Economic burden of diabetes related to excess body weight in Hong Kong

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KEY MESSAGES

1. Current health care costs for diabetes amount to around $2 billion per year, about half of which are related to overweight and obesity among adults.
2. Hong Kong may witness an increase in adult obesity in future, which is predicted to lead to an 8% rise in health care costs for diabetes and a 10% rise in deaths due to diabetes in those aged <65 years.
3. e model developed in this project can be used to predict impacts on deaths in persons aged <65 years, changes in life expectancy, years lived with diabetes, and health care costs for diabetes with changes in rates of excess weight in adults.

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Introduction

In Hong Kong, rates of obesity appear to be rising, with almost 20% of children at school in 2006 being classified as obese.[1] A local survey found 21% and 18% of adults to be obese and overweight, respectively.[2] e incidence of type-2 diabetes mellitus in adults is increasing. is has implications for mortality, quality of life, and cost of health care. A model predicting the impact of changes in rates of obesity on the costs of health care due to diabetes can be of use.

is study aimed to estimate the costs of diabetes in Hong Kong associated with excess body weight and the likely changes in these costs over time under di erent assumptions. e objectives were to (1) estimate the current cost of treating diabetes and its main complications, (2) estimate the risk of diabetes with increasing weight, the risk of complications in those who have diabetes, and the current levels of increased weight in the local population, and (3) build a decision-tree-based Markov model to simulate the costs of diabetes in the Hong Kong population over future years under various rates of obesity over time.

Methods

is study was conducted from April 2007 to March 2008. Local information was used to estimate the prevalence of di erent levels of body weight by age-groups in both adults and children and to make assumptions about possible levels of adult obesity based on levels presently prevailing among children.

e Asian cut-o levels for overweight (body mass index [BMI], ≥23) and obesity (BMI, ≥25) were used.[3] e estimates for overweight and obesity in adults were taken from the measured data recorded in the Population Health Survey in 2003/4[2] and for children from the data reported by the Department of Health.[1] Asia Pacific risks of mortality from specific causes were used,[4] overseas estimates for risks of developing diabetic complications[5] and local estimates for risk by body weight of developing diabetes.[6] e population attributable risk (PAR) method was used to calculate the number of deaths attributable to diabetes and its complications each year and the number of inpatient admissions. Survey data was used to identify the likelihood of extra outpatient consultations for those with diabetes. Local data on health care costs, the annual cost of diabetes and related complications were estimated, and a cost per case derived.

Applying the PAR method using the risk of developing diabetes for those who are overweight or obese and the prevalence of excess weight, the proportion of inpatient and outpatient use for diabetes attributable to increased weight was calculated. e average cost per case of diabetes and current and future levels of overweight in the Hong Kong population were used in a Markov model along with US estimates of the probability, based on BMI, of developing diabetes during their remaining lifetime to predict future health care costs of diabetes due to excess weight.[7]

Results

Using self-reported data on weight and height, the prevalence of overweight and obesity among adults has not increased markedly over the years from 2004 to 2007 except among men (Fig 1). In 2003/4, 18% and 21% of adults were overweight and obese, respectively.[2] e prevalence of obesity among

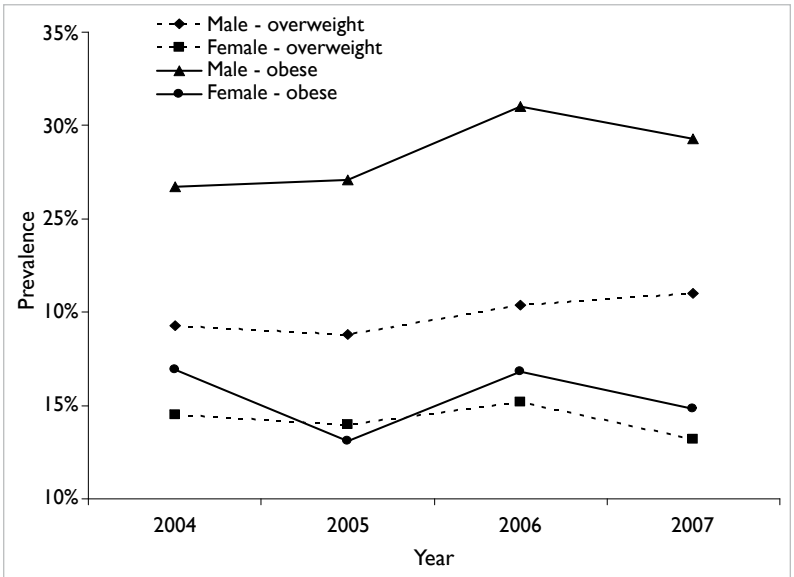

FIG 1. Prevalence of self-reported excess weight among adults, 2004-7
Source: Department of Health, Hong Kong[1]

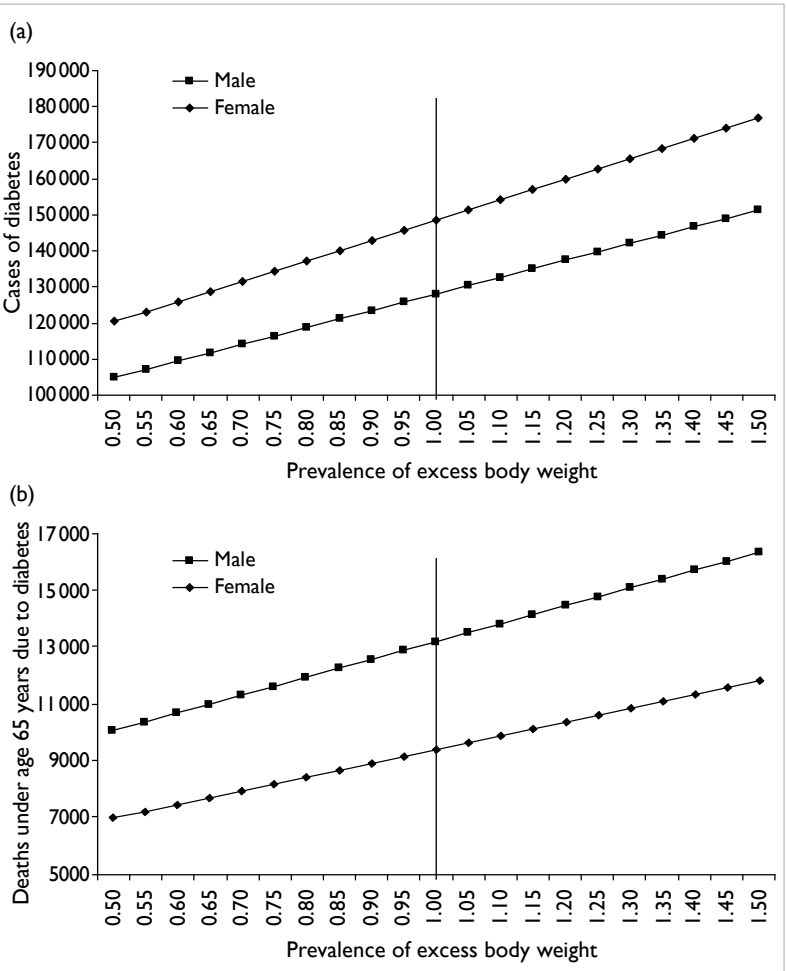

FIG 2. The number of people in one million who would (a) develop diabetes, and (b) die under the age of 65 years at specific prevalence of excess body weight relative to the present (1.00)

primary school children has increased from about 16% in 1997/1998 to 19% in 2005/2006, a rise of about 22%.

e Cardiovascular Risk Factor Study[6] showed that overweight subjects were 2.3 (95% confidence interval [CI]=1.5-3.4) times and obese subjects were 3.9 (95% CI=2.8-5.5) times more likely than those of normal or underweight to develop diabetes. Using the PAR approach, 1475 deaths (using those coded as due to diabetes or its complications) to 1648 deaths (using all-cause mortality) were estimated to be attributed to diabetes each year. e cost of health care for those with diabetes was HK$2.1 billion in 2006, of which $1.8 billion was for inpatient care and the rest for outpatient care. e average annual cost per case was about $5000 for those under 65 years and $14 000 for those ≥65 years. Of these costs, around half could be attributed to diabetes in those with excess body weight.

If we model the 2006 population of 5 653 000 inhabitants aged over 18 years, around 1.6 million cases of diabetes are expected during the cohort's lifetime, ie a lifetime risk of 28% on average. Of these cases, almost 600 000 (37%) would be among those of normal or underweight, whereas 300 000 (20%) and 700 000 (42%) among the overweight and obese people. ose with excess body weight would have diabetes at a younger age than those with normal weight. About 127 690 (8%) of the inhabitants would die before the age of 65 years and about half of these would be from the obese group.

Of the $396 billion diabetes-attributable health care costs over the lifetime of this cohort, $139 billion (35%) would be spent on those of normal weight, whereas $81 billion (20%) and $177 billion (45%) on those who are overweight and obese, respectively. On average, for each person with diabetes, $237 521 would be spent over their lifetime if he/she is of normal weight, and $14 309 and $30 890 more if he/she is overweight and obese, respectively.

On average, 13 years (for men) and 16 years (for women) from a life expectancy of 78 years and 84 years, respectively, would be spent with diabetes. For those with diabetes who are overweight the average duration of diabetes is 23 years (for men) and 26 years (for women), and for those who are obese, the respective estimates are 25 and 30 years.

is model was used to estimate the total lifetime costs for the population with an alternative scenario that the rates of adult obesity would rise by about 20%, as a result of an increase in obesity rates in primary school children 10 years previously. is would result in a 7% increase in the number of cases of diabetes (from 1.57 to 1.66 million), a 10% increase in the number of deaths under 65 years (from 128 000 to 140 000), and an 8% increase in the health care costs (from $396 to $430 billion) [Figs 2 and 3]. e impact of the current level of overweight

is shown by the vertical line from the prevalence of 1.00 in the middle of the chart, and an increase or decrease in prevalence is reflected by moving to the right or left of this point along the horizontal axis. For example, the impact of a rise in obesity rates of 50% would be indicated by a vertical line from the prevalence of 1.50.

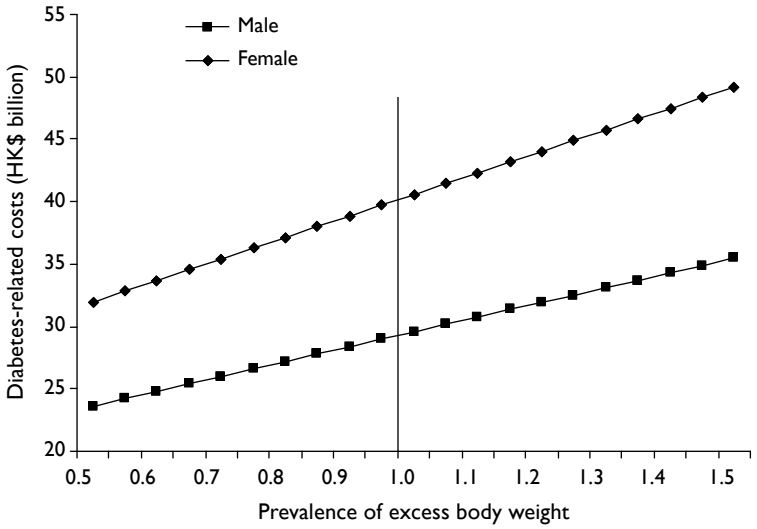

FIG 3. The costs of health care for diabetes in a population of one million at specific prevalence of excess body weight relative to the present (1.00)

Conclusions

Diabetes is a chronic disease which results in around 1500 deaths and health care costs of about $2 billion per year in Hong Kong. Around half of this cost, $1 billion, is related to excess body weight, and some of this is potentially avoidable with improved lifestyle and prevention of excess weight gain. ere is no evidence that rates of obesity in adults are rising, but the rates in children are rising with an increase of 22% and 23% in primary and secondary schoolchildren over the 10 years to 2006. If a future rise of about 20% in adult obesity is estimated, a rise of about 8% in health care costs and 10% in deaths in those aged under 65 years are expected. is model can be used to determine the impact on deaths in persons aged under 65 years, life expectancy, years spent with diabetes, and health care costs with changes in rates of overweight/obesity or the impact of interventions to stem such an increase.

Acknowledgement

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