The impact of weight loss in a Japanese cohort of individuals living with obesity

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Aims

- In this analysis, we modelled the estimated effects of 10% and 15% weight loss on obesity-related complication (ORC) incidence and associated healthcare costs in Japan by 2029.

Introduction

- The prevalence of obesity has increased worldwide over the past decades,[1] including in Japan.[2,3]
- The total costs of overweight/obesity, including both direct and indirect costs, have been estimated to amount to 1% of Japan's gross domestic product.[4] ORCs such as type 2 diabetes (T2D) and cardiovascular disease are major drivers of these costs.[5,6]
- Weight loss can lead to improvements in ORCs and reductions in associated healthcare costs.[7] In Japan, weight loss of 3% or more is considered clinically relevant to improve risk factors for ORCs.[8]

Methods

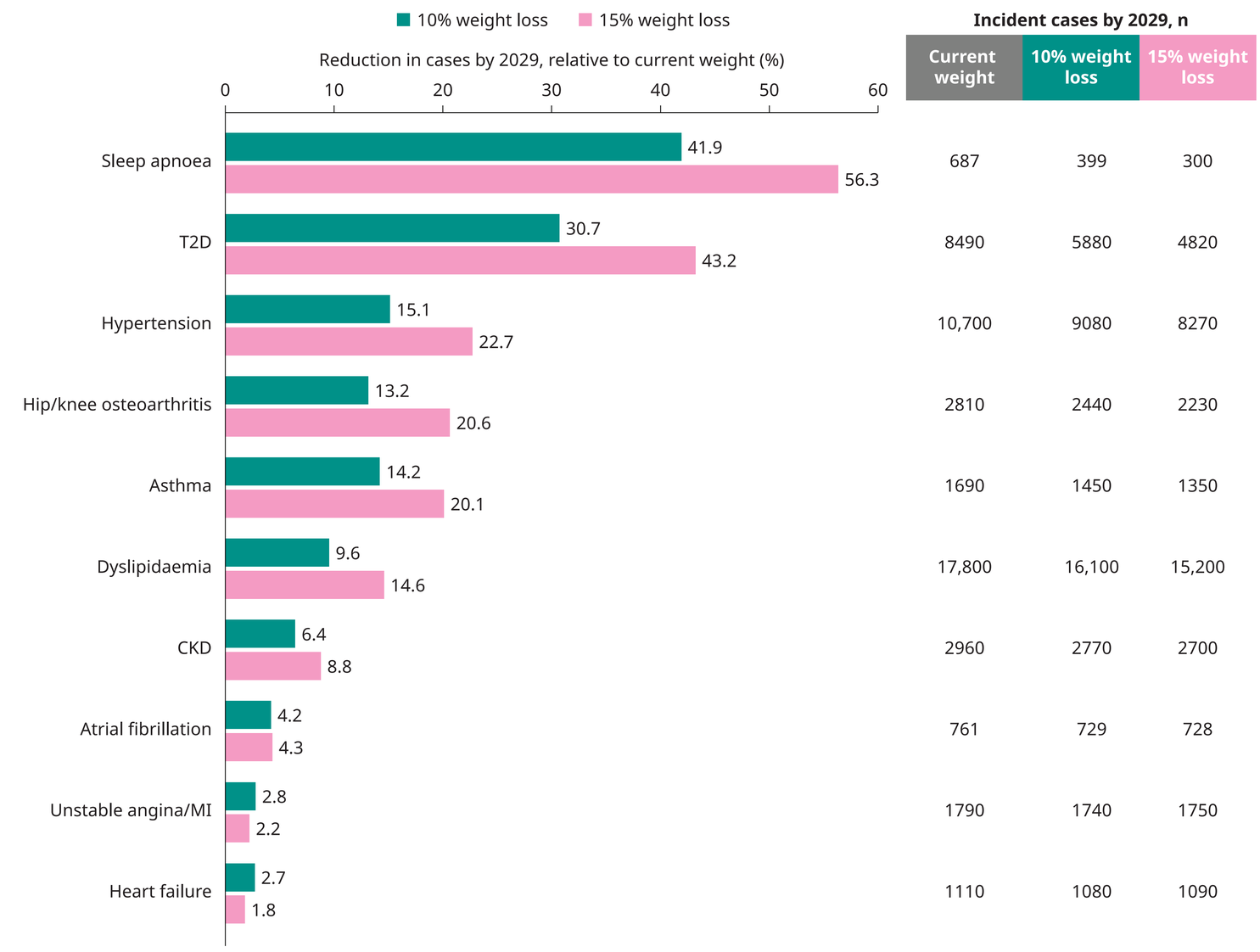
- We employed a previously published model originally developed using a UK cohort.[9] The model generates incidence estimates and associated direct healthcare costs for 10 ORCs in a given cohort defined by age range, sex distribution and body mass index (BMI) range.
  - The risk engine behind the simulation is based on individual risk prediction on the basis of BMI, weight change, age, sex, smoking status, baseline comorbidities and cardiovascular history.
  - The 10 ORCs included in the model are asthma, atrial fibrillation, chronic kidney disease (CKD), dyslipidaemia, heart failure, hip/knee osteoarthritis, hypertension, sleep apnoea, T2D and unstable angina/myocardial infarction (MI).
  - Direct healthcare costs comprised outpatient and emergency room visits, inpatient care and pharmacy costs.
- We used an adaptation of the UK risk engine that reflects the higher ORC risk for a given BMI in Asian populations.[10]
- The model estimated the incident ORCs and associated direct healthcare costs that would be avoided if all individuals in a cohort of 100,000 Japanese individuals with obesity in 2024 had either 10% or 15% lower body weight compared with their actual weight in that year.
  - The model results represent a hypothetical scenario whereby the cohort has lower mean weight without modelling how this has been achieved. Therefore, the duration and cost of weight loss interventions are not taken into account.
- Data on age and sex distribution in the Japanese population were obtained from the e-Stat portal site for Japanese government statistics.
- Obesity and ORC prevalence data were obtained from the Japanese Medical Data Vision (MDV) electronic health records database, and cost estimates were from the IQVIA claims database and studies identified in a targeted literature review.
  - Costs from the studies were converted to estimated costs in 2024, and are shown in US dollars (USD) and Japanese yen (JPY).

Table 1: Estimated ORC prevalence and associated direct healthcare costs in Japan in 2024

ORC	Prevalence (%)	Direct costs, millions, USD (billions, JPY)
Hypertension	**30.8**	5.4 (0.8)
Dyslipidaemia	**17.7**	3.3 (0.5)
T2D	**16.6**	**58.1 (8.7)**
Unstable angina/MI	9.0	**47.4 (7.1)**
Asthma	5.3	4.6 (0.7)
CKD	4.4	6.7 (1.0)
Heart failure	4.2	**38.7 (5.8)**
Atrial fibrillation	3.7	3.4 (0.5)
Hip/knee osteoarthritis	3.6	1.8 (0.3)
Sleep apnoea	3.1	2.4 (0.4)
Total	–	**171.7 (25.6)**

Bold text indicates the ORCs with the highest prevalence and/or associated costs.
CKD, chronic kidney disease; JPY, Japanese yen; MI, myocardial infarction; ORC, obesity-related complication; T2D, type 2 diabetes; USD, US dollar.

Figure 1: Reductions in incident ORC cases by 2029 with 10% and 15% weight loss, relative to current weight



CKD, chronic kidney disease; MI, myocardial infarction; ORC, obesity-related complication; T2D, type 2 diabetes.

- Based on data from the general population, the study population was assumed to be 56.9% men and 43.1% women, aged between 20 and 69 years, and with a BMI in the range of 25–50 kg/m^2, which is in alignment with Japanese guidelines that define a BMI of ≥25 kg/m^2 as the lower threshold for obesity.[11]

Results

- The ORCs with the highest estimated prevalence in Japan in 2024 were hypertension (30.8%), dyslipidaemia (17.7%) and T2D (16.6%; **Table 1**).
- The estimated total direct healthcare costs associated with the 10 ORCs of interest were 171.7 million USD (25.6 billion JPY) in 2024, with the highest costs contributed by T2D, unstable angina/MI and heart failure (**Table 1**).
- Compared with a scenario based on the current weight distribution, there were estimated to be fewer incident cases of ORCs by 2029 with 10% weight loss, and generally fewer still with 15% weight loss (**Figure 1**).
  - The ORCs with the greatest estimated reductions in incidence as a result of 10% or 15% weight loss were sleep apnoea (41.9%/56.3% reduction), T2D (30.7%/43.2% reduction) and hypertension (15.1%/22.7% reduction).
- The total cumulative cost reduction resulting from reduced incidence of all ORCs by 2029 with 10% weight loss was estimated as 34.6 million USD (5.2 billion JPY). With 15% weight loss, the estimated cost reduction was 47.7 million USD (7.1 billion JPY; **Table 2**).
  - The majority of estimated cost reductions resulted from reductions in cases of T2D (10% weight loss: 28.3 million USD/4.2 billion JPY; 15% weight loss: 39.7 million USD/5.9 billion JPY).
  - The remaining estimated cost reductions largely resulted from reduced incidence of dyslipidaemia, hypertension and CKD.

Table 2: Estimated cost reductions by 2029 with 10% and 15% weight loss

ORC	Cumulative reductions with 10% weight loss, millions, USD (billions, JPY)	Cumulative reductions with 15% weight loss, millions, USD (billions, JPY)
T2D	28.3 (4.2)	39.7 (5.9)
Dyslipidaemia	1.0 (0.16)	1.6 (0.24)
Hypertension	0.92 (0.14)	1.4 (0.20)
CKD	0.89 (0.13)	1.2 (0.18)
Sleep apnoea	0.68 (0.10)	0.92 (0.14)
Asthma	0.63 (0.09)	0.91 (0.14)
Hip/knee osteoarthritis	0.54 (0.08)	0.85 (0.13)
Unstable angina/MI	0.68 (0.10)	0.61 (0.09)
Heart failure	0.91 (0.14)	0.53 (0.08)
Atrial fibrillation	0.08 (0.01)	0.09 (0.01)
Total	**34.6 (5.2)**	**47.7 (7.1)**

Cost reductions for each ORC have been rounded and do not sum to the total value displayed.
CKD, chronic kidney disease; JPY, Japanese yen; MI, myocardial infarction; ORC, obesity-related complication; T2D, type 2 diabetes; USD, US dollar.

Strengths and limitations

- We adapted a published model that has been employed to assess the impact of weight loss in different geographic regions.
- The MDV database contains a broad range of detailed data from a large proportion of the Japanese population, and costs of ORCs were identified via a comprehensive literature review.
  - However, the MDV database has limited generalizability because the data are from hospitals, which means that patients tend to have more severe conditions than those in primary care.
- In addition, the model did not account for new cases of obesity and considered only a limited selection of ORCs.
- The analysis does not consider any reductions achieved by improvement of existing ORCs via weight loss, meaning that some economic benefits of weight loss are not captured.
- The model did not consider the costs associated with weight loss interventions.

Conclusions

- Our results suggest that weight reduction in Japanese people living with obesity could reduce the incidence of ORCs over the next 5 years.
- In addition to reducing the clinical burden of obesity, this could result in considerable cost savings for the healthcare system, thus helping to limit the overall economic burden of obesity.

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