

# The costs and benefits of using private housing as the 'home base' for care for older people: a systematic literature review

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## **The costs and benefits of using private housing as the 'home base' for care for older people: a systematic literature review**

authored by

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for the

**Australian Housing  
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## GLOSSARY

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ABS	Australian Bureau of Statistics
AHURI	Australian Housing and Urban Research Institute
AIHW	Australian Institute of Health and Welfare
ATSI	Aboriginal and Torres Strait Islander
CACP	Community Aged Care Package
CALD	Culturally and Linguistically Diverse
CPI	Consumer Price Index
CSHA	Commonwealth State Housing Agreement
CURF	Confidentialised Unit Record Files
DACS	Disability Aged and Carers Survey
DACS	Disability, Ageing and Carers Survey
DVA	Department of Veterans Affairs
EACH	Extended Aged Care at Home
FACS	Department of Family and Community Services
HACC	Home and Community Care Program
ICER	Incremental Cost Effectiveness Ratio
NRCP	National Respite Care Package
PADP	Program of Aids for Disabled People
PRA	Private Rental Assistance
RA	(Commonwealth) Rent Assistance

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# **EXECUTIVE SUMMARY**

## **Introduction**

This paper outlines research by the Australian Housing and Urban Research Institute University of Sydney Research Centre into the relationships between the costs and benefits of using private housing as the 'home base' for care for older people.

## **Project Aims**

This project aims to inform policy and program delivery issues associated with achieving the most appropriate health care and housing interventions. It does this by answering three research questions:

What are the financial costs and benefits to individuals and governments of using private housing as the home base for the provision of care services for older people?

How do the different aspects of housing, such as tenure, dwelling type, location, and access to support, contribute to the financial costs and benefits of using private housing as the home base for the provision of care services for older people?

How do different forms of housing assistance and related programs affect the costs and benefits of using private housing as the home base for the provision of care services for older people?

## **Previous Research**

A systematic review of relevant literature provides the background for developing a model to help determine the influence of a range of housing variables on the cost of aged care, focusing on the impact of different aspects of housing (i.e., tenure, dwelling type, location). While there is a considerable body of research relating to economic evaluations of care in the home for older people, much of it was conducted outside of Australia, and the features posited as significant in regard to in-home care for older people and the formulas used to calculate their respective economic impacts vary widely. All of the most recent systematic reviews located concluded that there was insufficient evidence to estimate the likely benefits, harms, and costs of institutional or at-home care for older people.

Our review of the literature also found that there were a number of methodological issues that require careful thought in regard to any future studies. These included more clarity concerning methods for control of:

Variation of effect in relation to amount of care provided

Variation of effect across the type of care received

The lack of a clear distinction between respite and hospital care

The lack of information about supportiveness or otherwise of the home environment

## **Stage Two of the Work**

During stage two, we will construct our data cube and apply secondary data analysis methods to estimate cost-benefit outcomes over time and across functional capacity, income, and housing variables. In addressing the aims and research questions the study will draw on two primary data sources:

- A comprehensive international systematic literature review; and

- The Disability Ageing and Carers Survey (DACS) Confidential Unit Record File (CURF), which provides national data on met and unmet needs that are not directly associated with service delivery. CURF is sufficiently reliable, comprehensive, and targeted to yield the relevant information about housing, disability, and care circumstances of older adults living at-home and in institutions (Australian Bureau of Statistics, 1999).

## **Conclusion**

The absence of economic evaluations of care at-home for older people in Australia is significant given that policy and care arrangements vary substantially from country to country. To date, cost-benefit studies associated with home care for older people have used inconsistent terminology and inconsistent methodologies. They have not viewed costs and benefits from similar perspectives or considered the same dependent or independent variables. As a consequence, results have at times been contradictory. One significant limitation of prior research is its focus on either care or accommodation, without analysing the relationships between the two. The present project aims to overcome these limitations by considering the impact of potentially significant variables on the costs and benefits of home care in a context that will allow assessment of the interrelationships between housing, care, and personal characteristics.

# **1 CONTEXTUAL BACKGROUND TO THE RESEARCH**

## **1.1 Introduction**

Understanding the relationship of housing to the costs and benefits of home care for older people is a pressing matter for government. In the 65 plus age group, the proportion of people aged 75 and over increased from 66% in 1998 to 73% in 2003 (Australian Bureau of Statistics, 2003). By the year 2051, over one quarter of the total population will be aged 65 years or older (Australian Bureau of Statistics, 1996). The increasing percentage of older Australians, coupled with their strong desire to age in their own home, increases the importance of reliable cost-benefit models to guide policy makers, particularly because costs are increasing rapidly. The Hogan Report estimated that the demand for aged care services might rise from \$7.8 billion in 2002-2003 to \$106.8 billion by 2042-3 (Hogan, 2004).

Although it is generally believed that care in the home is less expensive than institutional care, the validity of that belief remains unclear. The relative net benefit of receiving care in the home versus other settings depends on the difference between the cost of the service and the value of benefits derived from the service in each setting. A range of variables, including some housing characteristics such as tenure, dwelling type and house design, affects the costs and benefits of ageing in place.

Improvements in residential housing options can substantially increase opportunities for healthy and productive ageing by providing a supportive physical environment for older people and by providing housing assistance packages that increase physical and social independence and enable effective care without relocation. Older people can age in place within their local community if they have an appropriate and secure home into which care can be effectively and efficiently provided. Home delivery of non-shelter services, such as personal and health care, has costs and benefits to both individuals and governments.

Low-income elders are at the greatest risk of losing their independence when the cost of maintaining a safe and habitable home is beyond their financial means. Older people with physical impairments, particularly those with only minimal levels of informal support, have the fewest choices regarding accommodation and care. The Australian government supports home ownership through favorable tax treatments and through aged care policy that provides assistance with property maintenance, personal care, health care, and household tasks (Olsberg, Perry, Encel, & Adorján, 2004). Direct housing assistance, including Commonwealth Rent Assistance and public rental housing, is the traditional means of easing housing vulnerability (Melhuish & King, 2004). Nevertheless, direct housing assistance falls short when suitable accommodation is hard to locate or when obtaining housing requires relocation far from services and/or informal caregivers.

## **1.2 Background**

Although the ability of older persons to continue to live independently depends on the availability of housing and community care, these programs are operated and evaluated independently. Accordingly, there is no direct information about the financial impact of various combinations of housing and community care assistance. Sound fiscal practice and good public policy require an understanding of how these two dimensions interact. Moreover, the modeling of this interaction must capture cohort and location differences as well as individual differences and changes that occur over time. To understand and map the interactions of housing and care options across various dimensions requires researchers who are well versed in both housing and community care issues and who have strengths in economic and social research.

### **1.3 Aims of the Study**

This project aims to determine the costs and benefits to individuals and governments of in-home delivery of non-shelter services to elders. To accomplish this, the project will seek to answer the following research questions.

#### *1.3.1 Key research questions*

What are the financial costs and benefits to individuals and governments of using private housing as the home base for the provision of care services for older people?

How do the different aspects of housing, such as tenure, dwelling type, location, and access to support, contribute to the financial costs and benefits of using private housing as the home base for the provision of care services for older people?

How do different forms of housing assistance and related programs affect the costs and benefits of using private housing as the home base for the provision of care services for older people?

#### *1.3.2 Outputs*

The outputs of the project include:

- A robust method to determine the financial costs and benefits to individuals and governments of in-home delivery of non-shelter services to elders;
- An estimation of the financial costs and benefits to individuals and governments of in-home delivery of non-shelter services to elders;
- An understanding of how different aspects of housing (such as tenure, type, location, and access to support) impact financial costs and benefits to individuals and governments of in-home delivery of non-shelter services to elders;
- An understanding and estimation of how different forms of housing assistance and related community care programs impact financial costs and benefits to individuals and governments of in-home delivery of non-shelter services to elders; and
- Identification of the information implications for housing policy, including the targeting of housing assistance.

The skills and experience of a broad range of multidisciplinary researchers at the Sydney and Queensland AHURI Centres will contribute to this comprehensive understanding. This multi-level project will model costs and benefits of in-home delivery of non-shelter services to elders by analysing income (e.g., equity, income support, imputed credits), housing (e.g., type, value, tenure), and care (e.g., type, degree). This type of comprehensive analysis is rare. Unfortunately, applied research (as with the programs themselves) typically has addressed either housing or community care, giving little consideration to the relationships between them. For instance, the community-care 'Channeling' demonstration (U.S. Department of Health and Human Services, 1991), focused on care services with little consideration of housing variables. This program of research is designed to address the relationship between housing and care in an integrated and comprehensive manner.

## **1.4 Examining the research questions**

An implicit assumption of the first research question is that the costs and benefits of providing care in private housing can be compared to the costs and benefits of providing care in other residential settings. In addition, the costs and benefits of both settings are compared for older people of similar functional needs in order to allow a reasonable comparison. The main task of the second question is to measure how cost, benefit, and care change as a result of changes in tenure, location, and dwelling type. The main task of the third question is to measure how cost, benefit, and care change as a result of changes in the form of housing assistance. For example, an older person receiving rent assistance from Centrelink might have difficulty accessing a rental property that has an appropriate design and is located in an area that maintains access to informal carers. When comparing the costs and benefits, three elements need to be measured:

- The costs of the care services;
- The impact of functional impairment levels on cost; and
- The impact of housing type and tenure on cost.

## **1.5 Structure of the Paper**

This paper provides a preliminary discussion of accommodation and care services currently available for adults with disabilities within Australia. Some comparisons are made to overseas initiatives, but the primary focus is on Australian practices. Most prior research has concentrated on either disability, accommodation, or care, and very little published research has explored the relationships between them. The remainder of the positioning paper includes the following chapters:

Chapter Two outlines the terminology relevant to unpacking and fully addressing the research questions. It examines population, method, and outcome characteristics relevant to understanding and analysing housing and care outcomes for older people.

Chapter Three reviews housing, ageing, and care literature and reports on the systematic review methodology.

Chapter Four describes the methodology adopted in the Disability Ageing and Carers Survey analysis, cost sources, and cost assumptions and their implications for the next stage of work.

## **2 RELEVANT VARIABLES AND DEFINITIONS**

### **2.1 Introduction**

The context guiding this report includes both knowledge and practice domains. The domain of knowledge in which this research is being conducted is functional loss associated with ageing and the care intervention required to accommodate such loss. The domain of practice, on the other hand, is the influence that housing has on cost-benefit outcomes when care is provided in the homes of older people. It has been argued that providing care at home is directly substitutable for institutional care. Some say that currently this is unsubstantiated as there is insufficient evidence to estimate likely benefits, harms, and costs of institutional or at home care for functionally dependent older people (Mottram, Pitkala, & Lees, 2002). However, it is generally believed that support in the home is less costly than support in institutional settings.

### **2.2 What does it mean to describe someone as an older person?**

Typically, an older person is one who retires from paid employment and/or who is eligible for financial assistance such as a senior's card or aged pension. Consequently, the threshold age can range from 50 - 65 years. The Australian Bureau of Statistics defines an older person as anyone aged 60 years and over for the purposes of its Disability, Ageing and Care Census undertaken in 2003 (Australian Institute of Health and Welfare, 2005b) even though turning 65 is the most commonly applied discriminator. Because the Disability, Ageing and Care Survey (DACS) will inform the next stage of data analysis, it makes sense to assume the 60 plus definition in order to be congruent with the input data.

It is clear that as people age, their housing and care needs also change. For instance, as a person's degree of disability increases, that person's ability to independently leave home to obtain needed supplies and services decreases (White, Paine-Andrews, Mathews, & Fawcett, 1995). Thus, the level of functional impairment is critical as it affects the housing and community care needs of the older population.

There is a strong linear correlation between disability and ageing. For example, the rate of disability increases linearly with ageing, such that 92% of those persons aged 90 years and over, is identified as having a disability (Australian Bureau of Statistics, 2003). It is the oldest old (85 plus years) who are generally identified as having the highest levels of core activity restriction. They therefore also are the most dependent on adequate care and support to have a reasonable quality of life and to achieve full community participation and integration. This group also is most likely to experience the highest levels of multiple disadvantages because disability severity is linked to a reduction in accommodation choices and to an increased likelihood of premature entry into cared accommodation (Brooke, Davidson, Kendig, & Reynolds, 1998).

The population of older people with functional impairments is, however, far from homogenous. For instance, people with dementia are a significant subgroup, and dementia has very high social costs for family carers. The incidence of Alzheimer's disease and other dementias rises exponentially with age until at least 90 years of age (Jorm & Jolley, 1998). It has been projected that by 2050, the total number of Australians newly diagnosed with dementia will exceed 730,000 (2.8% of the projected population) – a fourfold increase since 2000 (Access Economics, 2005).

While physical decline is inevitable, evidence suggests that its impact can be reduced substantially through provision of housing and community care services (Hogan, 2004; World Health Organisation, 2002). Presently, unmet housing needs for people with disabilities and their carers range from 35% for home modification to 60% for housing maintenance (Bridge, Kendig, Quine, & Parsons, 2002).

## **2.3 What constitutes home for an older person?**

The concept of 'accommodation' is broad and implies any type of shelter, lodging, or living premises, including the whole range of domestic, sole occupancy, family and group households, and cared accommodations. For older people, however, a private home fulfills many needs other than basic shelter. It serves as a space for self-expression (Clemson, Cusick, & Fozzard, 1999), a vessel of memories (Marcus, 1997), and a place of refuge from the outside world (Davison, Kendig, Stephens, & Merrill, 1993).

The term 'home' generally refers to owned or leased accommodation within the community. It therefore includes a wide range of dwelling types, such as houses, flats, units, caravans, mobile homes, and boats. In statistical reporting, homes are most commonly listed as owned/purchasing, private rental, public rental, or community housing. Although neither the Australian Institute of Health and Welfare (2002a) Aged Care Assessment Program Data Dictionary nor the HACC Data Dictionary (Australian Institute of Health and Welfare, 1998) define private housing; private dwellings subcategories such as houses, units, flats, townhouses, and villas are given under the more general descriptor of 'Accommodation Setting' (Australian Institute of Health and Welfare, 1998, 2002a). We anticipate differences in costs and benefits between houses, units, flats, townhouses, and villas as dwelling types for community care provision; thus dwelling type subcategories will be part of our future analysis.

More than 90% of older people own or are purchasing their own dwellings. Further, the current housing of older people results largely from trajectories set by their employment and housing opportunities well before mid life (Kendig & Bridge, in press). This means that dwelling size may exceed both need and capacity to maintain it without assistance. If resources have been restricted, it is also possible that dwelling amenity may have deteriorated over time. While dwelling size, condition, amenity, and quality will vary enormously between older persons and between geographical areas, most of our current housing has stairs or other inaccessible features that create dependency and/or place older people and their carers at risk (Buckle, 1971).

For those who do not own their own home and are thus without a secure home base, the dwelling condition, amenity, and quality are likely to be significantly worse. Thus, increasing numbers of vulnerable older people are stressed by high rents and face long waiting lists for public housing, but lack the high level of dependency required to access residential care.

## **2.4 What care can be received at home?**

Home care can include any diagnostic, therapeutic, or social support service provided at home (Levine, Boal, & Boling, 2003). Because older people typically have chronic conditions (not usually related to a specific short-term medical condition) their ability to carry out everyday activities may be impaired. As a consequence, they typically need continuous care ranging over months or years. Care typically consists of assistance with everyday activities such as dressing, bathing, cooking, laundry, homecare, and community mobility. Though older persons may have some rehabilitation goals and from time to time suffer from acute flare-ups of medical conditions, they generally are not the post-acute Medicare "home-health" population whose outcome goals focus on rehabilitation and recovery (Weissert, Chernew, & Hirth, 2003).

Care needs also are affected by gender, lifestyle, health, socioeconomic factors, and living arrangements. For example, older people are less likely to share accommodation with peers and are more likely to be living alone or with a spouse or children (Ministerial Reference Group, 1999). However, greater numbers of older people are now living alone without assistance from a spouse or other live-in carer, which implies a greater need for formal care services.

The move to home-based care, individually tailored services, greater flexibility, more coordinated services, and actively participating clients, which is now evident in policy reform in Australia, echoes developments already underway in the UK, Sweden, and the Netherlands (Boldy, Kendig, & Denton, 1993). The move to in-home care in Australia has resulted in a gradual shift in expenditure in favour of community care, which is provided under programmes like HACC and Community Aged Care Packages (CACAP) (Fine & Chalmers, 1998). These programmes provide the following types of services:

- home help
- community nursing
- home modification
- home maintenance
- food services
- allied health services
- community respite services

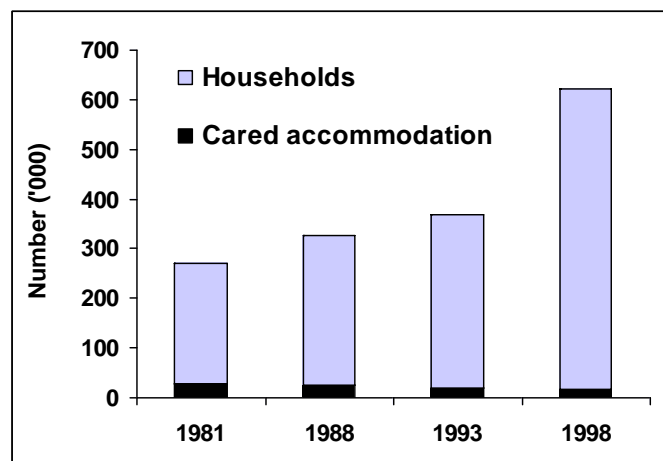
Community care services have enabled people with low to high care needs to remain in their homes and access the specific packages of services relevant to their care needs. These small, locally based services offer choice; however, the diversity and fragmentation of what is available makes finding out who does what, for whom, and where, an almost impossible task (Fine, 1997). Furthermore, people with high-level needs often require a complex mix of services, which requires an assessment and coordination of their care needs (i.e., General Practitioner or ACAT referral) and an overall coordination of their service delivery. The limited resources available because of community services funding caps limit the provision and flexibility of services regardless of individual need.

The vast majority of Australians in need of care and support prefer to remain in their own homes within their local community. However, the availability of carers is central to the ability to provide home-based care for older adults. According to the Carers Association of Australia, formal care through the HACC Program and Disability and Aged Care programs accounts for only 10% of care needs in the community (Payne, 2003). The carers also are often older people. Older people are more likely to be carers than younger people, with those aged 65 years and over being almost twice as likely to be a carer as the general population (Australian Bureau of Statistics, 2003). More than 17% of people aged 50 and over are carers (Wolcott & Glezer, 1999), and 75% of carers of severely handicapped older people are the spouses of the care recipients. In addition, women are nearly three times more likely than men to be primary carers in Australia. The importance of informal care is corroborated by evidence that a substantial number of informal carers provide more than 40 hours of care per week, with some doing so for twenty-five years or longer (Australian Bureau of Statistics, 2003). Therefore, reducing residential care admissions depends to some extent on improving respite care benefits for informal carers (i.e., friends, family, neighbours) (Ball, 1990).

The cost of caring is both personal (emotional and physical health decline) and financial (cost of care, lost income, and lost opportunities for advancement) both in immediate and longer terms (Watson & Mears, 1996). The dependence of the ability to remain at home on the availability of care is significant both because of the economic disadvantage experienced by informal carers and the increased likelihood that the physical demands of caring will result in acquired disability for both formal and informal carers. Figure 1 illustrates the trend toward home care as a result of governmental policy changes such as 'ageing in place' and 'deinstitutionalisation' and its impact on carers (Madden, 2004).



**Figure 1: Change in numbers of people with disabilities being cared for in households over time**



Source: Madden, 2004.

The cost of institutional care in a residential setting (e.g., nursing home or the like) has been estimated to be as high as \$30,000 per person per year (Access Economics, 2005). Further, high-level residential aged care at nearly \$50 billion for the 2003-04 period comprises just under 7% of all health related expenditure (Australian Institute of Health and Welfare, 2005a). In contrast, the estimated value of informal care was only \$18.3 billion in 1999-2000 (Australian Institute of Health and Welfare, 2001).

## 2.5 What is cost-benefit analysis?

An understanding of the cost and benefits of home-based care requires an understanding of economic analysis in general. Economic evaluation can be done from a variety of perspectives (e.g., medical, governmental, societal) and by a number of methods (e.g., cost-benefit analysis, cost-effectiveness analysis, cost-utility analysis, financial appraisal) (Culyer, 2005). Discerning causal relationships is difficult as multiple interdependent variables often relate to observed economic effects, and manipulation of any one variable can have unanticipated consequences depending on the perspective and method used (Stretton, 2000).

Unfortunately, implicit in most cost-benefit assessment is the notion of cost minimisation (meaning cost is the dominant determining factor in a choice between alternatives). Cost-effectiveness is a term sometimes used interchangeably with cost-benefit and is intended to compare outcome variables (e.g., wellbeing, mortality, or morbidity) of various care alternatives. Cost-effectiveness is often used when benefits are difficult to value monetarily (e.g., informal care or transport costs), or when benefits that are measurable are not commensurable. The major difference between cost-effectiveness and cost-benefit is that cost-effectiveness results are expressed in terms of a homogenous index of results achieved (e.g., quality adjusted life years) instead of in monetary terms. Many of the issues associated with cost-benefit analysis also arise in cost-effectiveness analysis (Culyer, 2005).

Cost-benefit analysis is thus a method of comparing the economic costs and the money-valued benefits of various alternative courses of action. It usually requires the calculation of present values. In cost-benefit analysis, a first step is to specify the anticipated effects of the decision at hand. However, in the cost-benefit literature this step has not been worked out in much detail (Nas, 1996). Unfortunately, making value judgments is inherent in the practice of cost-benefit analysis. In addition to choosing the perspective, other critical choices include the choice, scaling, and combining of outcome measures. Models typically are restricted to more or less direct effects, but may include indirect effects or even take into account secondary effects involving macro-economic mechanisms.

Discounting and incremental cost are important components of a reliable cost-benefit analysis. Discounting reduces costs or benefits occurring at different dates to a common measure by use of an appropriate discount rate. Thus, with an annual discount rate ( $r$ ) (expressed as a decimal fraction) the present value (PV) of a cost ( $C$ ) in one year's time is  $PV = C/(1 + r)$ . In two years' time, it is  $PV = C/(1 + r)^2$  and so on. Using this or a similar algorithm, the present value of a stream of future costs can easily be calculated. However, there is controversy about whether benefits (for example, quality-adjusted life years gained) ought to be discounted. Unlike discounting, incremental costs are those additional costs that result from an increased rate or volume of an activity. Mathematically, incremental cost is the first derivative of cost with respect to the continuous variable in question.

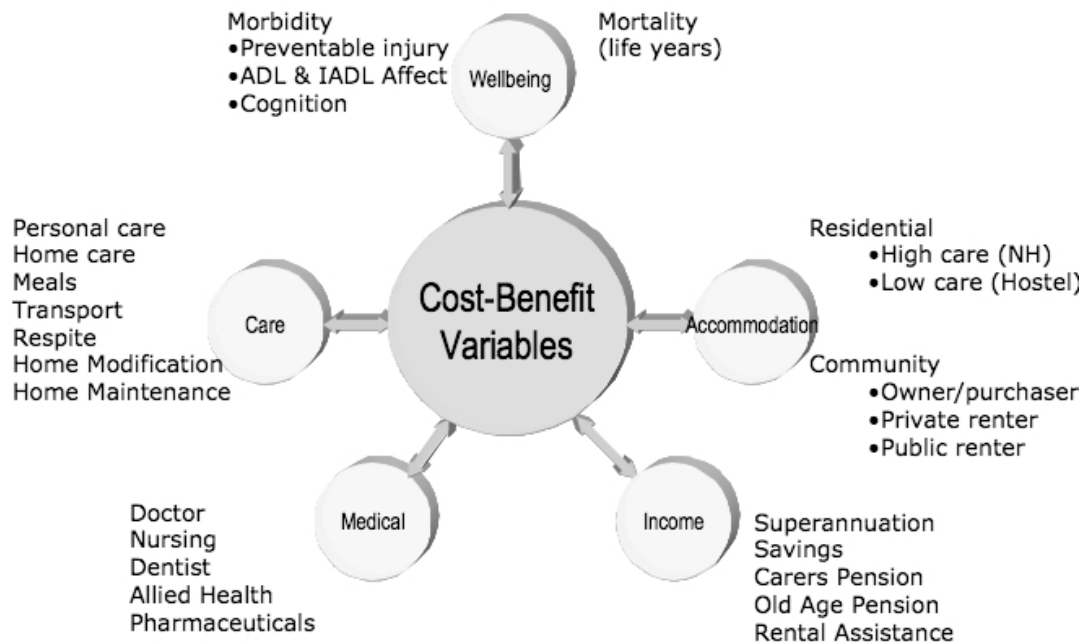
Sensitivity analysis adds information to that derived in cost-benefit analyses by ensuring that the outcomes are robust. Sensitivity analysis may be variable-by-variable (sometimes called univariate sensitivity analysis) or scenario analysis (sometimes called multivariate sensitivity analysis). In variable-by-variable analysis one lists the important factors that affect the values around the mean and examines each at an 'optimistic', 'most-likely', or 'pessimistic' level. Incremental cost-effectiveness ratios (ICERs) are then calculated for each value of each factor, holding all other factors at their expected or most likely values. Thus, if there are three important factors and three estimates for each factor, seven different ICERs will be calculated. The goal is to identify the source(s) of the biggest variations about which decision makers will have to make a judgment and perhaps identify priority areas for future research.

Scenario analysis, on the other hand, allows for the possibility that factors affecting ICERs are not independent of one another, as is assumed in variable-by-variable analysis. In a scenario analysis, one selects a variety of generalised states of the world (for example, worst-case, middling-case, best-case) and takes all the worst, middling, and best-case outcomes to calculate the ICERs that would result under the circumstances specified. Typically, this method produces much more extreme variations than the variable-by-variable method (Culyer, 2005).

## **2.6 What variables are critical to outcomes?**

The costs associated with care of the elderly are both financial and psychosocial. The psychosocial costs associated with care may, in many circumstances, result in increased financial burden – an area of major concern to government. The total costs to the government of client assistance and likelihood of institutionalisation may vary depending upon age, level of disability, mental and physical health conditions, and subsequent deterioration. In an effort to understand the cost and benefit factors isolated in previous research, we have divided them into five major categories. (See Figure 2).

**Figure 2: Cost-benefit variables previously identified**



The above analysis reflects that the factors that influence a comprehensive cost-benefit analysis of using home as the base for elderly people are broad and far reaching, encompassing not only the cost of direct care (such as medical and allied health care), but also the costs of enabling an older person to function independently in the home.

The variables included in earlier research have not been consistent. Deciding which variables are to be costed is critical because the inclusion or exclusion of a variable will yield different results. Some authors include medical, health and wellbeing visitations, or services that may be required to enable an older person to remain in their home environment and undertake general daily activities. These services may include general practitioner and nursing visits and any other services necessary for general patient care, such as travel to out of home general practitioner, podiatry or hairdressing appointments (Smith, Klienback, Fernengel, & Mayer, 1997), and home modification costs (Anderson, Ni Mhurchu, Brown, & Carter, 2002).

Once variables are identified, a conceptual model is used for cost-benefit monetary allocations. For example, Kendig, Wells, Swerrison and Reynolds (1999) estimated the weekly cost to the government for services such as home nursing and health aides, meals, transportation, and case management based on direct and indirect service costs. The direct costs were calculated by multiplying the hours or sessions per week by the Home and Community Care agencies' average cost per unit. Indirect case management costs were based on the amount of time with each client; indirect administration costs were allocated equally to all clients at the rate of \$18 per week.

## **2.7 Summary**

In exploring the relationships between older people, their homes, and their care needs, it is worth remembering that nearly all older owners (93%) currently spend less than one quarter of their income on housing (Australian Institute of Health and Welfare, 2002b). The home is thus a substantial asset for many older people that can enable them to buy aged care. In addition, the cost of residential care includes the cost of shelter and food. Therefore, any cost-benefit analysis that can assist in examining aged care costs by 'unbundling' them into financially means-tested 'accommodation' and 'care' components has merit. This is particularly so since the National Residential Structural Reform budget of 1996 did away with the Care Aggregate Module (direct personal care component) and the Services Aggregate Module (infrastructure component) as ways to cost aged care (Kendig & Duckett, 2001). However, following on from the Hogan Report, the breakdown of accommodation and care costs may be a fruitful method to more equitably cap and distribute government housing and care subsidies. It is hoped that this cost-benefit analysis will assist in any informed decision-making around these issues.

## 3 SYSTEMATIC REVIEW

### 3.1 Introduction

This systematic review chapter compiles and evaluates evidence of the costs and benefits of providing care in the home to older people. Evidence from studies in many disciplines has been published; however, this evidence has not been brought together and analysed in a coherent manner. By compiling the available evidence from across disciplines, this systematic review provides a summary of available information about the costs and benefits of providing care in the home to older people.

### 3.2 Search method

A systematic review, guided by the protocol guidelines for systematic reviews of home modification information to inform best practice (Bridge & Phibbs, 2003) was implemented in this study.

#### 3.2.1 *Terms used*

Specific terms were used to search for relevant materials in a variety of sources. Table 1 outlines the root search terms regarding problem, intervention, comparison, outcome, and target population.

**Table 1: Question component breakdown**

Problem	Intervention	Comparison	Outcome	Target population
housing	cost	benefit	care	elderly

Table 2 contains the full list of search terms, which was generated using a standard and an online thesaurus and knowledge gained from the literature review.

**Table 2: Search terms used**

Problem	Intervention	Comparison	Outcome	Target population
abode	cost	advantage	care	aged
residence	price	help	charge	aging
dwelling	economic	aid	custody	ageing
habitation	monetary value	benefit	keeping	elderly
domicile		capitalise	supervision	old
home		profit	trust	older
housing		reward	watching	senior
lodgings		worth	guarding	geriatric
room			overseeing	disabled
quarters			family community	

### 3.2.2 Inclusion and exclusion criteria

Articles were eligible for inclusion if they were published between 1980 and 2006, available through the University Library network or the World Wide Web, written in English, contained cost estimates and had an abstract. Articles that did not meet the inclusion criteria, such as videodiscs, conference abstracts, unpublished conference papers and whole of subject texts were excluded. A list of exclusion terms was also used to refine the search.

### 3.2.3 Search strategy

Using the search terms listed in Table 2, articles were identified from 16 databases, the World Wide Web via the Google search engine, and grey literature (including the 4,000 plus housing references held by the Home Modification Information Clearinghouse library). Several articles also were identified from a review of the reference lists of review articles. The 16 databases that were searched included the following:

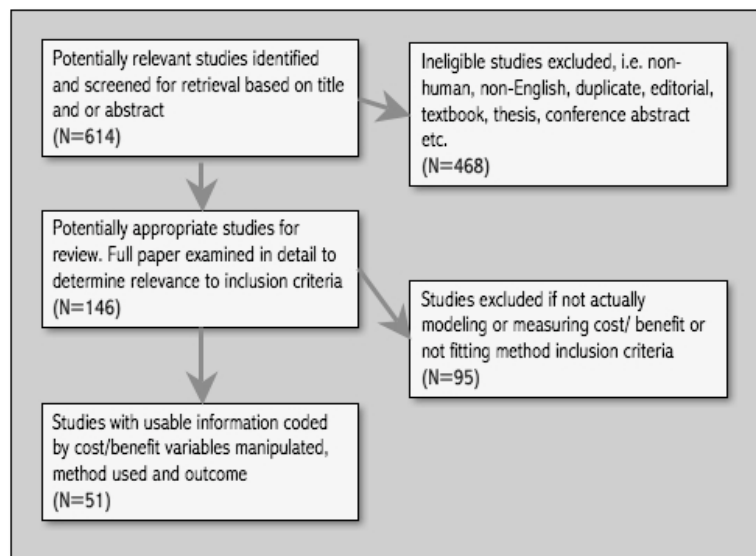
- Ageline (Ageing in psychological, health-related, social, and economic)
- AMED (allied and complimentary medicine)
- APAIS - Health Arch: Australian Architecture Database
- ARCH (Architecture)
- Cinahl (nursing and allied health)
- Current contents via Ovid (science, social sciences, arts and humanities)
- EBM Review
- EconLit
- Expanded Academic Index ASAP (humanities, social sciences, environment, science & technology)
- Family (family and society)
- Health and Society

- Medline via Ovid (allied health, health care, medical, biological, physical sciences)
- Proquest
- PsychInfo
- Social work abstracts
- Web of Science (science, social science, arts and humanities)

The search strategy combined terms relating to 'home care', 'cost analysis', 'cost-benefit analysis', and 'aged' based on the keywords and synonyms listed in Table 2. See Appendix 2 for an overview of the search strategy employed on the 'Ageline' database.

The review process occurred in stages. First, the title was reviewed to determine if the article was potentially relevant. If the title was deemed potentially relevant, two reviewers screened the abstract. If both the title and abstract appeared to meet the inclusion criteria, the full text of the article was reviewed. The following information from each full-text article reviewed was entered on a spreadsheet: reference, author's country of origin, process and issues addressed, whether housing was mentioned, cost-benefit factor(s) addressed, and methodology. The spreadsheet was then analysed qualitatively for cost estimates, methods, and formulas. Only those articles ultimately determined to meet the selection criteria were included in the final data matrix. To eliminate bias, 10% of the sources deemed to meet the selection criteria were read and coded by a second reviewer. Figure 3 depicts the review process and the outcome at each stage.

**Figure 3: Review process**



The initial search yielded more than 600 articles. After ineligible studies were excluded based on a review of the title and/or abstract, 146 full text articles were reviewed and initially coded on the spreadsheet. Following the qualitative review of the information on the spreadsheet, 51 articles were found to meet the selection criteria and were included in the review (see Appendix 1). As shown in Table 3, a number of papers were retrieved that contained cost-benefit analysis relevant to older people but were excluded as their focus was too narrow (e.g. focusing on a single discipline or intervention).

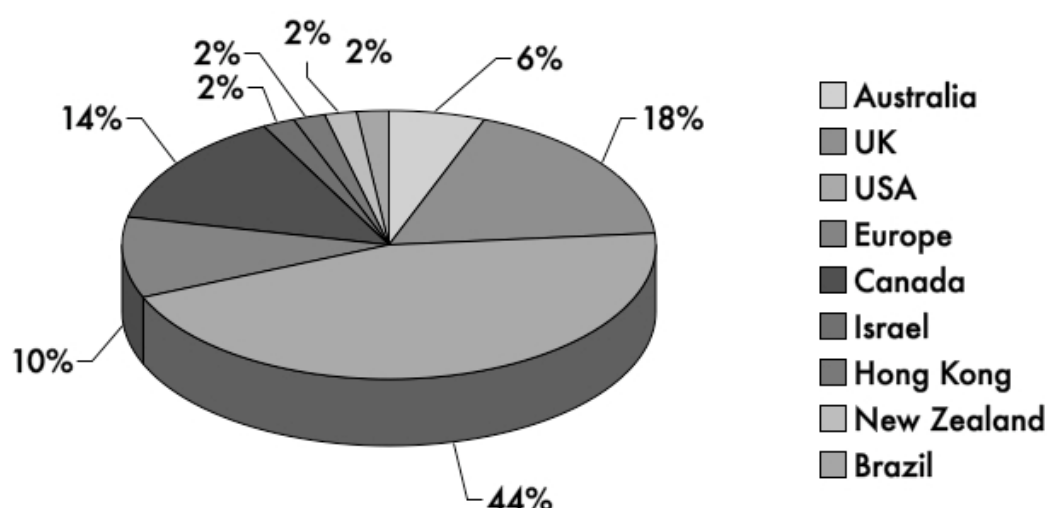
**Table 3: Articles with costing excluded due to not fitting problem statement**

Diagnostic costing (effects on health & social system vary with condition)	13
Telecare/Assistive Technology costing (remote monitoring and Information Technology can decrease formal care cost)	7
Rehabilitation/ Day hospital costing (rehab/respite decrease acute care cost)	5
Professional costing (inclusion of professionals in home care i.e. nursing & allied health is cost neutral or reduces cost)	5
Costs to elderly (community dwelling elders and their carers pay more towards care accommodation)	4
Assessment costing (quality of assessment impacts cost)	2

### 3.3 Search Results

#### 3.3.1 Authors' countries of origin

The majority of the papers analysed in this review were from English speaking countries. This is not surprising because the inclusion criteria required sources to be written in English. Figure 4 depicts the authors' countries of origin for the articles included in the review. The large percentage of material from the United States of America may result from its larger and more rapidly ageing population. The greater number of older people who require housing and care interventions has likely increased demand for information regarding the costs and benefits of such interventions. The majority of studies also are from countries with a relatively high standard of living in Organisation for Economic Co-operation and Development (OECD) terms. Governmental policies and cultural practices also impact results. For instance, the United States of America is the most capitalist system, and the majority of interventions there are from the private sector. In terms of health care practices, Canada and the United Kingdom are more similar to Australia.

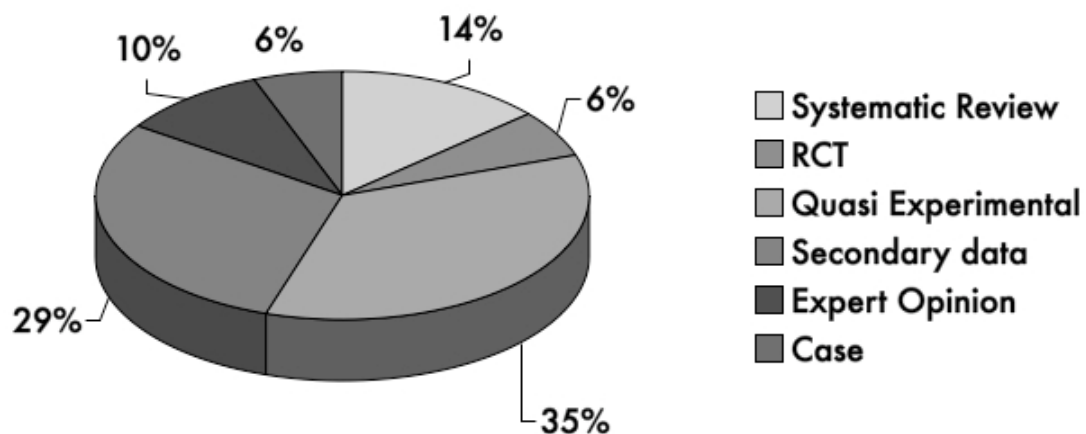
**Figure 4: Author country of origin**



### 3.3.2 Methodologies

Figure 5 depicts the methodologies used in the 51 sources included in this review. There were 7 systematic reviews (14%), 3 random control trials (6%), 18 quasi-experimental (35%), 15 secondary data analyses (29%), 5 expert opinion pieces (10%) that modeled a cost-benefit exploration and 3 case studies (6%). The large percentage of quasi-experimental studies is not surprising as true random control studies are expensive and ethically fraught. The large amount of secondary data analysis is also unsurprising as it is relatively effective and inexpensive methodology. What is surprising is the relatively large number of systematic reviews, which implies that there is a general belief amongst funders and researchers that sufficient empirical studies are available for meaningful meta-analysis. It is also interesting to note the relative paucity of case study and observational approaches. This may be due to their lower status in the experimental rigour hierarchy or to a general belief that variables and their interactions can be better understood in terms of large population samples.

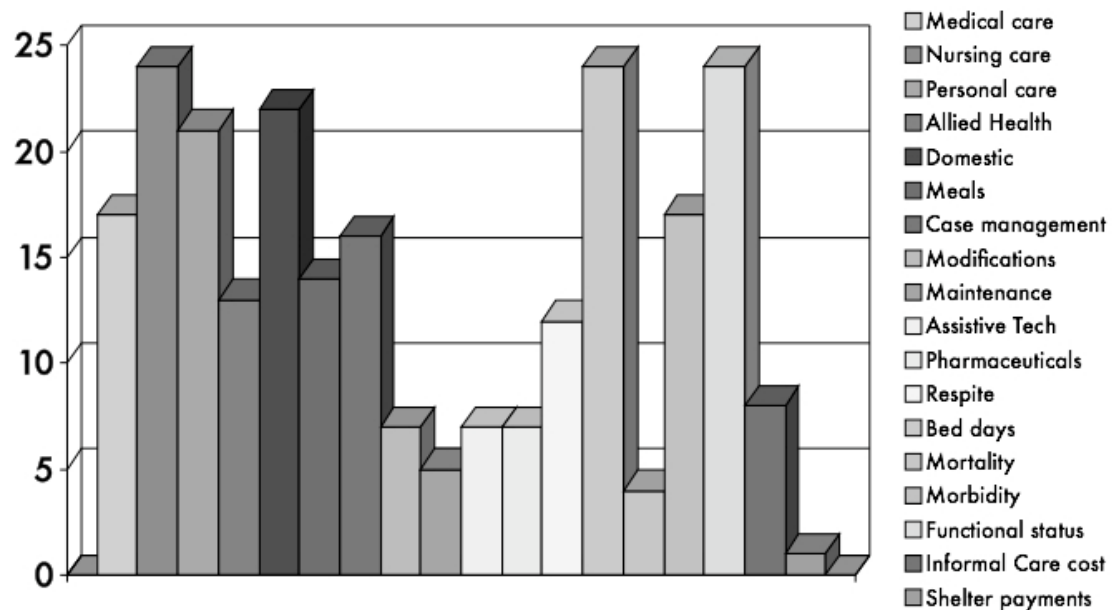
**Figure 5: Methodologies evident from review**



### 3.3.3 Cost benefit variables and their citation frequency

The cost-benefit variables investigated in this review were categorised within the matrix under the categories currently available in the Australian health, housing, and community care system. Figure 6 depicts the percentage of sources that specifically referred to each cost-benefit variable.

**Figure 6: Cost-benefit variables and their citation frequency**



No study has considered all of the cost-benefit variables, and there was a definite bias evident toward a health rather than a social or community system approach. Only one study mentioned shelter payments as a component of the cost-benefit analysis. Why this is so is unclear. In contrast, nursing, bed days, and functional status were mentioned in almost 50% of studies. A number (if not the majority) of authors did not make transparent the variables costed. In addition, a number of studies included transportation as a variable, but this was not included in the matrix as it is difficult to cost. For instance, those authors who mentioned transportation did not categorise the cost in the same way. Some included transportation as a case-management cost; others viewed it as part of direct care. Viewed as care, transport could be treated as either formal or informal care and usually was calculated in terms of mileage and person hours.

#### *3.3.4 Housing as a variable or an outcome in previous work*

Only 14 (28%) of the studies included accommodation as a variable, and the authors treated housing as a variable very differently. One source distinguished between sheltered, council, social landlord, and private sector housing (Appleton & Porteus, 2003); others treated home-ownership or property sale as an economic status indicator (Coughlin, McBride, Perozek, & Liu, 1992; MacMillian, Chapin, & Rachlin, 1999); another treated it as an opportunity cost (O'Shea & Blackwell, 1993). One calculated land and building costs across a range of accommodation settings (Hebert, Dubuc, Buteau, Desrosiers, Bravo, Trottier, et al. 2001) while others just noted that all participants were living in the community in their own or a group home (Ruchlin, Morris, Gurkin, & Sherwood, 1989) or that sheltered housing was provided (Fahrenfort, 1995).

Those authors who focused on housing as an outcome noted a range of findings: standard housing does not easily accommodate people with a high level dependency or dementia (Croucher, Hicks, & Jackson, 2006; Kendig et al., 1999); home ownership is associated with a significantly lower risk of nursing home admission (Greene, Ondrich, & Laditka, 1998); home modifications were required to deal with dwelling deficiencies (Newman, 1985; O'Shea & Corcoran, 1989); and appropriate home modifications can reduce care costs (Svenson, Edebalk, & Persson, 1991).

### **3.4 Key findings by method employed**

#### **3.4.1 Systematic review findings**

The findings of the systematic reviews were varied, and the strongest outcome was that there is limited and sometimes contradictory evidence on the cost-effectiveness of home care for elders. Several found that there was insufficient evidence to make any robust conclusions about outcomes (e.g., Mottram et al., 2002). Others found that disparity in methods of writing economic evaluations compromises comparisons and results (e.g., Ramos, Ferraz, & Sesso, 2004). However, some claimed that housing with care could in some part substitute for long-term residential care (Croucher et al., 2006) and that housing with care reduced mortality and improved wellbeing (Elkan, Kendrick, Dewey, Hewitt, Robinson, Blair et al., 2001; van Haastregt, Diederiks, van Rossum, de Witte, & Crebolder, 2000). Other studies found that home care services usually raise overall health care service use and costs without being cost-effective (e.g., Weissert, Mathews-Cready, & Pawelak, 2005).

#### **3.4.2 Random control trial results**

The three random control trials focused on hospital admissions, pharmaceutical use, and effectiveness of managed care. All three claimed that community care reduced hospital bed days by 25-33% as a result of decreased admissions and decreased length of stay (Leung, Liu, Chow, & Chi, 2004; Melin, Hakansson, & Bygren, 1993; Williams, Williams, Zimmer, Hall, & Podgorski, 1987). Melin et al. (1993) also reported that community care clients had better health and functional outcomes and used fewer pharmaceuticals.

#### **3.4.3 Quasi-experimental study results**

The 18 quasi-experimental studies had a wider range of results and limitations than the random control trials. Results were inconsistent regarding the overall cost-benefit of in-home care for older people. Some studies found either no difference or greater costs of providing in-home care to older people (Stessman, Ginsbert, Hammerman-Rozenburg, Friedman, Ronen, Israeli et al., 1996; Vertrees, Manton, & Adler, 1989; Widiatmoko & Smith, 1996). Other authors reported greater client satisfaction and cost neutrality (Challis, Darton, Johnson, Stone, & Traske, 1991; Hughes, Cummings, Weaver, Manheim, Conrad, & Nash, 1990; Marek, Popejoy, Petroski, Mehr, Rantz, & Lin, 2005; Ruchlin & Morris, 1981, 1983). Still others reported significant cost savings, particularly in regard to reduced bed days (Cummings, Hughes, Weaver, Manheim, Conrad, Nash et al., 1990; Hollander, Chappell, Havens, McWilliams, & Miller, 2002; Hollander, Chappell, Havens, McWilliams, Walker, Shaver et al., 2001; Landi, Gambessi, Pola, Tabaccanti, Cavinato, Carbonnin et al., 1999).

The impact of particular variables on the cost of in-home care also was inconsistent. One study concluded that time spent care giving and indirect cost variables impact care efficiency and reduce income for caregivers (Smith et al., 1997). Another found that home care costs were lower than institutional care costs even when informal caregiver time was valued at an appropriate replacement wage (Chappell, Havens, Hollander, Miller, & McWilliams, 2004). Two studies found that the older person's level of disability directly affected the cost of care (Hebert et al., 2001; Hollander, 2001; Svenson et al., 1991). One study reported a linear relationship between cost and the older person's degree of mental impairment (Shapiro & Tate, 1997).

While a number of authors made claims about the best independent predictors of community care use and cost, there was no consensus about those predictors. For instance, Kendig et al. (1999) found that client dependency and incontinence and the use of male or non-resident carers were linked to cost. Shapiro and Tate (1997), on the other hand, identified living arrangement, functional disability, and mental functioning as predictors of community care use (and, by implication, community care cost).

#### *3.4.4 Secondary data analysis findings*

The studies that used secondary data analysis also yielded inconsistent results. One concluded that home health care was more effective and acceptable than institutional care, but not necessarily less costly (Chen, Kane, & Finch, 2000/2001). In contrast, another concluded that, for the majority of older people, the cost of formal in-home care was less than long-term institutional care, even when living expenses were factored in (Harrow, Tennstedt, & McKinlay, 1995). Some studies analysed data from pilot or demonstration projects. For example, Greene, Lovely, & Ondrich (1993) reviewed data from the National Long-Term Care Channeling Demonstration in the United States and found that additional community services would be cost-reducing for less than half of the target population. Dutrenit (2005) reviewed data from a youth employment program and found that elders receiving some social home care interventions spent less on pharmaceuticals than elders not receiving the service.

The secondary data analysis studies also did not agree regarding cost determinants. One study reported that housing fitness and location are related to the cost of providing home care (Newman, 1985). This is not surprising since a substantial proportion of elderly people live in housing units and environments that impede or preclude efficient service delivery (Newman, 1985). Some found that client characteristics, such as dependency level (Coughlin, McBride, Perozek, & Liu, 1992) or case mix (Dudzinski, Erikson, & Ziegert, 1998), were the primary cost determinants. Kendig, Wells, Swerisson, & Reynolds (1999), however, concluded that only one third of cost variance could be explained by client characteristics alone. One study concluded that the availability of public formal care would not significantly impact costs if that availability did not significantly affect the amount of informal care provided by family and friends (Coughlin, McBride, Perozek, & Liu, 1992). This is consistent with O'Shea and Corcoran's (1989) conclusion that the real cost of home care depends on the extent to which the cost of informal care is included. Informal care is an important consideration because people in stable situations with spouse carers are the most likely to stay in the community (Wells, Swerissen, & Kendig, 1999). This implies that the dollar value of informal caregivers' time is an essential component of a meaningful cost-benefit analysis of home care.

Many studies concluded that case management and optimal or rationed service allocation were also significant in capping costs (Grabbe, Demi, Whittington, Jones, Branch, & Lambert, 1995; Greene et al., 1998; MacMillian et al., 1999; Weissert et al., 1997). Another study cautioned, however, that case management may not be as effective as anticipated because it increases cost and would be necessary in most cases because the majority of elderly use a substantial amount of care (Ruchlin et al., 1989).

#### *3.4.5 Expert opinion findings*

The studies reported under the category of expert opinion consisted primarily of cost projections based on demographics and subsidies and often involved comparisons of base-case, pessimistic, and optimistic cost projections (e.g., Bell, 2006). Another study, however, reflected on activities such as experimental substitutions of home care for long-term care in two real-life small-scale projects (Fahrenfort, 1995).

Most cost savings were achieved via modeling more targeted delivery and direct substitution of formal care for informal care (Weissert et al., 2003). Some authors (e.g., Eastaugh, 2001) claimed that home care was cost justified based on crude measures, meaning that the cost of home care is highly dependent on a number of uncertain factors, including substitution between formal and informal care, unmet demand, private purchase, inflation, and changing demographics (Greene, 2005). All expert opinions were limited in that they failed to consider the intangible and indirect effects of quality of care and the impact of informal care.

### **3.4.6 Case analysis findings**

The case analysis methods were varied and included individual cost survey, narrative literature review, and one statistical study. They raise a slightly different set of issues as they highlight the local political and accommodation context relevant to decision making rather than aggregating data. For instance, Appleton and Porteus (2003) reported that a shortage of small suitable housing has driven demand for specialised housing irrespective of the level of care offered. Most found home care less costly (e.g., Chappell et al., 2004). Narrow home care service targeting was advocated; however, limiting access to services that are highly valued by older people and their carers may be politically difficult (Doty, 2000).

## **3.5 Cost-benefit implications**

The review has revealed a number of significant limitations of previous cost-benefit research. The disparity in the terms used to describe economic evaluations compromises the comparisons and any resulting conclusions (Ramos et al., 2004). Analyses have been described as cost minimization, cost effectiveness, cost/benefit, and cost utility. There is also inconsistency in the perspective from which costs are considered (e.g. societal or provider, recipient, carer, etc.), which results in inconsistency in the costs that are included in the analysis. Variation in the cost model used (e.g. simple direct local/national care costing versus micro-simulation, sensitivity analysis discounting and/or combination of the above) also impedes valid comparisons. Other limitations include lack of blind controls in quasi-experimental and random control trial work and poor or incomplete consideration of informal care and travel time costs. Potentially most significant of all, many current methods of economic analysis may have a bias against the elderly. For example, quality of life year scores are dependent on the number of years of life that are left. Future research should consider the development of better methodological tools for economic evaluations for the elderly population.

## **3.6 Care implications**

There are at least three models of home care discussed in the literature reviewed: the acute-care substitution model (where home care meets the needs of those who would otherwise be in hospital); the long term care substitution model (where home care meets the needs of those who would otherwise be in a nursing home or other residential care facility); and the maintenance and prevention model (where home care maintains existing functional levels). Unfortunately, authors often fail to specify which model is being evaluated. In addition, much work has evaluated innovative interventions compared to existing systems. While such evaluations are useful for decision making about innovations, they provide little guidance about resource distribution among existing systems.

Home care is not a “boutique” service, but a key element within the broader health and aged care system, which can vary from region to region. Accordingly, it might make more sense to consider home care as part of the broader continuing care service delivery system, especially as the majority of costs appear to be incurred during transitions. Indeed, one study found that the cost for stable clients was about one half of the cost for clients in transition (Hollander et al., 2002).

Subject to the limitations of existing work, there is some evidence that home care can be cost effective. American and other international studies have generally found that home care can be cost-effective when services are targeted to meet individual needs and when they include preventive initiatives. Formal and informal care is generally considered substitutive, but may instead be complementary (Hollander et al., 2002). In general it appears that formal home care costs are lower than institutional care costs, because informal carers provide much care. However, the true cost-benefit analysis must appropriately account for the dollar value of informal care providers' time.

### **3.7 Housing implications**

The most surprising outcome of this review was that so few studies explored accommodation settings. For instance, the quasi-experimental studies rarely considered tenure and dwelling type. While more studies considered location and access to support, the outcomes were almost impossible to compare because of differences in culture, climate, and policy. The most significant feature was the very poor understanding and attention given to capital and maintenance costs of housing.

### **3.8 Implications for next steps**

This systematic review has revealed that further work needs to address:

- Terminology (i.e. the variety of terms used to describe care schemes such as close care, sheltered housing, flexi-care, etc., makes comparisons difficult);
- Conceptual clarity (i.e. specification of tenure, housing, support, provider relationships, etc. as either independent or dependent variables);
- Housing and care resource availability (i.e. differing housing, health, and social care finance systems, patterns of tenure, and policy formation impact on and dominate in different regions at different times);
- Variables to be included (i.e. most prior work has not included building type or design, consumer costs, etc.); and
- Transparency of any model developed (i.e. many cost-benefit models lack transparency).

## **4 IMPLICATIONS FOR SECONDARY ANALYSIS AND STAGE TWO RESEARCH**

### **4.1 Introduction**

The next stage of the research will involve secondary data analysis building on the systematic review of relevant literature presented in the previous chapter. Data analysis will assist in model development and testing. The model will be calibrated using demographic profiles obtained from cross-sectional data obtained from the 2003 Survey of Disability, Ageing and Care (DAC). Once the model is developed, it will be applied to cases from longitudinal studies that highlight housing factors that precipitated older people into residential care or increased care usage.

### **4.2 Secondary data analysis**

The Australian Bureau of Statistics summary of the main findings of the Disability, Ageing and Carers (DAC) Survey 2005 will provide some basic tabulation between certain characteristics, particularly person attributes (core activity restrictions, severity of disability, age, sex, marital status, etc.), income, and housing (dwelling type, living arrangements, and dwelling characteristics). In setting up our data files, key inclusion criteria will be based on constructing a data cube where aggregation will be based on care setting (including both an accommodation and care component) as the dependent variable and person variables (including a functional capacity and financial resources component) as the independent variables. Adding cost estimates to the cells in the data cube will enable the generation of outcomes and the cost-benefit calculation. Care costs will be based on current national rates as per government services data and the like and will include private and public purchase costs and an estimate of informal carer costs.

Table 4 illustrates the base DAC variables from which this more aggregated conceptual cluster will be created.

**Table 4: Core Statistical Model Variables**

Functional Capacity	Income	Housing
Disability type (e.g. 'intellectual/learning disability'; 'psychiatric disability'; 'sensory/speech disability'; 'physical/diverse disability'; and 'acquired brain injury')	Government cash pension or allowance received	Private accommodation (e.g. owner (outright), owner (with mortgage), public rental, private rental and community housing)
Disability severity (e.g. mild, moderate and severe)	Wages or salary income (including from own incorporated business)	Cared accommodation (e.g. hospitals, homes for the aged, retirement home, and retired or aged selfcare accommodation)
Age (e.g. 60, 70, 80 and 90+)	Superannuation or annuity	Dwelling structure (e.g. separate house, single storey semi-detached/row or terrace house/town house, flat attached to house/houseflat or shop/office, two-three storey flat/unit/apartment, four+ storey flat/unit/apartment and caravan/houseboat/camping out)
Gender	Profit or loss from rental property	Household structure (e.g. person living alone, couple only, couple living only with unmarried children)
Marital status	Dividends or interest	House moves

The secondary data analysis will enable the exploration of the more complex associations between housing, ageing and care need. This exploration based on housing is a first both nationally and internationally. It will help identify the complex associations between housing, care service use, ageing and functional loss from which a robust theoretical model can be developed.

Analysis of the DAC Confidential Unit Record Files will be first by year, second by cohort and third by comparing prior DAC surveys back to the first in 1981. Cohort analysis will start with 2005 and will be compared with the earlier surveys to illustrate the effects of housing and market trends. Differences between the 10-year age cohorts will suggest the effects of individual ageing. While geographical disaggregating may be limited, we will examine outcomes in different housing markets (e.g. by state and capital city) wherever possible.



### 4.3 Sensitivity Analysis

In order to determine which variables account for the greatest change, other comparisons will be carried out based on age, gender, marital status and mortality. We also will conduct variable-by-variable analysis to explore the values around the mean (e.g. 'optimistic', 'most-likely' or 'pessimistic') for a number of individual case scenarios where housing circumstances are likely to impact cost-benefit outcomes. Examination of individual case scenarios using a variety of tenure, location and dwelling types will enhance understanding of the significance of accommodation settings as they apply to older individuals with a variety of functional, income and care characteristics. The case examples given in Figure 7 are intended to illustrate how accommodation and care variables interact to create potential differing cost-benefit scenarios.

**Figure 7: Detailed case analysis as a basis for exploring intervention impact**

Pat is 65 years old and lives in the outer suburbs of a city in a rental unit. She suffers from Multiple Sclerosis and has recently been prescribed a wheelchair. Pat has the support of her elderly, functionally able husband John, who works part-time as an accountant and is currently willing and able to assist her with most activities of daily living, including showering, toileting and dressing.

**Optimistic Scenario:** Pat goes into remission, and she remains stable and recovers her ability to walk unaided. In addition the landlord offers to sell the unit to Pat and John and, as homeowners, they decide to modify their home by installing a hob free shower to help maintain Pat's functional ability into the future. John is able to continue his part-time employment and Pat and John both continue to participate in their local community.

**Most Likely Scenario:** Pat's condition continues to worsen. John is able to continue to care for Pat in their family home with a relatively modest amount of personal, domestic and respite care services on a regular basis. In order to supplement Pat's care needs he has to give up his part-time employment, and they decide to apply to the Department of Housing for a more suitable dwelling. Unfortunately this will require them to relocate to another suburb where there is less support from neighbours and relatives.

**Pessimistic Scenario:** Pat's condition continues to worsen. John injures his back lifting Pat over the shower hob. He is hospitalized, and Pat is placed in residential care. They lose their rental unit while in crisis care.

This illustration is provided solely to illustrate the process; a number of more detailed case analyses will permit a more detailed examination of how incremental cost-effectiveness ratios (ICERs) might be calculated for a range care settings and personal variables over time, holding all other factors at their expected or most likely values. It is hoped that such examination will provide a better understanding of the costs and benefits of different accommodation and care interventions.

### 4.4 Advantages and limitations of the DACS data

The DACS is the only detailed national survey that focuses specifically on disability issues for a large, nationally representative sample. Major strengths of this as a data source are that its sample design includes both a cared accommodation component and a series of carer questions. Its limitations include error related to relatively small population groups per geographic area sampled and a lack of consistent time-series data as the survey items have changed across surveys. The survey originally was designed using the International Classification of Impairments, Disabilities and Handicap (ICIDH) as its conceptual framework. Unfortunately, the ICIDH evolved into the International Classification of Function (ICF), making it difficult to infer change over time using time slices. In order to overcome this limitation, either time series projections need to be calculated or equivalencies between surveys fudged.

## **4.5 Summary**

Home care of older people may be financially and psychosocially beneficial. While the government may be most interested in the benefit of reduced cost, individuals able to remain in their homes may want to emphasise the benefits associated with improved wellbeing. For some, an institutional setting may be a more cost-effective outcome all benefits being considered equally. Both financial and non-financial benefits will need to be considered in the next stage of the research. Our process must seek to focus on regularities and the development of theories that can account for non-market forces such as government housing policy. Housing policy options include, but are not limited to, building regulation, planning regulation, taxation, subsidies and changing social and community housing capacities.

The next stage of the research will provide a better understanding of the impact of tenure types, dwelling appropriateness, dwelling fitness and locale. Information from studies already completed in other countries indicates that such knowledge is critical, but we cannot extrapolate from this international body of knowledge without considering our own unique housing and policy environment.

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## APPENDIX 1: DATA MATRIX

Reference	Nationality	Main Findings	Process & issues	Housing mentioned	Cost/Benefit factors considered																	Methodology				
																						Experimental				Other
					Medical care	Nursing care	Personal care	Allied Health	Domestic	Meals	Case management	Modifications	Maintenance	Assistive Tech	Pharmaceuticals	Respite	Bed days	Mortality	Morbidity	Functional status	Informal Care cost	Shelter payments	Systematic review	RCT	Quasi Experimental	Secondary data
Appleton, N., & Porteus, J. (2003)	UK	Housing and care options have emerged and exist somewhere on a continuum between community and LTC residential options. Shortage of small suitable housing has driven demand for specialised housing irrespective of level of care offered.	Narrative literature and policy review	Distinguishes between sheltered, council, social landlord & private sector.							1								1						1	

Reference	Nationality	Main Findings	Process & issues	Housing mentioned	Cost/Benefit factors considered																	Methodology				
																						Experimental			Other	
					Medical care	Nursing care	Personal care	Allied Health	Domestic	Meals	Case management	Modifications	Maintenance	Assistive Tech	Pharmaceuticals	Respite	Bed days	Mortality	Morbidity	Functional status	Informal Care cost	Shelter payments	Systematic review	RCT	Quasi Experimental	Secondary data
Bell, D. (2006)	UK	Costs of home care are highly dependent on a number of uncertain factors including substitution between formal and informal care, unmet demand, private purchase, inflation, and changing demographics.	Cost projections based on demographics and subsidies. Comparison between base case, pessimistic and optimistic cost projections				1		1										1						1	
Challis, D., Darton, R., Johnson, L., Stone, M., &	UK	Higher rate of client satisfaction and home-care no more expensive than hospital care.	Non-random matched case comparison of control (113) and intervention (101) clients in different geographic regions.					1	1		1			1		1		1				1				

Reference	Nationality	Main Findings	Process & issues	Housing mentioned	Cost/Benefit factors considered																	Methodology					
																						Experimental			Other		
					Medical care	Nursing care	Personal care	Allied Health	Domestic	Meals	Case management	Modifications	Maintenance	Assistive Tech	Pharmaceuticals	Respite	Bed days	Mortality	Morbidity	Functional status	Informal Care cost	Shelter payments	Systematic review	RCT	Quasi Experimental	Secondary data	Case
Chappell, N., L., Havens, Hollander, Miller, &	Canada	Home care less costly than residential care even when informal caregiver time is valued at replacement wage.	Survey comparison of individual costs in two geographical settings by level of care. Shelter fee only included for LTC.					1	1			1			1				1						1		
Chen, Q., Kane, R. L., & Finch, M. D. (2000/2001)	USA	Home health care more cost-effective than hospital or home without care.	Multinomial logit regression based on data from post-acute care study for non-homogenous and homogenous groups of clients.		1	1			1	1						1	1			1					1		

Reference	Nationality	Main Findings	Process & issues	Housing mentioned	Cost/Benefit factors considered																	Methodology				
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					Medical care	Nursing care	Personal care	Allied Health	Domestic	Meals	Case management	Modifications	Maintenance	Assistive Tech	Pharmaceuticals	Respite	Bed days	Mortality	Morbidity	Functional status	Informal Care cost	Shelter payments	Systematic review	RCT	Quasi Experimental	Secondary data
Coughlin, T., McBride, T., Perozek, M., & Liu, K. (1992)	USA	Increased age and functional disability strongly correlated with increased home-care usage. Costs of home-care entitlement might be impacted by behavioural change based if not based on means.	Cost simulation techniques based on survey. Dependant variables were no of formal home-care visits. Cost simulation of increased home-care uptake based on change in income as a proxy.	Home-ownership treated as an economic status variable.		1	1		1						1	1	1			1						
Cummings, J., Hughes, S., Weaver, F., Manheim, L.,	US	Higher satisfaction and 13% lower costs for home-care intervention group. Team home-care can reduce hospital stays.	Randomised survey design of 419 clients tracked at baseline, one month and then 6 months.		1	1		1									1					1				

Reference	Nationality	Main Findings	Process & issues	Housing mentioned	Cost/Benefit factors considered																	Methodology					
																						Experimental			Other		
					Medical care	Nursing care	Personal care	Allied Health	Domestic	Meals	Case management	Modifications	Maintenance	Assistive Tech	Pharmaceuticals	Respite	Bed days	Mortality	Morbidity	Functional status	Informal Care cost	Shelter payments	Systematic review	RCT	Quasi Experimental	Secondary data	Case
Croucher, K., Hicks, L., & Jackson, K. (2006)	UK	Housing with care can substitute for but not replace LTC as increasing care needs and preferences means this may not be sustainable long term. Housing with care can have a positive impact on health and wellbeing but evidence on cost-effectiveness is particularly limited and sometimes contradictory.	A scoping review of literature published since 1985. Only 11 UK papers reporting primary research. Issues with definitions and conceptual clarity noted.	Housing does not easily accommodate high level dependency or dementia			1		1		1	1		1				1				1					

Reference	Nationality	Main Findings	Process & issues	Housing mentioned	Cost/Benefit factors considered																	Methodology				
																						Experimental				Other
					Medical care	Nursing care	Personal care	Allied Health	Domestic	Meals	Case management	Modifications	Maintenance	Assistive Tech	Pharmaceuticals	Respite	Bed days	Mortality	Morbidity	Functional status	Informal Care cost	Shelter payments	Systematic review	RCT	Quasi Experimental	Secondary data
Doty, P. (2000.	USA	Home-care is only more cost-effective if appropriately targeted. Narrow targeting, low average benefits and similar services to those in LTC can achieve budget neutrality; however, this titration limits service access.	Literature review of US quasi-experimental studies. Almost impossible to design and conduct research that measures cost-effectiveness as distinct from "cost-shifting".			1	1		1	1							1		1							1
Dudzinski, C. S., Erekson, H. O., & Ziegert, A. I. (1998)	US	Case mix determines care needs. Some home care services are substitutable and for profit home-care did not significantly impact costs.	Hedonistic-translog cost estimation using a nationwide database.					1	1	1	1				1	1								1		

Reference	Nationality	Main Findings	Process & issues	Housing mentioned	Cost/Benefit factors considered																	Methodology						
																						Experimental			Other			
					Medical care	Nursing care	Personal care	Allied Health	Domestic	Meals	Case management	Modifications	Maintenance	Assistive Tech	Pharmaceuticals	Respite	Bed days	Mortality	Morbidity	Functional status	Informal Care cost	Shelter payments	Systematic review	RCT	Quasi Experimental	Secondary data	Case	Expert
Dutrenit, J.-M. (2005).	Europe	Social and technological home-care interventions can save costs by reducing pharmacy expenditures (20% of medical expenditures) by a factor of 4.	Control group comparison using multiple regression analysis of pharmaceutical consumption with four home-care services.								1				1	1										1		

Reference	Nationality	Main Findings	Process & issues	Housing mentioned	Cost/Benefit factors considered																		Methodology				
																							Experimental			Other	
					Medical care	Nursing care	Personal care	Allied Health	Domestic	Meals	Case management	Modifications	Maintenance	Assistive Tech	Pharmaceuticals	Respite	Bed days	Mortality	Morbidity	Functional status	Informal Care cost	Shelter payments	Systematic review	RCT	Quasi Experimental	Secondary data	Case
Easlaugh, S. R. (2001)	USA	Home health care appears to be cost justified based on crude measures	Sensitivity analysis of annual home health costs, annual hospital days saved & two estimates (high/low) for each hospital day saved. Study did not examine intangible and indirect effects of quality of care. Further work needs to be done on technical, allocation and traditional efficiency.		1	1	1									1								1			



Reference	Nationality	Main Findings	Process & issues	Housing mentioned	Cost/Benefit factors considered																	Methodology					
																						Experimental				Other	
					Medical care	Nursing care	Personal care	Allied Health	Domestic	Meals	Case management	Modifications	Maintenance	Assistive Tech	Pharmaceuticals	Respite	Bed days	Mortality	Morbidity	Functional status	Informal Care cost	Shelter payments	Systematic review	RCT	Quasi Experimental	Secondary data	Case
Elkan, R., Kendrick, D., Dewey, M., Hewitt, M., Robinson, J., Blair, M., et al. (2001)	UK	Home visits to older people reduce mortality & admissions to LTC. Meta analysis showed that 6/8 trials reduced admission to LTC & 4/15 showed significant effect on mortality. No significant effect on admissions to hospital or functional status.	Systematic review of 15 empirical studies (13 RCT & 2 non RCT) addressing general elderly & another 6 frail elderly with comparison group addressing wide range of preventative outcomes. Single goal & single discipline studies excluded.		1	1				1	1	1	1	1	1		1	1	1	1			1				
Fahrenfort, M. (1995)	Europe	Cost & effectiveness of care-at-home depends on local conditions, quality of case management and relations between institutions	Experimental substitutions of home care for LTC in 2/6 real life small-scale projects.	Sheltered housing provided	1	1	1			1	1						1		1							1	

Reference	Nationality	Main Findings	Process & issues	Housing mentioned	Cost/Benefit factors considered																	Methodology				
																						Experimental				Other
					Medical care	Nursing care	Personal care	Allied Health	Domestic	Meals	Case management	Modifications	Maintenance	Assistive Tech	Pharmaceuticals	Respite	Bed days	Mortality	Morbidity	Functional status	Informal Care cost	Shelter payments	Systematic review	RCT	Quasi Experimental	Secondary data
Greene, V. L. (2005)	USA	Even with complete high quality data and a logically specified model behavioural & theoretical assumptions impact costs (i.e., different bundles of services have different outcomes).	Application of a titration model of home allocation based on risk to a single case study as proof of concept.			1	1		1								1							1		
Greene, V. L., Ondrich, J., & Laditka, S. (1998)	USA	Optimal allocation of home care services resulted in a 10% net reduction in LTC. Cost neutrality or cost-saving may be possible with tighter more medically targeted services.	Development of statistical model for costing LTC and home-care then use of model for cost-minimisation comparison with statistically equivalent population & channelling intervention group.	Being a homeowner is associated with a significantly lower risk of nursing home admission.		1	1		1								1		1				1			

Reference	Nationality	Main Findings	Process & issues	Housing mentioned	Cost/Benefit factors considered																	Methodology					
																						Experimental				Other	
					Medical care	Nursing care	Personal care	Allied Health	Domestic	Meals	Case management	Modifications	Maintenance	Assistive Tech	Pharmaceuticals	Respite	Bed days	Mortality	Morbidity	Functional status	Informal Care cost	Shelter payments	Systematic review	RCT	Quasi Experimental	Secondary data	Case
Greene, V. L., Lovely, M. E., & Ondrich, J. I. (1993)	USA	41% of community care demonstrates more net LTC reductions.	Logistic regression and Markov chain algorithms were used to model individual risk of LTC transition with data from individuals in Channelling demonstration (3,446).			1	1		1								1		1	1					1		
Harris, R., Ashton, T., Broad, J., Conolly, G., & Richmond, D. (2005)	NZ	Hospital care-at-home compared to standard inpatient care was more costly possibly being due to new intervention not being run at full capacity during trial period, but acceptable, efficient & safe.	Direct care costs calculated for 30-day period following randomisation of 185 people. No perspective stated. No informal costs assessed.		1	1	1	1									1		1						1		

Reference	Nationality	Main Findings	Process & issues	Housing mentioned	Cost/Benefit factors considered																	Methodology				
																						Experimental				Other
					Medical care	Nursing care	Personal care	Allied Health	Domestic	Meals	Case management	Modifications	Maintenance	Assistive Tech	Pharmaceuticals	Respite	Bed days	Mortality	Morbidity	Functional status	Informal Care cost	Shelter payments	Systematic review	RCT	Quasi Experimental	Secondary data
Harrow, B. S., Tennstedt, S. L., & McKinlay, J. B. (1995)	USA	For the majority of older people even the cost of complete substitution of formal for informal care plus living expenses was less than LTC.	Statistical analysis of a sub sample of two stage follow up survey (15 months apart) of geographically stratified random sample of (634) disabled respondents				1		1	1									1	1				1		
Hebert, R., Dubuc, N., Buteau, M., Desrosiers, J., Bravo, G., Trottier, L., et al. (2001)	Canada	Significant differences in costs depending on level of disability. Nursing care was the greatest cost but the societal cost of home-care was greater than LTC for severely disabled people.	Multistage survey sampling (1,345 people) comparing actual value of replacement costs of home-care, hostel care & nursing home care in Quebec. Mixed statistical methods including Bonferroni & regression analysis.	A cost value was calculated for land & building for all three settings.		1	1			1	1	1	1	1			1					1				

Reference	Nationality	Main Findings	Process & issues	Housing mentioned	Cost/Benefit factors considered																	Methodology						
																						Experimental			Other			
					Medical care	Nursing care	Personal care	Allied Health	Domestic	Meals	Case management	Modifications	Maintenance	Assistive Tech	Pharmaceuticals	Respite	Bed days	Mortality	Morbidity	Functional status	Informal Care cost	Shelter payments	Systematic review	RCT	Quasi Experimental	Secondary data	Case	Expert
Hollander, M. J. (2001)	Canada	Overall health costs to government for clients in home care are about one half to three quarters the cost for LTC by level of care, but costs differ by the type of client. Acute hospitalisations account for a significant proportion of home care costs and transition points are the most costly. Service delivery system structure may have an impact on cost-effectiveness.	Analysis of data contained in linkable longitudinal database with data for hospitals, doctors, drugs, and care based on unique health number.		1	1		1								1		1				1				1		

Reference	Nationality	Main Findings	Process & issues	Housing mentioned	Cost/Benefit factors considered																	Methodology				
																						Experimental			Other	
					Medical care	Nursing care	Personal care	Allied Health	Domestic	Meals	Case management	Modifications	Maintenance	Assistive Tech	Pharmaceuticals	Respite	Bed days	Mortality	Morbidity	Functional status	Informal Care cost	Shelter payments	Systematic review	RCT	Quasi Experimental	Secondary data
Hollander, M. J., Chapell, N., Havens, B., McWilliams, C., Walker, E., Shaver, J., et al. (2001)	Canada	Significant interaction between type of care and care level. Caregivers of community clients significantly more satisfied. Hospital admission higher for community clients.	Small pilot study for a larger-scale study. 20 community vs. 20 LTC clients compared. Multi-section client questionnaire and a caregiver questionnaire. Diaries and cost inventories also used. Accessing caregivers was difficult plus high cost of data collection.	living arrangements mentioned (i.e. lives alone vs. lives with others)													1	1	1				1			

Reference	Nationality	Main Findings	Process & issues	Housing mentioned	Cost/Benefit factors considered																	Methodology				
																						Experimental				Other
					Medical care	Nursing care	Personal care	Allied Health	Domestic	Meals	Case management	Modifications	Maintenance	Assistive Tech	Pharmaceuticals	Respite	Bed days	Mortality	Morbidity	Functional status	Informal Care cost	Shelter payments	Systematic review	RCT	Quasi Experimental	Secondary data
Hollander, M. J., Chapell, N., Havens, B., McWilliams, C., & Miller, J. A. (2002).	Canada	Community care significantly less costly for stable clients when only public costs considered but informal costs were considerable. Different planning regions have different care policies that impact care costs. Community clients had better cognitive functioning and stronger social networks with spouses and non-family members more likely to provide care.	Comparison of costs and outcomes of home care versus LTC via survey of clients (n=580) based on level of care and stability.		1	1	1	1								1		1	1	1			1			

Reference	Nationality	Main Findings	Process & issues	Housing mentioned	Cost/Benefit factors considered																	Methodology				
																						Experimental				Other
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Hughes, S., Cummings, J., Weaver, F., Mannheim, L., Conrad, K., & Nash, K.	USA	Significant improvement in satisfaction & cognitive functioning with a 10% non-significant decrease in care costs mainly due to lower use of private sector hospital care.	Random control comparison survey of service utilisation and patient and caregiver outcomes over a six month period.		1	1	1	1									1	1				1				
Kendig, H., Wells, Y., Swerissen, H., & Reynolds, A. (1999)	Australia	Only 29% of cost variance could be explained by client characteristics. Costs to government and carers were varied and were best predicted by client dependency, incontinence, male carers and non-resident carers.	Statistical and regression analysis of all costs of community services irrespective of funding source as derived from a user census over a weekly period. Actual community-care inputs not discussed.	Wide variation in supportiveness of clients' homes noted.			1		1	1	1					1						1				



Reference	Nationality	Main Findings	Process & issues	Housing mentioned	Cost/Benefit factors considered																	Methodology						
																						Experimental			Other			
					Medical care	Nursing care	Personal care	Allied Health	Domestic	Meals	Case management	Modifications	Maintenance	Assistive Tech	Pharmaceuticals	Respite	Bed days	Mortality	Morbidity	Functional status	Informal Care cost	Shelter payments	Systematic review	RCT	Quasi Experimental	Secondary data	Case	Expert
Landi, F., Gambessi, G., Pola, R., Tabaccanti, S., Cavinato, T.,	Europe	Significant reduction in number of hospitalisations resulting in a 29% cost reduction.	Non-random sample (115) if patients referred to primary care, control was based on hospital admission record for the six months prior to enrolment in the trial.		1						1							1	1						1			
Leung, A. C.-t., Liu, C.P., Chow, N. W.-s., & Chi, I. (2004)	Hong Kong	Well-managed home-care reduced hospital admissions and length of stay by over a third.	Randomised control trial comparison of 260 with 130 allocated to either case management or control. Minimum data set home-care and hospital admissions used to calculate cost.			1			1		1					1	1			1				1				

Reference	Nationality	Main Findings	Process & issues	Housing mentioned	Cost/Benefit factors considered																	Methodology					
																						Experimental			Other		
					Medical care	Nursing care	Personal care	Allied Health	Domestic	Meals	Case management	Modifications	Maintenance	Assistive Tech	Pharmaceuticals	Respite	Bed days	Mortality	Morbidity	Functional status	Informal Care cost	Shelter payments	Systematic review	RCT	Quasi Experimental	Secondary data	Case
MacMillian, K., Chapin, R., & Rachlin, R. (1999)	USA	The cost-benefit analysis determined if only 9% of clients had been expedited to community services delivery the cost of providing services would have been offset.	Retrospective review of Medicaid home-care files from across one Midwestern state	Clients who owned or sold property were ineligible							1						1								1		
Marek, K. D., Popejoy, L., Petroski, G., Mehr, D., Rantz, M., & Lin, W. C. (2005)	USA	Community care significantly impacted cognition, depression, ADL & incontinence.	Matched control trial used the Cochran-Mantel-Haenszel method to test association between intervention and outcome.			1	1		1		1					1				1					1		

Reference	Nationality	Main Findings	Process & issues	Housing mentioned	Cost/Benefit factors considered																	Methodology				
																						Experimental				Other
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Melin, A.L., Hakansson, S., & Bygren, L. O. (1993)	Europe	Community care clients had better health and functional outcomes and used fewer pharmaceuticals. Significant cost reductions for a selection of patients at risk of LTC.	Randomised control trial (n=249), 150 in intervention and 99 in control group.		1	1			1						1		1		1					1		
Moltram, P., Pitkala, K., & Lees, C. (2002)	UK	Insufficient evidence to estimate the likely benefits, harms & costs of LTC or homecare for functionally dependent older people	Cochrane RCT systematic review. One study included of 112 people randomly assigned to foster care vs. nursing home care. Cost analysis based on sample of 10 and incomplete (no indirect costs or confidence limits).							1							1		1	1			1			

Reference	Nationality	Main Findings	Process & issues	Housing mentioned	Cost/Benefit factors considered																	Methodology					
																						Experimental			Other		
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Newman, S. (1985)	USA	Substantial fractions of elderly people live in housing units and environments that impede or preclude efficient service delivery. Housing fitness and housing location increase costs of home-care	Initial exploration of cost-inefficiencies associated with home-care delivery in unsuitable housing based on National Annual Housing Survey.	Limiting factors include incomplete kitchens, complete plumbing and physically deficiency.							1	1							1						1		
O'Shea, E., & Balckwell, J. (1993)	UK	Confirms relationship between cost and dependency	Opportunity cost method with two-week sample drawn from attendance at a day hospital.	Housing opportunity costs based on crude monetary evaluation of value using a discount rate and house life of 50 years.	1	1		1	1	1						1				1	1						

Reference	Nationality	Main Findings	Process & issues	Housing mentioned	Cost/Benefit factors considered																	Methodology				
																						Experimental			Other	
					Medical care	Nursing care	Personal care	Allied Health	Domestic	Meals	Case management	Modifications	Maintenance	Assistive Tech	Pharmaceuticals	Respite	Bed days	Mortality	Morbidity	Functional status	Informal Care cost	Shelter payments	Systematic review	RCT	Quasi Experimental	Secondary data
OShea, E., & Corcoran, R. (1989)	UK	The major factor in determining the real cost of domiciliary care is the extent to which informal care is factored in.	Logit regression model applied to actual domiciliary use by elders at the risk of transfer to LTC.	20% required home modifications to housing stock.	1	1		1	1	1		1				1	1									
Ramos, M. L., Ferraz, M. B., & Sesso, R. (2004)	Brazil	The disparity in methods of writing economic evaluations compromises comparisons	Systematic appraisal of 24 economic evaluations between 1980-2004. All five principles only addressed in 2 studies. 19 studies had RCT and only 8 studies stated point of view of analysis (i.e. societal etc.). Indirect costs, informal care, incremental and sensitivity costs & discounting not uniform.								1	1					1			1	1		1			

Reference	Nationality	Main Findings	Process & issues	Housing mentioned	Cost/Benefit factors considered																	Methodology				
																						Experimental				Other
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Ruchlin, H., Morris, J., Gurkin, C., & Sherwood, S. (1989)	USA	Case management increases cost and the majority of elderly use a substantial amount of care without case management so the potential for community care demonstration programs to achieve cost savings appears limited.	Analysis of a stratified random sample extracted from four longitudinal data sets of those 62 yrs + to compare costs of case-managed community care versus unmanaged community care. Multivariate model used to classify and predict risk of institutionalisation.	All participants in own home or in group housing.			1		1	1	1						1					1				
Ruchlin, H., & Morris, J. (1981)	USA	Provision of an emergency alarm system reduced hospital and LTC stays and also reduced utilisation of community services (but not statistically significantly).	Sample (n=139) of paired and matched subjects from within the randomly allocated intervention and control groups.		1	1	1	1	1				1								1					

Reference	Nationality	Main Findings	Process & issues	Housing mentioned	Cost/Benefit factors considered																	Methodology						
																						Experimental			Other			
					Medical care	Nursing care	Personal care	Allied Health	Domestic	Meals	Case management	Modifications	Maintenance	Assistive Tech	Pharmaceuticals	Respite	Bed days	Mortality	Morbidity	Functional status	Informal Care cost	Shelter payments	Systematic review	RCT	Quasi Experimental	Secondary data	Case	Expert
Ruchlin, H., & Morris, J. (1983)	USA	A pilot program showed that substitution of domiciliary care for institutional care was cost effective. The majority of saving (90%) was attributable to lower use of institutional care.	Sample (n=190) subjects from one of three groups (aged, mental health & mental retardation) and two settings (community or institution) intervention and control groups. Duration of service was assumed on basis of expert opinion; costs were best estimate of agency costs.		1	1	1	1	1	1							1	1							1			

Reference	Nationality	Main Findings	Process & issues	Housing mentioned	Cost/Benefit factors considered																	Methodology					
																						Experimental				Other	
					Medical care	Nursing care	Personal care	Allied Health	Domestic	Meals	Case management	Modifications	Maintenance	Assistive Tech	Pharmaceuticals	Respite	Bed days	Mortality	Morbidity	Functional status	Informal Care cost	Shelter payments	Systematic review	RCT	Quasi Experimental	Secondary data	Case
Shapiro, E., & Tate, R. B. (1997)	Canada	Living arrangement, functional disability and mental functioning are independent predictors of community care use. The more mental impairment the more care used with associated cost increase. Demented elders used (50%) more care than those with no mental impairment (who only used 25%).	Sample (n=226) subjects who completed screening interview and who were clinically assessed; additional information was extracted from the Manitoba health files and costs were provided by the health service. Hourly payment x hours of service was used to create annual costs. Indirect costs not included.			1	1	1	1							1								1			



Reference	Nationality	Main Findings	Process & issues	Housing mentioned	Cost/Benefit factors considered																	Methodology					
																						Experimental			Other		
					Medical care	Nursing care	Personal care	Allied Health	Domestic	Meals	Case management	Modifications	Maintenance	Assistive Tech	Pharmaceuticals	Respite	Bed days	Mortality	Morbidity	Functional status	Informal Care cost	Shelter payments	Systematic review	RCT	Quasi Experimental	Secondary data	Case
Soderstrom, L., Tousignant, P., Kaufman, T. (1999)	Canada	Limited evidence indicates no notable difference (mixed or no effect) in health outcomes when substituting home care for inpatient care. Effects on social & health systems vary with diagnosis.	Systematic review of 20 articles, only 4 studies met selection and internal validity criteria. Huge variation between effects reported; many did not report on caregivers' health, social costs or patients' costs.		1												1		1	1	1		1				
Smith, C. E., , Klienback, S.V.M.,, Fernengel, K., & Mayer, L. S. (1997)	USA	Time spent in care giving and indirect cost variables impact care efficiency and reduce income for caregivers.	Data envelope analysis using a cumulative stepped process was used to determine formal and informal care costs via interview and survey of patients & caregivers (n=17) families. Medical condition not considered.												1						1			1			

Reference	Nationality	Main Findings	Process & issues	Housing mentioned	Cost/Benefit factors considered																	Methodology						
																						Experimental		Other				
					Medical care	Nursing care	Personal care	Allied Health	Domestic	Meals	Case management	Modifications	Maintenance	Assistive Tech	Pharmaceuticals	Respite	Bed days	Mortality	Morbidity	Functional status	Informal Care cost	Shelter payments	Systematic review	RCT	Quasi Experimental	Secondary data	Case	Expert
Stessman, J., Ginsberg, G., Hammerman-Rozenburg, R., Friedman, R., Ronen, D., Israeli, A., et al. (1996)	Israel	Cost savings due to reduced hospitalisations in community care group.	Non-random control comparison survey of a home health intervention (n=741) versus a routine medical care control group (n=9000). Informal costs not included.		1	1	1	1							1		1		1						1			

Reference	Nationality	Main Findings	Process & issues	Housing mentioned	Cost/Benefit factors considered																	Methodology						
																						Experimental			Other			
					Medical care	Nursing care	Personal care	Allied Health	Domestic	Meals	Case management	Modifications	Maintenance	Assistive Tech	Pharmaceuticals	Respite	Bed days	Mortality	Morbidity	Functional status	Informal Care cost	Shelter payments	Systematic review	RCT	Quasi Experimental	Secondary data	Case	Expert
Svenson, M., Edebalk, P. G., & Persson, U. (1991)	Europe	Costs of service depend on level of functional disability. Cost of services is lower for those with poor mental health everything else being equal. Cost of care increases when informal care decreases and with provision of alarm telephones.	Survey analysis (n-180) to determine actual home service hours in pensioner's homes plus level of disability. Multiple regression analysis used with variables not mentally disabled, man, alarm telephone, modification and service flat.	Home modification decrease care costs. Housing designed for care reduces costs by 20%.								1	1	1						1					1			

Reference	Nationality	Main Findings	Process & issues	Housing mentioned	Cost/Benefit factors considered																	Methodology				
																						Experimental				Other
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van Haastregt, J., Diederiks, J., van Rossum, E., de Witte, L., & Crebolder, H. (2000)	UK	No clear evidence of effectiveness of preventative home visiting for elderly people living in the community. No negative effects reported and favourable effects reported in trials for physical functioning (5/12), psychosocial (1/8), falls (2/6), LTC (2/7), and mortality (3/13)	Systematic review of 15 RCT studies. Multidimensional nature of studies impeded comparison. Methodological quality varied considerably; over 50% had weaknesses with blinding, co-intervention reporting or dropouts.												1	1		1			1					

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																						Experimental			Other	
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Vertrees, J., Manton, K., & Adler, G. (1989)	USA	Home care services are not budget neutral and cannot avert nursing home placement especially in the context of bed rationing. Further, poor targeting impacts their efficacy.	Comparison of home service users' nursing home use (n=269) versus control (n=479) established prior to demonstration project. To correct for no-matched sampling a statistical correction known as grade of membership (pattern matching) was applied.				1		1	1	1					1					1					

Reference	Nationality	Main Findings	Process & issues	Housing mentioned	Cost/Benefit factors considered																	Methodology				
																						Experimental			Other	
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Weissert, W., Lesnick, T., Musliner, M., & Foley, K. (1997)	USA	Expanded home care when rationed to the most at risk clients is cost-effective.	Logistic regression model used to estimate risk of LTC and then applied to the Home Care Benefits Data Set. This model was based on merging National Nursing Home File with National Health Interviews Supplement on Ageing to estimate risk of LTC and was then applied to the Home Care Benefits Data Set. A substitute strategy for control involved actual costs versus estimates of costs based on no service.												1		1	1				1				

Reference	Nationality	Main Findings	Process & issues	Housing mentioned	Cost/Benefit factors considered																	Methodology				
																						Experimental			Other	
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Weissert, W., Chemew, M., & Hirth, R. (2003)	USA	Most home care recipients are at low risk of LTC entry and savings are generally achieved via substitution. Further most low risk clients receive too much care and most high risk clients receive too little.	Pilot application on 25 cases of a new model for factoring in effectiveness, risks and value (ERV) for individual clients versus usual case management budgeting practice. Unclear what services were available for purchase.														1							1		

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																							Experimental			Other	
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Weissert, W., Mathews-Cready, C., & Pawelak, J. (2005)	USA	Home care services usually raise overall health care service use and costs. Targeting has been uneven and effect sizes are small. Effects in relation to caregiver satisfaction and unmet needs reduction are limited but appear to be a consistent benefit.	Systematic review of RCT & quasi-experimental studies (n=31). Services between studies vary significantly as does policy and case management and targeting.		1	1	1		1	1	1								1	1		1					



Reference	Nationality	Main Findings	Process & issues	Housing mentioned	Cost/Benefit factors considered																	Methodology				
																						Experimental			Other	
					Medical care	Nursing care	Personal care	Allied Health	Domestic	Meals	Case management	Modifications	Maintenance	Assistive Tech	Pharmaceuticals	Respite	Bed days	Mortality	Morbidity	Functional status	Informal Care cost	Shelter payments	Systematic review	RCT	Quasi Experimental	Secondary data
Wells, Y., Swerissen, H., & Kendig, H. (1999)	Australia	Intensive community services can avert LTC admissions. Those in stable situations and with spouse carers were the most likely to stay in the community while those with incontinence were the most likely to go to LTC.	Longitudinal data analysis of community options survey (n=628) over 20 month period. Cross sectional analysis with logistic regression was used to select final models for predictors of LTC.			1	1		1	1	1					1	1			1				1		

Reference	Nationality	Main Findings	Process & issues	Housing mentioned	Cost/Benefit factors considered																	Methodology					
																						Experimental			Other		
					Medical care	Nursing care	Personal care	Allied Health	Domestic	Meals	Case management	Modifications	Maintenance	Assistive Tech	Pharmaceuticals	Respite	Bed days	Mortality	Morbidity	Functional status	Informal Care cost	Shelter payments	Systematic review	RCT	Quasi Experimental	Secondary data	Case
Widiatmoko, D., & Smith, R. (1996)	Australia	While the intervention was assumed to reduce 25% of falls and thus subsequent hospitalisations and morbidity the cost of home care exceeds the expected costs of the control.	Analysis modelled the expected cost per elderly person associated with no intervention (control) versus intervention. Assumptions were developed into a decision-tree over a 12-month period. Cost data was assumed based on expert opinion and was applied to actual cases (n=6149). Sensitivity analysis was done to check validity of assumptions.			1		1	1					1			1							1			

Reference	Nationality	Main Findings	Process & issues	Housing mentioned	Cost/Benefit factors considered																		Methodology				
																							Experimental		Other		
					Medical care	Nursing care	Personal care	Allied Health	Domestic	Meals	Case management	Modifications	Maintenance	Assistive Tech	Pharmaceuticals	Respite	Bed days	Mortality	Morbidity	Functional status	Informal Care cost	Shelter payments	Systematic review	RCT	Quasi Experimental	Secondary data	Case
Williams, M., Williams, F., Zimmer, J., Hall, J., & Podgorski, C. (1987)	USA	Team oriented outpatient care can reduce hospitalisation costs for those 65+ by up to 25%. 15% of the clients accounted for 75% of the costs.	Randomised control trial (n=117) of multidisciplinary assessment versus normal service.		1	1	1	1	1	1							1		1					1			

## APPENDIX 2: EXAMPLE SEARCH HISTORY

### Ageline Database

#15 #14 not (videodiscs or video or conference abstracts) (164 records)

#14 (( Advantage or help or aid or benefit or capitalize or profit or reward or worth )not( Subjective or survey or surveyed or interview or personal account or life histories or life history or hermeneutic or ethnography or commentary or manifestos or questionnaire or case stud\* or ethnographic interview or opinion poll )) and (( Cost or price or economic or monetary value )not( financial settlement or computer network or legal or coordination or financial advisor or life insurance polic\* or social security )) and (( Care or charge or custody or keeping or supervision or trust or watching or guarding or overseeing or family or community )not( ("hospital in the home") or pharmaceutical or long term care or long-term care or Medicaid medicare or assisted living or postoperative or hospital discharge or LTC or medication use or chronic care or foster care or geriatric custodial care )) and (( Aged or aging or ageing or elderly or old or older or senior or geriatric or disabled )not( Insane or psychotic or psychotropic or adult children or transgender or grandparents or psychiatric )) and ((Abode or residence or dwelling or habitation or domicile or home or housing or lodgings or room or quarters )not( Caravan or boarding or dormitory or mental institution or mental hospital or mental home or asylum or hospice or psychiatric hospital or nursing home or clustering or cluster home residential care facilit\*)) and (PY:AL >= 1980)(167 records)

#12 (( Advantage or help or aid or benefit or capitalize or profit or reward or worth )not( Subjective or survey or surveyed or interview or personal account or life histories or life history or hermeneutic or ethnography or commentary or manifestos or questionnaire or case stud\* or ethnographic interview or opinion poll )) and (( Cost or price or economic or monetary value )not( financial settlement or computer network or legal or coordination or financial advisor or life insurance polic\* or social security )) and (( Care or charge or custody or keeping or supervision or trust or watching or guarding or overseeing or family or community )not( ("hospital in the home") or pharmaceutical or long term care or long-term care or Medicaid medicare or assisted living or postoperative or hospital discharge or LTC or medication use or chronic care or foster care or geriatric custodial care )) and (( Aged or aging or ageing or elderly or old or older or senior or geriatric or disabled )not( Insane or psychotic or psychotropic or adult children or transgender or grandparents or psychiatric )) and ((Abode or residence or dwelling or habitation or domicile or home or housing or lodgings or room or quarters )not( Caravan or boarding or dormitory or mental institution or mental hospital or mental home or asylum or hospice or psychiatric hospital or nursing home or clustering or cluster home residential care facilit\*)))(198 records)

#11 ( Advantage or help or aid or benefit or capitalize or profit or reward or worth )not( Subjective or survey or surveyed or interview or personal account or life histories or life history or hermeneutic or ethnography or commentary or manifestos or questionnaire or case stud\* or ethnographic interview or opinion poll )(12849 records)

#10 ( Cost or price or economic or monetary value )not( financial settlement or computer network or legal or coordination or financial advisor or life insurance polic\* or social security )(10832 records)

#9 ( Care or charge or custody or keeping or supervision or trust or watching or guarding or overseeing or family or community )not( ("hospital in the home") or pharmaceutical or long term care or long-term care or Medicaid medicare or assisted living or postoperative or hospital discharge or LTC or medication use or chronic care or foster care or geriatric custodial care )(37080 records)

#8 ( Aged or aging or ageing or elderly or old or older or senior or geriatric or disabled )not( Insane or psychotic or psychotropic or adult children or transgender or grandparents or psychiatric )(75782 records)

#7 (Abode or residence or dwelling or habitation or domicile or home or housing or lodgings or room or quarters )not( Caravan or boarding or dormitory or mental institution or mental hospital or mental home or asylum or hospice or psychiatric hospital or nursing home or clustering or cluster home residential care facilit\*)(16558 records)

The search: #14 not(videodiscs or video or conference abstracts) in the database(s) AGELINE 1978-2005/12 returned 164 records

### **AHURI Research Centres**

Queensland Research Centre  
RMIT-NATSEM Research Centre  
Southern Research Centre  
Swinburne-Monash Research Centre  
Sydney Research Centre  
UNSW-UWS Research Centre  
Western Australia Research Centre

### **Affiliates**

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