

TIPPING THE SCALES:

WHY PREVENTING OBESITY
MAKES ECONOMIC SENSE



CANCER
RESEARCH
UK



UK HEALTH
PREVENTION FIRST
FORUM



OBESITY IS A MAJOR CAUSE OF ILLNESS AND DEATH

This places a disease and economic burden on the NHS which can be prevented

10 TYPES OF CANCER

could be caused
by being
overweight
or obese

Oesophagus

Breast

after menopause

Gallbladder

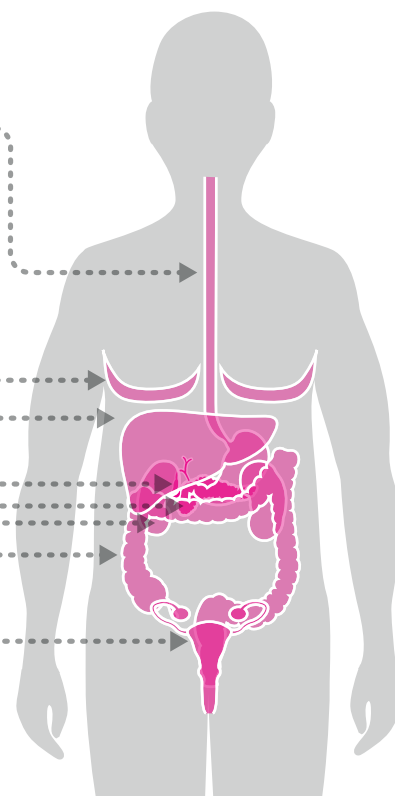
Liver

Pancreas

Kidney

Bowel

Womb



Being overweight may also cause aggressive prostate and ovarian cancer

This report predicts that if trends of being overweight and obese continue:



Almost 3 in 4 adults will be overweight or obese by 2035



Over the next 20 years rising levels of obesity would lead to an additional 670,000 cases of cancer



This level of obesity would lead to an additional £2.5bn in NHS and social care costs in 2035

HOW THE GOVERNMENT CAN TACKLE CHILDREN'S OBESITY



A national strategy to reduce obesity should include:



Introducing a 6am to 9pm watershed ban on TV advertising of foods high in fat, sugar and salt

A review of online marketing of unhealthy foods and drinks to children



Examining the case for further taxes on food high in fat, sugar and salt, and increasing the affordability of healthy alternatives



Extending front-of-pack nutritional traffic light labelling to as many food and drink products as possible



A Government framework for businesses to reduce the fat, calorie and sugar content in their foods



Increase funding for cycling and walking

Introducing a 20p per litre duty on sugary drinks



CANCER RESEARCH UK

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ABOUT THE UK HEALTH FORUM



The UK Health Forum is a charitable alliance of professional and public interest organisations working to reduce the risk of avoidable non-communicable diseases (NCDs) by developing evidence-based public health policy and supporting its implementation through advocacy and information.

Working with and through our members, we are a centre of expertise in policy research and development, epidemiological and economic modelling of NCDs, and information provision.

UK Health Forum is a registered charity (803286).

ABOUT CANCER RESEARCH UK



Cancer Research UK is the world's largest independent cancer charity dedicated to saving lives through research. We support research into all aspects of cancer through the work of over 4,000 scientists, doctors and nurses. In 2014/15, we spent £434 million on research institutes, hospitals and universities across the UK – including a £41 million contribution we made to the Francis Crick Institute. We receive no funding from the Government for our research.



This project has been commissioned by the Cancer Research UK Policy Research Centre for Cancer Prevention. To learn more about this research centre, please [click here](#).

Cancer Research UK is a registered charity in England and Wales (1089464), Scotland (SC041666) and the Isle of Man (1103).

EXECUTIVE SUMMARY

INTRODUCTION

Being overweight and obese is a major cause of preventable early illness and death in the UK, placing a significant disease and economic burden on the NHS.

This research provides new evidence on the future trends of overweight and obesity over the next 20 years, alongside the benefits to society that reducing excess weight in the UK can have on:

- Avoiding cases of cancer, type 2 diabetes, coronary heart disease and stroke
- Avoiding costs to the NHS, composed of primary care, secondary care, urgent and emergency cases, and social care, as well as costs to wider society of losing economic productivity from early illness or death

To generate our findings, we used a computer model developed during the Government's Foresight: Tackling Obesity project in 2007. This involved inputting the latest demographic, disease and health cost data, to produce estimates of avoidable costs and disease incidence associated with obesity.

By taking current and historic data, the model has estimated future obesity and overweight trends. If the current trends continue, rates of overweight and obesity could increase even further. However, making small inroads into reducing obesity levels can create opportunities for the health of the UK population to improve substantially.

THE KEY FINDINGS ARE THAT IF CURRENT TRENDS CONTINUE:

- Almost three in four (72%) of the UK adult population would be predicted to become overweight or obese by 2035
- Almost four in ten (39%) of the UK adult population would be predicted to become obese by 2035
- Rates of overweight and obesity would continue to be higher in men than in women, with 76% of men becoming overweight or obese by 2035 compared to 69% of women
- Overweight and obesity prevalence would be predicted to increase across all income groups, with the poorest in society likely to continue to be the heaviest. Almost half of women (49%) from the lowest income quintile would be predicted to be obese in 2035.

THIS RATE OF INCREASE IN THE PREVALENCE OF OVERWEIGHT AND OBESITY¹ IS PREDICTED TO LEAD TO SIGNIFICANT INCREASES IN HEALTH COSTS AND DISEASE PREVALENCE:

- In 2035 alone, around 440,000 new cases of disease would be attributable to overweight and obesity in the UK. This includes around 257,200 new cases of type 2 diabetes.
- Over the next 20 years rising levels of obesity could lead to around an additional 4.62 million cases of type 2 diabetes, 1.63 million cases of coronary heart disease, and 670,000 new cases of cancer

EXECUTIVE SUMMARY

- These new obesity-related diseases could lead to an additional £2.51 billion in direct NHS and social care costs in the year 2035 alone

HOWEVER, SMALL SUSTAINED REDUCTIONS IN OBESITY CAN RESULT IN MEANINGFUL PUBLIC HEALTH AND ECONOMIC GAINS:

- Reducing the prevalence of overweight and obesity by just 1% each yearⁱⁱ below the predicted trends would save £300 million in NHS healthcare and NHS social care costs in the year 2035 alone
- This level of reduction in obesity rates could also lead to the avoidance of around 64,200 new cases of cancer between 2015 and 2035

CATEGORIES OF CLASSIFICATIONS

Overweight is defined as having a body mass index (BMI), the ratio of height to weight of an individual between 25 and 29.9.

Obese is defined as having a BMI of 30 or over.

Overweight and obesity are associated with a number of conditions, including type 2 diabetes, coronary heart disease, stroke and cancer.

FOOTNOTES

i. Estimates are calculated by estimating the avoidable costs and diseases resulting from a 100% reduction every year in overweight and obesity prevalence below the expected trends. Note: Healthy weight individuals still have a chance of getting a disease in the model and current BMI and disease statistics are used to compute future disease incidence.

ii. Estimates are calculated by a 1% reduction in overweight and obesity prevalence below trend every year between 2015 and 2035. This leads to an overall reduction of 7% in excessive weight prevalence in the UK by 2035.

POLICY RECOMMENDATIONS

This modelling analysis shows that a small consistent reduction in obesity can lead to significant public health gains.

Building on analysis of the most cost-effective measures, this report examines the potential merits of different policy options in helping to achieve small, consistent reductions in overweight and obesity.

BASED ON THE CURRENT EVIDENCE THE MOST EFFECTIVE POLICIES WOULD INCLUDE:

- Introducing a 6am to 9pm ban on TV advertising of unhealthy foods and drinks, to reduce children's exposure to unhealthy food choices;
- Restricting online marketing of unhealthy food and drinks products to significantly restrict the placement and content of unhealthy food marketing online and reduce children's exposure;
- Introducing a 20p per litre duty on sugar-sweetened beverages;
- Examining the case for further fiscal measures on foods high in sugar, salt and fat, and increasing the affordability of healthy alternatives;
- Strengthening and implementing standards for procurement of food provided in all publicly-funded institutions and ensuring existing food standards are fully applied in all schools including academies and free schools;
- Extending front-of-pack nutritional colour coded labelling to cover as many food and drink products as possible in the UK alongside awareness campaigns to educate people on their use;
- Increasing access to recreation facilities and open space, particularly for deprived groups;
- Devoting greater, sustained funding to promote walking and cycling as easy and accessible modes of transport; and
- Developing a new accountability framework with food businesses. This would support and monitor action by the food industry to deliver on government-led national standards for reformulation and portion sizing to reduce free sugars, fat and calories in the food supply. This framework should be transparent and include independent and rigorous monitoring and evaluation of any established standards.



Almost 3 in 4 adults are predicted to be overweight or obese by 2035



Over the next 20 years rising levels of obesity could lead to an additional 670,000 cases of cancer.



Rising levels of overweight and obesity could lead to an extra £2.51 billion a year in NHS costs in 2035 alone

OVERWEIGHT AND OBESITY IN THE UK

SOME HELPFUL DEFINITIONS

Body Mass Index (BMI): BMI is a measure of whether a person is a healthy weight for their height, calculated by dividing weight in kilograms (kg) by height in metres (m), then dividing the answer by height in metres again. Whilst BMI is not a perfect measure for all individuals, it is the most widely used population measure for weight classifications.¹

Healthy weight: classified as a BMI of 18.5 to 24.9.

Overweight: classified as a BMI of 25 to 29.9.

Obese: classified as a BMI of 30 or above; BMI of 40 or above is considered severely obese.

OBESITY RATES IN ADULTS

Data collected through the Health Survey for England shows that, in 2013, almost two in three (62.1%) adults in England were overweight or obese – one in four (24.9%) of whom were classified as obese.² Men are more likely to be overweight and obese than women.

High levels of overweight and obesity among adults in England is neither a recent nor sudden phenomenon. Since the inception of

the Health Survey for England in 1991, intended as a monitoring tool of the nation's health, the prevalence of overweight and obesity has been increasing. Over 20 years the percentage of people who are a healthy weight has decreased by about 10 percentage points in both men and women in England.³

As well as in England, the numbers of adults who are overweight and at risk of obesity are very high in other parts of the UK. Scotland continues to have the highest prevalence of overweight and obesity, with rates increasing across all parts of the UK.

Obesity in adults and children is also linked to deprivation. The highest prevalence of excess weight is found among lower socio-economic groups for both men and women.⁷

TABLE 1: RATES OF OVERWEIGHT AND OBESITY IN ADULTS IN THE UK

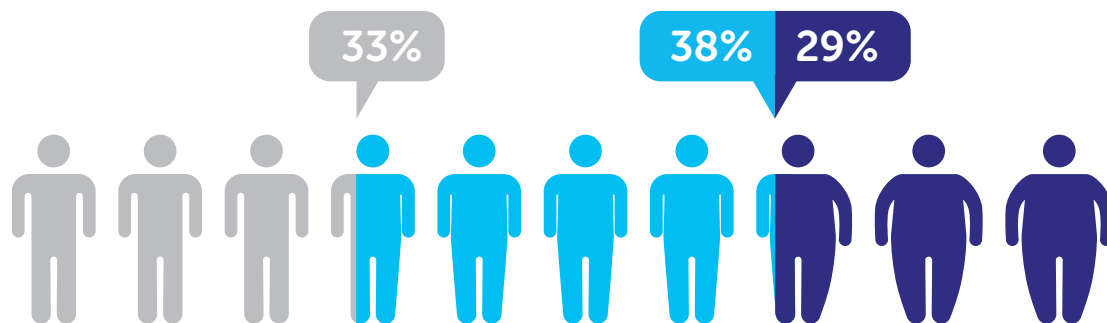
	% overweight or obese (BMI >25)	% obese (BMI > 30)	Data source
England	62.1	24.9	Health Survey for England 2013 ³
Scotland	64.6	27.1	Obesity Indicators 2014 ⁴
Wales	58.0	22.0	Welsh Health Survey 2014 ⁵
Northern Ireland	61.0	24.0	Health Survey Northern Ireland 2013/14 ⁶



IF TRENDS CONTINUE, ALMOST 4 IN 10 ADULTS ARE PREDICTED TO BE OBESE BY 2035

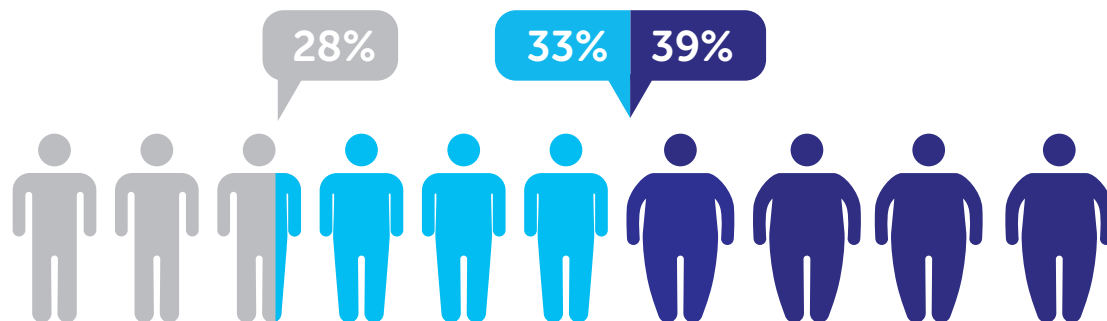
 Healthy Weight  Overweight  Obese

IN
2015



Around **3 in 10** adults are obese.

IN
2035



Around **4 in 10** adults will be obese.

AIMS AND METHODS

The purpose of the study was to examine the effect of future trends in overweight and obesity on incidence of non-communicable disease such as coronary heart disease (CHD), type 2 diabetes, stroke and cancer. This study builds and updates on previous studies by reviewing the latest trends in overweight and obesity in the UK to predict the rates of overweight and obesity 20 years into the future, and quantifying the consequences of these future obesity rates in terms of incidence of disease and health costs in the UK. Projections and simulations were made possible by adapting a predictive microsimulation model originally developed for the Foresight: Tackling Obesities project.⁸

METHODS

The model examined risk factor data, specifically historical and current prevalence of BMI groups (healthy weight, overweight and obese) by age, sex and income quintile to create longitudinal projections of BMI distribution to the year 2035.

Using this distribution, and inputting disease data, demographic data and health economic data (see Table 2 below), a dynamic microsimulation model was used to simulate a virtual population of individuals which possesses demographic and health profiles that accurately represent the population at large. The microsimulation simulates the long-term impact of different scenarios to estimate the impact of total directly attributable diseases and costs associated with obesity in 2035.

A full breakdown of the data sources and methods is available in the technical report.ⁱⁱⁱ

TABLE 2: TABLE OF OUTPUT DATA FROM THE MICROSIMULATION PROGRAMME

OUTPUT DATA FROM THE MICROSIMULATION PROGRAMME
Projection of the prevalence and incidence of obesity-related diseases from 2015 to 2035
Impact of a range of intervention scenarios on the incidence and prevalence of obesity related diseases of the prevalence and incidence of obesity-related diseases from 2015 to 2035
Impact of a range of intervention scenarios on the costs incurred by the NHS and wider society

DISEASES INCLUDED IN THE MODEL

Coronary heart disease, type 2 diabetes, stroke and eight cancers were included as BMI-related diseases to the model. Cancers included in the model were determined by Cancer Research UK in light of the strength of evidence between disease and excess weight. Cancers that were classified as BMI-related were based upon published literature that supports this disease association.⁹ Whilst overweight and obesity could cause up to ten types of cancer, we have included eight of the ten cancers in this project as there was insufficient high-quality data for ovarian and aggressive prostate cancer to be included in the research. BMI-related diseases refer to diseases that can be caused by excess weight but may also be caused by other factors such as smoking, alcohol and genetics. Given the lack of complete datasets for coronary heart disease, myocardial infarction was used as proxy for coronary heart disease. Hypertension was not included to avoid double counting with diseases associated with hypertension such as CHD, stroke and diabetes. Musculoskeletal diseases such as osteoarthritis were also not included. Individuals who are overweight or obese are at a *higher risk* i.e. they have a higher chance of getting a BMI-related disease than individuals

AIMS AND METHODS

who are a healthy weight. To determine the disease incidence which is directly attributable to weight, we present the data resulting from theoretical reductions in overweight and obesity.

THE MODEL

A dual-module modelling process written in C++ software, developed by the UK Foresight working group, was further refined and then utilised for this study. The future projections of BMI have been used to predict the burden of diseases from 2015 until 2035. Module one uses a nonlinear multivariate, categorical regression model fitted to cross-sectional risk factor data to create longitudinal projections to 2035. The categories are defined by ten-year age groups and sex. Within each age and sex category of the population, the predicted proportions of each of the risk factor categories are constrained to sum to 100%. Module two uses a microsimulation as a technique for predicting disease burden using longitudinal projections from module one. A microsimulation is a computer model of any specified population which accurately reflects age profiles, births, deaths and health statistics to make future projections. The simulations specifically target the relationship between individuals' evolving risk factors and disease incidence.

BMI distributions are determined by past and current trends and the model can simulate and compare the impact and cost of various public health interventions.

FOOTNOTES

iii. Available at: <http://www.cancerresearchuk.org/about-us/we-develop-policy/our-policy-on-preventing-cancer/our-policy-on-obesity-and-diet>

Events compete to occur in each simulated life and a random component embedded in the models ensures that not all individuals at risk of an event may experience it. Individual life trajectories are simulated until death. Within the UKHF model, costs can be assigned to interventions associated with the life events that have been simulated to project a future trend in health spending. The microsimulation also incorporates an economic module. The module employs Markov-type simulations of long-term health benefits, health care costs and cost-effectiveness of specified interventions.

SCENARIOS WE HAVE TESTED

The microsimulation programme enables different intervention scenarios to be tested so that policy makers can assess the impact of public health interventions on the epidemiology and health economy of diseases relative to a baseline or 'no change' scenario. BMI scenarios were modelled by sampling the specified percentage of overweight and obese individuals combined and shifting them to the healthy weight category. This process was repeated at each year of the simulation. This report focuses on the impact of three scenarios, which are outlined in the table below. We have reported the baseline scenario in yearly intervals between 2015 and 2035, whilst the scenarios looking at reductions in overweight and obesity projections have been reported in five-year intervals.

AIMS AND METHODS

TABLE 3: TABLE OF DATA INPUTTED INTO THE MODEL

RISK FACTOR DATA Historical and current prevalence of BMI groups (healthy weight, overweight and obese) reported by age, sex and income quintile. This is sourced from Health Survey for England data between 2000 and 2012.
DISEASE DATA - Most recent incidence, mortality and survival of the diseases of interest by age and sex - Relative risk of acquiring the diseases of interest, stratified by age and sex, where available These have been sourced from a range of datasets including CR-UK, Office of National Statistics (ONS), World Obesity Federation and Dynamic Model for Health Impact Assessment sources.
DEMOGRAPHIC DATA - Most recent and projected UK population, stratified by age and sex - Most recent mortality and fertility rates of the UK population These are both sourced from the ONS.
HEALTH ECONOMIC DATA - Mean utility weights of the diseases of interest without medical intervention - Most recent direct cost associated with the diseases of interest. 'Direct costs' are comprised of prevention and health promotion, primary care, secondary care, urgent and emergency care, community care and social care. - Most recent indirect cost associated with the diseases of interest. 'Indirect costs' are comprised of productivity losses attributable to premature morbidity and mortality. This has been sourced from a range of sources including Sullivan et al. (2011), NHS, Health and Social Care Information Centre (HSCIC), ONS, School of Health and Related Research University of Sheffield (SchARR), and Centre for Health Economics (York).

TABLE 4: THE OVERWEIGHT AND OBESITY SCENARIOS TESTED IN THE MODEL

SCENARIO 1 (BASELINE) Projection to 2035 based on continuing current trends in overweight and obesity as predicted using Health Survey for England cohort data including years 2000 to 2012. This leads to an overweight and obesity prevalence of 72% by 2035.
SCENARIO 2 (SMALL REDUCTION) Projection to 2035 based on the reduction of the baseline overweight and obesity prevalence projections by 1% year on year. This leads to an overweight and obesity prevalence of 65% by 2035.
SCENARIO 3 (SCALE OF THE PROBLEM)^{iv} Reduce the baseline overweight and obesity prevalence projections by 100% year on year. This provides an estimate of the total directly attributable impact of overweight and obesity over the period between 2015 and 2035

AIMS AND METHODS

ASSUMPTIONS

As with any predictive modelling research, a series of assumptions are applied to ensure that the microsimulation model can produce robust and reproducible outputs. In generating findings, the following assumptions have been made:

- The model assumes that individuals stay on the same BMI percentile relative to others throughout their life. This reflects the reality that over their lifetime, individuals may lose or gain weight, but tend to stay on the same BMI percentile relative to others. Population shifts in BMI in recent decades are the result of all individuals having increased their BMI. Furthermore, children's weight categories tend to track into adulthood.
- The model assumes dynamic changes in the specified risk factor and in population trends. All other variables, such as changes in other disease risk factors or the potential impact of new treatments and technologies, are kept constant.
- The model assumes that, for a given BMI, the risk of an individual acquiring a disease does not change over time. However, as an individual ages, the relative risks may change depending on the disease.
- When modelling the reductions in future excess BMI prevalence discussed above, it was assumed that:
 - The scenarios would apply to all adults (defined as those aged 18-100 years)
 - The percentage reductions would occur in the start year (2015) and all subsequent years (a year-on-year reduction)
 - The percentage reductions would be applied equally to both men and women in the model
- The hypothetical BMI scenarios were modelled by random sampling a specified percentage of overweight and obese individuals and shifting them to the healthy weight category. This process was repeated at each year of the simulation. As these are hypothetical scenarios intended to demonstrate theoretical changes in disease and cost burdens, it is not implied that shifting individuals from the obese category directly to the healthy weight category is realistic in terms of the progressive nature of weight loss.

FOOTNOTES

iv. Complexities and noise within the modelled data calculations around each BMI estimate means that the resulting prevalence in 2035 is 2% and not 0%.

KEY FINDINGS

OVERWEIGHT AND OBESITY PREVALENCE IN 2035

IF CURRENT TRENDS WERE TO CONTINUE, 72% OF THE ADULT UK POPULATION WOULD BE OVERWEIGHT OR OBESE BY 2035

Projecting forward the historical trend of overweight and obesity in England and applying this to the UK population shows us that if current trends were to continue, the proportion of the population who are overweight and obese will continue to increase over the next 20 years. This is true for both men and for women. By 2035, almost three in four of all UK adults (72%) could be overweight or obese. This means that in 2035, around 40 million adults in the UK could be overweight or obese.

The prevalence of overweight and obesity is projected to remain higher among men than women. 76% of men are projected to become overweight or obese by 2035, compared to 69% of women. The difference between unhealthy weight among men and women narrows slightly from 9% in 2015 to 7% in 2035.

Between 2015 and 2035, the prevalence of obesity is predicted to increase from 29% to 39% among adult UK men, with an increase from 30% to 40% expected among adult UK women. Conversely, the proportion of those just overweight (a BMI between 25 and 29.9) is predicted to fall from 38% to 33%. The prevalence of people being a healthy weight (a BMI of less than 24.9) is predicted to decrease across all age groups, with the exception of men aged 30-39.

The increase in obesity is only partially off-set by the reduction in overweight.

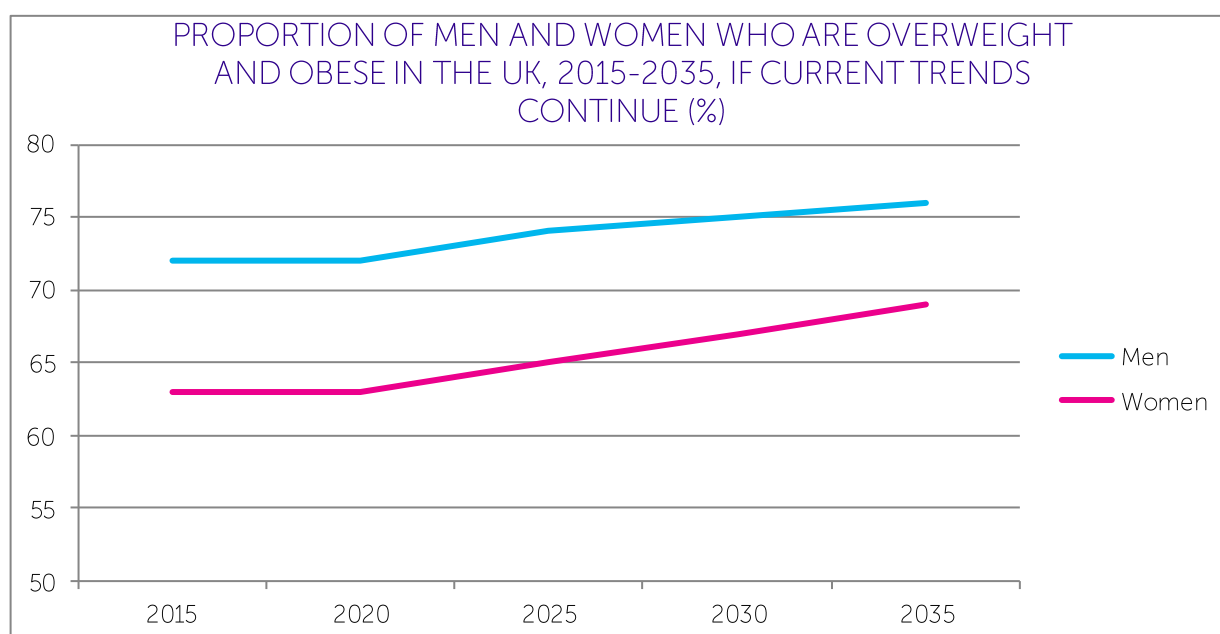
As Figure 1 shows, between 2015 and 2020 the rate of overweight and obesity appears to be flat. This is the result of the increase in those who are obese being matched by a reduction in those who are just overweight. However, as reductions in the rates of those overweight slow and rates of those obese continue to rise, the total proportion of those who are an unhealthy weight increases between 2020 and 2035.

KEY FINDINGS

TABLE 5: PREDICTED TRENDS IN OVERWEIGHT AND OBESITY IN ADULTS, 2015-2035

BMI %	2015			2020			2025			2030			2035		
	25-29.9	30+	Both	25-29.9	30+	Both	25-29.9	30+	Both	25-29.9	30+	Both	25-29.9	30+	Both
Men	43	29	72	41	31	72	40	34	74	38	36	75	37	39	76
Women	33	30	63	31	32	63	31	34	65	30	37	67	29	40	69
Total	38	29	67	36	31	67	35	34	69	34	37	71	33	39	72

GRAPH 1: PROPORTION OF MEN AND WOMEN WHO ARE OVERWEIGHT AND OBESE IN THE UK, 2015-2035, IF CURRENT TRENDS CONTINUE (%)



KEY FINDINGS

OVERWEIGHT AND OBESITY BY INCOME GROUP

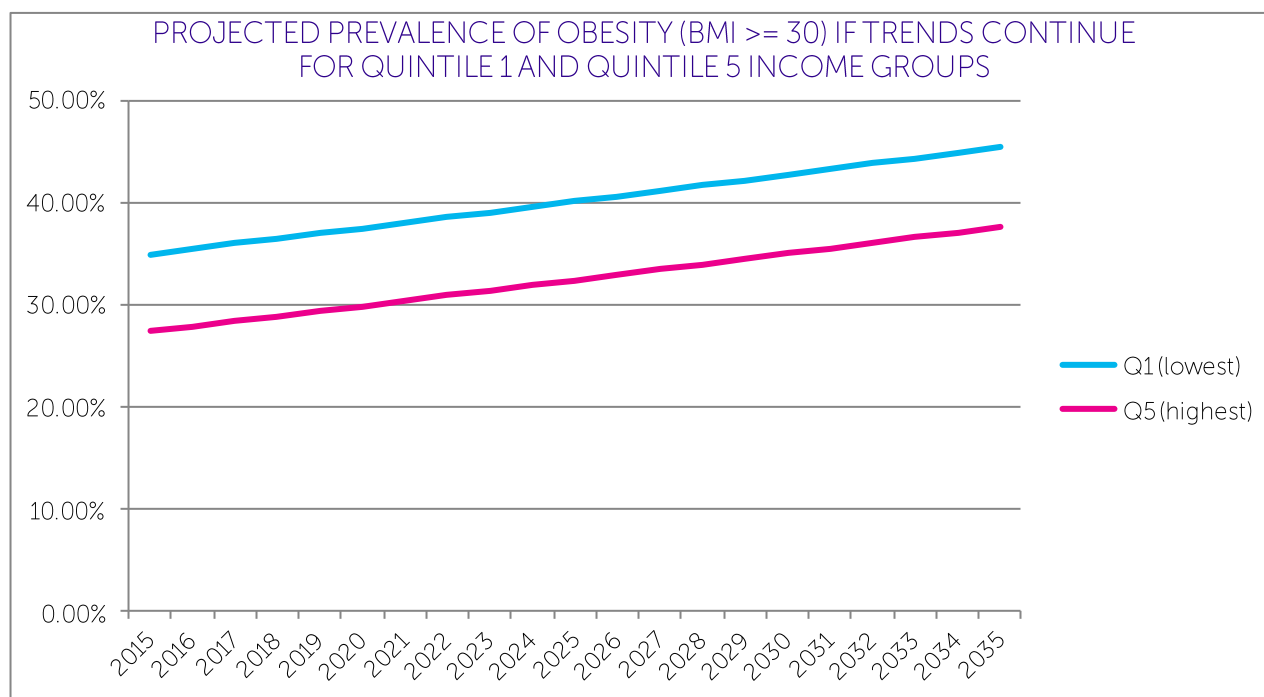
45% OF ALL ADULT MEN AND WOMEN IN THE LOWEST INCOME QUINTILE IN THE UK ARE PREDICTED TO BE OBESE IN 2035

As the prevalence of overweight and obesity is predicted to increase, this is reflected across income quintiles. When projecting forward the current trend in overweight and obese prevalence, our findings are consistent with previous data showing that overweight and obesity is an issue of social position. The pattern reflects the continuation of the current social gradient found in overweight and obesity.

ALMOST ONE IN TWO OF ALL ADULT WOMEN FROM THE LOWEST INCOME QUINTILE WILL BE OBESE IN 2035

The highest prevalence of overweight and obesity is found among the second lowest income quintile for both women and men. 49% of women and 42% of men from the lowest income quintile will be obese in 2035, compared to just 37% of men and 38% of women in the highest income quintile. Further research into the BMI differences among different socioeconomic groups are needed to help better understand why this is the case.

GRAPH 2: PREDICTED PREVALENCE OF OBESITY (BMI ≥ 30) IF TRENDS CONTINUE FOR QUINTILE 1 AND QUINTILE 5



KEY FINDINGS

TABLE 6: PREDICTED PREVALENCE OF OBESITY IF TRENDS CONTINUE BY INCOME QUINTILE (%)

	Obese proportion of population overall (%)	Obese proportion of population, broken down by income quintile (%)				
		Q1	Q2	Q3	Q4	Q5
Women in 2015	30	37.9	37.8	30.9	27.1	25.3
Women in 2035	41	48.7	48.8	35.9	29.7	37.9
Men in 2015	29	32.1	37.4	34.0	30.8	29.6
Men in 2035	41	42.1	54.5	46.4	39.5	37.4
Total in 2035	41	45.4	51.6	41.1	37.6	37.6

THE SCALE OF THE PROBLEM

DISEASE PREVALENCE

IN 2035 THE PREDICTED LEVEL OF OVERWEIGHT AND OBESITY WOULD RESULT IN APPROXIMATELY 440,000 AVOIDABLE CASES OF OBESITY-RELATED DISEASES IN THE UK PER YEAR

This includes:

- 257,200 cases of type 2 diabetes
- 101,000 cases of CHD
- 43,600 cases of stroke
- 38,500 cases of obesity-related cancer

The cases of diseases are those directly attributable to obesity and which would develop between 2015 and 2035. Unsurprisingly, the biggest consequence of this level of obesity is a significant number of additional cases of type 2 diabetes. Within cancer, oesophageal and endometrial cancer

are most sensitive to changes in overweight and obesity rates. Of the 38,500 cases, just under a quarter of the avoidable cases are oesophageal cancers and slightly fewer are endometrial cancer. Breast and colorectal cancers also contribute a significant proportion of the new avoidable cancer cases.

BETWEEN 2015 AND 2035, MILLIONS OF CASES OF DISEASE COULD RESULT IF OVERWEIGHT AND OBESITY RATES CONTINUE AS PREDICTED

Examining the cumulative increase in disease incidence provides a sense of scale of the potential impact of obesity over the next 20 years. The greatest impact is seen in type 2 diabetes, where over 4.62 million additional cases are expected to occur as a result of the current trends. In addition to this, 1.63 million cases of CHD, 680,000 cases of stroke and 670,000 cases of cancer would result over the time period.

KEY FINDINGS

ECONOMIC COST

IN 2035, THE LEVEL OF OVERWEIGHT AND OBESITY IS PREDICTED TO RESULT IN £2.51 BILLION IN EXTRA DIRECT HEALTH COSTS IN THE UK

By 2035, the increasing prevalence of obesity and overweight between 2015 and 2035 could result in excess cases of CHD, type 2 diabetes, stroke and cancer. Treating these diseases could result in £2.5bn in extra costs a year by 2035. These costs are calculated by comparing the costs associated with the treatment of the diseases in 2035 if unhealthy weight trends continued with the equivalent costs in 2035 if overweight and obesity was virtually eliminated from 2015 onwards. Of the £2.51 billion, over £980 million is due to type 2 diabetes, over £930 million due to CHD, £330 million due to cancer, and almost £270 million due to stroke.

As described in the methodology section, direct health costs are comprised of costs to primary care, secondary care, urgent and emergency care, community care and social care. These costs do not include the indirect health costs of some diseases such as type 2 diabetes. These costs also do not include other major obesity related diseases such as osteoarthritis and some hypertension related healthcare costs. This therefore represents a portion of the direct NHS costs associated with obesity.

IN 2035, THE LEVEL OF OVERWEIGHT AND OBESITY IS PREDICTED TO RESULT IN £13.98 BILLION IN INDIRECT COSTS TO SOCIETY

The costs considered are those due to the loss of productivity due to premature

morbidity and mortality from additional cases of type 2 diabetes, CHD, stroke and cancer.

EVEN SMALL CHANGES IN OBESITY PREVALENCE ARE EXPECTED TO DELIVER MAJOR HEALTH GAINS

In addition to examining the scale of the problem, the model examined practical scenarios to inform policy. The model assessed the impact of a 1% year on year reduction below the predicted baseline to assess the diseases and costs avoided. The model predicts a 1% reduction year on year below the baseline would result in overweight and obesity prevalence falling 7 percentage points from 72% to 65%.

DISEASE PREVALENCE

IF THE PREVALENCE OF OVERWEIGHT AND OBESITY WAS REDUCED BY 1% YEAR ON YEAR BETWEEN 2015 AND 2035, AROUND 77,000 NEW CASES OF DISEASE COULD BE AVOIDED IN 2035 ALONE. THIS INCLUDES:

- 45,000 cases of type 2 diabetes
- 17,400 cases of CHD
- 7,300 cases of stroke
- 7,300 cases of obesity-related cancer

IF THE PREVALENCE OF OVERWEIGHT AND OBESITY WAS REDUCED BY 1% YEAR ON YEAR BELOW THE PREDICTED TREND THEN AROUND 64,200 CASES COULD BE AVOIDED BETWEEN 2015 AND 2035

KEY FINDINGS

ECONOMIC COST

IF PREVALENCE OF OVERWEIGHT AND OBESITY WAS REDUCED 1% YEAR ON YEAR BETWEEN 2015 AND 2035, £300 MILLION COULD BE AVOIDED IN DIRECT HEALTH AND SOCIAL CARE COSTS IN THE UK IN 2035 ALONE

The savings are primarily the result of reductions in type 2 diabetes and CHD where savings are over £110 million. Despite having a relatively low incidence compared with diabetes and CHD, the savings resulting from fewer cancers are also significant at over £40 million. There are also £30 million in healthcare costs due to stroke. In addition to these health costs, £1.31 billion in wider societal costs could be avoided in 2035 alone.

TABLE 7: ANNUAL INCIDENCE OF DISEASES ATTRIBUTABLE TO OVERWEIGHT AND OBESITY IN 2035 IN DIFFERENT SCENARIOS IN THE UK

	Measure	CHD	Diabetes	Stroke	All Cancers
Scenario 1% reduction relative to baseline	inc. avoided 95% CI [+-]	17,440 727	45,053 727	7,267 727	7,267 1,028
Scenario 100% reduction relative to baseline	inc. avoided 95% CI [+-]	101,005 727	257,236 727	43,599 727	38,513 1,028

TABLE 8: CUMULATIVE INCIDENCE OF DISEASES ATTRIBUTABLE TO OVERWEIGHT AND OBESITY BETWEEN 2015 AND 2035

	Measure	CHD	Diabetes	Stroke	All Cancers
Scenario 1% reduction relative to baseline	Cumu. inc. avoided 95% CI [+-]	169,148 4,142	468,781 5,523	68,350 4,142	64,207 3,311
Scenario 100% reduction relative to baseline	Cumu. inc. avoided 95% CI [+-]	1,626,582 3,452	4,620,846 4,833	679,353 3,452	668,997 3,311



EVEN SMALL REDUCTIONS IN OBESITY COULD PREVENT CANCER AND SAVE MONEY

Reducing being overweight and obese
by 1% every year could...

**AVOID
64,200**
CASES OF CANCER
OVER THE NEXT
20 YEARS

**SAVE
£40M**
IN THE ANNUAL
COST OF NHS
CANCER CARE


**AVOID
7,300**
CASES OF CANCER
ANNUALLY FROM 2035

DISCUSSION: STRENGTHS AND WEAKNESSES OF THE MODEL

TRENDS AND INCIDENCE

The evidence extrapolated from current and historic data (2000-2012) shows that rates of obesity will continue to rise and that the proportion of those of a healthy weight in the population will continue to fall. As other previous studies have concluded, this analysis suggests obesity rates will continue to rise and healthy weight rates will continue to fall. However, these figures show a lower predicted rate of overweight and obesity than was predicted in the original estimates for the Foresight report in 2007. That report predicted that by 2025 47% of men and 36% of women would be obese.¹⁰ However, this report predicts 34% of both men and women will be obese by 2025. Estimates in this report are also below those of a more recent study using this model published in 2011. That study projected that 41-48% of men and 35-43% of women would be obese by 2030.¹¹ By contrast, this study puts the estimates at 36% and 37% respectively. These differences are most likely to reflect the slowing down of the increase in obesity and overweight rates in adults in the UK in recent years and the inclusion of the more recent data.¹² Another recent study estimated that obesity and overweight would rise to 71% in the UK.¹³ This is similar to the estimate (69%) produced in this report.

This study adds to previous assessments on the predicted incidence for selected diseases directly attributable to obesity over the next 20 years and in particular the scale of the impact on cancer. As expected, millions of additional cases of diabetes and heart disease could result as a consequence of obesity. This study also shows that

hundreds of thousands of cancer cases could also result due to the continuation of high rates of obesity and overweight.

HEALTH AND ECONOMIC COSTS

Different modelling research projects will inevitably produce different estimates of results, because each project uses a different selection of data and assumptions. As such, the cost figures produced from different modelling approaches are not directly comparable. This report examines a proportion of the cost associated with the major preventable diseases such as CHD, diabetes and cancer but does not include some other diseases such as osteoarthritis, hypertension or wider health costs.

Previous estimates show that obesity trends will result in significant health costs. In England, the National Audit Office (NAO) reported in 2001 that obesity had tripled over the previous three decades, and estimated healthcare and societal costs at £2.5 billion a year.¹⁴ A more recent study estimated that the current cost of obesity to the NHS is approximately £5.1 billion a year.¹⁵

In 2007, the Foresight report estimated that the annual cost of overweight and obesity to the NHS was £4.2 billion in 2007, with the potential to rise to £9.7 billion by 2050¹¹. Building on that report, a further study estimated that the cost of obesity would be an additional £1.9-2 billion a year by 2030¹¹. Our results update this figure, highlighting that by 2035 an additional £2.5bn a year in health costs could result due to higher rates of obesity related CHD, type 2 diabetes, stroke and cancer.

DISCUSSION: STRENGTHS AND WEAKNESSES OF THE MODEL

STRENGTHS OF THIS STUDY

A strength of this study is the use of the microsimulation method. Although data intensive, it has been cited as the most robust method for risk factor and chronic disease modelling.¹⁶ Microsimulation can recreate the characteristics of individuals – such as age, sex and disease state – within a population (as opposed to modelling cohorts of people) that evolve over time.

Microsimulation is the right approach for chronic disease modelling because it is the only modelling approach that is applicable if an individual's history matters. For example, an individual's history of risk-taking behaviour, dual's history of disease matters for whether they live or die. Microsimulation models are designed to remember an individual's history and take it into account to influence their future life course. The UKHF model includes this time series component, enabling the dynamic changes in risk factors over time to be accounted for. Other models, although less data intensive and requiring less computing power, often take a 'static' approach whereby interventions are applied at a single time point. This microsimulation model has developed substantially since its first iteration in the Foresight report with the use of more up-to-date and comprehensive epidemiological data as well as the further development of the methodologies and validation techniques.

CHALLENGES AND CONSIDERATIONS

The challenge with any predictive model is that it does not take account of major future changes in circumstances such as the introduction of new drugs or technologies. In theory, their effects can be estimated by altering parameters in the model but these will significantly increase the degrees of uncertainty. It was beyond the scope of this study to carry out an in-depth uncertainty and sensitivity analysis. This is acknowledged good practice; however, there is a lack of validated datasets by which to compare the outputs. Furthermore, given the complexity of the microsimulation involving many thousands of calculations, relative to simpler spreadsheet models, uncertainty analysis would require many thousands of consecutive runs. As part of the EU project EConDA (econdaproject.eu), the UKHF models were validated against other models existing in the Netherlands (RIVM NCD model) and US (Pohem).

One challenge of the microsimulation method is that it is data intensive. Data are often gathered from a variety of sources, and statistical techniques are required to standardise the various databases, so that they can be used to populate all of the desired attributes of individuals included in the sample. Incidence data for diseases other than cancers were difficult to acquire. More up-to-date and detailed disease data would be required to make more accurate estimate of future disease incidence. Also, utility weights were derived from US-based community scores for the UK population, since UK score were not available. Furthermore, utility weights for certain cancers were not available in this data source and from a literature search that was conducted.

DISCUSSION: STRENGTHS AND WEAKNESSES OF THE MODEL

These included endometrial cancer, gallbladder cancer and post-menopausal breast cancer. To address these gaps in the data, utility weights were identified from the same data source for conditions that were considered to be suitable proxy measures.

The Health Survey for England (HSE) was used for projecting BMI forward, so projections are from England only, since there were insufficient numbers of historical data points for the other UK countries. Risk factor data from England (adjusted for the UK population) was used to estimate disease outcomes. This model did not have access to the risk factor data that are available for other UK countries. Prevalence figures for overweight and obesity vary by nation. However, more in-depth comparison is necessary to ensure that the data from different health surveys can be similarly compared. It was not possible to find more recent data for Northern Ireland.

The availability of disease cost data was also limited. NHS England programme budgeting cost data were used in the model and several assumptions had to be made, which have been highlighted in the methods section of the technical report. It is acknowledged that the cost outputs produced by this project are crude estimates. Future iterations of the microsimulation model would incorporate a more sophisticated direct cost model that takes account of variation in cost based on disease progression and severity.^v

There were few data on the time lag ('latent period') used to define the relevant time period between initiation of health risk behaviours and clinical manifestation of diseases. From a systematic literature search there were a high number of studies that looked into the differences in life expectancy between subjects who adopted health risk behaviours such as overconsumption of energy dense, high fat, high sugar foods, and those who did not. These sets of data could not be used for the microsimulation programme since they did not specify when these subjects adopted the health risk behaviours; therefore, an estimate of the time lag period could not be calculated. A recommendation for further research would be to develop longitudinal studies that investigate time lag periods for various types of cancers according to behavioural risk factors such as high BMI.

FOOTNOTES

v. Please note that discounting the costs (both direct NHS and indirect costs) were outside the scope of this project.

RECOMMENDATIONS

"THERE HAS TO DATE NOT BEEN CO-ORDINATED AND CONCERTED ACTION TAKEN TO ADDRESS OBESITY, AND IT IS ESSENTIAL THAT THIS NOW BECOMES A PRIORITY."

REPORT OF THE INDEPENDENT CANCER TASKFORCE, 2015.¹⁷

ACHIEVING SMALL REDUCTIONS

A number of studies have highlighted the drivers of obesity, including the Foresight report. A range of factors are known to influence weight in childhood and later life. These include biology, early life, psychological factors that affect behaviour, the environment and economic factors. To achieve consistent reductions in overweight and obesity a range of measures are needed to change behaviour over time by addressing some of the causes of obesity. While some drivers such as metabolism are beyond the control of policy makers, many elements that create the obesogenic environment are amenable to positive change.

Obesity is recognised as a complex interplay between diet, increasing sedentary behaviours and changing environments. But recent evidence from the WHO has found that increases in the food energy supply alone are sufficient to explain the weight gain over recent decades, especially in high income countries.¹⁸

As our study shows just a 1% reduction year on year in excess weight from 2015 could yield significant health benefits, avoiding 77,000 cases of disease a year by 2035, and saving £300 million a year in NHS and social care costs. Moreover, over the next 20 years this level of reduction could avoid 64,200 cases of

cancer. Given the trends established in this report, achieving even this 1% annual reduction in obesity will require additional policies above what is currently in place in the UK. A report by McKinsey Global Institute in 2014 highlighted that a comprehensive approach is the most effective way to reduce obesity. It also concluded that the highest impact levers do not rely on willpower to change behaviour but instead seek to restructure the choices in our environment.¹⁹ The report highlighted a number of potential interventions which could be cost effective in reducing obesity. It noted that if the recommended 44 interventions were implemented together they could reduce obesity by 20% in the UK within 5 years.

Building on this work and the recent review on sugar reduction by Public Health England we have examined a selection of policies which should form part of a national obesity strategy. We briefly summarise the evidence for interventions that could be implemented quickly and which could be part of the forthcoming Government's national children's obesity strategy expected in 2016.

CURRENT POLICY RESPONSES TO OBESITY

GLOBAL

According to the Global Burden of Disease Study, published in 2014, an estimated 2.1 billion people are overweight globally.²⁰ While some developed countries have seen an apparent slowing of the rise in obesity prevalence since 2006, no country has reported significant decreases for three decades.

RECOMMENDATIONS

Obesity is a complex issue driven by seismic commercial, social and cultural change in recent decades. Margaret Chan, WHO's Director General has acknowledged that: *"ending childhood obesity is one of the most complex health challenges facing the international community during this century".*²¹

The WHO's Global Action Plan for the Prevention and Control of Non-Communicable Diseases 2013-2020 commits Member States to a target of reducing non-communicable diseases (NCDs) by 25% by 2025.²² A supporting NCD Global Monitoring Framework sets out targets and indicators to reduce the prevalence of NCDs and their risk factors which includes a target of no increase in prevalence of obesity between 2010 and 2025.²³ However, in the absence of concerted efforts to introduce policies to reduce obesity, and given the reliance on voluntary approaches in most countries, it is unlikely that even this modest goal will be reached.

ENGLAND

Ministers have signalled that the Westminster Government will introduce a new childhood obesity strategy. Speaking in May 2015, Secretary of State for Health, Jeremy Hunt, said:

"I think at the start of a parliament you have a chance to put in place a national strategy to reducing diabetes and indeed particularly childhood obesity, which I think is a great scandal".²⁴

The level of ambition and detail of the strategy is expected to be announced in early 2016. The Government has accepted the recommendations made by the Scientific Advisory Committee for Nutrition (SACN) for

Public Health England, which notes that sugar should not make up more than 5% of adult and children's total energy intake.²⁵ The report from SACN noted that a diet high in sugar can lead to weight gain and increased risk of a number of diseases. Given that every age group consumes sugar at more than double this guideline²⁶ – with teenagers trebling it – Public Health England has published a review of its evidence to support effective policies, which suggests the most effective approach is a comprehensive strategy including reducing price promotions, restrictions on food marketing to children and adults, a sugary drinks tax and establishing a programme of gradual sugar reduction in everyday foods.²⁷

The current policy landscape in England is shaped by the previous coalition Government's strategy *Healthy Lives, Healthy People*, published in 2011. It stated that rising rates of overweight and obesity 'challenges us all to a new level of ambition, reflecting the scale of the task and the importance of action'.²⁸ The target set by the Government was for a sustained downward trend in the level of excess weight in children by 2020 and a downward trend in the level of excess weight averaged across all adults by 2020. The strategy identified a broad and shared responsibility for action including local and national government, businesses and individuals.

SCOTLAND

In 2010, the Scottish Government introduced a *Route Map Towards Healthy Weight* which sets out a long term strategy to tackle overweight and obesity. It has set a national indicator 'to increase the proportion of healthy weight children' alongside a number of interventions and initiatives supported by £200

RECOMMENDATIONS

million investment in sports and health budgets.²⁹ The Scottish Government has developed a vision for becoming a *Good Food Nation by 2025* and has produced *Supporting Healthier Choices: a framework for Voluntary Action* to shape healthier diets in Scotland.

WALES

The new *Welsh Public Health Bill* (2015) does not include new actions to tackle obesity but the Welsh Government has stated that it continues to consider a range of actions to tackle obesity in Wales such as nutritional standards for pre-school and care home settings.³⁰ Previously the Welsh Government has introduced regulations on *Healthy Eating in Schools* (2013).

NORTHERN IRELAND

In 2012, the Northern Ireland department of health, social services and public safety published *A Fitter Future For All*, a 10-year framework for addressing overweight and obesity.³¹ The framework sets targets for reducing obesity by 4% in adults and 3% in children by 2022 and sets out a range of desired outcomes at different life stages. The framework sets out a voluntary approach to encourage the food industry to reformulate its products and reduce the marketing of unhealthy foods.

OUR POLICY RECOMMENDATIONS

Reviewing a number of possible policy options we have identified nine which could form part of a comprehensive national obesity strategy and could reduce both adult and childhood obesity rates if implemented.

INTRODUCING A 6AM TO 9PM BAN ON TV ADVERTISING, TO REDUCE CHILDREN'S EXPOSURE TO UNHEALTHY FOOD CHOICES

Evidence is clear that the promotion of food high in fat, sugar and salt (HFSS) influences children's preferences, consumption behaviours and purchase behaviours. Studies have shown that food promotion to children increases purchasing, consumption and requests for advertised products, and that the advertised products contradict dietary recommendations.³² Children watch the most TV in the hour before the watershed, a timeslot for adult or family programming which is effectively exempt from restrictions. Ofcom research shows that implementing a pre-9pm ban would reduce the amount of HFSS adverts seen by children by 82%, compared to 37% for the current regulations.³³

³⁴

Restricting television advertising of these products to after the 9pm watershed would likely be a proportional response to the problem of HFSS food and drink marketing and could be implemented without significant difficulty. Of the categories assessed by the McKinsey report, marketing restrictions had the lowest cost per disability life adjusted year saved.¹⁹

RESTRICTING ONLINE MARKETING OF UNHEALTHY FOOD AND DRINK PRODUCTS TO SIGNIFICANTLY RESTRICT THE PLACEMENT AND CONTENT OF UNHEALTHY FOOD MARKETING

Online promotion is another effective tactic used by food industry actors to market their products to children.³⁵ The rapid growth of 'advergames' as a way to expose children to junk food marketing is concerning, particularly when such games influence children's food choices, brand recognition and intentions to purchase.³⁶⁻⁴⁰ As children change how they use different sources of media, addressing this type of media is important for addressing the growing potential for new forms of marketing to influence dietary patterns.

INTRODUCING A 20P/LITRE DUTY ON SUGAR-SWEETENED BEVERAGES (SSB)

There is ample real-world and modelled evidence that a duty on sugar sweetened beverages leads to reduced consumption and lower weight outcomes.⁴¹⁻⁴⁴ A focus on sugary drinks in the first instance is justified given the clear association between consumption of sugary drinks and weight gain.²⁵ Moreover, given that sugary drinks represent the primary source of 'free sugars' among 11-18 year olds, such a measure could be effectively targeted at young people.²⁶

EXAMINING THE CASE FOR FURTHER FISCAL MEASURES ON FOODS HIGH IN SUGAR, SALT AND FAT, AND INCREASING THE AFFORDABILITY OF HEALTHY ALTERNATIVES, TO MAKE HEALTHIER DIET CHOICES THE NORM

Fiscal measures can help increase the affordability of healthier diets, and create an

OUR POLICY RECOMMENDATIONS

environment where it is easier to eat more nutritious food. They can also be effective in addressing health inequalities, by helping the most vulnerable in society to improve their dietary behaviours. A study by the Commission of the European Union found that food taxes aimed at specific nutrients such as sugar, salt and fat as well as on specific products could reduce consumption of those taxed products and increase consumption of untaxed products.⁴⁵ Therefore, if appropriately targeted, these taxes could address consumption of high calorie foods that can contribute to weight gain. The efficacy of such fiscal measures would be dependent on the structure of the tax and how it was implemented.

STRENGTHENING AND IMPLEMENTING STANDARDS FOR PROCUREMENT OF FOOD PROVIDED IN ALL PUBLICALLY-FUNDED INSTITUTIONS AND ENSURING EXISTING FOOD STANDARDS ARE FULLY APPLIED IN ALL SCHOOLS INCLUDING ACADEMIES AND FREE SCHOOLS

How we procure our food in our workplaces, schools, hospitals and other public services is important. The public sector employs over 5 million people in the UK and provides services including the provision of food to a large number of particularly vulnerable groups such as children.⁴⁶ Strengthening the Government Buying Standards for Food and Catering could be an effective way to radically improve food provision in the UK. To be effective, monitoring would be required and tools should be provided to improve implementation of the guidelines. Furthermore, there is little justification for the loophole around the application of school food standards among maintained schools and academies founded between 2010 and

June 2014 which are exempt from these standards.⁴⁷

EXTENDING FRONT-OF-PACK NUTRITIONAL COLOUR CODED LABELLING TO COVER AS MANY FOODS AND DRINK PRODUCTS AS POSSIBLE IN THE UK, ALONGSIDE AWARENESS CAMPAIGNS TO EDUCATE PEOPLE ON THEIR USE

Engaging labelling such as colour coded traffic light labelling can have benefits. It can enable consumers to make more informed choices at-a-glance which may lead to lower consumption of foods high in calories. An integrated hybrid model of nutritional labelling, including colour-coding, guideline daily amounts (now reference intakes) and the words 'high', 'medium' and 'low' has been shown to best meet the needs of UK consumers across all socio-economic groups.^{48 49} Such labelling may also help to stimulate reformulation and reduction in portion sizes across a wide range of products.

INCREASING ACCESS TO RECREATION FACILITIES AND OPEN SPACE, PARTICULARLY FOR DEPRIVED GROUPS, TO ENCOURAGE PHYSICAL ACTIVITY

Creating accessible spaces for physical activity is important to help people keep physically active in their local community. Increasing physical activity can contribute to healthy weight management and weight loss. A study suggested that those who lived closest to formal parks were more likely to achieve good physical activity levels and were less likely to be overweight or obese.⁵⁰ Moreover, children are more likely to be active when they live close to parks, playgrounds and recreational facilities.⁵¹

OUR POLICY RECOMMENDATIONS

DEVOTING GREATER AND SUSTAINED FUNDING FOR ACTIVE TRAVEL, TO PROMOTE WALKING AND CYCLING AS EASY AND ACCESSIBLE MODES OF TRANSPORT

Active travel is an important way for adults and families to build physical activity into their routines. Evidence shows that those who increase their active travel increase their total physical activity.⁵² An economic analysis of policy interventions to address obesity found that active travel would be both cost-effective and positively impact on disability-adjusted life years (DALYs)¹⁹. Promotion of active travel is best delivered strategically. While investment is necessary to promote cycling and walking, small changes to the local environment can help to make walking or cycling default options for short journeys.

DEVELOPING A NEW ACCOUNTABILITY FRAMEWORK WITH FOOD BUSINESSES WHICH SUPPORTS AND MONITORS ACTION BY THE FOOD INDUSTRY TO DELIVER ON INDEPENDENTLY DEVELOPED GOVERNMENT-LED NATIONAL STANDARDS FOR REFORMULATION AND PORTION SIZING TO REDUCE FREE SUGARS, SATURATED FAT AND CALORIES IN THE FOOD SUPPLY

Recent efforts to use voluntary agreements has led to few businesses going beyond 'business as usual'.⁵³ Nevertheless, it is suggested that voluntary reformulation under the direction of the Food Standards Agency played a role in reducing salt consumption in the UK.⁵⁴ Similar achievements could be possible in calorie reduction and could have a dramatic effect on diets at the population level. Economic analysis by the McKinsey Global Institute found that reducing portion sizes and small incremental changes to the

formulation of foods and drinks are among the most cost effective ways of reducing obesity¹⁹. Collectively, they would prevent over 3,800,000 disability adjusted life years (DALYs) in the UK. To be effective, this framework should be transparent and include independent and rigorous monitoring and evaluation of any established standards. Beyond reformulation and portion control, action by the food industry within an effective framework could address unhealthy behavioural cues such as the placement of high calorific foods at the end of the aisles at supermarkets.

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