

# Opportunity Knocks

David Sinclair  
& Helen Creighton

July 2015

Designing solutions for an ageing society





# Executive Summary

## ***“We are continually faced by great opportunities brilliantly disguised as insoluble problems”***

**John W. Gardner** - American activist, author, and Secretary of Health, Education, and Welfare under President Lyndon Johnson. (1912-2002)

This short report by ILC-UK, in conjunction with the University of Cambridge's Engineering Design Centre and the Institute of Engineering and Technology, seeks to explore how design and technology could better respond to the challenges of an ageing society.

## **An ageing population brings a number of challenges - it means significantly higher health and social care costs and it means many more people will need help carrying out the activities of daily life.**

The Office for Budget Responsibility (OBR) projects that population ageing will result in health spending rising from 6.2 % of GDP in 2018-19 to 8.0 % of GDP in 2063-64<sup>1</sup>. Long-term social care costs are forecasted to rise from 1.2 % of GDP to 2.2 % of GDP over the same period. Moreover among the over 80s less than 55% report finding it easy to travel to a hospital, a bank or a post office. As our population continues to age, more and more people will need help carrying out the activities of daily life.

## **Technology must be part of the solution.**

The technological revolution experienced over the past 20 years has happened alongside recognition of the opportunities and challenges of our ageing society. As a result, technology has been increasingly seen as a silver bullet - something which will improve the lives of older people whilst also reducing health and care costs.

## **And new innovations are coming thick and fast.**

Technology has changed almost beyond recognition over the past two decades. We now have wearable technologies, 3D printing and cloud computing. The Internet of Things, Smart Cities and Big Data could all transform our lives in the next two decades while mobile apps already are.

## **Older consumers represent a huge market for these new technologies.**

The over 65s in the UK currently spend around £2.2 billion per week (£114 billion per annum) on goods and services. Assuming their weekly spending rises in line with annual inflation of 2%, they are likely to be spending over £6 billion per week (£312 billion per annum) by 2037.

## **We need to do more if technology is to meet our expectations.**

Technology has not yet delivered its full potential. While the advancement in technological capabilities have been huge, the practical application of new technologies hasn't always met the needs of older people.

## **The older consumer remains an undervalued target for the private sector.**

The market for older peoples products doesn't not seem to be working as well as it could. At the same time, older people are put in the “too difficult to reach” box for many industry groups

## **The problem is not the technology, it is how we apply it.**

In August 2011, the Health Minister, Andrew Lansley called on health professionals, patients and app designers to “suggest ideas for health-related smartphone apps and information maps”. Given that in 2010 there were already 250,000 health related apps available on online marketplaces, perhaps the Minister was asking the wrong question? Perhaps the right question is, if the

technology and the ideas are out there, why are too few of them getting to market? And when they get to market, why do they fail to deliver?

### **While many older people have embraced new technologies others shy away, feeling that it's not for them.**

Many older people are not only less confident using new technologies, many actually distrust them. Research from the Oxford Internet Institute, found that only 60% of retired people agreed that technology “makes things better”, and over half thought that technologies “fail when you need them most”<sup>2</sup>. Moreover a lot of the branding surrounding new and innovative products aims to attract younger consumers, alienating potential older users.

### **Technology is vital if we are to keep costs down.**

The OBR forecasts on health spending assume productivity in the healthcare sector rises at a rate of 2.2% per annum. Yet such an increase in productivity is not guaranteed. Indeed productivity in the health sector only rose by around 1% per annum on average between 1979 and 2010. If this slower rate of progress was maintained the OBR project that health spending in 2063-64 would need to be 5.0% of GDP higher.

These stark projections by the OBR highlight the need for urgent technological advances in healthcare technologies and new approaches to service delivery in this sector if we are to meet the additional costs generated by an older population.

### **Harnessing the power of good design and promoting innovative applications of technology will be essential in helping us meet the challenges of an ageing society. So what needs to happen?**

**We need to design for inclusivity.** It's not a new argument but we need to ensure all mainstream products are designed to the highest inclusive design standards. We need our homes to meet lifetime homes standards and our neighbourhoods to adopt age friendly guidelines. The Government could take the lead in driving inclusive and age friendly design by only buying and commissioning products and services designed with older people in mind. We know this philosophy can ensure that everyone else will find the products and services easy to use, so everyone wins. **Simple is beautiful. It works and it sells.**

### **We need fewer glib promises about technology “solving the problems of ageing”.**

Wishful thinking and a lack of understanding of the barriers is partly to blame. We need leadership. Someone to get angry about the missed opportunities.

**We need to tackle digital exclusion.** Older people continue to be more digitally excluded than younger despite progress over the past decade. This prevents too many older people from using online services and mobile apps, putting them at significant social, financial and potentially healthcare disadvantages.

**We need to better engage with older people to ensure they maximise the benefit of new technology.** We should use design to open up older people's lives and to give them a wider range of experiences. Technology should be developed which promotes and facilitates social interaction, it should not be isolating. We should collate and encourage older people to share their own life hacks for old age.

### **We must engage industry to better respond to the opportunity of the older consumer.**

Designers, marketers and retailers must get to grips with the potential economic return of targeting this consumer.

**We need more evidence on what works and whether it really will save money.** The

new Centre for Ageing Better should invest research in understanding effectiveness and cost effectiveness of technological intervention. This must incorporate proper independent evaluation. We need more RCTs and other evaluation methods to assess the impact of a technological intervention.

**We need to make the most of the potential of big data and the sharing economy in relation to our ageing society.** Government and industry must work together to ensure UK PLC doesn't miss the boat in relation to big data and the sharing economy. Big data offers a wealth of information to designers, this opportunity should be embraced so that they can better understand the diversity of end-users for whom they are designing.

**We need a proper public debate on data sharing, protection and ownership.** Government must regulate to ensure that whilst individual data is protected, we do not miss opportunities to innovate. We need individuals to engage with a debate about how they can benefit from sharing their data.

**We need regulation which protects consumers but does not stop innovation.** Getting products to market can be challenging and some of the ideas outlined in this report require service providers from different sectors to start to talk to each other.



# Contents

Introduction – Technology, design and the opportunity of age.....	8
The big picture – Where are we now? And where are we going?.....	9
What happens next?.....	15
What are the possibilities?.....	16
Healthcare .....	17
Home.....	19
Leisure .....	21
Transport.....	23
Money.....	25
About this project.....	26

# Introduction – Technology, design and the opportunity of age

This short report by ILC-UK, in conjunction with the Engineering Design Centre at Cambridge University and the Institute of Engineering and Technology, seeks to explore how design and technology could better respond to the challenges of ageing. Technology is often billed as a magical solution to any intractable problem and there have been countless reports on the potential of benefits of technology in our ageing society. However more needs to be done to help tech live up to our expectations. The problem is not the lack of innovation or technological progress, but of how we apply these new technologies. This report aims to open up a new debate about not only the opportunities, but also on what the barriers to progress are likely be over the coming decade.

The first half of this report begins by assessing the scale of the challenge - looking at the implications of an ageing society and measuring the technological progress already made. We then highlight some of the reasons why technology and design hasn't got to grips with ageing and outline what needs to happen in order for them to live up to their full potential.

The second half investigates five of the key challenges surrounding an ageing population: healthcare, the home environment, leisure time, transport and the management of personal finances. It details ways in which existing technologies might be better applied, and new technologies might be developed, to support the needs of older people. These ideas are the suggestions from a number of experts who were gathered together at a workshop in May 2015. Although they only scratch the surface of what is possible, these ideas go some way towards highlighting the potential that design offers.



# The big picture – Where are we now? And where are we going?

## An ageing population brings a number of challenges

### It means significantly higher health and social care costs...

The Office for Budget Responsibility (OBR) has repeatedly highlighted the significant pressures population ageing puts on health and social care spending, forecasting that health spending would rise from 6.2% of GDP in 2018-19 to 8.0% of GDP in 2063-64<sup>3</sup>. Long-term social care costs are forecasted to rise from 1.2% of GDP to 2.2% of GDP over the same period.

### ... and it means many more people will need help carrying out the activities of daily life

There are already 1.45 million over 65s who find it quite difficult or very difficult to travel to a hospital, and 630,000 over 65s who find it difficult or very difficult to travel to their GP. Furthermore among the over 80s less than 55% report finding it easy to travel to a hospital, a bank or a post office. As our population continues to age, more and more people will need help carrying out the activities of daily life.

### Technology must be part of the solution

The technological revolution experienced over the past 20 years has happened alongside recognition of the opportunities and challenges of our ageing society. As a result, technology has been increasingly seen as a silver bullet - something which will improve the lives of older people whilst also reducing health and care costs.

Technological advancement has delivered huge improvements to the lives of older people and we are all living longer and better as a result of the advances over recent decades.

At a most basic level, industry has recognised that in-house technology needs to be better designed and easier to use. It's not that long ago that it was commonplace for products and services to be poorly designed, to come with complex instructions, or to feature difficult to open packaging.

Increased mainstreaming of inclusive design has made life a little bit easier for all of us. Good examples range from OXO Good Grips tin openers to BT's big button telephones. Amazon's investment in "frustration free packaging" has delivered both smaller and easier to open parcels. Such products have seen commercial success through design that understands the needs of older consumers and consequently delivers a better experience for everyone.

### What is inclusive design?

The British Standards Institute (2005) define inclusive design as: 'The design of mainstream products and/or services that are accessible to, and usable by, as many people as reasonably possible ...without the need for special adaptation or specialised design.'

Inclusive design attempts to ensure that the journey a user needs to complete to use a product or service is as barrier free as possible. Interventions might include making control buttons larger and labels more legible, making a technology interaction more intuitive, or providing wider doors and step-free access to buildings.

More information about inclusive design can be found at [www.inclusivedesigntoolkit.com](http://www.inclusivedesigntoolkit.com)

## OXO/Good Grips

Sam Farber founded OXO International in 1989 after watching his wife, who had arthritis in her hands, struggle to use many kitchen utensils. OXO commissioned a new range of kitchen utensils whose design was based on the principles of inclusive design. The design brief explicitly stated that the aim was to develop products with the broadest possible appeal, not just for consumers with specific needs.

The designers tried to understand the consumer needs that had to be addressed. These included the needs of regular domestic consumers and professional chefs, as well as consumers with arthritis or declining strength through ageing. As part of this the team tested rival kitchen products. They found many suffered from common defects, including a tendency to rust or crack, blunt cutting edges and poor ergonomics.

The brand 'Good Grips' was born from this design process. These products feature a handle design that does not rotate in the hand, is large enough to not strain the hand and also distributes the pressure across the hand when in use. The soft rubber fins designed for enhanced finger-grip also serve the dual purpose of making it clear to consumers that these products have been designed for ease of use. Even the design of the large, tapered hole for hanging the utensils was intended to make it easier for someone with poor vision or reduced co-ordination to use.

The first 20 Good Grips products were launched in 1990 and nearly 100 products have been added to the range since. Good design has propelled OXO to success and from an initial turnover of £2 million in 1991, sales have grown by 50% each year since. The company attributes its success to understanding the consumer's needs and practising user-centred design.

## And new innovations are coming thick and fast

Technology has changed almost beyond recognition over the past two decades, below we look ahead to what the game changers could be over the next decade.

- **Wearable technologies**

Clothing and accessories incorporating computer and advanced electronic technologies are becoming more widely available and more elegantly designed. Products such as smart watches or Google Glass give people access to information instantly, while wearable health devices could help individuals better manage a whole range of conditions from asthma to diabetes.

- **Additive manufacturing**

Additive manufacturing techniques (3D printing) have a huge potential in industrial, biomedical and consumer settings. It allows streamlined prototyping, low volume and customisable manufacturing as well as a wide range of new products.

- **The Internet of Things**

Connecting wireless technology, the internet and micro-electromechanical systems, the Internet of Things allows objects, people or even animals to transfer data over a network without requiring human-to-human or human-to-computer interaction. It offers increasing levels of automation as well as better early warning systems, greatly increasing efficiency.

- **Cloud Computing**

Cloud Computing allows content and applications to sync across multiple devices, eventually supporting the simultaneous use of multiple devices. In the future the use of multiple screens and

wearable devices concurrently will greatly enhance user's experiences.

- **Data sharing**

Over recent years, there has been growing interest in how big data can deliver better and more personalised services for us all. 'Big data' - large data sets that may be analysed to reveal patterns, trends, and associations - offer huge potential to addressing these challenges.

Linking medical records and real-time clinical data creates the possibility of identifying health trends, and developing effective interventions, that reduce costs and provide more effective healthcare for patients.

- **Mobile Apps and the Sharing Economy**

From Ebay to Uber and AirBnB to Funding Circle, recent years has seen the development of an increasing number of online platforms which allow individuals to trade directly with other individuals.

Whether it be lending money, hiring a cab or renting a room, online platforms now make it easier than ever. The sharing economy offers huge potential for older people to connect with others. There is undoubtedly potential for the sharing economy to expand beyond taxis and second hand goods to products and services which could help support the independence and improve the quality of life for older people.

- **Smart Cities**

The redesign of cities using digital technologies will enhance the quality and performance of urban services. Increasing use of ICT will reduce costs and resource consumption over the coming years while also allowing governments to engage more effectively and actively with their citizens.

### **Older consumers represent a huge market for these new technologies**

The over 65s in the UK currently spend around £2.2 billion per week (£114 billion per annum) on goods and services. Assuming their weekly spending rises in line with annual inflation of 2%, they are likely to be spending over £6 billion per week (£312 billion per annum) by 2037.

From now until 2037, the 15-64 age group in the UK will, on average, grow by just 29,000 per annum. By contrast, the number of people aged 65 and over will rise by 278,000 on average each year. Across more economically developed countries, the proportion aged 65 and over will rise from 16% to 26% and the proportion over 80 will rise from 4.3% to 10%.

### **The promise of technology has long been recognised**

Countless Government and Parliamentary reports over the past decade have highlighted the potential of new technology to improve the lives of older people whilst reducing costs.

*Technology has the capacity to transform the way we offer services and the support that is available to help people with dementia stay in their own homes. Technology provides a range of options to meet individual needs that can be adapted as those needs change.* (Independence, Well-being and Choice Our vision for the future of social care for adults in England, DH, 2005)

*We need to seize the full potential of the advanced application of science and technology to help deliver better later lives.* (Cross Government Ageing Strategy, Opportunity Age, 2005)

*New service models and technology have an important role in enabling older people to remain in their own homes and avoid unnecessary moves into residential care or hospital.* (The Wanless social care review, Securing Good Care for Older People: Taking a long-term view, 2006)

*Using technology to enable delivery of high-quality support will be a vital element of the future care and support system.* (Shaping the Future of Care Together, DH 2009)

*New technology opens up new horizons for care. From community alarms to sophisticated communication systems, telecare can help people stay in their own homes and live independently*

*for longer...[we discuss] its potential to save resources as well as promote independence (A Vision for Adult Social Care: Capable Communities and Active Citizens 2009)*

*Technologies, including telecare and telehealth, also have the potential to save money and improve the quality of care that older people experience, as well as prevent accidents and crises. (Ready for Ageing Report, House of Lords March 2013)*

### **But we need to do more if technology is to meet older people's expectations**

Technology has not yet delivered its full potential. While the advancement in technological capabilities have been huge, the practical application of new technologies hasn't often met the needs of older people.

For example, in the case of telecare whilst the Wanless Social Care review (2006) advocated greater use of technology it conceded that there remained evidence gaps.

*Often it is clear that these improve the quality of life of older people, but it can be harder to judge the overall impact on costs. Telecare brings health and social care directly to an older person, usually in their own homes, supported by information and communication technology. It has the potential to postpone and divert older people from moving into residential care and possibly hospital, and many pilot studies have shown positive results. But there has been no consensus over assessing costs, so it is difficult to model the future cost impact of the national implementation of telecare.*

### **The older consumer remains an undervalued target for the private sector**

The market for older people's products does not seem to be working as well as it could. At the same time, older people are put in the "too difficult to reach" box for many industry groups. Extensive work has been undertaken over recent years exploring why the potential of the older consumer does not seem to have been realised. ILC-UK's own "golden economy" report highlighted how retailers, designers, and marketers did not seem to be adequately reaching older consumers.

#### **Remote controls**

Television remote controls should act as a convenience aid for their users to allow easier channel selection and volume changes without the user having to walk to the television every time that a change was required. However, in a world of multiple media streams, the poor design and integration of the different services makes accessing them needlessly complex to use. Often multiple remote controls are needed to access different hardware, and within hardware different media services have differing interaction paradigms which further confound users. This can leave older users without the ability to confidently use a service that they stand to gain much from.

### **Whilst the UK has not adequately developed a private marketplace for preventative healthcare interventions**

Our NHS is heavily focussed on tackling illness rather than promoting wellness. And a private market for preventative healthcare interventions has arguably failed to reach its potential.

This might be changing and there is an exciting opportunity on the horizon. The recent growth of relatively affordable wearable monitoring technology offers huge greater potential to support healthy ageing.

### **And Government has been relatively slow off the mark**

It was 1997 when the Government promised to "*harness the enormous potential benefits of IT to support the drive for quality and efficiency in the NHS by: making patient records electronically available when they're needed using the NHSnet and the Internet to bring patients quicker test results, on-line booking of appointments and up-to-date specialist advice enabling accurate information about finance and performance to be available promptly providing knowledge about*

*health, illness and best treatment practice to the public through the Internet and emerging public access media (e.g. digital TV) developing telemedicine to ensure specialist skills are available to all parts of the country”<sup>4</sup>.*

We have seen some progress in this area but it has been extraordinarily slow compared with the speed of technological change in other areas. Online bookings are now possible but it took almost 20 years before being in a place where “all GPs should offer their patients online access to their GP records”<sup>5</sup>.

### **The Ford Approach**

The original Ford Focus was designed with the needs of older drivers specifically in mind. Designers were encouraged to wear the ‘Third Age Suit’, a suit which simulated the effects of ageing. It stiffened joints, added bulk around the torso and added visual impairments such as cataracts. The Focus has a wider front doors and a higher seating position, which makes it easier to get in and out, than the Ford Escort. It has more headroom, and the controls are easier to reach and grasp and the displays are more legible. The car went on to become the world’s bestselling car, as well as winning Car of the Year awards in Europe and North America.

Given that the number of older drivers is set to increase in coming years, other manufacturers would do well to follow Ford’s example in recognising the benefits of designing interactions which target the needs of older users, to ensure that as many users as possible have an outstanding user experience.

### **The problem is not the technology, it is how we apply it**

In August 2011, the Health Minister, Andrew Lansley called on health professionals, patients and app designers to “suggest ideas for health-related smartphone apps and information maps”. Given that in 2010 there were already 250,000 health related apps available on online marketplaces, perhaps the Minister was asking the wrong question?

Perhaps the right question is, if the technology and the ideas are out there, why are too few of them getting to market? And when they get to market, why do they fail to deliver?

### **What are the barriers to better application and usage of technological advancements?**

While many older people have embraced new technologies others shy away, feeling that it’s not for them. Digital literacy and online participation are much lower among older age groups, indeed 29% of people aged 65-74 report never having used the internet<sup>6</sup>.

Older people are not only less confident using new technologies, many actually distrust them. Research from the by the Oxford Internet Institute, based in the University of Oxford, found that only 60% of retired people agreed that technology “makes things better”, and over half thought that technologies “fail when you need them most”<sup>7</sup>.

Moreover a lot of the branding surrounding new and innovative products aims to attract younger consumers, alienating potential older users.

## The Tesco website

When Tesco originally provided on-line shopping facilities through its Tesco.com website, blind and partially-sighted users complained that they found the site inaccessible as screen-readers and other access software could not cope with the graphics-intensive layout and complex interaction.

The Royal National Institute and Tesco worked together to create the Tesco Access web-site. The redesigned site had a vastly simplified page structure through use of simple html coding, with no use of Flash or frames. This means that pages are both more accessible and quick to download even over slower connections.

The revised site was much more popular not only with the intended users, but also with many users with unimpaired vision, who find the simplified structure and appearance both easier to navigate and faster to use. Estimates placed the number of new customers generated for Tesco.com at 25,000 people.

## Technology is vital if we are to keep costs down

As already highlighted the OBR predicts that health spending will rise from 6.4% of GDP in 2018-19 to 8.0% of GDP by 2063-64<sup>8</sup> as a result of population ageing. However this projection is based on the assumption that productivity in the healthcare sector rises at the same rate as elsewhere in the economy – 2.2% per annum.

Yet such an increase in productivity is not guaranteed. Indeed the OBR report that productivity in the health sector only rose by around 1% per annum on average between 1979 and 2010. If this slower rate of progress was maintained the OBR project that 'real health spending per person would need to rise by 3.3% a year'. As a result spending in 2063-64 would be 5.0% of GDP higher.

These stark projections by the OBR highlight the need for urgent technological advances in healthcare technologies and new approaches to service delivery in this sector if we are to meet the additional costs generated by an older population.

And it is a similar story in other sectors. Local government budgets are being steadily squeezed putting transport and community outreach services for older people under pressure. With a growing number of users needing support it is vital we harness technology to keep costs down in these areas too.

**Harnessing the power of good design and promoting innovative applications of technology will be essential in helping us meet the challenges of an ageing society.**

# What needs to happen?

**We need to design for inclusivity.** It's not a new argument but we need to ensure all mainstream products are designed to the highest inclusive design standards. We need our homes to meet lifetime homes standards and our neighbourhoods to adopt age friendly guidelines. The Government could take the lead in driving inclusive and age friendly design by only buying and commissioning products and services designed with older people in mind. We know this philosophy can ensure that everyone else will find the products and services easy to use, so everyone wins. **Simple is beautiful. It works and it sells.**

**We need fewer glib promises about technology “solving the problems of ageing”**

Wishful thinking and a lack of understanding of the barriers is partly to blame. We need leadership. Someone to get angry at industry and Government about the missed opportunities.

**We need to make the most of the potential of big data and the sharing economy** in relation to our ageing society. Government and industry must work together to ensure UK PLC doesn't miss the boat in relation to big data and the sharing economy. Big data offers a wealth of information to designers, this opportunity should be embraced so that they can better understand the diversity of end-users for whom they are designing.

**We need more evidence on what works and whether it really will save money.** The new Centre for Ageing Better should invest research in understanding effectiveness and cost effectiveness of technological intervention. This must incorporate proper independent evaluation. We need more RCTs and other evaluation methods to evaluate the impact of a technological intervention.

**We need a proper public debate on data sharing, protection and ownership.** Government must regulate to ensure that whilst individual data is protected, we do not miss opportunities to innovate. We need individuals to engage with a debate about how they can benefit from sharing their data.

**We need regulation which protects consumers but does not stop innovation.** Getting products to market can be challenging and some of the ideas outlined in this report require service providers from different sectors to start to talk to each other.

**We must engage industry to better respond to the opportunity of the older consumers.** Designers, marketers and retailers must get to grips with the potential economic return of targeting this consumer.

**We need to tackle digital exclusion.** Older people continue to be more digitally excluded than younger despite progress over the past decade. This prevents too many older people from using online services and mobile apps, putting them at a significant disadvantage.

**We need to better engage older people better to ensure they maximise the benefit of new technology.** We should use design to open up older people's lives and to give them a wider range of experiences. Technology should be developed which promotes and facilitates social interaction, it should not be isolating. We should collate and encourage older people to share their own life hacks for old age.

# What are the possibilities?

In May 2015 we hosted an expert workshop to discuss the possibilities for technology and design in an ageing society. Participants were drawn from a diverse range of backgrounds, some were designers themselves or worked in the wider technology sphere, while others were specialists in the experiences of older people.

Conversations were structured around five topics – healthcare, the home, leisure, transport and money. Throughout the discussions we asked the assembled experts to consider the following questions:

- **What can be done using existing technology or adaptations to existing technology?**
- **Where could technology transfers work well?**
- **What new technology could be developed?**
- **What are the barriers currently preventing improvements being adopted?**

The following sections give background information on the five areas of discussion, highlighting the key challenges posed by an ageing society, and detail the technological adaptations and innovations put forward during the course of the afternoon.





An ageing population puts our healthcare system under unprecedented pressures.

In 2013-14 the top four categories (in order) for NHS spending in England per head<sup>9</sup> were: (1) mental disorders (including dementia); (2) problems of circulation; (3) cancers & tumours; and (4) problems with the musculoskeletal system. Spending on all these areas is set to rise as our population ages. Innovations in both the technology used to treat patients and the way healthcare is delivered is essential in order for the NHS to continue to provide world class care without health budgets spiralling out of control.

## Key Figures



**Public expenditure on social care and continuing health care for older people** is projected to increase by **37%** between **2010 and 2022**<sup>10</sup>.

- Average NHS spending for retired households is nearly double that for non-retired households<sup>11</sup>.
- The average cost of providing hospital and community health services for a person aged over 85 is around three times greater than for a person aged 65 to 74 years.
- The number of older people with moderate-severe disabilities is projected to rise 32% in the years 2010 to 2022<sup>12</sup>.

## The cost of cancer

Cancer is primarily a disease of older people, with incidence rates increasing with age for most cancers. 3 in 5 new cancers are diagnosed in people age over 65<sup>13</sup> and more than a third of cancers are diagnosed in people aged 75 and over<sup>14</sup>. A quarter of cancers in elderly men are prostate cancers. Lung and bowel cancers contribute 17% and 15% of cases in this age group, respectively<sup>15</sup>. Breast (21%), bowel (15%) and lung (15%) cancers are the most common in elderly women<sup>16</sup>.

In 2012/13 the NHS spent £6.7 billion on cancer services<sup>17</sup>.

***Detecting cancers earlier can provide cost savings, as the cost of early stage treatment is often significantly cheaper.***

- For colon cancer, stage 1 treatment costs £3,373, whereas stage 4 treatment costs £12,519
- For rectal cancer, stage 1 treatment costs £4,449, whereas stage 4 treatment costs £11,815
- For lung cancer, stage 1 treatment costs £7,952, whereas stage 4 treatment costs £13,078
- For ovarian cancer, stage 1 treatment costs £5,328, whereas stage 4 treatment costs £15,081<sup>18</sup>.

Colon, rectal, lung and ovarian cancers account for approximately 21% of overall cancer diagnoses in England. If the findings for these cancers were replicated for all cancers, then savings in treatment costs of just under £210 million would be realised, resulting in over 52,000 people being diagnosed with earlier stage cancer. This suggests that commissioners should develop plans in the expectation of being able to realise significant savings if they can deliver earlier diagnosis<sup>19</sup>.

## Key Challenges:

- Difficulties in getting to a GP practice or hospital - 1.45 million over 65s find it quite difficult or very difficult to travel to a hospital, whilst 630,000 over 65s find it difficult or very difficult to travel to their GP<sup>20</sup>.
- Ensuring people take their medications – research shows that up to 50% of patients do not take their medications as prescribed<sup>21</sup>.
- Managing chronic diseases - people with long-term conditions account for around 50% of GP appointments, 64% of outpatient appointments and 70% of hospital bed days<sup>22</sup>.

## How can design and technology step in?

### A kettle which monitors blood pressure

Maintaining a healthy blood pressure can drastically reduce the risk of a cardiovascular event such as a heart attack or stroke. Research from the U.S. has found that individuals regularly monitoring their own blood pressure at home find it easier to reduce their blood pressure - 72% of those engaged in home monitoring had their blood pressure under control, compared to 57% of those who had usual care<sup>23</sup>.

For example, a kettle which could take people's blood pressure each morning as they made their tea would provide regular monitoring. Sensor pads could be fitted to the handle and an individual would have to grip the handle while the kettle was heating in order for it to boil.

### The possibilities for digital communication between patients and doctors

- Older people with mobility issues struggle to travel to their GP. A secure video calling platform could allow some consultations to be done without the patient leaving their home.
- A secure connection between a GP practice and an older person's mobile phone, TV or computer could allow doctors to send patients prompts to take their medications.

### Mobile health services

GPs already make home visits to frail patients but for more complex outpatient appointments they must travel to their local hospital. For many of the oldest old this journey can be a difficult barrier to overcome – less than 55% of individuals over the age of 80 find it easy to get to a hospital<sup>24</sup>. Outpatient services, such as X-rays, could be run out of specially adapted vehicles able to visit patients in their communities.

### Redesign the water bottle to prevent dehydration

Older people are considered to be at particular risk of dehydration which can lead to functional and long term health problems<sup>25</sup>. Research has shown that cognitive and physical issues start to rise with a loss of water in the body as little as 1%<sup>26</sup>. Older people may become dehydrated for a number of reasons: there is a reduction in thirst sensation with age (meaning people may be unaware that they may need to drink more fluids); medication can prevent absorption of water into the body; and those who rely on others to bring them drinks or to take them to the toilet find it harder to regulate their fluid intake. For example, one idea from the workshop was a 'smart' water bottle which could help people stay hydrated by monitoring how much water an individual had consumed, and which could also calculate roughly how much they should be drinking depending on factors such as the weather. Depending on how much water someone had been drinking the bottle would glow green, amber or red.



# Home

Many older people would prefer to remain in their own home in later life but a number of factors can make this difficult, including the risk of falls, the onset of dementia and poor insulation.

## Falls

One in three people aged over 65, and half of those aged over 80, fall at least once a year<sup>27</sup>. Falls account for 10–25% of ambulance call-outs for people aged 65+, costing £115 per call-out<sup>28</sup> and the combined cost of hospitalisation and social care for hip fractures (most of which are due to falls) is £2 billion a year or £6 million a day<sup>29</sup>.

Research by the King's Fund<sup>30</sup> found that:

- On average, the cost of hospital, community and social care cost services for each patient who fell were almost four times as much in the 12 months after admission for a fall as the costs of the admission itself.
- Comparing the 12 months before and after the fall, the most dramatic increase was in community care costs (160%), compared to a 37% increase in social care costs and a 35% increase in acute hospital care costs.

## Dementia

Research conducted by the Alzheimer's Society shows that there will be 850,000 people living with dementia in the UK by 2015. The overall economic impact of dementia in the UK is £26.3 billion. This works out at an average annual cost of £32,250 per person<sup>31</sup>. This consists of:



### Of the social care costs:

- £4.5 billion spent on publically-funded social care
- £5.8 billion spent on privately-funded social care
- £11.6 billion of unpaid care
- £111 million on other dementia costs<sup>32</sup>.

Two-thirds (£17.4 billion) of the cost of dementia is paid by people with dementia and their families, either in unpaid care (£11.6 billion) or in paying for private social care<sup>33</sup>. This is in contrast to other conditions, such as heart disease and cancer, where the NHS provides care that is free at the point of use. This is because, although dementia is a physical disease of the brain, most of the essential care required supports daily activities, such as washing and dressing, which is classified as 'social' rather than 'health' care<sup>34</sup>.

## Heating and insulation

Cardiovascular diseases – strokes caused by blood clotting and heart attacks – account for a 40% of excess winter deaths<sup>35</sup>. Following a cold snap, a peak of deaths due to heart attack has been observed two to three days later, and a peak due to strokes five days later<sup>36</sup>. About 152,000 people in the UK have a stroke every year, of which 75% are aged 65+<sup>37</sup>.

There are massive financial costs associated with additional winter deaths and illness. For each death, there are many more people who become seriously ill, needing hospitalisation in the short

term and possibly social care in the longer term. Older people who suffer from heart attacks or strokes as a result of winter colds can face permanent disability. They may find themselves needing care at home or even full-time residential care as a result, so there are likely to be substantially increased demands and costs on care services<sup>38</sup>.

Age UK has calculated that the estimated cost to the NHS in England arising just from cold homes is around £1.36 billion per year<sup>39</sup>. This incorporates costs of both primary care and hospital treatment. The average cost of making a property energy efficient is just £7,500 whereas the cost of keeping an older person in hospital is estimated at £1,750–£2,100 per week<sup>40</sup>.

### **Key Challenges:**

- Badly maintained home flooring and poorly designed footwear can lead to avoidable falls.
- As people live longer dementia is becoming more prevalent and by 2025 it is predicted that there will be one million people in the UK living with dementia<sup>41</sup>.

### **How can design and technology step in?**

#### **Sensors and pressure pads**

Floor sensors, which can detect a fall and send for help, are already available. An alternative approach, which may convey greater information (short of installing cameras in people's homes), is to fit sensors which monitor noise levels in the home. When initially installed they could be calibrated to the base or usual level of sound in a home. If there was a large deviation from this, for example if someone had had a stroke in their arm chair, then relatives could be alerted.

#### **Light emitting shoes**

Many falls occur because people cannot see the ground they are walking on clearly. Shoes which emit a beam of light at floor level could highlight potential hazards.

#### **Cuddle cushions**

A great deal of emotional comfort can be conveyed by touch. A 'cuddle cushion' could act as a receiver for physical communication at a distance with relatives being able to send each other cuddles via a large cushion containing foam which could contract to mimic an embrace.

#### **Smart sensor lighting**

Poor lighting makes a fall much more likely while those with poor vision require additional lighting. Automatic lighting, with lights which adapt to the level of daylight in a room, could help prevent falls.

#### **3D printed custom grips**

Advances in 3D printing mean that it is now possible to print individualised grips for Zimmer frames, walking sticks and other mobility aids making them easier and more comfortable to use.



Retirement brings a great increase in people's leisure time but many do not get the chance to enjoy it as they hope - social isolation, loneliness and mental health issues are big issues among the over 65s.

## Social isolation and loneliness

Social isolation refers to separation from social or familial contact, community involvement, or access to services. Loneliness, by contrast, can be understood as an individual's personal, subjective sense of lacking these things to the extent that they are wanted or needed<sup>42</sup>.

Both social isolation and loneliness are slowly being seen as public health issues, as they have been shown to have significant effects on older people's health. Loneliness in older people is associated with high blood pressure<sup>43</sup>, an increased number of GP visits, and higher incidences of falls<sup>44</sup>. It has also been linked to cognitive decline<sup>45</sup> and depression<sup>46</sup>. Furthermore there is evidence that loneliness can lead to earlier admission to a care home<sup>47</sup>.

## Key Figures



**10.8**  
million people  
aged 65 or over  
in the UK



**3.8**  
million live  
alone (36%)

Of the **10.8 million people aged 65 or over** in the UK, **3.8 million live alone (36%)<sup>48</sup>**. **70% of these are women<sup>49</sup>**.

- 23% of older men and 15% of older women have less than monthly contact with their children, while 19% of older men and 12% of older women have less than monthly contact with their friends<sup>50</sup>.
- 9% of older people feel trapped in their own home<sup>51</sup> and 6% leave the house once a week or less<sup>52</sup>. 24% of pensioners do not go out socially at least once a month<sup>53</sup>.
- 49% of people over 65 say that television or pets are their main form of company<sup>54</sup>.

## Mental Health

Depression affects 22% of men and 28% of women aged 65 or over. This would be just over 2 million people aged 65+ in England<sup>55</sup>. The Royal College of Psychiatrists estimates that 85% of older people with depression receive no help at all from the NHS<sup>56</sup>. Another study estimates that depression affects 40% of older people in care homes<sup>57</sup>.

Worse general health can be associated with depression among older adults<sup>58</sup>, and other risk factors include not living close to friends and family, poor satisfaction with accommodation, and poor satisfaction with finances<sup>59</sup>.

Nearly a third of people with long-term physical conditions have at least one co-morbid mental health problem. This can exacerbate the person's physical condition and increases the cost of treatment by between 45% and 75%. This costs the health service an estimated £10 billion per year<sup>60</sup> in addition to the £14 billion per year already being spent on mental health services.

2012 figures<sup>61</sup> show that overall cash investment in adult mental health services fell by 1% in real terms between 2010/11 and 2011/12, with individual regions experiencing cuts of up to 5.3%. In older people's mental health services, the real decrease was 3.1%. This also masked cuts of up to 10.6% in individual regions.

## **Key Challenges:**

- Fear of venturing outside of the home due to vulnerabilities or disability
- A lack of appropriate transportation – over 20% of over 65s who don't use public transport report health and mobility problems as the key factor<sup>62</sup>.

## **How can design and technology step in?**

Many leisure, activities take place outside the home or with people from outside the home. Technology can help bring activities and people in to the home, making them more accessible.

### **TV buddies**

For many, television can be a solitary activity but watching programs with others can increase people's enjoyment of them. An interface which allowed people in different places to watch TV together could help people keep in touch with friends and relatives around the country. It could work in a similar way to Skype, the majority of the TV screen would show the program but in the corner there could be a video link to a friend's living room.

### **Cooking buddies**

A barcode scanner in the home could be used to upload the contents of your fridge to an interface which would share the information with your neighbours. Taking a peek in to each other's fridges, seeing what people had a surplus of or what was about to go out of date, could encourage neighbours to cook together making meal times more sociable.

### **Integrated leisure and transport**

Leisure activities, such as a trip to the theatre or to a restaurant, could come with transport included. When you book a ticket there could be the option to also book transport. If a large number of people were also booking transport to an event a mini-bus could then be sent to collect them all at a much lower costs than them all booking taxis separately.



## The car

Driving a car remains the most common mode of transport for people aged 70 and older, with people over 70 making on average 315 trips per year driving a car. The next most common mode of transportation is travelling as a passenger in a car (an average of 162 trips per year), followed by walking (140 trips)<sup>63</sup>. However in later life many older people give up driving due to health and vision problems – viable alternatives to the car are vital.

## Public transport

Despite free bus travel, one third of over 65s in England never use public transport. And over half either never use public transport or use it less than once a month<sup>64</sup>. Every journey on public transport begins with a walk, to the bus stop, to the train station or to the tube/tram. For those with a mobility issue this can be a significant barrier - indeed there are approximately 35,000 people aged 65-84 in England who have difficulty walking even a short distance (less than ¼ of a mile), but do not have access to a car as an alternative<sup>65</sup>.



**1.45**  
million over 65s  
travel difficulties

**1.45 million over 65s** find it quite difficult or very difficult to travel to a **hospital**, whilst 630,000 over 65s find it difficult or very difficult to **travel to their GP**.

- Among the over 80s less than 55% report finding it easy to travel to a hospital, a bank or a post office.
- Just 20% of those aged 70-74 living in rural areas use public transport weekly, compared to 38% of those who live in an urban setting.

## Walking

Older people can have problems making short trips on foot. Older pedestrians walk more slowly than others which can cause problems at road crossings. Pelican crossings assume that pedestrians walk at a pace of at least 1.2 metres per second (2.7 miles per hour); however, research by L. Asher et al (2012) found that this is an unrealistic expectation for many older people. For pedestrians over 65, who were able to walk unaided, 76% of men and 85% of women walk more slowly than this, meaning road crossings do not give them adequate time to cross safely<sup>62</sup>.

Older people can also be put off walking due to a lack of public benches and toilets. Benches are essential to allow people with short stamina to take a break and easily accessible toilets are needed to increase confidence when taking longer trips. Unfortunately there was a 40% drop in the number of public toilets across the UK between 2003 and 2013<sup>63</sup>.

## Key Challenges:

- Walking to get to public transport.
- Ill adapted public transport and fear of travel due to vulnerabilities or disability.

## How can design and technology step in?

### Driverless cars

Most car manufacturers are developing driverless cars and many are already being tested on roads. The technology is not yet fully developed, but the trajectory is clear. However, two key societal problems which need addressing are in the space of legislation and insurance/liability. Currently driverless cars are in a legal grey area but the government has promised a full review of current legislation by the summer of 2017. Driverless cars could help many older people continuing to travel by car for longer. They also offer opportunities for new models of car ownership whereby instead

of an individual or a household owning a car, cars are owned collectively by neighbours, families of members of the same community. Because the car can drive by itself it can act more as a taxi, ferrying its various owners around independently. This new model of ownership could reduce the cost of motoring which would be of great benefit to pensioners on low incomes. Driverless cars can also address the problem of excessive insurance premiums for older drivers; KPMG have predicted that car insurance costs could halve by 2020 with the increased presence of driverless vehicles<sup>68</sup>.

### **Redesign the mobility scooter and the walking frame**

Mobility scooters could help overcome the barrier of the short walk to public transport but many older people aren't keen to use them because of the stigma surrounding them. Re-designing the scooter to make it into a desirable consumer item which was more streamlined and less bulky could boost uptake. Similarly the walking frame should also be re-designed, with a clean beautiful design it could become an iconic design in an ageing society.

### **A car with easy entry/exit**

Getting out of a car sideways can be difficult for those with mobility problems, a car where the exit was straight ahead could make it much easier. The seats inside the car could be fitted so that they could swivel to the sides, upon arrival a passenger could open the door, rotate their chair and step easily out of the vehicle.

### **Comfort break app**

An app which located the nearest public toilet and the nearest comfortable seating area could allow older pedestrians to plan their routes better and increase their confidence in walking places.

### **Boris Scooters**

Mobility scooters which could be hired dotted around urban areas, in a similar format to Boris Bikes in London, would allow people to use scooters as and when they needed them, without having to store them in their homes (which can be difficult due to their bulk).

### **Improve the transport system design**

Given that it is the first ¼ of a mile of a journey on public transport that is the most difficult, as this is usually walked, a re-design of the bus network could enable more people to use it. Instead of having lots of buses taking long indirect routes, a small number of fast and direct buses could run along major transport trunks. To connect people to these trunks smaller mini-buses could collect people directly from their homes, having been summoned by an app, a text message or through a phone call.



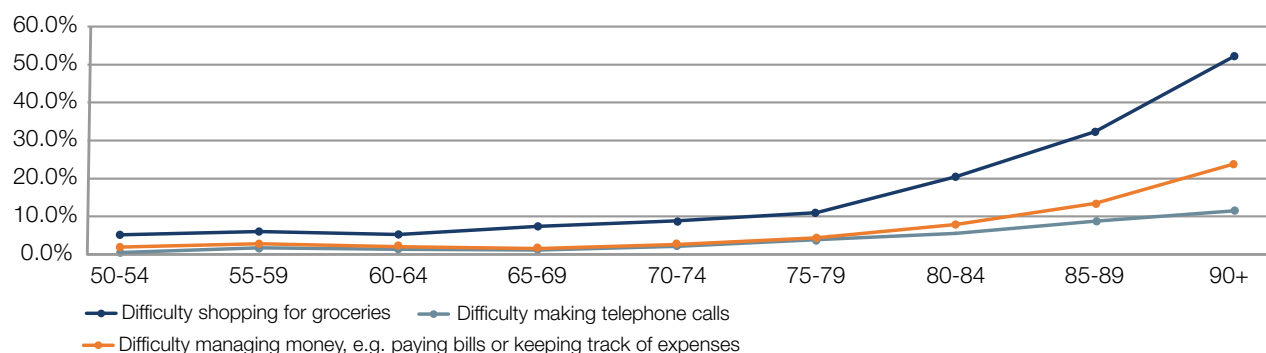


# Money

There is a divergence between age groups in terms of how individuals pay for goods and services. While only one in twenty 16-24 year olds used a cheque in 2012, almost 7 in ten over 65s did. Internet banking also varies with age - 70% of 25-34 year olds made internet banking payments in 2012, but only 30% of over 55's did. People aged over 65 made just over two remote payments on average in 2012 (that is, payments made using internet, telephone and mobile banking), whilst those aged 25-34 made around 12 on average. Many older people have limited dexterity and or a sight impairment, making mobile and online banking difficult to access.

Research using the English Longitudinal Study of Ageing shows that as people age, they find it more and more difficult to manage their money.

**Table 1:** Difficulty completing key tasks



Source: English Longitudinal Study of Ageing Wave 6

Ensuring that older people can manage their money is essential not only to prevent them falling victim to fraud, but also to ensure they can remain active participants in society.

## Key Challenges



Over half of **over 80s**

**Over half** of those in their **80s do not have internet** access in their homes<sup>69</sup>.

- Many people have an understandable caution surrounding new forms of banking and payments.
- The fear and possibility of fraud.

Age Group	Percentage without internet access
50-54	10%
55-59	11%
60-64	12%
65-69	19%
70-74	29%
75-79	43%
80-84	57%
85-89	74%
90+	78%

Source: English Longitudinal Survey of Ageing Wave 6

## **How can design and technology step in?**

### **Trusted information**

To avoid fraud it is important people can access financial information they know to be true. In the same way that there is a lock symbol in the browser's address bar when you access a secure payment system there could be a tick symbol on websites providing financial advice or information to show that they were not related to any scams. Similarly for contacting people regarding financial issues over the phone there could be a trusted telephone number status that would mean your phone displayed a tick when registered numbers, such as banks, called.

### **Biometric alternatives to passwords**

Instead of having to have numerous passwords, which are easily forgotten, fingerprint or iris scanners could be used to verify identities online.

### **Password wills**

With more and more services moving online it is important people put key passwords or access codes for digital legacies in to their wills to avoid problems after their death.

### **Digital consolidation**

A secure platform which allowed the management of bank accounts, bills and pensions through one simple portal could help many people – old and young. It would reduce confusion, reduce the number of passwords needed and allow people to clearly assess their personal finances.

# About this project

This project is a collaboration between the **International Longevity Centre – UK**, the leading think tank on longevity and demographic change, the **Institution of Engineering & Technology**, the largest multidisciplinary professional engineering institution in the world, and the **Engineering Design Centre**, a research centre dedicated to improving the design process based at the **University of Cambridge**.

These partners joined forces to explore the potential for design and technology to deliver cost savings and improve services in the context of an ageing society. The UK population is ageing. By 2027 there will be over **1 million people aged over 90** and by 2037 **one in four of us will be aged over 65**. Demographic change is likely to result in soaring health and social care costs as age related illnesses become more prevalent and a growing number of people struggle to live independently.

This project aimed to investigate the opportunities to improve older people's quality of life through good design, engineering and technology, as well as the barriers to putting innovations in to practice. To this end in May 2015 we held an experts workshop, bringing together leading thinkers from across the ageing, technology and design spectrums. The key ideas from the event are showcased in this report, which highlights the action needed from industry, individuals and government to maximise the financial and health benefits of good design.

## Approach

We began by investigating the sources of additional expenditure in an ageing society as well as the major problems older people face in completing the Activities of Daily Living (ADLs) and the Instrumental Activities of Daily Living (IADLs). Basic ADLs are the functions that we all must perform each day including: personal hygiene; functional mobility; and eating. IADLs are the activities of daily life and include: housework; taking medications; shopping; transportation within the community; communication with friends and family; and managing money.

Based on this research we developed five areas of interest - **(1) healthcare, (2) the home environment, (3) leisure time, (4) transport and (5) the management of money**. ILC-UK research on these five areas was written up in to a detailed briefing note which was shared with expert participants at a workshop held in May 2015. The experts were drawn from a diverse range of backgrounds, some were designers themselves or worked in the wider technology sphere, while others were specialists in the experiences of older people in one of the five focus areas. At this workshop we asked the assembled experts to consider the following questions:

- **What can be done using existing technology or adaptations to existing technology?**
- **Where could technology transfers work well?**
- **What new technology could be developed?**
- **What are the barriers currently preventing improvements being adopted?**

# Acknowledgements

This project has been a collaboration between the International Longevity Centre – UK, the Institution of Engineering & Technology (IET), and the Engineering Design Centre (EDC) at the University of Cambridge.

We would like to thank Alan Howard and Gordon Attenborough, from the IET, and Mike Bradley and John Clarkson, from the EDC, for all their input. We would also like to thank Jonathan Scrutton and Lyndsey Mitchell, from the ILC-UK, for their significant contributions.

We are extremely grateful to all of the attendees at the workshop, held on the 14th of May 2015, whose insight forms the basis of the second half of this report.

# Endnotes

- 1 Office for Budget Responsibility (2015) Fiscal Sustainability Report
- 2 Oxford Internet Surveys (OxIS) (2013) "Cultures of the Internet: The Internet in Britain 2013" Oxford Internet Institute, University of Oxford
- 3 Office for Budget Responsibility (2015) Fiscal Sustainability Report
- 4 The new NHS modern . dependable 1997 Department of Health
- 5 <http://www.nhs.uk/NHSEngland/thenhs/records/healthrecords/Pages/overview.aspx>
- 6 Office for National Statistics (2014) % Never Used the Internet – 2014 Q1
- 7 Oxford Internet Surveys (OxIS) (2013) "Cultures of the Internet: The Internet in Britain 2013" Oxford Internet Institute, University of Oxford
- 8 Office for Budget Responsibility (2015) Fiscal Sustainability Report
- 9 In real terms at 2013-14 prices
- 10 Nuffield Trust (2012) Care for older people: projected expenditure to 2022 on social care and continuing health care for England's older population
- 11 Key Issues for the New Parliament (2010) House of Commons Library Research
- 12 Nuffield Trust (2012) Care for older people: projected expenditure to 2022 on social care and continuing health care for England's older population
- 13 National Audit Office (2015) Progress in improving cancer services and outcomes in England
- 14 <http://www.cancerresearchuk.org/cancer-info/cancerstats/incidence/age/>
- 15 <http://www.cancerresearchuk.org/cancer-info/cancerstats/incidence/age/>
- 16 <http://www.cancerresearchuk.org/cancer-info/cancerstats/incidence/age/>
- 17 National Audit Office (2015) Progress in improving cancer services and outcomes in England
- 18 <http://www.incisivehealth.com/uploads/Saving%20lives%20averting%20costs.pdf>
- 19 <http://www.incisivehealth.com/uploads/Saving%20lives%20averting%20costs.pdf>
- 20 English Longitudinal Study of Ageing
- 21 Brown, M. T., & Bussell, J. K. (2011). Medication Adherence: WHO Cares? *Mayo Clinic Proceedings*, 86(4), 304–314. doi:10.4065/mcp.2010.0575
- 22 Department of Health (2012a) Long Term Conditions Compendium of Information, 3rd ed.
- 23 Margolis KL, Asche SE, Bergdall AR, et al. Effect of Home Blood Pressure Telemonitoring and Pharmacist Management on Blood Pressure Control: A Cluster Randomized Clinical Trial. *JAMA*. 2013;310(1):46-56. doi:10.1001/jama.2013.6549.
- 24 H. Creighton and G. Holley-Moore (2015) *The Future of Transport in an Ageing Society ILC-UK*
- 25 L. Wilson (2014) *Hydration and Older People in the UK: Addressing the Problem, Understanding the Solutions, ILC-UK*
- 26 Menten, J. (2006) 'Oral hydration in older adults', *American Journal of Nutrition*, 106(6), pp 40-49
- 27 [https://www.rcpsych.ac.uk/pdf/FR\\_OA\\_1\\_forweb.pdf](https://www.rcpsych.ac.uk/pdf/FR_OA_1_forweb.pdf)
- 28 Fall prevention: New approaches to integrated falls prevention services. NHS Confederation, Briefing, April 2012 Issue 234
- 29 The National Hip Fracture Database National Report 2011; by British Orthopaedic Association, with the Information Centre and NHS. 2011
- 30 [http://www.kingsfund.org.uk/sites/files/kf/field/field\\_publication\\_file/exploring-system-wide-costs-of-falls-in-torbay-kingsfund-aug13.pdf](http://www.kingsfund.org.uk/sites/files/kf/field/field_publication_file/exploring-system-wide-costs-of-falls-in-torbay-kingsfund-aug13.pdf)
- 31 Alzheimer's Society (2014), *Dementia UK: Second edition*
- 32 Alzheimer's Society (2014), *Dementia UK: Second edition*
- 33 Alzheimer's Society (2014), *Dementia UK: Second edition*
- 34 Alzheimer's Society (2014), *Dementia UK: Second edition*
- 35 G. C. Donaldson and W. R. Keatinge (1997) 'Early Increases in Ischaemic Heart Disease Mortality Dissociated from and Later Changes Associated with Respiratory Mortality after Cold Weather in South East England', *Journal of Epidemiology and Community Health*, December 51(6): 643–648
- 36 Chief Medical Officer (2009) Annual Report
- 37 The Stroke Association. Accessed 18/02/15 at <http://www.stroke.org.uk/about/about-stroke>

- 38 [http://www.ageuk.org.uk/Documents/EN-GB/Campaigns/STW/The\\_cost\\_of\\_cold\\_2012.pdf?dtrk=true](http://www.ageuk.org.uk/Documents/EN-GB/Campaigns/STW/The_cost_of_cold_2012.pdf?dtrk=true)
- 39 Calculated by José Iparraguirre, Chief Economist, Age UK, using the method described in South East Regional Public Health Group Factsheet (2009) Health and Winter Warmth. This made use of a calculator produced by the Chartered Institute of Environmental Health to estimate the total cost to the NHS in England arising from cold homes. Age UK updated their figure (£859 million) using 2011 household numbers estimates for England (Office for National Statistics) and the GDP deflator (from HM Treasury's website) to inflate the estimates to 2011/12 prices. Age UK's new figure does not take into account recent improvements in home insulation, which might be expected to lead to a slightly lower estimate
- 40 NHS Institute Return on Investment calculator: [www.institute.nhs.uk/quality\\_and\\_service\\_improvement\\_tools/quality\\_and\\_service\\_improvement\\_tools/Return\\_on\\_Investment\\_\(ROI\)\\_calculator.html](http://www.institute.nhs.uk/quality_and_service_improvement_tools/quality_and_service_improvement_tools/Return_on_Investment_(ROI)_calculator.html)
- 41 Alzheimer's Society (2007) Dementia UK, The Full Report
- 42 Age-UK (2010) Loneliness and Isolation Evidence Review
- 43 Hawkey LC, Thisted RA, Masi CM, Cacioppo JT. 2010. Loneliness predicts increased blood pressure: 5-year cross-lagged analyses in middle-aged and older adults. *Psychology and Aging* 25 (1) pp.132-41
- 44 Cohen, G.D. et al. 2006 'The impact of professionally conducted cultural programs on the physical health, mental health, and social functioning of older adults' *The Gerontologist* 46
- 45 James BD, Wilson RS, Barnes LL, Bennett DA. 2011. Late-life social activity and cognitive decline in old age. *Journal of the International Neuropsychological Society* 17 (6) pp. 998-1005
- 46 Green B. H, Copeland J. R, Dewey M. E, Shamra V, Saunders P. A, Davidson I. A, Sullivan C, McWilliam C. 1992. Risk factors for depression in elderly people: A prospective study. *Acta Psychiatr Scand.*86 (3) pp.213-7
- 47 Russell DW, Cutrona CE, de la Mora A, Wallace RB. 1997. Loneliness and nursing home admission among rural older adults. *Psychology and Aging* 12(4) pp.574-89
- 48 General Lifestyle Survey 2011, Table 3.3. ONS, 2013
- 49 Labour Force Survey, ONS, 2011
- 50 B. Beech and S. Bamford (2014) Isolation : the emerging crisis for older men, ILC-UK
- 51 One Voice: Shaping our ageing society, Age Concern and Help the Aged, 2009
- 52 TNS Loneliness survey for Age UK, April 2014
- 53 Households Below Average Income 2012/13, Chapter 6, DWP, 2014
- 54 TNS survey for Age UK, April 2014
- 55 Depression is defined as a high score on the GDS10 (Geriatric Depression Scale), Health Survey for England 2005: Health of Older People, IC NHS 2007
- 56 Royal College of Psychiatrists press release, 29 October 2009
- 57 Depression and Older People: Towards securing well-being in later life, Help the Aged, 2004
- 58 General health status and vascular disorders as correlates of late-life depressive symptoms in a national survey sample. Stewart, R, & Hirani, V. *International Journal of Geriatric Psychiatry*, 25(5): 483-488, 2010
- 59 Depressive symptoms in the very old living alone - prevalence, incidence and risk factors. Wilson, K, Mottram, P, Sixsmith, A. *International Journal of Geriatric Psychiatry*, 22(4): 361-366, 2007
- 60 Parsonage, Naylor. Mental health and physical health: a comparative analysis of costs, quality of service and cost effectiveness: London School of Economics, 2012.
- 61 DH. National Survey of Investment in Adult Mental Health Services: Department of Health, 2012.
- 62 H. Creighton & G. Holley-Moore (2015) The Future of Transport in an Ageing Society, *ILC-UK*
- 63 Department for Transport (2012). Average number of trips (trip rates) by age, gender and main mode: Great Britain, 2012.
- 64 H. Creighton & G. Holley-Moore (2015) The Future of Transport in an Ageing Society, ILC-UK
- 65 H. Creighton & G. Holley-Moore (2015) The Future of Transport in an Ageing Society, ILC-UK
- 66 Laura Asher, Maria Aresu, Emanuela Falaschetti, and Jennifer Mindell (2012) *Most older pedestrians are unable to cross the road in time: a cross-sectional study*. *Age Ageing* first published online June 13, 2012 doi:10.1093/ageing/afs076
- 67 The British Toilet Association (2013)
- 68 Society of Motor Manufacturers. (2015). Connected and Autonomous Vehicles: The UK Economic Opportunity.
- 69 English Longitudinal Study of Ageing Wave 6



**ILC-UK**

11 Tufton Street

London

SW1P 3QB

Tel : +44 (0) 20 7340 0440

[www.ilcuk.org.uk](http://www.ilcuk.org.uk)

Published in July 2015 © ILC-UK 2015

Registered Charity Number: 1080496.