Healthy Life Simulation
A behavioural simulation on public health policy

A REPORT OF THE SIMULATION RUN BY NEWCASTLE INITIATIVE ON CHANGING AGE ADDRESSING THE GAP IN HEALTHY LIFE EXPECTANCY BETWEEN 55 YEAR OLDS FROM DIFFERENT SOCIAL GROUPS

Project Funded by NIHR Biomedical Research Centre for Ageing and Chronic Disease
# Table of Contents

Acknowledgements ............................................................................................................. 4
Executive Summary ............................................................................................................... 4
Introduction ......................................................................................................................... 7
Simulation Aims and Objectives .......................................................................................... 13
Background Research .......................................................................................................... 13
Decision Support Model ....................................................................................................... 15
Simulation Methodology ....................................................................................................... 15
Voting ................................................................................................................................... 17
Simulation Overview ............................................................................................................ 18
Scenario ................................................................................................................................. 18
Teams and Roles .................................................................................................................. 19
Simulation Move 1 Analysis and Selection ......................................................................... 20
Plenary Sessions ................................................................................................................... 29
Simulation Move 2 Negotiation and Discussion .................................................................. 30
Simulation Move 3 Innovation ............................................................................................... 31
Round up ............................................................................................................................... 32
Logistics ................................................................................................................................. 32
Simulation Key Findings ...................................................................................................... 32
Intervention Selections ......................................................................................................... 35
Innovation .............................................................................................................................. 39
Publicity ................................................................................................................................. 43
Conclusions .......................................................................................................................... 43
Appendix 1 Decision Support Model .................................................................................... 46
Appendix 2 List of Participants ............................................................................................ 57
Appendix 3 Simulation Project Team and Game Controllers ................................................. 60
Appendix 4 Voting Results .................................................................................................... 62
Appendix 5 Media Reports .................................................................................................... 67
Appendix 6 References ......................................................................................................... 68
Acknowledgements

Newcastle Initiative on Changing Age would like to acknowledge the extremely valuable contributions made by local citizens whose voice was vital to the success of the simulation.

The project team are also very grateful to NIHR Biomedical Research Centre for Ageing and Chronic Disease who provided funding for the project.

Executive Summary

Changing Age is a Newcastle University-led campaign focussed on influencing policies, attitudes and opportunities to do with ageing. As part of this campaign, the University commissioned the development of an innovative behavioural simulation to generate new insights into the avoidable, unnecessary and unjust problems of inequalities in ageing.

Research at the University has shown that there is an 11 year difference in healthy life expectancy (HLE) for people aged 55 between the most affluent and most deprived electoral wards within the city of Newcastle. This finding is in accord with many other reports of disparities in health and life expectancy by social class both between and within regions.

The Healthy Life Simulation was designed to be reusable as a tool for policy makers in other regions and to have application as an educational resource for medical students, schools, and community groups. The simulation package was launched at a flag ship two day event at Newcastle University in September 2013.

At the event, two teams representing Health & Wellbeing Boards (HWB) worked to close the gap in HLE for 55 year olds by 50% in 10 years with no additional funding. The teams consisted of key members of Newcastle City Council, local health and social care services, community organisations, businesses and citizens. The teams developed their strategies based on selecting interventions applied at the different levels of the wider determinants of health – population, community, health services and individual. They negotiated with representatives of the environment and government, who were following the game and developing their own positions and arguments, in order to persuade them to make changes. At key points HWB Teams presented their policy proposals to the mixed group of members of the wider environment, which led to facilitated debate and discussion of key concepts and ideas.

Players were challenged by injects describing possible future scenarios, such as mobile health monitoring and big data analytics, and were required to innovate and develop new approaches to service design and delivery in order to close the gap. Their decision making processes and selections were observed and evaluated by academics from Newcastle University. A bespoke calculation engine, which estimated the costs and benefits of
resource allocation to different intervention policies, provided decision support to players
and estimated the impact on the HLE gap of the choices made.

The flagship simulation event showed that there is huge interest in the subject of health
inequalities and a real will across sectors to make progress in reducing the health gap
between social groups. The presence of citizens in policy making teams, working alongside
professionals, provided an invaluable frontline perspective in finding solutions to issues
affecting disadvantaged groups.

Investing in good quality housing and creating opportunities for employment, and
volunteering, for people in their middle years were seen as challenging but essential in
achieving the goal of reducing the HLE gap for 55 year olds.

Participants expressed a strong desire for central Government to actively intervene to
control the availability of cheap alcohol through a minimum pricing strategy. The wide
ranging benefits to disadvantaged groups of improving the quality of processed food were
also a priority. At the community level, enhanced local authority control of licensed
premises to reduce the damaging consequences of alcohol overuse and control of poor
quality fast food outlets in disadvantaged areas were selected as factors critical to success in
achieving the mission.

Promoting social interaction by investing in schemes to reduce loneliness and establish
supportive communities was a major priority for interventions targeted at individuals.
Increasing exercise and activity levels in middle aged people from disadvantaged groups was
also seen as an essential mechanism for promoting all aspects of health and wellbeing and
thus reducing the gap.

Innovation in the simulation mostly centred on mechanisms of service delivery of existing
evidence-based interventions. The citizens’ voice was considered all important in service
design and development as was local, peer to peer delivery of services using assets such as
community health trainers and local centres. The requirement for joined up services and a
focus on families was also stated clearly.

Reliance on public health interventions with a fully formed evidence-base from randomly
controlled trials was seen as an obstacle to innovation in this area, potentially stifling new
ideas and local knowledge and experiences. There was consensus amongst players that new
thinking is needed to allow the development of novel interventions based on a wider
spectrum of concepts with built in evaluation and this approach is being actively pursued as
a follow on activity from the simulation event.

This flagship simulation event clearly demonstrated that behavioural simulation was a valid
methodology for bringing together policy makers, voluntary organisations and citizens to
address the complex and challenging issues of health inequalities and ageing. Now that the
concept is proven, the simulation is being made available to other groups for both educational and policy development purposes. The materials and decision support model that formed the basis of the simulation will be renewed and refreshed as research at Newcastle University uncovers new data and understanding.
Introduction

Trends in Life Expectancy

Increasing longevity is one of humanity’s greatest achievements. Improved living and social conditions led to a steady decline in mortality from infectious disease in the 19th century. The development of vaccines and antibiotics in the early 20th century further reduced deaths from infectious diseases and improvements in life expectancy continued. The continuing increase in life expectancy in recent decades, which shows no signs of abating, can be attributed to the rapidly declining mortality rates amongst those who are already old – brought about largely by advanced medical and scientific knowledge and massive investment in healthcare systems. In the UK, the number of over 85s is expected to double in the next 25 years and globally the over 60s will triple in number to reach 2 billion.

Life expectancy at birth, UK, 1980-82 to 2008-2010

![Graph showing life expectancy at birth in the UK from 1980-82 to 2008-2010.]

Source: Office for National Statistics (1)

The Health Gap

However, not everyone gets an equal share of the pie of increasing good health and longevity. There is a widening gap between the health outcomes of the most prosperous and the most deprived communities. People who are well educated and financially prosperous have a better chance of living a long and healthy life than those living with significant levels of deprivation.
Inequality in life expectancy and disability-free life expectancy for males at birth by area deprivation quintile, 2002-05 and 2006-09

Source: Office for National Statistics (2)

Measures of Health and Life Expectancy

Health inequalities are the differences in health status or the distribution of health determinants between different population groups. These differences are labelled as health inequities when they are judged to be avoidable, unnecessary, and unjust.

Historically, life expectancy has been used as the main measure of population health but fear of growing old is a fear of loss of health and independence and so new measures of life free from diseases and disability are necessary.

Healthy life expectancy (HLE) is a commonly used measure of healthy life years. It is defined as the average number of years a person at a certain age would be expected to live in good health for their remaining years and is based on statistics for a particular area’s age-specific mortality and health rates.

Disability-free life expectancy (DFLE) is a term often also used to describe the average number of years an individual is expected to live free of disability if current patterns of mortality and disability continue to apply.
The Roots of Inequality

Many of the root causes of inequalities in health outcomes are known to be social in origin, and can be understood by looking at the main determinants of health in general. These determinants can be thought of as layers of influence. The diagram below shows the individual at the centre with their largely fixed characteristics of age, sex, hereditary factors surrounded by influences that are modifiable by policy and interventions. Firstly, there are behavioural habits such as smoking, alcohol consumption, activity and eating patterns. Next there are peoples’ social and community contacts and influences. The wider influences on a person’s health and life expectancy include the conditions in which they live, work, age, and their access to essential goods and service including health systems. Finally, there are overarching social, cultural and economic conditions prevailing in society as a whole.

The Social Determinants of Health

![Diagram](image)

*Source: Dahlgren and Whitehead (3)*

The Life-Course

There is an accumulation of advantage and disadvantage across the life course and policies addressing inequalities at all stages - from prenatal and early years, through school and working life to circumstances affecting older people – are needed to target and reduce disparities in health and life expectancies.
Action across the life course


However, recent advances have shown that the ageing process is more malleable than previously thought and that the peri-retirement window, around age 55, is a significant point in life where there are opportunities for interventions and policies to improve life expectancy and health at older ages.

Inequalities within Regions

Researchers at Newcastle University, and others, know that where people live can give an indication of how long they will live but there are big differences within regions and local areas as well as between them. Newcastle researchers therefore analysed data for healthy life expectancy at age 55 by electoral ward within the city of Newcastle in order to produce a local map of disparities. The data generated are presented on the following Metro map which shows a dramatic gap of 11 years in HLE on a journey from leafy, affluent Ponteland South to Byker with its prominent levels of social and economic deprivation and ill health.
Healthy life expectancy along the Newcastle Metro for adults aged 55

Source: Professors Carol Jagger & Peter Gore, Newcastle University

The Cost of Health Inequalities

The benefits of reducing health inequalities are economic in addition to the social impact in reducing human suffering. Across the UK, avoidable deaths and illness are estimated to account for productivity losses of £31-33 billion per year, lost taxes and higher welfare payments in the range of £20-32 billion per year and additional healthcare costs associated with inequality are well in excess of £5.5 billion per year (4).

Coping with increasing numbers of ageing citizens who are living long enough to develop a long term condition is causing a financial crisis in our health and social care systems. The cost of treating diabetes alone is £10.3bn a year – around 10% of the entire NHS budget. However, by walking for 45 minutes every day, patients with type 2 diabetes can get the same improvement in blood glucose control as from a major class of drugs, which could unlock substantial savings and improve quality of life.
Action taken to address Health Inequalities

- In 1980 an expert committee chaired by Sir Douglas Black determined that economic inequality was the main cause of health inequalities and recommended fairer distribution of resources and an end to child poverty. (5)

- In 1998 Sir Donald Acheson chaired an inquiry into health inequalities which recommended all relevant policies should be evaluated for their health inequality impact and that health of families and children should be given higher priority. (6)

- WHO published the Global Commission on Social Determinants Report led by Sir Michael Marmot in 2008. (7)

- Commissioned by the Government, Sir Michael Marmot chaired an independent review to propose the most effective evidence based strategies for reducing health inequalities which was published as Fair Society, Healthy Lives in 2010 (4).This report stressed that tackling health inequalities was a matter of social justice with real economic benefits and was a call for action in tackling the social gradient in health outcomes.

- Also in 2010, the National Audit Office confirmed that the gap in life expectancy between the most affluent and disadvantaged members of society continued to grow despite many government initiatives. It concluded that health inequalities are longstanding, deep seated and difficult to change. (8)

The above reports supplied the backdrop to the Healthy Life Simulation.
Simulation Aims and Objectives

Changing Age is a Newcastle University led campaign dedicated to highlighting the opportunities that increasing life expectancy offers, challenging negative attitudes towards ageing and influencing national policy on everything to do with ageing.

As part of this campaign, the University commissioned a unique and high profile behavioural simulation as an innovative approach to generating new insights into the deep-rooted and complex problems of health inequalities and ageing.

The simulation was required to:

- Shine a spot light on the complex and challenging problems of health inequalities and ageing
- Provide a forum for actual decision makers (prominent members of local government, health and social services, local citizens, voluntary & community groups, academics) to explore and exchange ideas and develop innovative solutions on how to close the gap in HLE for 55 year olds
- Increase understanding of the complexities of decision-making in health and local government
- Produce a simulation package that is reusable as a tool for policy makers in other regions and has an educational application for use by medical students, schools and any other interested parties
- Attract media and public attention to the world leading expertise on ageing and health that resides within Changing Age and Newcastle University

Background Research

A series of in-depth interviews were conducted with key opinion leaders so that the simulation designers were able to identify and analyse the problems associated with the gap in HLE for 55 year olds. That knowledge was assimilated and combined with specific knowledge in simulation design in order to frame the key issues in the context of simulation.

Detailed reviews of the scientific and medical literature on health inequalities, public health policy and frameworks, healthcare interventions and models were also undertaken in order to produce a credible scenario and robust set of materials for playing the game.

The complexity of the subject meant that issues had to be distilled in order to be accessible to all players, including lay citizens with no prior knowledge of health inequalities. An expert
panel drawn from the key opinion leaders formed an editorial board that reviewed simulation materials to ensure their validity.

**Key Opinion Leaders Interviewed by Simulation Designers**

<table>
<thead>
<tr>
<th>Title</th>
<th>First Name</th>
<th>Surname</th>
<th>Professional Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr</td>
<td>Jean</td>
<td>Adams</td>
<td>Senior Lecturer in Public Health, IHS, Newcastle University</td>
</tr>
<tr>
<td>Professor</td>
<td>Ashley</td>
<td>Adamson</td>
<td>Professor of Public Health Nutrition, IHS, Newcastle University</td>
</tr>
<tr>
<td>Professor</td>
<td>John</td>
<td>Bond</td>
<td>Professor of Social Gerontology and Health Services Research, Newcastle University</td>
</tr>
<tr>
<td>Dr</td>
<td>Lynne</td>
<td>Corner</td>
<td>Director of Engagement, Changing Age, Newcastle University</td>
</tr>
<tr>
<td>Ms</td>
<td>Sarah</td>
<td>Cowling</td>
<td>CEO HealthWORKS, Newcastle</td>
</tr>
<tr>
<td>Professor</td>
<td>Chris</td>
<td>Drinkwater</td>
<td>Emeritus Professor of Primary Care Development, Northumbria University in Newcastle</td>
</tr>
<tr>
<td>Professor</td>
<td>Jim</td>
<td>Edwardson</td>
<td>Professor of Neuroendocrinology, Founding Director of IAH</td>
</tr>
<tr>
<td>Professor</td>
<td>Gary</td>
<td>Ford</td>
<td>Consultant Stroke Physician, Jacobsen Chair of Clinical Pharmacology, Newcastle University</td>
</tr>
<tr>
<td>Professor</td>
<td>Carol</td>
<td>Jagger</td>
<td>AXA Professor of Epidemiology of Ageing, IAH, Newcastle University</td>
</tr>
<tr>
<td>Professor</td>
<td>Eileen</td>
<td>Kaner</td>
<td>Professor of Public Health Research, IHS, Newcastle University</td>
</tr>
<tr>
<td>Dr</td>
<td>Meng</td>
<td>Khaw</td>
<td>(Former) Acting Director of Public Health, Newcastle upon Tyne</td>
</tr>
<tr>
<td>Professor</td>
<td>Tom</td>
<td>Kirkwood</td>
<td>Associate Dean of Ageing, IAH, Newcastle University</td>
</tr>
<tr>
<td>Professor</td>
<td>John</td>
<td>Mathers</td>
<td>Professor of Human Nutrition, IAH, Newcastle University</td>
</tr>
<tr>
<td>Dr</td>
<td>Peter</td>
<td>McMeekin</td>
<td>Senior Research Associate, IHS, Newcastle University</td>
</tr>
<tr>
<td>Dr</td>
<td>Dorothy</td>
<td>Newbury-Birch</td>
<td>Lecturer in Public Health Research, IHS, Newcastle University</td>
</tr>
</tbody>
</table>
Decision Support Model

A bespoke Decision Support Model was developed to support the simulation that:

- Modelled the health and socioeconomic profile of two groups of 55 year olds – one group from a disadvantaged area and the other from a prosperous area
- Compared and contrasted the profiles of the two groups in order to generate a data set that defined the “Gap” in healthy life expectancy at age 55
- Presented the features, costs and benefits of a wide range of healthcare and socioeconomic interventions
- Modelled the impact of applying different sets of interventions to HLE gap
- Provided a mechanism for judging and evaluating simulation outcomes as intervention strategies were selected and executed during play in the simulation
- Provided a rapid and easily digestible interface to assist decision making in a dynamic meeting environment with lay and health professional participants

Further details of the Decision Support Model can be found in Appendix 1.

Simulation Methodology

Behavioural simulations are three dimensional analytical tools that utilize aspects of military wargaming, simulation, scenario building and role play. This knowledge was used to build a realistic scenario where a significant gap in healthy life expectancy between 55 year olds from disadvantaged and prosperous communities had been exposed in the media. This led
to the formation of a Health & Wellbeing Board Task and Finish group challenged with the mission to:

**Close the gap in healthy life expectancy for 55 year olds by 50% in 10 years with no new money**

**Participants**

Critical to all behavioural simulations are the interactions between people which simulate the human dimensions of decision making and this game was no exception. The simulation brought together a wide range of stakeholders to address the issues of health disparity. Uniquely, this simulation included citizens recruited directly from disadvantaged groups who worked alongside health and social care professionals, voluntary sector organisations and others to tackle the mission. Equal membership of the policy making group by citizens from disadvantaged groups, who had been appropriately mentored, was essential in enabling the true community voice to be heard.

**Briefing materials**

The art of designing an effective simulation is to make the approach (scenario, materials, and calculation engine) as realistic as possible so that participants can ‘live’ the game and make realistic, meaningful decisions. Equally, the approach needs to be clearly set out so that participants, particularly those who are not subject matter experts, quickly understand the context and their roles and tasks.

In the Healthy Life Simulation, the bespoke Decision Support Model served both to frame the complexities of how an individual’s health and life expectancy is determined and to provide decision support to players needing to quantify the impact of allocating resources to a set of interventions directed at different layers of the traditional model. (See Appendix 1 for detailed description of Decision Support Model)
The simulation format enabled players to develop quickly the skills and understanding necessary to tackle the gap in healthy life expectancy between social groups, to assess and review existing approaches, to find solutions and to think creatively about novel approaches. The model provided a quantitative mechanism for comparing new and existing health interventions on a common and transparent basis.

**Voting**

The beliefs and attitudes concerning the gap in HLE that the players brought to the game were canvassed in a vote before play commenced. At the end of the first day of play the voting questions were repeated to allow a comparison of participant views before and after the experience of playing in the simulation. People were asked to identify themselves by profession and by simulation team membership so that opinions could be analysed by group membership.
Simulation Overview

The simulation was divided into three Moves or cycles of play – each Move started with a briefing for all participants before players broke up into their teams where they worked collectively on the scenario in separate meeting rooms.

At the end of a Move, players came back together for a Plenary Session in the main auditorium. These sessions were led by an experienced facilitator and players were debriefed and asked to reflect upon their experience, discuss what went well and identify opportunities for applying lessons learnt to real world improvement. This mechanism built a common understanding by all participants and facilitated the development of priorities, goals and mechanisms to achieve the mission.

Scenario

A dramatic film was used to introduce all players to the scenario in which the fictional city of North Oakwich was the subject of a TV news report that identified it as having the widest gap in the UK in HLE for citizens aged 55, between its most prosperous and most deprived electoral wards. Interviews with actual citizens and actors highlighted the complexities of tackling this emotive issue and the narrative ended with the leader of the council convening a task and finish team from the health and wellbeing board to devise an action plan to close the gap. The council leader emphasised that there was no new money to put this plan into effect and insisted that people from disadvantaged areas should be in the room with professionals and that they should have equal status during policy formulation.
Teams and Roles

Health & Wellbeing Teams

Two health and wellbeing board task and finish groups (HWB Teams) played against each other in the game and the team were made up of the following members —

<table>
<thead>
<tr>
<th>HWB Teams and Roles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health &amp; Wellbeing Board Team</td>
</tr>
<tr>
<td>Director of Public Health</td>
</tr>
<tr>
<td>GP Commissioner</td>
</tr>
<tr>
<td>Local Authority Councillor</td>
</tr>
<tr>
<td>LA Director of Communities</td>
</tr>
<tr>
<td>LA Director of Adult Services</td>
</tr>
<tr>
<td>Voluntary &amp; Community Sector</td>
</tr>
<tr>
<td>Local Healthwatch</td>
</tr>
<tr>
<td>Citizen representatives (2)</td>
</tr>
</tbody>
</table>

Environment Team

A mixed group of players were brought together in order to represent the individuals and organisations from the environment who have to change if the health & wellbeing board plans and interventions were to be successful in closing the HLE gap.

<table>
<thead>
<tr>
<th>Environment Team and Roles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environment Team</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

The primary role of the environment team was to monitor, assess and critically evaluate strategies developed by HWB Teams. However, they also provided an important alternative perspective on the HLE gap and intervention policies based on their opinions and specific knowledge of the constraints in the wider environment. Their comments, selections and innovative ideas were incorporated into the main findings of the simulation because the importance of their alternative perspective was recognised.

White Team

Academics from the University of Newcastle with subject matter expertise covering public health,
primary care, ageing, epidemiology, nutrition, physical activity, alcohol and tobacco use, formed a White Team of experts who were briefed to observe and evaluate play. This group were able to provide additional advice and guidance to players and importantly to critically evaluate decision making and novel ideas. Their expert evaluation of how likely teams were to succeed with their chosen intervention policies were an additional factor in estimating success and difficulties.

All participants in the simulation were fully briefed and members of the teams were provided with a written specification for their individual role. A full list of participants is shown in Appendix 2.

Simulation Design and Control Team

The simulation was designed by a team of experienced simulation experts and regulated by a Control team who provided briefs, facilitated play, monitored activities and generally managed the simulation. (Details of the Simulation Project Team are shown in Appendix 3).

Simulation Move 1
Analysis and Selection

In the first move of the simulation the two HWB teams moved to their respective meeting rooms and were given 3 hours to make the first steps in achieving their mission.

Their sessions were guided by a Decision Support Analyst (a role played position that was filled by members of simulation Control team with expertise in decision analysis and in depth knowledge of both the simulation and health inequalities).

The analysts used a script, to ensure a consistent approach, which was used to guide HWB team members through the complex relationships between the gap in HLE, the major diseases that contribute to the gap, the risk factors that can be modified that contribute to the diseases, and the interventions that can be applied to reduce risks, modify disease burden and consequently narrow the gap. This process was used to ensure that all team members were equally briefed on the key issues to be addressed.
An easy to read and understand graphical card format was used to present all the data for the simulation. This unique approach successfully enabled all players (professionals and lay members alike) to quickly digest and assess a large amount of complex data in a relatively short amount of time.

Examples of the graphical data and cards are shown in the following figures:

**Figures 1 and 2 Ward Profiles**

These profiles provided players with single page description of a fictional prosperous electoral ward (named Richville) in the city of North Oakwich together with an account of a disadvantaged ward (named Sicton).

**Figure 3 Spine Chart Comparative Health Profile**

This clear visual picture presented a set of indicators that showed the comparative health profiles of the prosperous and disadvantaged wards. It indicated the nature of the two communities, the adult population’s life style factors, disease burden and life expectancy. Players were therefore able to understand community needs and identify what had to be done to reduce inequalities.

**Figure 4 Example of Disease Card**

These cards provided summary information on the key modifiable diseases that contribute to the gap in HLE at 55 years of age – chronic obstructive pulmonary disease (COPD), lung cancer, liver disease, stroke, heart disease, Type 2 diabetes and mental illness. The impact of the diseases was described alongside their associated risk factors and the contribution each one made to the gap.

**Figure 5 Example of Risk Factor Card**

There was a risk factor card representing each of the modifiable risk factors associated with the diseases that contributed to the HLE gap –

**Social risk factors:** deprivation, built environment, education, social isolation, health literacy  
**Behavioural risk factors:** smoking, drinking, inactivity, poor diet  
**Physiological risk factors:** obesity, hypertension, cholesterol, atrial fibrillation

Risk factor cards presented a description of each modifiable risk factor, the distribution of risk factors in the disadvantaged and prosperous populations, associations between risk factors and each disease and a list of possible way to intervene and reduce risk factor prevalence.

**Figure 6 Example of Intervention Card**
**Intervention cards** provided key data on interventions that could be selected by players to close the gap in HLE by reducing the level of risk factors in the 55 year old population and thus limiting disease burden. Each card also showed:

- intervention impact on risk factors and diseases (as the red shaded areas)
- headlines that showed the key attributes of each intervention which were used to assess intervention impact in the Decision Support Model
- estimated annual cost of applying the intervention
- length of time the intervention would take to impact
Figure 1 Profile of Richville Ward
Sicton

**Highlights**

This ward is ranked one of the most deprived in England though there is a strong sense of community spirit amongst the great variety of people who live there. People in employment tend to be in manual occupations or semi-skilled office workers. There are high rates of long-term unemployment and educational attainment is low, with over 40% of people having no formal qualifications.

The majority of residents rent social housing from the council or housing associations and the population density is high as there are many high rise flats.

Demand for housing is growing and there are few empty homes.

Only half of the population consider themselves to be in good health and 30% of people live with a limiting long-term illness.

Over the last 10 years mortality rates from heart disease and cancer have fallen (though they remain higher than the average for England).

Local health services are seeking advice on how to get health improvement messages across as the people's health is significantly worse than national & regional averages and HIE is 10 years less than the best ward in the region.

There are 6 GPs within 1 mile and 5 Hospitals within 5 miles.

---

**General information**

Sicton is a council ward in the city of North Oatwich with a population of 12,500. There are many singles of mixed ages and people, including pensioners, living alone. The over 55 year olds make up nearly 30% of the population.

After a decade of neglect, a multiagency urban regeneration partnership has been formed to develop schemes aimed at regenerating the social housing and community facilities. Local residents have a strong presence on the regeneration partnership and there is an older people's forum, representing the views of the ageing population.

90% of residents have white British ethnicity though there is a group of asylum seekers who have settled well.

---

**Sights and activities**

There is a range of social activities within the ward which are important to the local people.

- **Community Gym** that also holds exercise classes for all ages and abilities. As well as exercising, you can also relax in the cafe and make new friends, educational days.
- **Fitness Centre** There is another gym in this ward but membership is necessary.
- **Village Bowls Club** A traditional bowling green in the heart of the ward.
- **Gala Bingo** A place to go where you can order a drink, have a bite to eat and win prize money. It has great value for money food and drink (including alcohol). All clubs are smoke free.
- **Working Men's Club** A social place where you can drink, play snooker and enjoy live music and comedy nights.
- **Betting Shops** Place a bet on professional sports like horse racing and football and take a chance with betting on political elections and awards ceremonies.

---

**Adult education**

**Sands Family Centre** offers a wide range of activities & classes including cookery courses for you to enjoy.

**Eating and drinking**

**Fast food**

There are 18 fast food shops serving a complete range of fried food, pizza, curries, Chinese & balti products. You can eat in, have a takeaway or get fast food delivered.

**Pubs**

There is a range of traditional English pubs in this area that are popular with locals – worth a visit if you are feeling adventurous are The Northumberland Arms and Butchers Tavern.

**Shopping**

There are two budget stores – Morrisons and Iceland in the ward where residents tend to shop, often buying own label brands. There are many convenience stores. There is a high consumption of take away food and beer and spirits.

**Getting there and away**

Public transport links are good. There are walkways and cycle ways. Only 25% of people in this ward own a car and these are mainly used for recreation.

**Dangers and annoyances**

Although crime rates are falling this ward still has problems. In June 2010 there were 599 crimes-335 of them were anti-social behaviour crimes.

---

Figure 2 Profile of Sicton Ward
Figure 3 Spine Chart Comparative Health Profiles
Mental Illness

Poor mental health is a major contributor to the HLE gap

Gap Analysis: Richville and Sicton

<table>
<thead>
<tr>
<th>Mental Illness</th>
<th>Richville</th>
<th>Sicton</th>
<th>Gap</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at onset</td>
<td>55</td>
<td>45</td>
<td>10</td>
</tr>
<tr>
<td>Survival, average years</td>
<td>20</td>
<td>20</td>
<td>0</td>
</tr>
<tr>
<td>Prevalence (%)</td>
<td>4.00%</td>
<td>12.00%</td>
<td>8.00%</td>
</tr>
<tr>
<td>Years life lost</td>
<td>240</td>
<td>1920</td>
<td>1680</td>
</tr>
<tr>
<td>Years lost due to disability</td>
<td>280</td>
<td>840</td>
<td>560</td>
</tr>
<tr>
<td>DALY (overall disease burden)</td>
<td>520</td>
<td>2,760</td>
<td>2,240</td>
</tr>
<tr>
<td>Treatment cost per year (£)</td>
<td>46,000</td>
<td>136,000</td>
<td>92,000</td>
</tr>
<tr>
<td>Total cost per total years survival (£)</td>
<td>920,000</td>
<td>2,260,000</td>
<td>1,840,000</td>
</tr>
</tbody>
</table>

Age at onset Prevalence (%) Years life lost Years life lost due to disability Treatment cost per year (£)

Richville 55 45 4% 12% 240 1920 280 840 648,000
Sicton

Disease impact

Mental health is tangible impact in increasing the gap in HLE. People suffering from depression, low self-confidence and stress are often unable to participate in employment or society. They can become withdrawn and socially isolated. This can trigger behaviour that leads to a decline in other conditions. Poor mental health is associated with increased exposure to other risk factors including unhealthy diet, smoking, alcohol and other drug abuse which leads to physical ill health. People on lower incomes also have higher rates of suicide and attempted suicide.

People on low incomes are less likely to access support such as counselling and cognitive behavioural therapies. They are also less likely to be able to draw on inner resilience developed from a stress free childhood.

In England, mental health conditions cost approximately £105 billion a year, due to loss of earnings and associated treatment and welfare costs. One in four people experience poor mental health at some stage of life. Mental ill health has however been seen as a lower priority possibly because it encompasses a range of conditions that are not immediately life threatening.

Risk factors: Mental Illness

Mental health conditions are multifactorial. The much higher incidence amongst people on lower incomes suggests risk factors are strongly associated with economic, environmental and social determinants. People who are unemployed or who have low paid jobs suffer more stress. Neighbourhoods with lower amenities and greater perceived crime or anti-social behaviour inhibit social interaction. The challenges of meeting basic needs for housing, shopping for fresh healthy food, exercise, reliable transport, entertainment are all more challenging in areas where people have lower incomes. This environment is served by businesses offering cheap and instant relief in the form of unhealthy fast food and cheap alcohol that themselves are risk factors.

Data for diagrams: Simulation model

Figure 4 Example of Disease Card
Figure 5 Example of Risk Factor Card
Figure 6 Example of Intervention Card

Scoring Interventions

The process of scoring attributes of interventions was a transparent and consistent process for converting qualitative judgements, informed by available evidence (though this was scant in many cases), into quantitative scores for the purposes of comparison in a decision making environment. The scores for effectiveness were weighted by the other attributes of evidence base, relevance to 55 year olds, disadvantaged target, impact on HLE which each influence the estimated impact of the interventions on the gap.

Further details of this process are provided in the paper that describes the Decision Support Model (Appendix 1)

Intervention Selection

In order for debate to cover the whole range of determinants of health, including social and economic determinants in addition to lifestyle choices, players were instructed to select 2 interventions directed at each of the following 4 categories:

1. Population level interventions
2. Health service mediated interventions
3. Community level interventions

4. Individual level interventions

They were told that they did not have the time, resources or money to adopt every intervention so they had to select and prioritise. They were reminded that a large element of intervention policy success would depend on their ability to persuade individuals and organisations to change behaviour. They were made aware of the fact that interventions that might offer the best potential return might also carry the highest risks of failure and of the often scant nature of the evidence-base for interventions.

For the purpose of this exercise, participants were required to work within a restricted budget which was set to be reasonable representation of reality (at the time the simulation was developed it was not clear how HWB budgets were to be allocated). The budget available was defined as a sum of £262 per 55 year old person per annum for the specific purpose of working to close the HLE gap. The assumption in the model was that there were one thousand 55 year olds in the relevant population and so there was an annual budget of £262,000 to be allocated to interventions chosen by HWB teams. Players were able to use the Decision Support Model to examine the consequences of selecting different sets of interventions which provided a measure of quantitative input to their qualitative discussions on resource allocation. The Model provided an estimate of the cost and impact of applying a chosen set of interventions over a ten year period.

The dramatic opening scenario had set a time limit of two hours for the teams to make and present their policy decisions to the media. This created a real world pressure to work quickly that conflicted with the desire for decision makers to take better decisions by using more time for research, consultation and debate when working with complex problems.

Policy Presentation

At the end of the session, the HWB teams took turns to present their chosen intervention strategy, and the rationale behind it, using a standard presentation template at a launch where the press and public were able to ask questions.

Plenary Sessions

Each move in the simulation was followed by a plenary session during which experts and observers analysed HWB team actions and decisions. These sessions were chaired by Dr Alan Maryon-Davies, Honorary Professor of Public Health,
who drew together key findings and comments and contrasted differences between team approaches. The discussions were filmed and reviewed and analysis of them provides additional evidence for the overall findings from the simulation.

Simulation Move 2 Negotiation and Discussion

In the second move of the simulation, the afternoon of Day 1, HWB team players were given a brief informing them that they had an opportunity to meet with representatives from the environment in order to negotiate and persuade people to make the changed necessary for their interventions to succeed.

Teams had exchanges with the wider environment and with central government in order to negotiate on their chosen strategies. Participants with detailed knowledge of government policy role-played the Permanent Secretary and Minister for Health for negotiations on population level interventions.

All negotiations were observed by experts from the White Team. These White Team observations provided a mechanism for direct feedback on the different viewpoints of local practitioners and central policy makers, as well as evaluation scores on the likely success of chosen intervention strategies which were then fed into the Model in order to calculate performance reacted impact scores.

In this move players were also challenged by a series of time jumps based on injects describing future technologies. These injects prompted players to debate the impact of new technology such as:

- personal activity/health monitoring
- big data and predictive analytics - the process of examining large amounts of data of a variety of types uncover hidden patterns, unknown correlations and other useful information
- multi pills targeting cardiovascular disease

All of these injects had the potential to widen the gap if they followed the historical norm whereby people from more prosperous backgrounds adopted
them faster than people from disadvantaged areas. The injects pressured teams to consider controversial tactics such as more 1) aggressive targeting 2) the use of incentives and penalties to change individual behaviour and 3) a pro-active, preventive use of personal patient data prior to the onset of a health condition. This ensured that decision makers were aware of the social, economic and political context that has an enormous influence over real world health policy.

Simulation Move 3 Innovation

At the beginning of the second day, players re-entered the simulation and were presented with the results of how successful they had been at closing the gap based on their chosen strategies on Day 1. Gap closure was estimated from the outputs of the decision support model modified by the opinions of the White Team of experts.

All players were briefed on other industries and disciplines where innovative thinking had led to transformational changes in performance in complex environment with no new money and then challenged to renew their efforts to close the gap in HLE. They were given additional freedom to innovate and find new ways to close the gap by identifying how to apply interventions more successfully and/or to develop new interventions and approaches.

When players developed new interventions they were required to use the same assessment process for identifying their key features and estimating their cost and benefits as was used for the predefined set of interventions. This ensured that direct comparisons could be made between new and existing interventions.

The feasibility and assessment of new interventions were independently evaluated by the White Team of experts during meetings between players and experts in which players presented their innovative ideas. This provided a mechanism for encouraging innovation together with a stringent assessment process that ensured ideas were well reasoned, realistic and fairly assessed.

As new interventions developed by players were evaluated and scored using the same process as existing interventions, it was possible to enter them into the Decision Support Model and estimate their potential impact on the HLE gap.
Round up

After one and a half days of play, the final session of the simulation was used to consolidate findings and produce a short list of priorities for action to close the gap in HLE for 55 year olds in the real world.

Logistics

The simulation was played out over a one and a half day period on September 27 and 28th 2013 in the Research Beehive at Newcastle University which is a fully equipped conference facility.

The large meeting room housed the Environment Team and was used for presentations and plenary sessions. The two HWB Teams and the White Team worked in separate syndicate rooms. The Control Team had a separate room for monitoring play, controlling IT functions and printing.

Diagram of conference facility layout for simulation

Data were captured from all stages of the simulation by document logs and video footage. High quality TV cameras were located in the players’ rooms and there was a live feed to the expert observers and controllers. All of the proceedings in the main auditorium were filmed for later analysis.

Simulation Key Findings

There is huge interest in this subject

Many people from different professional organisations, community and voluntary groups, universities in Newcastle, local schools, social contacts of the organisers, and the media contributed to the success of this project. Without fail, everyone whose involvement was
sought showed huge interest in the topic. Lay people, not involved with health and social care, were unaware of the gap and deeply shocked by it. This was particularly true when the simulation was tested at Walker Community College prior to the main event. Some of the Year 9 students, who participated in the test event, realised their parents were caught in the gap and were already suffering from the diseases that would blight their old age and life expectancy.

**People want action**

The overwhelming majority of people want to work to try to close the gap in healthy life expectancy between social groups – only one practitioner did not support this objective, all other participants across all groups did. Two thirds of people thought that the gap could be closed. (Full results from the Vote are shown in Appendix 3).

Every simulation participant believed that the gap will continue to grow if we do not make changes. New technologies based on personal health and activity monitoring devices and big data analytics were predicted to increase the gap. More educated prosperous groups are likely to have the purchasing power to buy health apps and the empowerment to put pressure on healthcare providers to support them whereas disadvantaged people will not. Consequently, the benefits of this new technology in transforming healthcare are likely to be felt by the affluent classes and not by the less well off and disadvantaged population who need it most. Any gains made in closing the healthy life expectancy gap may be put under increased threat.

**The gap is a consequence of circumstance and not of choice**

Over 90% of participants thought that it was harder or much harder for people who are disadvantaged to make healthy life style choices.

A participant whose family run a number of fish and chip shops explained that they had tried offering jacket potatoes as an alternative to chips but people did not want them – people follow the social norms that they have grown up with and prefer to choose chips.

“I don’t believe people living in abject poverty and deprivation make an active choice to live unhealthy lives, I think they are pushed into it, ground down into it …”

Dr Relton Cummings
Chairman, Newcastle North and East Clinical Commissioning Group
**Mental illness is the major contributor to the gap**

People came into the game with a good understanding of the diseases that contribute most to the gap in HLE at 55 ranking mental illness, diabetes type 2, chronic respiratory illness and heart disease as most influential. This finding may have been skewed in part by preparation work for the simulation as the citizen participants were pre-briefed so that they were able to participate on an equal footing with professionals. Discussions amongst players confirmed that mental ill health is unequally distributed across population groups with people from deprived backgrounds more likely to suffer mental health problems and illness and less likely to recover and lead fulfilling lives.

**Age 55 is not too late**

Many of the non professional participants were surprised to hear that it was not too late at 55 years of age to make changes to improve health and life expectancy. An important take home message was that stopping smoking, improving diet and increasing exercise levels can help 55 year olds reduce their fate of a lower healthy life expectancy.

“We spend the first 40 years of our lives trying to kill ourselves and the next 40 trying to stay alive”

Donna, Citizen

“**It is very difficult to say I will invest in this, it will have this cost to me but the benefits will be in someone else’s budget** …”

Colin Haylock

Principal, Haylock Planning & Design

**This is a high cost problem**

The moral case for taking action to close the gap is clear and compelling and players were made aware that so too is the economic case. Discussion in the plenary session at the end of Move 1 focussed on the difficulties of proving the economic case in real life when budgets and accounting are in different boxes.
The citizens’ voice matters

Although the subject is very complex it was clear that everyone, regardless of background, could understand the issues. Citizens with no formal qualifications were able to blend fully into the policy making process and were treated as equals. They supplied a level of frontline intelligence on what will or will not work that was valued highly by participants with professional status. Recruiting and mentoring these ordinary citizens was an essential and deliberate element of the game as the organisers wanted a true citizens’ voice as well as the voice of voluntary and community sector representatives. The simulation provided a route for taking a complex subject and putting it in the hands of lay people and has potential to be used to inform other HWBs, medical students and school children.

“Citizens voiced some very strong opinions (in the HWB Team) about what was likely or not likely to be acceptable which did influence our decisions”

Dawn Scott
Acting Director of Public Health, Newcastle City Council

Intervention Selections

The interventions selected by the two HWB teams and the two environment teams to close the gap are summarised in the Table 1.

Each team selected two interventions from four categories of

1. Population level interventions
2. Health service mediated interventions
3. Community level interventions
4. Individual level interventions

Selections were fed into the Decision Support Model which gave an estimate of the number of years the gap could be closed by and the amount of budget remaining. Players in the White Team evaluated choices and observed how persuasive players were in executing their chosen strategies. This evaluation generated a Performance Score for each choice made and allowed a more realistic projection of likely gap closure to be made.
1. Population level interventions

**Top Picks** = employment, alcohol pricing, healthier processed food

In this category, schemes to increase employment opportunities were the most selected by all teams. Lifelong worklessness and familial worklessness were of major concern and participants believed innovative ways to address these issues were urgently needed. Meaningful employment, it was argued, brought better health and higher mental wellbeing as well as increased income and social mobility. It was stressed that work should be of good quality and at an appropriate level for each individual. Working life may extend until people are in their 70s but people may need to be prepared for work after a major health event such as a heart attack. It was also considered very important to ensure people with jobs stayed in the workplace and had good working conditions as they get older.

HWB Teams also chose to lobby the government on a minimum unit price for alcohol to reduce harm from alcohol which they believed would reduce the gap as cheap alcohol is predominantly bought by people who are disadvantaged.

Improving processed food was also in the top pick of priorities for the wide ranging health benefits it would bring, particularly to people who are disadvantaged who are the main consumers.

Discussions in team meetings and plenary sessions highlighted that players think that Government policy should shift from persuasion to enforcement of measures to improve health by controlling alcohol pricing, making processed food healthier and cigarettes less attractive with plain labels. This would serve to counter balance the huge industry investment in consumer market advertising and promotion that far outweighs campaigns to educate and inform consumers.

“It is the job of the government. .... it would save them money in the future when people are healthier and therefore less likely to attend hospitals earlier due to illness”

Brian, Citizen

---

1 Top pick = selected in half or more of the available opportunities
2. Health service mediated interventions

Top pick = Community Health Trainers

Investing in Community Health Trainers was selected by all teams representing both HWBs and the wider Environment. Peer to peer support was cited as making much more difference to people’s lives than advice handed down from on high. Local knowledge indicates that people from areas of high deprivation need a lot of support to make lifestyle changes.

The direct experience of decision makers in Newcastle suggested that Health Trainers are very effective, although lack of an aggregated data set providing evidence of effectiveness from different regions was noted; it was not considered a rational reason not to invest and expand the service.

Other interventions selected in this category were:

- NHS Health Checks which would be offered in an innovative way to ensure uptake by the groups most in need and have an additional role in assessing mental health risk
- stop smoking services which would be linked to the Community Health Trainers programme to enhance uptake and longterm success rates
- integrating health & social care to provide a more holistic approach towards the individual, remove duplication and reduce costs
- social prescribing to target mental ill health

3. Community level interventions

Top picks = improve housing, control alcohol outlets

There was much support for improving the base level of living conditions as a means to improve all aspects of health – physical, mental and social good health. In the context of the simulation, HWB Team Green was prepared to invest half of their available budget to achieve this objective.

Controlling the availability of alcohol in the local community was also considered an important mechanism to reduce the gap by HWB Team Green and one of the environment teams. Alcohol control has direct benefits on health and additional social and family benefits.

“65% of people engaged with Health Trainers achieve their primary health goal”

Lynda Seery
Public Health Specialist
The other HWB team chose to invest in active transport networks to get people to take more exercise – a cheaper and more accessible way to increase physical activity than investing in gyms.

Also selected was reducing the high concentration of fast food take ways in areas of high deprivation as a mechanism for tackling obesity in poorer areas.

4. Individual level interventions

**Top Picks = social networks, exercise schemes**

Investing in schemes to promote social interactions to reduce isolation and establish supportive communities was selected by both HWBs as a means to improve mental wellbeing, reduce loneliness and to seek positive effects on other aspects of health and behaviour.

Exercise was also seen as a key contributor to many aspects of health and a mechanism to reduce the gap.

Also selected was providing welfare and benefits advice to reduce the impact of poverty and deprivation, lifelong learning to promote health literacy and other skills and the health benefits of volunteering.

**Closing the Gap in HLE for 55 year olds**

Table 1 shows how much of the gap was closed by the intervention strategies adopted by the teams according to the Decision Support Model which assessed the impact of the chosen strategy on the gap over a 10 year period. In the context of the simulation, the gap was 11 years and so there was some apparent progress towards meeting the aspirational objective of a 50% reduction. However, performance was adjusted by the White team of experts who assessed the likelihood of achieving the changes needed in the environment for interventions to be successfully applied. When this assessment had been made and the potential gap closure was adjusted by the Performance score in the Model, the gap was harder to close and no team achieved the objective of closing the gap by 50% in 10 years.

In terms of budget spend, most teams managed to work within the budget set for the simulation. The team that over spent presented a reasoned argument of how they would make up the deficit using savings derived from their policies.
Innovation

On the second day of the simulation when the teams had seen that they had not yet achieved their objective of closing the gap by 50%, the clock was turned back and they were re-challenged to think of new ways to apply interventions and/or novel interventions to enhance success. The logic behind the simulation model made this a critical moment. That logic implies that existing interventions and methods had not closed the real world gap – so innovation was required to create change.

The key findings from this challenge are as follows:

The way that services are delivered needs to change

- Local, peer to peer delivery was regarded as highly desirable and likely to increase efficacy
- Local health champions are key community assets
- Services should be targeted to the people and areas that need them by identifying high risk groups and getting alongside them
- The citizen voice is all important – should not be all about what can be “done to people”
- There should be a focus on families and shifting family values – working with children and grandparents together, combining the workload of Community Health Trainers to cover both children and adults
- As unhealthy behaviours (smoking, alcohol, illicit drugs) tend to cluster, intervention services should also be grouped

The way that services are communicated needs to change

- Shock makes people change behaviour – a sudden illness makes individuals act as ambassadors for health within the family unit – could this ambassador role be extended to the local community?
- Public service messages should focus on reasons to stop – perhaps using fear as a motivator
- Means of communication and sites used to communicate need to take more account of people’s lifestyles – for instance supermarkets were suggested as a place everyone goes and so could be used for health messaging
- The message that it is never too late needs to be more widely heard
Evidence-based practise is an obstacle to innovation

- When teams suggested novel ideas, they faced pressure to show proof of efficacy in the form of data collected by Randomised Control Trials (RCT).
- This revealed a paradox that works against health innovation – the requirement for a sound evidence base before interventions can be adopted is a direct obstacle to local innovation in developing and testing new interventions.
- Amongst frontline health practitioners and non-health professionals, there was a strongly held view that following the evidence-based route constrains the ability of public health to reduce health inequalities and, could even contribute to a widening gap.
- Introducing novel local interventions in local trials with guidance and support from academics was seen as potential solution if innovative services could be designed with a “learning as we go” evaluation methodology.

Novel interventions from the teams

The interventions listed below need to be considered within the context of the RCT paradox. The White Team were obliged to take cautious approach and felt unable to support the optimism of the innovators without first seeing validated evidence in the form of data collected in a formally organised and validated RCT. This had the effect of pushing HWB teams back to the Business As Usual interventions, with the inference that the gap would not change.

- Better Together

This proposal from Environment Team Green was for a one-stop advice shop or “supermarket for health and wellbeing”. It would be contained in existing local assets (such as the Bingo Hall) and use peer advocates to provide information to local people on healthy living, housing, shopping healthily on a budget, smoking cessation, exercise promotion. It would also form a hub for social interaction and volunteering opportunities and so impact many aspects of physical health and mental wellbeing. This initiative would lead its own development and service delivery with a bottom up approach. It would advise the HWB of its activities rather than be directed by it.

- Change 4 Life Centre

Environment Team Blue proposed the concept of a Change4Life Centre set up at the heart of disadvantaged communities that would offer a relaxed and informal
environment for activities and socialisation. By encouraging physical activity it would tackle obesity and opportunities for social interactions would target social isolation. The Centre would also provide an educational resource for boosting awareness of health issues and new technologies such as mobile health apps so disadvantaged people did not miss out. Funding could be accessed by involving industry – perhaps by linking development of major supermarkets with funds to build the centres.

- **Get Walking, Get Well**

The health benefits of physical activity are wide spread and so HWB Team Green chose to develop an intervention that supported people from deprived areas to take outdoor exercise. The intervention required walking/cycling motivators who would be volunteers supported by some staff paid by the Local Authority via Public Health. As this was a group activity it would also have a positive impact on social interaction and mental wellbeing. It was considered a low cost intervention with good evidence to support its effectiveness.

**Round up Session**

In the final session participants were asked whether they thought the simulation was a valid tool for tackling the complex issues of health inequalities and there was overwhelming support for the methodology. The simulation successfully brought people from a wide variety of backgrounds, including lay citizen members, together to address a complex problem. It is planned to make it available to other regional HWBs, schools and medical schools. The judgements made by the White Team in terms of how successful interventions might be expected to fare in the real world were felt to be harsh. The mood was that strict adherence to evidence based methods would not encourage the innovation needed to address deep social injustice.

Analysis of top interventions selections by frequency gave the following ranking:
<table>
<thead>
<tr>
<th>intervention</th>
<th>POPULATION LEVEL</th>
<th>HEALTH SERVICES</th>
<th>COMMUNITY LEVEL</th>
<th>INDIVIDUAL LEVEL</th>
<th>GAP CLOSURE AT 100%</th>
<th>GAP CLOSURE with Performance Scores from White Team</th>
<th>BUDGET REMAINING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Job creation schemes</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Plain Packaging For Cigarettes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Improve processed food</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Tax unhealthy food</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Minimum price per unit of alcohol</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Food vouchers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nudge people to healthy choices</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Community health trainers</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1(R)</td>
<td>1(R)</td>
<td>1(R)</td>
</tr>
<tr>
<td></td>
<td>Stop smoking services</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>NHS health checks</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Skills for Health Literacy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Brief interventions- alcohol</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Integrate health &amp; social care</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Social prescribing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Improve housing</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Active transport networks</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Safe parks &amp; green spaces</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Control take-aways</td>
<td>1</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Control alcohol outlets</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Leisure facilities</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>NEW Change 4 Life Centres</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Life long learning</td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Welfare &amp; benefits advice</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mediterranean diet</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Weight management</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Exercise schemes</td>
<td>1</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Social networks</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Volunteering</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>NEW Better Together</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>NEW Get Walking, Get Well</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>GAP CLOSURE AT 100%</td>
<td>3 years</td>
<td>5 years</td>
<td>4 years</td>
<td>6 years</td>
<td>3 years</td>
<td>5 years</td>
</tr>
<tr>
<td></td>
<td>GAP CLOSURE with Performance Scores from White Team</td>
<td>2 years</td>
<td>3 years</td>
<td>2 years</td>
<td>4 years</td>
<td>2 years</td>
<td>3 years</td>
</tr>
<tr>
<td></td>
<td>BUDGET REMAINING</td>
<td>£24,237</td>
<td>£29,129</td>
<td>£24,487</td>
<td>£41,015</td>
<td>£17,136</td>
<td>£2,882</td>
</tr>
</tbody>
</table>

Table 1: Team Intervention Selection
Publicity

The simulation was launched to the media at a press conference held as part of the British Science Festival 2013 hosted by Newcastle University. Following this event press launch there was a lead article on the front page of the Newcastle Journal.

The local press also published an account of a very successful test run of the simulation with students from Walker Community College as well as a run through with Medical Students.

Peter Day, broadcaster and presenter of BBC Radio 4 “In Business” attended the whole of the simulation with his Producer and a 30 minute programme covering the event was broadcasted on Radio 4 in December 2013.

Links to press reports can be found in Appendix 4.

Conclusions

- This flagship event demonstrated that behavioural simulation was a valid methodology for bringing together a mixed group of people (health professionals, council members, academics, local community and business sector representatives) to address the longstanding and challenging issue of health inequalities. Teams worked successfully together to address issues key of health disparities between income groups brought alive in a vivid and pressurised simulation of the real world.

- Lay people from disadvantaged areas were skilled in interpreting complex information and evidence and were valued members of policy making teams addressing healthy disparities. Local citizens provided a valuable frontline perspective and neglect of this wisdom risks producing action disconnected from context. All simulation participants were clear that effective policy could only be developed with citizens and not for citizens. Failure to do this risks developing policy that is focussed on the wrong problems and that produces the wrong solutions.

- Evidence from the simulation also clearly demonstrated that the true citizen voice can only be heard by reaching into deprived communities directly. Working through community representatives, who are often not from the same local community or income group, may not provide a true perspective.

- Mental ill health is a significant contributor to the health inequality gap at 55 years of age and one that needs to be addressed for the gap to be closed.
• Peer-to-peer support, with community health trainers or equivalent health advocates, recruited from local communities with a wide brief that embraced clusters of unhealthy behaviours were seen as critical to success. Interestingly this parallels solutions to improving basic health in developing countries.

• Health promotion and education services run from local community based centres and managed by local people were chosen as ways to have maximum impact on health outcomes. Families should be seen as a social unit when delivering services.

• Localism, for example in terms of control of licensing new alcohol premises and fast food outlets, was considered to have good potential in addressing health inequalities. Council members took away the message that services across the council should embed public health issues. More emphasis should be given to the social determinants of health when deciding local policy.

• Government measures directed at population level change were considered to be an important component of the solution to close the gap in HLE at 55. Programmes to support and encourage local employment opportunities, institute a fixed minimum unit price for alcohol, and to regulate the content of processed food were all topics where players wanted to engage government in discussions on legislation and support.

• At the level of individual disadvantaged 55 year olds, exercise was considered a huge potential win and exercise devices that monitor activity electronically were viewed as a popular and an effective route to monitoring and increasing daily activity levels.

• There was discussion amongst the teams on the issue of “targeting” according to need (or “progressive universalism”) where those who are most disadvantaged receive greater attention from service providers. This was considered an important aspect of service design in an economically constrained environment with an inherent lack of fairness in health outcomes.

• Innovative thinking on solutions to the health gap tended to centre on service delivery and communication with the emphasis on local community based providers and sites.

• Current trends to focus on randomly controlled trials as the gold standard source of evidence for decisions on public health priorities and policies were debated in plenary sessions. Participants voiced concerns with this model as RCTs of interventions may not be plausible in complex systems with multiple causal pathways and the need for a
pre-existing evidence base is in conflict with the need to innovate. Innovation is clearly needed as established intervention policies and solutions have not worked.

- Players argued for a fast track standardised evaluation methodology that would widen access to new ideas and increase the speed of adoption for those that are successful. They also proposed that a central database of innovations should be created that could be accessed by HWB boards to inform their own innovations and research others – so that Best Practice is faster to adopt.

- Participants from local communities, the City council, CCGs, and University experts left the event with a common sense of the need for action.

- Post event activities are in hand and include:
  - Re-running the simulation with HWBs in other regions and as an educational tool in schools, medical schools and community groups.
  - Developing the fast track evaluation methodology in a collaborative pilot project between the University and community health representatives using a protocol to evaluate the effects of exercise promotion in disadvantaged 55 year olds.
  - Refining and developing the simulation materials and Decision Support Model as research generates new data and understanding of health inequalities and ageing.
Appendix 1 Decision Support Model

Introduction

The Healthy Life Simulation was an innovative approach to identify the changes needed to close the gap in healthy life expectancy between social classes by 50% in the next 10 years – without any increase in spending on public health or social care.

The determinants of an individual’s health and life expectancy are many and are intertwined in a complex web of layers and relationships as described in the qualitative model developed by Dahlgren and Whitehead. ²

The simulation model aimed to simplify, in a meaningful way, this complexity and provide decision support to players who need to assess and quantify the impact of allocating resources to interventions directed at different layers of the traditional model in order to achieve their mission.

During this period of austerity and heightened financial accountability, there is increasing pressure to scrutinise long term cost effectiveness of health care interventions. The Model was therefore further required to present the health economic factors associated with the range of possible preventive interventions in such a way that participants were able to identify the optimum portfolio of interventions to achieve a reduction in the gap within the defined financial constraints.

This paper describes the data and methods used in the development of an entry level Decision Support Model for use in the simulation. It focused on people at the age of 55. This age was chosen because it is “pre-old” stage where many people still have time to improve their health in later age. Links relevant data sources and further information also provided where possible.

In the first instance, the model was used as tool for participants in the Healthy Life Simulation and was populated by a set of default data. However, it has also been designed to have a life after the simulation and be made available to commissioners and health and wellbeing boards to aid analysis, discussion and decision making. It is flexible so that data from any region can be included and it can be re-used and improved – as new evidence and learning become available.

² Policies and strategies to promote social equity in health. Dahlgren & Whitehead, 1991
A review of the literature revealed that although a number of quantitative models (such as LHO Intervention Toolkit ³, WHO CHOICE ⁴) have been developed for assessing the impact of intervention policies none were identified that matched the exacting requirements of the question posed by the Healthy Life Simulation.

We have therefore developed a bespoke Decision Support Model that matched our specific requirements of:

- Modelling the health and socioeconomic profile of 2 groups of 55 year olds—one group from a disadvantaged population and the other from a prosperous population
- Comparing and contrasting the profiles of the 2 groups in order to generate a data set that defines the “Gap” in healthy life expectancy at age 55
- Presenting the features, costs and benefits of a wide range of healthcare and socioeconomic interventions
- Modelling the impact of applying different sets of interventions.
- Providing a mechanism for judging and evaluating simulation outcomes as intervention strategies are selected and executed during play in the simulation
- Providing a rapid and easily digestible interface to assist decision making in a dynamic meeting environment with lay and health professional participants

**Methodology**

The complexities of the determinants of the probability of achieving a healthier life, together with the paucity of available evidence on interventions directed at tackling inequalities, particularly in middle age and in disadvantaged groups, led us to base the development of the Decision Support model on the methodology of Multi Criteria Decision Analysis (MCDA) ⁵. This technique has been used in a number of environments where the interaction of complex groups of criteria need to be addressed in order to select an optimum set of options. For example MCDA has been applied to selection of optimum portfolios of projects in the pharmaceutical industry and to the allocation of healthcare resources in the context of local public health decision making. ⁶

Multi-criteria decision analysis is particularly suited to situations in which the outcome of a given course of actions is determined by a complex, related group of factors. Using a value based approach it allows the relationship between determinants to be built up in a hierarchical relationship so that a

---

³ www.lho.org.uk/LHO.../HealthInequalitiesInterventionToolkit

⁴ www.who.int/choice

⁵ Priority setting of health interventions: the need for multi-criteria decision analysis

score can be derived which indicates the aggregate value of a given course of action. The technique provides a transparent methodology because it is possible to show exactly how the score is built up from a series of individual building blocks. Because the contributions of different factors can be weighted it is possible to take account, for example, of the relative strength of the evidence for the effectiveness of a particular course of action. For example, while a high weight of influence would be assigned to a factor for which there is strong, objective evidence, a lesser weight could be applied where the evidence is largely subjective. This allows the combination of available evidence-based research with assumptions informed from a wide review of the literature and interviews with key experts and opinion leaders.

**How the model worked**

The underlying logic of the model was that interventions could be selected that reduced the prevalence of the risk factors that influence the occurrence of the diseases which a) contribute most to the gap in healthy life expectancy and b) are sensitive to changes in the Determinants of Health. In turn, the incidence of diseases that mark the gap (such as diabetes and circulatory diseases) would then be reduced and thence the number of premature deaths and preventable ill health would be lower. This would result in the gap in healthy life expectancy between groups being narrowed. This basic hierarchical framework was populated by the default data as follows:

- Within the model: 7 diseases accounted for the entire gap in healthy life expectancy at 55
- 13 Risk Factors contributed to the 7 diseases in a complex web of relationships
- The possibility of suffering every disease was accounted for by the sum of its contributory risk factors
- Each intervention had an impact score on one or more risk factor
- The contribution of each risk factor to the gap could be completely mitigated by the full set of relevant interventions

---

7 Policies and strategies to promote social equity in health. Dahlgren & Whitehead, 1991
Disease Burden

The default value sets in the Model described the disease burden of two fictional, but representative, populations of 55 year olds from different ends of the socioeconomic spectrum. These were derived from published health and lifestyle surveys in which data had been analysed by socioeconomic group and from Ward level data analysed by Newcastle University experts on health and ageing.

The default values can be replaced with any regional data.

Disease burden was described in terms of age of onset and average survival years.

It was quantified using disability adjusted life years (DALYs) which provided a measure of years lost due to premature mortality (YLL) and years lost due to disability (YLD) with the severity of disease
being graded on a scale from 0 (perfect health) to 1 (dead) according to WHO disease burden metrics\(^8\).

\[ \text{DALY} = \text{YLL} + \text{YLD} \]

**Healthcare costs**

The healthcare costs associated with disease burden were derived from available published data and can be modified as necessary.

**Available budget**

The Model assumed that there was a restricted budget available for the specific purpose of closing the HLE Gap for 55 year olds. This was defined as a sum of £262 per 55 year old person per annum (considered to be reasonable representation of reality at the time the simulation was developed as the process of defining HWB budgets had not yet been defined). The assumption in the model was that there were one thousand 55 year olds in the relevant population and so there was an annual budget of £262,000 to be allocated to interventions chosen by HWB teams in their mission to close the gap in HLE by 50% in a ten year period.

**Estimating Risk Factor Contribution to Disease**

The impact of every risk factor on each of the diseases that mark the gap was given a relative score on a scale of 0-100. The default values in the Model were based on data ranging from controlled published studies to expert, but subjective, opinion. These values can be modified by simulation experts and organisers as necessary. In some cases the relationship of the risk factor to a disease was very well defined (for example, smoking is clearly a risk factor for lung cancer). In other cases it is recognised that the relationship may be considerably less well defined (for example the relationships of social risk factors to diseases are much less well defined). This was accounted for in the model by applying appropriate weighting factors.

**Estimating Intervention Impact Scores**

To ensure transparency in scoring the impact of interventions on the gap in HLE for 55 year olds, five key attributes of each intervention were assigned a score using the following system:

1. **General effectiveness**: this was a measure of the effectiveness of the intervention in the general population. It was based on published studies and expert opinion and scored between 1-5 where 5 = maximum effectiveness and 1= little effectiveness
2. **Evidence base**: this was a grade for the type of evidence that was available to support the intervention. It was largely based on published studies and scored as follows

\(^8\) [www.who.int/healthinfo/global_burden_disease/metrics](http://www.who.int/healthinfo/global_burden_disease/metrics)
5= NICE or Government guidance, 4= systematic reviews of RCTs, meta analyses, 3= literature reviews, non- RCT studies, 2=case reports, modelling 1= expert opinion

3. **Relevance to 55 year olds**; this was a measure of how relevant the intervention was likely to be when applied to 55 year olds. It was based on published studies combined with expert opinion and scored between 1-5 where 5= highly relevant and 1= little relevance

4. **Target low income> high**: this was a measure of the extent to which the intervention impacted disadvantaged groups preferentially. It was based on published studies together with expert opinion and scored between 1-5 where 5= highly targeted at low income groups and 1= not targeted at low income groups

5. **Impact HLE: LE ratio**: this was a measure of how much the intervention extended HLE not just LE. It was based on published studies together with expert opinion and scored between 1-5 where 5= high impact on HLE 1= low impact on HLE

The overall impact of each intervention was then estimated by weighting general effectiveness by the other attributes which defined the evidence base and its suitability for closing the gap in HLE for people aged 55 years. An average across all relevant risk factors was then taken as shown in the following worked example:

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Smoking</th>
<th>Drinking</th>
<th>Activity</th>
<th>Diet</th>
<th>Obesity</th>
<th>HyperT</th>
<th>Cholesterol</th>
<th>AF</th>
<th>Deprivation</th>
<th>Environment</th>
<th>Education</th>
<th>Social</th>
<th>Health Literacy</th>
<th>Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community health trainers</td>
<td>42</td>
<td>28</td>
<td>28</td>
<td>28</td>
<td>42</td>
<td>42</td>
<td>28</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>70</td>
<td>396</td>
<td></td>
<td></td>
</tr>
<tr>
<td>General effectiveness</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>39</td>
</tr>
<tr>
<td>Evidence base</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>44</td>
</tr>
<tr>
<td>Relevance to 55</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>39</td>
</tr>
<tr>
<td>Low income&gt; high</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>44</td>
</tr>
<tr>
<td>Impact HLE: LE ratio</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>39</td>
</tr>
</tbody>
</table>

This procedure converted qualitative judgements into quantitative scores for the purposes of comparison in a decision making environment. The score indicated how effective the intervention was expected to be and this score was then applied to quantify the impact of the intervention on a particular disease. In the simplest case the intervention was deemed to affect a single risk factor whereas others impacted a range of risk factors. The sum of impact of all available interventions on any one risk factor was set as the total benefit (100%) and individual scores were ranked proportionately.

Any wider benefits of the intervention to the local community were also taken into account by players in the simulation.

**Selecting Interventions**

The features, costs and benefits of each intervention were presented to players in the same format on Intervention Cards. The cards summarised, in a common format, a) the important factors relating to the interventions, including the description, b) the target population, c) resources required, d) who will pay, e) the evidence base, f) the expected impact on the gap and the g) threat to success (which is an indicator of how the practical challenges of achieving theoretical potential).

Each card also indicated graphically which risk factors were impacted and, in turn, which diseases would be affected as well as estimated cost per annum and time to impact.
The Headlines table presented a graphical description of five key attributes that determined the intervention impact score as described above.

Dashboard

A dashboard in the Model presented an overview of the interventions available to players when allocating their resources. For each intervention this table also showed:

- unit cost per 55 year old
- coverage within the population of 55 year olds
- total cost per annum

Players checked boxes in line with their relevant choices. The rules of the simulation dictated that players must select 2 options from each available intervention category:

1. Population based interventions
2. Health service led interventions
3. Local authority led interventions
4. Interventions directed at individuals

When players selected a set of interventions, the Model generated an impact profile of applying a given set of interventions on the health gap as follows:
- health cost savings
- net benefit
- budget remaining
- impact on GAP (in years)
- value of intervention in terms of DALYs averted
- cost per DALY averted

The calculation engine within the Model built up the scores at each level of the hierarchy to compute the overall impact of selected interventions on a) the risk factors, b) the impact of the risk factors on the disease burden and, c) finally, the contribution of the disease burden to the gap in HLE between the 2 groups of 55 year olds.
### Intervention Dashboard Example

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Category</th>
<th>Unit Cost</th>
<th>Coverage</th>
<th>Cost PA</th>
<th>Health cost savings</th>
<th>Net benefit</th>
<th>DALY's averted</th>
<th>Cost per DALY averted</th>
<th>GAP closure</th>
<th>Players selection</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>Job creation schemes</td>
<td>Population</td>
<td>£ -</td>
<td>60%</td>
<td>£</td>
<td>£ 33,219</td>
<td>£ 33,219</td>
<td>£ 583</td>
<td>£ -</td>
<td>0.93</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Plain Packaging For Cigarettes</td>
<td>Population</td>
<td>£ -</td>
<td>100%</td>
<td>£</td>
<td>£ 22,620</td>
<td>£ 22,620</td>
<td>£ 218</td>
<td>£ -</td>
<td>0.35</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Improved processed food</td>
<td>Population</td>
<td>£ -</td>
<td>100%</td>
<td>£</td>
<td>£ 15,504</td>
<td>£ 15,504</td>
<td>£ 165</td>
<td>£ -</td>
<td>0.26</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Tax unhealthy food</td>
<td>Population</td>
<td>£ -</td>
<td>100%</td>
<td>£</td>
<td>£ 10,754</td>
<td>£ 10,754</td>
<td>£ 139</td>
<td>£ -</td>
<td>0.22</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Minimum price per unit of alcohol</td>
<td>Population</td>
<td>£ -</td>
<td>100%</td>
<td>£</td>
<td>£ 12,531</td>
<td>£ 12,531</td>
<td>£ 126</td>
<td>£ -</td>
<td>0.20</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Food vouchers</td>
<td>Population</td>
<td>£ -</td>
<td>100%</td>
<td>£</td>
<td>£ 8,663</td>
<td>£ 8,663</td>
<td>£ 111</td>
<td>£ -</td>
<td>0.18</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Nudge people to healthy choices</td>
<td>Population</td>
<td>£ -</td>
<td>100%</td>
<td>£</td>
<td>£ 2,658</td>
<td>£ 2,658</td>
<td>£ 36</td>
<td>£ -</td>
<td>0.06</td>
<td></td>
</tr>
<tr>
<td>P1</td>
<td>Players own - P1</td>
<td>Population</td>
<td>£ -</td>
<td>-</td>
<td>£</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>£ -</td>
<td>-</td>
<td>0.00</td>
</tr>
<tr>
<td>P2</td>
<td>Players own - P2</td>
<td>Population</td>
<td>£ -</td>
<td>-</td>
<td>£</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>£ -</td>
<td>-</td>
<td>0.00</td>
</tr>
<tr>
<td>2</td>
<td>Community health trainers</td>
<td>Health</td>
<td>£ 83</td>
<td>40%</td>
<td>£</td>
<td>£ 33,200</td>
<td>£ 55,300</td>
<td>£ 22,100</td>
<td>£ 57</td>
<td>0.93</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Stop smoking services</td>
<td>Health</td>
<td>£ 22</td>
<td>80%</td>
<td>£ 6,600</td>
<td>£ 51,507</td>
<td>£ 44,907</td>
<td>£ 502</td>
<td>£ 33</td>
<td>0.80</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>NHS health checks</td>
<td>Health</td>
<td>£ 25</td>
<td>100%</td>
<td>£ 25,000</td>
<td>£ 33,000</td>
<td>£ 8,000</td>
<td>£ 359</td>
<td>£ 70</td>
<td>0.57</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Skills for Health Literacy</td>
<td>Health</td>
<td>£ 400</td>
<td>25%</td>
<td>£ 100,000</td>
<td>£ 19,656</td>
<td>£ 80,344</td>
<td>£ 218</td>
<td>£ 458</td>
<td>0.35</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Brief interventions - alcohol</td>
<td>Health</td>
<td>£ 24</td>
<td>25%</td>
<td>£ 6,000</td>
<td>£ 16,627</td>
<td>£ 10,627</td>
<td>£ 164</td>
<td>£ 37</td>
<td>0.26</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>Integrate health &amp; social care</td>
<td>Health</td>
<td>£ 25</td>
<td>100%</td>
<td>£ 25,000</td>
<td>£ 12,550</td>
<td>£ 12,450</td>
<td>£ 102</td>
<td>£ 244</td>
<td>0.16</td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>Social prescribing</td>
<td>Health</td>
<td>£ 32</td>
<td>25%</td>
<td>£ 8,000</td>
<td>£ 3,354</td>
<td>£ 4,646</td>
<td>£ 69</td>
<td>£ 116</td>
<td>0.11</td>
<td></td>
</tr>
<tr>
<td>H1</td>
<td>Players own - H1</td>
<td>Health</td>
<td>£ -</td>
<td>-</td>
<td>£</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>£ -</td>
<td>-</td>
<td>0.00</td>
</tr>
<tr>
<td>H2</td>
<td>Players own - H2</td>
<td>Health</td>
<td>£ -</td>
<td>-</td>
<td>£</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>£ -</td>
<td>-</td>
<td>0.00</td>
</tr>
<tr>
<td>31</td>
<td>Improve housing</td>
<td>Community</td>
<td>£ 100</td>
<td>100%</td>
<td>£ 100,000</td>
<td>£ 30,407</td>
<td>£ 69,593</td>
<td>£ 569</td>
<td>£ 176</td>
<td>0.91</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Active transport networks</td>
<td>Community</td>
<td>£ 100</td>
<td>100%</td>
<td>£ 100,000</td>
<td>£ 16,730</td>
<td>£ 83,270</td>
<td>£ 280</td>
<td>£ 357</td>
<td>0.45</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Safe parks &amp; green spaces</td>
<td>Community</td>
<td>£ 100</td>
<td>100%</td>
<td>£ 100,000</td>
<td>£ 16,257</td>
<td>£ 83,743</td>
<td>£ 279</td>
<td>£ 358</td>
<td>0.45</td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>Control take-aways</td>
<td>Community</td>
<td>£ 10</td>
<td>100%</td>
<td>£ 10,000</td>
<td>£ 17,300</td>
<td>£ 7,300</td>
<td>£ 248</td>
<td>£ 40</td>
<td>0.40</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Control alcohol outlets</td>
<td>Community</td>
<td>£ 100</td>
<td>100%</td>
<td>£ 1,000</td>
<td>£ 17,765</td>
<td>£ 16,765</td>
<td>£ 216</td>
<td>£ 5</td>
<td>0.34</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Leisure facilities</td>
<td>Community</td>
<td>£ 100</td>
<td>100%</td>
<td>£ 100,000</td>
<td>£ 15,172</td>
<td>£ 84,828</td>
<td>£ 202</td>
<td>£ 495</td>
<td>0.32</td>
<td></td>
</tr>
<tr>
<td>C1</td>
<td>Players own - C1</td>
<td>Community</td>
<td>£ -</td>
<td>-</td>
<td>£</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>£ -</td>
<td>-</td>
<td>0.00</td>
</tr>
<tr>
<td>C2</td>
<td>Players own - C2</td>
<td>Community</td>
<td>£ -</td>
<td>-</td>
<td>£</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>£ -</td>
<td>-</td>
<td>0.00</td>
</tr>
<tr>
<td>24</td>
<td>Life long learning</td>
<td>Individual</td>
<td>£ 100</td>
<td>50%</td>
<td>£ 50,000</td>
<td>£ 24,300</td>
<td>£ 25,700</td>
<td>£ 438</td>
<td>£ 114</td>
<td>0.70</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Welfare &amp; benefits advice</td>
<td>Individual</td>
<td>£ 75</td>
<td>60%</td>
<td>£ 45,000</td>
<td>£ 16,707</td>
<td>£ 28,293</td>
<td>£ 298</td>
<td>£ 151</td>
<td>0.48</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Mediterranean diet</td>
<td>Individual</td>
<td>£ 50</td>
<td>50%</td>
<td>£ 25,000</td>
<td>£ 22,975</td>
<td>£ 2,025</td>
<td>£ 291</td>
<td>£ 86</td>
<td>0.47</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Weight management</td>
<td>Individual</td>
<td>£ 70</td>
<td>25%</td>
<td>£ 17,500</td>
<td>£ 21,739</td>
<td>£ 4,239</td>
<td>£ 282</td>
<td>£ 62</td>
<td>0.45</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Exercise schemes</td>
<td>Individual</td>
<td>£ 215</td>
<td>25%</td>
<td>£ 53,750</td>
<td>£ 16,659</td>
<td>£ 37,091</td>
<td>£ 204</td>
<td>£ 264</td>
<td>0.33</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Social networks</td>
<td>Individual</td>
<td>£ 25</td>
<td>100%</td>
<td>£ 25,000</td>
<td>£ 7,614</td>
<td>£ 17,386</td>
<td>£ 120</td>
<td>£ 208</td>
<td>0.19</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>Volunteering</td>
<td>Individual</td>
<td>£ -</td>
<td>100%</td>
<td>£ 4,100</td>
<td>£ 4,100</td>
<td>£ 85</td>
<td>£ -</td>
<td>£ -</td>
<td>0.13</td>
<td></td>
</tr>
<tr>
<td>S1</td>
<td>Players own - S1</td>
<td>Individual</td>
<td>£ -</td>
<td>-</td>
<td>£</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>£ -</td>
<td>-</td>
<td>0.00</td>
</tr>
<tr>
<td>S2</td>
<td>Players own - S2</td>
<td>Individual</td>
<td>£ -</td>
<td>-</td>
<td>£</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>£ -</td>
<td>-</td>
<td>0.00</td>
</tr>
</tbody>
</table>
**Expert Adjudication**

When players executed their intervention strategy in the simulation, a panel of academics and experts acted as adjudicators and scored their performance using a value between 0-100 percent. This factor acted as a multiplier in the Model. When players were judged as performing well in executing strategies, for instance by successfully persuading Government representatives to change policy and agree to introduce a minimum price for alcohol, their scores were uplifted more using the Performance Factor than if experts predicted intervention policies chosen were less likely to be effective.

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
<th>Code</th>
<th>Performance Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Population</td>
<td>Improve processed food</td>
<td>14</td>
<td>30%</td>
</tr>
<tr>
<td></td>
<td>Minimum price per unit of alcohol</td>
<td>17</td>
<td>80%</td>
</tr>
<tr>
<td>2 Health</td>
<td>Community health trainers</td>
<td>2</td>
<td>40%</td>
</tr>
<tr>
<td></td>
<td>NHS health checks</td>
<td>3</td>
<td>30%</td>
</tr>
<tr>
<td>3 Community</td>
<td>Active transport networks</td>
<td>21</td>
<td>50%</td>
</tr>
<tr>
<td></td>
<td>Control take-aways</td>
<td>36</td>
<td>40%</td>
</tr>
<tr>
<td>4 Individual</td>
<td>Welfare &amp; benefits advice</td>
<td>23</td>
<td>60%</td>
</tr>
<tr>
<td></td>
<td>Social networks</td>
<td>28</td>
<td>60%</td>
</tr>
</tbody>
</table>

**Results**

**Impact of intervention strategy**

As players made their selections, further tables were populated that indicated the impact on HLE gap closure if the strategy was completely effective and with the performance factor weighting. These tables showed the overall cost benefit analysis, budget remaining as well as HLE gap closure.

**Impact of intervention strategy at 100%**

<table>
<thead>
<tr>
<th>Cost pa</th>
<th>Health cost savings</th>
<th>Net benefit</th>
<th>Cost per DALY averted</th>
<th>DALYS averted</th>
<th>Budget remaining</th>
<th>GAP closure in years</th>
<th>% Gap Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>£238,200</td>
<td>£174,686</td>
<td>-£63,514</td>
<td>£883</td>
<td>2,182</td>
<td>£24,237</td>
<td>3.48</td>
<td>31.7</td>
</tr>
</tbody>
</table>

**Actual Impact of intervention**

<table>
<thead>
<tr>
<th>Cost pa</th>
<th>Health cost savings</th>
<th>Net benefit</th>
<th>Cost per DALY averted</th>
<th>DALYS averted</th>
<th>Budget remaining</th>
<th>GAP closure in years</th>
<th>% Gap Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>£238,200</td>
<td>£76,574</td>
<td>-£161,626</td>
<td>£1,788</td>
<td>982</td>
<td>£24,237</td>
<td>1.57</td>
<td>14.3</td>
</tr>
</tbody>
</table>
Novel interventions

The Model also provided a facility for players to develop their own interventions during the course of the simulation which, in conjunction with organisers’ input, could be ranked and assessed alongside existing options using the same scoring system.

Summary

This was a simulation model - it should not be regarded as a definitive tool that complies with operational standards of evidence normally applied in academic research or health practice.

However, the model was closely informed by academic research and expert opinion, so it supplied a realistic bridge to decision making in a behavioural simulation on health inequalities in the ageing population. The objective of the simulation was to provide a platform for debate and discussion on this important topic and to allow players to make well informed comparisons and to experiment with different approaches in the safe environment of simulation.

It is an entry level tool and is designed to be accessible to all levels of players in the simulation, including non healthcare specialists, and is amenable to accepting specific data in place of the default values.

It has been produced in a manner that means it can be refined and further developed as required and as knowledge grows. For instance consideration could be given to healthcare costs associated with saving the lives of people who go on to incur health care expenditure (so called unrelated future healthcare costs).
## Appendix 2 List of Participants

<table>
<thead>
<tr>
<th>Participant</th>
<th>Title and Organisation</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr Karen Nielsen</td>
<td>GP The Grove Medical Group</td>
<td>HWB Blue Team</td>
</tr>
<tr>
<td>Ms Linda Woodcock</td>
<td>Local Citizen</td>
<td>GP Commissioner</td>
</tr>
<tr>
<td>Mr Brian Graham</td>
<td>Local Citizen</td>
<td>Citizen</td>
</tr>
<tr>
<td>Ms Mary Nicholls</td>
<td>Chair Elders Council of Newcastle</td>
<td>Citizen</td>
</tr>
<tr>
<td>Mr Don Pinchbeck</td>
<td>Company Director</td>
<td>Vol &amp; Community Sector</td>
</tr>
<tr>
<td>Mrs Ann Schofield</td>
<td>Councillor Elswick Ward&lt;sup&gt;9&lt;/sup&gt;</td>
<td>Local Healthwatch</td>
</tr>
<tr>
<td>Dr Dawn Scott</td>
<td>Acting Director Public Health&lt;sup&gt;9&lt;/sup&gt;</td>
<td>Councillor</td>
</tr>
<tr>
<td>Mr Colin Williams</td>
<td>Director of Transformation&lt;sup&gt;9&lt;/sup&gt;</td>
<td>Director of Public Health</td>
</tr>
<tr>
<td>Dr Relton Cummings</td>
<td>Chair Newcastle North &amp; East CCG</td>
<td>HWB Green Team</td>
</tr>
<tr>
<td>Ms Gillian Lumley</td>
<td>Local Citizen</td>
<td>GP Commissioner</td>
</tr>
<tr>
<td>Mr Peter Monaghan</td>
<td>Local Citizen</td>
<td>Citizen</td>
</tr>
<tr>
<td>Ms Sarah Cowling</td>
<td>Chief Executive HealthWORKS</td>
<td>Vol &amp; Community Sector</td>
</tr>
<tr>
<td>Mr Tony Durcan</td>
<td>Director of Communities&lt;sup&gt;9&lt;/sup&gt;</td>
<td>Local Healthwatch</td>
</tr>
<tr>
<td>Dr Gill Samuels</td>
<td>Executive Director Pfizer-retired</td>
<td>Councillor</td>
</tr>
<tr>
<td>Mrs Lynda Seery</td>
<td>Public Health Specialist</td>
<td>Director of Public Health</td>
</tr>
<tr>
<td>Mr Ewen Weir</td>
<td>Director of Wellbeing, Care &amp; Learning&lt;sup&gt;9&lt;/sup&gt;</td>
<td>Director Adult Services</td>
</tr>
</tbody>
</table>

---

<sup>9</sup> Newcastle City Council
### White Team of Experts

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professor Ashley Adamson</td>
<td>Professor of Public Health Nutrition</td>
</tr>
<tr>
<td>Professor Mike Catt</td>
<td>Professor of Practice in Translational Age</td>
</tr>
<tr>
<td>Professor Chris Drinkwater</td>
<td>President &amp; Public Health Lead for the NHS Alliance Research</td>
</tr>
<tr>
<td>Professor Carol Jagger</td>
<td>AXA Prof of Epidemiology of Ageing</td>
</tr>
<tr>
<td>Professor Eileen Kaner</td>
<td>Professor of Public Health Research</td>
</tr>
<tr>
<td>Professor Tom Kirkwood</td>
<td>Associate Dean for Ageing</td>
</tr>
<tr>
<td>Professor John Mathers</td>
<td>Professor of Human Nutrition</td>
</tr>
<tr>
<td>Dr Peter McMeekin</td>
<td>Senior Research Associate (Health Economics)</td>
</tr>
<tr>
<td>Professor Eugene Milne</td>
<td>Public Health England</td>
</tr>
<tr>
<td>Professor Mike Trenell</td>
<td>NIHR Senior Research Fellow &amp; Director; Physical Activity &amp; Exercise Research</td>
</tr>
<tr>
<td>Professor Martin White</td>
<td>Professor of Public Health</td>
</tr>
</tbody>
</table>

### Environment Team & Observers

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mr Paul Brotherton</td>
<td>PHE Health Equity Unit</td>
</tr>
<tr>
<td>Ms Jan Cromarty</td>
<td>Co-operative Council Change Team Lead</td>
</tr>
<tr>
<td>Professor Chris Day</td>
<td>Pro-Vice-Chancellor</td>
</tr>
<tr>
<td>Ms Barbara Douglas</td>
<td>Strategic Director, Quality of Life Partnership</td>
</tr>
<tr>
<td>Ms Margie Driver</td>
<td>Local Citizen</td>
</tr>
<tr>
<td>Professor Jim Edwardson</td>
<td>Professor for Neuroendocrinology</td>
</tr>
<tr>
<td>Mr Colin Haylock</td>
<td>Principal, Haylock Planning and Design</td>
</tr>
<tr>
<td>Professor Paul Johnstone</td>
<td>Regional Director, PHE North of England</td>
</tr>
<tr>
<td>Mr Gareth Jones</td>
<td>VP &amp; GM EMEA, Fitbit</td>
</tr>
<tr>
<td>Ms Abi Kelly</td>
<td>Director of Public Relations</td>
</tr>
</tbody>
</table>

---

10 Newcastle University
<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professor Ngaire Kerse</td>
<td>Head of School of Population Health, University of Auckland</td>
</tr>
<tr>
<td>Dr Margaret Lawlor</td>
<td>Business Development Manager</td>
</tr>
<tr>
<td>Dr Roberta Marshall</td>
<td>Centre Director, North East PHE</td>
</tr>
<tr>
<td>Mr Rémi Martin</td>
<td>Agent General AXA</td>
</tr>
<tr>
<td>Mr Dave Newton</td>
<td>Great North Run</td>
</tr>
<tr>
<td>Ms Nikki Niblo</td>
<td>Walker Activity Dome</td>
</tr>
<tr>
<td>Ms Judith Oliver</td>
<td>Local Citizen</td>
</tr>
<tr>
<td>Dr Monika Preuss</td>
<td>Public Health England</td>
</tr>
<tr>
<td>Mr Neil Ramshaw</td>
<td>Walker Activity Dome</td>
</tr>
<tr>
<td>Dr Zeb Sattar</td>
<td>Director Local Fast Food Outlets</td>
</tr>
<tr>
<td>Ms Donna Steel</td>
<td>Local Citizen</td>
</tr>
<tr>
<td>Professor Richard Thomson</td>
<td>Professor of Epidemiology &amp; Public Health</td>
</tr>
<tr>
<td>Professor Michael Whitaker</td>
<td>Associate Dean of Innovation</td>
</tr>
<tr>
<td>Mr Peter Day</td>
<td>Correspondent BBC Radio 4</td>
</tr>
<tr>
<td>Ms Sandra Kanthal</td>
<td>Producer BBC Radio 4</td>
</tr>
</tbody>
</table>

**Media**
Appendix 3 Simulation Project Team and Game Controllers

Project Team

**Mr Ken Charman, Simulation Project Director**  
Research Associate, Newcastle University  
Ken was the CEO of Simulstrat – a spin-out company from King’s College London – where he helped build simulations for government, international agencies and multi-national companies. When this business was acquired he worked as the Director of the simulation unit at Deloitte. Prior to this he was the UK and EMEA VP for software companies that specialised in Decision Support and Forecasting for large, complex organisations. These software companies were acquired by Oracle, IBM, SAP and Sungard.

His research interests include exploring the reasons for failure in complex megaprojects and he completed an MSc in major projects at Oxford University in 2012. As well as this he has a passionate interest in inequality which has motivated him to work with Oxford University’s widening access team to help applicants from the most deprived areas to make it to Oxbridge and Russell group universities and provide financial support when they get there.

Ken has been involved in the Healthy Life Simulation since the idea surfaced in 2008 and believes that it is the most important simulation that he has worked on and hopes that the participants can reveal ways to narrow the gap, believing that health inequality is an urgent priority for our society that the hopes the simulation will solve.

**Mr Ron Clarke, Simulation Publicity Director**  
PR and Media Consultant, Northfield Communications  
Ron is a former journalist who has held several pivotal PR roles. These include Government News Network, Northumbria Police, Northumberland County Council and Northumberland Tourism. He specialises in raising the profile of individuals, companies and organisations through positive media coverage across radio, television and newspapers. He has experience in providing corporate literature, project management, event organisation, crisis control, branding and reputation management.

**Professor Peter Gore, Simulation Director**  
Professor of Practice, Newcastle Initiative on Changing Age, Newcastle University  
Prof Peter Gore graduated from Loughborough with a degree in Engineering followed by a Masters in Engineering Design (studying under the late Prof Stuart Pugh). His early career was mostly in the design of medical technology for hospitals, from specialist therapeutic beds to anaesthetic systems. He spent 3 years as Director of R&D and Quality in the Medical Engineering Division of BOC Healthcare based in the US. Returning to the UK he ran a company translating research from Universities into commercial products, and reviewing and monitoring research in the field of technology and ageing, for the European Commission. In 2002 he founded his present business providing evidence-based matching of older people and supportive technology. In 2007 he was recruited to the part-time role of Professor of Practice specialising in Ageing, where he supports the transfer of leading research into practice. In 2008 his statistical analysis and thinking led to the idea of the Healthy Life Simulation.
Dr Susie Holdsworth, Simulation Designer
Research Associate, Newcastle University
Susie Holdsworth has six years specialist experience in the design and delivery of novel simulations and wargames. Whilst at Simulstrat – a spin out from King’s College London set up to commercialise wargaming methodology – she developed games addressing a wide range of complex issues in health that included the funding crisis in the UK biotechnology industry; anti-microbial resistance and healthcare needs in sub-Saharan Africa. When Simulstrat was acquired by Deloitte, she continued as a Senior Manager and began researching health inequalities. She has been developing the materials and content of the Healthy Life Simulation up to its point of delivery.

Prior to becoming a simulation designer, Susie qualified as a clinical biochemist and then held posts in new product development in the biopharmaceutical industry and as a healthcare analyst.

Mr Tim Woodman, Simulation Administrator
Economics Graduate
Tim graduated this year with a BA degree from King’s College, University of Cambridge where he was reading Economics. He project managed the production of materials, event logistics and participant attendance.

Control Team

Dr Lynne Corner
Director of Engagement: Changing Age, Newcastle University

Mrs Sarah Gore
Manager of Knowledge Network, ADL Smartcare Limited

Mr Roger Holdsworth
Decision Support Analyst, Kromite

Miss Gemma Holdsworth
Student

Ms Helen Sandford
Newcastle Initiative on Changing Age, Newcastle University

Dr David Slavin
Consultant Occupational Physician, Ocean Occupational Health, Devonport Royal Dockyard

Mr Max Slavin
Medical Student, Guy’s King’s St. Thomas’s

Mr Matthew Temple
Graduate Electronics Engineer

Mr Tim Wickens
Director, Man or Mouse Studio Ltd.
Appendix 4 Voting Results

**Healthy Life Simulation**

**Which 2 diseases do you think contribute most to the gap in healthy life expectancy?**

Day 1 AM

- 0% 1. Lung cancer
- 22% 2. Breathing difficulties (COPD)
- 35% 3. Heart disease
- 8% 4. Stroke
- 0% 5. Liver disease
- 46% 6. Mental Illness
- 35% 7. Type 2 Diabetes

Day 1 PM

- 0% 1. Lung cancer
- 16% 2. Breathing difficulties (COPD)
- 16% 3. Heart disease
- 3% 4. Stroke
- 0% 5. Liver disease
- 59% 6. Mental Illness
- 41% 7. Type 2 Diabetes

---

**Healthy Life Simulation**

**If we don’t make changes what do you think will happen to the gap in healthy life expectancy?**

Day 1 AM

- 100% Grow
- 0% Shrink

Day 1 PM

- 95% Grow
- 5% Shrink
Healthy Life Simulation

Should we try to close the gap in healthy life expectancy between social groups?

Day 1 AM
- Yes: 97%
- No: 3%

Day 1 PM
- Yes: 87%
- No: 13%

Healthy Life Simulation

What is the most important reason to close the gap?

Day 1 AM
1. To reduce costs for health and social care: 12%
2. To reduce avoidable human suffering: 58%
3. It’s not fair: 30%

Day 1 PM
1. To reduce costs for health and social care: 24%
2. To reduce avoidable human suffering: 54%
3. It’s not fair: 12%
Healthy Life Simulation

What has the most influence on the gap?

Day 1 AM

1. National measures (laws, taxes) 14%
2. Local living conditions (amenities, local housing) 4%
3. Health services 0%
4. Personal circumstances (income, employment, education, health literacy, social connections, lifestyle) 73%

Day 1 PM

1. National measures (laws, taxes) 17%
2. Local living conditions (amenities, local housing) 12%
3. Health services 4%
4. Personal circumstances (income, employment, education, health literacy, social connections, lifestyle) 18%

Is it harder or easier for people on the lowest incomes to make healthy lifestyle choices?

Day 1 AM

1. Much harder 46%
2. Harder 51%
3. The same 3%
4. Easier 0%

Day 1 PM

1. Much harder 48%
2. Harder 33%
3. The same 19%
4. Easier 19%
5. Much easier 0%
### Healthy Life Simulation

**Which of the following is more helpful in closing the gap?**

<table>
<thead>
<tr>
<th></th>
<th>Day 1 AM</th>
<th>Day 1 PM</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>30%</strong></td>
<td>1. Laws to control suppliers</td>
<td><strong>31%</strong></td>
</tr>
<tr>
<td><strong>70%</strong></td>
<td>2. Education to inform consumers</td>
<td><strong>69%</strong></td>
</tr>
</tbody>
</table>

### Healthy Life Simulation

**Which of the following is more helpful in closing the gap?**

<table>
<thead>
<tr>
<th></th>
<th>Day 1 AM</th>
<th>Day 1 PM</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>85%</strong></td>
<td>1. Payments to reward healthy behaviour</td>
<td><strong>76%</strong></td>
</tr>
<tr>
<td><strong>15%</strong></td>
<td>2. Tax or fines to deter unhealthy behaviour</td>
<td><strong>24%</strong></td>
</tr>
</tbody>
</table>
Which of the following is more helpful in closing the gap?

Day 1 AM           Day 1 PM

66%  1. **Targeted investment** to help people on lower income

34%  2. **Universal access** to help across all income groups

Do you think we can close the gap?

Day 1 AM           Day 1 PM

66% Yes            68% Yes

34% No             32% No
Appendix 5 Media Reports

- BBC presenter Peter Day covered the Healthy Life Simulation for BBC Radio 4's 'In Business' programme, Dec 2013
- 'North East researchers tackle health lottery gap' The Journal, 3 Oct 2013
- 'Newcastle students test out pioneering life expectancy simulation' The Journal, 25 Sep 2013
- 'Newcastle University scientists could wipe out life expectancy gaps' The Journal, 20 Sep 2013
- 'Gaming simulation hopes to reduce life expectancy gap' The Irish Times, 11 Sep 2013
- The Naked Scientists, audio interview with Professor Gore, 10 Sep 2013
Appendix 6 References

(1) UK Interim Life Tables, 1980-82 to 2008-10 Released: 29 September 2011

(2) Inequality in Disability-free life expectancy by area deprivation: England, 2002-05 and 2006-09 Date: 15 May 2012
   http://www.ons.gov.uk/ons/dcp171778_265133.pdf

   http://www.ais.up.ac.za/med/scm870/developingpolicychallenginginequitieshealthcare.pdf

   http://www.instituteofhealthequity.org/projects/fair-society-healthy-lives-the-marmot-review


(7) Closing the gap in a generation: health equity through action on the social determinate of health.

(8) Tackling inequalities in life expectancy in areas with the worst health and deprivation. National Audit Office 2010