



Auckland UniServices Limited

An Economic Evaluation of the Assessment of Service Promoting Independence and Recovery in Elders (ASPIRE)

Final Report

31 October 2006

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1. EXECUTIVE SUMMARY

The Assessment of Services Promoting Independence and Recovery in Elders (ASPIRE) was a prospective meta-analysis¹ of three initiatives designed to promote independence and continued living in the community for elderly people (ageing-in-place). The three initiatives are:

- The Community Flexible Integrated Restorative Support Team (Community FIRST) initiative in Hamilton; a restorative home support model of care;
- The Promoting Independence Programme (PIP) in Lower Hutt; a rehabilitation services model of care; and
- The Coordinator of Services for Elderly (COSE) initiative in Christchurch; an individual case-management model of care.

This report presents the results of a cost effectiveness analysis of each of the three ageing-in-place initiatives to assess their cost effectiveness relative to the elderly receiving conventional health care services (usual care) in each region.

The study design was based around 3 randomised controlled trials with a total sample size for analysis of 564 older people assessed as having high or very high needs, across the 3 centres; Christchurch had a much larger sample size with 350 participants compared with 111 in Hamilton and 103 in Lower Hutt.

Table 1 presents the incremental, costs and benefits for each of the 3 ageing-in-place initiatives compared with usual care. Costs are measured in terms of the health care resources used by the elderly participants involved in the assessment over the two-year study period, and include community costs incurred by either the DHB or elderly person, and the residential costs associated with permanent entry into either a rest home or hospital. Benefits are measured in terms of extra days in community care gained under the 3 ageing-in-place initiatives, which can be broken down into 2 other benefit measures which are days of residential care avoided, and days of life gained or equivalently days deceased avoided.

Dividing the incremental cost of the initiative by the incremental benefit produces an Incremental Cost Effectiveness Ratio (ICER). The ICER is the key cost-effectiveness measure to be used to contrast the study findings in terms of the cost and benefit outcomes of the 3 ageing-in-place initiatives.

The key findings can be summarised as follows:

¹ In statistics, a meta-analysis combines the results of several studies that address a set of related research hypotheses.

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Community First Cost Effectiveness Results

- The Community FIRST initiative cost an estimated \$46,256, on average per person over a 12 month period. This compares with the estimated cost for usual care of \$32,413, on average per person over a 12 month period.
- The Community FIRST initiative resulted in, on average per person, 246 days in community care, 75 days in residential care, and 43 days deceased over a 12 month period. Usual care resulted in, on average per person, 195 days in community care, 91 days in residential care, and 79 days deceased over a 12 month period.
- The Community FIRST initiative, therefore, cost an estimated additional \$13,843, on average per person over a 12 month period compared to usual care, and resulted in an additional 51 days spent in the community (of which 16 were avoided residential care and 35 were avoided death).
- The ICER for Community FIRST compared with usual care amounts to a cost of \$271 per person for each additional day in the community gained over a 12 month period. The ICER for Community FIRST expressed in terms of the 2 other benefit measures of days of residential care avoided, and days deceased avoided are set out in Table 1 below.

PIP Cost Effectiveness Results

- The PIP initiative cost an estimated \$40,560, on average per person over a 12 month period. This compares with the estimated cost for usual care of \$32,732, on average per person over a 12 month period.
- The PIP initiative resulted in, on average per person, 278 days in community care, 60 days in residential care, and 28 days deceased over a 12 month period. Usual care resulted in, on average per person, 255 days in community care, 81 days in residential care, and 29 days deceased over a 12 month period.
- The PIP initiative, therefore, cost an estimated additional \$7,828, on average per person over a 12 month period compared to usual care, and resulted in an additional 23 days spent in the community (of which 22 were avoided residential care and 1 was avoided death).
- The ICER for PIP compared with usual care amounts to a cost of \$340 per person for each additional day in the community gained over a 12 month period. The ICER for PIP expressed in terms of the 2 other benefit measures of days of residential care avoided, and days deceased avoided are set out in Table 1 below.

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COSE Cost Effectiveness Results

- The COSE initiative cost an estimated \$13,936, on average per person over a 12 month period. This compares with the estimated cost for usual care of \$13,779, on average per person over a 12 month period.
- The COSE initiative resulted in, on average per person, 326 days in community care, 16 days in residential care, and 24 days deceased over a 12 month period. Usual care resulted in, on average per person, 318 days in community care, 23 days in residential care, and 25 days deceased over a 12 month period.
- The COSE initiative, therefore, cost an estimated additional \$157, on average per person over a 12 month period compared to usual care, and resulted in an additional 8 days spent in the community (of which 7 were avoided residential care and 1 was avoided death).
- The ICER for COSE compared with usual care amounts to a cost of \$20 per person for each additional day in the community gained over a 12 month period. The ICER for COSE expressed in terms of the 2 other benefit measures of days of residential care avoided, and days deceased avoided are set out in Table 1 below.

Table 1: Base Case Cost, Outcome and Incremental Cost Effectiveness Ratio (ICER) Results for 0 to 12 month period

Results	Hamilton (Community FIRST)	Lower Hutt (PIP)	Christchurch (COSE)
Incremental costs and benefits			
Incremental Cost Per Person Over 12mth Period	13,842.66	7,828.28	157.49
Incremental Days in the Community Per Person Over 12mth Period	51	23	8
Incremental Days of Residential Care Avoided Per Person Over 12mth Period	16	22	7
Incremental Days Deceased Avoided Per Person Over 12mth Period	35	1	1
ICER: cost per person per annum			
ICER community (days gained)	271.26	340.07	20.13

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Results	Hamilton (Community FIRST)	Lower Hutt (PIP)	Christchurch (COSE)
gained)			
ICER residential (days avoided)	880.57	361.96	22.84
ICER deceased (days avoided)	392.27	5,545.03	190.74

ASPIRE Cost Effectiveness Results Discussion

The approach taken to evaluate the cost effectiveness of ASPIRE is consistent with that used in comparable studies internationally². It centres around a key outcome of keeping elderly people in the last year or so of their life, in the community for longer, by both avoiding residential home admission and prolonging life.

The cost effectiveness analysis results for ASPIRE shows that, on the basis of the ICERs calculated, that the Christchurch COSE initiative is the most cost effective per additional day spent in the community, as it only cost an additional \$20 more than usual care per person per annum, compared with corresponding figures for Hamilton Community FIRST of \$271 and for Lower Hutt PIP of \$340.

All 3 ageing-in-place initiatives, however, despite costing more relative to usual care, all had the result of increasing the time spent in the community over a 12 month period by decreasing time in residential care and deceased.

While Christchurch COSE has the lowest incremental cost on average per person compared with usual care, it also has the lowest incremental benefit. On the days in the community gained measure, Hamilton Community FIRST clearly achieves the best outcomes with 51 days gained, contrasting with 23 for PIP and only 8 for COSE. On the days deceased avoided measure, Hamilton Community FIRST achieves the highest gain in days of life compared with usual care with an extra 35 days contrasting with only 1 day for PIP and COSE. On the days of residential care avoided measure, PIP achieves the highest gain with 22 days avoided, followed by Community FIRST with 16 days avoided and COSE with only 7 days avoided.

However, the results should be interpreted with some caution for a number of reasons. These are covered in detail in the report but some of the key ones are set out below.

² For example, the Wanless Social Care Review, *Securing Good Care for Older People*, Derek Wanless, 2006: specifically cites the example in the paper by Davies et al 2000, which shows that spending on home care and day care services 'buys' additional days for people in the community before a residential care solution becomes the only option for them.

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ASPIRE Cost Effectiveness Results Caveats

- i. Questionnaires were administered to the elderly participants at 3 months, 12 months, and 18 months over the course of the two-year study period (ending 11 November 2005). The questionnaires were used to determine the community costs for each time period. The number of participants still in community care in Hamilton and Lower Hutt at 18 months was too small for a statistically valid analysis for the 12 to 18 month period³, hence, the analysis focuses on a 12 month period instead.
- ii. Sensitivity analysis is required to allow for uncertainty surrounding the unit cost, resource use, outcomes variables, time period, and assumptions used to calculate the ICERs; while the best estimate of the values for these variables was used to construct the ICERs for the elderly study participants, the data represents a statistical sample only; and results could be different to those that would be observed for an entire population or for a different time period of study.
- iii. Sensitivity analysis carried out shows that the results can be quite sensitive to changes in the average resource use; also the sensitivity analysis shows for Christchurch that the ICER results change when constructed based on 12 months verses 18 months data; using the 18 month data, the COSE programme costs \$120 less than usual care for each additional day spent in the community. This appears to be due to the proportion of time spent in residential care in the usual care group increasing in the 12 to 18 month period by a lot more than in the initiative group.
- iv. Finally, the sample for the Hamilton Community FIRST initiative had much higher levels of mean physical and cognitive disability at entry into the ASPIRE trials than the sample for the Christchurch COSE initiative, with the Lower Hutt PIP initiative having a mean level of disability between the two other initiatives⁴. These differences, which were not adjusted for in the cost effectiveness analysis, may influence the final results, as Community FIRST may appear much more expensive for the outcome it achieves, but this is because it faced greater challenges with its sample participants.

³ Questionnaires could only be administered to those still in the community at 18 months and so the 18 month sample excludes participants who had died, entered residential care, or were recruited after the first 6 months of the 2 year study period. The sample size of participants administered a questionnaire at 18 months for Hamilton, Lower Hutt, and Christchurch at 18 months was 12 , 13 , and 108 respectively.

⁴ Refer to page 64 of: ASPIRE Assessment of Services Promoting Independence & Recovery in Elders, ASPIRE Report 1, Auckland UniServices Limited, Dr Matthew Parsons et al, 2006.

2. INTRODUCTION

The Assessment of Services Promoting Independence and Recovery in Elders (ASPIRE) was a meta-analysis of three initiatives designed to promote independence and continued living in the community for elderly people (ageing-in-place). The three initiatives are:

- The Community Flexible Integrated Restorative Support Team (Community FIRST) initiative in Hamilton;
- The Promoting Independence Programme (PIP) in Lower Hutt; and
- The Coordinator of Services for Elderly (COSE) initiative in Christchurch.

Each initiative had different approaches to promoting ageing-in-place, such as individual case-management (COSE), provision of rehabilitation services (PIP) and provision of home support services (Community FIRST). A more complete description of the initiatives can be found in Parsons et al (2006).⁵

The ASPIRE analysis firstly involved selection of a random sample of elderly from each of the three initiatives, along with a random sample from elderly receiving conventional health care services (usual care) in each of the three regions. Each sample was tracked over a two-year period (from 10 November 2003 to 11 November 2005), with questionnaires administered to sample participants and other data collected (such as the date a person died or entered a residential care facility).

One aspect of ASPIRE is to perform a cost effectiveness analysis (CEA) of each of the three ageing-in-place initiatives to assess their cost effectiveness relative to usual care. This report sets out the results of this analysis.

⁵ Parsons, M., C. Anderson, H. Senior, X. Chen, N. Kerse, D. Jorgensen, P. Brown, S. Jacobs, S. Vanderhoorn and J. Kilpatrick (2006). *ASPIRE: Assessment of Services Promoting Independence and Recovery in Elders*, Report to Ministry of Health.

3. METHODOLOGY AND RESULTS

3.1. BACKGROUND TO COST EFFECTIVENESS ANALYSIS

Cost effectiveness analysis is a form of cost benefit analysis. It is typically used to evaluate scenarios where, while the volume of the benefits can be quantified, it is difficult to determine the dollar value of those benefits. As such, it is often used in health care where, for example, the value of a human life or extra life gained is hard to quantify.

CEA establishes a ratio of the incremental costs of a particular (“factual”) scenario (i.e. the costs of the factual scenario less the costs of some alternative baseline or “counterfactual” scenario) to the incremental benefits or outcomes of that scenario – the ratio is thus termed an Incremental Cost Effectiveness Ratio (ICER). That is, if TC is the total dollar cost of the scenario (either factual F or counterfactual CF) and B is the volume of benefits achieved under the scenario, then the ICER is given by:

$$ICER = \frac{TC_F - TC_{CF}}{B_F - B_{CF}}$$

If, for example, the benefits are in terms of human lives saved, then the ICER may be interpreted as being the additional cost per life saved under the factual scenario relative to the counterfactual. By comparing ICERs of different factual scenarios (e.g. different policies or programmes, different types of drugs, etc) we can measure their relative cost effectiveness per benefit achieved, without having to measure the monetary value of those benefits.

3.2. ASPIRE CEA METHODOLOGY

For the ASPIRE CEA we used data from a range of sources, including information from questionnaires administered to the sample of elderly people involved in the assessment, and information obtained from the HealthPAC and CCPS invoicing databases for those same elderly people.⁶ These data provided us with information on the resources used by those involved in the assessment over the two-year study period, such as the number of visits to a GP, the use of services such as physiotherapy and occupational therapy, and the number of admissions to a hospital or emergency ward. By also using data on the unit cost of each particular resource, we were thus able to estimate the total cost of the resource used by the elderly.

⁶ See Appendix A for a full description of the data used.

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In each region, we calculated the total cost per person for both the ageing-in-place initiative and usual care. Appendix A provides full details of how this was calculated, but we provide a brief summary here. We firstly split the costs of the initiative/usual care into community related costs and the costs of being in a residential care facility. Community costs are those incurred by either the DHB or elderly person whilst in the community, and include the examples listed above such as GP visits and occupational therapy. Residential costs are the costs associated with permanent entry into either a rest home or hospital.

As the ASPIRE analysis involved administering questionnaires to those still in the community at intervals of 3 months, 12 months and 18 months from when an individual entered the sample, we calculated community costs over each of the 0 to 3 month, 4 to 12 month and 13 to 18 month periods. This was done by determining the average resource use for each of the community resources in each period, multiplying by the unit cost of each resource and summing over all resources.

While we therefore had 18 months of data available for each region and initiative/usual care, not all of this was considered statistically reliable. In particular, the number of questionnaires administered in the Hamilton and Lower Hutt regions at the 18 month assessment date was very low, with sample sizes of less than 7 across the regions and initiatives/usual care (due to individuals dying or moving into residential care, and thus not being in the community to receive a questionnaire). We therefore did not include the 18 month data in our calculation of total community costs for Hamilton and Lower Hutt. While Christchurch had larger sample sizes at the 18 month assessment, we have used only the data up to 12 months in order to ensure comparability with Hamilton and Lower Hutt.⁷

Total community costs are therefore calculated by summing the 0 to 3 month community costs and the 4 to 12 month community costs for each region and initiative/usual care to get the total community costs over the 12-month period.

⁷ Note, however, that we do include the 18 month Christchurch data as a sensitivity test.

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Note, however, that total costs for the Community FIRST scheme in Hamilton were calculated using a different approach. This scheme had a bulk funded component of \$360 per person per week. This amount covers a number of the services provided to those in the initiative. While information is available on the resource use of some of those services (such as visiting nurse, personal care, etc), a large proportion of the bulk funded cost covers services for which there is no data available (e.g. phone support services provided). As such, to only incorporate the cost of those resources that are available into the community cost would understate the total cost of this initiative. To overcome this problem, we have used the bulk funded component as an estimate of the total cost of community resources used in the Community FIRST initiative. We note, however, that there are some specific services not covered by the \$360,⁸ and thus we have added the resource cost of these services to the bulk funded component to get the total community cost.

We also calculate the total costs of residential care costs over the 12-month period by weighting together the costs of hospital care and the costs of rest home care (with the probability of being in each type of facility as the weights). Total costs are then given by the following equation:

$$\text{Total costs} = (\text{Total community care costs} \times \text{Probability of being in the community}) + (\text{Total residential care costs} \times \text{Probability of being in residential care})$$

In terms of calculating the outcomes, the key outcome from the ageing-in-place initiatives is keeping elderly people in the community for longer, by both avoiding residential home admission and prolonging life. The key outcome is therefore the additional days spent in the community, and this can be broken down into:

- Additional days of residential care avoided; and
- Additional days of death avoided.

While Parsons et al (2006) note that the differences in these outcomes are not always statistically significant between the initiative and usual care, the days avoided or gained move in the expected direction between the initiative and usual care, and we assume they are reasonable estimators for our purposes.

We used data from the ASPIRE questionnaires to determine the average time (per person) spent in the community, spent in residential care and dead over the 12-month period in each region and initiative/usual care.

⁸ These services are: GP visits, GP visits at home, medical specialists, speech therapy, social worker, dietician, day hospital, hospital admission, A&E admission, meals on wheels and modifications.

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3.3. RESULTS

As noted above, the ICER compares the incremental costs with the incremental benefits. For the ASPIRE CEA, we compared the incremental average total cost per person TC (that is, average total cost for initiative I less average total cost for usual care U) with the incremental benefit per person. As noted above, the benefit is one of days in the community (Com), days in residential care (RC) or days deceased (D). That is, for each region and initiative/usual care we can calculate three ICERs:

$$ICER_{Com} = \frac{TC_I - TC_U}{|Com_I - Com_U|}$$

$$ICER_{Res} = \frac{TC_I - TC_U}{|RC_I - RC_U|}$$

$$ICER_D = \frac{TC_I - TC_U}{|D_I - D_U|}$$

Each ICER represents, respectively, the incremental cost per person per day of community care gained, per day of residential care avoided, and per day deceased avoided.

We have calculated each ICER on the basis of the cost per person per annum. The results are shown in Table 2. The first part of the table shows the incremental costs and outcome days underlying the ICER calculations. The other two parts of this table show the incremental cost for each region calculated on the basis of cost per person per annum.

Table 2: Base Case Cost, Outcome and ICER Results for 0 to 12 month period

Results	Hamilton (Community FIRST)	Lower Hutt (PIP)	Christchurch (COSE)
Incremental costs and outcomes			
Incremental Cost Per Person Over 12mth Period	13,842.66	7,828.28	157.49
Incremental Days in the Community Per Person Over 12mth Period	51	23	8
Incremental Days of Residential Care Avoided Per Person Over 12mth Period	16	22	7
Incremental Days Deceased Avoided Per	35	1	1

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Results	Hamilton (Community FIRST)	Lower Hutt (PIP)	Christchurch (COSE)
Person Over 12mth Period			
ICER: cost per person per annum			
ICER community (days gained)	271.26	340.07	20.13
ICER residential (days avoided)	880.57	361.96	22.84
ICER deceased (days avoided)	392.27	5,545.03	190.74

The first part of these results show, for example, that while it cost an additional \$13,843 per person for the Community FIRST scheme in Hamilton over one year, the average person in this initiative gained 51 additional days in the community, which is made up of avoiding 16 additional days in residential care, and avoiding 35 days deceased relative to the average person in usual care in Hamilton.

To interpret the ICER results, consider again the Hamilton ICER for the community. This implies that the Community FIRST scheme in Hamilton costs an additional \$271 per person per annum for each additional day spent in the community. On this basis, the ICERs can be compared across regions. For example, the Christchurch COSE initiative is the most cost effective per additional day spent in the community, as it only cost an additional \$20 more than usual care per person per annum compared with \$271 more for Hamilton and \$340 more for Lower Hutt. Similarly, the COSE initiative is also more cost effective in terms of residential care days avoided and death days avoided, costing an extra \$23 per person per annum for each residential care day avoided and \$191 per person per annum for each additional day deceased avoided.

It is also informative to look at the average (per person) proportion of time spent in the community, in a residential home or deceased over the 12 month period. This information is shown in Table 3. It is clear from this that each initiative has the effect of increasing the time spent in the community, while decreasing the time spent in residential care or dead.

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Table 3: Proportion of Time Spent in Community, Residential or Dead⁹

	Hamilton (0-12mths)		Lower Hutt (0-12mths)		Christchurch (0-12mths)	
	Usual Care	Com FIRST	Usual Care	PIP	Usual Care	COSE
Proportion of Time in Community	0.54	0.67	0.70	0.76	0.87	0.89
Proportion of Time in Residential	0.25	0.21	0.22	0.16	0.06	0.04
Proportion of Time Dead	0.22	0.12	0.08	0.08	0.07	0.06

⁹ Figures may not sum to 100 due to rounding.

4. SENSITIVITY TESTING

We ran the following sensitivity tests on our base case ICER results:

- Unit costs: we tested the impact of increasing/decreasing the unit costs of resources by 10%;
- Resource use: as the average resource use comes from sample data, it is possible to construct 95 percent confidence intervals around these averages, such that the true population has a 95 percent chance of lying in this confidence interval. Thus, we tested the impact of increasing/decreasing the average resource use for each resource to the upper/lower bound of its 95 percent confidence interval;
- Outcomes: similarly, the outcomes (days in the community, etc) are based on sampled data. We therefore tested the impact of increasing/decreasing the average days and probabilities for each outcome to the upper/lower bound of its 95 percent confidence interval; and
- Christchurch 18 month data: as noted earlier, we have statistically reliable data out to 18 months for the Christchurch initiative and usual care. Thus we calculated the ICER for Christchurch using this additional data, and converted it to an annual result, as a comparison with the 12 month ICER presented earlier.

The following sections provide the results from each of these sensitivity tests.

4.1. TESTING UNIT COST SENSITIVITY

We obtained information on the unit cost of a number of resources, and used these costs as an input into the calculation of total costs. As is explained in more detail in Appendix A, these costs are based on various sources and assumptions. To test the sensitivity of our results to these costs we increased and decreased the costs by 10%, with the ICER results per annum for each of these tests shown in Table 4 and Table 5 respectively.

Table 4: ICER Results for 0 to 12 month period with 10% Unit Cost Increase

Incremental Cost Effectiveness Ratio Over 12 Month Period	Hamilton	Lower Hutt	Christchurch
ICER community	273.94	370.36	14.63
ICER residential	889.28	394.20	16.60
ICER deceased	396.15	6,083.98	138.64

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Table 5: ICER Results for 0 to 12 month period with 10% Unit Cost Decrease

Incremental Cost Effectiveness Ratio Over 12 Month Period	Hamilton	Lower Hutt	Christchurch
ICER community	268.58	309.78	25.63
ICER residential	871.87	329.72	29.08
ICER deceased	388.39	5,051.59	242.85

In comparison with the 12 month results of Table 2, the ICERs are not overly sensitive to changes in the unit costs. While the degree to which the ICERs change with changes in the unit costs varies by region and ICER, the results are still of a similar magnitude to the base case results and the relative cost effectiveness of each region remains unchanged.

4.2. TESTING AVERAGE RESOURCE USE SENSITIVITY

As noted above, for each resource used we multiplied the unit cost for each resource by the average amount of each resource used. As these averages are drawn from a sample, we can use the standard deviation and sample size to construct 95 percent confidence intervals around the average. In Table 6 and Table 7 respectively we test the impact on our results of increase and decreasing the average resource use for each resource to the upper and lower bound of that confidence interval. Note that, in some instances the lower bound of the confidence interval is a negative number. In these cases we have assumed the average resource use is zero units.

Table 6: ICER Results for 0 to 12 month period with Average Resource Use Increase to Upper Bound on 95% Confidence Interval

Incremental Cost Effectiveness Ratio Over 12 Month Period	Hamilton	Lower Hutt	Christchurch
ICER community	232.79	378.11	135.77
ICER residential	755.68	402.45	154.02
ICER deceased	336.64	6,165.30	1,286.35

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Table 7: ICER Results for 0 to 12 month period with Average Resource Use Decrease to Lower Bound on 95% Confidence Interval

Incremental Cost Effectiveness Ratio Over 12 Month Period	Hamilton	Lower Hutt	Christchurch
ICER community	321.96	317.26	-80.66
ICER residential	1,045.15	337.68	91.50
ICER deceased	465.59	5,137.04	764.19

The ICER results here are clearly quite sensitive to changes in the average amount of resource used. An increase to the upper bound of the confidence interval changes the relative cost effectiveness of the regions for the residential and survival ICERs, making Hamilton the least cost effective for the former and the most cost effective for the latter. The Christchurch ICER also changes substantially from its base case results, while there is less of a change in the ICERs for Hamilton and Lower Hutt relative to the base case.

For a decrease in the average resource use to the lower bound of the confidence interval, there are also considerable changes for Christchurch. Moreover, the signs on the Christchurch ICERs also change, as the total cost of the COSE initiative is less than the total cost of usual care under this test. In other words, it is possible that the COSE initiative could result in a net cost saving.

4.3. TESTING OUTCOME SENSITIVITY

The outcomes (days in community, residential care and dead) enter the analysis in two ways: as the denominator in the ICER calculations; and as probabilities for weighting community and residential costs. We tested the sensitivity of our results to changes in these outcomes by both increasing and decreasing the outcomes (as both days and probabilities) to the upper and lower bound of their 95 percent confidence interval.

It is not possible to change all three outcomes simultaneously, as to do so would result in the outcomes no longer summing to 365 days or a probability of 1. Thus we changed each outcome individually, and adjusted the remaining two outcomes to ensure they stay in the same relative proportion to the base case. The results for increasing the days and probabilities in the community, residential care and deceased are shown respectively in Table 8, Table 9 and Table 10. Similarly the results for decreasing the outcomes are shown in Table 11, Table 12 and Table 13.

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Table 8: ICER Results for 0 to 12 month period with Community Outcomes Increased to Upper Bound on 95% Confidence Interval

Incremental Cost Effectiveness Ratio Over 12 Month Period	Hamilton	Lower Hutt	Christchurch
ICER community	240.29	173.80	40.57
ICER residential	662.20	202.00	54.52
ICER deceased	377.20	1,235.19	162.46

Table 9: ICER Results for 0 to 12 month period with Residential Outcomes Increased to Upper Bound on 95% Confidence Interval

Incremental Cost Effectiveness Ratio Over 12 Month Period	Hamilton	Lower Hutt	Christchurch
ICER community	340.79	514.79	16.14
ICER residential	953.21	531.14	17.77
ICER deceased	530.81	16,405.04	201.30

Table 10: ICER Results for 0 to 12 month period with Deceased Outcomes Increased to Upper Bound on 95% Confidence Interval

Incremental Cost Effectiveness Ratio Over 12 Month Period	Hamilton	Lower Hutt	Christchurch
ICER community	256.51	346.18	16.52
ICER residential	1,284.91	354.85	15.97
ICER deceased	320.69	13,670.39	337.07

Table 11: ICER Results for 0 to 12 month period with Community Outcomes Decreased to Lower Bound on 95% Confidence Interval

Incremental Cost Effectiveness Ratio Over 12 Month Period	Hamilton	Lower Hutt	Christchurch
ICER community	298.81	500.46	0.19
ICER residential	1,152.44	492.64	0.19
ICER deceased	403.82	32,848.63	5.55

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Table 12: ICER Results for 0 to 12 month period with Residential Outcomes Decreased to Lower Bound on 95% Confidence Interval

Incremental Cost Effectiveness Ratio Over 12 Month Period	Hamilton	Lower Hutt	Christchurch
ICER community	209.60	131.78	25.35
ICER residential	793.41	145.75	29.95
ICER deceased	285.02	1,358.10	182.76

Table 13: ICER Results for 0 to 12 month period with Deceased Outcomes Decreased to Lower Bound on 95% Confidence Interval

Incremental Cost Effectiveness Ratio Over 12 Month Period	Hamilton	Lower Hutt	Christchurch
ICER community	288.44	334.96	22.71
ICER residential	664.05	368.34	29.38
ICER deceased	510.29	3,663.29	105.30

These results suggest the ICERs are sensitive to changes in the outcomes within a 95 percent confidence interval. However, in many cases the changes are not substantially different from the base case results. In addition, the COSE initiative in Christchurch generally remains the most cost effective of the three initiatives, with the relative cost effectiveness of the Community FIRST and PIP initiatives changing depending on the particular sensitivity tested.

4.4. TESTING CHRISTCHURCH 18 MONTH SENSITIVITY

We have data available for the Christchurch initiative and usual care that is derived from a relatively large sample size and is thus likely to be statistically reliable. We calculated our ICER results for Christchurch using this 18 month data, although we have converted our results to a per annum basis for comparison with the base case per annum results. Results from this are shown in Table 14.

Table 14: ICER Results for 0 – 12 month period for all regions and 0 – 18 month period for Christchurch

Incremental Cost Effectiveness Ratio Over 12 Month Period	Hamilton 0 -12 months	Lower Hutt 0 – 12 months	Christchurch 0 – 12 months	Christchurch 0 – 18 months
ICER community	271.26	340.07	20.13	-120.18

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Incremental Cost Effectiveness Ratio Over 12 Month Period	Hamilton 0 -12 months	Lower Hutt 0 – 12 months	Christchurch 0 – 12 months	Christchurch 0 – 18 months
ICER residential	880.57	361.96	22.84	-177.74
ICER deceased	392.27	5,545.03	190.74	-372.50

While the 18 month results for Christchurch do not change the position of the COSE programme as the most cost effective, the signs on the ICERs do change. For example, when we include the 18 month data for Christchurch, the COSE programme costs \$120 less than usual care for each additional day spent in the community. In contrast, the 12 month data for Christchurch shows that the COSE programme costs \$20 more than usual care for each additional day in the community. This appears to be the result of changes in the proportion of time spent in residential care in the last 6 months of the 0 to 18 month period, particularly for the usual care scenario – that is, the proportion of time spent in residential care in the usual care increases from the 12 to 18 month period by a lot more in the usual care scenario than it does in the initiative, thus increasing the costs in usual care.

5. CONCLUSIONS AND CAVEATS

In this report, we have analysed the cost effectiveness of three ageing-in-place initiatives in Hamilton (the Community FIRST initiative), Lower Hutt (the PIP initiative) and Christchurch (the COSE initiative), relative to usual care. While the cost of each initiative was more than the cost for usual care, the three initiatives all had the result of increasing the amount of time spent in the community relative to usual care over a 12 month period, by decreasing the time spent in residential care and the time spent deceased.

In terms of the relative cost effectiveness of each initiative, the COSE initiative in Christchurch is generally the most cost effective of the three. Our base case results suggest that COSE costs an additional \$20 per person over a 12 month period for each extra day spent in the community relative to usual care, while for an extra day in the community the Community FIRST initiative costs an additional \$271 per person and PIP costs an additional \$340 per person.

Our results are subject to a number of caveats. Firstly, the data is taken from a number of different sources that may not necessarily be consistent with each other. Moreover, the data sources also have individual problems. Some of the data has been taken from questionnaires administered to survey participants. However, this is likely to be unreliable due to problems associated with poor recall of elderly participants. While we have replaced these data to the extent possible with invoicing data from the HealthPAC and CCPS databases, these sources may not pick up all resources used over the period (due to discrepancies between the date of invoicing and date of actual resource use) and do not provide a breakdown of resource use into the same 3 month, 12 month and 18 month assessment periods of the questionnaire data.

The data was also subject to low sample sizes at the 18 month collection period in Hamilton and Lower Hutt. While we have not used the data for these two regions, the sensitivity testing shows that including the Christchurch 18 month data gives some substantial changes to the ICER results. Accordingly, it is possible that a larger sample size for Hamilton and Lower Hutt at the 18 month period, or even a longer time period of analysis across all three regions, would give significant changes in results.

Our sensitivity analysis also suggests that the results can be quite sensitive to changes in average resource use. Even within the bounds of a 95 percent confidence interval, the ICER results can change quite considerably. This suggests that if a different sample were chosen then the results may be quite different.

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Caution should also be exercised in interpreting the results of the Community FIRST intervention in Hamilton. As noted above, we used the \$360 per person per week bulk funded cost as the community cost of this intervention, plus resource costs not covered by this amount. This \$360 covers a range of resources, only some of which we have information on. We have assumed that the \$360 accurately reflects the cost of all resources used in the initiative, however it is possible that this may underestimate or overestimate the cost of the actual resource use, and this is something we have not been able to account for.

It should also be noted that the sample for the Community FIRST initiative had much higher levels of disability than the samples for the PIP and COSE initiatives (see p.64 of Parsons et al, 2006). This difference may influence the final results, as Community FIRST may appear much more expensive for the outcome it achieves, but this is because it faced greater challenges with its sampled participants. While adjusting for this difference may be conceptually possible, it is not clear to us how this could be done from the data we had available.¹⁰ Moreover, adjusted and unadjusted figures reported by Parsons et al (2006, p.71) for Christchurch show very little difference. While we cannot be certain of the differences in making an adjustment to the other regions, the sensitivity testing we have conducted should capture this variability.

10 In terms of converting the unadjusted and adjusted hazard ratios of Parsons et al (2006) into changes in the probabilities entering the cost effectiveness analysis.

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APPENDIX A: DETAILED DESCRIPTION OF DATA, METHODOLOGY AND RESULTS

A.1 DATA

The data sources we used for the CEA are as follows:

- ASPIRE study questionnaires: questionnaires were administered to participants in the study at the time they were recruited into the study and at 3, 12 and 18 month intervals after recruitment. The questionnaires were only administered to participants in the community at the date of their assessment, so this excludes those who had moved permanently into a residential home or who were not in the study long enough to receive a questionnaire (see notes below on “censored” observations);
- HealthPAC and CCPS data: we used invoicing data from HealthPAC and the Client Claims Processing System (CCPS). These data were in the form of units and costs invoiced to the DHB for services provided to ASPIRE study participants over the study period; and
- The initial draft economic evaluation: we utilised information from an initial draft of an economic analysis by Brown (2006).¹¹

The ASPIRE questionnaires were based on self-reported resource use by elderly, which is likely to be unreliable due to poor recall. As such, we used as little of this data as possible, and have replaced it with the HealthPAC and CCPS data, where such replacement data were available. We set out the specific data used in our analysis and its source in Table 15.

Table 15: Data Used in CEA

Data Used	Data Source
Resource use for the following resources: GP visits, GP visits at home, day centre, day hospital, hospital admission, A&E admission, meals on wheels, transport, pharmacy visits and modifications. ¹²	ASPIRE questionnaires
Resource use of the following resources: medical specialist, visiting nurse, volunteer services,	HealthPAC data

¹¹ Brown, P. (2006), “Economic Evaluation of the Assessment of Service Promoting Independence and Recovery in Elders (ASPIRE)”, Centre for Health Services Research and Policy, University of Auckland.

¹² These data were not available from the HealthPAC or CCPS datasets. The questionnaire data for GP visits and GP visits at home are relatively reliable, as they were verified by caregivers and family members of the elderly person.

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Data Used	Data Source
physiotherapy, occupational therapy, speech therapy, day care, social worker and dietician.	
Resource use of the following resources: personal care, household management, carer support, respite and day activities.	CCPS data
Days (and probabilities) in community, residential and dead over the period	ASPIRE questionnaires
Distribution of residential home placements (rest home or hospital)	CCPS data
Unit cost of resources	Brown (2006)

These data sources were not all in a consistent and usable format. Thus, we cleansed these datasets in the following ways:

- For the ASPIRE questionnaire data, the questionnaires asked for resource use over a recent time period, which for the data we used was typically two weeks, one month or three months. Thus, the questionnaire does not always provide an indication of the resource use over the entire period. Nonetheless, we assumed that the resource use over the time period given in the questionnaire is representative of the resource use over the entire assessment period, and made an adjustment to reflect this. For example, if a participant's questionnaire at the 3 month assessment gives 2 visits to the GP in the last month, then we assumed that there were 6 visits (2 per month) over the entire 0 to 3 month assessment period;
- For the HealthPAC and CCPS data, the resource use was invoiced over a time period that did not necessarily match up with the particular assessment period (0-3 months, 4-12 months or 13-18 months). To adjust for this we took the time period on the invoice and allocated a proportion of that to the assessment period on a pro rata basis, thus giving the resource use over that entire time period.

A.2 METHODOLOGY

A.2.1 Sample Size

The study of the three ageing-in-place initiatives was undertaken over a 24 month period (from 10 November 2003 to 11 November 2005). Recruitment in to the study sample was staggered (with participants entering the sample throughout the assessment period) and the ASPIRE questionnaires were administered to those in the community at the date of recruitment and 3, 12 and 18 month intervals from their date of recruitment. As such, those participants who had moved into a residential home or had died at one of their assessment dates did not receive a questionnaire, and thus the sample size for which there is questionnaire data decreases over time.

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Furthermore, as a result of the staggered recruitment, a number of participants that were recruited late in the study period were not in the study long enough to receive the later questionnaires (which we refer to as “censored” observations). In the COSE and PIP initiatives, the sample was recruited over 12 months, and thus participants recruited after the first 6 months of the study period would not receive their 18 month questionnaire as the study would have ended. For the Community FIRST initiative the sample was recruited over 18 months and thus some participants recruited after the first year of the study period would not receive their 12 or 18 month questionnaires before the end of the study. Thus, the sample size also decreased over time because of this effect.

Table 16 shows the changes in the number of participants receiving questionnaires at each of the 3, 12 and 18 month assessment dates, by region and initiative/usual care. It is obvious that there is a clear fall in the sample sizes over time. In addition, the samples in Hamilton and Lower Hutt are very small at the 18 month assessment. Accordingly, we have not used the 18 month data for Hamilton and Lower Hutt, as the results will lack statistical power. We use both the sample up to 12 months and the entire sample for Christchurch, but convert our results for the latter to an annual basis to allow meaningful comparisons.

Table 16: Sample Size from ASPIRE Questionnaires

Assessment Date	Hamilton		Lower Hutt		Christchurch	
	Usual Care	Com FIRST	Usual Care	PIP	Usual Care	COSE
Baseline	57	54	53	50	181	169
3 months	34	45	35	37	160	151
12 months	12	15	19	26	117	116
18 months	5	7	6	7	46	62

A further issue regarding the sample is whether to include the data points of censored observations, where they exist. For example, if a participant did not receive a 12 month survey due to being a censored observation, but did receive a 3 month survey, should that participant's 3 month survey be removed from the sample to be analysed? Our approach has been to include censored observations where they exist, as this ensures the sample size is not reduced and thus improves the accuracy of the results. So in this example, the participant's 3 month survey would be included in the analysis of the 0 to 3 month period.

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Note also that there is no measure of resource use available for those who spent some time in the community over an assessment period, but were not in the community at the date of the assessment (and so did not receive a questionnaire). However our calculations implicitly assume that the average of the data for those who were in the community at the assessment date is representative of those who were only in the community for a portion of the assessment period.

A.2.2 Calculation of Costs

We calculated the total costs over a 12 month period for each region and initiative/usual care. Total costs are calculated on the basis of the cost per person over 12 months of being in either the particular initiative or usual care. This is calculated by adding the average cost per person of being in the community, weighted by the probability of being in the community, to the average cost per person of being in residential care, weighted by the probability of being in residential care.¹³ Information on the calculation of each of these variables is given in the following sections.

Community costs

The costs of being in the community include the direct costs to the DHB and the costs to the older person. For given resources used by the older person (e.g. GP visits, meals on wheels, hospital visits, etc) the cost is determined by the number of units of the resource used multiplied by the unit cost for each resource.

We obtained unit cost data from Brown (2006), as shown in Table 17. The estimates are based on information such as salaries, DHB charges, HealthPAC average reimbursements and communication with relevant health officials. Further information on the exact sources for these costs can be found in Brown (2006, table 1).

Table 17: Unit Costs

Resource	Units used in analysis	Unit cost
GP visits	Per visit	\$38.35
GP home visit	Per visit	\$100.00
Medical specialist	Per hour	\$54.93
Visiting nurse	Per hour	\$25.89
Volunteer service	Per hour	\$18.75
Physiotherapy	Per hour	\$27.23
Occupational therapy	Per hour	\$27.23

¹³ No information on death-related costs was available, so we have explicitly excluded this from our analysis.

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Resource	Units used in analysis	Unit cost
Speech therapy	Per hour	\$27.23
Day care	Per hour	\$5.83 ¹⁴
Social worker	Per hour	\$27.23
Dietician	Per hour	\$27.23
Day centre	Per day	\$46.66 ¹⁵
Day hospital	Per day	\$185.05
Hospital stay	Per visit	\$3410.00 ¹⁶
A&E visit	Per visit	\$457
Meals on wheels	Per meal	\$7.16
Pharmacy visit	Per visit	\$15.00
Transport	Per trip	\$15.50
Personal care	Per hour	\$20.14
Household management	Per hour	\$18.87
Carer support	Per hour	\$3.02 ¹⁷
Respite	Per hour	\$4.83 ¹⁸
Day activity	Per hour	\$5.83 ¹⁹

14 We have converted the unit cost for day care from \$46.66 per day in Brown (2006) to per hourly on the basis of an 8 hour day.

15 We have used the unit cost for day care (per day) given in Brown (2006) as the unit cost for a day centre.

16 We have used the unit cost for a hospital admission of \$682 per day given in Brown (2006), and multiplied by the average length of stay (5 days) as noted in Brown (2006) to obtain the unit cost per visit.

17 We have converted the unit cost for carer support from \$72.59 per day in Brown (2006) to per hourly on the basis of a 24 hour day.

18 We have converted the unit cost for respite from \$115.93 per day in Brown (2006) to per hourly on the basis of a 24 hour day.

19 Brown (2006) does not give the unit cost for day activities, and thus we have assumed the hourly cost is the same as that for day care.

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We also incorporated cost information on the upfront assessment costs for each ageing-in-place initiative or usual care. This was again sourced from Brown (2006), where we have used the following costs:

- Hamilton: the cost of the needs assessment and service coordination for usual care in Hamilton is given as \$225. For the Community FIRST scheme, we used the bulk funded cost of \$360 per person per week, as explained earlier;
- Lower Hutt: the usual care cost for the needs assessment and service coordination in Lower Hutt is \$66.21. The initial assessment cost for entry into the PIP initiative is \$595; and
- Christchurch: the usual care cost for the needs assessment and service coordination is \$314.99. The initial assessment cost for entry into the COSE initiative is \$380.

Using the data on resource use from the various sources noted above, we calculated the average use of each resource per person for each region and initiative/usual care, over the 0-3 month, 4-12 month and 12-18 month (for Christchurch only) periods. These averages, along with the standard deviation, for each resource are shown in the first two columns of Table 18 through to Table 31 below. These tables also show the calculation of the total community cost. Note that for the Community FIRST initiative in Hamilton, the actual community cost per person is given by \$360 per week multiplied by the number of weeks in the particular time period, plus the cost of other resources for which we have data on that are not covered by the \$360. Nonetheless, for completeness we include the individual resource costs for all those resources that we have data available for.

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Table 18: Average Community Costs Per Person: Hamilton, Usual Care, 0-3 months

Resource used	Base average units	Standard deviation of units used	Unit cost	Total cost over period
GP visits	1.59	1.84	38.35	60.91
GP visits at home	0.44	1.67	100.00	44.12
Medical specialist	0.30	0.79	54.93	16.69
Visiting nurse	0.83	2.51	25.89	21.58
Volunteer services	1.62	4.79	18.75	30.33
Physiotherapy	0.39	0.95	27.23	10.68
Occupational therapy	0.50	1.48	27.23	13.48
Speech therapy	0.00	0.00	27.23	0.00
Day care	3.35	6.14	5.83	19.56
Social worker	0.14	0.45	27.23	3.74
Dietician	0.00	0.00	27.23	0.00
Day centre	3.63	7.01	46.66	169.49
Day hospital	0.00	0.00	185.05	0.00
Hospital admission	0.26	0.62	3410.00	902.65
A&E admission	0.12	0.33	457.00	53.76
Meals on wheels	9.26	22.33	7.16	66.34
Transport	26.00	29.25	15.50	403.00
Pharmacy visits	10.88	32.82	15.00	163.24
Modifications	45.88	177.89	1.00	45.88
Personal care	56.62	74.72	20.14	1140.31
Household Management	7.64	9.37	18.87	144.08
Carer support	34.17	78.64	3.02	103.36
Respite	0.00	0.00	4.83	0.00
Day Activity	0.00	0.00	5.83	0.00
Initial programme cost				225.00
TOTAL COMMUNITY COST				3638.18

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Table 19: Average Community Costs Per Person: Hamilton, Community FIRST, 0-3 months

Resource used	Base average units	Standard deviation of units used	Unit cost	Total cost over period
GP visits	2.40	2.76	38.35	92.04
GP visits at home	0.53	1.47	100.00	53.33
Medical specialist	0.41	0.73	54.93	22.58
Visiting nurse	0.18	0.39	25.89	4.60
Volunteer services	0.18	0.78	18.75	3.33
Physiotherapy	0.34	0.90	27.23	9.28
Occupational therapy	0.08	0.45	27.23	2.12
Speech therapy	0.02	0.15	27.23	0.61
Day care	5.42	12.37	5.83	31.63
Social worker	0.00	0.00	27.23	0.00
Dietician	0.02	0.15	27.23	0.61
Day centre	7.94	14.79	46.66	370.69
Day hospital	0.29	1.35	185.05	53.46
Hospital admission	0.18	0.49	3410.00	606.22
A&E admission	0.13	0.34	457.00	60.93
Meals on wheels	20.53	29.57	7.16	147.02
Transport	34.86	38.83	15.50	540.39
Pharmacy visits	5.56	5.18	15.00	83.33
Modifications	137.29	724.58	1.00	137.29
Personal care	7.17	23.90	20.14	144.47
Household Management	1.88	7.52	18.87	35.50
Carer support	0.00	0.00	3.02	0.00
Respite	0.00	0.00	4.83	0.00
Day Activity	0.00	0.00	5.83	0.00
Community cost using known resources				2399.43
TOTAL COMMUNITY COST (bulk funded + resources not covered)				5854.09

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Table 20: Average Community Costs Per Person: Hamilton, Usual Care, 4-12 months

Resource used	Base average units	Standard deviation of units used	Unit cost	Total cost over period
GP visits	6.00	8.86	38.35	230.10
GP visits at home	0.00	0.00	100.00	0.00
Medical specialist	0.00	0.00	54.93	0.00
Visiting nurse	0.43	0.79	25.89	11.15
Volunteer services	0.67	1.78	18.75	12.50
Physiotherapy	0.00	0.00	27.23	0.00
Occupational therapy	0.17	0.39	27.23	4.54
Speech therapy	0.04	0.14	27.23	1.13
Day care	6.67	10.70	5.83	38.88
Social worker	0.00	0.00	27.23	0.00
Dietician	0.00	0.00	27.23	0.00
Day centre	32.50	52.15	46.66	1516.45
Day hospital	0.00	0.00	185.05	0.00
Hospital admission	0.00	0.00	3410.00	0.00
A&E admission	0.00	0.00	457.00	0.00
Meals on wheels	15.00	51.96	7.16	107.40
Transport	87.75	70.80	15.50	1360.13
Pharmacy visits	10.75	12.23	15.00	161.25
Modifications	458.33	1495.73	1.00	458.33
Personal care	164.62	216.42	20.14	3315.52
Household Management	35.29	35.28	18.87	665.90
Carer support	151.12	289.82	3.02	457.08
Respite	0.00	0.00	4.83	0.00
Day Activity	0.00	0.00	5.83	0.00
Initial programme cost				0.00
TOTAL COMMUNITY COST				8340.37

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Table 21: Average Community Costs Per Person: Hamilton, Community FIRST, 4-12 months

Resource used	Base average units	Standard deviation of units used	Unit cost	Total cost over period
GP visits	9.60	9.90	38.35	368.16
GP visits at home	0.00	0.00	100.00	0.00
Medical specialist	0.67	1.19	54.93	36.62
Visiting nurse	0.02	0.09	25.89	0.58
Volunteer services	0.00	0.00	18.75	0.00
Physiotherapy	0.13	0.52	27.23	3.63
Occupational therapy	0.00	0.00	27.23	0.00
Speech therapy	0.07	0.26	27.23	1.82
Day care	25.00	51.29	5.83	145.81
Social worker	0.27	1.03	27.23	7.26
Dietician	0.00	0.00	27.23	0.00
Day centre	50.70	62.45	46.66	2365.66
Day hospital	0.00	0.00	185.05	0.00
Hospital admission	0.40	1.06	3410.00	1364.00
A&E admission	0.60	1.68	457.00	274.20
Meals on wheels	60.00	87.83	7.16	429.60
Transport	153.40	171.57	15.50	2377.70
Pharmacy visits	18.00	15.38	15.00	270.00
Modifications	205.33	795.25	1.00	205.33
Personal care	22.50	72.92	20.14	453.25
Household Management	1.67	6.45	18.87	31.44
Carer support	0.00	0.00	3.02	0.00
Respite	0.00	0.00	4.83	0.00
Day Activity	0.00	0.00	5.83	0.00
Community cost using known resources				8335.06
TOTAL COMMUNITY COST (bulk funded + resources not covered)				16726.99

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Table 22: Average Community Costs Per Person: Lower Hutt, Usual Care, 0-3 months

Resource used	Base average units	Standard deviation of units used	Unit cost	Total cost over period
GP visits	2.74	2.23	38.35	105.19
GP visits at home	0.43	1.07	100.00	42.86
Medical specialist	0.83	3.39	54.93	45.51
Visiting nurse	0.71	3.22	25.89	18.49
Volunteer services	0.46	2.08	18.75	8.57
Physiotherapy	0.26	0.95	27.23	7.00
Occupational therapy	0.14	0.49	27.23	3.89
Speech therapy	0.00	0.00	27.23	0.00
Day care	9.14	21.02	5.83	53.33
Social worker	0.03	0.17	27.23	0.78
Dietician	0.00	0.00	27.23	0.00
Day centre	3.71	8.68	46.66	173.31
Day hospital	0.74	4.39	185.05	137.47
Hospital admission	0.40	0.85	3410.00	1364.00
A&E admission	0.37	0.88	457.00	169.74
Meals on wheels	17.06	29.88	7.16	122.13
Transport	19.50	17.60	15.50	302.25
Pharmacy visits	3.60	3.72	15.00	54.00
Modifications	17.14	87.13	1.00	17.14
Personal care	33.97	87.46	20.14	684.12
Household Management	12.29	30.59	18.87	231.92
Carer support	0.00	0.00	3.02	0.00
Respite	0.00	0.00	4.83	0.00
Day Activity	0.35	2.08	5.83	2.05
Initial programme cost				66.21
TOTAL COMMUNITY COST				3609.95

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Table 23: Average Community Costs Per Person: Lower Hutt, PIP, 0-3 months

Resource used	Base average units	Standard deviation of units used	Unit cost	Total cost over period
GP visits	2.76	2.59	38.35	105.72
GP visits at home	0.89	1.85	100.00	89.19
Medical specialist	0.38	0.72	54.93	20.78
Visiting nurse	6.46	36.77	25.89	167.24
Volunteer services	0.03	0.16	18.75	0.51
Physiotherapy	1.99	3.08	27.23	54.21
Occupational therapy	0.05	0.33	27.23	1.47
Speech therapy	0.00	0.00	27.23	0.00
Day care	5.81	17.75	5.83	33.89
Social worker	0.00	0.00	27.23	0.00
Dietician	0.00	0.00	27.23	0.00
Day centre	4.74	12.69	46.66	221.32
Day hospital	0.00	0.00	185.05	0.00
Hospital admission	0.30	0.46	3410.00	1013.78
A&E admission	0.30	0.46	457.00	135.86
Meals on wheels	17.84	31.70	7.16	127.72
Transport	27.49	22.47	15.50	426.03
Pharmacy visits	4.03	4.84	15.00	60.41
Modifications	599.27	3283.82	1.00	599.27
Personal care	42.22	68.21	20.14	850.29
Household Management	27.11	73.48	18.87	511.54
Carer support	0.00	0.00	3.02	0.00
Respite	0.00	0.00	4.83	0.00
Day Activity	0.00	0.00	5.83	0.00
Initial programme cost				595.00
TOTAL COMMUNITY COST				5014.23

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Table 24: Average Community Costs Per Person: Lower Hutt, Usual Care, 4-12 months

Resource used	Base average units	Standard deviation of units used	Unit cost	Total cost over period
GP visits	7.11	7.69	38.35	272.49
GP visits at home	0.95	2.84	100.00	94.74
Medical specialist	0.05	0.23	54.93	2.89
Visiting nurse	0.45	1.12	25.89	11.58
Volunteer services	0.00	0.00	18.75	0.00
Physiotherapy	0.16	0.50	27.23	4.30
Occupational therapy	0.00	0.00	27.23	0.00
Speech therapy	0.00	0.00	27.23	0.00
Day care	1.89	4.69	5.83	11.05
Social worker	0.00	0.00	27.23	0.00
Dietician	0.11	0.46	27.23	2.87
Day centre	12.32	26.17	46.66	574.65
Day hospital	0.00	0.00	185.05	0.00
Hospital admission	0.79	1.69	3410.00	2692.11
A&E admission	0.16	0.69	457.00	72.16
Meals on wheels	21.32	56.86	7.16	152.62
Transport	69.33	76.33	15.50	1074.67
Pharmacy visits	12.79	10.81	15.00	191.84
Modifications	2.11	9.18	1.00	2.11
Personal care	35.25	70.99	20.14	710.03
Household Management	13.29	32.18	18.87	250.78
Carer support	0.00	0.00	3.02	0.00
Respite	0.41	1.78	4.83	1.98
Day Activity	9.60	30.62	5.83	55.99
Initial programme cost				0.00
TOTAL COMMUNITY COST				6178.84

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Table 25: Average Community Costs Per Person: Lower Hutt, PIP, 4-12 months

Resource used	Base average units	Standard deviation of units used	Unit cost	Total cost over period
GP visits	6.58	5.43	38.35	252.23
GP visits at home	1.38	3.31	100.00	138.46
Medical specialist	0.01	0.07	54.93	0.70
Visiting nurse	0.27	0.86	25.89	6.97
Volunteer services	0.77	3.92	18.75	14.42
Physiotherapy	0.29	1.18	27.23	7.85
Occupational therapy	0.02	0.10	27.23	0.52
Speech therapy	0.00	0.00	27.23	0.00
Day care	1.62	5.77	5.83	9.42
Social worker	0.00	0.00	27.23	0.00
Dietician	0.00	0.00	27.23	0.00
Day centre	22.50	40.04	46.66	1049.85
Day hospital	0.00	0.00	185.05	0.00
Hospital admission	0.35	0.98	3410.00	1180.38
A&E admission	0.46	1.10	457.00	210.92
Meals on wheels	40.50	80.95	7.16	289.98
Transport	61.50	55.34	15.50	953.25
Pharmacy visits	9.23	5.81	15.00	138.46
Modifications	7.38	37.65	1.00	7.38
Personal care	105.57	135.37	20.14	2126.12
Household Management	39.07	83.09	18.87	737.27
Carer support	24.68	87.26	3.02	74.64
Respite	23.65	83.79	4.83	114.24
Day Activity	36.14	80.61	5.83	210.80
Initial programme cost				0.00
TOTAL COMMUNITY COST				7523.89

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Table 26: Average Community Costs Per Person: Christchurch, Usual Care, 0-3 months

Resource used	Base average units	Standard deviation of units used	Unit cost	Total cost over period
GP visits	2.61	2.29	38.35	99.95
GP visits at home	0.26	1.18	100.00	26.25
Medical specialist	0.22	0.71	54.93	12.02
Visiting nurse	0.43	1.78	25.89	11.17
Volunteer services	0.23	1.30	18.75	4.28
Physiotherapy	0.43	2.08	27.23	11.83
Occupational therapy	0.03	0.18	27.23	0.68
Speech therapy	0.03	0.32	27.23	0.68
Day care	3.15	11.83	5.83	18.37
Social worker	0.02	0.14	27.23	0.51
Dietician	0.00	0.00	27.23	0.00
Day centre	1.38	4.97	46.66	64.45
Day hospital	0.08	1.03	185.05	15.04
Hospital admission	0.17	0.47	3410.00	575.44
A&E admission	0.08	0.27	457.00	37.13
Meals on wheels	8.85	20.02	7.16	63.37
Transport	24.90	22.91	15.50	385.89
Pharmacy visits	3.27	3.19	15.00	49.03
Modifications	91.14	779.79	1.00	91.14
Personal care	16.59	24.38	20.14	334.14
Household Management	18.87	13.70	18.87	356.03
Carer support	35.12	128.18	3.02	106.23
Respite	4.74	35.49	4.83	22.92
Day Activity	3.22	14.30	5.83	18.77
Initial programme cost				314.99
TOTAL COMMUNITY COST				2620.28

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Table 27: Average Community Costs Per Person: Christchurch, COSE, 0-3 months

Resource used	Base average units	Standard deviation of units used	Unit cost	Total cost over period
GP visits	2.30	2.48	38.35	88.38
GP visits at home	0.34	1.12	100.00	33.77
Medical specialist	0.28	1.39	54.93	15.22
Visiting nurse	0.69	2.42	25.89	17.92
Volunteer services	0.34	1.96	18.75	6.46
Physiotherapy	0.61	2.62	27.23	16.50
Occupational therapy	0.25	2.02	27.23	6.85
Speech therapy	0.00	0.00	27.23	0.00
Day care	6.75	26.75	5.83	39.40
Social worker	0.05	0.32	27.23	1.41
Dietician	0.00	0.00	27.23	0.00
Day centre	2.54	9.87	46.66	118.50
Day hospital	0.00	0.00	185.05	0.00
Hospital admission	0.18	0.48	3410.00	609.74
A&E admission	0.04	0.20	457.00	18.16
Meals on wheels	11.19	22.75	7.16	80.09
Transport	24.98	23.68	15.50	387.23
Pharmacy visits	3.15	3.00	15.00	47.19
Modifications	257.68	1848.07	1.00	257.68
Personal care	19.26	32.94	20.14	387.92
Household Management	20.69	18.81	18.87	390.41
Carer support	37.82	127.05	3.02	114.40
Respite	13.21	65.98	4.83	63.80
Day Activity	2.98	14.16	5.83	17.37
Initial programme cost				380.00
TOTAL COMMUNITY COST				3098.40

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Table 28: Average Community Costs Per Person: Christchurch, Usual Care, 4-12 months

Resource used	Base average units	Standard deviation of units used	Unit cost	Total cost over period
GP visits	6.62	6.73	38.35	253.70
GP visits at home	0.62	3.06	100.00	61.54
Medical specialist	1.59	14.78	54.93	87.32
Visiting nurse	0.64	2.86	25.89	16.56
Volunteer services	0.49	3.34	18.75	9.13
Physiotherapy	0.20	1.01	27.23	5.35
Occupational therapy	0.09	0.79	27.23	2.56
Speech therapy	0.03	0.26	27.23	0.93
Day care	4.24	15.17	5.83	24.73
Social worker	0.01	0.10	27.23	0.35
Dietician	0.00	0.05	27.23	0.12
Day centre	4.67	16.52	46.66	217.75
Day hospital	0.50	4.02	185.05	92.53
Hospital admission	0.38	1.28	3410.00	1311.54
A&E admission	0.15	0.77	457.00	70.31
Meals on wheels	27.31	57.24	7.16	195.52
Transport	77.51	67.98	15.50	1201.35
Pharmacy visits	9.26	8.78	15.00	138.85
Modifications	68.63	739.58	1.00	68.63
Personal care	50.31	70.62	20.14	1013.14
Household Management	60.25	38.66	18.87	1136.86
Carer support	85.65	234.35	3.02	259.05
Respite	12.25	64.75	4.83	59.16
Day Activity	10.70	48.70	5.83	62.41
Initial programme cost				0.00
TOTAL COMMUNITY COST				6289.39

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Table 29: Average Community Costs Per Person: Christchurch, COSE, 4-12 months

Resource used	Base average units	Standard deviation of units used	Unit cost	Total cost over period
GP visits	6.28	6.42	38.35	241.01
GP visits at home	1.24	4.09	100.00	124.14
Medical specialist	0.59	3.40	54.93	32.67
Visiting nurse	0.54	2.54	25.89	13.95
Volunteer services	0.07	0.39	18.75	1.29
Physiotherapy	0.50	2.52	27.23	13.62
Occupational therapy	0.15	1.11	27.23	3.99
Speech therapy	0.03	0.28	27.23	0.70
Day care	6.76	23.51	5.83	39.42
Social worker	0.05	0.29	27.23	1.45
Dietician	0.00	0.00	27.23	0.00
Day centre	7.56	27.91	46.66	352.97
Day hospital	0.34	3.62	185.05	62.22
Hospital admission	0.44	1.14	3410.00	1499.22
A&E admission	0.16	0.67	457.00	70.91
Meals on wheels	43.60	75.22	7.16	312.20
Transport	69.77	66.01	15.50	1081.38
Pharmacy visits	9.12	8.35	15.00	136.75
Modifications	485.26	3987.73	1.00	485.26
Personal care	59.63	99.40	20.14	1201.02
Household Management	61.59	40.65	18.87	1162.29
Carer support	64.26	194.38	3.02	194.37
Respite	19.22	103.73	4.83	92.85
Day Activity	9.20	39.87	5.83	53.68
Initial programme cost				0.00
TOTAL COMMUNITY COST				7177.36

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Table 30: Average Community Costs Per Person: Christchurch, Usual Care, 13-18 months

Resource used	Base average units	Standard deviation of units used	Unit cost	Total cost over period
GP visits	5.48	6.67	38.35	210.09
GP visits at home	0.52	1.71	100.00	52.17
Medical specialist	0.40	1.25	54.93	21.89
Visiting nurse	0.70	3.08	25.89	18.01
Volunteer services	0.09	0.59	18.75	1.63
Physiotherapy	0.09	0.35	27.23	2.37
Occupational therapy	0.00	0.00	27.23	0.00
Speech therapy	0.00	0.00	27.23	0.00
Day care	2.96	9.14	5.83	17.24
Social worker	0.00	0.00	27.23	0.00
Dietician	0.00	0.00	27.23	0.00
Day centre	2.26	7.41	46.66	105.49
Day hospital	0.28	1.92	185.05	52.30
Hospital admission	0.35	0.87	3410.00	1186.09
A&E admission	0.13	0.50	457.00	59.61
Meals on wheels	18.65	39.80	7.16	133.55
Transport	47.67	32.09	15.50	738.83
Pharmacy visits	7.00	6.24	15.00	105.00
Modifications	44.57	294.81	1.00	44.57
Personal care	26.26	39.22	20.14	528.83
Household Management	43.54	25.50	18.87	821.54
Carer support	35.80	123.76	3.02	108.27
Respite	8.09	54.86	4.83	39.07
Day Activity	1.69	10.80	5.83	9.85
Initial programme cost				0.00
TOTAL COMMUNITY COST				4256.42

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Table 31: Average Community Costs Per Person: Christchurch, COSE, 13-18 months

Resource used	Base average units	Standard deviation of units used	Unit cost	Total cost over period
GP visits	5.03	5.45	38.35	192.99
GP visits at home	0.48	2.25	100.00	48.39
Medical specialist	0.18	0.68	54.93	9.89
Visiting nurse	0.85	3.31	25.89	21.92
Volunteer services	0.00	0.00	18.75	0.00
Physiotherapy	0.25	0.90	27.23	6.81
Occupational therapy	0.10	0.56	27.23	2.64
Speech therapy	0.02	0.13	27.23	0.44
Day care	10.84	30.08	5.83	63.22
Social worker	0.05	0.28	27.23	1.32
Dietician	0.00	0.00	27.23	0.00
Day centre	8.39	24.36	46.66	391.34
Day hospital	0.42	3.30	185.05	77.60
Hospital admission	0.35	1.17	3410.00	1210.00
A&E admission	0.00	0.00	457.00	0.00
Meals on wheels	26.13	48.07	7.16	187.08
Transport	43.33	40.96	15.50	671.67
Pharmacy visits	6.58	6.55	15.00	98.71
Modifications	403.39	1928.69	1.00	403.39
Personal care	45.68	78.51	20.14	920.09
Household Management	38.56	28.00	18.87	727.65
Carer support	49.38	130.29	3.02	149.36
Respite	33.91	123.18	4.83	163.78
Day Activity	9.48	35.99	5.83	55.30
Initial programme cost				0.00
TOTAL COMMUNITY COST				5403.56

Residential Costs

The costs of residential home placement are the costs associated with permanent entry into either a rest home or hospital. From the CCPS data, we determined the number of study participants who had entered each type of residential care facility (rest home or hospital) for each region and initiative/usual care. As the sample size in the CCPS data for those entering a residential care facility in each assessment period was relatively small, we determined these numbers over the aggregated periods of 0 to 12 months and 0 to 18 months (for Christchurch only). From this we determined the probability of being in either type of facility, and used this information to weight the costs of each facility.

Cost information for being in a residential care facility was obtained from Brown (2006). In particular, we used the following unit costs:

- For hospitals, we used a cost of \$682 per day; and
- For rest homes, we used the average of the cost per day across the four different level facilities noted in Brown (2006), which equals \$87.50.

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These costs were multiplied by the number of days over the time period considered (0 to 12 months or 0 to 18 months) and weighted by the probabilities mentioned above to determine the total residential cost over each assessment period. These results are shown in Table 32 to Table 39 below.

Table 32: Average Residential Cost Per Person: Hamilton, Usual Care, 0-12 Months

Residential facility	Probability	Cost over period	Weighted cost over period
Residential care: hospital cost	0.33	248,930	82,977
Residential care: resthome cost	0.67	31,938	21,292
TOTAL RESIDENTIAL COST			104,268

Table 33: Average Residential Cost Per Person: Hamilton, Community FIRST, 0-12 Months

Residential facility	Probability	Cost over period	Weighted cost over period
Residential care: hospital cost	0.55	248,930	135,780
Residential care: resthome cost	0.45	31,938	14,517
TOTAL RESIDENTIAL COST			150,297

Table 34: Average Residential Cost Per Person: Lower Hutt, Usual Care, 0-12 Months

Residential facility	Probability	Cost over period	Weighted cost over period
Residential care: hospital cost	0.39	248,930	96,806
Residential care: resthome cost	0.61	31,938	19,517
TOTAL RESIDENTIAL COST			116,323

Table 35: Average Residential Cost Per Person: Lower Hutt, PIP, 0-12 Months

Residential facility	Probability	Cost over period	Weighted cost over period
Residential care: hospital cost	0.73	248,930	181,040
Residential care: resthome cost	0.27	31,938	8,710
TOTAL RESIDENTIAL COST			189,750

Table 36: Average Residential Cost Per Person: Christchurch, Usual Care, 0-12 Months

Residential facility	Probability	Cost over period	Weighted cost over period
Residential care: hospital cost	0.29	248,930	73,215
Residential care: resthome cost	0.71	31,938	22,544
TOTAL RESIDENTIAL COST			95,759

Table 37: Average Residential Cost Per Person: Christchurch, COSE, 0-12 Months

Residential facility	Probability	Cost over period	Weighted cost over period
Residential care: hospital cost	0.35	248,930	87,858
Residential care: resthome cost	0.65	31,938	20,665
TOTAL RESIDENTIAL COST			108,523

Table 38: Average Residential Cost Per Person: Christchurch, Usual Care, 0-18 Months

Residential facility	Probability	Cost over period	Weighted cost over period
Residential care: hospital cost	0.39	373,736	146,245
Residential care: resthome cost	0.61	47,950	29,187
TOTAL RESIDENTIAL COST			175,431

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Table 39: Average Residential Cost Per Person: Christchurch, COSE, 0-18 Months

Residential facility	Probability	Cost over period	Weighted cost over period
Residential care: hospital cost	0.35	373,736	130,808
Residential care: resthome cost	0.65	47,950	31,168
TOTAL RESIDENTIAL COST			161,975

Probabilities

We have calculated the average probability per person of being in the community and of being in a residential home over the 0 to 12 month period for all regions, and 0 to 18 months for Christchurch. This is calculated from the ASPIRE questionnaire data on the basis of the number of days spent in either the community or residential home. That is, for each study participant we calculated the number of days they spent in the community or residential home as a proportion of the number of days in the period. Censored observations for which we did not have information on their status (community or residential home) over the period were excluded from this calculation. We then averaged these proportions to determine the average proportion of time per person.

Table 40 shows the results from calculating the proportions over the 0 to 12 month period (and 0 to 18 months for Christchurch). These results can be interpreted as follows, using the example of the Community FIRST scheme in Hamilton: the average person in the Community FIRST scheme spent 67% of the 12 months in the community, 21% in a residential home, and 12% dead.

Table 40: Proportion of Time Spent in Community, Residential or Dead²⁰

	Hamilton (0-12mths)		Lower Hutt (0-12mths)		Christchurch (0-12mths)		Christchurch (0-18mths)	
	Usual Care	Com FIRST	Usual Care	PIP	Usual Care	COSE	Usual Care	COSE
Proportion of Time in Community	0.54	0.67	0.70	0.76	0.87	0.89	0.68	0.78
Proportion of Time in Residential	0.25	0.21	0.22	0.16	0.06	0.04	0.17	0.10
Proportion of Time Dead	0.22	0.12	0.08	0.08	0.07	0.06	0.15	0.12

²⁰ Figures may not sum to 100 due to rounding.

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Total costs

Total costs are calculated by first summing the 0 to 3 month community costs and the 4 to 12 month community costs for each region and initiative/usual care to get the total community costs over the 12-month period. For Christchurch, we also sum the community costs over the 13 to 18 month period. We also use the total residential care costs over the 0-12 month period and 13 to 18 month period (for Christchurch only). Total costs are then given by the following equation:

$$\text{Total costs} = (\text{Total community care costs} \times \text{Probability of being in the community}) + (\text{Total residential care costs} \times \text{Probability of being in residential care})$$

Calculation of the costs in this way is shown in Table 41 for usual care in each region and Table 42 for the ageing-in-place initiative in each region. Also shown in these two tables is the number of days in the community, in a residential home and dead over the relevant periods. Note that the costs for the 0 to 18 month period for Christchurch have been converted to an annual basis (by multiplying by 12/18) in order to assist in comparability with the other calculations. Note also that, as explained earlier, the community costs in Hamilton are based on the bulk funded amount of \$360 per person per week plus the cost for resources not covered by this amount (GP visits, GP visits at home, medical specialist, speech therapy, social worker, dietician, day hospital, hospital admission, A&E admission, meals on wheels and modifications).

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Table 41: Calculation of Total Costs for Usual Care in Each Region

Usual Care	Hamilton 0-12 months	Lower Hutt 0-12 months	Christchurch 0-12 months	Christchurch 0-18 months
COMMUNITY COSTS	11,978.55	9,788.79	8,909.67	8,882.39
Prob in community 0-12m	0.54	0.70	0.87	0.68
GP visits	291.01	377.68	353.65	375.83
GP visits at home	44.12	137.59	87.79	93.31
Medical specialist	16.69	48.40	99.34	80.82
Visiting nurse	32.72	30.08	27.72	30.49
Volunteer services	42.83	8.57	13.41	10.03
Physiotherapy	10.68	11.30	17.18	13.03
Occupational therapy	18.02	3.89	3.24	2.16
Speech therapy	1.13	0.00	1.61	1.07
Day care	58.44	64.38	43.10	40.23
Social worker	3.74	0.78	0.86	0.57
Dietician	0.00	2.87	0.12	0.08
Day centre	1,685.94	747.96	282.20	258.46
Day hospital	0.00	137.47	107.56	106.57
Hospital admission	902.65	4,056.11	1,886.98	2048.71
A&E admission	53.76	241.90	107.44	111.37
Meals on wheels	173.74	274.75	258.89	261.63
Transport	1,763.13	1,376.92	1,587.24	1550.72
Pharmacy visits	324.49	245.84	187.88	195.25
Modifications	504.22	19.25	159.77	136.22
Personal care	4,455.84	1,394.14	1,347.28	1250.74
Household Management	809.99	482.69	1,492.89	1542.96
Carer support	560.44	0.00	365.28	315.70
Respite	0.00	1.98	82.08	80.77
Day Activity	0.00	58.04	81.18	60.69
Initial programme cost	225.00	66.21	314.99	314.99
RESIDENTIAL COSTS	104,268.33	116,323.47	95,758.82	116,954
Prob in residential 0-12m	0.25	0.22	0.06	0.17
TOTAL COST	32,413.00	32,731.50	13,778.74	25,535.48
Days in community 0-12m	195.43	254.88	317.81	374.19
Days in residential 0-12m	91.07	81.31	22.99	91.18
Days dead 0-12m	78.67	28.96	24.52	82.33

Table 42: Calculation of Total Costs for the Ageing-in-Place Initiative in Each Region

Intervention	Hamilton 0-12 months	Lower Hutt 0-12 months	Christchurch 0-12 months	Christchurch 0-18 months
COMMUNITY COSTS	22,581.08	12,538.12	10,275.76	10,579.55
Prob in community 0-12m	0.67	0.76	0.89	0.78
GP visits	460.20	357.95	329.39	348.25
GP visits at home	53.33	227.65	157.91	137.53
Medical specialist	59.20	21.49	47.89	38.52
Visiting nurse		174.21	31.87	35.86
Volunteer services		14.93	7.75	5.17
Physiotherapy		62.07	30.12	24.62
Occupational therapy		2.00	10.84	8.99
Speech therapy	2.42	0.00	0.70	0.76
Day care		43.31	78.82	94.69
Social worker	7.26	0.00	2.86	2.79
Dietician	0.61	0.00	0.00	0.00
Day centre		1271.17	471.47	575.21
Day hospital	53.46	0.00	62.22	93.21
Hospital admission	1970.22	2194.17	2108.96	2212.64
A&E admission	335.13	346.79	89.07	59.38
Meals on wheels	576.62	417.70	392.29	386.25
Transport		1379.28	1468.61	1426.85
Pharmacy visits		198.87	183.93	188.43
Modifications	342.62	606.65	742.94	764.22
Personal care		2976.40	1588.93	1672.68
Household Management		1248.81	1552.71	1520.24
Carer support		74.64	308.77	305.42
Respite		114.24	156.64	213.61
Day Activity		210.80	71.06	84.24
Initial programme cost		595.00	380.00	380.00
RESIDENTIAL COSTS	150,297.05	189,750.23	108,523.09	107,983.40
Prob in residential 0-12m	0.21	0.16	0.04	0.10
TOTAL COST	46,255.66	40,559.78	13,936.23	19,147.03
Days in community 0-12m	246.46	277.90	325.63	427.35
Days in residential 0-12m	75.35	59.69	16.09	55.23
Days dead 0-12m	43.38	27.55	23.69	65.18

A.2.3 Calculation of Benefits

The key outcome from the ageing-in-place initiatives is keeping elderly people in the community for longer, by both avoiding residential home admission and prolonging life. The key outcome is therefore the additional days spent in the community, and this can be broken down into:

- Additional days of residential care avoided; and
- Additional days of death avoided.

Given that the time spent in each of the community, residential home or dead has already been calculated to determine the proportions in Table 40 above, calculating these benefits is straightforward. Each is simply a measure of the average number of days per person spent in each state over the 0 to 12 month period for each region and initiative/usual care (and 0 to 18 month period for Christchurch).

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A.3 RESULTS

We calculate the ICER over the 0 to 12 month timeframe (and 0 to 18 months for Christchurch) by comparing the incremental average total cost per person TC (that is, average total cost for initiative I less average total cost for usual care U) with the incremental benefit per person. As noted above, the benefit is one of days in the community (Com), days in residential care (RC) or days deceased (D). That is, for each region and initiative/usual care we can calculate three ICERs:

$$ICER_{Com} = \frac{TC_I - TC_U}{Com_I - Com_U}$$

$$ICER_{Res} = \frac{TC_I - TC_U}{RC_I - RC_U}$$

$$ICER_D = \frac{TC_I - TC_U}{D_I - D_U}$$

Each ICER represents, respectively, the incremental cost per person per day of community care gained, per day of residential care avoided, and per day of death avoided.

We have calculated each ICER on the basis of the cost per person per annum. The results are shown in Table 43.

Table 43: ICER Results

Incremental Cost Effectiveness Ratio	Hamilton 0 -12 months	Lower Hutt 0 – 12 months	Christchurch 0 – 12 months	Christchurch 0 – 18 months
ICER: cost per person per annum				
ICER community (days gained)	271.26	340.07	20.13	-120.18
ICER residential (days avoided)	880.57	361.96	22.84	177.74
ICER deceased (days avoided)	392.27	5,545.03	190.74	372.50