

A fatter, healthier but more unequal world

Lancet readers know that the world's population is getting heavier, but the detail in the latest overview of global trends in mean body-mass index (BMI) and the proportion of individuals classified as overweight and obese remains striking.¹ In their pooled analysis of 1698 population-based studies, with more than 19 million participants representing most countries, the NCD Risk Factor Collaboration found that between 1975 and 2014 the mean age-corrected BMI increased from 21.7 kg/m² to 24.2 kg/m² in men and from 22.1 kg/m² to 24.4 kg/m² in women. The prevalence of obesity also increased from 3.2% in 1975 to 10.8% in 2014 in men and from 6.4% to 14.9% in women.

During the same period, global life expectancy at birth has increased from less than 59 years to more than 71 years—an increase of about a third of a year for each year that has passed. Although healthy life expectancy has increased somewhat less than overall life expectancy, it has still shown consistent global improvement.² The common sense view that large increases in obesity should translate into adverse trends in health is not immediately obvious in the global data. The world is at once fatter and healthier.

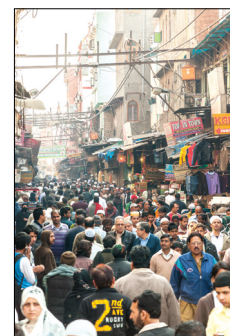
Are the increases in BMI evenly spread throughout the world's population? At a global level, the variance (a statistical estimate of the spread) in BMI has substantially increased.¹ This increase in variance has also been seen in detailed examination of trends within particular countries, and in many demographic subgroups.³ Globally, in the past 40 years, the absolute proportion of obese individuals has increased by 8.5% in women and 7.6% in men, whereas the absolute proportion of underweight individuals has decreased by only 4.9% in women and 5.0% in men.¹ In other words, far fewer people globally are escaping being underweight than are becoming obese. As economic inequalities have increased worldwide,⁴ so have inequalities in weight. The burden of health-compromising levels of BMI—too low and too high combined—is increasing. A study⁵ published in 2015 reported that the prevalence of individuals with a BMI of less than 16 in low-income and middle-income countries remains high, and is strongly related to adverse socioeconomic circumstances.

A controversial aspect of the BMI mortality association is estimation of the optimum BMI. Some observational

studies show that mortality rates are lowest in people classified as overweight,⁶ with the publication of such studies generating glee in the popular media and Twittersphere. If this association between overweight and low mortality were a causal relation, it would resolve the apparent paradox of increasing aggregate BMI and improving health. However, much evidence suggests that this association is generated by the BMI-reducing effects of prodromal factors related to mortality and other confounding factors. BMI assessed in childhood and early adulthood will be less affected by such disease-related processes, and BMI measured at these earlier stages of the life course does not show any apparently protective influence of being overweight.⁷ Markers of BMI, which should not be affected by such processes (so-called instrumental variables), suggest a dramatically different shape of the relationship, with optimum BMI being low-normal.⁸ If higher BMI was having a biologically mediated protective effect then the same optimum BMI level should be seen in populations with different mean BMIs. This is not the case—the lower tail of the BMI distribution shows increased mortality whatever the absolute level of BMI, strongly indicative of selection rather than causation.

Many health consequences of high BMI are unlikely to be directly related to the increased weight itself, rather they are mediated by the adverse metabolic and physiological consequences of increased BMI, including higher blood pressure, adverse lipid profiles, and other metabolic consequences.⁹ These links can be broken, particularly pharmacologically, which is now being done on a mass scale globally (although unevenly). These interventions will attenuate the anticipated morbidity and mortality sequelae of high BMI. However, some of the health effects—and many of the adverse economic consequences¹⁰—of obesity will not be alleviated in this way.

Prevention of the global increase in obesity is proving hard—partly for physiological reasons. With respect to calorie intake, weight change is a buffered and self-limiting process.¹¹ Increased voluntary physical activity leads to compensatory decreases in other components of energy expenditure,¹² resulting in little net benefit. In this respect, human beings are no different to other primates, and genetically informed



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studies suggest that the association between BMI and physical activity is generated to a large extent by higher BMI leading to lower voluntary physical activity, rather than vice versa.¹³ Many proposals exist for comprehensive sets of advisory and legislative policies aimed at tackling obesity.¹⁴ Such presentations greatly outnumber interventions that have robust evidential support. Evaluations that use methods that allow for reasonable causal inference have been applied to several of these approaches with generally disappointing results,¹² yet they have had little influence on the flow or content of the many “calls to action” on global obesity.

Increased disparities are, of course, not restricted to bodyweight. In terms of income and related measures of economic wellbeing, global inequalities have grown in the past four decades.⁴ The increase in inequality, along with increases in healthy life expectancy, is another paradox. With respect to obesity, in high-income countries the poor are more likely to be obese than the better off. However, in many parts of the world the reverse is the case and the poor remain thin¹ to an extent that compromises health and economic productivity. For example, in women of childbearing age, this poverty-related low BMI can have intergenerational effects on the health and development of offspring.⁵ The desire to coherently link sometimes paradoxical trends has led some well-meaning commentators to promote the notion that obesity-related non-communicable diseases are diseases of the poor in low-income and middle-income countries, which is not generally the case.¹⁵ A focus on obesity at the expense of recognition of the substantial remaining burden of undernutrition threatens to divert resources away from disorders that affect the poor to those that are more likely to affect the wealthier in these countries.¹⁵

The NCD Risk Factor Collaboration initially used the same title for their paper as did the sociologist Pierre Bourdieu for his last major work, *The Weight of the World*.¹⁶ Bourdieu’s book, subtitled *Social Suffering in Contemporary Society*, linked individual narratives and experience to the structuring force of social inequality, revealing the complexities of reading one from the other.¹⁶ To the poor and undernourished in low-income countries, the perception of international

agencies concentrating on the problems of overnourishment—and potentially encouraging the shift of health care and other resources away from undernourishment—could contribute to, rather than alleviate, social suffering.

George Davey Smith

MRC Integrative Epidemiology Unit, School of Social and Community Medicine, Bristol BS8 2BN, UK
julia.mackay@bristol.ac.uk

I declare no competing interests.

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- 1 NCD Risk Factor Collaboration. Trends in adult body-mass index in 200 countries from 1975 to 2014: a pooled analysis of 1698 population-based measurement studies with 19.2 million participants. *Lancet* 2016; **387**: 1377–96.
- 2 Salomon JA, Wang H, Freeman MK, et al. Healthy life expectancy for 187 countries, 1990–2010: a systematic analysis for the Global Burden Disease Study 2010. *Lancet* 2012; **380**: 2144–62.
- 3 Krishna A, Razak F, Lebel A, Davey Smith G, Subramanian SV. Trends in group inequalities and interindividual inequities in BMI in the United States, 1993–2012. *Am J Clin Nutr* 2015; **101**: 598–605.
- 4 Goda T, Torres Garcia A. The rising tide of absolute global income inequality during 1850–2010: is it driven by inequality within or between countries? *Soc Indic Res* 2016; published online Jan 4. DOI:10.1007/s11205-015-1222-0.
- 5 Razak F, Corsi DJ, Slutsky AS, et al. Prevalence of body mass index lower than 16 among women in low- and middle- income countries. *JAMA* 2015; **314**: 2164–71.
- 6 Flegal KM, Kit BK, Orpana H, Graubard BI. Association of all-cause mortality with overweight and obesity using standard body mass index categories. *JAMA* 2013; **309**: 71–82.
- 7 Borge T, Engeland A, Tverdal A, Davey Smith G. Body mass index in adolescence in relation to cause-specific mortality: a follow-up of 230,000 Norwegian adolescents. *Am J Epidemiol* 2008; **168**: 30–37.
- 8 Davey Smith G, Sterne JAC, Fraser A, Tynelius P, Lawlor DA, Rasmussen F. The association between BMI and mortality using offspring BMI as an indicator of own BMI: large intergenerational mortality study. *BMJ* 2009; **339**: b5043.
- 9 Varbo A, Benn M, Davey Smith G, Timpson NJ, Tybjaerg-Hansen A, Nordestgaard BG. Remnant cholesterol, low-density lipoprotein cholesterol, and blood pressure as mediators from obesity to ischemic heart disease. *Circ Res* 2015; **116**: 665–73.
- 10 Cawley J. An economy of scales: a selective review of obesity’s economic causes, consequences, and solutions. *J Health Econ* 2015; **43**: 244–68.
- 11 Katan MB, Ludwig DS. Extra calories cause weight gain—but how much? *JAMA* 2010; **303**: 65–66.
- 12 Pontzer H, Durazo-Arvizu R, Dugas LR, et al. Constrained total energy expenditure and metabolic adaptation to physical activity in adult humans. *Curr Biol* 2016; **26**: 410–17.
- 13 Richmond RC, Davey Smith G, Ness AR, den Hoed M, McMahon G, Timpson NJ. Assessing causality in the association between child adiposity and physical activity levels: a Mendelian randomization analysis. *PLoS Med* 2014; **11**: e1001618.
- 14 Swinburn B, Kraak V, Rutter H, et al. Strengthening of accountability systems to create healthy food environments and reduce global obesity. *Lancet* 2015; **385**: 2534–45.
- 15 Subramanian SV, Corsi DJ, Subramanyam MA, Davey Smith G. Jumping the gun: the problematic discourse on socioeconomic status and cardiovascular health in India. *Int J Epidemiol* 2013; **42**: 1410–26.
- 16 Bourdieu P. *The weight of the world: social suffering in contemporary society*. Palo Alto, CA: Stanford University Press, 1999.