

## Body mass index history and mortality among persons with recently diagnosed type 2 diabetes

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**Background and aims:** The association of historical BMI with longevity among persons with type 2 diabetes (T2D) is scarcely understood. Any adverse prognostic impact of high BMI at T2D diagnosis may be biased downwards by lower BMI being related to recent weight loss due to e.g., falling insulin secretion and undetected comorbidity. We compared associations of self-reported BMI at age 20 years, self-reported highest lifetime BMI, and BMI at diabetes diagnosis with mortality.

**Materials and methods:** We included 4,703 persons with recently diagnosed T2D enrolled in the Danish Centre for Strategic Research in Type 2 Diabetes (DD2) cohort. BMI was categorized as normal weight (NW, 18.5-25 kg/m<sup>2</sup>), overweight (OW, 25-30 kg/m<sup>2</sup>), obesity-I (OB-I, 30-35 kg/m<sup>2</sup>), and obesity-II (OB-II, >35 kg/m<sup>2</sup>). We followed all patients in the registers from DD2 enrolment until the exact date of death, emigration, or end of follow-up. Using Cox regression, we estimate hazard ratios as a measure of mortality rate ratio (MMR) adjusted for sex, age, smoking, alcohol intake, family history of T2D, patient enrolment site, and Charlson Comorbidity Index using NW as reference.

**Results:** We observed 263 deaths (5.6%) during a median of 4.4 years of follow-up. For BMI at age 20 years, MMRs (95% confidence interval (CI)) were 1.28 (0.92, 1.76), 1.01 (0.47, 2.17), and 2.99 (1.44, 6.18) for OW, OB-I, and OB-II, respectively. MMRs for highest lifetime BMI were 1.54 (0.79, 3.01), 1.39 (0.71, 2.71), and 2.11 (1.09, 4.08), and MMRs for BMI at diabetes diagnosis were 0.86 (0.58, 1.27), 1.03 (0.69, 1.53), and 1.41 (0.92, 2.15). Modelling BMI at diabetes diagnosis as a continuous variable yielded a non-linear J-shaped association with all-cause mortality. In contrast, there was a strictly linear association of highest lifetime BMI with mortality (Figure 1).

**Conclusion:** Among persons with recently diagnosed T2D, mortality associations differed for BMI measured at different time points in life. This has implications for the interpretation of the prognostic impact of BMI at diabetes diagnosis and the clinical guidance associated herewith. All-cause mortality was particularly increased with severe obesity (BMI>35 kg/m<sup>2</sup>), with the highest MMRs observed for BMI at age 20 years and highest lifetime BMI.

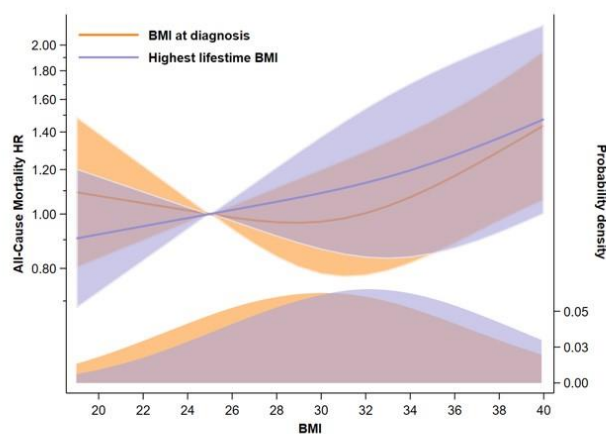


Figure 1: All-cause mortality rate ratios among persons with recently diagnosed T2D, associated with BMI measured at diabetes diagnosis (yellow) versus self-reported highest lifetime BMI prior to diabetes diagnosis (blue). The continuous dose-response pattern was modelled using restricted cubic splines with knots at the 10<sup>th</sup>, 50<sup>th</sup>, and 90<sup>th</sup> percentiles of the exposure distribution. The reference was a BMI of 25 kg/m<sup>2</sup>.

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