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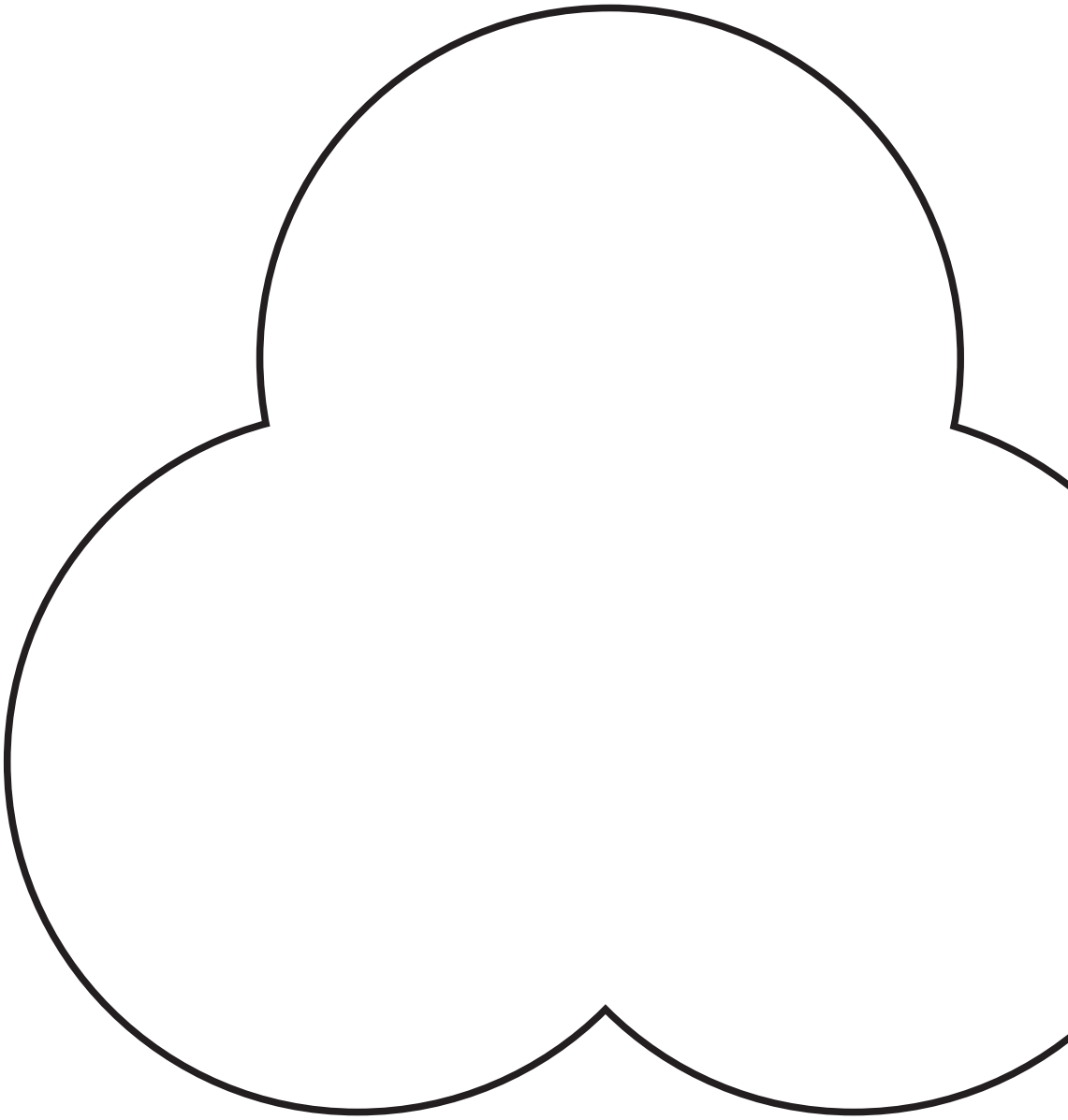

A report for the Sustainable Development Unit by NEF Consulting

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Client: Sustainable Development Unit for the NHS, public health and social care system

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NEF Consulting is the consultancy arm of the UK think tank, New Economics Foundation (NEF). We put NEF's ideas into practice by placing people and the planet at the heart of decision-making.

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1. Introduction

Background

Across the NHS, public health and social care system there are some great examples of groups working to build a sustainable healthcare system. The achievements of these groups are often hidden in frameworks, organisational reports and practitioner plans. Together they are contributing towards the health system's commitment to reduce emissions by 28% from 2013 – 2020; to finding new creative means of making budgets go further; and to improving the nation's health and well-being.

The Sustainable Development Unit (SDU) is tasked with enabling these communities and services. Its broad remit includes holding up a mirror to the NHS, public health and social care system, and linking sustainability to the wider determinants of health. It does this through a variety of tools, policy and research.

The SDU commissioned NEF Consulting to bring together and celebrate some of the triple bottom line (economic, social and environmental) achievements of these initiatives, and to show their impact. By capturing the potential of these initiatives in common metrics and over a consistent timeframe in this project, we have been able to show how together they create "healthy returns from sustainability actions" in the UK's health and care system.

Context

In 2014 the SDU launched a five year sustainable development strategy for the NHS, public health and social care system: "Sustainable, Resilient, Healthy People and Places." The vision is to achieve a sustainable health and care system by reducing carbon emissions, protecting natural resources, preparing communities for extreme weather events and promoting healthy lifestyles and environments.

There is a clear need to address the challenges of 21st century health and social care in the UK. Issues ranging from finite planetary resources to our changing climate; and from economic austerity to health concerns related to long term conditions, the obesity pandemic and the dementia time bomb must be addressed.

For example:

- Reduced environmental impact – to meet at least 34% reduction of Scope 1, 2 and 3 carbon emissions in line with the UK Climate Change Act targets (against 1990 levels)
- Resilient communities – to be prepared for extreme heat and cold weather
- Local community leadership – health and well-being boards taking local leadership
- Embedding sustainability – decisions at all levels to include sustainability

- Recognition of improved health outcomes and replication across the system

While this may seem to be an ambitious goal, much can be achieved through adopting “living well” models of care.

The SDU has a strong history of developing and supporting sustainability interventions across the NHS, public health and social care system since April 2008. Its work includes the development of tools, policy and research to support the health and care system in England to become a more sustainable organisation environmentally, financially and socially.

This broad ranging remit means that the SDU works in areas as diverse as energy, infrastructure and procurement while tackling the long term needs of the health service, including the wider determinants of health, corporate social responsibility and developing new sustainable models of care.

This project looks to showcase the scale and range of sustainability interventions to decision makers through an infographic. While many decision makers are supportive of sustainability work in principle, they still consider there to be trade-offs against their other agendas. For example, investing in less packaging for medical equipment may be seen to be more expensive and likely to reduce health outcomes.

By embarking on an infographic project the SDU aims to present the co-benefits (social, environmental and health) of sustainability work across the health, social and care systems. Specifically the aims are to:

- change people’s perspectives on the relevance of sustainability work by showing the **interrelationships** between sustainability and health.
- communicate a **“journey**” or story of how sustainability interventions can be set up: from positing a challenge to providing a solution. Where we’re moving from and to…
- empower advocates with useful data to present to decision makers
- show a range of “game changing” interventions from all parts of the NHS, public health and social care

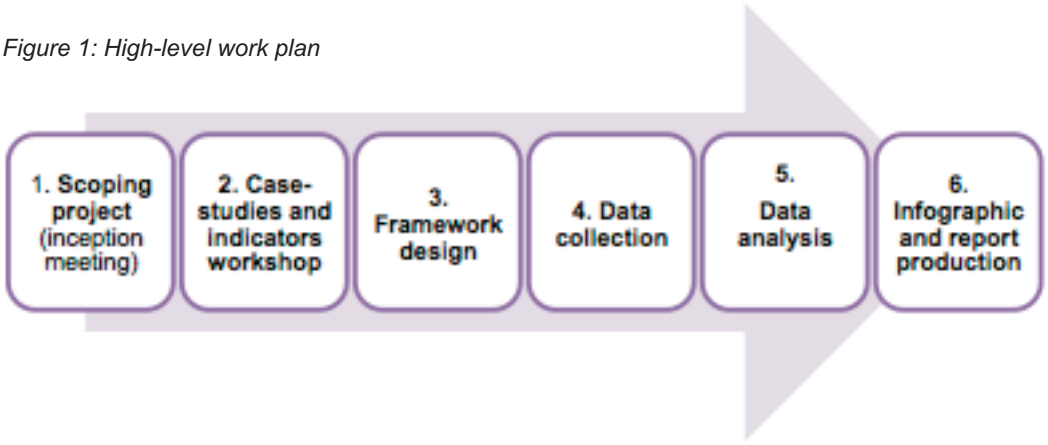
2. Methodology

The main purpose of the “Healthy Returns” project was to craft the most interesting, compelling and relevant stories from a series of case-studies of interventions and to present these in the form of a clear and accessible infographic that would speak to a wide range of possible audiences: from practitioners across the health and care system to members of the public that use the services.

Project initiation and scoping

The project began with the development of a high level work plan, as represented by Figure 1 below. This workplan identified the key stages of the project and the relevant approach for each stage.

Figure 1: High-level work plan



Selecting case-studies

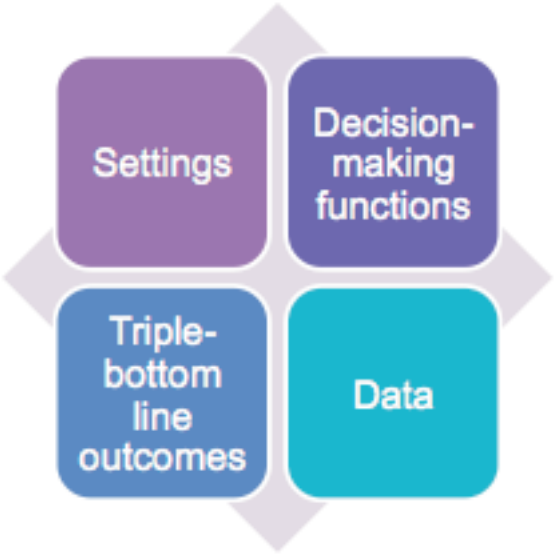
A critical first step was to identify a long list of case studies to illustrate specific activities or interventions that demonstrate “co-benefits” in terms of the sustainability outcomes that they achieved. An example of co-benefits is when carbon-reducing initiatives can be shown to have benefits to the financial bottom-line through savings in energy consumption and its associated costs.

The SDU’s previous work on the Marginal Abatement Cost Curve (MACC) of the health service was a good illustration of this kind of co-benefit. However it was equally important to demonstrate the co-benefits of activities that have positive social impacts in the health and care system, as well as both environmental and financial savings.

To begin to identify these case studies, NEF Consulting convened a workshop with the aim of bringing together stakeholders from across the health and care system and within the SDU to share their views and knowledge of the most important outcome areas for their work.

The case studies needed to have good data on triple bottom line outcomes and represent a broad range of settings and decision making functions to be relevant to the broadest possible audience across the health and care system. Figure 2 illustrates the key case study selection criteria

Figure 2: Considerations for selection of case studies



Within each of these areas of focus we aimed to identify showcase interventions from various types of organisation within the health and care system: such as NHS Trusts and organisations in the wider public health and social care system.

The aim was to include preventative projects that join up housing, health and care services and ideally would represent a combination of existing qualitative and quantitative data. The initial case study mapping identified a range of interventions in the following settings:

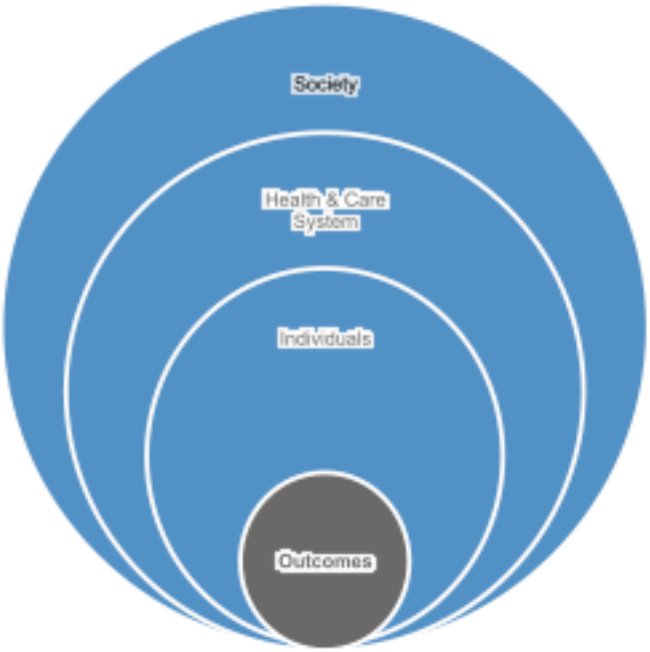
1. Estate management
2. Food
3. Pharmaceuticals
4. Supply chain / procurement (eg. medical equipment)
5. Travel and transport
6. Waste
7. Commissioning
8. Design of buildings and landscape
9. Design of care models
10. HR and operations

In the process of narrowing down the long list of case studies these groupings were later changed to reflect an equally comprehensive range of settings that were more appropriate for the final short-list of interventions.

Developing the indicator framework

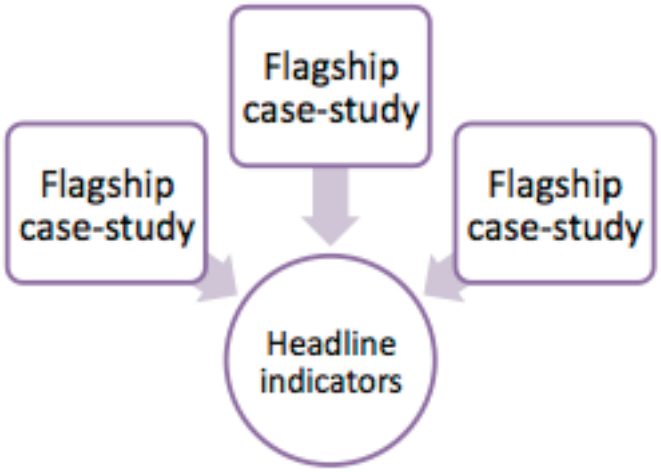
An additional goal of the workshop was to use the case studies identified to determine the kinds of indicator that would be most useful for measuring triple-bottom line outcomes. After much discussion it was agreed that a good high level framework would include outcomes for individuals (eg patients, staff), for organisations withing the health and care system (eg hospitals, Trusts) and for the wider society and economy, as illustrated in Figure 3 below.

Figure 3. Model for the indicator framework



The next step was to link the flagship case studies with the range of headline indicators from across the health care system, as illustrated in Figure 4 below.

Figure 4. Relationship between flagship case-study interventions and the overall narrative



Data collection

It became clear that one of the main challenges of the project was to find suitable case studies that illustrated the full range of co-benefits (social, environmental and financial. While many case studies provided good examples of headline indicators in one or two areas (eg environmental and/or cost savings), a much more limited number presented the co-benefits across the triple bottom line. This is not to say that many more case studies do not exist but the number that had quantified triple bottom line outcomes was limited.

Short-listing potential case-studies

From the initial long-list of case studies, identified at the initial workshop and refined through subsequent conversations, it was necessary to conduct a more in-depth review to determine whether each one met the requirements of good data illustrating triple bottom line outcomes.

This process began with a detailed review of thirteen case studies representing a range of different scenarios and settings:

Setting	Scenario
Public health and commissioning	1. Fuel poverty - percentage of those in fuel poverty and living in houses of SAP Grade F or less retrofitted with energy efficiency improvement. Case study: private SROI on social housing in Manchester[1]
NHS Staff	2. Active travel for NHS staff - percentage of staff travel to work on foot / by bike. Case study: SDU case study – West Hertfordshire[2]
GPs and commissioning	3. Reducing over prescribing of medicines – percentage reduction through adherence to prescription regime. Case study: Centre for sustainable healthcare[3]
GPs and Pharmacists	4. Pharmacist-led repeat prescription management Case study: NICE[4] – proportion of repeat prescriptions.
Hospitals	5. Reducing carbon intensity of anaesthetic gas use in hospitals Case study: SDU[5] guide with expertise on substitutability of gases.
Social care	6. Reducing social isolation in older people and improving long term condition management for old people (reduced care home admissions). Case study: Well Connected Worcestershire[6]
Commissioning and Public health	7. Technology based smoking cessation. Case study: NICE[7] and British Thoracic Foundation[8]
Hospitals	8. Retrofitting percentage of hospitals to adapt to climate change Case study: DeDeRHECC

Setting	Scenario
Hospitals	9. Energy awareness campaign for staff in hospitals (and care homes) Case study: Operation TLC in Barts Hospital http://bit.ly/1rE6wKw
Hospitals and supply chain	10. Reduce waste by improving packaging of theatre waste in hospitals Case study: Packaging operation equipment together at Royal Liverpool and Broadgreen University Hospitals.[9]
Commissioning and Public health	11. Green spaces in NHS providing eco services such as: ecotherapy; physical exercise; flooding avoidance; improved health/recovery when looking out on green spaces. Percentage of care homes that have a garden for physical exercise and healthy food.
Hospitals	12. Energy Efficiency Projects e.g. CHP, lighting, insulation
GPs	13. GPs switching to prescribing propellant free inhalers where appropriate and encouraging return of used inhalers Case study: http://goo.gl/98PaUq

Data analysis

The initial analysis of the thirteen case studies aimed to identify:

1) If the case study had good data on triple bottom line outcomes (or at least represented a good example of co-benefits across two areas of sustainability; eg environmental and financial)
2) If the case study had data that could be represented using standard indicators: carbon emissions for environmental outcomes, Quality Adjusted Life Years (QALYs) for social outcomes and financial savings (£s) for economic outcomes.
3) If the case study could be meanigfully scaled up to be representative of the benefits if it were to be applied across the relevant part of the health and care system.

1 http://www.salixhomes.org/documents/Salix_SROI_-_Post_Retrofit_2012.pdf

2 http://www.sduhealth.org.uk/documents/case_study/20140625_Travel_West_Hertfordshire_Trust.pdf

3 http://sustainablehealthcare.org.uk/mental-health-susnet/resources/2014/08/carbon-footprint-depot-prescribing-0

4 http://bit.ly/1F2u6sW

5 http://www.sduhealth.org.uk/areas-of-focus/carbon-hotspots/anaesthetic-gases.aspx

6 https://public.worcestershire.gov.uk/web/home/DS/Documents/Appendix/Cabinet/Agendas%20and%20Reports%202013/Thursday%2C%2012%20December%202013/Item%2014%20Background%20paper.pdf

7 http://bit.ly/18GMdXB

8 https://www.brit-thoracic.org.uk/document-library/clinical-information/smoking-cessation/bts-case-for-change/

9 http://bit.ly/1beT5Nq

This stage of the project was particularly intensive as most case studies did not have all the data required to meet these three objectives. It was necessary to conduct wider research to fill in the gaps where possible and where data could not be identified to fil the gaps some case studies had to be removed from the analysis.

Final list of interventions

At the end of this process, the following eight appropriate case studies with good data, meeting the three criteria above, remained.

1) Reducing social isolation in older people
2) Energy awareness campaign for staff in hospitals
3) Building management system in all NHS trusts
4) Reduce waste by improving packaging of theatre kits in hospitals
5) Prescribing treatment for asthma without propellant inhalers
6) Proper use of long-acting injections
7) Active travel for NHS staff
8) Tele-healthcare for people with long term health conditions in the community

Indicators and units

Even though the case studies had been selected on the basis that they mostly provided some good data across a range of triple bottom-line outcomes (social, environmental and economic) there was still a need to present these outcomes consistently for the purpose of producing the infographic.

This presented some significant challenges as the diversity of the case studies also meant that there was a real diversity of outcomes, whereas, for an infographic to be clear it needed to be focused on a small number of consistent indicators. The case studies selected included social outcomes such as reduced loneliness, improved comfort or greater convenience while environmental outcomes included net changes in carbon emissions but also in other indicators such as waste. Only the economic outcomes were particularly consistent with benefits that could be represented as financial savings in £s in all cases.

After further analysis and discussion, it was agreed that the standard indicators and units to be presented should be net savings in £s (economic), carbon emissions avoided in tonnes of CO_2 equivalent or CO_2e (environmental) and Quality Adjusted Life Years or QALYs (social).

Net savings or costs to the health and social care system

These are unit cost savings in £s to the NHS and state social and care systems for a particular intervention. They are determined by considering what costs or savings are made in relation to what would have happened anyway. For example, if hospitals are retrofitted with insulation there would be a short term capital cost but longer term savings.

Carbon emissions avoided

This is the equivalent carbon dioxide reduction made as a result of the intervention. It is a saving in terms of greenhouse gas production. It is important to note that the headline environmental indicator presents this in terms of tonnes of CO_2 equivalent. However it is widely accepted that carbon emissions also represent an economic cost and there is an accepted method of calculating this as the social cost of carbon. The savings in the social cost of carbon for activities that reduce emissions were therefore also calculated although these are presented separately to the more direct financial savings (such as those from reduced energy consumption).

Increase in Quality Adjusted Life Years (QALYs)

A QALY is an indicator of the health giving potential of an intervention. It is calculated by taking into account both the quality and duration of any health benefits derived. The indicator is used in health economics to determine the value for money of different health interventions. Each QALY represents the number of years of life that would be added by a medical intervention. A year of perfect health has a value of one but the year's health quality could be represented on the spectrum down to zero for death. It is often measured in terms of the person's ability to perform the activities of daily life, freedom from pain and mental disturbance. An intervention may also create multiple years of partial health (for example if the patient is in a confined to bed or in pain) so the final number may be greater than one, or averaged down to a single year.

Time and scale

The next challenge relating to the presentation of consistent triple bottom-line outcomes for the infographic was to consider the timeframe and scale of the interventions. Here the challenge was, again, that the diversity of the case studies meant that the benefits they reported were not presented consistently in relation to these two dimensions. For example, some presented benefits over differing numbers of years (or over a lifetime, which is in itself an imprecise period); and some had achieved benefits at a small scale (for example in one hospital) whereas others had calculated much wider benefits to the health and care system.

Once again, we needed to standardise the outcomes for the purpose of presenting these consistently and clearly in the infographic.

Time

Indicators for each intervention have been standardised to an average annual saving or each indicator is shown as net present value (meaning the total value created over the lifetime of the intervention) corrected for time value depreciation. Net present value calculations used a discount rate of 3.5% as per NICE guidelines[10]. Eventually, it made sense to present the outcomes as savings in two different categories: those showing a five year benefit period and those showing lifetime benefits. It was not considered practical or meaningful to scale down two of the interventions that had lifetime benefit period to five years so these have been presented distinctly.

10 Ref: http://www.nicedsu.org.uk/NICE-Methods-Guide-updates%281985333%29.htm

Scale

All of the interventions have been considered with respect to their ability to create benefit across the whole of the NHS, public health and social care system. This means the likely number of patients they will affect, total prescriptions affect or eligible houses retrofitted etc.

Detailed Case Study Analysis

For each of the following case studies, a presentation of the detailed calculations is provided in Appendix 1. Brief details of the interventions described in the case studies are provided below.

1) Reducing social isolation in older people

This case study looked at the outcomes of a social impact bond to reduce social isolation and improve long-term condition self-management, based on a study by Social Finance and Age UK (Hereford and Worcestershire)[11]. The case study shows that to achieve "long term improvements in health and wellbeing and establish a health and care system that is financially sustainable in the medium term, the causes of health deterioration in the older population must be addressed earlier."

NEF Consulting's analysis looked at how an intervention to reduce social isolation in the over 65s can lead to financial and carbon savings from reduced service use, based on reductions in the risks of dementia, depression and inactivity-related conditions (stroke, CHD, diabetes). The original case study analysis was extended to look at the additional expected carbon savings over the first five years. The expectation of reduced use of healthcare services as a result of reduced social isolation implies a secondary assumption that the unused healthcare services are not redirected to treat other patients. Although it is quite likely that services would be redirected, this would lead to a different set of positive outcomes that could not be quantified in this analysis.

2) Energy awareness campaign for staff in hospitals

This case study is based on Operation TLC, in which "staff teams at Barts Health NHS Trust have created better environments for patients, and saved on the Trust's bills by reducing energy waste. Since 2013, nurses, doctors, facilities, security and cleaning staff have run Operation TLC – a campaign to give patients a little more tender loving care by taking the following actions: T – turn off equipment when not in use; L – switch off lights were possible; C – close doors and windows."

The Barts case study for this initiative identified £428,000 financial savings and 1,900 tonnes of CO_2 savings to the Trust per annum and an "opportunity to save £35m and 200,000 tCO_2 per annum across NHS." NEF Consulting's analysis took a conservative approach to these findings, assuming that many trusts may already have their own initiatives in place. Based on the assumption that 50% of hospitals and similar buildings already have some kind of

11 http://bit.ly/1D2jBDp

implementation in place, the savings to the NHS identified by Barts were scaled down by 50% and calculated as a net present value over five years.

3) Building management system in all NHS trusts

For this case study, NEF Consulting used details of all funded NHS Energy Efficiency Fund projects, split between project types.[12] From this data, Ashford and St Peters was identified as a representative example of roughly average electricity use. Annual financial and CO_2 emissions savings were then calculated based on this example, scaled up to the number of NHS Trusts and presented as the net present value of the five year savings. The wider social savings of reduced carbon emissions were also calculated based on the social costs of carbon.

4) Improve packaging of theatre kits in hospitals

This case study focused on Royal Liverpool and Broadgreen University Hospitals NHS Trust (RLBUH), "one of the largest and busiest hospitals in the North of England. It has more than 5,600 staff and sees 600,000+ patients per annum. The Trust operates over two sites in Liverpool and carries out more than 13,000 procedures in 19 theatres every year. RLBUH wanted to reduce the amount of time medical teams took to prepare for each patient in order to improve turn around times. One area highlighted was the number of items required per operation and the amount of time it took to unwrap them."

The case study identified that reducing waste by packaging operation equipment together, through a reduction of the time required per operation, more operations can take place. It has also "reduced the volume of associated packaging waste by 90% (around 2.6 tonnes) helping the Trust to reduce its carbon footprint by five tonnes."

NEF Consulting's analysis considered these savings and scaled the results to calculate the net present value of the potential benefits over five years across the NHS in England. A decision was made to calculate social and environmental benefits only. This is based on the assumption that the staff time saved will be used to perform more operations, resulting in social benefits, rather than financial benefits from reducing the costs of staff time.

A further assumption was of a one week reduction in waiting time for knee operations; while the potential for additional carbon emissions due to additional bed care for those with extra operations was ignored as this could potentially be offset by the ability of individuals to take care of themselves after the operations. The data was scaled up to show the potential benefits using the ratio of the number of theatres and Royal Liverpool and Broadgreen to the national number of theatres.

5) Prescribing treatment for asthma without propellant inhalers

The SDU provided a case study showing the substantial carbon emissions that can be achieved by replacing MDI inhalers for asthma (containing HFCs) with dry powder inhalers. As this intervention has such significant potential for a

12 The findings are published at: https://www.gov.uk/government/publications/nhs-energy-efficiency-fund-report

positive environmental outcome and is essentially cost neutral and has no impact on health, a decision was made to include it.

The NEF Consulting analysis is based on the assumptions that all inhalers currently use MDI; that 75% are suitable for replacement (based on Defra data); that demand for inhalers will remain constant (this is considered a conservative assumption) and that there will be no costs and no adverse health implications associated with switching.

Savings of carbon emissions of 28kg per inhaler have been identified and the NHS supplier Glaxo SmithKline (GSK) estimates that 73 million inhalers are used each year. From these data the net present value of the five year carbon savings could be calculated.

6) Proper use of long-acting injections

This analysis was based on a study into "the economic cost and carbon burden of long acting injections" by Dr Daniel L Maughan; Dr Rob Lillywhite and Professor Matthew Cooke and provided by http://sustainablehealthcare.org.uk/.

The case study "explores the economic cost and carbon footprint associated with current patterns of prescribing long term Flupentixol Decanoate long acting injections." It found that: "Around £300,000 could be saved across England by improving prescribing behaviour, and as much as 170 tonnes CO_2e could be saved. Most of this carbon is attributable to the carbon footprint of the appointment; 88 tonnes CO_2e (including energy use and materials used) and the over-prescribing of medication, 66 tonnes CO_2e."

NEF Consulting then calculated the net present value of the five year financial and carbon emissions savings, based on these results.

7) Active travel for NHS staff

This case study is based on research into using motivational interviews as tool for promoting active travel. The benefits identified included reduced carbon emissions from reduced car use; additional QALYs and cost savings from the health benefits of increased personal levels activity. It was based on a research study to develop and apply a method for prioritising investments in preventative interventions for England by Matrix Insight, in collaboration with Imperial College London, Kings College London and Bazian Ltd.[13]

NEF Consulting's additional analysis assumes take up by 25% of NHS staff, resulting in 3.22% of staff adopting active travel to work; while the rest do other active exercise. It assumes national average levels of activity in NHS, as well as average commuting times; however the analysis ignores carbon savings from reduced healthcare service use due to lack of detail on healthcare service use reduced. Financial savings and carbon savings along with increased QALYs were calculated based on forecasted benefits of increased physical activity and reduced use of fossil fuel based transport.

13 Case study: English telehealth and telecare trial in 2008/2009

14 "http://bmj.co/1lad7Y6

8) Tele-healthcare for people with long term health conditions in the community

The British Medical Journal (BMJ) has published research[14] showing the cost effectiveness of tele-health for patients with long term conditions. The "primary outcome for the cost effectiveness analysis was incremental cost per quality adjusted life year (QALY) gained." This was based on a "net benefit analyses of costs and outcomes for 965 patients (534 receiving telehealth; 431 usual care). The adjusted mean difference in QALY gain between groups at 12 months was 0.012. Total health and social care costs (including direct costs of the intervention) for the three months before 12 month interview were £1,390 and £1,596 for the usual care and telehealth groups, respectively."

NEF Consulting's analysis extrapolated these benefits based on UK Government data on the number of people with a variety of relevant long term conditions, chronic obstructive pulmonary disease (COPD), coronary heart disease (CHD) and diabetes to calculate the potential triple bottom-line benefits of the telehealth and telecare approach. The analysis made assumptions that there would be reductions in service use and cost savings from increased capacity 80% reductions of equipment costs. In the analysis a conservative assumption was made that one cohort is 2% of people with long term conditions - CHD, diabetes, COPD per year, based on one cohort per year for five years. The reduction in service use is considered to save carbon emissions though the analysis ignores carbon emissions resulting from the telehealthcare service itself as this is expected to be very low carbon intensity.

Key findings

The key findings of the eight case studiers analysed are presented in section 3, following.

Infographic design

With the data gathered and analysed the next step was to review its nature to see what story it could tell. Both the indicators themselves and the patterns between the various measures were then used to inform a brief for an infographic designer. The key elements of the brief were as follows:

Positioning and target audience

The infographic is aimed at a general public audience (to inform) and for use within the NHS to encourage more and better sustainability actions for greater social value.

Format

The infographic will be used:

- Within print materials and on as an A3 a poster – this will require high-resolution print-ready images with bleeds etc.
- Online downloadable pdf. An essential requirement is that it can be viewed and read easily so possibly larger than a standard A4.
- Sections of the graphic will be used on social media, webpages etc. Separate images for each of the interventions were provided.

Design considerations

The proposed infographic then went through numerous iterations based on the input of various NHS, public health and social care stakeholders and their perspectives on the design considedrations.

3. Findings

Intervention	(Net) Financial Saving	Social Cost of Carbon	Carbon (tCO2e)	Health/patient experience (QALYs)	Scale	Benefit period used to calculate total savings	Additional benefits	Setting
Reducing social isolation in older people	£6,740,227	£115,601	1,865	2,320	National	15 years	1. Reduce loneliness in 6% of cases 2. 85 cases of entry into residential care avoided, costing £45,000 per admission	Social care
Energy awareness campaign for staff in hospitals	£79,013,417	£27,993,325	451,505	See additional benefits - patient experience	National	5 years	1. Improved comfort for patients (1/3 fewer sleep disruptions; 1/4 fewer privacy intrusions) 2. Staff feel proud to improve patient experience 3. Staff more environmentally conscious	Hospitals
Building management system in all NHS trusts	£16,341,606	£55,648,490	897,556	See additional benefits - patient experience	National	5 years	1. Improved comfort for patients (temperature/lighting)	Hospitals
Improving packaging of theatre kit in hospitals	£0	£184,314	2,973	109	National	Over 5 years	1. Time savings of around 40% per operation - making staff more efficient (reflected in QALYs).	Hospitals/ supply chain
Prescribing treatment for asthma without propellant inhalers - in the community	£0	£381,932,525	6,160,202	0	National	Over 5 years	None	GPs
Proper use of long-acting injections	£1,341,539	£46,538	751	See additional benefits - patient experience	National	Over 5 years	1. Reduce number of injections and inconvenience to patients. 2. Similar interventions for those currently taking pills might reduce adverse drug reactions - 4% of hospital bed days due to adverse drug reactions	GPs and commission-ing
Active travel for NHS staff	£264,605,177	£1,171,143	18,889	113,785	National	Lifetime benefit for QALYs and cost. Carbon only for reduced car use, not reduced service use.	1. Wellbeing benefits of exercise (reduce stress; alleviate anxiety; improved cognitive activity). 2. Additional carbon benefits from reduced healthcare service use by NHS staff.	NHS staff
Tele-healthcare for people with long term health conditions in the community	£5,092,756	£4,181,677	67,446	5,671	National	Over 5 years	1. Autonomy: improved feeling of control over condition.	Care in the community

4. Key messages

In addition to the primary objectives of the project it is helpful to reflect on some of the broader learnings from analysing this data for this infographic with respect to implementing, monitoring and benefiting from sustainability actions.

The following are some of the headline messages for patients, practitioners and policy makers:

Benefits from sustainability actions go beyond the financial bottom line

- Most interventions we looked at are win-win-wins on economic, social and environmental measures.
- Often, but not always, the social and environmental outcomes positively drive financial savings[15].
- The interventions identified can be implemented now and provide clear benefits.
- These case studies show that when it comes to sustainability actions: patients gain, taxpayers save (as resources are used more efficiently) and we all gain in environmental benefits.

There's a wide pool of potential metrics to use

- A small range of common measures was used for this exercise to align and compare diverse case studies.
- There is potential to use a much wider range of metrics which would have allowed us to capture more case studies.
- These could include: social capital, health inequality, water use, waste generation, reduced pollution, gross value added to the economy and increased personal incomes.
- QALYs are a useful standardised method for capturing health outcomes but are recognised as not capturing some mental health factors so well. Metrics such as DALYs or subjective well-being may also be used.
- Subjective well-being indicators such as the National Accounts for Well-being[16] could be used to wrap up some of the broader socio-health outcomes.
- Patient experience should be presented alongside these broader social, environmental and economic impact measures.

15 For example reducing social isolation in over 65s (social outcome) drives a positive health returns which mean a lower healthcare footprint (financial and environmental outcomes).

16 An indicator framework that isolates different aspects of well-being including personal and social dimensions. See http://www.neweconomics.org/publications/entry/national-accounts-of-well-being

Healthcare should be seeking to measure TBL benefits as a matter of routine

- Healthcare routinely monitors health and financial outcomes however the environmental benefits are often missed.
- There are currently no common metrics or approaches for tracking the diverse range of sustainability interventions across the health, care and public health system.
- This work has shown the huge potential of TBL measurement, for example in tracking national targets in carbon reduction. Further targets could be set for example in reducing health inequality.
- It will be easier to show the value of preventative projects if more metrics are captured and linked to broader local authority agendas.

Appendix 1 – detailed calculations

1 Reducing social isolation in older people

Intervention description

Intervention to reduce social isolation in over 65s. Reduces risk of dementia, depression and inactivity (stroke, CHD, diabetes). Money and carbon saved from reduced service use.

Source

Prospective calculations for intervention in Worcestershire

Ref: http://bit.ly/1D2jBDp

Assumptions

Healthcare services not used are not filled by someone else's use
Carbon savings only for first five years
Model uses loneliness rather than social isolation as its primary measure

Scaling data			
Number of participants targeted by intervention	3,000		Social finance - Worcestershire
Total population of England	56,100,000	2011	Census - Ref: http://www.ons.gov.uk/ons/rel/census/2011-census/population-and-household-estimates-for-england-and-wales/index.html
Proportion of UK population 65+	16% of population is over 65	2011	Census Ref: http://www.ons.gov.uk/ons/dcp171776_325486.pdf
Number of 65+ people in England	8,976,000	2011	NEFC calculation
Proportion living alone	31%	2011	Census Ref: http://www.ons.gov.uk/ons/dcp171776_325486.pdf
Total living alone	2,782,560		NEFC calculation

Scaling data		
Proportion of those living alone living in 'social isolation'	20%	ASSUMPTION: based on Age UK research that two fifths of those living alone who say the television is their main company (Age UK, 2014). Ref: http://bit.ly/1CuSIKJ - halved to be conservative
Total number living in social isolation	556,512	NEFC calculation
Proportion of population elderly and living in social isolation	1%	NEFC calculation
Scope of intervention: proportion of socially isolated to target	0.05	ASSUMPTION of model
Total number targeted	28,520	NEFC calculation
Ratio to scale the model	9.51	NEFC calculation
Cost data		
Total cost	£618,000	NEFC calculation
Cost per person	£206	NEFC calculation
Total cost scaled	**£5,875,120**	NEFC calculation
Savings		
NHS service usage value in first five years	471,000	Social finance - Worcestershire
NHS usage, 5 - 15 year follow up	825,000	Social finance - Worcestershire
NHS usage, emergency admissions	21,000	Social finance - Worcestershire
NHS usage, A&E visits	10,000	Social finance - Worcestershire
Total NHS usage per 3000 people	1,327,000	NEFC calculation

Total social care usage per 3000 people	£840,000		
Cost saved (15 year period, Net Present Value)	£12,615,347		NEFC calculation - not including social care savings
Net Cost Saved	**£6,740,227**		NEFC calculation
Health data	**Impact on: depression, dementia, CHD, stroke, type II diabetes**		
QALYs gained	244		Social finance - Worcestershire
QALYs per person	0.0813		NEFC calculation
Number of A+E visits reduced	92		Social finance - Worcestershire
Number of emergency admissions avoided	26		Social finance - Worcestershire
Number of GP appointments avoided	2175		Social finance - Worcestershire
Number of entries to residential care avoided	9		Social finance - Worcestershire
QALYs gained (scaled)	2,320		NEFC calculation - 15 years
Carbon savings			
Average bed days for admission (dementia, depression, CHD, type II diabetes, stroke)	23.3	days	HSCIC - Hospital episode statistics (2013)
Average bed days for dementia	59.7	days	HSCIC - Hospital episode statistics (2013)
Average bed days for depression	29.5	days	HSCIC - Hospital episode statistics (2013)
Average length of stay - CHD	5.2	days	HSCIC - Hospital episode statistics (2013)
Average length of stay - stroke	16.3	days	HSCIC - Hospital episode statistics (2013)
Average length of stay - type II diabetes	5.8	days	HSCIC - Hospital episode statistics (2013)

Carbon savings from GP appointments avoided	1,364,682	$kgCO_2e$	NEFC calculation
Carbon savings from A+E visits reduced	48,978	$kgCO_2e$	NEFC calculation
Carbon savings from emergency admissions avoided	651,129	$kgCO_2e$	NEFC calculation
TOTAL CARBON SAVINGS	2,064,789	$kgCO_2e$	
TOTAL CARBON SAVINGS	**2,065**	**tCO_2e**	
Total carbon savings (NPV - assume service usage reduced consistently across 5 years)	**1,865**	**tCO_2e**	NEFC calculation
Additional benefits calculations			
Entries to residential care avoided	9		Case study
Entries to residential care avoided (scaled)	85.56		NEFC calculation
Cost per residential care admission	45,032		Case study

2 Energy awareness campaign for staff in hospitals

Intervention description

Energy awareness campaign in hospitals (TLC) - behavioural change

Source

Operation TLC (Barts Hospital) http://www.globalactionplan.org.uk/operationtlc

Assumptions

50% of hospitals and similar buildings already have some kind of implementation in place

Scaling data			
Financial savings across NHS	£35,000,000	£/year	Ref: TLC
Carbon saved across NHS	200,000	tCO_2e/year	Ref: TLC
Proportion suitable for intervention	0.5	ASSUMPTION	
Financial savings (conservative estimate)	£17,500,000	£/year	NEFC Calculation
Carbon saved (conservative estimate)	100,000	tCO_2e/year	NEFC Calculation
Cost saved			
NPV (5 years)	£79,013,417		NEFC Calculation
Carbon saved			
NPV (5 years)	451,505	tCO_2e	NEFC Calculation

3 Building management system in all NHS Trusts

Intervention description
Installing building management systems

Data source
Energy Efficiency Fund (EEF)
https://www.gov.uk/government/publications/nhs-energy-efficiency-fund-report

Assumptions
75% of trusts suitable/do not already have this
Carbon savings were prospective
Assume social benefits in case study are social cost of carbon
Ashford and St Peters as representative example

Data from case study

	Cost	Annual CO^2e saved tCO^2e	5 year savings (includes social cost of carbon)	# of sites	Electricity use	Elec. use (Hosp. est. stats)	Total staff employed
Ashford and St Peters[17]	£643,000	846	£988,479	2	45,385,318	43m	3,355

Scaling up

Number of trusts	251		ERIC
Number of trusts - not including independent	245		ERIC (NEFC Calculation)
Average energy usage/trust	53.3	million kWh	ERIC (NEFC Calculation)
ASSUMPTION: use Ashford and St Peters as case study			
Proportion of sites suitable	0.5		ASSUMPTION
Number of trusts	125.5		NEFC Calculation

17 Analysis of the EEF data revealed Ashford and St. Peters to be the NHS Trust, closest to the average of all trusts in terms of energy usage

Cash saving			
Total cost (scaled)	£80,696,500	£ (2014 prices)	NEFC Calculation
5 year saving (per trust -including social benefits)	£988,479	2014 prices (NPV)	Case study
5 year saving (per trust-social benefits)	£215,267	2014 prices (NPV)	Case study
5 year saving (per trust - not including social benefits)	£773,212	2014 prices (NPV)	NEFC Calculation
Total saving (scaled)	£97,038,106	2014 prices (NPV)	NEFC Calculation
Total net saving (scaled)	**£16,341,606**	2014 prices (NPV)	NEFC Calculation

Carbon saving			
Annual carbon saved (scaled)	198,792,000	$kgCO_2e$	NEFC Calculation
Annual carbon saved	198,792	tCO_2e	NEFC Calculation
Carbon saved (5 years)	**897,556**	tCO_2e	NEFC Calculation

4 Improving packaging of theatre kits in hospitals

Intervention description

Reducing waste by packaging operation equipment together. Reduces time/operation - more operations can take place.

Source

Royal Liverpool and Broadgreen University Hospitals

Assumptions

Ignores additional carbon usage of beds and care for those with extra operations – though this may be offset by increased ability of individuals to care for themselves after operations

Assumes waiting time for knee operation reduced by 1 week

Scaling data		
Number of Theatres (Royal Liverpool and Broadgreen)	19	HSCIC
Total number of theatres (NHS in England)	2,502	HSCIC
Proportion of operations increased	0.5	ASSUMPTION

Cost saved			
Money saved (Royal Liverpool)	£175,000	staff time saved	Case study
Money saved (England)	£23,044,737	staff time saved	NEFC Calculation

Health data			
Increase in number of knee operations (potential)	47%		Case study
Likely increase in number of knee operations	24%		Assumption
Number of additional knee operations (6 month period - Liverpool)	72		Case study
Number of additional knee operations (one year - Liverpool)	144		NEFC Calculation
Total number of additional knee replacements (England)	9,481		NEFC Calculation
QALY gained per knee operation	1.33	QALY	Ref: http://bmj.co/1GnI5qH
(Waiting list for knee replacement)	66,796		HES
Average age (knee replacement)	71	years	Ref: http://bit.ly/1CuShQt
Average life expectancy (UK)	81	years	ONS
QALY per year	0.133		NEFC Calculation
Waiting time for knee replacement	93	days	HES
Assume waiting time reduced by one week	24	QALYs	NEFC Calculation
QALY (5 years)	109	QALYs	NEFC Calculation

Carbon saved			
Carbon reduction (Royal Liverpool)	5	tCO_2e	Case study
Carbon reduction (England)	658	tCO_2e/year	NEFC Calculation
Carbon reduction (5 years)	2,973	tCO_2e	NEFC Calculation

5 Prescribing treatment for asthma without propellant inhalers

Intervention description

MDI inhalers for asthma (containing HFCs) replaced by dry powder inhalers

Source

SDU

Assumptions

All inhalers currently MDI
75% suitable for replacement
Constant demand for inhalers (conservative assumption)
No costs associated with switching

Scaling data			
Number of inhalers	64,970,000	/year (UK wide)	NEFC Calculation based on GSK data scaled down to England only – UK wide total of 73 million multiplied by 0.89 as GSK data includes Scotland and Wales
			Ref: http://www.asthma.org.uk/News/news-giant-inhaler-marks-launch-of-first-uk-wide-inhaler-recycling-scheme
Proportion suitable for replacement	0.75		DEFRA

Carbon savings			
Carbon emissions/inhaler (MDI)	28	kgCO_2e/inhaler	
Total carbon/year (inhalers)	1,819,160,000	kg CO_2e/year	
Carbon reduced/year	1,364,370,000	kg CO_2e/year	
Carbon reduced/year	1,364,370	tCO_2e/year	
Carbon reduced/year	1,364	kt CO_2e/year	SDU
Carbon reduced/year	1.5	MtCO_2e/year	NEFC Calculation
Carbon Reduced NPV	6,160,202	tCO_2e/5 years	NEFC Calculation

6 Proper use of long-acting injections

Intervention description

Depot prescription (injection) of specific anti-psychotics every 4 weeks rather than every 2 weeks (Flupentixol Decanoate).

Data source

NHS (ref: Daniel Maughan, Centre for Sustainable Healthcare)

Assumptions

No adverse reactions from 4 week injections

Data		
Resource	Potential financial savings nationally (£/year)	Potential carbon footprint savings for England (kgCO2e/year)
Medication	152,935	65,762
Needle and syringe	1,631	110
Appointment	128,250	87,750
Travel	14,310	12,623
Total	**297,126**	**166,245**
Total financial savings (5 years)	**£1,341,539**	
Total carbon savings (5 years)		**750,604 kg CO_2e**

7 Active travel for NHS staff

Intervention description

Using motivational interviews as promotion tool for active travel.
Reduced carbon from reduced car use. QALYs from health benefits. Cost savings from health benefits (NEFC Calculations)

Case study source

Ref:
http://help.matrixknowledge.com/interventions/docs/HE%20Intervention%20Report%207.pdf

Assumptions

Assumes take up by 25% of staff, resulting in 3.22% of staff active travel to work; the rest do other active exercise.
Assumes national average levels of activity in NHS, as well as commuting times etc.
Ignores carbon savings from reduced healthcare service use due to lack of detail on healthcare service use reduced

Scaling data			
NHS staff in England	1,197,733	Dec-13	HSCIC http://www.hscic.gov.uk/searchcatalogue?productid=16721&topics=1%2fWorkforce%2fStaff+numbers&sort=Relevance&size=10&page=1#top
Population of England	53,900,000	2013	ONS
NHS staff as proportion of the population	2.22%		NEFC Calculation
Proportion of staff (ACTIVE TRAVEL)	3.22%		NEFC Calculation

Case study data			
Cost per participant	31	(2007/08 prices)	Case study
Cost per participant	39.14	(2014/15 prices)	NEFC Calculation
As well as five staff to coordinate at £35,000 salary each (3 years)	£525,000		ASSUMPTION
QALY per participant	1.52	Note: increase in 22% inactive to moderate exercise; 6% moderate to vigorous.	
NHS savings per completer	£3,301	(2007/08 prices)	Case study
NHS savings per completer	£4,168	(2014/15 prices)	NEFC Calculation
Scale benefits by:	0.25	Conservative ASSUMPTION	

Assume this is offered to all NHS staff			
Uptake rate	0.25		ASSUMPTION
Total cost	£47,404,270		one off
Total savings	£312,009,447		(lifetime)
Net benefit	£264,605,177	£	
	£265	£m	

Health benefits		
113,785	**QALYs**	**lifetime)**

Carbon savings		
4,184	tCO_2e	Carbon saved per year
0.10	tCO_2e	Assumed drop off rate to reflect increasing efficiency of cars
18,889	tCO_2e	Carbon saved (5 years - assuming maintained levels of transport)
29,096	tCO_2e	Carbon saved (lifetime working age - assume 20 years)

8 Tele-healthcare for people with long term health conditions in the community

Intervention description

Tele-health for patients with long term conditions (heart failure, lung disease, diabetes)

Case study source

Whole systems demonstrator telehealth trials - http://www.bmj.com/content/346/bmj.f1035.full.pdf+html

Assumptions

Take costs from over capacity and 80% of equipment costs (justification: economies of scale)
One cohort is 2% of people with long term conditions - CHD, diabetes, COPD per year (justification: conservative). Assume one cohort per year for five years.
Not using resources saves carbon.
Ignores carbon used by tele-healthcare service - would be preferable if this could be very low carbon.

Case study source data				
Number of people	3,230		Case study	
QALY gained/person	0.012		Case study	
Savings/person - increased capacity and 80% reduction in equipment prices	£42	2010 prices (including intervention)	Case study	
Savings/person - increased capacity and 80% reduction in equipment prices	£49	2014 prices	NEFC Calculation	
Reduction in service use per person	**Service use reductions**	**Carbon**	**Kg reduced per person**	
Emergency department	0.15	124	18.6	Case study; SDU
Inpatient bed days	0.25	446	111.5	Case study; SDU
Day hospital and other day attendances	0.13	56	7.28	Case study; SDU
Outpatient attendances	0.18	56	10.08	Case study; SDU
Paramedic	0.05	68	3.4	Case study; SDU
Community nurse visit	-0.53	39	-20.67	Case study; SDU
GP	0.19	66	12.54	Case study; SDU
TOTAL			**142.73**	

Scaling			
Number of people with long term conditions	15,000,000	2012	
Number of people with COPD	899,000	2012	
Number of people with CHD	1,878,000	2012	
Number of people with diabetes	2,456,000	2012	
Assume proportion of each	0.02		

Total number of people	**104,660**		NEFC Calculation

Total cost			
Cost saved	£5,092,756	2014 prices	NEFC Calculation

Health benefits			
QALYs gained (12 months)	1,256	QALYs	NEFC Calculation
QALYs gained (5 years)	**5,671**	QALYs	NEFC Calculation

Carbon savings			
Carbon saved	14,938,122	$kgCO_2e$	NEFC Calculation
Carbon saved	14,938	Tco_2e	NEFC Calculation
Carbon saved (5 years)	**67,446**	Tco_2e	NEFC Calculation