**Institution:** University of Sheffield  
**Unit of Assessment:** A-02 Public Health, Health Services and Primary Care  
**Title of case study:** Shaping policy and practice for type 2 diabetes prevention in the UK  
**Period when the underpinning research was undertaken:** 2012–2020

### Details of staff conducting the underpinning research from the submitting unit:

<table>
<thead>
<tr>
<th>Name(s)</th>
<th>Role(s) (e.g. job title):</th>
<th>Period(s) employed by submitting HEI:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alan Brennan</td>
<td>Prof of Health Economics &amp; Decision Modelling</td>
<td>1994–present</td>
</tr>
<tr>
<td>Penny Breeze</td>
<td>Research Fellow</td>
<td>2012–present</td>
</tr>
<tr>
<td>Chloe Thomas</td>
<td>Research Fellow</td>
<td>2014–present</td>
</tr>
<tr>
<td>James Chilcott</td>
<td>Professor of Healthcare Operational Research</td>
<td>1996–present</td>
</tr>
<tr>
<td>Michael Gillett</td>
<td>Research Fellow</td>
<td>2004–present</td>
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<tr>
<td>Elizabeth Goyder</td>
<td>Professor of Public Health</td>
<td>2001–present</td>
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<tr>
<td>Maxine Johnson</td>
<td>Honorary Research Fellow</td>
<td>2003–2019</td>
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<tr>
<td>Kelly Mackenzie</td>
<td>Academic Public Health Fellow</td>
<td>2015–2019</td>
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<tr>
<td>Susi Sadler</td>
<td>Research Associate</td>
<td>2014–2016</td>
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<tr>
<td>Hazel Squires</td>
<td>Modelling Researcher</td>
<td>2005–present</td>
</tr>
<tr>
<td>Laura Heathcote</td>
<td>Research Assistant</td>
<td>2018–present</td>
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<tr>
<td>Lindsay Blank</td>
<td>Research Fellow</td>
<td>2002–present</td>
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<tr>
<td>Daniel Pollard</td>
<td>Research Fellow</td>
<td>2013–present</td>
</tr>
</tbody>
</table>

**Period when the claimed impact occurred:** 2015–2020

**Is this case study continued from a case study submitted in 2014?**  
N

### 1. Summary of the impact  
(indicative maximum 100 words)

Over 4 million people in the UK are estimated to be affected by type 2 diabetes (T2D), with treatment costs accounting for just under 9% (£8.8 billion) of annual NHS expenditure. Our integrated approach to modelling diabetes, cardiovascular disease and dementia enables comprehensive evaluation of the long-term health and health care costs of public health policies in the UK.

Our modelling was key to the implementation of the NHS Diabetes Prevention Programme, designed to prevent or delay the onset of T2D, and provide tools to forecast return on investment. National guidelines have been updated to include recommendations based on our economic modelling and targeting of interventions, enabled by the tools we developed.

### 2. Underpinning research  
(indicative maximum 500 words)

Over 4 million adults in the UK are estimated to be affected by type 2 diabetes (T2D). T2D and its complications have considerable health impacts and lead to a reduction in life expectancy and health related quality of life as well as being a significant burden on the NHS. T2D is a complex condition with a range of risk factors, but most cases could be prevented or delayed.
Between 2012-2014, funded by the National Institute for Health Research School for Public Health Research (NIHR SPHR), in collaboration with Lancaster University and University College London, Sheffield led the development of a new mathematical model which could be used to evaluate a wide range of preventive strategies for T2D (Versions 1.0 to 2.1). This model was used to assess the impact of a lifestyle intervention for diabetes prevention in different high risk subgroups within the UK population. This work was published in June 2015 as an online report with study publication in 2017 [R1]. The research showed that intervention is potentially cost-saving over a lifetime horizon, and that it will have a differential impact on disease outcomes and time horizon of cost-savings in different high-risk groups. Two further papers gave methodological detail and undertook further evaluation of different interventions [R2, R3].

In 2015, with research funded by NHS England, our model was used to assess the new NHS Diabetes Prevention Programme (DPP). This programme aims to identify those at high risk and refer them onto an evidence-based behaviour change programme to help reduce their risk (version 2.2). The model assessed the health impacts, costs, and NHS savings of introducing the DPP under a range of scenarios for NHS England.

In 2016, we conducted a health economic assessment of the DPP (funded by PHE). We undertook qualitative assessment of important system incentives and disincentives around delivering prevention programmes like the DPP, and quantitative modelling work to understand whether different subgroups of the population would stand to benefit more or less from the DPP. This concluded that the programme was cost-effective for all subgroups examined but provided particularly high health benefits and value for money for people living with obesity (especially BMI 35+). The work also resulted in the development of a local return on investment forecasting tool to help commissioners understand and predict the impact of delivering the DPP locally [R4].

Diabetes has some of the same risk factors as cardiovascular disease (for example, heart attack, stroke), and the model evolved to become a diabetes and cardiovascular disease prevention model.

In 2017, funded by PHE, we developed a new return on investment tool for cardiovascular disease (CVD) prevention in people at high risk (diabetes, pre-diabetes, hypertension, high cholesterol, atrial fibrillation, and chronic kidney disease). The tool consists of a web interface with underlying model, and runs in response to user inputs, allowing a range of outcomes to be explored [R5].

Between 2016-2017, our diabetes prevention model has been further developed as part of the NIHR SPHR Ageing Well programme to include a dementia module to describe mid-life risk factors for the incidence of dementia, and burden of ageing and social care costs in older age (version 3.1) [R6]. The model utilises data from the English Longitudinal study of Ageing to update BMI, blood pressure, cholesterol and blood glucose trajectories into old age. The incidence of dementia is derived using risk equations developed from a large GP database.

3. References to the research (indicative maximum of six references)


4. Details of the impact (indicative maximum 750 words)

A diabetes diagnosis reduces the quality of life of affected individuals, whilst costing society a huge amount in treatment of the disease and its complications. School of Health and Related Research (ScHARR) research provided key evidence to shape national policy and implementation for the prevention of T2D in the UK.

Informing national decisions and implementation

‘Healthier You’, the NHS Diabetes Prevention Programme (NHS DPP) offers adults in England at high risk of T2D an evidence-based behavioural intervention to prevent or delay T2D onset. Our modelling initially funded by NHS England (NHSE) in 2015 has been used to support their business case:

“Outputs from ScHARR’s independent and peer reviewed model indicated that the programme was cost-effective and potentially cost-saving under a range of scenarios which was highly beneficial in supporting and steering planning for the continued roll out and expansion of the NHS DPP” [S1]

NHSE’s Impact Analysis of the NHS DPP supports the investment in the provision of services for 2016/17 until 2020 and makes explicit reference to our modelling i.e. if 390,000 people participate in the NHS DPP intervention over 5 years, this would result in approximately £1.1bn of health benefits; 12,000-18,000 cases of T2D prevented or delayed by year 8 and by year 12 the programme will be cost saving [S2]. Our model was used in 2016 to support the ongoing planning and development of the programme for PHE and developed a local return on
investment forecasting tool [S3]. The report provides support for the commissioning framework and is directly referenced on the PHE website [S3].

In 2018, we updated NHSE’s Impact Analysis of the NHS DPP based on data from the initial roll-out. We developed a new tool for NHSE including cost, uptake and effectiveness of the programme enabling NHSE to keep updating their business plan as the DPP progresses [S4].

**Roll-out of the NHS DPP:** the DPP began in 2015 in seven ‘demonstrator sites’, followed in June 2016 with a roll out to a first wave of 27 areas covering 26 million people, making up to 20,000 places available. In April 2017, a further 13 sustainability and transformation partnerships (STP) were included, achieving full coverage in England from April 2018. NHSE and Diabetes UK have provided a suite of resources to support implementation of the DPP [S4, S5]. NHSE and NHS Improvement indicate that “the NHS DPP has now been rolled out nationally in England to all STPs and is already the largest such programme in the world” [S1].

The ‘NICE impact diabetes’ report 2018, notes that by 2017 the DPP had reached 75% of the population of England. Between June 2016 - March 2017, 43,603 referrals were made. The 43,603 referrals were 16% higher than expected [S6]. Of those referred, 49% attended the initial assessment, higher than the 40% modelled uptake. Data suggests that the programme is reaching both those who are at greater risk of developing T2D and those who typically access healthcare less effectively [S7]. As at 30 September 2020, data from the National Diabetes Audit (NDA) indicates that 687,730 people have been offered the NHS DPP. Of those, 245,665 declined (35.7%), slightly lower than the modelled figures. 442,065 people have now been offered the NHS DPP and not declined. Data as available indicates that 89,604 have completed the NHS DPP as at January 2020 [S8]. Analysis of outcomes by NHSE and NHS Improvement indicates that “the programme is highly effective with a mean weight change of -3.7kg for participants who are overweight or obese which means the NHS DPP is having a tangible real life impact for thousands of users on the programme and will contribute to the ambitions as outlined in the NHS Long Term Plan to ensure the NHS is sustainable for generations to come” [S1].

**Informing national guidelines on diabetes prevention**

Our research has been incorporated into the National Institute for Health and Care Excellence (NICE) Guideline ‘Type 2 diabetes: prevention in people at high risk’, PH38. The September 2017 update includes reference to our cost-effectiveness modelling and targeting who should be prioritised for the DPP. It includes new recommendations for intensive lifestyle-change programmes and metformin for people at risk of T2D based on results of the economic modelling [S9].

**Enabling national and local cardiovascular disease (CVD) prevention decision-making**

Our return on investment tool for CVD in people at high risk (diabetes, pre-diabetes, hypertension, high cholesterol, atrial fibrillation, and chronic kidney disease) provides for the first time a single platform in which a large number of different strategies for detection and management of people at high CVD risk can be analysed. The CVD tool incorporates our work on the dementia module.

The tool is available from the PHE website and allows a range of outcomes to be explored, including cost-savings, quality adjusted life year gains and CVD events prevented. Results are tailored to each clinical commissioning group, STP, local authority and at national level [S10].
The tool was used 2,000 times within the first year of launch [S10]. PHE indicate that CVD costs the NHS £7.4 billion each year. Examples of exemplar analyses indicate that optimising the use of statins and hypertensives could bring the most considerable cost-savings [S10].

5. Sources to corroborate the impact (indicative maximum of 10 references)


