

# Abstract

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## Body-mass index and incidence of cancer: a systematic review and meta-analysis of prospective observational studies.

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**BACKGROUND:** Excess bodyweight, expressed as increased body-mass index (BMI), is associated with the risk of some common adult cancers. We did a systematic review and meta-analysis to assess the strength of associations between BMI and different sites of cancer and to investigate differences in these associations between sex and ethnic groups.

**METHODS:** We did electronic searches on Medline and Embase (1966 to November 2007), and searched reports to identify prospective studies of incident cases of 20 cancer types. We did random-effects meta-analyses and meta-regressions of study-specific incremental estimates to determine the risk of cancer associated with a 5 kg/m<sup>2</sup> increase in BMI.

**FINDINGS:** We analysed 221 datasets (141 articles), including 282,137 incident cases. In men, a 5 kg/m<sup>2</sup> increase in BMI was strongly associated with oesophageal adenocarcinoma (RR 1.52, p<0.0001) and with thyroid (1.33, p=0.02), colon (1.24, p<0.0001), and renal (1.24, p<0.0001) cancers. In women, we recorded strong associations between a 5 kg/m<sup>2</sup> increase in BMI and endometrial (1.59, p<0.0001), gallbladder (1.59, p=0.04), oesophageal adenocarcinoma (1.51, p<0.0001), and renal (1.34, p<0.0001) cancers. We noted weaker positive associations (RR <1.20) between increased BMI and rectal cancer and malignant melanoma in men; postmenopausal breast, pancreatic, thyroid, and colon cancers in women; and leukaemia, multiple myeloma, and non-Hodgkin lymphoma in both sexes. Associations were stronger in men than in women for colon (p<0.0001) cancer. Associations were generally similar in studies from North America, Europe and Australia, and the Asia-Pacific region, but we recorded stronger associations in Asia-Pacific populations between increased BMI and premenopausal (p=0.009) and postmenopausal (p=0.06) breast cancers.

**INTERPRETATION:** Increased BMI is associated with increased risk of common and less common malignancies. For some cancer types, associations differ between sexes and populations of different ethnic origins. These epidemiological observations should inform the exploration of biological mechanisms that link obesity with cancer.

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