

## What is the optimal body mass index for Chinese people?

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See related research article by Lin and colleagues at [www.cmaj.ca/cgi/doi/10.1503/cmaj.100303](http://www.cmaj.ca/cgi/doi/10.1503/cmaj.100303).

In this issue, Lin and colleagues report the findings of their study of the association between body mass index (BMI) and all-cause mortality among Chinese adults aged 20 years or older.<sup>1</sup> Using data collected over 10 years for 124 456 participants, they observed a U-shaped association between BMI and mortality. A BMI of 24.0–25.9 for men and women was associated with the lowest mortality and was deemed by the authors as optimal.

Lin and colleagues' findings are consistent with those from previous studies in Chinese and white populations. In a cohort study involving 169 871 Chinese people aged 40 years or older, for example, Gu and colleagues found that a BMI of 24.0–24.9 was related to the lowest risk of death.<sup>2</sup> In white populations, extremely low and high BMI values were found to be associated with an excess risk of death in several nationwide studies.<sup>3–5</sup> In a more recent study involving 11 326 Canadians aged 25 years or older, Orpana and colleagues found that both underweight (BMI < 18.5) and severe obesity (BMI ≥ 35) were strong risk factors for all-cause mortality.<sup>4</sup> However, the optimal BMI values reported in the two Chinese studies<sup>1,2</sup> were higher than those reported in the white populations. For example, on the basis of data from 19 prospective studies involving a total of 1.46 million white adults, Berrington de Gonzalez and colleagues found that BMI values of 22.5–24.9 were optimal in white adult populations.<sup>5</sup>

The findings in the study by Lin and colleagues are important because they seem to challenge the current definitions of overweight and obesity and are inconsistent with the pattern found in white populations and for the relation between BMI and chronic diseases, in particular cardiovascular diseases. The World Health Organization (WHO) defines overweight as a BMI of 25 or higher and obesity as a BMI of 30 or higher. Lower BMI cutoff values for overweight and obesity have been suggested for Chinese populations by WHO and others.<sup>6</sup> For example, Zhou suggested cutoff values of 24 for overweight and 28 for obesity among Chinese adults.<sup>7</sup> Weng and colleagues reported that a BMI of 23 seemed more appropriate for

identifying Chinese people at increased risk of obesity-related metabolic disorders.<sup>8</sup> However, according to the findings by Lin and colleagues<sup>1</sup> and by Gu and colleagues,<sup>2</sup> these BMI values used to define overweight fall clearly in the range of optimal values. Is there sufficient evidence to consider raising the BMI cutoff for overweight and obesity in the adult Chinese population?

Over the past decades, the prevalence of cardiovascular diseases and diabetes in China has climbed to a level almost equal to that in developed countries. The prevalence of overweight and obesity, although still lower than that in developed countries, is increasing rapidly. For example, from 1992 to 2002, the prevalence of overweight in China increased by 38.6%, and the prevalence of obesity by 80.6%.<sup>9</sup> In 2002, the average BMI among Chinese adults was reported to be a few units lower than that among white adults.<sup>10</sup> In addition, Asian people are reported to have a higher percentage of body fat and more abdominal fat than white people with the same BMI.<sup>11</sup> Central obesity defined by such methods as waist circumference has been shown to be more strongly related to the risk of cardiovascular diseases and other chronic diseases than obesity defined by BMI. Consequently, a lower BMI value may still be associated with an increased risk of chronic diseases, especially cardiovascular disease and diabetes. These observations all suggest that the optimal BMI values in the adult Chinese population should be lower than those in the white population, which contradicts what is suggested by Lin and colleagues.

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### KEY POINTS

- A new study suggests a U-shaped association between body mass index (BMI) and all-cause mortality among adult Chinese people as opposed to the generally observed J-shaped association.
- The U-shaped association suggests a higher BMI than the currently recommended cutoff for defining overweight and obesity in Chinese populations.
- Raising the BMI cutoff for overweight and obesity could play down the burden of obesity and lead to further increases in its related diseases.
- More evidence is needed to clarify whether a low BMI is a direct cause of mortality or merely a consequence of pre-existing chronic diseases that cause death.

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The critical part of the curve for determining whether BMI values of 24.0–25.9 are optimal is the lower end rather than the upper end we have discussed above. If the lower BMI values associated with increased mortality are not causal or only partially causal, the upward tail of the curve at the low end would be “pressed down” and the association between BMI and mortality would become a linear line or a J-shaped curve instead of a U-shaped curve. Either a J-shaped curve or a linear line would still suggest that the current or an even lower BMI would be appropriate for defining overweight and obesity.

Can the increased mortality among people with very low BMI values be explained by factors other than a low BMI? Evidence seems to suggest that the increased mortality among underweight people may be due at least in part to reverse causality,<sup>12</sup> whereby a chronic, undiagnosed disease develops first, and the patient later loses weight as a result. In this scenario, both death and low BMI are the consequences of the chronic disease; low BMI will be associated with, but is not the true cause of, the excess mortality. Lin and colleagues did reanalyze their data by excluding people who died during the first three years of follow-up, but they did not report the results in detail.

But is three years long enough to exclude most people in whom an asymptomatic disease such as cancer has already developed before the study has begun? Freedman and colleagues found that the risk of death among people with low BMI values was reduced substantially when they excluded smokers and people who died during the first five years of follow-up.<sup>12</sup> Berrington de Gonzalez and colleagues found that the hazard ratios for a BMI below 20.0 were attenuated with longer-term follow-up.<sup>5</sup>

In conclusion, the study by Lin and colleagues carries an important message about the appropriateness of the current definition of overweight and obesity. Their findings suggest a BMI for Chinese adults that is higher than the currently recommended cutoff value for defining overweight and obesity in Chinese populations. However, raising the cutoff could play down the cur-

rent burden of obesity and lead to further increases in its related diseases. More evidence is needed to clarify whether a low BMI is a direct cause of mortality or merely a consequence of pre-existing chronic diseases that cause death.

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