

INTEGRATED HOMES, CARE AND SUPPORT

Measurable Outcomes
for Healthy Ageing

The ExtraCare Charitable Trust
Research Report

March 2019

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It's not all about age!



Aston University
Birmingham



Lancaster
University

What is The ExtraCare Charitable Trust?

ExtraCare is a registered charity established in 1988 and based in Coventry. Our vision is better lives for older people and our mission is creating sustainable communities that provide homes older people want, lifestyles they can enjoy and care if it's needed. To deliver our vision and mission we essentially do three things:

- **We develop new villages**
- **We operate villages and schemes**
- **We support our villages, schemes and our 'extra-care' model through fundraising, advocacy and research**

Each village or scheme has 5 to 18 social, health and leisure facilities that are accessible to our residents, volunteers and local people representing all age groups living in surrounding communities. Our Charity Shops help fund care and well-being services for older people living at our each of our locations.

What does this research tell us about ExtraCare residents during the past five years? Here are the key findings:

Personal Health

- Significant improvements in the level of exercise done by residents (75% increase)
- Improvements in residents' perceived health, which is a good indicator of their actual health status
- No change (either improvement or deterioration) in residents' level of independence or functional limitations over the 5 year period
- Increase in walking speed, where slow walking speed is an indicator of falls risk
- A reduction in risk of falls over the first 2 years of living in ExtraCare and no changes in the risk of falls over a 5 year period
- The increase of frailty is delayed by up to 3 years in residents

Psychological Well-being

- Low levels of depression and depressive symptoms in residents
- 23% decrease in anxiety symptoms
- Improvements in memory and cognitive skills: 24% increase in autobiographical memory and 17% increase in memory recall tests
- No decline in measures of executive function over the range of the study
- Improvements in physical fitness measured using walking speed have benefited residents in terms of psychological Well-being and reduced depressive symptoms. Analysis of relationships shows that if walking speed had stayed the same, depression would have increased

Social Well-being

- 86.5% of residents were 'never or hardly ever' lonely
- Levels of loneliness are lower for residents in ExtraCare than the national averages

Healthcare Costs

- Residents are making more effective use of healthcare resources, reducing visits to GPs but increasing visits to Practice Nurses
- Residents average 3 days less per year in hospital than previously
- There are no expected increases in NHS costs over time as people age
- Living in ExtraCare saves the NHS around £1,994 per person, on average, over 5 years

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1. Introduction

This report provides an overview of the research findings from the collaborative research project between Aston Research Centre for Healthy Ageing (ARCHA) and the ExtraCare Charitable Trust, collated by Professor Carol Holland, Centre for Ageing Research (C4AR), Lancaster University. This report extends the findings of the 2015 report, covering the period from 2012 to 2018. Throughout the report, the focus is on the benefits to residents generated through ExtraCare villages and schemes, including sustained improvements in markers of health and well-being for residents and subsequent cost implications for the NHS.

1.1 Contributions to this Report

This report began with contributions from both Jennifer O'Donnell, the Knowledge Transfer Partnership (KTP) associate¹ in September 2017, and Ian Garner, the PhD student in April 2018. ExtraCare have made a small further grant to enable the original Principal Investigator (PI) on the collaborative project, Professor Carol Holland and a Research Fellow, Dr. Holly Gwyther, to spend some time updating and furthering the report.

As always, the emphasis of the report is on key learning points: what are the implications of the findings and what could be further developed? These questions are also informed by a wealth of background knowledge from the published scientific and social science literature, which the specialist authors of this report are well placed to provide.

1.2 Original Objectives

The original objective of the study, reported in 2015 was to evaluate whether the ExtraCare approach gave positive outcomes for healthy ageing which resulted in measurable health and social care cost savings. In that longitudinal study, measures of health, well-being, cognitive ability and mobility in 162 new residents across thirteen ExtraCare villages and schemes, were compared with measures from 39 control participants at 3, 12 and 18 months. Qualitative data were gathered using focus groups, interviews and case studies. People were also invited to keep a diary to record activities. The report noted significant continuous improvements in depression, perceived health, memory and autobiographical memory in residents compared with control participants. The report also described significant social care and NHS cost savings.

¹ The Knowledge Transfer Partnership is a joint initiative between ExtraCare Charitable Trust and Aston University whereby Jennifer O'Donnell is engaged in a research project for two years to develop an evidence-based tool (app) to assist with frailty screening and intervention planning during well-being assessments.

1.3 Longitudinal Data Report at August 2018

This report is a follow-up to that submitted to ExtraCare at the end of the main collaborative project with ARCHA in 2015 (see the full report at extracare.org.uk/research/findings/). Although intensive data collection stopped at that stage, ExtraCare has made a series of different sized grants to enable some continuity in the collection of longitudinal data. Currently, two researchers - a KTP associate and a PhD student, both part-funded by ExtraCare, are contributing data to the longitudinal study. However, this is not the primary goal of their research projects, both of which have their own aims and objectives. Other contributions to the longitudinal dataset have been made by researchers in the FOCUS² project, which was not funded by ExtraCare but by a large grant from the European Union. This project has now ended. However, with ExtraCare's kind cooperation, the FOCUS project benefited from residents' participation while ExtraCare benefited from their contribution to the longitudinal dataset. Consequently, well-being and frailty related data is now available at 24 months, 36 months, 48 months and 60 months, although we did not collect any further qualitative data after the end of the original project.

However, there are some important differences in the way that the data are examined in this new report. Our original ethics and consent forms only applied until the end of the 2015 study and only enabled us to collect data (known as repeated measures) from participants until the end of the first 18 months. On continuation, we re-applied for ethics and re-consented all participants for the new phase of the study. At this point, many participants either declined to take part any further, or were no longer available. In response, we recruited a large number of new participants, matching them to the periods at which we were now conducting assessments. Thus, our new recruitment was for people who had lived in ExtraCare for 18 months or more, given that our numbers at the earlier points were more than sufficient for analysis. This means that repeated measures analysis is no longer appropriate given that there are now few people taking part who were in the original baseline cohort. Instead, we use growth curve analysis, which uses time since moving in as the main independent variable. This means that we can still examine change over time even though the same people were not assessed throughout. This is a recommended type of analysis for longitudinal studies (Hofer & Sliwinski, 2006) and we also used it in many cases in the 2015 report. However, in these analyses we are making the assumption that the people recruited later were no different from the original participants when they moved in. As the demographics of the participants are similar, this would seem a reasonable and appropriate approach. Since 2015, we have added new measures, which we can now examine for the first time. Although we do not have these measures from baseline, we can still compare them with the control groups and examine them over time. These measures include loneliness and social isolation, quality of life, resilience, grip strength, perceived exhaustion and perception of the age friendliness of the environment.

1.4 ExtraCare Villages and Schemes Taking Part

We have continued with all 13 of the schemes and villages included in the 2015 report and have added a further six since then. However, some of the schemes and villages will not be included in future assessments, either because they have transferred to Midland Heart or because they no longer have any residents taking part.

² FOCUS stands for Frailty Management Optimisation through EIPAHAs Commitments and Utilisation of Stakeholders' Input. It was an EU funded research project conducted between 2015 and 2018 involving eleven institutions across six EU countries. Both Aston and Lancaster Universities were collaborating institutions.

2. Findings

2.1 Numbers of People Taking Part and Number of Assessments

At the beginning of the original study in 2012, our target for recruitment was 160 ExtraCare and 25 control participants who entered the study at its start (baseline). Results from the original study were reported in the Final Report in April 2015. At this point, 162 ExtraCare and 31 Control participants had been recruited for the quantitative measures (the data gathered by Aston assessment visits) with some analyses being done with fewer people where well-being data (collected by well-being advisors) did not quite match up. We have continued recruitment where ExtraCare and control participants have been entered in the study at each subsequent stage to support control for attrition and practice effects (although further attrition was still expected), see Table 1. To avoid mismatches, we have collected the well-being data as well as our own measures since 2015.

Table 1: Achieved sample

	Baseline	3 months	12 months	15/18 months	24 months	36 months	48 months	60 months
ExtraCare	162	153	140	132	60	51	43	22
Control	31	33	33	36	30	45	12	2
Total sample	193	186	173	168	90	96	55	24

That is, overall, we have conducted 985 assessments, over 300 since the full funding ended in 2015. Following agreement with ExtraCare, further recruitment and assessment of the control participants is now restricted only to those people for whom we need assessments for the PhD studies, and no further assessments after 60 months will be made (72 months and following) to ensure that any data collection focuses on building the sample at 24-60 months.

2.2 Participant Profile

At baseline, ExtraCare participants were significantly older than controls on average, had more chronic illnesses and differed in terms of socio-economic groupings such that there were fewer professional and higher management and more people with unskilled occupational backgrounds. Control group participants perceived their health to be significantly better than did ExtraCare participants at baseline, and had fewer care needs or functional limitations. Cognitive function and emotional well-being differed between the groups at baseline, even controlling for age differences. There were proportionately more men in the ExtraCare sample than in the Control sample (38.3% as compared with 25.8%). Table 2 shows the current demographics of all participants in the study (including those for whom we have data but who are no longer taking part).

Table 2: Age and gender of the current overall sample

	ExtraCare	Control	Overall sample
Age (mean)	75.89	71.89	75.06
Gender:			
Men N (%)	103 (39.31%)	31 (35.63%)	134 (38.40%)
Women N (%)	159 (60.69%)	56 (64.37%)	215 (61.60%)

ExtraCare participants are still significantly older than controls with a mean age of 75.89 years when they enter the study compared to 71.89 years. There are also still proportionally more men in ExtraCare (39.31%) compared to the control group (35.63%), although this difference has narrowed compared to the 2015 data and is not a statistically significant difference. While comparisons between groups are not possible after the 36 month data point given numbers, and there are many differences as previously discussed, some longitudinal comparisons are still informative. For example, in the 2015 data we showed that autobiographical memory for ExtraCare residents improved while it declined for the control participants, despite starting at different levels. Such controlled comparisons are essential to be able to say that any such change is an effect of living in ExtraCare. We will examine these types of interactions at the current time points where appropriate.

2.3 Comparisons Between the ExtraCare Residents and Controls at 36 Months (controlling for age).

In order to determine the extent to which the differences in key well-being variables persisted, we repeated the original comparisons three years after people moved in to ExtraCare (bearing in mind this is not all the same people, but all people who have lived in ExtraCare for 3 years). The 3 year time point was chosen as this has the most comparable sample sizes for each group.

Residents still had significantly more chronic illnesses than control participants, took more medication and were more physically frail, controlling for the contribution of the age difference. For example, their walking speed was slower and they took longer to rise from a chair, key indicators of physical frailty. Control group participants still perceived their health to be significantly better than did ExtraCare participants, but the difference in care needs was no longer significant. This was related to fewer ExtraCare residents in this group having any care rather than an increase in care reported by the control participants. The difference in Instrumental Activities of Daily Living (IADL) was now only marginally significant, and the difference in Basic Activities of Daily Living (ADL) was not significant, although the overall difference in the functional limitations profile, a much broader measure, remained highly significant.

However, importantly, there were now no differences between the groups in emotional well-being (anxiety and depression) or cognitive function. In the well-being assessment, we take two general measures of general cognition. The Mini Mental State Examination (MMSE: Folstein, Folstein, & McHugh, 1975) and the fuller Addenbrooke's Cognitive Examination III measure (ACE-III: Hsieh, Schubert, Hoon, Mioshi, & Hodges, 2013). We checked the MMSE as well as the more inclusive ACE-III measure, and also some important specific sub-constructs, memory and fluency. We also examined the measure of autobiographical memory specificity, which we know has important relationships to a range of important everyday social functions and depression (see Section 2.3 below), and again, the original difference between groups had gone.

There were also no differences in most of our newer measures:

- loneliness (using the brief UCLA measure: Russell, Peplau, & Cutrona, 1980)
- quality of life (using the CASP-12 measure derived from: Hyde, Wiggins, Higgs, & Blane, 2003)
- personal resilience (using the CDRISC-10: Connor & Davidson, 2003)
- perception of the age friendliness of the environment (using the newly designed AFEAT measure: Garner & Holland, Submitted)

However, there was a significant difference in self-perceived exhaustion, another frailty indicator.

These changes are important. They demonstrate that whilst the ExtraCare residents who take part in this study do have more physical health problems than the control group, any differences in psychological well-being and cognition are now no longer apparent. Some of this may be related to the fact that our ethics does not allow for us to continue to assess anyone who no longer has mental capacity to consent to take part in the study, and also people who find the tasks very difficult may be more likely to withdraw, so the people with the poorest cognition will no longer be in the sample. However, this does not fully account for the reduction in the differences between groups in cognition and psychological well-being, which we attribute to the ExtraCare effect. These findings will be examined in more depth in the longitudinal analyses that follow.

2.4 Changes across Time in the Key Measures

Improvements that can be attributed to ExtraCare: The 2015 report showed that there were significant continuous improvements across the period in depression, perceived health, memory and autobiographical memory, that were unique to ExtraCare participants (i.e. significant improvements were absent from control participants and the interaction term was statistically significant). These analyses were repeated: a) over a 3-year period to assess for any continued change (or lack of) in comparison to the control; b) over the full 60 months for the ExtraCare residents only.

Psychological Well-being: Depression and Anxiety

Depression and anxiety in this study were measured using the Hospital Anxiety and Depression Scale, or HADS (Zigmond & Snaith, 1983). This is a short, simple tool to use. Scores for anxiety and depression range separately from 0 to 21. For both scales, scores of 7 and under suggest no clinical level depression, between 8 and 10 suggest a mild clinical level, 11-14 a moderate clinical level and over 15 a severe clinical issue (e.g., Stern, 2014).

Depressive Symptoms

Depressive symptoms were examined over a 3-year period to assess any change between participants. Results are displayed below in Figure 1. Higher numbers signify more and more intrusive depression symptoms.

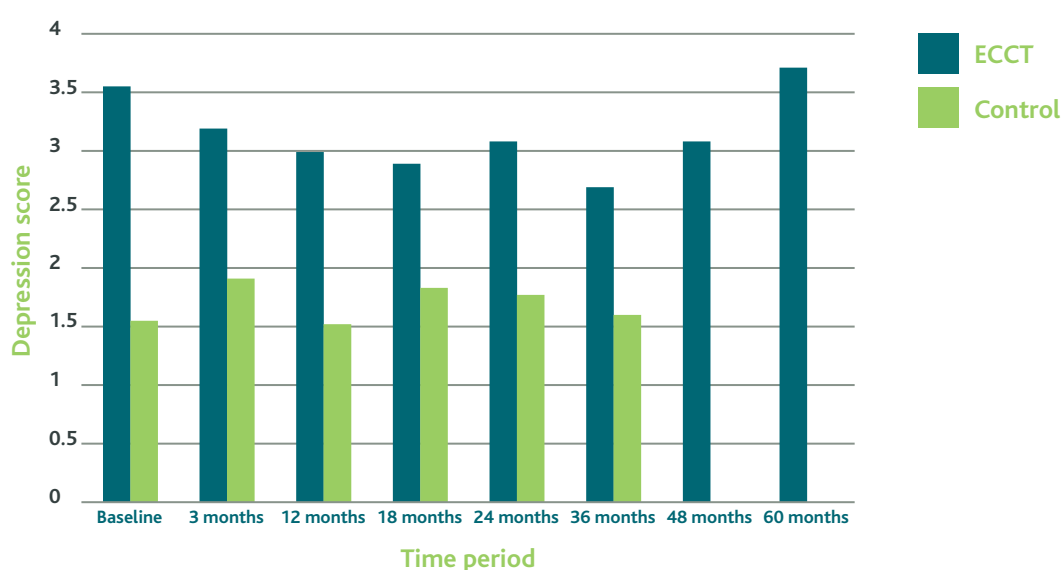


Figure 1: Depressive symptoms by time point for ExtraCare (ECCT) residents and controls

- a) Over 36 months, there was no significant overall effect of time period and no interaction, such that the effect of time for the residents was not significantly different to the effect of time for the control group. Although depressive symptoms at 36 months were 24% lower overall for residents than at baseline, the variance means that this effect is not statistically reliable. However, as illustrated, ExtraCare residents throughout the period had a significantly and reliably higher number of depressive symptoms than controls.
- b) Data for ExtraCare residents over the full 60 months was examined. Again, the overall effect of time was not significant, and previous reductions in depressive symptoms are no longer apparent.

It should be borne in mind that these are still very low levels of depressive symptoms in both populations, with the criterion for clinically relevant levels being a score of 8 or above (e.g., Stern, 2014).

Significant Depression

Building on analysis of depressive symptoms, change in being considered depressed at a clinical level (a score on the depression component of the HADS of 8 or more) over a 3-year period was assessed. Results are presented below in Figure 2.

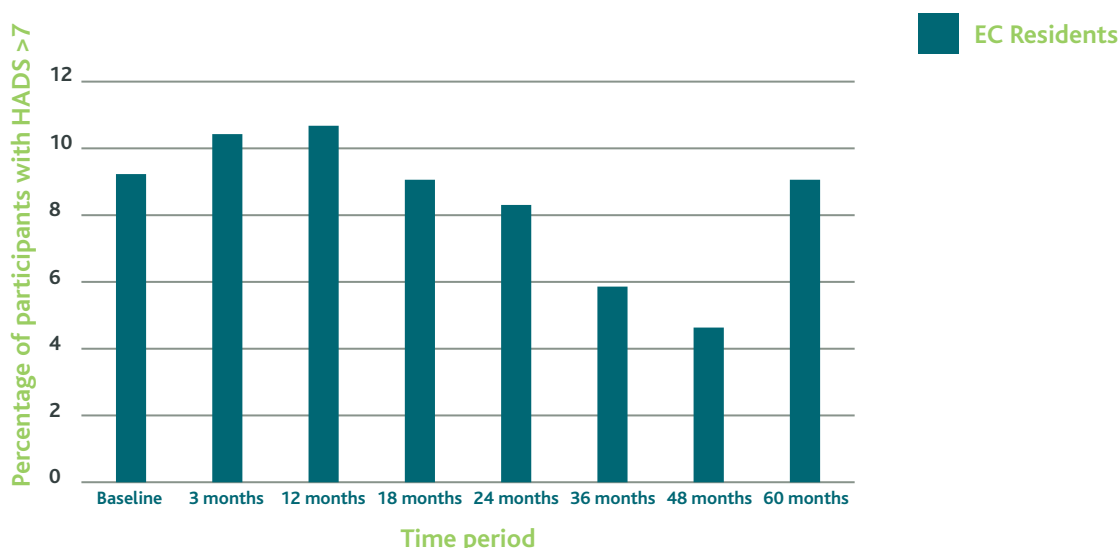


Figure 2: Percentage of ExtraCare Participants Considered Depressed over a 5-year Period

Given the small number of control participants scoring 8+ on the depression aspect of the HADS this analysis was conducted exclusively on ExtraCare participants. Although a trend is shown, indicating a decrease in percentage of individuals considered depressed over a 5-year period, the trend was not significant.

Predictors of Depression

Further analyses were conducted to examine some potential predictors of depression in terms of their effect on the observed trajectory. Frailty was examined first. Whilst controlling for frailty, there was no longer any significant difference between the ExtraCare and control groups in depression over the 3 years, suggesting that frailty is an important component of depression and that the difference in depression between ExtraCare and control participants is related to their frailty. The effect of frailty on depression was highly significant. This concurs with the background literature: frailer people are more likely to have lower mood or be depressed (Collard, Boter, Schoevers, & Voshaar, 2012) and the risk of frailty increases if depression is present (Chang, Weiss, Xue, & Fried, 2010).

In further assessing the change in depression, analyses were performed to assess the predictive strength of mobility in ExtraCare and Control participants, as research consistently highlights the impact of mobility on depression (Rosso, Auchincloss, & Michael, 2011). Results are displayed below in Table 3.

We included the sum of the number of mobility related chronic illnesses out of COPD, osteo and rheumatoid arthritis, stroke, Parkinson's), walking speed category, and ambulatory and mobility related functional limitations as predictors in a model to examine the prediction of depression at each time point.

Table 3: The proportion of variance in depression (R^2) predicted by the total mobility model, with significance¹

Assessment Period	R^2	F	DF1,DF2	p
ExtraCare				
Baseline	.104	13.63	1,118	<0.001
3 months	.187	29.46	1,129	<0.001
12 months	.153	25.09	1,140	<0.001
15/18 months	.182	26.98	1,122	<0.001
24 months	.214	14.70	1,55	<0.001
36 months	.268	16.46	1,46	<0.001
Control				
Baseline	.201	6.80	1,28	<0.05
3 months	.402	20.16	1,31	<0.001
12 months	.209	8.18	1,32	<0.01
15/18 months	.250	11.00	1,34	<0.05
24 months	.247	9.17	1,29	<0.01
36 months	.091	4.76	1,44	<0.05

¹to be statistically significant, p must be less than 0.05. Note that statistical significance is affected by the number of people in the two groups, as it affects the degrees of freedom, df. F = F-Ratio, a measure of the reliability of the effect.

Although the initially found reduction in the relationship was no longer clear, with the relationship being significant for the ExtraCare residents throughout, analyses indicated that mobility is a greater predictor of depressive traits in control participants than ExtraCare participants (R^2 , or the proportion of the variance in depression accounted for by the mobility combined measure, is generally higher.) This indicates that mobility has a lesser impact on depressive traits in ExtraCare than in the community.

Since mobility in terms of walking speed did significantly improve over the period for the residents (see Figure 3), we investigated whether the change in walking speed may impact the effect of time on depression symptoms. To do this, we examined a mediation model. Walking speed was demonstrated to be a significant mediator – once the relationships due to walking speed with depression and time were controlled, depression did significantly increase over time. This analysis shows us what would happen to depression if walking speed stayed the same, and so demonstrates that the improvement in walking speed over time for the ExtraCare residents is having a positive impact on depression, emphasising the importance of improving physical fitness for diverse aspects of well-being.

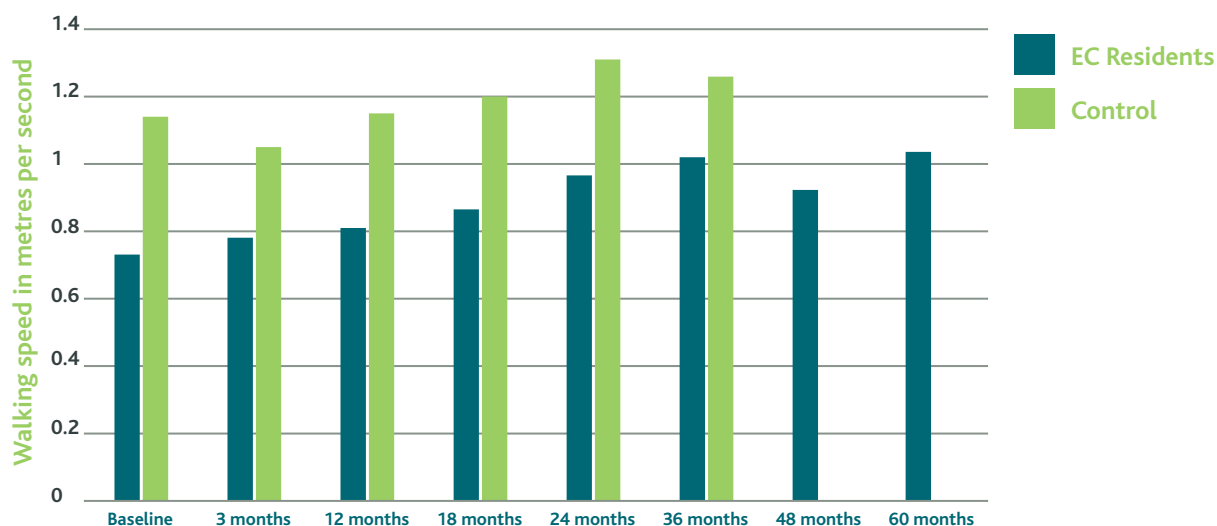


Figure 3: Walking speed over time

Anxiety Symptoms

At the beginning of the period, there were significantly higher levels of anxiety symptoms in ExtraCare participants compared to control participants. At the point of the 2015 report, it was clear that anxiety improved (reduced) but there was no clear difference between residents and controls in the amount of reduction. However, over this longer period, anxiety continues to reduce for the residents but not for the control participants, see Figure 4.

- a) Over 36 months, there is a significant interaction between the two trends. The interaction pattern (crossing, or non-parallel trends) is illustrated in Figure 4. Further analysis demonstrates that even after 3 months, the difference between the groups is not significant.
- b) A second analysis examined just the residents over the 60 month period and replicated the significant effect of overall reduction in anxiety. By 5 years after moving in, residents' anxiety is 23% less than it was at the start. The lowest anxiety point was at 24 months, where it was 40% lower.

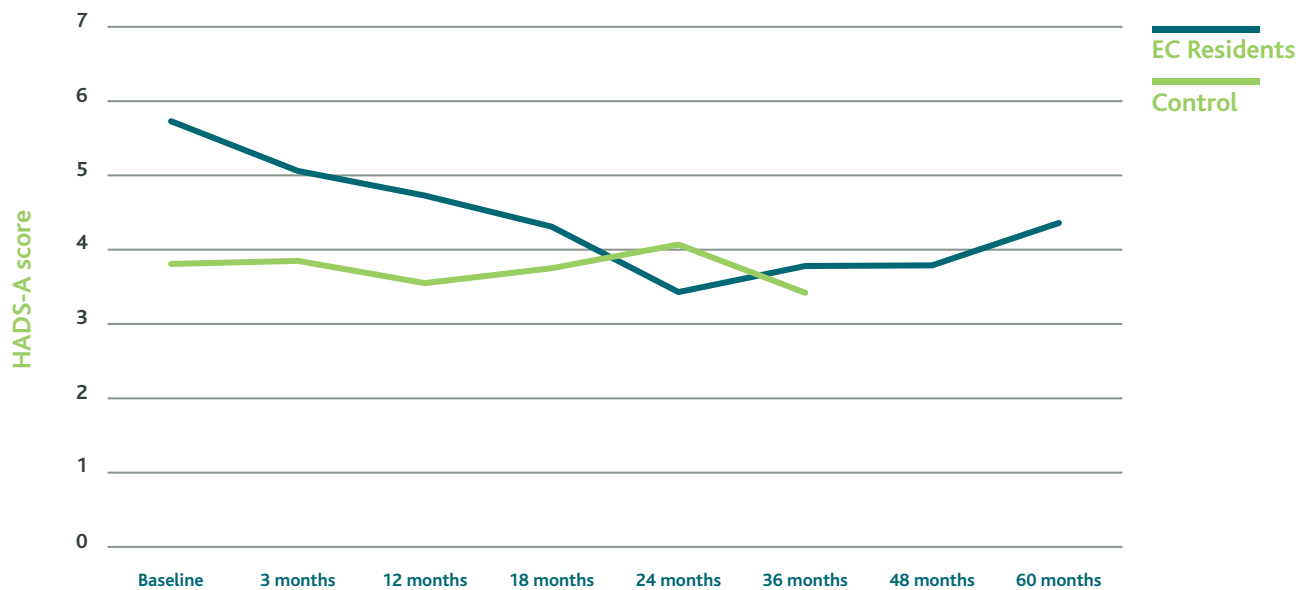


Figure 4: Reduction in Anxiety symptoms over 3 years for Residents but not for controls

Learning Points

- ExtraCare residents generally have low levels of depression and maintenance of low levels over 5-years is a positive finding.
- Reduction in anxiety levels was more apparent over the longer period than it was in the first 18 months, suggesting that the reduction in anxiety levels takes time.
- Mobility is a key factor in breaking the link between older adults and depression. If access to social interaction and ability to fulfil activities of daily living is less restricted, mobility may have less impact on depression.
- Mobility in terms of walking speed improved over time for residents. These improvements in walking speed have had a positive effect on depressive symptoms in ExtraCare residents. The lesson here is that improving physical fitness can also benefit residents in terms of psychological well-being.

Cognition and Memory

Overall Cognition

In the well-being assessment, we take two general measures of general cognition. The Mini Mental State Examination (MMSE: Folstein, Folstein, & McHugh, 1975) and the fuller Addenbrooke's Cognitive Examination III measure (ACE-III: Hsieh, Schubert, Hoon, Mioshi, & Hodges, 2013). The MMSE is a well-known initial cognitive screening tool used to determine whether further investigation is needed. The ExtraCare residents' group showed remarkable stability in this measure and no change was seen. However, there was a significant decline in MMSE scores in the control group.

The ACE-III is a fuller measure that examines five areas including memory, attention, fluency, language and visuospatial processing. Again, although there was a steady but small increase over time for residents, and the initial difference between residents and controls was no longer significant at the 3-year point (controlling for age), the overall time trend for residents was not statistically significant.

The trend is illustrated in Figure 5. It is important to note that this measure normally declines with increasing age (e.g., Deary et al., 2009) and we are not seeing the normally expected declines. The lack of significance is related to the large variance in the ExtraCare group, where there are some people with significant impairment (14 people with a diagnosis of dementia, but rather more with scores suggesting significant cognitive impairment), but also many people who are not showing decline.

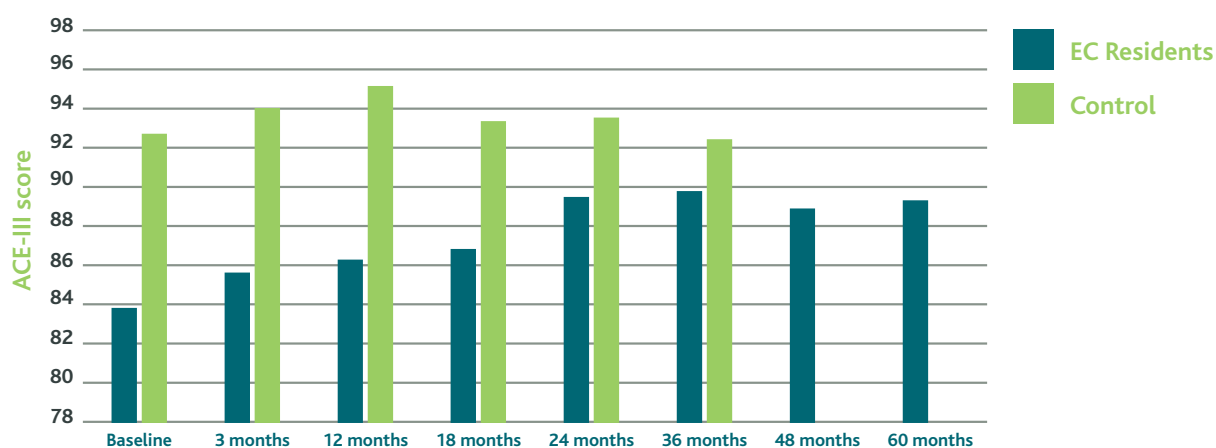


Figure 5: Cognitive scores (ACE-III) over time

Memory

Immediate and Delayed Recall

Memory is measured as part of the Addenbrooke's Cognitive Examination III (ACE-III: Hsieh et al., 2013). People are asked to recall three words that they have previously heard, a name and address with multiple components, both immediately and at a delayed point, and four facts about world leaders.

In the 2015 report, a significant increase in residents' memory was observed over the 18 month period.

- Results from analysis examining this trend over a 3-year period are presented below in Figure 6. As the maximum score on this is 26, we cannot conclude there is a real interaction as the control group are already performing almost perfectly.
- However, we can conclude that there is a very reliable overall improvement for the residents of about 16.7% over the 5 years.

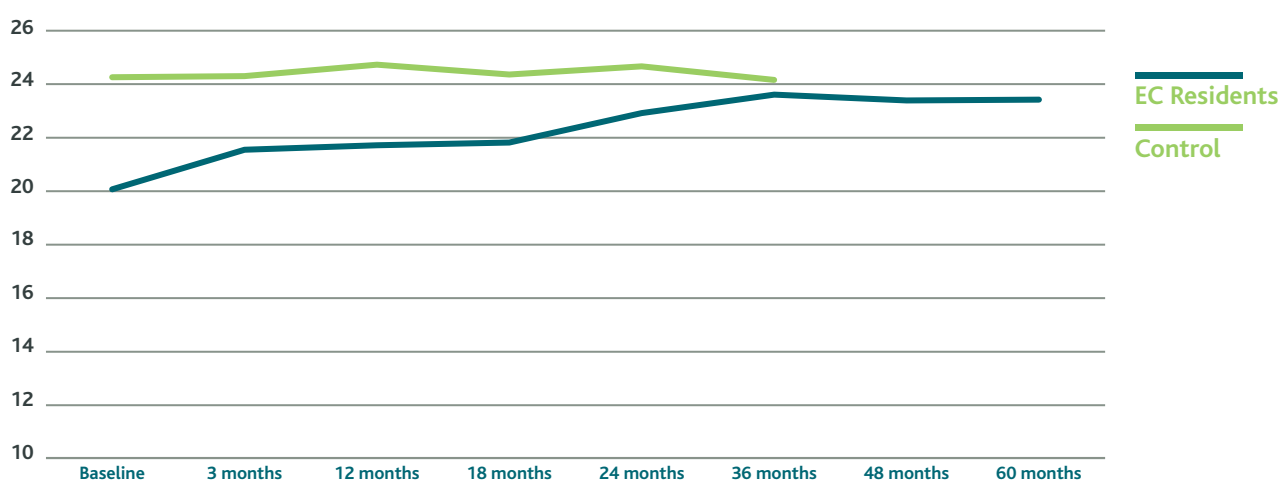


Figure 6: Change in Memory Scores for ExtraCare and Control Participants

Autobiographical Memory

The term 'autobiographical memory' refers to a person's ability to recall the specific details of events from across their lifespan. As a measure linked to effective functioning in social relationships, including values such as intimacy and empathy (Alea & Bluck, 2003), it is particularly important in maintaining social and emotional well-being in older adults (Leahy, Ridout, & Holland, 2018). Autobiographical memory has a role to play in building relationships and successful problem solving (Beaman, Pushkar, Etezadi, Bye, & Conway, 2007). However, many older adults have difficulty recalling detailed memories of specific events and instead recall general memories, which has been linked to age-related declines in cognitive function (Holland, Ridout, Walford, & Geraghty, 2012). Difficulties in retrieving the details of specific events or specific autobiographical memories are a known risk factor for depression (Sumner, Griffith, & Mineka, 2010; Williams et al., 2007; Williams & Broadbent, 1986). Further, depression is a significant risk factor for dementia (e.g., Da Silva, Goncalves-Pereira, Xavier, & Mukaetova-Ladinska, 2013). Therefore, Leahy et al., (2017) suggest that memory interventions to improve recall of specific autobiographical memories may be a positive way of improving mood, maintaining well-being and improving social functioning in older adults.

In the autobiographical memory task (Dalglish et al., 2007) participants were asked to recall specific memories to a series of ten emotional cue words. Some words were positive (e.g., clever, safe, happy, calm, proud) and some words were negative (e.g., bored, nervous, clumsy, disappointed, sad). Positive and negative words were presented alternately.

- a) Over 36 months, analyses discovered that control participants possessed higher levels of autobiographical memory specificity compared to ExtraCare participants over the whole 3 years on average, but this was only significant at specific time points: Baseline, 3 months and 15/18 months. However, a significant increase in autobiographical memory was observed for ExtraCare participants over the 3-year period, which was different to the change over time for control participants. The interaction is again significant, with people living in their original homes showing a steady decline in this measure, as would be normally expected in a group of people in this age group. Results are displayed in Figure 7.
- b) The analysis on the ExtraCare participants alone up to 60 months demonstrates clearly that this function continues to improve for the residents, with significant positive effects.

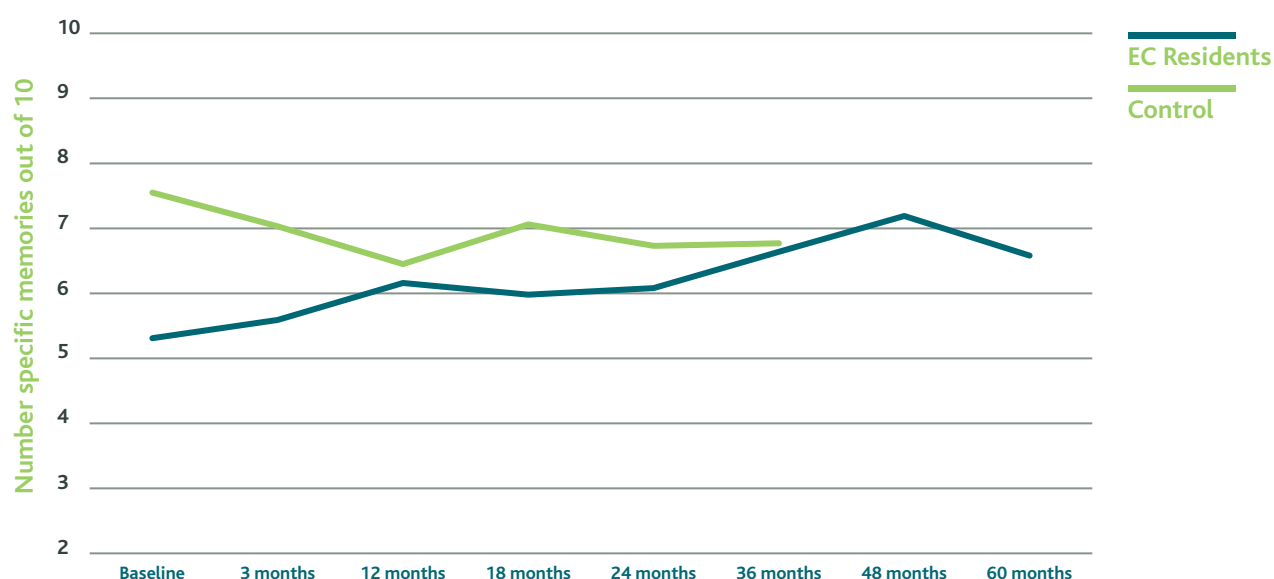


Figure 7: Change in Autobiographical Memory Scores over time

The 24% improvement in autobiographical memory scores is important as this function is used in solving social problems, making and maintaining relationships and showing empathy. It is also used in ability to plan for future activities and has been related to important well-being factors such as self-identity and hope. As indicated above, being unable to produce specific memories, and instead being over general, is a known risk factor for depression and poor social problem solving. Holland et al. (2017) also demonstrated that it is related to functional limitations, specifically relating to communication.

Executive Functioning (Fluency)

The measure of executive function used within the ACE-III overall assessment is known as verbal fluency. This consists of two tasks: category fluency (Benton, 1968) and letter fluency (sometimes called phonemic fluency, e.g., Lezak, Howieson, Loring, & Fischer, 2004). In these tasks, participants are given 1 minute to recall as many words as possible within a category (category, or semantic fluency) or starting with a given letter (letter fluency). Verbal functioning is a useful measure of executive functioning. Executive functioning can be thought of as an ability to control where your attention is, in this case to update yourself to ensure you stick to the task and don't repeat words, to inhibit irrelevant associations that may spring to mind, and the ability to change focus when necessary (e.g., Fisk & Sharp, 2004). Executive function is associated with problem solving, with our ability to use or switch strategies when something gets difficult and is thought to have an important role in ability to compensate for other age related changes in cognition. Like many cognitive and memory measures, executive function is subject to age-related declines (MacPherson, Phillips, & Della Sala, 2002). For example, verbal fluency declines with age on average. However, healthy older adults tend to perform better on semantic fluency than on letter fluency tasks (Shao, Janse, Visser, & Meyer, 2014) whereas people living with dementia, e.g., Alzheimer's Disease tend to decline faster in terms of semantic fluency (e.g., Martin & Fedio, 1983).

In the 2015 report, executive functioning did not show any significant improvements when compared to control participants over a 2-year period.

Examination at this point also did not show a significant improvement over the 3 or 5-year period but did show that the difference between EC residents and controls had gone by the 5-year time point. That is, there was a continued non-significant improvement in ExtraCare executive functioning over the 5-year period, whereas control participant executive functioning fluctuated. While the lack of a significant increase is not surprising, given that this function commonly declines with increasing age, what is important is that there is no decline and a trend for improvement in the EC residents.

Learning Points

- With age, there are some normal expected reductions in memory and cognitive measures. Although some residents were living with dementia, generally residents showed no decline in these measures. In fact, there was a 16.7% improvement in memory recall tasks over the 5-year period, and a 24% improvement in autobiographical memory over the same period. Further, there was no decline in executive function over the range of the study.
- Memory and cognitive skills are vital in ensuring well-being and good social relationships. This evidence shows that some factors can be changed: decline is not inevitable and improvement is possible even in variables that commonly decline with increasing age, given a supportive and active environment.

Health Profile

Perceived Health

The way in which an individual perceives or assesses their own health status is a very good indication of their actual physical and psychological health (Idler & Benyamini, 1997; Miilunpalo, Vuori, Oja, Pasanen, & Urponen, 1997). People are actually very accurate at this even in the absence of clear diagnoses. Many studies have found an association between self-perceived poor health and mortality (e.g., Idler & Benyamini, 1997; Kaplan & Camacho, 1983), while relatively good perceptions of health result in lower health service usage, e.g. fewer GP visits per year (Miilunpalo et al., 1997).

- a) For the 36 month analysis, perceived health improves over time for residents, peaking at 24 months, see Figure 8. While the significant difference between the groups maintains, as would be expected given their differences in health, the interaction is again significant, indicating overall improvement for residents (to 36 months) and reduction for controls.
- b) Although it appears that over the 5 years residents' perceived health is beginning to reduce again, the positive overall effect is still significant.

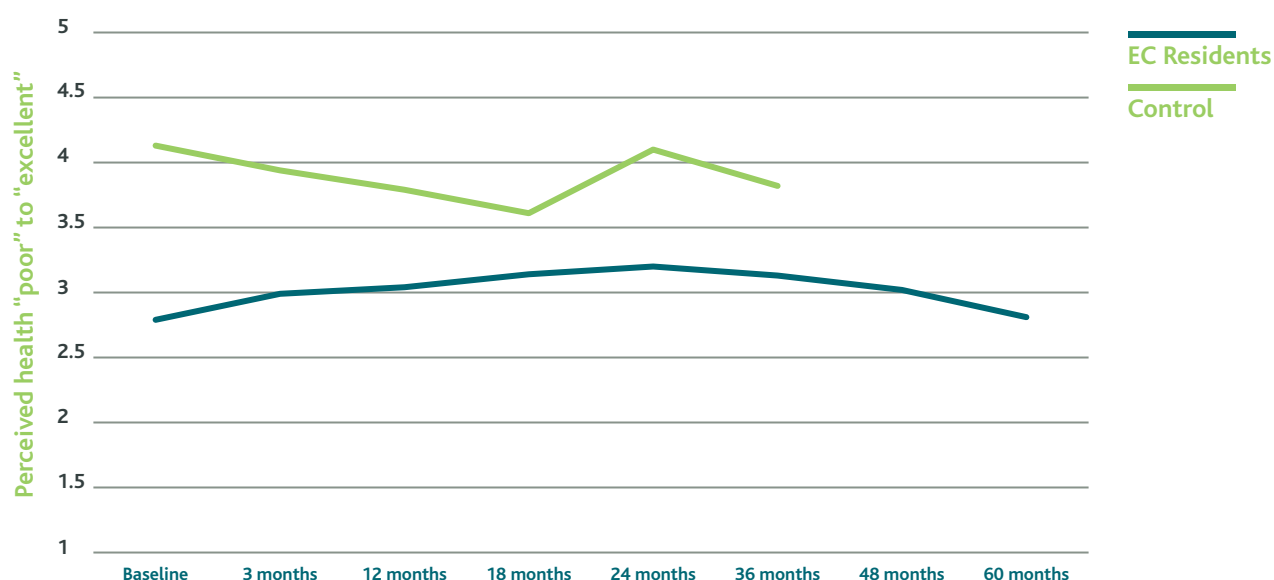


Figure 8: Perceived health shows an overall positive increase for residents

Comorbidity

In the 2015 report, it was concluded that ExtraCare participants had a significantly higher number of chronic illnesses than control participants, although this was not significant once age was controlled for. With the exception of the 24-month period, ExtraCare participants displayed higher levels of comorbidity than control participants. In the general population, 58% of people aged over 60 have at least one long term condition and the likelihood of multi-morbidity (having two or more chronic diseases) increases with age (Kingston et al., 2018). Kingston et al. (2018) demonstrated that in the general English population, 54% of people aged 65+ have two or more chronic diseases, and 68.7% of the over 85s. In ExtraCare, 44.7% of people aged over 65 have two or more chronic diseases at baseline, with 50% of people 85+ (although there were only 18 people in this group). At the 3-year point, 54.5% of people aged 85+ have two or more diseases (but this is only 11 people), and 60.8% of those aged over 65 years.

- a) When comparing the groups over the baseline to 36-month time point, the group difference is still significant but is still related to the age difference, such that once this is statistically controlled, the group difference becomes marginally non-significant. Results are displayed in Figure 9. Although it appears that number of comorbidities is increasing for both groups, only the increase for the control group is significant, and the interaction is marginally significant when controlling for age.
- b) However, when we examine ExtraCare residents alone, over the full 5-year period, the increase in number of chronic diseases and impairments is significant, but only when Year 4 and 5 are included. That is, their increase is no greater than the control group in the comparable 3-year period.

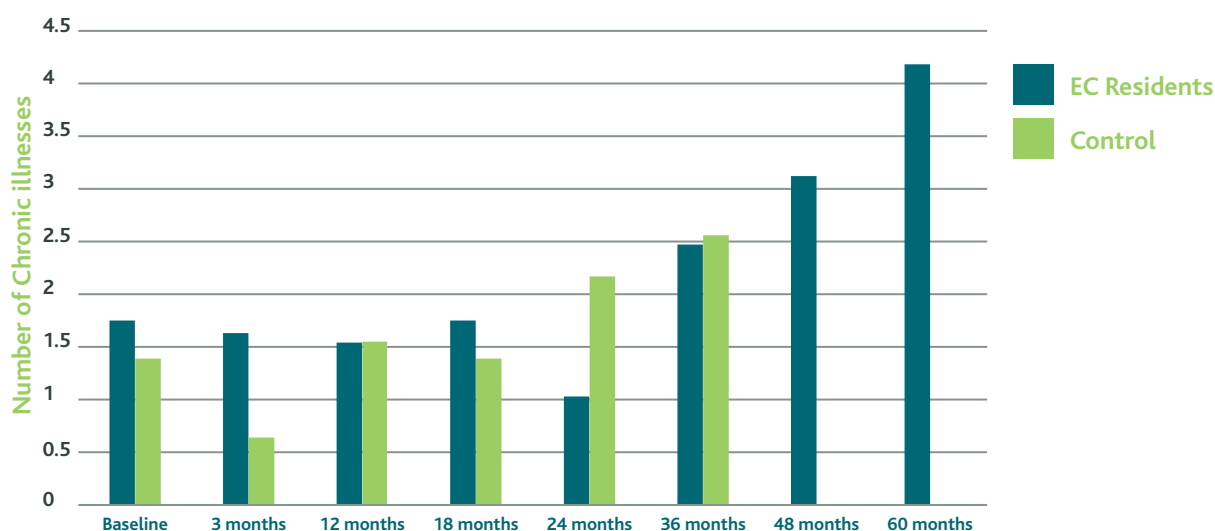


Figure 9: Comorbidity in ExtraCare and Control Participants over time

Together, these findings suggest that an increase in numbers of chronic diseases is more likely with increasing age, regardless of where you live.

Prescribed Medication

In 2015, the report showed that ExtraCare participants took more prescribed medications than control participants, a difference that was maintained throughout the period, but which was not significant once the difference in age was controlled for. Now, the number of prescribed medications has increased for ExtraCare residents but reduced over the same period for control participants, neither effect statistically significant, but the effect is that the difference is still significant even once age is controlled.

Indices of Independence

One measure of independence in older adults, is the Instrumental Activities of Daily Living scale (IADL: Lawton & Brody, 1969). This scale reviews a person's abilities to live independently, examining items such as their ability to clean and maintain a household, shop and manage money.

In the 2015 report significant changes were observed within the control sample in Instrumental Activities of Daily Living (IADL) but not the ExtraCare sample.

- a) Over a 3-year period, no significant change over time was observed in either ExtraCare or Control participants. There was no interaction.
- b) Over a 5-year period there was no significant change for ExtraCare residents.

Again, this is important as it demonstrates that for the people taking part in the study, independence is not changing.

As in the previous report, few participants had any issues with basic Activities of Daily Living (e.g. bathing themselves, eating unaided), and so with limited variance, analysis was not possible.

Another measure used in the well-being assessment is that of the Functional Limitations Profile (FLP: Pollard & Johnston, 2001). This is a measure that assesses the impact of any health issues on everyday functions, consisting of 97 items designed to measure functional limitations under eight subheadings – ambulatory, mobility, household management, recreation, social, alertness, sleep and communication. People are asked to agree or disagree with a list of statements and to confirm that their comment is due to the state of their health. The measure is scored by agreement with a statement. An example statement under the ambulatory subheading is 'I only walk with help from someone else'.

As more variance is available within the Functional Limitations Profile we assessed the total limitations, which consists of the summed limitations in each of the eight subcategories. There were no effects of time or interactions, and the difference between residents and controls was maintained throughout the period. The general trend was very slightly downwards for residents, indicating that Functional Limitations were not increasing over time.

Falls

Despite their older age and higher levels of frailty, ExtraCare residents did not fall any more than controls (see Figure 10). Although there had been a significant reduction from baseline to 18 months noted in the 2015 report, this was not sustained. Over a 3-year period, no significant change in number of falls was observed in either ExtraCare or Control participants, and over the 5-year period, again there was no significant change for the residents. Thus, although the reduction seen in the 2015 report did not continue, falls also did not increase significantly over time on average as people got older.

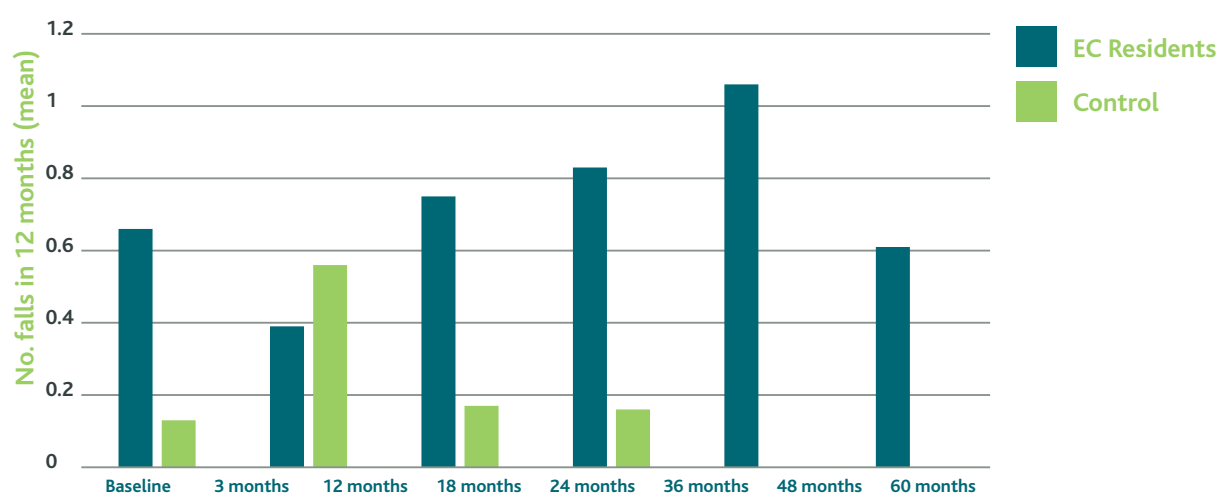


Figure 10: Number of falls in the last 12 months over time

Learning Points

- Residents' level of independence does not change over the 5-year period.
- Similarly, there was no increase in the number of falls.
- The fact that there are no changes in these factors should be viewed positively. This shows that despite increasing age and high levels of frailty, people are living independent lives and, contrary to expectations at these ages, the rate of falls is not going up.

2.5 Frailty

Frailty was measured using a frailty index (based on Rockwood, Mitnitski, Song, Steen, & Skoog, 2006). Frailty is defined as a state of high vulnerability for adverse health outcomes when exposed to a stressor, that is, an absence of resilience. It is related to morbidity and mortality, and utilisation of healthcare. Crucially, frailty, and especially pre-frail states, are malleable. Five important facts about using a measure of frailty are indicated below:

- Although diagnosed illness has an impact on need for health and social care, and negative outcomes like hospitalisation, people can be frail without having any diagnosed diseases. Our model includes diagnosed diseases alongside a range of other physical and psychological indicators.
- Once frailty level is taken into account, chronological age has little further predictive power in terms of health and independence outcomes.
- On average, deficits accrue and so frailty increases at a stable rate in the population in general. For example, Rockwood and Mitnitski (2007) analysed data using a range of measures, over 4 developed countries, and at different time points over a range of 20 years, and found a stable increase in frailty of 0.03 per year on average (range 0.02-0.04, logarithmic scale).
- Women accumulate more deficits over time than men, but live longer with frailty (for any given frailty level, men have a higher mortality rate).
- Frailty is highly related to age in community samples, but less so in institutional or clinical cohorts which have some degree of selection (that is, because many people move into ExtraCare because of existing or developing impairments and health concerns, age is less important).

In the 2015 analyses, the frailty measure was based on a set of 49 different variables. These included medical indices (e.g. number of chronic illnesses, polypharmacy), physical robustness (grip strength, walking speed, sit-to-stand ability, BMI extremes, basic independence measures), mental well-being (depression, anxiety) and cognitive health (memory, fluency, instrumental independence measures) amongst others, to define a continuous measure of frailty. The original analyses showed significant differences between ExtraCare residents and community based control participants in the level of frailty, where ExtraCare participants were frailer than the control group, as would be expected.

Since 2015, our work has continued on our frailty index and the original 49-item measure has been refined to the new 34-item tool used in the current analysis, which also now includes some new measures. To calculate a frailty profile, the number of deficits a person has out of the list of selected variables is added up and divided by the total number of variables assessed. That is, a frailty score is a proportion, with scores between 0 and 1. Scores closer to 0 indicate a higher degree of resilience, while scores closer to 1 indicate frailty.

Using this new measure, the analyses in frailty change were repeated over a 3-year period. Frailty changes over time are displayed below in Figure 11. In this figure, the 3 and 18 months' time points are not included to enable an assessment of annual changes.

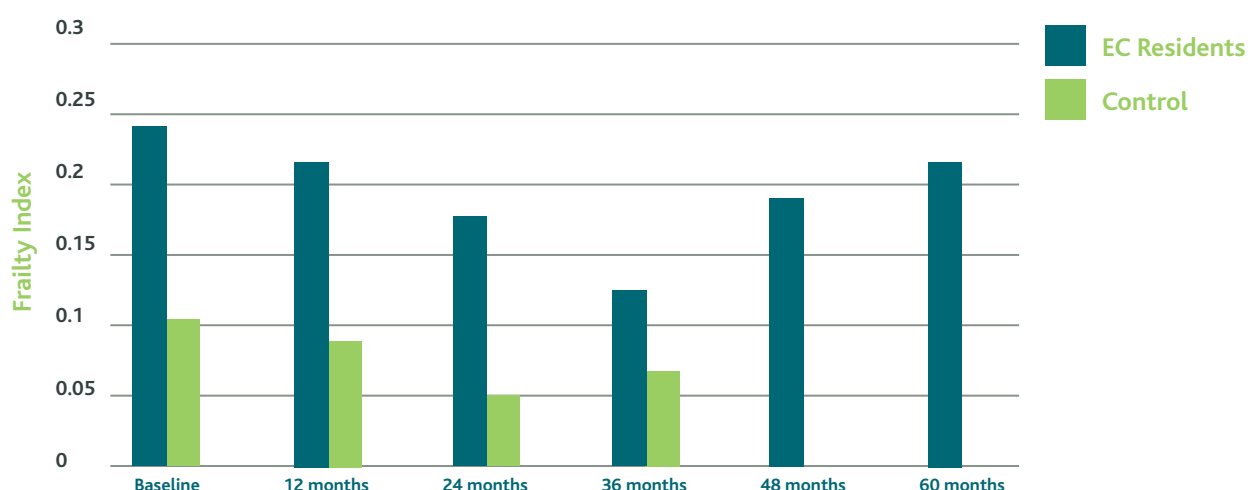


Figure 11: Frailty profile over time

- a) Over the first 36 months, there is a significant difference between groups, even once the effects of the age difference are controlled. There is also an overall reduction of frailty (reduction for both groups), but no difference between groups in how frailty changes, that is, no interaction.
- b) When Residents are examined separately, there is a significant reduction in frailty over the first 36 months. This is not significant over the 60 months. As can be seen in Figure 11, frailty increases after this point. Over the 5-year period, there is no clear increase in frailty, in contrast to expectations based on previous studies. This is important and suggests that frailty increase with age still occurs, but is being delayed in the ExtraCare residents.

In order to examine the relationship between frailty and age, correlations were performed for the Residents group. The relationship across all time points was small but significant. The slope of the relationship was much less than would normally be expected, and starts off at a higher level than would be expected, suggesting that this is a specific sample that differs from the average population in terms of frailty. At any one time point, this relationship was not significant.

We can also categorise people as frail, pre-frail (at risk of becoming frail), and not frail, based on cut-off scores provided by Song, Mitnitski, and Rockwood (2010).

Table 4: Categorisation of Frailty Severity over a 5-year Period for ExtraCare Participants
Frailty Categorisation Scores (%)

	ExtraCare		
	Not Frail	Pre-Frail	Frail
0 months	9.30	53.70	37.00
3 months	16.40	55.90	27.60
12 months	16.40	52.90	30.70
15/18 months	18.30	60.30	21.40
24 months	25.40	49.20	25.40
36 months	43.10	47.10	9.80
48 months	18.60	58.10	23.30
60 month	18.20	50.00	31.80

Although these are not all the same people at each time point, the table and figure both illustrate that frailty is generally malleable, with fewer people classed as frail at subsequent periods after baseline.

Frailty and Falls

The relationship between age, frailty and falls was examined at the annual points for residents. Table 5 illustrates the correlations between age and the measures, with * indicating a significant correlation ($p < 0.05$).

Table 5: Correlations between age, frailty and falls

	Age and falls	Age and frailty	Frailty and falls
Baseline (N=148)	0.18*	0.06	0.32*
12 months (N=110)	0.13	0.14	0.12
24 months (N=60)	0.12	0.18	0.27*
36 months (N=42)	-0.09	0.11	0.32*
48 months (N=35)	0.16	-0.12	0.67*
60 months (N=18)	0.25	0.31	0.35

It can be seen that the relationship with age is significant at baseline, but not thereafter. However, the relationship with frailty is rather more consistent.

To examine the question of predictors of falls for residents in detail, a multiple regression model was constructed. Age, frailty and time living in ExtraCare were entered in that order, enabling us to control for the amount of variance predicted by age before duration of residence was entered into the model. Gender was also entered to account for differences between men and women.

Results demonstrated that gender had no impact, and once frailty was entered, age no longer had any impact, confirming that frailty is a more important predictor than age. However, in addition to frailty, duration in ExtraCare also added to the prediction of number of falls, suggesting that as time went on, the risk of falls does increase when analysed with these controls.

Weekly Exercise

One of the main lifestyle changes recommended to prevent or reduce frailty is physical activity, with interventions providing exercise, and also a generally active lifestyle, being shown to have significant impacts (Apóstolo et al., 2018). In the 2015 report, no significant difference between ExtraCare and control participants was observed.

- a) Over a 3-year period both ExtraCare and control participants displayed a significant increase in exercise frequency, but there was no interaction between the groups. Results are displayed in Figure 12.

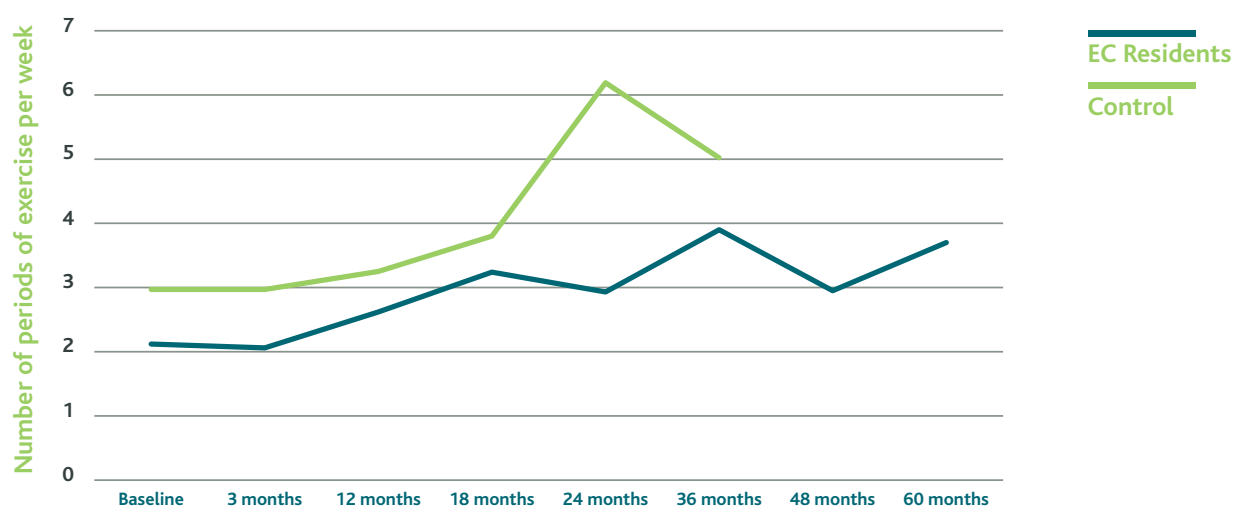


Figure 12: Frequency of Exercise for ExtraCare and Control Participants over time

- b) Over the full 5 years, again, the residents demonstrated a significant increase in exercise frequency. This increase was almost 75%, or put another way, 1.75 times the amount of exercise they were doing at baseline.

We examined the relationship between frailty and number of times a person said they did at least 30 minutes of exercise in per week in the ExtraCare residents. Increased frailty significantly predicted lower exercise frequency. Given that there is robust evidence for the positive impact of appropriate exercise on frailty, this suggests that further efforts to encourage and enable frailer people to take part in exercise are needed.

Falls and Exercise

In a regression model, the number of times a person did 30 or more minutes of exercise per week had a significantly negative impact on number falls, once age and the impact of duration living in ExtraCare was accounted for (that is, exercise is related to reduced risk of falls). However, because frailty increases the risk of falls and reduces exercise frequency, once frailty was accounted for, the impact on falls was no longer significant. Together, this suggests that further support for exercise for the frailer residents could have an important effect on reduction of falls.

Learning Points

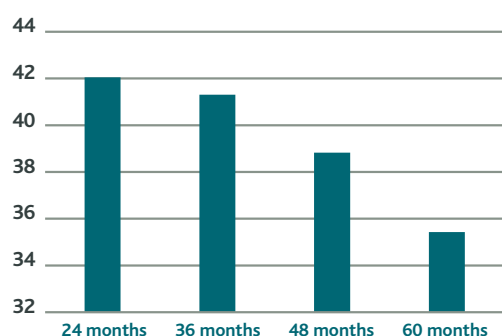
- The frailty index examines the cumulative deficits in a person's health, irrespective of age.
- Frailty reduces in residents over the first 3 years of the study but this reduction does not continue over the latter two years where changes occur. The findings suggest that a slight increase in frailty with age still occurs, but is being delayed in the ExtraCare environment.
- Residents who exercise more are less likely to be frail and have a lower fall risk. Further efforts to support and encourage residents to exercise appropriately might help reduce levels of frailty and the incidence of falls.

2.6 Components of Social Frailty

Frailty can be thought of as not just related to a person's internal physical and psychological health (what could be described as a medical model), but also related to their interactions with their social environment. Frailty has been associated with psychosocial factors such as loneliness and social isolation (Herrera, Badilla, Navarrete-Reyes, Amieva, & Avila, Funes, 2015; Rockwood et al., 2004) and research has also demonstrated that psychological and social variables have a role in frailty development (Levers, Estabrooks, & Ross Kerr, 2006; Young, Glaser, Spector, & Steves, 2016). We are defining social isolation as the number of friends and family one feels close to combined with how often one sees or communicates with them. We are defining loneliness as the difference between perceived and desired for companionship. Recently, Gale, Westbury, and Cooper (2018) demonstrated that social isolation and loneliness could act as risk factors for the development of frailty and change in frailty severity, using data from a community sample, collected as part of the English Longitudinal Study of Ageing (ELSA). They found that participants who scored high for social isolation and for loneliness had an increased risk of becoming physically frail or pre-frail over time (using a categorical measure of purely physical frailty, the Fried Phenotype) than those less socially isolated, with the relationship of loneliness being more statistically robust once other covariates were controlled for.

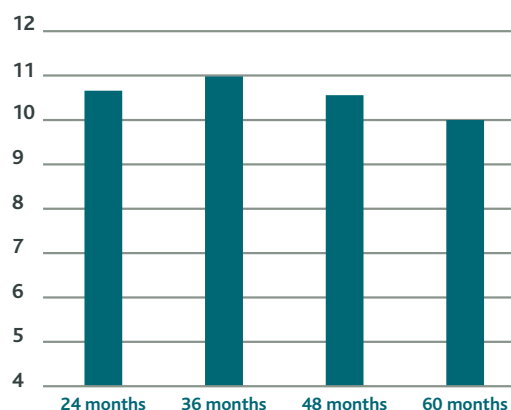
A new set of analyses were possible in this report given the addition of new variables at around the 24 month point. These analyses examined changes in loneliness (Four item UCLA scale: Russell et al., 1980) and also the impact of social interaction as measured by items taken from the ASCOT tool (Netten et al., 2012) in terms of the quality of connectedness to family and friends and numbers of close family and friends. We constructed a total social connectedness/isolation score from these measures. We have sufficient data in these newer measures from the 24-month stage to the 60-month stage for ExtraCare residents. Loneliness and Social isolation as they changed across the period for the residents are shown in Figures 13a and b. Lower scores mean less connected/more socially isolated in Figure 13a, and more lonely in Figure 13b.

Fig 13a. Social Connectedness to family and friends



EC Residents

Fig. 13b. Loneliness



Figures 13a and 13b : Social Isolation and Loneliness as they Changed Across the 5-year Period

Social Isolation

Although there is a trend for residents to become more socially isolated as time goes on, the means are high (not socially isolated: the lowest score possible would be six on this measure, a long way from the means displayed) and the trend is not statistically significant. Over the two time points at which there was sufficient data to compare with the control group (24 and 36 months), there was no difference between the groups.

Loneliness

Again, there was a non-significant trend for residents to become more lonely over time but the means are again high – the most a person can score on the scale is 12, suggesting that people are generally not particularly lonely. The majority of residents (86.5%) rated themselves as 'hardly ever or never' lonely (scores greater than 9), only 12.5% rated themselves as lonely 'some of the time' and less than 1% (0.7%) reported that they were 'often' lonely (defined as a score of <4). These scores appear lower than the UK national averages. Victor, Scambler, Bowling, and Bond (2005) reported that of the 999 participants in their study, which was largely representative of the general population, albeit with a slightly higher incidence of widows, 7% of adults aged over 65 years and living in their own homes were severely lonely, while 61% were 'never' lonely. Similarly, Steptoe, Shankar, Demakakos, and Wardle (2013) analysed data from the English Longitudinal Study of Ageing and found that around 81.9% of adults aged over 60 years scored in the lowest quintile for loneliness (meaning that they were not lonely) while 18.1% had scores in the highest quintile, suggesting that they were lonely. Together, these comparisons suggest that ExtraCare residents are less likely to be lonely than the general population.

Predictors of Loneliness: The Case of Autobiographical Memory

Loneliness is a significant risk factor for older adults, being associated not only with depression and poor quality of life, but also with the development of dementia, frailty and comorbidity (Herrera, Badilla et al., 2015; Stickley & Koyanagi, 2018; Wilson, Krueger, Arnold, et al., 2007).

As we discussed above, our measure of autobiographical memory specificity (AMS), is related both to depression and to functional limitations, which includes social, recreational and communication limitations at baseline. Our own research has also indicated that AMS mediates the impact of cognitive impairment on functional limitations and measures of social engagement, and moderates the impact of depression (Holland, Boukouvalas, Wallis, Clarkesmith, & Cooke, submitted). That is, if AMS is good, the impact of depression on outcomes like functional limitations is reduced.

We may therefore expect AMS to have an impact on loneliness over and above the effect of social isolation, perhaps via its impacts on functional limitations and social engagement, or maybe directly. That is, AMS may be a crucial social-cognitive ability that may have an impact on ability to interact and overcome or avoid loneliness. We know that loneliness is not the same as being socially isolated, although isolation may be one of the predictors of loneliness. The following analysis examines the hypothesis that AMS is another important predictor.

Using the first time point where we have a reasonable number of loneliness assessments, 24 months, we examined if AMS scores, depression and functional limitations added to the prediction of loneliness (feelings of connectedness) by social networking measures (number of friends and family they feel close to and frequency of communication).

Social networking measures together accounted for a significant 13.2% of the variance confirming that relationships with friends and family are important. However, AMS added a significant further 6.5%. Functional limitations and depression did not add anything further to the variance predicted, once social networking and AMS had been accounted for.

Further analysis (mediation) showed that once variance due to AMS is controlled, there is a stronger relationship between social network and loneliness. This suggests that any aspect of ExtraCare that improves AMS is likely to have a positive impact on the relationship between good social connectedness and loneliness.

Further models were examined. Our mobility model was also shown to have an impact on loneliness once social networks and AMS had been accounted for overall, demonstrating that having mobility impairments can have an impact on loneliness. In detail though, mobility did not have an impact on loneliness until the 48 month period, with social networks still being more important up until this time point, although mobility impairment had not significantly increased. The impact of social networks in the model at this stage, however, was less important (and reducing), suggesting that a person's ability to get out and about had more of an impact on loneliness than their social network as time went by. This underlines the importance of building resilient social networks, as a strong social network may counter the negative effects of mobility impairments on loneliness.

Learning Points

- Work on autobiographical memory with residents could help to improve social connectedness and loneliness even further, and have an impact on prevention of depression or its impacts.
- Building a resilient social network for people with mobility issues is critical in reducing their level of loneliness over time.

2.7 Healthcare Use

General Practitioner and Practice Nurse

There were no changes in unplanned nurse or GP visits over time, but there was an overall reduction in planned GP visits (although only marginally significant) and an increase in planned nurse visits, which was significant. Whilst controlling for frailty, analyses did not discover a significant change over a 3-year period in planned and unplanned GP visits, and planned and unplanned practice nurse visits in the difference between ExtraCare and control participants. Results for the ExtraCare residents are presented below in Figure 14.

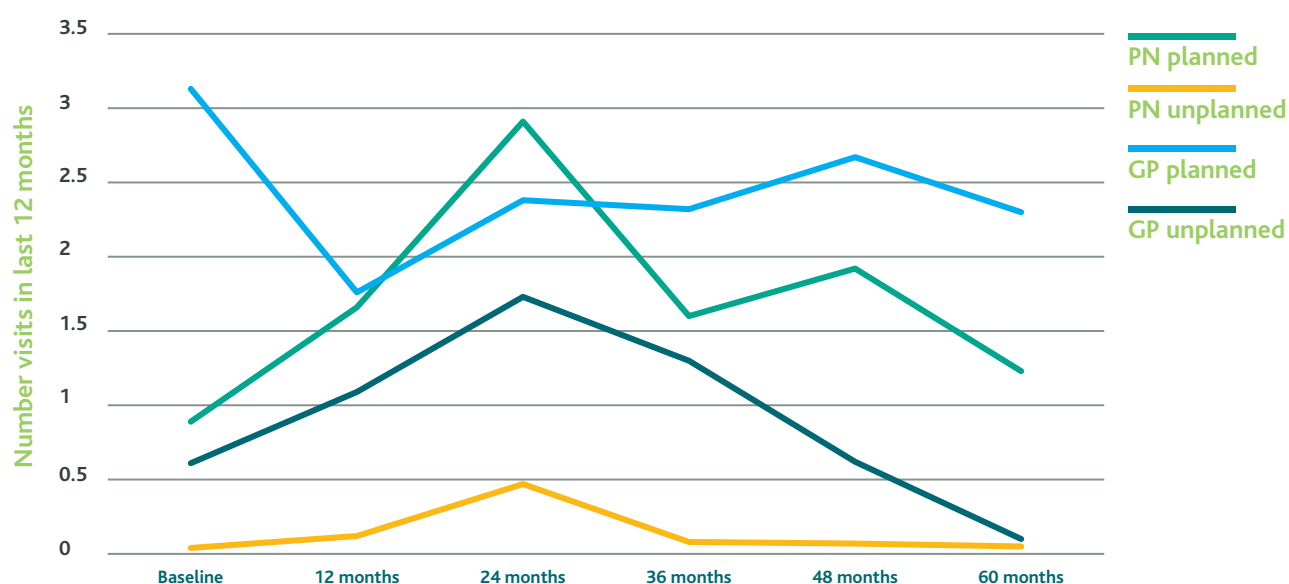


Figure 14: Planned and Unplanned GP and Practice Nurse Visits for ExtraCare Participants over a 5-year Period

Averaging over all periods subsequent to Baseline, Table 6 below gives the mean change and direction of change. It can be seen that planned nurse visits increase by approximately one visit a year, whilst planned GP visits reduce by about one visit a year. Given that a GP visit costs the health service more than a nurse visit, this change is important.

Table 6: Mean change after 12 months or more of living in ExtraCare (up to 60 months)

	Baseline	Average of subsequent 5 years	Mean change per year
Practice Nurse, planned visit	0.89	1.93	+1.04
Practice Nurse, unplanned visit	0.04	0.17	+0.13
GP, Planned visit	3.13	2.17	-0.96
GP, Unplanned visit	0.61	1.12	+0.51

Outpatient Appointments

- There was no significant difference between ExtraCare and Control participants in relation to the number of outpatient appointments or hospital visits, controlling for age, nor was any significant change observed over the 3-year assessment period.
- There was no change in number of outpatient appointments over the 60 months for the Extracare residents.

Hospital Admissions

- No significant change in number of planned or unplanned admissions in was observed over a 3-year period, and there were no differences between the groups once age was controlled. Age was a highly significant predictor of unplanned admissions for both groups.
- There was no significant change over the 5-year period in number of planned or unplanned admissions for the ExtraCare Residents.

Duration of Stay

To examine duration of stay, we added together duration of stay in hospital for planned and unplanned admissions, with people getting a score of zero if they had no admissions.

- a) There was no significant difference between ExtraCare and control participants, nor was there a significant change over the 36 months or an interaction between the groups in the way duration changed over time. Age was a significant predictor of duration of stay for the two groups together.
- b) However, over the longer duration (5 years), there was a significant reduction in duration of stay for the residents. This 31% reduction in duration of stay between the 12 months before moving in, and the fifth year of living in ExtraCare is illustrated below in Figure 15. Summing the means after baseline, we get a mean of 1.387 over the 12 month to 60 month periods, suggesting an average of 3 days less per year per resident in hospital over 5 years.

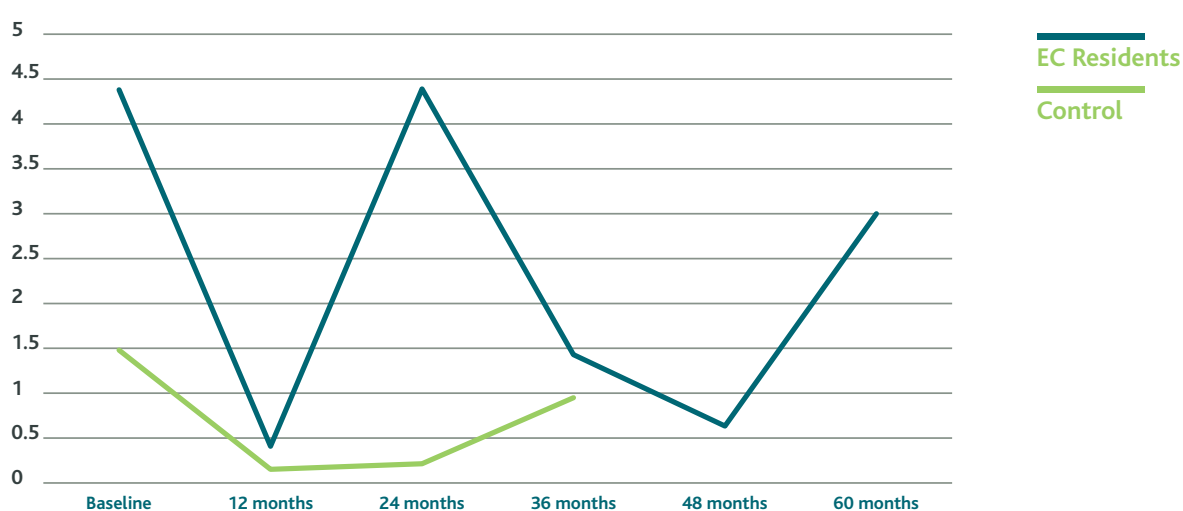


Figure 15: Duration of hospital stays, in days, over time

Frailty had an impact on duration, but this impact reduced over time (a marginally significant impact). That is, although frailty level has an impact on how long people spend in hospital when they are admitted, this is less so for ExtraCare residents as time goes by.

2.8 Healthcare Costs

In the original 2015 report the health costs benefits of living in an ExtraCare retirement village opposed to a community-setting were examined, with a reduction of £1114.94 over the first 12 months of living in ExtraCare schemes and villages, as compared with baseline.

In the current report, costs were once again assessed for change over a 3-year period, with costs determined by the NHS 2017/18 National Tariff (NHS, 2017) and the Personal Social Science Research Unit costs 2016 report (Curtis & Burns, 2016).

The total costs were added together for General Practitioner visits (£36 per visit), practice nurse visits (£7 per visit), number of prescribed medications (£28 per medication), and hospital admission (£163 on admission) and duration of stay (£222 per day) and average outpatient visit cost (£166 per visit). Note that the average cost per medication figures, and the extra cost of admission in addition to cost per night spent in hospital were not included in the 2015 report. Results are displayed below in Figure 16. As for other health measures, annual figures only are appropriate.

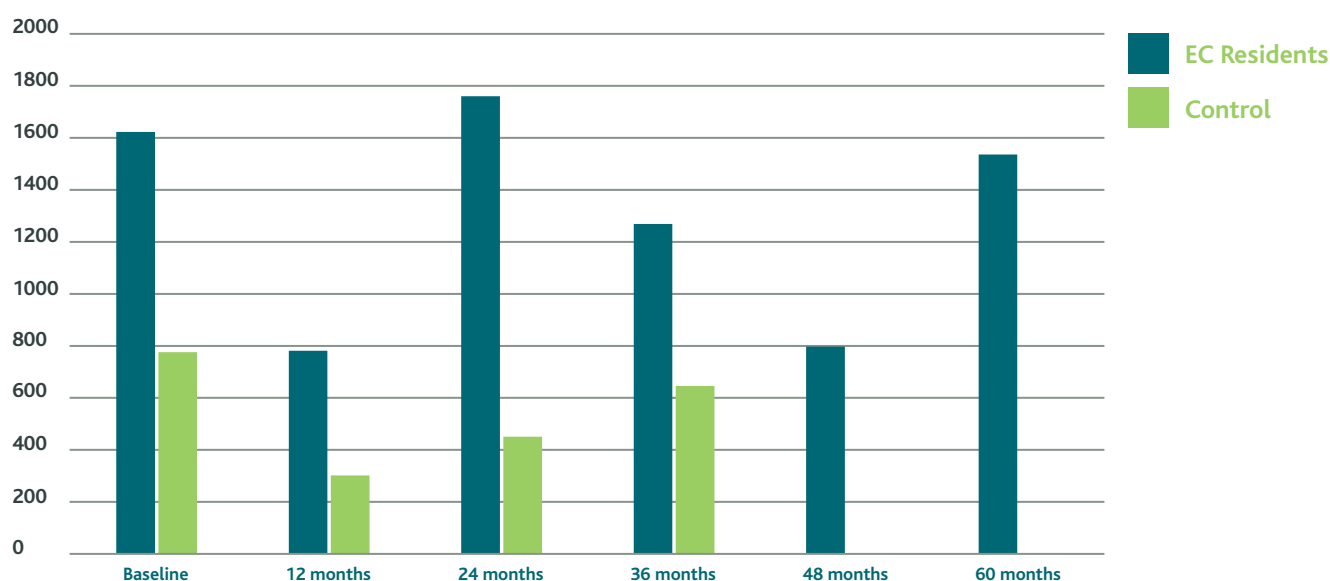


Figure 16: Average total Healthcare Costs (£s) in ExtraCare and Control Participants over time

- Over the first 36 months, there was no overall reduction in healthcare costs and no interaction between the groups. However, despite the appearance of the figure, there was no significant difference between the groups, with both groups having high variance.
- In ExtraCare participants over the full 5 years, there was a reduction of costs over time, but this was not a significant linear effect. The key points to note are that the reduction in the first year is robust, but there is also no expected increase over time as people get older.

Using average costs per person at baseline as our expected annual cost (£1626.90), accumulated over 5 years, on average, living in ExtraCare is saving the NHS £1991.94 in total per person. The difference between the expected 5 year cost and the actual cost is highly statistically significant, despite annual fluctuations.

Frailty and Costs

At Baseline, there was a strong relationship between level of frailty and NHS costs, showing that the frailer a person is, the greater their NHS costs. This relationship was not significant for ExtraCare residents at the 12 month or 60 month time points. In order to investigate the prediction of costs, multiple regression analysis was conducted with age, frailty, time living in ExtraCare and perceived health as potential predictors.

The model was significant, with both age and frailty, but not time living in ExtraCare, being significant predictors of total annual NHS cost. A 0.1 increase/decrease in score on the frailty index was related to a £550 increase/decrease in annual NHS costs, with a 95% confidence interval of £397 to £703, indicating the potential average impact on costs of interventions that reduce frailty.

Participants were categorised as frail, pre-frail and robust using published cut-offs. Figure 17 below illustrates how costs vary across time for the different frailty groups, with only the 36 month period used because of smaller numbers at the later point, which became too small to analyse once people were split into the three categories. Frailty level has a clear and highly significant impact on NHS costs.

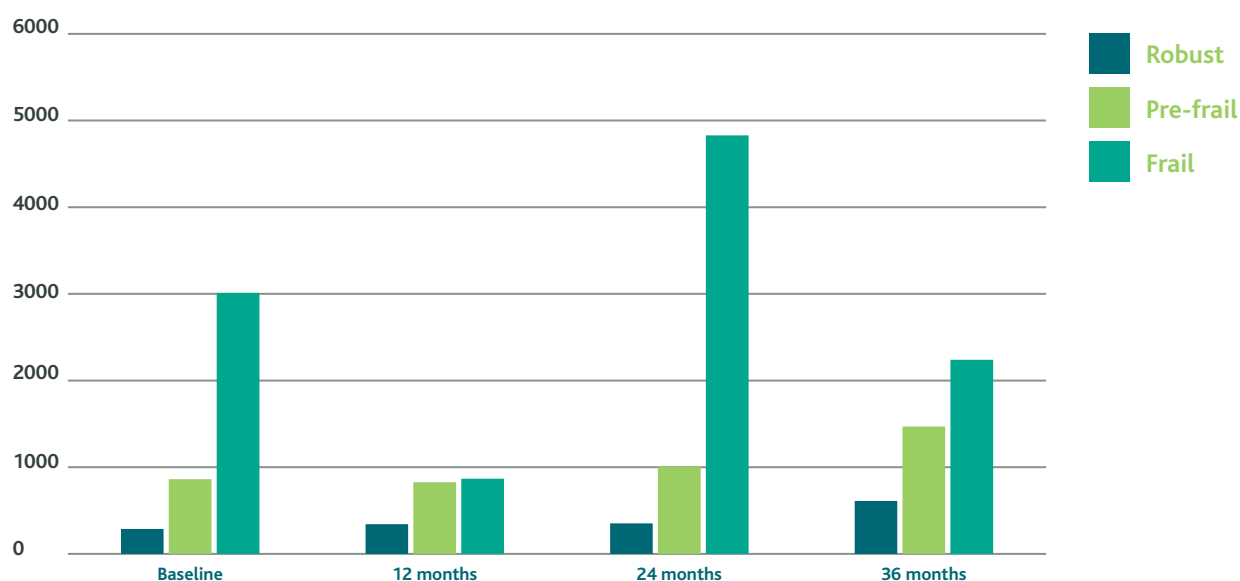


Figure 17: Average Healthcare costs for ExtraCare participants Categorised as Not Frail, Pre-Frail, and Frail over the 3-year Period

Learning Points

- Although the number of planned GP surgery visits have not changed, there has been a change in the way in which residents manage their health. Planned visits to nurses have increased while planned visits to GPs have decreased. This demonstrates that residents are making more effective use of healthcare resources.
- Over the 5-year period, residents spend an average of 3 days less per year in hospital than they did previously and although frailty level has an effect on how long people spend in hospital, this is less so for ExtraCare residents as time progresses. This is a positive finding and supports the view in the previous report that where homes are accessible, care support is readily available and existing care needs understood, as in ExtraCare communities, there can be reductions in the duration of hospital stays.
- There is no expected increase in NHS costs over time as ExtraCare residents age, which is an important finding. Further, ExtraCare saves the NHS around £1991.94 per person over 5 years.

3. Conclusions

In conclusion, over the 5-year period since moving in, significant improvements can be found in ExtraCare residents' health and well-being. Notably, residents are exercising more and have improved their memory and cognitive abilities. Importantly, in some critical health factors where a downward trend might normally be expected with age, for example in terms of functional abilities, independence or age-related changes in cognitive function, specifically executive function, no such trends are emerging. This is very encouraging. Further, usual age-related changes in frailty status are delayed in ExtraCare residents, which demonstrates that frailty is indeed malleable and that positive changes in physical, cognitive and social health can influence the progression of frailty. Levels of depression are low among residents while social well-being is high, with lower levels of loneliness than national averages. Further, ExtraCare residents have changed the way in which they use health care resources and we note that there is a cost saving to the NHS of just under £2000 per person, over 5 years. This is in contrast to the usual expected increase in NHS costs as people age.

4. Recommendations and Actions by ExtraCare Team

As they did with the first report in 2015, ExtraCare plan to take the learning points from this research and put them into action to further enhance the lives of residents. The following actions are being planned or have already been implemented:

- The introduction of the Resilience Tool app (formerly known as the Frailty Calculator) as part of the Well-being assessment to monitor frailty levels and ensure that interventions are triggered at appropriate times. Interventions might include physical or cognitive exercises, or social engagement, where desired by residents.
- Specific personal goal setting with residents after their well-being assessment to improve their frailty levels. Referral to the Gym or Locksmith or other activities as appropriate depending on their frailty levels.
- Work with the Locksmiths to identify specific interventions that could help improve autobiographical memory for residents.
- Well-being Advisors to work with the Fitness Instructors and Activity staff to refer residents who are physically frail to specific activities that will improve physical frailty.
- ExtraCare location teams to identify residents who are frail and have fallen, or at risk of falls and offer more support or care plans to reduce or mitigate these risks.
- To review social networks and loneliness scores in residents with mobility issues or reduced mobility and discuss activities, volunteering and opportunities to build social networks to combat loneliness.

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