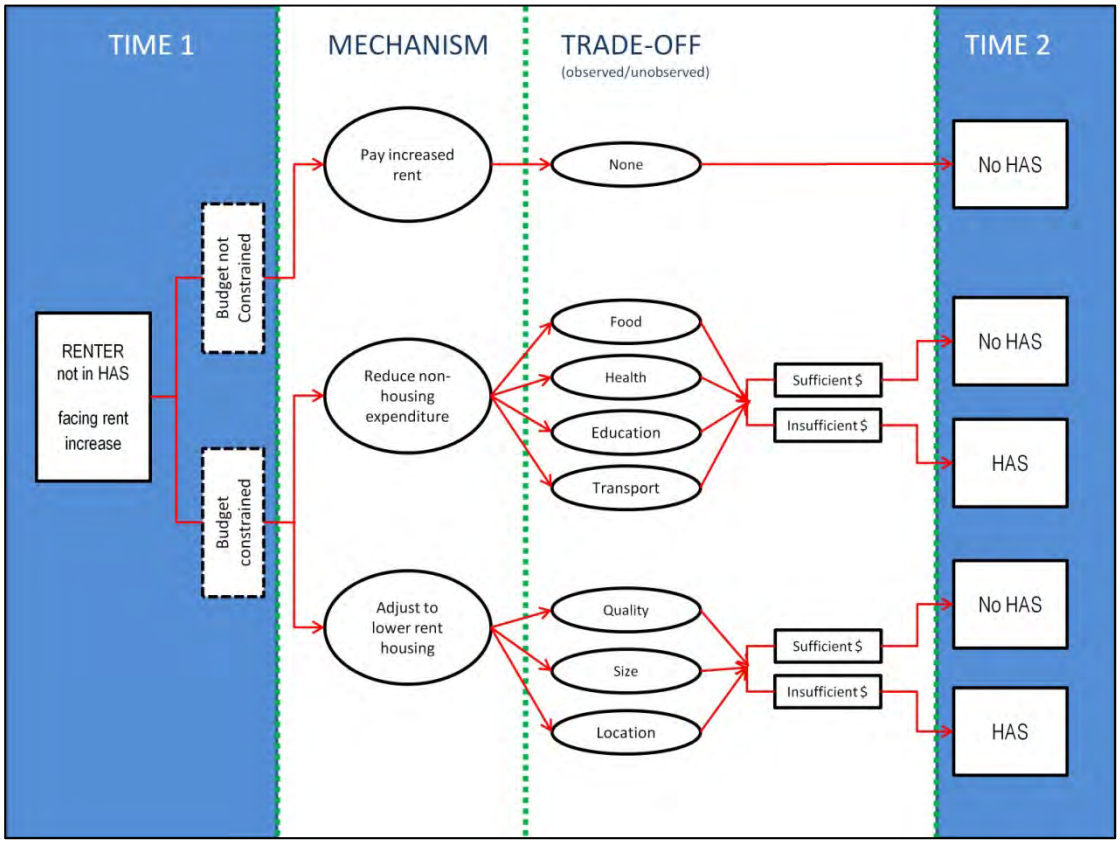
2.2 A Trade-off Model

This section examines the types of decisions and trade-offs that individuals may make in response to affordability constraints. **Responses to affordability constraint fall within two distinct pathways involving housing, and non housing, adjustment.**

In the housing response, households may act to reduce their housing expenses, either by relocating, renegotiating their finance costs, or making some other change to the quality or quantity of the housing that they consume.

In the non-housing response, households may address their housing affordability constraint by adjusting their non-housing consumption, for example by reducing their private health insurance coverage, or expenditure on food.

Figure 2.2: Trade-off Model



Using the example of a renting household, Figure 2.2 suggests a decision structure that occurs in response to a housing affordability change. We note that this decision process occurs in time and cannot be captured in cross sectional analysis (this issue of causality is discussed further in the gap analysis at the conclusion of this section). In this example response to an anticipated increase in rent, the household may make three responses:

1. pay the higher rent without having to make trade-offs; or
2. reduce their non-housing expenses by trading off the amount or quality of non-housing consumption (for example food, transport, health costs); or finally,
3. reduce their housing expenses by trading off the quality of housing that they consume (for example, relocating to a smaller home or less desirable location).

We note that the trade-offs made may or may not be sufficient to avoid HAS, the household may make both housing and non-housing trade-offs, and of course, these reasons and trade-offs will vary for any household over time. Examining the issue of trade-offs in more detail, we consider the example of a household of two adults and two school aged children living in an average Australia suburb, such as Marion in South Australia, or Camden in New South Wales. We note that this example, while showing what decisions a specific household may make is of course, not exhaustive. Each different household type (an indeed each individual household) will have different priorities and options, and hence make different trade-off decisions. At the conclusion of this section we suggest that future work should be undertaken to develop an understanding of what these trade-offs might be for different household types (for example, marginal purchasers, newly formed households, etc.).

The Franklins are currently renting and have just begun saving for a deposit to purchase their own home. They have a total household income after tax of $47,000/year, from Mathew who works as a plumber, and Susan who works part time at the local supermarket. They have a savings plan which enables them to save $200/week for their house deposit. Their elder child Sarah attends the local parish school, and their younger child Jane attends the local day care centre for two days a week while Susan works. The Franklins have just been contacted by their real estate agent who has notified them that their

rent will be rising significantly from 325/week to 385/week at the conclusion of their current contract next month. The Franklins cannot afford this rent rise, while meeting all of their other commitments (which includes maintaining their saving plan). They examine the following possible bundle of changes and consider the implications of each:

1) *Do nothing, pay the additional rent and save $60/week less towards their home loan deposit.*
2) *Look for a $60/week saving in non-housing expenses.*
3) *Look for a house that is $60/week cheaper.*

The implications of 1: it will take approximately one year[3] longer for them to save for their home loan deposit of $20,000. This concerns Mathew and Susan because they see house prices rising and worry that an extra year of saving may result in having to purchase a more expensive house.

The implications of 2: Looking at their weekly expenses Mathew and Sarah think that they can find some areas to allocate the $60/week from. The problem that they face is that they are already on a tight budget to save for their house, and so the savings made across these areas will be limited.

The implications of 3: in order to relocate to a more affordable house will require expenditure (e.g. moving costs) that makes this option less attractive. **To some extent housing trade-offs have a 'harder edge' than non-housing trade-offs, that is, they are less flexible and more disruptive.**

The following are the potential trade-offs that Mathew and Susan consider. From this they develop a bundle of housing decisions which may include a number of housing and non-housing choices.

Non-housing Trade-offs:

- Food: eat less; eat cheaper, poorer quality food.

[3] For example, if they just started saving and have $0 today and planned $200 at the next pay, it will take them 142 weeks to get to $20000 at $140 per week--an extra 42 weeks. If house prices rise by 2% in that 42-week period, a $200,000 entry level house will have increased by $4000. They will have saved $5880 so in 42 weeks they are ahead by only $1880. If the price rise is 3% they will be $120 worse off.

- Health: reduce private health insurance, reduce dental maintenance, reduce preventative treatments (e.g. asthma medicine); put off filling prescriptions.
- Education: move elder child to State education system
- Childcare: reduce amount of childcare; or increase amount of childcare in order for Susan to work more.
- Transport: reduce car use, have one car rather than two.
- Utilities: reduce the level of heating in the house; use less water; reduce unnecessary power consumption.
- Another child: Mathew and Susan plan to have another child once they have saved for their home loan deposit. They could not afford for Susan to be out of the workforce at the moment.
- Work more: there is little benefit gained form Susan working extra hours as she would have to purchase more childcare to do so.

We note that many of these trade-offs will have a negative influence on quality of life; several can lead to health and other social problems.

Housing Trade-offs:

- Tenure: delay home purchase; rent.
- Location: relocate to a less convenient location; a location with lower amenity, a location that may have poorer access to services; require higher transport expenditure.
- Size: relocate to a smaller dwelling – fewer bedrooms, smaller house.
- Quality: relocate to a lesser quality dwelling (e.g. a more basic home without insulation).

All of these trade-offs have potential costs. For example, while the Franklins may relocate to a cheaper, poorer quality dwelling, the cost saving of this move may be outweighed by increased costs associated with utility costs to heat it -or to increased transport costs. Further, in order to make trade-offs sufficient to meet the additional $60 a week housing cost a combination of responses may be necessary.

This example mirrors the experience of many lower income renters captured in the important work by Burke *et al*. (2007). In their qualitative study of the trade-offs and experiences of unaffordable housing, they found that renters were an especially

vulnerable group who often had few resources to buffer them from rent increases, and many had been forced to make trade-off decisions that were "arguably unacceptable in an affluent society" (p. 2). Similar to this example many in the Burke *et al* (2011) study had gone without meals, dental care, or children's school requirements in order to pay their rent.

Newly forming households are likely to make similar trade-off decisions, though because their decision process necessarily occurs concurrently with a housing relocation (for at least one member of the household), it is likely to involve more housing (as opposed to non-housing) trade-offs compared to the case of Mathew and Susan. Though housing trade-offs may well have a 'harder edge' than non-housing trade-offs, at a time of household formation housing may be much more readily traded-off. In this case, decision makers within the newly forming household are much more likely to consider the location (and associated transport costs), size, tenure and quality of a dwelling relative to its cost. Initial work done by the Grattan Institute (2011) attempts to understand trade-off decisions among some households in Sydney and Melbourne.

2.3 Addressing the Gaps

This section has highlighted two main areas in which further analysis is required to address existing gaps in knowledge.

2.3.1 A Longitudinally Informed Measure of Housing Affordability

An important knowledge gap identified in this report centres around the longitudinal understanding of housing affordability problems. Because HAS is experienced as part of an individual's progression through their housing career, we need to better understand the prevalence of HAS from a longitudinal perspective. Beyond providing a potentially more accurate assessment of the prevalence of HAS, a longitudinal view of the process will importantly allow the **causes and consequences** of poor housing affordability to be derived. Cross-sectional (or 'point in time') assessment is a useful tool for describing and comparing housing affordability at the average population level, but it is unable to provide information about **how** households react to declining housing affordability. To address questions such as how individuals react to the onset of housing affordability stress, or how individuals or households in varying

circumstances respond to housing affordability pressures, requires data that can track individuals (or households) through time—that is longitudinal data.

The most suitable existing longitudinal dataset to examine HAS is the Household Income and Labour Dynamics Australia dataset (HILDA). It is based upon a large national probability sample of households, and is designed to statistically reflect the total population of Australians residing in private dwellings. The dataset currently contains 10 annual waves of data. While HILDA allows a valuable longitudinal insight into HAS, it is secondary data and is hence limited in a number of ways, such as:

1) It is focussed on private dwellings, and therefore cannot capture the housing experiences of individuals who may spend periods outside of the private housing market; and related to this point,
2) More residentially mobile individuals and their households, and more vulnerable population cohorts (such as indigenous persons, or the unemployed) are likely to be undercounted, especially over time.

In the absence of longitudinal data, several methods of varying sophistication are available to describe average effects. For single time-period data cross-tabulations are available; for multi-period cross-sectional data shift-share analysis and decomposition analysis can be used for constructed pseudo-longitudinal data. With longitudinal data the use of advance empirical modelling techniques is an option and such methods can quantify cause and effect for individual and household facing declining housing affordability.

2.3.2 How Might the Trade-offs made by Householders be Measured?

Understanding how specific population cohorts make trade-off decisions is important in responding to housing affordability problems. Nevertheless, analysis of housing affordability trade-offs has rarely been undertaken in Australia, and it has never been undertaken in a large scale manner.[4] In responding to this knowledge gap, research should therefore be incremental. It should also, as previously suggested, be focussed on developing average typologies for key groups within the Australian

[4] We note the Burke et al study which was based on focus group information collected from around 100 individuals in three Australian states, the Grattan Institute (2011) initial work which was also spatially restricted, and earlier ABS Motivations and Intentions studies which looked at housing preferences, but not trade-offs.

population who are most affected by housing affordability stress (especially low income renters and low income home purchasers). We do note additionally, that beyond those households most affected by housing affordability stress, many Australian households actively avoid housing stress because of the housing trade-offs that they have already made. These households may also be the focus of some later work to establish what trade-off buffers might best protect households from affordability problems, or what residual affordability effects may be caused by housing trade-offs. Nevertheless, we suggest that the following two stages are critical foundation analyses to understanding housing affordability trade-offs in the Australian population.

Stage 1: Building upon the focus group findings of Burke and Pinnegar (2007) and the recent work of the Grattan Institute (2011), a larger scale qualitative study based around interviews should be undertaken across all of the major housing market locations in Australia. Stratified by HAS typology and broad housing market location, these interviews would collect information about previous housing affordability trade-off decisions, and their subsequent effects. Data from these interviews would allow a series of generalised pathway typologies for Australian population cohorts to be defined. These pathway typologies should then be subjected to more detailed statistical testing to enable the weighting of 'typical' pathways.

Stage 2: In order to quantify the likelihood of different trade-offs in the generalised typologies, a more detailed statistical study, using a Discrete Choice Experiment (DCE) methodology, could be undertaken. This type of analysis would provide statistically representative evidence of the pattern and strength of the typology pathways for each of the focus populations. A methodology and example for this approach is detailed in Appendix A, but essentially the approach allows the probabilities of one trade-off to be ranked against the probabilities of others. The DCE analysis would enable the production of a series of statistically weighted profiles to be produced representing the trade-offs of each of the focus cohorts. Such roadmaps would be especially valuable in the policy environment, and allow different affordability and response scenarios to be modelled.

Section 3: Is housing affordability a cause of population and economic change?

3.1 Introduction

Australia's population structure has been altered over recent years by a combination of processes, including:

- shifts in household composition;
- the ageing population;
- on-going increases in the number of one and two-person households,
- a large decline in household formation rates;
- significant declines in home-ownership particular for younger individuals;
- increased retention of offspring in the family home; and
- higher rates of group households.

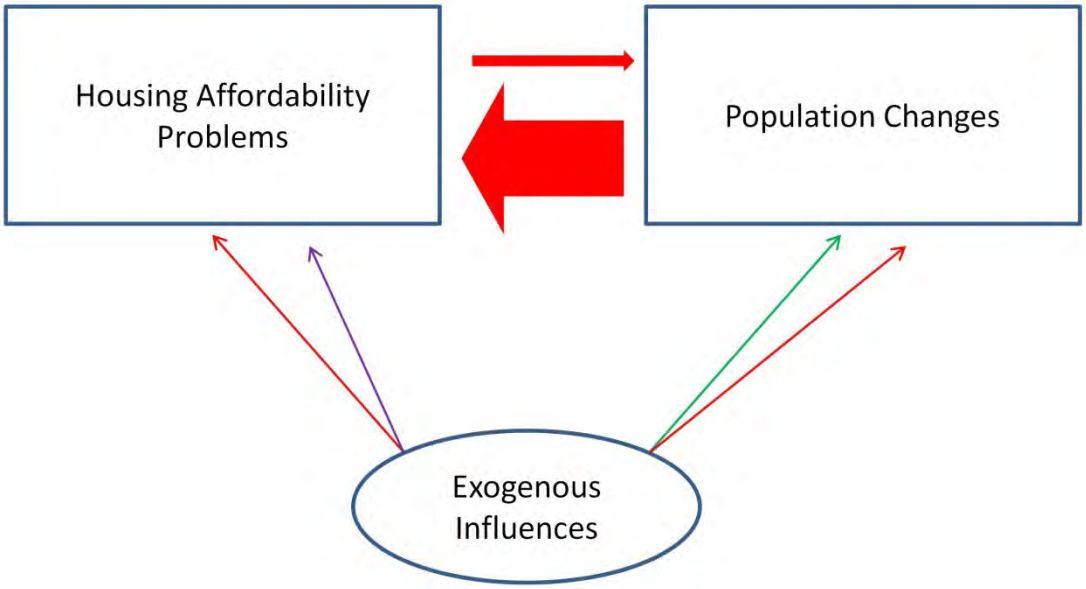
At the same time Australia has been established as one of the most unaffordable housing markets in the world.

We begin this section by examining the ways in which population and housing affordability may be interrelated. We suggest that in some respects housing affordability may have influenced population change, but that population changes have had a much greater effect on housing affordability. Figure 3.1 provides an important description of the bi-directional relationship between housing affordability and population change. It highlights the fact that population changes are much more likely to affect housing affordability, and correspondingly, housing affordability appears to have a relatively minor effect on population change. Though there is an assumption in policy and research that housing affordability must in some way influence the shape and characteristics of the population, there is surprisingly little empirical and logical evidence to support this.

Not only is the relationship between housing affordability and population change uneven, it does not occur in isolation. Non-housing factors (exogenous influences, such as a loss of employment) also influence both housing affordability and/or population changes. Any analysis of the relationship between population change and housing affordability is confounded by these inter-relationships and exogenous

factors making it difficult to establish the degree to which housing affordability actually influences population change (and vice versa).

Figure 3.1: Population and Housing Affordability Stress



With this uneven relationship acknowledged, we now identify a number of pivotal population and economic changes that have occurred in Australia in an era of poor housing affordability, investigation of these changes should provide a productive focus for future research. The section concludes by discussing gaps in current knowledge and key approaches to address those gaps.

3.2 The Major Population Changes related to Housing Affordability

Population and economic changes both contribute to the number and clustering of households, which translates to (uneven) demand within a limited housing stock. We suggest that beyond housing affordability, the following factors are of significant importance within the relationship described in Figure 3.1.

1) Demographic Change: including ageing of the population; decreased household size; increased life expectancy, increase in sole person households; increased life expectancy; increase in sole person households.

2) Divorce
3) Changes to the forms of employment: Casualisation of the Workforce; gendered changes to labour force participation rate
4) Growth in Remote Employment in Remote Mining
5) Increased higher education participation
6) increasingly uneven income and wealth distribution

3.4 Gap Analysis and a future methodological focus

There has been little empirical analysis detailing the relationships between population changes, economic circumstance and housing affordability, especially analysis which has established cause. Future work around housing affordability should be aimed at understanding the **interaction** between housing affordability, and these population centred changes. A number of important questions stand out as priorities for further work, such as:

- To what extent are young people staying at home longer due to declining affordability?
- How are newly forming households reacting to poor affordability?
- To what extent might housing unaffordability be preventing divorce and relationship breakdown?
- How might the tightening of the financial market and changes to the forms of employment interact in response to housing affordability problems?

Importantly, these questions all aim to understand causal questions of **'how'** and **'why'**, and are therefore poorly answered by cross-sectional data. While information can be obtained about associations and changes in proportions from cross-sectional data (e.g. the Census) sophisticated empirical methods are necessary to establish causality: current analysis allows only implied causality. Among these more sophisticated methods, we suggest that econometric models are especially valuable. Such a modelling approach is detailed below, highlighting an example application of the method set around the question: How does the number of adults living in a household change due to a change in housing affordability?

Econometric Methods

A longitudinal econometric model can be used to examine the causal relationship between housing affordability stress, population changes, and current economic factors.[5]

Example question: How does the number of adults living in a household change due to a change in housing affordability?

An econometric model must specify the dependent variable (the outcome) and the set of explanatory variables that are expected to influence the outcome. Some explanatory variables will be of interest to the analyst, some will be included to control for known confounding influences. In addition, the time-sequence or dynamic element can be model. For example, a dynamic longitudinal model examining the influence of HAS on a population measure (e.g. the number of adults living in a family home) can be specified as:

$$NAdults_{i,t} = \alpha + \beta_1 HAS_{i,t-1} + \beta_2 HAS_{i,t} + \ ...others... + u_i + \varepsilon_{i,t}$$

We will use this example to demonstrate the results obtained from a dynamic longitude model.[6]

In the equation the dependent variable is the number of non-married individuals age 18 years and over in the household at time *t* (*NAdults*$_{it}$).

- α represents the (common) intercept or regression constant.
- u_i is the "fixed effects" parameter to control for individual unobserved heterogeneity (a perennial problem in cross-sectional models and a major strength of panel models).[7]

[5] Panel models have a number of strengths including they can account for unobserved heterogeneity in the data (i.e. the unobserved individual differences typical in any group of people which if ignored leads to unreliable model results) and they can include dynamics. Nonetheless, the advantages of panel methods are not costless—issues include state or time dependence (past status influences current status) and initial condition (those who are in HAS in the first year of the survey may be a non-random sample of the population). All such issues must be dealt with appropriately: they are not discussed further.

[6] As noted above, the causal direction of the relationship between population/economic and HAS can be ambiguous. For example it is possible that the number of adults in a household contributes to HAS. The issues relating to the estimating 'feedback model', i.e. where HAS and population (or economic) changes occur simultaneous are not considered in this report, but it is noted that this is an important matter to be considered.

- The set of explanatory variables includes the particular measure of interest—current HAS and lagged one period (HAS_{t-1}) to attempt to establish causality.[8] "Others" could be, for example, income, age, education and employment status (some of which may not be of particular interest, but are known or expected to influence the outcome, i.e. control variables).
- βs are slope coefficients attached to each explanatory variable to be estimated —they are interpreted as the rate at which the dependent variable changes for a one-unit change in the explanatory variable (all other things held constant).[9]

That is, this model provides the explanation for changes in the number of individuals in each household due to multiple influences—including housing affordability stress. **The inclusion of lagged explanatory variables has the potential to establish temporal ordering and allow statistically significant model coefficients to be interpreted as causal.**

Example output with interpretation

Table 3.3: Correlation *Number in Household (hhnumber) & continuous explanatory Variables*

	hhnumber	***LTHconds***	***hhYd***	***urate***
hhnumber	1			
LTHconds	0.8665	1		
hhYd	0.3852	0.3912	1	
urate	-0.0034	-0.0104	-0.1464	1

Notes: *hhnumber* = Number of 18 plus in household; *LTHconds* = number of long-term health conditions; *hhYd* = household disposable income; *urate* = unemployment rate.

[7] The basis of a longitudinal data models is an adjustment to the regression error (residual); the error is assumed to be composed of two elements, u_i represents the unobserved individual specific heterogeneity and ε_{it} the individual time-specific errors. One issue to be considered at the modelling stage is the use of the 'random effects' or the 'fixed effects' (this represents either).

[8] HAS(*t-1*) is exogenous—required for causality to hold. If it could be established that *HAS(t)* were exogenous causality could be assumed (and the issue of simultaneity would be solved), but this cannot be established here.

[9] More precisely, the coefficient on any explanatory variable is interpreted as the difference in the conditional expectation of the *NoAdult* between those with and without that characteristic.

Interpreting the correlations (Table 3.3 above)

Correlations measure the strength of statistical association between two continuous variables.[10] For example, the table above suggests no correlation between the number of individuals living in the house (*hhnumber*) and the unemployment rate (*urate*): correlation = -0.0034, but there is "very high" correlation between *hhnumber* and the number of long-term health conditions reported (*LTHconds*): correlation = 0.8665. This is a useful demonstration of the limited use of correlations: although the unemployment rate does not appear to be associated with *hhnumber* when this simple bivariate analysis is used in the regression model below *urate* is "highly" statistically significant (*p*-value < 0.0001).

Interpreting the model (Table 3.4 below)

The dependent variable is the number of adults (age 18 and over) living in the house. Positively signed coefficients on explanatory variables are associated with an increase in the number of those in the house when that explanatory variable increases (negatively signed coefficients are associated with a decrease in the number)—subject to the statistical significant of the coefficient.[11]

Consider the result for the continuous explanatory variable (percent) unemployment rate (*urate*):[12]

- As the *p*-value is less than 0.05 (or alternatively the z-statistic is > 1.96) the coefficient is statistically significant (at the 5% or better level of significance).
- The coefficient is 0.0156—for each 1 percentage point increase (decrease) in the unemployment rate there will be, on average, an increase (decrease) of 0.0156 in the number of individuals living in the household. Alternatively this can be express as an elasticity: a 1% increase in the unemployment rate increase the number of individuals living in the house by 12%.[13]

Consider the result for the dichotomous explanatory variable being in housing affordability stress (HAS):

- As the *p*-value is less than 0.05 the coefficient is statistically significant.

[10] Alternative methods to the commonly presented "Pearson's product moment" correlations are required when the data are not continuous.
[11] Coefficients that are not statistically significant do not different from zero—they are not empirically associated with the dependent variable.
[12] This is the unemployment rate at the time of the collection of the data by sex and state.
[13] Calculated elsewhere.

- The coefficient is -0.0299—on average, if individuals "switch" from being in HAS to not being in HAS the number of individuals in the house will fall. In elasticity terms a 1% increase in those not in HAS will reduce the number of individuals in a house by about 3%.[14]

Table 3.4: Econometric Model for Number of Adults living in house

	Coefficient	S.E.	z-statistic	p-value
Unemployment rate	0.0156	0.0019	8.050	0.000
HAS	-0.0299	0.0088	-3.390	0.000
HAS(lagged)	0.0068	0.0087	0.780	0.218
L/Term health conditions	0.5204	0.0722	7.208	0.000
H/Hold disposable Income	-0.0034	0.0011	-5.711	0.000
Rent Private vs. Owner	0.0101	0.0177	0.570	0.284
Rent Government vs. Owner	0.1880	0.0778	2.416	0.008
Intercept	0.8889	0.0242	36.680	0.000

Notes: (1) Coefficients are βs in the equation; S.E. represents standard error; z-statistic is coefficient divided by SE; *p*-value is the probability of falsely rejecting the null hypothesis that the β is not statistically significantly different from zero (e.g. *p*-value < 0.05 is statistically significant at the 5% level or better). (2) This model is not claimed to be an acceptable model. Specifically, no attempt has been made to ensure it is correctly specified or to run the necessary battery of diagnostic tests to ensure its veracity. It is a hypothetical example.[15]

Other coefficients are interpreted similarly. Variables with a *p*-value < 0.05 are statistically significant (at the 5% level or better); a positive coefficient (e.g. long-term health conditions) is associated with an increase in the number of individuals in the household; negative coefficients (e.g. income) are associated with a reduction.

Generally, multivariate longitudinal econometric models can provide the size, sign and relative importance of explanatory variables in relation to the dependent variable—the influence of the explanatory variable on the depended variable can be completely specified. By the inclusion of longitudinal 'fixed effects' the problems of biased and inconsistent model estimates from cross-sectional

[14] Calculated elsewhere.

[15] For example, random effects assumptions ignored and inconsistent estimates of coefficients as *NoAult*(t-1) correlates with u_i (i.e. initial condition problem requires instrumental variables).

analysis are solved, and a dynamic model can examine causal relationship due to specification of temporal ordering.[16]

[16] In the simple example provided several potential issues are overlooked: for example, advance econometric techniques (e.g. simultaneous model methods) may be necessary to model 'feedback loops'; exogeneity issues must be considered and several issues relating to longitudinal model specification and estimation have been put aside.

Section 4: The Housing Needs of the Population Unable to Access the Housing Market

This section considers the question:

> To what extent are the housing needs of the population unable or unwilling to access the private housing market being met (or to what extent can they be met) in the non-private housing market?

The accommodation of individuals and households in non-private dwellings is a much under-examined dimension of housing and social policy analysis in Australia. Households resident in non private dwellings may be representative of the general population, but may also reflect particular groups who are at risk of being over-represented in such housing. For example, the Centre for Housing and Regional Planning (CHURP) has recently examined some of these issues through its work with Families, Housing, Community Services and Indigenous Affairs (FaHCSIA) as part of its Homelessness Research Partnership. In addition, it is important to acknowledge that some persons with a disability or long term health condition may be accommodated in non-private dwellings because of the absence of alternative forms of housing (Beer and Faulkner 2009). The existing literature has documented the fact that many persons with a psychiatric disability reside in boarding houses, and that others with long term health conditions may live in hostels and nursing homes, despite their relative youth (Cleary et al. 1998; Horan et al. 2001; Anderson et al. 2003). Recent research by Beer et al. (2011) notes that some people with an acquired brain injury live in boarding houses because of the lack of other options. In our analysis, we will consider non-private dwellings with an eye on both general population processes and the drivers affecting the accommodation of particular at-risk groups. We are also mindful of the fact that there is relatively little prior work to guide our investigations and that this is an area of housing supply that is likely to have changed substantially over recent decades.

Our proposed method for this part of the study included:

1. A review current and past literature on non private dwellings in Australia, including Census related publications and data from the homelessness, nursing home and caravan park sectors;
2. Undertaking a scoping investigation of the light the Census can shed on non private dwellings in Australia for the 1996, 2001 and 2006 Censuses. This

was not cast as an analysis of the data *per se*, but instead a meta analysis of the data collection and categorisation processes and what that may tell us about this important topic. This component of the work was to be informed by the recent ABS review of *Counting the Homeless;* and,

3. Undertaking a gap analysis of the questions that either remain unanswered or cannot be answered within existing analyses and data sets, and recommend measures to fill this vacuum.

We base this report on an analysis of data from 2001 to 2006. This selection is intended to reflect the decade covered by the two most recently available Censuses. The selection of this time period also permits a focus on the two largest and most widely available data sets. Detailed data from the previous 1996 Census was found to be incomplete for the purposes of this report.

In this section of the report we examine, and estimate the size of, the Australian population who live outside the traditional housing market. This group, who are either unable or unwilling to access more traditional private housing options, represents a particular challenge for planning housing supply. A large proportion of Australians who live in the non-private sector of the housing market are vulnerable, because of illness, disability, poverty or instability. Importantly in this light, the cohort is also diverse and relatively difficult to enumerate, and as a result they are often missing, under-recognised, or poorly-characterised in analysis, and hence policy consideration.

No single data set accurately classifies all of the major groups who live in this non-private sector. We therefore base our review on a number of data sets.

- We build the foundation of our analysis on the relatively robust ABS enumeration of non-private dwellings;
- We then consider the population resident in caravans and similar dwellings; and,
- We finish by examining estimates of the homeless population and what those estimates can tell us about persons living outside the formal housing market.

Through this review we make a preliminary estimate of the number of persons living in the non-private dwelling sector because they cannot, or choose not to, have their

needs met by the formal housing market. We estimate that between 135,000 and 167,000 persons were living in non private dwellings (or other informal arrangements) at the 2006 Census because of the inability of these individuals to access the market.

4.1 Non-private Dwellings

The count of non-private dwellings and the individuals residing within them occurs as part of the five yearly Census of Population and Housing and it is one of the more robust data sets to be considered within this section. Unsurprisingly, because it is secondary data, the Census-based classification of non-private dwellings imperfectly captures the housing situation of Australians who are either unable or unwilling to access more traditional private housing options. It does this in three main ways:

a) Firstly, it includes many who, though enumerated in non-private dwellings, do not actually live within them;
b) Secondly, it does not include some important residential dwelling types (for example caravan/residential parks); and,
c) Thirdly, it most probably under-enumerates individuals in some key (harder to capture) groups.

As a result, the 679,436 persons enumerated in non-private dwellings in the most recently published Census does not reflect the real number of persons living outside the private housing market in Australia, nor does it accurately reflect the characteristics of that population. It is therefore important to understand the data collection parameters for the non-private dwelling enumeration in the Census of Population and Housing. The Census counts all dwellings each five years, and classifies them across six dwelling types:

1. Occupied private dwellings
2. Unoccupied private dwellings
3. Non-private dwellings
4. Migratory
5. Off-shore
6. Shipping.

Over both Census periods, persons counted in non-private dwellings represented just over three per cent of all Australians. This group was counted across a number of different dwellings types, the categories of which are presented in Table 4.1. Both 2001 and 2006 classifications are shown, highlighting a stability of definition across these two Census collections, where the only differences were two additional explicit inclusions in 2006– 'bed and breakfast' accommodation which was included within the hotel/motel category, and the addition of a separate category for 'Immigration detention centre'.

Table 4.1: Non Private Dwelling Categories, 2001 and 2006 Census

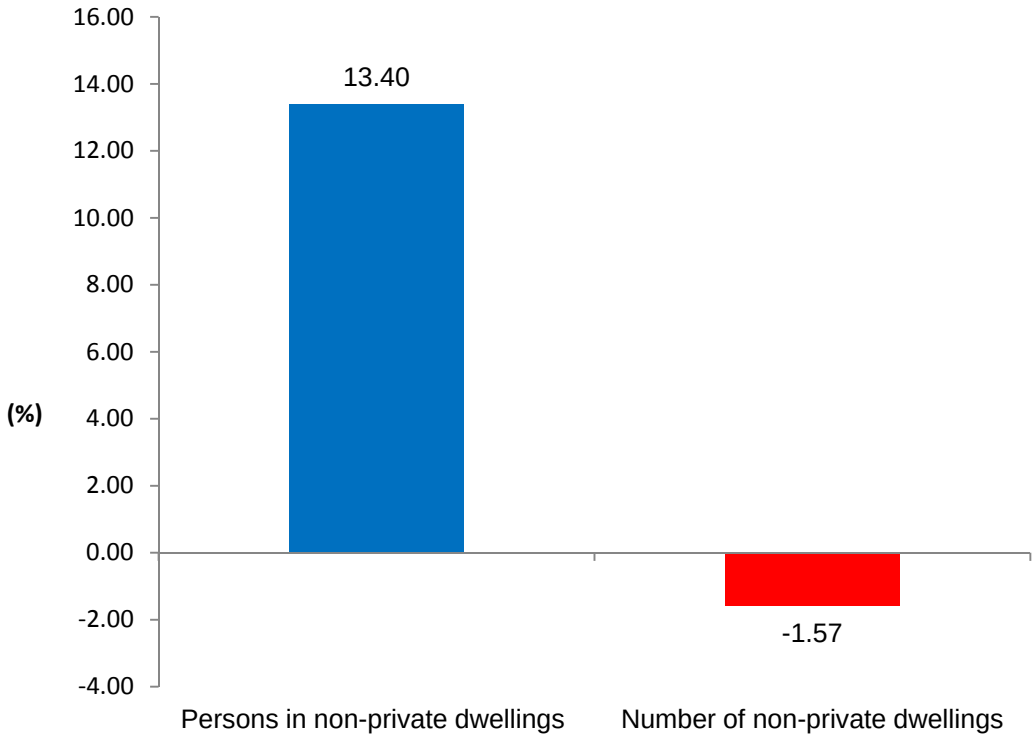
2001	2006
Hotel, motel	Hotel, motel, bed and breakfast
Nursing home	Nursing home
Accommodation for the retired or aged (cared)	Accommodation for the retired or aged (not self-contained)
Residential college, hall of residence	Residential college, hall of residence
Public hospital (not psychiatric)	Public hospital (not psychiatric)
Staff quarters	Staff quarters
Prison, corrective and detention institutions for adults	Prison, corrective institution for adults, Immigration detention centre
Boarding house, private hotel	Boarding house, private hotel
Boarding school	Boarding school
Private hospital (not psychiatric)	Private hospital (not psychiatric)
Hostel for the disabled	Hostel for the disabled
Psychiatric hospital or institution	Psychiatric hospital or institution
Hostel for homeless, night shelter, refuge	Hostel for homeless, night shelter, refuge
Convent, monastery, etc.	Convent, monastery, etc.
Other welfare institution	Other welfare institution
Nurses quarters	Nurses' quarters
Corrective institution for children	Corrective institution for children
Childcare institution	Childcare institution
Other and not classifiable	Other and not classifiable
Not stated	Not stated

Source: ABS, 2001 and 2006, Census

Importantly, the comparison of 2001 and 2006 data also reveals a substantial increase in the number of persons residing in non-private dwellings over this period. Between 2001 and 2006 there was a 13 per cent increase in persons enumerated in non-private dwellings, a rate well above the Australian population growth rate of 1.4 per cent. While a causal explanation is not established, it is likely to be related to a combination of factors such as the ageing of the population, ongoing housing

affordability problems, and the increasing marginalisation of some groups within the population. Of further interest, while the number of *persons* residing in non-private dwellings increased, the number of *dwellings* decreased slightly (by two per cent). Of particular interest, across the two categories of 'Boarding house, private hotel' and 'Hostel for homeless, night shelter, refuge' there were substantial decreases. Importantly, both of these represent housing options for those unable to access the private market. The gain of persons and concurrent loss of dwellings (summarised in Figure 4.1) is of particular interest and importance for the provision of housing options for those unable to access the private housing market, and this pattern should be examined against the upcoming release of data from the 2011 Census.

Figure 4.1: Growth in the number of non-private dwellings and persons resident in non-private dwellings, 2001 to 2006.



Source: ABS, 2001 and 2006, Census

In order to examine which groups enumerated in non-private dwellings actually resided in them Table 4.2 presents Census data enumeration which highlights a number of dwelling types that could be removed from a supply based consideration of non-private dwellings.[17] As the table shows, in many cases the majority of those

[17] This table is based on a 2001 Census cross tabulation but is indicative of 2006 data.

enumerated in non-private dwellings were simultaneously resident in another dwelling. Standing out among these figures are six categories where more than half of those enumerated are counted elsewhere (these are highlighted in bold). Almost 90 per cent of those enumerated in the 'hotel, motel' category at 2001 had a different usual address (dwelling place). Similar results (86 per cent and 92 per cent respectively) are evident for both public and private (non-psychiatric) hospitals. The percentage of persons with a different residential address but enumerated in both 'corrective institutions for children' and 'staff quarters' is also high. The category of 'other and not classifiable' is predominantly temporary or holiday related housing, including ski lodge and backpacker accommodation. In the context of this housing supply focussed examination of non-private dwellings, each of these should be considered as secondary non-residential dwellings and therefore excluded.

Table 4.2: Percentage of Persons in Non Private Dwellings with a Different Usual Address, 2001 Census

	estimated percentage with a different usual address	estimated percentage at usual address
Hotel, motel	89.7	10.3
Nurses quarters	45.2	54.8
Staff quarters	50.0	50.0
Boarding house, private hotel	20.9	79.1
Boarding school	9.1	90.9
Residential college, hall of residence	19.8	80.2
Public hospital (not psychiatric)	86.1	13.9
Private hospital (not psychiatric)	91.8	8.2
Psychiatric hospital or institution	41.4	58.6
Hostel for the disabled	5.6	94.4
Nursing home	2.0	98.0
Accommodation for the retired or aged (cared)	3.4	96.6
Hostel for homeless, night shelter, refuge	25.8	74.2
Childcare institution	36.4	63.6
Corrective institution for children	55.5	44.5
Other welfare institution	34.1	65.9
Prison, corrective and detention institution for adults	1.3	98.7
Convent, monastery, etc	13.0	87.0
Other and not classifiable: includes lodges and youth/backpackers	56.27	43.73
Not stated	na	na

Source: ABS, 2001 and 2006, Census.

The number of persons enumerated in each non-private dwelling type in 2006 is shown in Table 4.3, within it secondary dwellings are again highlighted in bold. We note that in 2006 almost half of all persons (313,885) were enumerated in secondary non-residential non-private dwellings. In fact the largest group within the non-private dwelling count was 'Hotel, Motel and Bed and Breakfast accommodation', within which almost one third of those in non-private dwellings were counted.

Table 4.3: Person Enumerated in Non Private Dwellings by Category (2006)

	2006
Hotel, motel, bed and breakfast	204,160
Nursing home	100,154
Accommodation for the retired or aged	63,722
Residential college, hall of residence	46,861
Public hospital (not psychiatric)	39,884
Staff quarters	53,157
Prison, corrective institution for adults	26,258
Immigration detention centre	574
Boarding house, private hotel	16,268
Boarding school	23,480
Private hospital (not psychiatric)	15,899
Hostel for the disabled	10,496
Psychiatric hospital or institution	6,596
Hostel for homeless, night shelter, refuge	4,385
Convent, monastery, etc	4,401
Other welfare institution	6,429
Nurses' quarters	1,345
Corrective institution for children	785
Childcare institution	353
Other and not classifiable(b)	47,582
Not stated	6,647
Total	679,436
Total minus secondary non-residential	365,551

Source: ABS, 2006 Census.

For the purposes of this initial review we suggest that relatively few persons enumerated in non-private dwellings at the Census were unable or unwilling to access the private housing market. Examining Table 3 further, we suggest that only

those enumerated in the following categories should be included in a count of those excluded from the private market (Table 4.4) as these are the housing circumstances where persons are most likely to be living in a non private dwelling because of their inability to gain access to the housing market.

Table 4.4: Categories of Non Private Dwellings Likely to Include Persons Unable to Access the Market with Estimated Resident Population (2006)

	2006
Boarding house, private hotel	16,268
Hostel for the disabled	10,496
Hostel for homeless, night shelter, refuge	4,385
Other welfare institution	6,429
Not stated	6,647
Total	**44,225**

Data Source: 2006 Census.

Whilst drawing the conclusion that 44,225 persons were unequivocally resident in non-private dwellings on a permanent basis because of an inability to access the market for conventional dwellings, we also believe that approximately half the 63,772 persons in accommodation for the aged or the retired should also be included in our estimates of unmet housing need. We note that such accommodation is defined as

> *accommodation for retired or aged people where the occupants are not regarded as being self-sufficient and do not provide their own meals refers to accommodation for retired or aged people where the occupants are not regarded as being self-sufficient and do not provide their own meals.*

In some instances, such as Abbeyfield housing, such non-private dwellings represent lower level care and support for ageing individuals. In other instances, however, such arrangements simply represent a relatively inexpensive form of housing for income poor and asset limited older persons. The aged housing enterprise formerly known as Village Life (now Eureka), for example, built its business on a model of accommodating low income older persons in non private housing, whilst providing

meals and linen at the cost of the aged pension. As part of their model they charge $155 to $245 per week (depending on the location). This represents 85 per cent of the aged pension and 100 per cent of rent assistance. In exchange residents are provided with rental of an apartment, three meals each day, and access to a private laundry and community facilities. Eureka currently has 45 facilities and almost 3000 residents and therefore represents ten per cent of those we consider to be outside the private rental market. It is worth noting that 11 per cent of persons aged over 65 remain dependent on the rental market and for many within this tenure such arrangements may represent a welcome escape from escalating rents and living costs. More research is needed on this topic, though it appears beyond the scope of the current project. This is a gap within the evidence base that needs to be filled.

On the basis of the evidence presented in the tables above we therefore estimate that at the 2006 Census between 44,000 and 72,000 persons were enumerated in Census defined 'non-private' accommodation who can be considered as excluded from the private housing market. We note that this number is an early estimate and includes a number of individuals (6,647) for whom the type of non-private accommodation was not stated. Though this number is an estimate its substantial difference from the total of 679,436 enumerated in non-private accommodation is striking and highlights the complexity of the issues under investigation.

4.2 Caravans and Related Private Dwellings

As the previous section has shown, the Census data collection and categorisation over represents many non residential housing types. At the same time, it is narrowly defined in some key dimensions, most importantly in that it excludes caravans and relocatable homes. Caravans and relocatable homes are classified by the ABS as private dwellings. While regarded as 'private dwellings by the Census, this form of housing is clearly important in meeting the housing needs of those unable to access accommodation in the conventional private housing market. Caravans and relocatable homes constitute both some of the most marginal housing for low income Australians and simultaneously a desirable lifestyle choice for another group. As the following section highlights, this type of dwelling is accessed by two groups for very different purposes – those who choose a caravan or relocatable home as part of a

lifestyle decision and those who use such accommodation as part of a solution to a pressing housing need. It is the latter group who are of interest to this study.

At the last published Census, 81,000 people were resident in structures classified as 'caravans, cabins and houseboats', of which 57,000 were recorded as living in caravan parks, with the majority of the balance living on their own land, on farms, in backyards or in mining areas. While little is known of the characteristics of the 24,000 individuals living outside of caravan parks, the characteristics of those resident in parks is relatively well developed. It would, however, be reasonable to assume that a percentage of those individuals living in caravans on private land in mining areas have been excluded from the housing market by high house prices and limited access to accommodation (Haslam McKenzie *et al*. 2009). Unfortunately, it is not possible at this stage to estimate the number of affected individuals.

Caravans and relocatable homes are affordable housing to many people unable to access rental accommodation in the private market or public housing, and with few other housing options (Reed and Greenhalgh, 2004; Nelson and Minnery, 2008). This has given rise to cohort of marginalised people, estimated by the ABS in 2006 at around 18,000 persons (ABS, 2006), living below accepted community standards in caravan parks without security of tenure and with fewer rights than people renting conventional housing (Greenhalgh, 2002; Wensing *et al*., 2003; Bunce, 2010). Stuart (2007, p.6) has argued that it is possible to identify a cohort of marginalised individuals within caravan parks who are characterised as being persons of working-age, without an adult household member in full-time work who are reliant upon a caravan park as their usual place of residence (Stuart, 2007, p.6). Generally, it could be said that the lower the standard of the park, the greater the number of marginalised people living there (Stuart, 2007). For these residents the housing offered is of a last resort and many are accommodated through referral by the Supported Accommodation Assistance Program (SAAP). Levels of residential satisfaction with this type of accommodation are very low, especially for families with children or women escaping domestic violence. These caravan parks also accommodate large numbers of single males, many of whom have complex needs caused through addiction, mental illness or physical disabilities and are described as 'tertiary homeless' individuals because under the cultural definition of homelessness a caravan is regarded as temporary accommodation.

The standard of caravan parks varies widely in terms of amenity, accommodation and location. Park management styles are also wide ranging and sometimes dictatorial and selective in accepting and evicting residents and in enforcing park rules (Heipern, 1988). In many regional and inland areas of Australia the local caravan park may be the only source of available housing. However, because of the disruptive behaviour of some housing referral clients many caravan park owners refuse to accept them (Stuart, 2007, p.7). This situation may cause even greater problems in sourcing accommodation. Park residents living in caravans are characterised by a reliance on Centrelink benefits or age pensions, have lower educational standards, work in unskilled occupations, have higher levels of unemployment and some have low levels of literacy (Stuart, 2007). Two-thirds of residents in caravan and residential parks (also known as manufactured home estates) are lone person households, the former tend to have more single males and the latter more single females. Lower proportions of couple households and very few children are resident in parks compared to mainstream Australia. Almost all park residents were born in Australia, New Zealand, the UK and Ireland. People from non-English-speaking backgrounds (NESB) are under-represented in parks (Purdon, 1994). There are few Indigenous people living in parks overall, but in inland areas of NSW and in lower standard parks they are over-represented (Stuart, 2007).

Many holiday caravan parks, especially on the coast however, are of a reasonably high standard and play a role in providing affordable housing opportunities and supportive social networks for elderly residents (Beckwith, 1998; Secomb, 2000; Newton, 2008). Dedicated residential parks usually contain retirees living there as a lifestyle choice, though in some instances it may also be a constrained choice caused by lack of income or a previous relationship breakdown. Relocatable homes are of a standard comparable to that of a holiday home or transportable home and are usually around 90 square metres in size and usually comprise two bedrooms, and have self-contained laundry and bathroom facilities (Bunce, 2010). This group of people are attracted by personal security such as an entrance boom gate, tend to have quite high levels of residential satisfaction and embrace the community aspects of the park lifestyle, which may include a recreation building, swimming pool and a community bus (Lea, 1994; Secomb, 2000). Residents living in relocatable homes tend to be from skilled trades or lower level clerical backgrounds. The majority had sold their traditional home upon retirement and paid cash for a relocatable home leaving a surplus to enhance their lifestyle or increase income (PLI, 1994; Bunce,

2007). An ageing population may create more demand for this form of affordable housing and evidence indicates that the informal support networks on parks enable people to continue to lead independent lives (Connor and Ferns, 2002), thus saving government health and aged care expenditure.

Overall, the number of people currently resident in caravans and relocatable homes in Australia is small (approximately 81,000 individuals in 2006), but sizeable in the context of a discussion of the housing needs not met by the traditional private market. Many residents in a caravan or similar dwelling on Census night were there by choice, either while travelling around Australia or because they had chosen to retire or live in an attractive and affordable location. However, others living within this sector were occupying unsatisfactory housing resulting from the inability to access better housing. Based on an estimate of the proportion of caravan park residents who were non-holiday makers in 2006 (approximately 44 per cent, Chamberlain and MacKenzie, 2008), we suggest that 36,000 residents of caravans in 2006 could be classified as persons who were unable to obtain accommodation in the private housing market. For the purposes of this initial review we note that the number of 'involuntary' residents of caravan parks is similar in scale to the number estimated in the previous section to be housed in the conventional non-private market (also involuntarily).

4.3 Homelessness

This discussion of homelessness and individuals unable to have their needs met through the housing market focuses on the question of under-enumeration. The homeless are a group within the Australian population who, through either choice or circumstance are unable to access accommodation in the private housing market. Because Australia's Census is principally dwelling based, the homeless, who may be transient or hidden, are especially vulnerable to being undercounted by the data collection process. Counting the homeless is a well-documented problem in Australia, and an ongoing focus for the ABS, as well as other service provision agencies.

The ABS report 'Counting the Homeless' (Chamberlain and MacKenzie, 2008) classified 105,000 people as homeless in 2006. The ABS subsequently (2011)

reviewed the methodology and revised their 2006 official figure down to 65,394. The revision of this figure resulted in an ongoing debate across the research and policy community. To date, there is no clear consensus within the research community, the homeless sector or amongst policy makers whether the revised figures better reflect the true number of homeless persons in Australia. It would appear that many of the revisions to the estimate of homeless people at the 2006 Census appear logical and well founded – for example, removing from the homeless count workers living in ATCO huts while they work on relatively remote new housing estates – while other changes are open to question. For example, the ABS has re-categorised as backpacker accommodation dwellings that were previously enumerated as short term boarding houses. There also remains an important background question about the enumeration of Indigenous persons who are homeless, and neither the Chamberlain and McKenzie (2008) or the revised ABS methodology can provide surety on that issue.

The following section compares the respective methodologies, and suggests a working estimate of the population unable or unwilling to access the private housing market that have been included in the count of the homeless. The estimate of the homeless population published in Counting the Homeless (2006) is based on Census data. The homeless population is classified into four major categories, representing primary, secondary, and tertiary homelessness:

1. People who are in improvised dwellings, tents or sleeping out;
2. Individuals using SAAP services;
3. People staying temporarily with other households; and
4. People staying in boarding houses.

It is important to note that these categories of homeless individuals and households do not match the definitions of non private dwellings discussed earlier, though some overlap is possible (Table 4.5).

Table 4.5: Categorisation and Enumeration of the Homeless Population for Counting the Homeless

Conceptual Category	Operational Category	Exclusions	Data source(s)
Primary	People who are in improvised dwellings, tents or sleeping out	people with a usual address elsewhere in Australia; people with an address overseas	Census
Secondary homelessness	Hostels for the homeless, night shelter, refuge		ABS Census data in Vic; SAAP data in all other states
	visitors to private dwellings with 'no usual address'	include estimate for young people missed in Census exclude missing SAAP individuals	Census
Tertiary homelessness	Boarding house/private hotel	exclude owners and staff; residents with a usual address elsewhere in Australia; residents with address overseas; dwellings identified as hotels and staff quarters. Include boarding houses misclassified as hotels and staff quarters; dwellings misclassified as 'other' which fit boarding house criteria; boarding houses misclassified as private dwellings	Census

Source: Adapted from Chamberlain and Mackenzie, 2008, p.10.

The ABS (2011) figure used the same broad classification, as well as an additional category that represented persons staying in 'temporary lodging'. Table 4.6 compares the number of persons estimated in each category.

Table 4.6: Comparison—data components, Counting the Homeless and ABS review (2011)

	Improvised dwellings	SAAP	temporarily with other households	staying in boarding houses	in other temporary lodging	All
2006	16 375	19 849	46 856	21 596	n/a	104 676
2006 (2011 review)	7 763	17 328	19 577	16 830	1 971	63 469

Source: ABS, 2006, Census & Counting the Homeless, 2011

Across each of the four original categories, the 2011 ABS review of the homeless count revised the estimate of this population down, and this downward revision was of considerable surprise to many working within the field who had assumed that if a revision were to be made it would be increased, to include potentially hidden

homeless who were not enumerated because they either could not (or did not want to) be located in formal accommodation on Census night. Chamberlain and Mackenzie (2008) flagged this problem in their original report, saying

> People without conventional accommodation are particularly difficult to count because they usually hide away at night to escape the cold. The 2006 Census was carried out in winter in the southern states, where night-time temperatures were generally cold. In addition, some homeless people are hostile to the idea of providing information to the government and do not want to fill out official forms. Others were hidden away in derelict buildings and census collectors were unaware of their presence.

In order to develop a better understanding of the number of individuals counted as homeless who are either unable or unwilling to access more traditional private housing options, each component is examined below.

4.3.1 People who are in Improvised Dwellings, Tents or Sleeping Out

This component of the enumeration of the homeless attempts to capture individuals who are sleeping in sheds, tents, humpies and other improvised dwellings, as well as those rough sleeping on Census night. Undercounting is an obvious problem with this group because they can be difficult for a Census collector to find. Some may not wish to be identified. Some indication of the complexity and likelihood of enumeration can be gained from the collection processes. Census forms are often handed out near food vans and individuals are able to include a return envelope if they wish to remain anonymous. The fact that Indigenous persons are over represented in this segment of the homeless population serves to underline the possibility that many persons rough sleeping or occupying the least formal forms of accommodation are simply not be accessible to Census collectors. Importantly, the 2011 revision of the homeless population more than halved the 2006 estimate of those in this category. It assumed an over count because of the informal living arrangements of some construction workers and as a consequence of the housing decisions of sea/tree changers. We assume for this examination of unmet housing need that the potential over count due to construction employees and sea/tree

changers would be roughly equalled by a corresponding under count of, for example, Indigenous persons.

4.3.2 Individuals using SAAP (Supported Accommodation Assistance Program) Services

The estimate of the number of persons using SAAP services changed little on review as it was seen as being based on relatively robust SAAP data. There is, however, evidence that reliance on SAAP data, though relatively robust, may also result in an undercount of the number of individuals within this segment of the homeless population. This potential problem stems from the data collection method which requires SAAP establishments to be identified. Though confidential, some SAAP residences do not wish to be identified. Their confidentially is an important part of their service as many people in refuges are fleeing domestic violence. Though a number of cross checks are applied to ensure that SAAP accommodation is not recorded as private dwellings, a brief review of directly collected SAAP data indicates that undercounting within this category of the homelessness count may still occur.

Though the ABS review removed 2,518 from the count of people in SAAP accommodation (as they believed these people were double counted as staying away from the shelter) examination of SAAP figures suggest that the number in this category could be higher rather than lower.

4.3.3 Persons Staying Temporarily with other Households

These people are identified through the question: What is the person's usual address?' Within the census, a person in another home is given a choice of four answers to choose from to indicate their where they are living:

(a) The address shown on the front of this form
(b) Elsewhere in Australia
(c) Other country
(d) For persons who now have no usual address write 'none' in the 'suburb/locality'

Option (d) indicates that the person has no usual address and is staying temporarily with friends or family. The number of persons enumerated in this segment of the homeless population was revised downwards by almost two thirds in the ABS's 2011 review of Counting the Homeless. The revision attempted to counter a potential over count of individuals who were more probably travelling (for example, grey nomads) or were staying with friends temporarily by choice (for example, teenagers having sleepovers). While the downward revision is logical in some respects, the revised figure is likely to under acknowledge couch surfing. We suggest that while the estimate of numbers in this category would be lower than 47,000, the revision to around 20,000 represents an undercount. We suggest a working figure of 23,000, but highlight this as an area for more detailed examination at the release of the 2011 Census. An additional important data source in this case is the Census on Youth Homelessness in Australia (2006). This source has reliable data on the demographics of school children who are homeless, as well as intervention for homeless students. Further analysis of the population unable or unwilling to gain housing via the private market should consider integrating current estimates of the total homeless population with the outcomes of the Census of Youth Housing.

4.3.4 People Staying in Boarding Houses

Estimates of the number of persons accommodated in boarding houses in Counting the Homeless (2006) included a subset of individuals enumerated in both 'boarding houses' and 'hotels, motels and bed and breakfast' accommodation.

The Review of Counting the Homeless (2011) attempted to develop a more reliable estimate of the number of homeless persons, and as part of this process dwellings were adjusted in their categorisation if:

- 60 per cent or less of their adult residents were working and had incomes of $600 or less per week;
- 20 per cent or more of their residents were living there permanently (very unusual for a hotel);
- 75 per cent or more of residents were either unemployed or outside the labour force and had incomes of less than $600 per week

- people who were within the 'hotel, motel' category who reported 'no usual address', who were also unemployed or not in the labour force and had an income of below $400 a week. These people were put into the boarding house category; and,
- People who were in other types of non-private dwellings who reported 'no usual address'. This could be people from any of the other categories such as psychiatric and public hospitals, as well as people in religious orders. These were also considered part of the boarding house category.

The first part of this section examined non-private dwelling data collected in the Census. In the discussion of persons resident in non-private dwellings those individuals enumerated in 'hotels, motels and bed and breakfast' accommodation were removed from the analysis because approximately 90 per cent were estimated to have a permanent dwelling elsewhere. For the purposes of this study we will not integrate the homeless count of persons in boarding houses within our estimate of the total population unable to find accommodation in the conventional housing market as they have already been included in the estimates derived from the enumeration of non-private dwellings.

4.3.5 Persons in other temporary lodging

This additional category was included in the ABS (2011) Review of Counting the Homeless. It aimed to capture additional people who were 'enumerated in 'non-private dwellings' other 'boarding house/private hotel' who reported no usual address' (ABS, 2011). As with the previous category we do not include this number in our estimation of unmet housing need as it is included in the non-private dwelling enumeration (Table 4.7).

Table 4.7: Estimation of the Homeless Population where Housing Needs are not met in the Private Market

	Improvised dwellings	SAAP	temporarily with other households	staying in boarding houses	in other temporary lodging	All
Working estimate for unmet housing need	16 375	19 849	23 000	Included in non-private dwellings count	Included in non-private dwellings count	59224

Overall, we suggest that the homeless contribute the largest proportion of individuals whose needs are not met by the traditional private housing sector. We estimate that almost 60,000 individuals are in this homeless cohort.

4.4 Conclusion and Gap analysis

The overarching goal of this section is to generate an estimate of the number of persons unable to find – or who choose not to find – accommodation through the conventional housing market. We note that the number of persons housed in non-private accommodation in Australia appears to be growing substantially, concurrent with an apparent shrinking of the number of non-private dwellings available. This section has reviewed the count of persons in non conventional housing, which in this instance includes:

- Persons enumerated in non-private dwellings;
- Persons living in caravan parks; and,
- Persons who are homeless but not enumerated in non-private dwellings at the Census.

We conclude that at the 2006 Census between 167,000 and 135,000 persons were unable to meet their housing needs via the conventional housing market. This population was comprised of between 39,800 and 71,800 persons enumerated in non-private dwellings, 36,000 residents in caravan parks who were accommodated in this tenure through necessity rather than choice and 59,224 persons who were homeless at the 2006 Census and not included in the other components of this count.

The clear gap in addressing this question is the nature and direction of change since 2006. There is a need for a detailed analysis of the 2011 Census data. There is also a need for some more detailed examination of the aged housing sector and the number of individuals living in 'non market' housing. There is a case for primary data collection in this area, including qualitative data. Key areas of focus would include:
Analysis of the number and distribution of non private aged housing units that are not nursing homes:

- A detailed Census analysis of students over 19 years of age living in boarding houses;
- A quantitative survey of the housing of international students;
- Analysis of the housing preferences and pathways of the residents of boarding homes;
- Analysis of 'The Road Home' data set in order to shed light on the short term moves of those who are homeless;
- Census and qualitative analysis of the population living in a hostel, or other forms of congregate housing, for persons with a disability. Data collection in this area may become significant with the advent of the National Disability Insurance Scheme.

5. Conclusion

This project aimed to investigate existing knowledge around individual and household responses to declining housing affordability in Australia across three areas:

1. Affordability constraints and trade-offs.
2. Population changes that might occur in response to poor housing affordability.
3. The extent to which the housing needs of the population unable or unwilling to access the private housing market are met in the non-private housing market?

The research has considered the trade-offs households make when confronted by housing affordability challenges. We noted that households can adjust their expenditures with respect to either housing or non housing costs, but noted also that adjustment of housing costs is potentially very disruptive. Currently there is no firm evidence as to the trade-offs household make, and the paper suggests methods and data sources to fill this gap.

The research also examined the interaction between population changes and housing affordability, and the degree to which one might cause the other. This section suggested a number of principle areas in which housing affordability might influence population change, but also stressed the importance of population change as a driver of housing affordability. The section concluded with a focus on methodological approaches to improve understanding of this relationship. Importantly, we highlight the need for research which seeks to understand the 'why' and 'how' of this interaction, and therefore suggest dynamic longitudinal econometric modelling as an ideal methodological framework.

Finally, the paper considered whether some persons cannot, or choose not to, have their housing needs met through the housing market. We found that approximately 150,000 persons fall into this category and that they occupy a variety of circumstances.

This report has a number of specific findings:
:

Finding 1: Housing affordability stress is a major challenge across Australia but despite at least 30 years of debate around this issue there remain significant gaps in our understanding of the nature and dimensions of this problem. We find that point in time measures of housing stress can be a poor indicator of long term housing position.

Finding 2: Any future work to understand the mechanisms and likely choice paths involved in affordability related trade-off decisions should focus on characterising typical trade-off decisions for low income renters (private and public) and home purchasers.

Finding 3: Longitudinal data is needed to address questions such as how individuals react to the onset of housing affordability stress, or how individuals or households in varying circumstances respond to housing affordability pressures. This requires data that can track individuals (or households) through time.

Finding 4: Analysis of housing affordability trade-offs has rarely been undertaken in Australia, and it has never been undertaken in a large scale manner. In responding to this knowledge gap, research should therefore be incremental. It should also be focussed on developing average typologies for key groups within the Australian population who are most affected by housing affordability stress (especially low income renters and low income home purchasers).

Finding 5: A larger scale qualitative study based around interviews should be undertaken across all of the major housing market locations in Australia. Stratified by HAS typology and broad housing market location, these interviews would collect information about previous housing affordability trade-off decisions, and their subsequent effects. Data from these interviews would allow the definition of a series of generalised pathway typologies. These pathway typologies should then be subjected to more detailed statistical testing to enable the weighting of 'typical' pathways.

Finding 6: Discrete Choice Experiment (DCE) analysis should be undertaken in order to quantify the likelihood of different trade-offs in the generalised typologies.

This type of analysis would provide statistically representative evidence of the pattern and strength of the typology pathways for each of the focus populations. The DCE analysis would enable the production of a series of statistically weighted profiles to be produced representing the trade-offs of each of the focus cohorts. Such roadmaps would be especially valuable in the policy environment, and allow different affordability and response scenarios to be modelled.

Finding 7: In some respects housing affordability may have influenced population change, but we suggest that the direction of relationship is predominantly, from population changes to housing affordability stress.

Finding 8: There has been little empirical analysis detailing the relationship between population change and housing affordability, especially analysis which has established cause. Future work around housing affordability should be aimed at understanding the **interaction** between population change and housing affordability, and econometric models may be an especially valuable approach.

Finding 9: There is a substantial population whose housing needs are not being met by the conventional housing market and **at the 2006 Census between 167,000 and 135,000 persons were unable to meet their housing needs via the conventional housing market.** This population was comprised of between 39,800 and 71,800 persons enumerated in non-private dwellings, 36,000 residents in caravan parks who were accommodated in this tenure through necessity rather than choice and 59,224 persons homeless at the 2006 Census and not included in the other components of this count

Finding 10: A large number of Australians currently live in non-private dwellings (or other informal arrangements) because of their inability (through choice or circumstance) to access the private housing market.

Finding 11: The Census count of non-private dwellings shows a substantial (13 per cent) increase in the number of persons residing in non-private dwellings between the last two published Censuses (2001 and 2006). There was however a (two per cent) decrease in the number of non-private dwellings.

Finding 12: Closer examination of the Census collected non-private dwelling data reveals that a majority of those enumerated were simultaneously resident in another dwelling. Therefore from a total of 679,436 persons enumerated in non-private dwellings we estimate that between 44,000 and 72,000 persons should be considered as excluded from the private housing market.

Finding 13: We estimate that approximately 36,000 residents of caravans (44 per cent) in 2006 could be classified as persons who were unable to obtain accommodation in the private housing market.

Finding 14: Across their two methodologies, the ABS classified between 105,000 and 65,394 people as homeless in 2006. The homeless are clearly a major group whose needs are not met by the traditional private housing market.

Finding 15: We suggest that the homeless contribute the largest proportion of individuals whose needs are not met by the traditional private housing sector. We estimate that almost 60,000 individuals are in this homeless cohort.

On a positive note, the guiding questions around trade-offs, population change, and the non-private housing market can clearly be answered through the detailed empirical research outlined in this paper. Such steps are to be encouraged both for their contribution to better policy making at the national and sub national scale, as well as their capacity to add deep insight into the functioning of the Australian housing market. We conclude with four key directions for future work:

1. Investigate the affordability constraints faced by Australian households by using the analysis of longitudinal data – specifically HILDA – to better distinguish those households and cohorts most affected by poor housing affordability;
2. Undertake a large scale, qualitative study that retrospectively investigates the housing and non-housing trade-offs undertaken by key household groups. Such analysis will allow the identification of generalised groups or typologies of affordability decisions;

3. Undertake Discrete Choice Experiment (DCE) modelling in order to quantify the likelihood of different trade-offs in the major typology cohorts. This type of analysis would provide statistically representative evidence of the pattern and strength of the typology pathways for each of the focus populations. The DCE analysis would enable the production of a series of statistically weighted profiles to be produced representing the trade-offs of each of the focus cohorts;

4. Estimate the number of people whose needs are not met by the traditional housing market. This would require targeted analysis of the 2011 Census data to further investigate the nexus between homelessness, non private housing and the inability of the housing market to meet the needs of all who seek accommodation.

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APPENDIX A. Discrete Choice Experiments (DCE)

Trade-offs due to housing affordability stress are the result of a process of subjective value judgments that individuals make. They are therefore difficult to model, but discrete choice experiments (DCE) are designed to measure individuals' preferences for alternatives (e.g. products or course of action). From these choices, using appropriate empirical analysis, the rate at which individuals trade attributes or goods can be inferred.

DCE requires the definition of the potential choices and their levels to force respondents to trade in a way that can be measured. For example, attributes relating to housing may include living in the CBD or suburbs, travel time to work, and the price attribute is the cost of travel (Table A.1).

Table A.1: Simple hypothetical example

Attributes	**Levels**
Travel time to work (daily)	1 Hour 2 Hours 3 Hours 4 Hours
Travel costs (daily)	$10 $20
Housing (discrete choice)	CBD (coded as 0) Suburbs (coded as 1)

This number of attributes (3) and levels (4, 2, 2) in this simplistic hypothetical example results in a "choice set" of 16 (4x2x2) possible alternatives (combinations or profiles).[18]

From the DCE model it is possible to extract the rate at which individuals "trade" between various attributes[19] and the willingness to pay (WTP) for attributes.

[18] In this example it is possible to have each survey taker face each choice set but the number of possible alternatives increases exponentially when the number of attributes and levels increases, e.g. 3 attributes with 2 levels each means $2^3 = 12$ possible combinations of attribute levels, constituting 12 alternatives—5 attributes with 4 levels give $5^4 = 625$ alternatives and in this more usual case a process is available to select the optimum number of alternatives to be presented to each survey taker to maintain the required statistical properties (i.e. fractional factorial design).

[19] That is, the marginal rate of substitution (MRS).

The model can be specified as a "limited dependent variable" model where the dependent variable (U_i) is a binary variable[20] that assumes individuals' choices lead to higher level of utility (or satisfaction):

$$U_i = \alpha + \beta_1 Housing_i + \beta_2 TravelCost_i + \beta_3 TravelTime_i + \varepsilon_i$$

where α is the intercept, βs are the coefficients and ε is the regression residual.[21]

Table A.2: Typical results

Attribute	Coefficient (β)	Odds Ratio	P-value
Housing Location	1.9523	7.208	0.021
Travel costs	-0.1000	0.900	0.011
Travel Time	-1.3236	0.266	0.001

Note: *p*-value < 0.05 indicates statistically significant at the 5% level or better.

Interpretation of hypothetical example

Model estimates (see Table A.2) can be converted to "odds ratio" for ease of interpretation. For example, for Housing the coefficient is 1.95 therefore the odds or probability of chooseing to live in the Suburbs is $e^{1.95}$ = 7.2 times the probaility of choosing to live in the Suburbs (holding all other attributes constant).

For travel costs and travel time (as expected) indivuials prefer lower costs and travel time all other things equal (negative coefficients translate to lower preference for higher costs and travel time).

The rate at which indivudauls will "trade" between attributes or goods is the ratio of the coefficients. For example, the rate of trade between travel time and CBD/Suburbs is the ratio 1.95/-1.32 = -1.48 and hence each increase in travel time means individuals are one and a half times less likely to choose to live in the suburbs.

[20] In this case it is assumed the choice is restricted to two options—multinomial models can be used for scenarios with more than two choice sets. This method is based on the premise that U represents an underlying linear utility function.

[21] This is a simple example model which does not represent all features of the required model.

The willingness to pay (WTP) is the ratio of coefficient on the attribute to the “cost”. The ratio of travel time to cost is -1.32/-0.1 = $13.2 per hour and so indivduals will be prepared to pay $13 to travel one hour less.

We can summarise the results of this hypothetical simple example at follows: indivudals have a strong preference for the suburbs (positve coefficient or odds ratio greater than one); they have a strong prefer to spend less time travelling (small odds ratio) and a slight preference to pay less in travel costs (negative coefficients or odds ratios less marginally less than one).

Generally, DCE can establish preferences, relative preferences (or the rate at which individuals will trade between attributes or goods) and their willingness to pay for various attributes or goods.