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Original Research

The potential health and economic effect of a Body Mass Index decrease in the overweight and obese population in Belgium

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ABSTRACT

Objectives: The aim of the study was to examine the health and economic consequences of a Body Mass Index decrease in the Belgian overweight and obese population over a 20-year time period.

Study design: Health economic evaluation study.

Methods: A Markov decision-analytic model using a societal perspective was applied, projecting the one-year results of a one unit Body Mass Index decrease over a time horizon of 20 years. Scenario analysis was applied evaluating the effects on the results of an alternative modelling assumption. One-way sensitivity analysis and probabilistic sensitivity analysis were performed to assess the effects on the findings of varying key input parameters.

Results: A one unit Body Mass Index decrease resulted in improved health outcomes and cost savings/patient (overweight women: 785€, obese women: 1039€, overweight men: 613€, obese men: 864€). For the total overweight and obese population, a cost saving of 2.8 billion euros was estimated. Considering the economic value of the health impact would result in a total economic benefit of about 15.9 billion euros for the Belgian society over a 20 year time period.

Conclusions: A one unit Body Mass Index reduction in the overweight and obese population in Belgium was found to be associated with improved health outcomes and cost savings. The evidence of such research can assist regulatory bodies in the allocation of healthcare budgets in a more efficient way.

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Introduction

The prevalence of overweight (Body Mass Index – BMI 25–29.9 kg/m^2) and obesity (BMI ≥30 kg/m^2) has increased in the last decades and has become a serious global public health concern.[1] According to the results of the US National Health and Nutrition Examination Survey from 2009 to 2010, 69% of a nationally representative sample of the adult population was overweight, including 36% of them classified as obese.[2] In Europe, the obesity prevalence has increased by about 10–40% in the majority of countries during the last ten years of the 20th century.[3] In Belgium, the results of the 2008 Health Survey Interview identified that 33% of a nationally representative sample of the adult general population was classified as being overweight and 14% as obese. It was moreover found that the prevalence of overweight increased from 30% in 1997 to 33% in 2008, while for obesity an increase from 11% to 14% during the same period was observed.[4] The burden of overweight and obesity is not only increasing in the developed world, but also in low- and middle-income countries.[5] Whereas in the past obesity was mostly associated with the higher socio-economic groups in these countries, it now tends to shift towards the groups with lower socio-economic status. It is assumed that the two most important reasons for the obesity increase in low- and middle-income countries are urbanization and globalization of food production and marketing.[6,7] Obesity is together with a number of clinical and metabolic elements a risk factor for the development of several non-communicable diseases such as diabetes, coronary heart disease (CHD), stroke, colon cancer and breast cancer.[8]

The growing burden of obesity and its related comorbidities will likely result in rising direct and indirect healthcare expenditures. Direct costs include the costs of the diagnosis and treatment of overweight and obesity and especially their associated diseases and complications, while the indirect costs are those resulting from work absenteeism, early retirement, and the lost value of life due to premature mortality.[9] Therefore strategies aimed at reducing this burden should be integrated into public health policies. Evidence on which strategies work best and are thus most 'effective' is yet insufficient for policy making. Healthcare budgets are limited, hence governments are facing the problem how to set priorities in the allocation of health care resources to medical or public health interventions. So, studies evaluating the impact of weight loss on health outcomes and costs are important because such research can provide payers and governments with better insights how to spend the available resources in the most efficient way. Indeed, weight management interventions require an investment and it is therefore important for policy makers to understand the potential savings and health benefits of such interventions. With this study, it was the aim to evaluate the potential health and economic consequences for the Belgian society if the BMI of the overweight and obese population would decrease with one unit and thereby to apply a framework and method that can also be applied in other countries.

Methods

Decision-analytic model

A Markov decision-analytic model was used to predict costs and health outcomes – expressed as quality-adjusted life years (QALYs) – associated with one unit BMI decrease vs. no BMI decrease over a 20-year time horizon including 20 one-year time periods (called 'cycles'). QALYs are calculated by multiplying the utility level for a given condition (a health-related quality of life weight ranging between 0 and 1) with the number of years an individual lives with a particular condition. A simulation of the cohort was made based on BMI change and the associated risk of weight gain related diseases. As the risk of developing these diseases varies according to age, sex and BMI category, four separate models were constructed: (i) overweight women, (ii) obese women, (iii) overweight men, and (iv) obese men.

The Markov model is based on two published models[11,12] and further developed to account for the specific context of the current study. Eleven health states were included (Fig. 1). All individuals start in the 'at risk' state. During each cycle, an individual has a risk of moving to one of the disease states or to 'dead'. Once an individual is suffering from diabetes, he or she can only remain in that state, move to one of the other disease states or to 'dead'. Patients suffering from stroke move to the 'stroke 1' state. Subsequently, they move to the 'stroke 1+' state or to 'dead'. Patients who have had a fatal stroke move to the 'dead' state after being in the 'stroke 1' state for one year. Patients in the 'stroke 1+' state can only stay in that state or move to 'dead'. Transitions throughout the model for patients suffering from CHD, colon cancer and breast cancer are analogous as for stroke. Once a patient enters the 'dead' state, no further transitions are possible, since this is the final state. Breast cancer was not taken into account in the Markov model for men.

Clinical data inputs: disease and mortality transition probabilities

First, the risk of developing the diseases included in the model was calculated not accounting for the increased risk of suffering from such a disease associated with overweight or obesity. For diabetes, CHD, and stroke age- and sex-dependent incidence rates from the Netherlands[13] were used, since no such data for Belgium was found. The age- and sex-dependent risk of developing colon and breast cancer was derived from the Belgian Cancer Registry.[14] Second, the transition probabilities were multiplied with a relative risk (RR) factor since it is known that overweight and obesity are associated with an increased risk of developing the diseases included in the model[15] (Table 1). The transition probabilities from 'diabetes' to the other disease states were calculated by multiplying the transition from 'at risk' to 'diabetes' since diabetic patients have an increased risk of developing stroke, CHD, colon cancer, or breast cancer (Table 1).

The mortality probabilities were obtained from the literature or they were calculated by multiplying national mortality probabilities with the increased risk of dying from one of the diseases.