Likelihood of residential aged care use in later life: a simple approach to estimation with international comparison

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Abstract

Objectives: In New Zealand (NZ), place of death among decedents aged 65+ years has been reported as residential aged care (RAC, 38%), acute hospital (34%) or elsewhere (28%). However, lifetime risk of use of RAC (or nursing homes) is unknown. A simple method of estimation is demonstrated for NZ and Australia, with comparisons to other countries.

Methods: Deaths of RAC residents in acute hospitals were estimated for NZ from four separate studies and added to deaths occurring in RAC, to derive the likelihood of using RAC after age 65 years. Academic and other sources were searched for comparative reports.

Results: An estimated 18% of RAC residents died in acute hospital in NZ. When added to those who died in RAC, the proportion using RAC for late-life care was estimated at over 47% (66% if aged 85+ years). Of 12 US reports, the median report was 41%. Elsewhere, Finland was 47%, UK 28%, Australia 34% to 53%, and Germany 22% & 26%.

Conclusions: Simple estimation using existing data demonstrates that RAC in late life is common.

Implications: Late-life care services will continue to evolve. Monitoring RAC utilisation is necessary for informed debate about palliative care provision in RAC, use of hospital by RAC residents and for planning and policy setting.

Key words: long-term care of older people, palliative care, frail elderly, lifetime use

Long-term residential aged care (RAC) is used at any one time by about 4-6% of those aged 65 years or over in many developed countries, including NZ.[1-3] This figure – usually derived from research adopting cross-sectional methods such as censuses and surveys – sometimes leads to the erroneous assumption that only few people use RAC during their lifetimes.[4]

Inappropriate use of cross-sectional figures for estimating the likelihood of use of RAC – which Kastenbaum and Candy referred to as "the four per cent fallacy"[5,6] – may suggest that the sector is small and affects few people. To avoid such misunderstandings, and for policy and planning purposes, estimates are needed of the likelihood people aged 65 and over will use residential care at any time before they die, hereafter termed 'lifetime use'.

Studies of place of death have been used to answer this question.[5,7-9] Deaths in RAC are widely available, based on death certificate information. For example, a large international comparison of 21 populations aged 65+ years showed RAC was the place of death for a median of 18% (inter-quartile range 14-29 %) of decedents[10]. In the US the proportion was 29% and in Australia and Canada 32%, but in Iceland and NZ the proportion was higher at 38%. However, deaths in RAC underestimate total RAC use wherever a proportion of RAC residents die in an acute hospital.

Other than place of death, three methodologies have previously been used to assess lifetime use. These include 1) assembling a population-representative cohort and following it either prospectively until death or from death retrospectively; 2) using the lifetable method as used in demographic projections; and 3) modelling transition probabilities between residence at home, residence in RAC and death, and then simulating lifetime risk. All these methods require the assembly of large or long cohorts. In countries where there are no such cohorts, including NZ, another method of estimation is required. The need for simple methods to estimate lifetime use has previously been recognised.[9]

This paper describes a simple method of estimation of lifetime use of RAC for people who reach the age of 65 years. Administrative data for place of death obtained from death certificates are obtained first for the NZ population, derived from all death certificates over a five-year period. To that figure is added an estimate of the number of RAC residents who die, not in RAC, but in acute hospital. It then compares NZ estimates to published reports for other countries.

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Methods

National counts of all 112,176 deaths registered for people aged 65+ years during the years 2006-10 were obtained from the Ministry of Health Mortality Collection, summarised by year, age, gender and place of death.[11] Place of death classification was based on a previously developed algorithm to categorise place of death recorded as text on the Certificate of Cause of Death, described elsewhere.[10] All those who died in a RAC facility were assumed to be living there and this count becomes the first component of the overall estimates of lifetime use.

The second component is the count of deaths that occur in acute hospital but are of RAC residents aged 65+ years. For this study four independent sources were used. Two studies, OPAL and ARCHUS, were of RAC resident cohorts from which were derived the proportion of RAC residents who died in acute hospital. Two other studies were used to describe the proportion of in-hospital deaths of RAC residents. All were analysed by age group (65-74, 75-84, 85+ years) and where numbers permitted, by gender. For each year and age-by-gender group, counts of hospital deaths of RAC residents were estimated in all four studies independently and the average expressed as a percentage of all deaths each year. The mean percentage across the five years was taken as a best estimate of deaths of RAC residents that occurred in hospital. These were added to those who died in RAC to yield estimated lifetime use of RAC. Details of these contributing studies are provided in a Supplementary File.

Unpublished aggregated data for deaths during 2004-05 were obtained from AIHW, Australia.[12] Similar methods were applied to derive estimated lifetime risk for Australia.

Official data for deaths (actual registrations and projections) were obtained from Statistics NZ by age group and gender for years 2000-2040.[13] Annual death projections for the years between 2030 and 2050 were then used to project future RAC deaths for NZ.

For comparison with RAC lifetime use in other countries, PubMed and Google Scholar were searched for reports from other countries. Because of differences in terminology for the sector and because literature is not necessarily in the academic literature, a wide range of search strategies was used. Official government offices in 26 nations were emailed but none was able to provide relevant data. We focused on studies published since 1990 with results for those aged 65+. Reference lists and citations were followed. Studies were excluded 1) if based purely on data for place of death unadjusted for any under-count; 2) if they were for specific diagnostic groups or a subset of the population or; 3) were for years prior to 1990. Where the report did not show the mean for the whole population aged 65+, the mean of the gender-specific proportions was used.

No ethical approval was necessary for acquiring national data for deaths, death projections or hospital deaths data due to the summary nature of the data. Ethical approvals for the two research studies that used records for individuals were obtained from the North Health Ethics Committees (NTX/08/49/EXP for OPAL and NTY/10/11/090 for ARCHUS).

Results

Place of death in NZ

During 2006-10, an annual average of 28,806 deaths (range 28,389-29,312) were registered in NZ. On average 22,464 (78%) occurred among people aged 65 years or over. Of these, about 8,600 (38% of all, 31% of men, 45% of women) occurred in a RAC facility, and 7,700 (34% of all, 37% of men, 32% of women) in an acute hospital (Table 1). The proportion dying in RAC increased with age; of decedents aged 85+ years, 54% died in RAC (47% of men, 59% of women). There was no observable trend in percentages of deaths in acute hospital or RAC over the period.

Deaths in hospital of RAC residents in NZ

As described (see Supplementary File) four data sources were used to estimate deaths that occurred in hospital patients who had previously used RAC, i.e. the second component. Among decedents aged 65+ years in the two RAC cohort studies, 16% and 20% of deaths occurred in acute hospital; of decedents in the two hospital studies, 22% and 32% were known to have used RAC (see supplementary file). Applying the age- and gender-specific proportions to NZ deaths of those aged 65+ in the years 2006-2010, an estimated 1941 RAC residents annually were admitted to an acute hospital during their last days or weeks of life, and died there. This represents 18% of deaths of RAC residents and 9% of all deaths of those aged 65+.

Estimated lifetime use of RAC in NZ

When the two components were combined, estimated lifetime risk of RAC use in NZ is 38% (RAC deaths) + 9% (in-hospital deaths from RAC) = 47% overall (39% of men, 54% of women, Table 1). For those aged 85+, estimated lifetime use of RAC was much higher, 66% overall (58% of men, 70% of women) (Figure 1).

Estimated lifetime use of RAC in Australia

A similar method to the one described was applied to place of death data from Australia for decedents over the age of 65 years. A

Table 1: Deaths and lifetime use of residential aged care in New Zealand 2006-2010.[a]

	Annual deaths registered in period			Estimations	
	Annual average N	Died in acute hospital %	Died in RAC %	Hospital deaths from RAC[b] %	Lifetime use of RAC[c] %
Men					
65-74 years	2,770	36.9	15.3	4.0	19.3
75-84 years	4,522	37.9	29.7	7.2	36.9
85+ years	3,273	34.1	46.7	10.9	57.6
Men 65+	10,565	36.5	31.2	7.5	38.7
Women					
65-74 years	1,988	38.9	18.7	4.8	23.5
75-84 years	3,903	37.6	36.7	9.0	45.7
85+ years	5,979	26.8	58.5	11.8	70.3
Women 65+	11,870	32.4	44.7	9.7	54.4
All deaths					
65-74 years	4,758	37.8	16.8	4.3	21.1
75-84 years	8,425	37.8	33.0	8.0	41.0
85+ years	9,253	29.4	54.3	11.5	65.8
All 65+	22,435	34.3	38.3	8.7	47.0

a: Methodological details included in online resource

b: Those who died in acute hospital having previously been in RAC

c: Estimated from summing deaths in RAC and deaths in acute hospital from RAC

summary of discharges from RAC facilities 'because of death' was obtained from the Australian Institute of Health and Welfare (AIHW) for the two years from July 2004, whether from a long- or short-term stay. Overall, 54% of all deaths of those aged 65+ occurred in acute hospital, and 32% in RAC[10]. Of all in-hospital deaths of people aged 65 years and over, 13% occurred while 'on leave' from RAC, i.e. during an admission to acute hospital directly from their long-term care facility (based on dates of leave discharge and death). Thus, a further 13% of 54% must be added. The estimated lifetime use of LTC in Australia after age 65 years is therefore 32% (from RAC) plus 7% (in-hospital deaths from RAC), making a total of 39%. Again, these estimates do not include those returning to the community and dying there. In comparison, previous published reports for lifetime RAC use in Australia were for 34%[14] and 38% when short-stay residents were excluded, and 53% when included.[15]

International comparisons

In this first known international comparison, 18 reports for other countries were found in a range of publications since 1990 – in clinical and health services, population and demography, sociological, economic, mathematics and insurance industry literature (Table 2). Twelve were from the US, three from Australia and one each from Finland, Germany and the UK. Seven cohort studies were either prospective cohort studies or decedent follow-back studies.[16-22] Lifetable studies estimated likelihoods for Australia,[14,15] USA[23] and UK.[24] Six simulation models were from the US[25-30] and one from Finland.[31]

Median overall estimates of lifetime use of RAC for people aged 65+ varied substantially: 39% (range 22%-47%) for decedent cohorts, 34% (26%-53%) for lifetables and 53% for simulations (35%-60%). Of the 12 studies from the US, decedent cohort studies in general yielded lower estimates than other studies, but there was wide variation, from 35%[26] to 60%.[29,30] Likelihoods for women aged 65+ were on average 1.6 times that of men (unadjusted for age).

Discussion

New Zealand findings

This method estimates that at least 47% of New Zealanders use RAC after reaching the age of 65 years (and two-thirds of those aged over 85 years). This level of lifetime use in NZ is nearly double the only previous rough estimate of 25%-30%, which was based on non-NZ data.[32] Population ageing will particularly impact NZ given its reliance on residential facilities for late-life care. Given that RAC is funded mainly from general taxation and from private (co-)payments,[33] rather than insurance funds or investments where the hazard is monitored, it is important to improve monitoring of RAC use.

Death projections anticipate changes in population structure arising from changing fertility, mortality and migration. Under current care provision and utilisation, population ageing alone will likely increase the likelihood of death in RAC in NZ.

When the age- and gender-specific rates are applied to projected death counts sourced from Statistics NZ, estimated lifetime use of RAC will increase from 47% in 2010, to 48% in 2020, and to 53% by 2040. This increase is similar to the increase projected for the US, from 37% in 1986 to 46% over 34 years.[20] Changes to entry criteria, funding or service provision, social preferences and lifestyles (e.g. as may arise from ageing of new migrants), availability of informal caregivers and prevalence of disability or functional decline could push estimates up or down.[3] However, as yet, increased longevity in NZ has been roughly matched by improved health and less disability – a dynamic equilibrium.[34] The best measure of current use therefore serves as the best estimate of future use, to which sensitivity analyses could be conducted to assess the impact of any overall change in dependency-related demand.

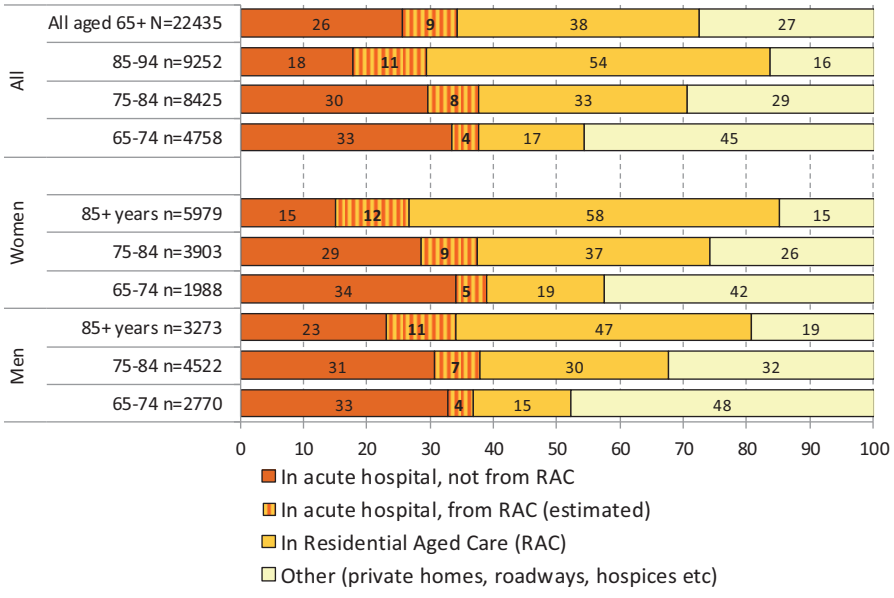
International comparisons

In Australia, the five different estimates range from 34% (not including low-level care) to 53% (including both high and low level of care plus respite care) and seem relatively consistent between reports and over time.[14,15,22] The latest report covers a seven-year period and clearly shows permanent (only) RAC use rising by 0.5% each year, from 39% in 2003-2004 to 43% in 2010-2011.[22]

In Germany, an insurance decedent cohort over the period 2000-2009 had very low risk (26%; 13% of men, 32% of women) of claiming a long-term care benefit.[21] However, studies published in 1994 based on place of death alone reported lifetime risk for Germany more than double these rates (57%; 43% for mean, 70% for women).[35] Possible explanations for these differences include: that the insurance cohort may not be representative of the population as a whole, that only some care types were included in the insurance estimate, or that major changes occurred over the intervening period.

That most reports were from the US possibly reflects the comparatively larger role of the insurance industry in long-term care, with corresponding interest and capacity to conduct complex studies. Some aspects of decision-making around use of insurance are included in the recent paper by Freidburg et al.[30] Greater use of RAC for restorative or 'step-down' care in the US will also lead to higher lifetime risk of RAC.

Figure 1: Percentage of decedents using residential aged care (RAC) in New Zealand 2006-2010, based on place of death with adjustment for RAC residents who die in an acute hospital.



The most striking finding of the international comparison is the variability between countries and indeed within countries where there is more than one study. Health systems' differences are likely to account for much of the variability. Comparisons are complicated by methodological variations – not only because of the different settings and health services available and in analytical methods employed,[14] but also in the differing periods of time over which data were collected, in the representativeness of samples, in the choice of age cut-off (if any), in the population of interest (e.g. the total population or an insurance cohort), in definitions of RAC applied (e.g. all or only high levels of care), of stay type (any stay or only long-term stays) and of measure of risk (lifetime use, first use, or accumulative).

Implications

Late-life care has already evolved. In several countries including NZ, RAC has moved from a predominantly housing and social welfare model to a health and care model. Although RAC beds outnumber acute hospital beds by more than three times and it is well recognised that population ageing will bring major challenges,[3] the RAC sector remains largely invisible, with residents not included in many population surveys and reports at a population level.[36] Beyond the continued surveillance of mortality and other dynamic indicators there is a need to monitor RAC use, to understand better the pressures that lead to RAC entry and the determinants of

Table 2: International comparison of lifetime use of residential aged care since 1990.

Country, year and author	Method	Risk from age 65 years (%)				Risk from higher age (%)			
		Note	Men	Women	All	From age...	Men	Women	All
Decedent cohort studies:									
USA 1990, Murtaugh[16]	Decedents from national long-term care cohort, with next-of-kin interviews	NH 1982-84	28	45	37	Aged 90+	53	70	64
USA 1991, Kemper[17]	Survey of next-of-kin of adult decedents in NMFS	As at 1986	28	46	37	Aged 95+	52	77	71
USA 1991, Kemper[18]	Lifetime use if turning 65, as previous report17	Projected as at 1990	32	52	43				
USA 1997, Murtaugh[19]	NNHS 1985 NH discharge data with next-of-kin interviews, lifetime NZ use	Projected as at 1995			39	Aged 85+			56
USA 2002, Spillman[20]	2 mortality follow-back cohorts, and projected mortality data	As at 1986 As at 1993	28 33	46 47	37 41	Aged 95+ Aged 95+	52 74	77 76	71 74
Germany 2012, Rothgang[21]	Insurance claims of decedents	As at 2000 As at 2009	13 16	32 35	22 (est.) 26 (est.)				
Australia 2014, (this report)	Administrative reports of RAC deaths plus hospital deaths during RAC leave	2004-2006			39				
Australia 2014, AIHW[22]	PIAC database, use of permanent RAC in last year of life 2010-2011	Aged 65+	34	52	43	Aged 85+	52	68	62
New Zealand 2014, (this report)	Place of death, +/- adjustment for deaths of RAC residents occurring in acute hospital, 2006-2010	Unadjusted Adjusted	31 38	45 55	38 47	Aged 85+ Aged 85+	47 58	59 71	54 66
Lifetable studies:									
USA 1996, Liang[23]	Multi-state life-table using four cohort studies, death in NH				52	Aged 85+			70
UK 1997, Bebbington[24]	National statistics and surveys	1994-95 1995-96	18 20	33 36	26 (est.) 28 (est.)	Aged 85+	30	47	
Australia 2000, Liu[14]	NH care, i.e. excludes low-level care, 1994-95	permanent only + respite	25 27	39 41	32 (est.) 34 (est.)	Aged 85+ Aged 85+	48 49	76 78	
Australia 2002, Rowland[15]	Lifetime use of aged care home, permanent +/- respite care,1990-2000	permanent only + respite	29 40	46 65	38 (est.) 53 (est.)	Aged 85+ Aged 85+	46 62	62 65	
Transition probability simulations:									
USA 1992, Arling[25]	3-state transition probability of residential LTC, in middle-income	Wisconsin NH			55				
USA 1994, Dick[26]	3-state transition probabilities, based on 1982--1985 NLTCS & NNHS data	Ever-use NH			35	At age 85	30	53	
USA 2005, Kemper[27]	Microsimulation model using Current Population Surveys from 1993 & 1994	If turning 65 in 2005	58	79	69				
USA 2007, Brown[28]	Robinson model, NH only, based on NLTCS & NNHS	1982--1994	30	48	39				
USA 2013, Hurd[29]	Robinson's Markov transition model of ever use, using NLTCS & NNHS data	NH 1982-1985 ALF 1982-1985	27 12	44 20	36 (est.) 16 (est.)				
	HRS War Babies & Early Baby Boomer 1992-2004 cohorts, 50+ years	non-parametric simulation	50	65	53 59	Aged 70-74			58
USA 2014, Friedberg[30]	Updated Robinson model using 1999-2004 NLTCS & 1998-2010 HRS data	NH	52	67	60				
Finland 2014, Martikainen[31]	Multistate lifetables using transition probabilities from population register	1997-2003	36	59	47 (est.)				

Abbreviations:
NH = nursing home, LTC = long-term care, ECF = extended care facility incl. nursing home, ALF = assisted living facility, DthCert= Death certificate,
USA = United States of America, UK = United Kingdom, NZ = New Zealand, est. =estimated from mean of results provided, proj. = as projected by authors
NMFS = National Mortality Followback Survey (USA), NLTCS = National Long-Term Care Survey (USA), NNHS = National Nursing Home Survey (USA),
HRS = Health and Retirement Study (USA), PIAC = Pathways in Aged Care database (Australia)

length of stay. To avert large increases in demand for RAC, alternatives are needed. Public debate and research is justified – for example, to determine if entry to RAC may be avoided or delayed for people with high dependency, without reducing quality of life. Such initiatives may improve management of chronic diseases, reduce falls, facilitate transitions back into the community post-discharge, provide day-care for people with dementia or other needs, and/or enable shared or sheltered accommodation. Research to investigate risk factors for entry to RAC in a variety of populations may contribute to a better understanding of the reasons for high levels of RAC, and facilitate reassessment of evidence-based alternatives.

Second, differences in lifetime risk between countries should caution readers of possible lack of generalisability of research studies. There are fundamental differences in RAC utilisation, whether in the care provided or in the mix of residents. Other reports suggest this is so.[37,38] Findings from intervention studies, whether randomised or not, and from studies assessing risk factors for RAC care or for acute hospitalisation from RAC may not be generalisable to other health systems.

Third, the findings have implications for personal financial and care planning.[4] Public recognition of personal future risk may raise awareness of the issues around managing housing and investment options, and may clarify expectations for financial advisors, family trusts, attorneys and others. Further, acknowledgement of the high risk of RAC may facilitate or ease discussions with families about preferences for late-life care.

Finally, for immediate needs, knowing that such substantial proportions of older people use RAC for late-life care indicates a need for a palliative care approach within RAC. For example, in NZ, RAC appears to serve as a de facto hospice following an acute hospital stay.[39] RAC staff are reportedly less willing to undertake training in palliative care when scoring more highly on a measure of burnout.[40] Yet, given that almost half of older people die having lived in RAC, a palliative care approach is relevant and appropriate.

This study offers a method of estimation of lifetime probability of RAC use in countries where large prospective cohorts are not assembled but where place of death information is available from death certificates. In this method, ratio estimators are derived from several smaller studies and applied to known information about place of death in the population. As such, it is simpler and cheaper than methods requiring cohorts of long duration and complex statistical models. The method could be viewed as a first step in developing more complex or refined methods if desired. Because it is based on recent data about place of death, it is less subject to time-related societal changes, unlike those that occur over decades-long cohort studies and so may be more accurate. Because the method uses the mean of smaller contributing studies (here four separate studies) to adjust place of death information for RAC residents who die in acute hospital, the ratio estimators may be more reliable than using any single source of data. It is likely that in many countries, such smaller datasets will be available to inform the ratio adjustment.

Limitations

Although based primarily on official death counts that are regarded as reliable, the method has some limitations. Four studies were used to estimate the under-count for NZ that arises from RAC residents dying in acute hospital care. Three were Auckland-based, and may differ from other regions. However, more than 25% of NZ's older population lives in the Auckland region, so any regional bias would need to be large and consistent to have a substantial effect on the results.

For several reasons, the estimates of RAC use based on the two cohort studies are under-counts. While they account for RAC residents who die in an acute hospital, they under-represent people who enter RAC for short stays only. In one of the RAC cohort studies, analyses of place of death stratified by duration of stay suggested that residents who had entered RAC within the past year were more likely to die in acute hospital than those with longer stays (19% vs. 15%, chi-square p-value=0.007, unpublished results). Short-stayers are under-represented when cross-sectional studies are used for period prevalence. Accordingly, estimates based on cohorts assembled from cross-sectional studies will emphasise that under-count. Further, counts in the two hospital-based studies will have missed some RAC deaths if not associated with a government RAC care subsidy or if RAC entry was before a formal care needs assessment. In all four studies, some deaths that occurred following RAC may have been miscounted if occurring at home or in a hospice. However, these are believed to be few because in NZ, RAC is almost always regarded as the last place of living, and seldom used for rehabilitation, 'step-down' or convalescent care. Therefore, for most who use RAC it is, or becomes, a permanent move.

For the comparisons between populations, the lack of a consistent international terminology for RAC means that reports that do not use the most common terms such as 'long-term care' or 'nursing home' may have been overlooked.

Conclusions

This is the first known original study of lifetime use of RAC for NZ. It confirms that the RAC model of late-life care is common. Indeed, in NZ and many other countries it has become the norm by about the age of 85 years. The method used in this study – using recent summaries of place of death in conjunction with estimates of in-hospital deaths of RAC residents – is simpler and requires less complex data and analyses than other methods used for estimating lifetime risk. Given that the only prior NZ estimate was 20-30%, these results provide significant new information.

Late-life care services have evolved and will continue to do so. High usage of RAC indicates a demand and/or need for such services, a lack of appropriate alternatives and/or use of these alternatives, and emphasises the need for utilisation information. Monitoring RAC utilisation is necessary for informed debate about late-life care in general, including palliative care provision in RAC, use of hospital by RAC residents and to inform planning and provision of care for older people.

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Supporting Information

Additional supporting information may be found in the online version of this article:

Supplementary Appendix 1: Estimation of hospital deaths of RAC residents in New Zealand.

Supplementary Figure 1: Lifetime use of residential aged care in those aged 65+ years in New Zealand, with estimation of deaths in acute hospital.

Supplementary Table 1: Summary of results from four contributing studies.