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# The cost of overweight and obesity on the Island of Ireland

## Executive Summary



# The cost of overweight and obesity on the island of Ireland

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## Executive summary

The prevalence of overweight and obesity worldwide has increased markedly over the past three decades. It is estimated that in 2008 a total of 1.46 billion adults worldwide were overweight, of whom 502 million were obese. In Ireland, based on the findings from the 2008-10 National Adult Nutrition Survey (NANS), the estimated prevalence of overweight in adults is 37%, with a further 24% meeting current body mass index (BMI) criteria for obesity. In analyses of the data from earlier surveys conducted in the Republic of Ireland using similar methods, the prevalence of obesity in 18-64 year old adults has increased significantly between 1990 and 2011, from 8% to 26% in men, and from 13% to 21% in women, with the greatest increase observed in men aged 51-64 years. Similar prevalence rates have been reported in Northern Ireland with the Health Survey 2010/11 finding that 36% adults were overweight and 23% obese. Increased adiposity (whether defined in terms of BMI, waist circumference or other measures of excess fat) is causally implicated in the development of type 2 diabetes, cardiovascular disease, specific cancers and a number of additional important conditions. Thus, the current global epidemic of overweight and obesity poses significant threats to the health and wellbeing of populations and represents a major challenge for health services.

### Cost of obesity studies

Estimates of the economic burden of illness provide critical information for priority setting, policy development and investment in both prevention and health services. Health systems throughout the world are struggling to meet the challenge of increasing demand for health care and increasing costs with diminishing resources from tax payers and other payers. Cost of illness studies for major health issues such as overweight and obesity has the potential to frame core policy issues, such as the relative priority of prevention and care in language that is tangible and accessible to policy makers. For instance in the US, it has been estimated that if every US adult who was obese (BMI of 30 Kg/M<sup>2</sup>) in 2008 had a BMI of 25 Kg/M<sup>2</sup>, annual public medical expenditures (excluding private medical expenditure and productivity loss due to weight-related ill health and premature mortality) would have declined by \$173.7 billion or 17.2% of annual public medical expenditures in that year. Assuming an optimal BMI distribution, it was estimated that the prevalence of obesity in 2008 resulted in a deadweight loss of \$216.7 billion to the US economy in 2008 [1]. Deadweight loss (DWL) refers to the welfare loss that arises as a result of the additional tax burden created by the need to fund health care and other supports for those ill or unemployed as a result of obesity and overweight.

## **Project aims and objectives**

The overall aim of the project was to provide a comprehensive assessment of the cost of overweight and obesity on the island of Ireland.

The specific objectives were as follows:

1. To review and summarise the international literature on cost of obesity studies with a particular focus on those published since 2001, with a view to guiding and informing the approach adopted in the current project.
2. To determine the health service related costs of overweight and obesity in the Republic of Ireland and Northern Ireland from a public health care payer perspective.
3. To estimate the cost, due to sickness, absence and premature mortality, related to overweight and obesity in both the Republic of Ireland and in Northern Ireland.
4. To examine the combined health service and lost production costs associated with overweight and obesity, and examine variations in these estimates across illnesses and jurisdictions.
5. To make recommendations based on the findings, including recommendations on measures that will facilitate ongoing work on the cost of overweight and obesity on the island of Ireland drawing on both routine data collection in health and social care services and specific population-based research programmes.

## **Literature review**

There is an extensive international literature on the costs associated with weight gain in various populations, and a total of 45 studies published since 2001 met the criteria for inclusion in the review. The literature is not readily summarised as it is extremely heterogeneous. Studies vary on core issues of focus (whether on obesity, overweight or overweight and obesity), specific costs estimated (direct costs, indirect costs or both) and methods (“top-down” or “bottom-up” approaches). For example, in studies addressing the direct healthcare-related cost of overweight and obesity, some have focused on hospital costs alone while others have focused on drug costs, or on GP/primary care costs alone. Assessment of indirect costs from lost productivity due to illness-related absenteeism and presenteeism (reduced productivity at work) is even more problematical, with studies drawing on divergent data sources to quantify absenteeism and limited primary research on the phenomenon of presenteeism. There are also divergent views on the appropriate methods used to value productivity, whether productivity should be valued using human-capital or friction-cost methods. The human-

capital method takes the patient's perspective and counts any hour not worked as an hour lost, whereas the friction-cost method takes the employer's perspective and only counts as lost those hours not worked until another employee takes over the persons' work.

### **Methodological approaches**

In the review we identified three main approaches to estimating the cost of excess weight: a “top-down” method based on estimation of population attributable fractions (PAF method) and two “bottom-up” approaches, based on analyses of cross-sectional and longitudinal datasets respectively. The PAF method used in 15 of the 45 studies reviewed, is based on the use of nationally available prevalence data for obesity and/or overweight, to which relative risk estimates for the relevant co-morbid conditions (such as type 2 diabetes) are applied, thereby producing estimates of the population attributable fraction (PAF) for each condition. The PAFs are applied to national cost data for the relevant conditions to give an overall estimate of the cost of overweight and obesity. The outputs from this top-down process depend on four core inputs which vary considerably in terms of the precision of estimates and the inclusion criteria applied by researchers in different studies: the estimated prevalence of overweight and obesity, the list of co-morbid conditions, the relative risk (RR) values used to calculate PAFs and the quality and availability of national cost data. There are additional concerns in relation to the PAF approach, including the problem of double counting due to multi-morbidity.

The second approach identified in the literature revolves around the analyses of cross-sectional survey data for healthcare usage and productivity loss (e.g. absenteeism) by BMI category. This approach, used in 15 studies, is obviously highly dependent on the quality of the available data on health outcomes and productivity loss and the representativeness of the sample. It is also dependent on the availability of cost data, either directly as a core element of the dataset or via resource use information that can be linked to average cost data. The longitudinal approach (used in eight of the studies reviewed) is likely to provide the most accurate estimates of the cost of overweight and obesity, requiring the fewest assumptions and extrapolations, as the occurrence (incidence) of health outcomes and sickness-related absenteeism is measured directly in a group of individuals (cohort) who are followed over time. However, such data are rare and resource-intensive in collection, the duration of follow-up required to accrue sufficient events is typically in decades, and participants in longitudinal cohort studies are often poorly representative of the wider population, thereby constraining the generalisability of the findings.



### **Main findings from the literature review:**

The findings from this review suggest that obesity as opposed to overweight is the main driver of direct healthcare costs, with costs escalating sharply in the obese group, currently the fastest growing segment of the overweight-obese population. A conservative interpretation of the current literature suggests that relative to those of normal weight, costs are increased by approximately 10% in the overweight group and by approximately 30% in the obese group. Overall the combined direct healthcare cost of overweight and obesity account for up to 9.1% of total health expenditure in the US and between 0.6% and 4.6% of total health expenditure in other countries. There is also clear evidence from the international literature that increasing BMI is associated with reduced productivity alongside increased health costs. In all of the studies that examined both direct and indirect costs, indirect costs were greater than direct healthcare costs accounting for 51% to 84% of the estimated combined total cost. The extent to which the costs rise with increasing BMI varies between countries depending on the prevalence of overweight and obesity in the population, patterns of healthcare utilisation and specific characteristics of the health and social welfare systems in different countries. Thus the review confirmed the need for country-specific estimations of the costs of overweight and obesity.

### **Methods**

We have focused in our analyses of direct and indirect costs of overweight and obesity on 19 specific conditions (**Table i**) for which there is strong evidence from systematic reviews of a causal association with excess body fat. The direct healthcare-related costs of overweight and obesity (in-patient and day-case costs, out-patient costs, GP costs and drug costs) were estimated using a combination of a top-down PAF method and a bottom-up approach, with the latter based on analyses of cross-sectional datasets. In the application of the PAF method to estimate direct healthcare-related costs, attributable fractions of the specific overweight and obesity-related conditions were applied to the Hospital Inpatient Enquiry (HIPE), the Primary Care Reimbursement Scheme (PCRS) databases in the Republic of Ireland, and the Hospital Inpatient System (HIS) and the Business Services Organisation (BSO) databases in Northern Ireland. The bottom-up approach was based on regression analyses of associations between overweight and obesity and self-reported health care utilisation in relevant cross-sectional datasets, specifically the SLÁN 2007 and the Irish National Longitudinal Study of Ageing (TILDA) datasets (Republic of Ireland) and the 2010/11 Health Survey Northern Ireland.

**Table i: Conditions associated with overweight and obesity included in this project**

	Condition
Endocrine	Type 2 diabetes
Cardiovascular	Hypertension
	Coronary heart disease
	Stroke
	Congestive cardiac failure
	Pulmonary embolus
	Deep vein thrombosis
Cancers	Oesophagus
	Post-menopausal breast
	Endometrial
	Kidney
	Colorectal
	Gall bladder
Other	Pancreas
	Asthma
	Gallbladder disease
	Low back pain
	Osteoarthritis
	Gout

The base case analysis for direct costs for the Republic of Ireland was, as previously mentioned, based on the self-reported SLÁN dataset. As the model used was only able to detect a significant difference in hospital use for the obese II group, it was felt to be an underestimate of the total in-patient-related costs associated with overweight and obesity. This may, in part, be due to the lower prevalence rates for overweight and obesity based on self-reported data. A triangulation exercise was performed to

validate results where possible, by performing a top-down analysis of corresponding data. This was possible for hospital in-patient and day-case activity in both jurisdictions. In order to make a total estimate of the direct healthcare costs, we therefore used the results of the top-down PAF approach to estimate in-patient and day-case costs.

The indirect costs that were estimated were productivity losses associated with work absenteeism and premature mortality. Work absenteeism was estimated using two methods in both jurisdictions. In the Republic of Ireland, the SLÁN 2007 dataset were analysed for evidence of associations between overweight and obesity and self-reported absenteeism during the previous year, using regression analyses similar to those used in the estimation of direct costs. We also analysed the Department of Social Protection illness benefit data for 2009, with the calculation of population attributable fractions of days absent from work for overweight and obesity-related co-morbid conditions. For Northern Ireland, the 2005/6 Health and Wellbeing Survey dataset was analysed. These analyses were augmented by an analysis of sickness benefits data obtained from the Analytical Services Unit of the Department of Social Development (Northern Ireland).

Mortality data were obtained from the Irish Central Statistics Office (CSO) and the Northern Ireland Statistics and Research Agency (NISRA) to estimate the impact of obesity and overweight on premature mortality. Population attributable fractions (PAFs) for death and absenteeism (indirectly estimated from disability claims), associated with the defined list of overweight and obesity-related conditions, were derived for each jurisdiction using separate risk estimates for overweight and obesity and, wherever available, separate relative risk estimates for males and females. Deaths were weighted using years of potential life lost (YPLL) up to age 75. Productivity loss was estimated using both human-capital and friction-cost methods. However as the human-capital approach is generally used in published cost of illness studies in the international literature, it is used in this report in the presentation of overall summary costs. Cost estimates are presented with upper and lower bounds (confidence intervals) reflecting uncertainty associated with sampling error. The latter incorporate uncertainty in estimates of effect sizes in the cross-sectional and PAF-based analyses. Uncertainty around costs was explored by varying costs by a factor of 33%.

In the estimation of the present value of future losses such as those associated with premature death, a discount rate of 4% was applied. Throughout the study we have taken a conservative approach to the estimation of costs.

Deadweight costs were not estimated in this study because of the uncertainty in relation to the marginal cost of public funds in the two jurisdictions. Insofar as possible, standardised approaches to the estimation of both direct and indirect costs were applied in both jurisdictions.

## Main findings

For the Republic of Ireland, the direct and indirect costs of overweight and obesity in 2009 were estimated at €1.13 billion and for Northern Ireland, the estimated cost was €510 million (**Table ii**).

**Table ii: Summary of the main findings**

Costs	ROI €	NI PPP € 2009	*NI Stg
Direct costs	€398,615,581	€127,406,641	£92,323,652
Indirect costs	€728,968,662	€382,917,113	£277,476,168
Total costs	€1,127,584,243	€510,323,754	£369,799,820

\*2009 Sterling = PPP Euro / 1.38

In the Republic of Ireland, 35% of these costs were direct healthcare costs, and 65% were indirect costs. The direct costs represent 2.7% of the total healthcare costs for 2009, the year for which the analysis was performed.

For Northern Ireland, 25% of the costs were direct healthcare costs, and 75% were indirect costs. The direct costs represent 2.8% of the total healthcare costs for 2009.

Further breakdown of these costs is given in **Table iii**. For some costs estimates based on both cross-sectional and PAF-based analyses are available. However, the level of agreement between cross-sectional and PAF-based analyses was poor. As the quality of the cross-sectional data on associations between BMI and both health service use and absenteeism was sub-optimal, we have drawn on the PAF-based analyses where available in the estimation of the overall costs. Estimates included in the overall summary costs are highlighted in bold, and these are used in the headline summary figures presented throughout the study. Cognisance should also be given to the full range of figures presented in this summary table, and throughout the study.

**Table iii: Breakdown of direct and indirect costs**

	Republic of Ireland	Range €	Cost €
<b>Direct costs</b>	GP (Cross-sectional analyses)	15,700,000 – 30,000,000	<b>22,900,000</b>
	In-patient/Day-case (Cross-sectional analyses)	7,100,000 – 91,100,000	45,910,000
	In-patient/Day-case (PAF method)	<b>89,589,111-179,178,223</b>	<b>134,383,667</b>
	Out-patient (Cross-sectional analyses) (significant at 90% level)	0- 14,855,791	<b>6,890,000</b>
	Drugs (PAF method)	<b>156,294,603-312,589,205</b>	<b>234,441,904</b>
<b>Indirect costs</b>	Absenteeism (Cross-sectional analyses) Human-capital approach	11,291,035-547,385,875	282,667,747
	Absenteeism (Cross-sectional analyses) Friction-cost approach	5,497,328-164,215,771	71,715,511
	Absenteeism (PAF method) Human-capital approach	104,106,280-164,115,974	<b>135,977,068</b>
	Absenteeism (PAF method) Friction-cost approach	54,904,907-87,400,050	72,133,090
	Premature mortality (PAF method)	420,200,000-748,500,000	<b>592,991,594</b>
	Northern Ireland	Range PPP € 2009	Cost PPP 2009 €
<b>Direct costs</b>	GP (Cross-sectional analyses)	0-15,210,484	<b>7,411,564</b>
	In-patient/Day-case (Cross-sectional analyses)	31,187,634-133,410,785	82,299,148
	In-patient/Day-case (PAF method)	<b>28,613,870-57,227,740</b>	<b>42,920,805</b>
	Out-patient (Cross-sectional analyses)		No significant difference detected
	Drugs (PAF method)	<b>51,382,848-102,765,696</b>	<b>77,074,272</b>
<b>Indirect costs</b>	Absenteeism (Cross-sectional analyses)		No significant difference detected
	Absenteeism (PAF method) Human-capital approach	215,000,000-256,000,000	<b>235,500,000</b>
	Absenteeism (PAF method) Friction-cost approach	74,400,000-88,600,000	81,500,000
	Premature mortality (PAF method)	107,022,854-186,486,711	<b>147,417,113</b>

The main drivers of direct costs due to drugs and hospital inpatient and day case care are cardiovascular disease, type 2 diabetes, colon cancer, stroke and gallbladder disease, although there are differences in how these costs are distributed between the two jurisdictions. In terms of absenteeism, low back pain is the main driver in both jurisdictions, and for productivity loss due to premature mortality the primary driver of cost is coronary heart disease.

## **Conclusions and recommendations**

This study provides the first estimates of the cost of overweight and obesity on the island of Ireland based on a comprehensive review and analyses of relevant data. While the personal and social costs of the current epidemic of overweight and obesity can never be fully quantified, the estimated economic costs are high, estimated for 2009 at approximately €1.13 billion in the Republic of Ireland and approximately €0.51 billion in Northern Ireland. Overweight and obesity combined account for an estimated 2.7% and 2.8% of total health expenditure in the Republic of Ireland and Northern Ireland respectively. These findings are consistent with estimates from a number of European countries over the past decade.

Repeated cross-sectional surveys show us that the population BMI distribution is "shifting to the right", but the duration of obesity - the period that obese people are living with obesity - is probably also increasing and the cumulative risks of adverse health events may actually be higher than we have used in our analyses (and the costs). This duration of obesity is not being captured in these cross-sectional surveys.

The costs in Northern Ireland presented as 2009 purchasing power parity (2009 PPP) – the standard method of comparing cost across different countries - seem relatively high and disproportionate to those estimated for the Republic of Ireland. However, if instead of purchasing power parity we use the average Euro-sterling exchange rates in 2009 of €0.89 = £1 and adjust for population size, the estimates for the two jurisdictions are remarkably similar. The main area of inconsistency between the two jurisdictions is in the estimation of indirect costs due to absenteeism. The estimates for the latter are higher for Northern Ireland. This inconsistency can be explained by differences in the social welfare claims datasets available to the research group. In Northern Ireland it was possible to access data on all social welfare schemes. However it was not possible to eliminate long-term claims from the datasets. By contrast, in the Republic of Ireland we had access to data from only one of the Department of Social Protection's three major social welfare schemes (Illness Benefit) but not from the Disability Allowance or the Invalidity Pension scheme. Moreover, in the analyses of the Illness

Benefit scheme it was possible to eliminate long-term claimants. Thus it is likely that absenteeism-related costs in Northern Ireland have been overestimated, while those in the Republic of Ireland may have been underestimated.

It may be argued that overall in this study we have taken a conservative approach in estimating the burden of suffering, premature mortality and costs associated with overweight and obesity. We have limited our analyses of direct and indirect costs to conditions which are well defined and for which there is strong evidence of a causal association. For instance, although the impact of overweight and obesity on quality of life including psycho-social well being is well recognised, it has not been addressed in this study due to the lack of primary research data of appropriate quality. It should also be noted that in the assessment of productivity losses, the economic and social contributions of retired people (those between 65 and 75 years) has been assumed to be one third of those aged under 65 years, and no monetary value has been assigned to years of life lost in persons over 75 years. These assumptions are likely to be challenged by emerging data on the substantial economic and social contributions to society from retired and elderly people. Further evidence of the conservative approach taken in these analyses is provided by the omission of deadweight cost from the overall estimates of the cost of overweight and obesity. The latter decision was based on both technical and pragmatic considerations. We have also had the advantage of estimating both direct and indirect costs in two separate jurisdictions at the same time which has helped with calibration of the analyses.

Cost of illness studies have important limitations which must be noted in our interpretation of these findings. While it is accepted that overweight and obesity increase the risk of illness, absenteeism from the workplace and early death, the magnitude of these effects in the population is measured with poor precision and there is even greater imprecision in the estimation of associated direct healthcare cost and indirect societal costs. It is therefore important to consider the uncertainty bounds/confidence intervals around the summary cost estimates. Indeed the value of cost of illness studies, including the current study, derives primarily from their ability to inform discussion of the relative economic burden associated with major health problems as opposed to the precise quantification of absolute costs.

We have already alluded to the uncertainty in relation to how best to value productivity loss and the issue of double counting in the application of the PAF method. There are additional conceptual and methodological challenges in the conduct of cost of illness studies. For instance, given the extent of fixed staffing and infrastructure cost in health systems, one might reasonably ask, how much of the

estimated costs would be saved if the current burden of overweight and obesity were reduced. In the context of priority setting, it is arguable that estimation of the absolute burden or costs of illness provides a poor measure of relative need. The latter (need) is determined both by the burden of disease and the capacity to benefit from interventions. Thus, under ideal circumstances, the priority assigned to overweight and obesity in public policy should be driven primarily by estimates of the incremental costs and the incremental benefits of interventions to prevent and/or manage overweight and obesity. Against these objections, it may be argued that cost of illness studies (including cost of obesity studies) have influenced policy at international (WHO) level and in specific countries worldwide.

The current epidemic of overweight and obesity has evolved over a relatively short time scale, approximately two to three decades. Reliable, contemporary and locally relevant data on the human and economic burden of this epidemic provide powerful evidence on the consequences of our failure to-date to manage this societal challenge. In particular, these data highlight the external (third party) costs of current models of food production and marketing and our relative failure at societal level to promote high levels of physical activity through walking, cycling and public transport throughout the life course. These data will also support work on modelling the future burden and costs of overweight and obesity. No one disputes the urgency of identifying and implementing effective broadly-based prevention strategies with the potential to shift the entire population distribution of excess weight toward more optimal levels. However, without reliable data on the current and future cost of overweight and obesity, the urgency and cost effectiveness of population-based prevention policies, including policies directed at the production and marketing of food and the promotion of physical activity, will be substantially underestimated.

### **Recommendations:**

- A. Urgent public health action is required to address the burden that overweight and obesity are placing on both the health services and the general economy.
- B. A population-wide approach to reducing the problem of overweight is required.
- C. Targeted action is required to reduce the burden being placed by the very obese on the health service.
- D. Workplace interventions to reduce the burden of absenteeism related to back pain in the overweight and obese is required.
- E. Given the overweight and obese-associated burden placed on the health service by colon cancer in particular, consideration should be given to targeting the overweight and obese specifically in the upcoming colorectal cancer screening programme.



- F. We note and reiterate the recommendations from the National Taskforce on Obesity (NTO) which reported in 2005 in ROI and the Fit Futures for All Framework published in 2012 in NI. Both identify actions across a broad range of sectors, high level governmental support and cross departmental approaches.
- G. The current findings on the cost of overweight and obesity highlight the extent of societal involvement in diet and health and the limitations of approaches which emphasise the role of personal choice, responsibility and market forces in relation to diet and health. The current obesity epidemic in children and adults represents a clear example of market failure with external/third party costs defaulting to the taxpayers. The food sector is currently regulated to ensure food safety. Policy makers need to consider whether there is a need to extend this regulatory framework to address the effects of diet on health and wellbeing.
- H. The findings on the cost of overweight and obesity highlight the need for significant investment in research to examine the influence of fiscal and other Government policies on consumer purchasing and their impact on overweight and obesity, including, for example, risk-benefits assessment of taxation that supports healthy eating and active living and subsidies for healthy food such as fruit and vegetables.
- I. There is also a need for work on modelling the future burden and costs of overweight and obesity over the next decade. This work will provide realistic estimates of the cost-benefit ratios and medium-term return on investment in societal level interventions designed to reduce calorie intakes and promote physical activity. For instance, based on the current estimates of the cost of overweight and obesity, significant investment in infrastructure to promote walking and cycling can be justified.
- J. There is a need for ongoing national health and lifestyle surveys at regular intervals to continue to monitor the progress of the epidemic of overweight/obesity and related chronic disease. Data, particularly relating to nutrition surveillance, has historically been collected at intervals through one-off studies, rather than through a co-ordinated continuous fashion that would maximise surveillance resources. Weight status measurements should be resourced to collect data on measured, as opposed to self-reported height, weight and waist circumference. There is also a need for ongoing surveillance data on blood glucose status to monitor the parallel epidemic of type 2 diabetes.
- K. The current study highlighted the dearth of reliable population-based (as opposed to service level) data on uptake of health services and illness-related productivity loss, including data on attendances at primary care, attendances at hospital emergency departments, referral to hospital outpatients and the costs associated with these services. Also unavailable are population-based data on admission to hospital, length of stay, drug prescribing and associated absenteeism from work. These data, which are vital to the conduct of cost of

illness studies and related health economic analyses, should form a core element in ongoing national health and lifestyle surveys in both the Republic of Ireland and Northern Ireland.

- L. There is also a need for a primary care database which would serve as a longitudinal cohort, from which estimates of use and cost of health services would be based on patient level data, and which could be used in the evaluation of public health and other interventions to reduce population level BMI.
- M. The availability of social welfare claims data was of critical importance in estimating the indirect costs of overweight and obesity in this study. However the range and quality of the data varied across the two jurisdictions. There is a need to consider how best we can facilitate access by researchers to social welfare claims data in both the Republic of Ireland and Northern Ireland, working within existing data protection legislation.

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