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METADATA – BURDEN OF HIGH BODY MASS INDEX

Description	The proportion of total mortality in Belgium that could be avoided by maintaining an optimal body mass index (BMI) is quantified through mortality and years of life lost (YLLs) attributable to high BMI. These indicators provide a measure of the population health burden associated with excess body weight, enabling the monitoring of this major public health issue and the evaluation of the impact of implemented policies.
Rationale	High BMI is a major public health concern and contributes substantially to the burden of disease worldwide and in Belgium. Understanding and quantifying this impact is essential for guiding public health interventions and policy. One way to measure this impact is through the calculation of the BMI-attributable burden of disease. High BMI is associated with an increased risk of numerous health outcomes, including cardiovascular diseases, type 2 diabetes, chronic kidney disease, musculoskeletal disorders, and several types of cancer (1). The attributable burden represents the proportion of disease burden that could be reduced if exposure to high BMI were decreased to an optimal level in the population. This burden is estimated using comparative risk assessment (CRA) methodology (2), which relies on the calculation of the population attributable fraction (PAF). The PAF represents the proportion of disease burden that is attributable to exposure to high BMI compared with a theoretical minimum-risk exposure level. Exposure to high BMI is estimated using the distribution of BMI in the Belgian population, taking into account differences by age and sex. Relative risks derived from epidemiological studies are then used to quantify the association between BMI and specific health outcomes. To estimate the attributable burden, the PAF is applied to the corresponding disease burden, which can be expressed in terms of mortality, morbidity, disability-adjusted life years (DALYs), years of life lost (YLLs), or years lived with disability (YLDs). The CRA approach provides valuable information on the health impact of excess body weight and can support the identification of public health priorities and the development of strategies aimed at preventing overweight and obesity.
Primary Data source	National data : • Self-reported height and weight from the Belgium Health Interview Survey by age, sex, and region for every wave. Correction was applied using the Health Examination Survey (HES). • Population data and mortality data from Statistics Belgium. International data : • Relative Risk dataset from the Global Burden of Disease Study (GBD) (3)
Indicator source	Estimate for high BMI attributable deaths and YLLs by age, sex and region from the Belgian Burden of Diseases Study, Sciensano
Periodicity	Yearly estimates from 2013
Calculation, technical definitions and limitations	High BMI-attributable burden was estimated using a Comparative Risk Assessment framework. The theoretical minimum risk exposure level (TMREL) for BMI was set at 22.5 kg/m², in line with GBD methodology (3). Individuals with BMI values below this threshold were assumed to have no excess risk, while relative risks increased continuously for BMI values above the TMREL, according to disease-specific risk functions expressed per 5 kg/m² increase in BMI. Disease-specific relative risks were estimated at the individual level using each participant's BMI and were then aggregated by year, region, sex and age group. To generate a full time series of relative risks and mean BMI, including years and strata without Belgian Health Interview Survey data, group-level estimates were modelled using Bayesian INLA models with a gamma likelihood distribution.

	The estimated relative risks were subsequently used to calculate PAFs for each disease. These PAFs were subsequently applied to disease-specific burden estimates, such as mortality and years of life lost, to estimate the burden attributable to high BMI. Limitations include: • BMI estimates were derived from corrected self-reported height and weight data. Although correction equations were applied to reduce reporting bias, residual measurement error may remain and could affect estimates of exposure and attributable burden. • The analysis assumes a fixed theoretical minimum risk exposure level (TMREL) of 22.5 kg/m² for all population groups and years, following GBD methodology. However, the optimal BMI associated with minimum health risk may vary across populations, age groups, and outcomes. Using a fixed TMREL does not capture this uncertainty, and a distribution-based TMREL could provide a more realistic representation of the minimum-risk exposure level. • Relative risks were derived from published epidemiological evidence and may not fully reflect the strength of associations in the Belgian population. • Disease-specific relative risk time series were partially based on modelled estimates to generate values for years and population subgroups with limited or no survey data, introducing additional model uncertainty. • Morbidity components are not available yet, offering a partial picture only of the attributable burden of high BMI
International comparability	Availability: estimates are available and calculated by GBD for each country. Comparability: Estimates are broadly comparable with those produced in other burden of disease studies because they follow GBD-based methods for relative risks, TMREL definition, and PAF estimation. However, differences in BMI data sources (corrected self-reported versus measured data), modelling assumptions, and population characteristics may limit direct comparisons between countries.

Reference list

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(2) Plass D, Hilderink H, Lehtomäki H, Øverland S, Eikemo TA, Lai T, et al. Estimating risk factor attributable burden - challenges and potential solutions when using the comparative risk assessment methodology. Arch Public Health. 2022 May 27;80(1):148. doi:10.1186/s13690-022-00900-8 PubMed PMID: 35624479; PubMed Central PMCID: PMC9137119.

(3) Brauer M, Roth GA, Aravkin AY, Zheng P, Abate KH, Abate YH, et al. Global burden and strength of evidence for 88 risk factors in 204 countries and 811 subnational locations, 1990–2021: a systematic analysis for the Global Burden of Disease Study 2021. The Lancet. 2024 May 18;403(10440):2162–203. doi:10.1016/S0140-6736(24)00933-4 PubMed PMID: 38762324.