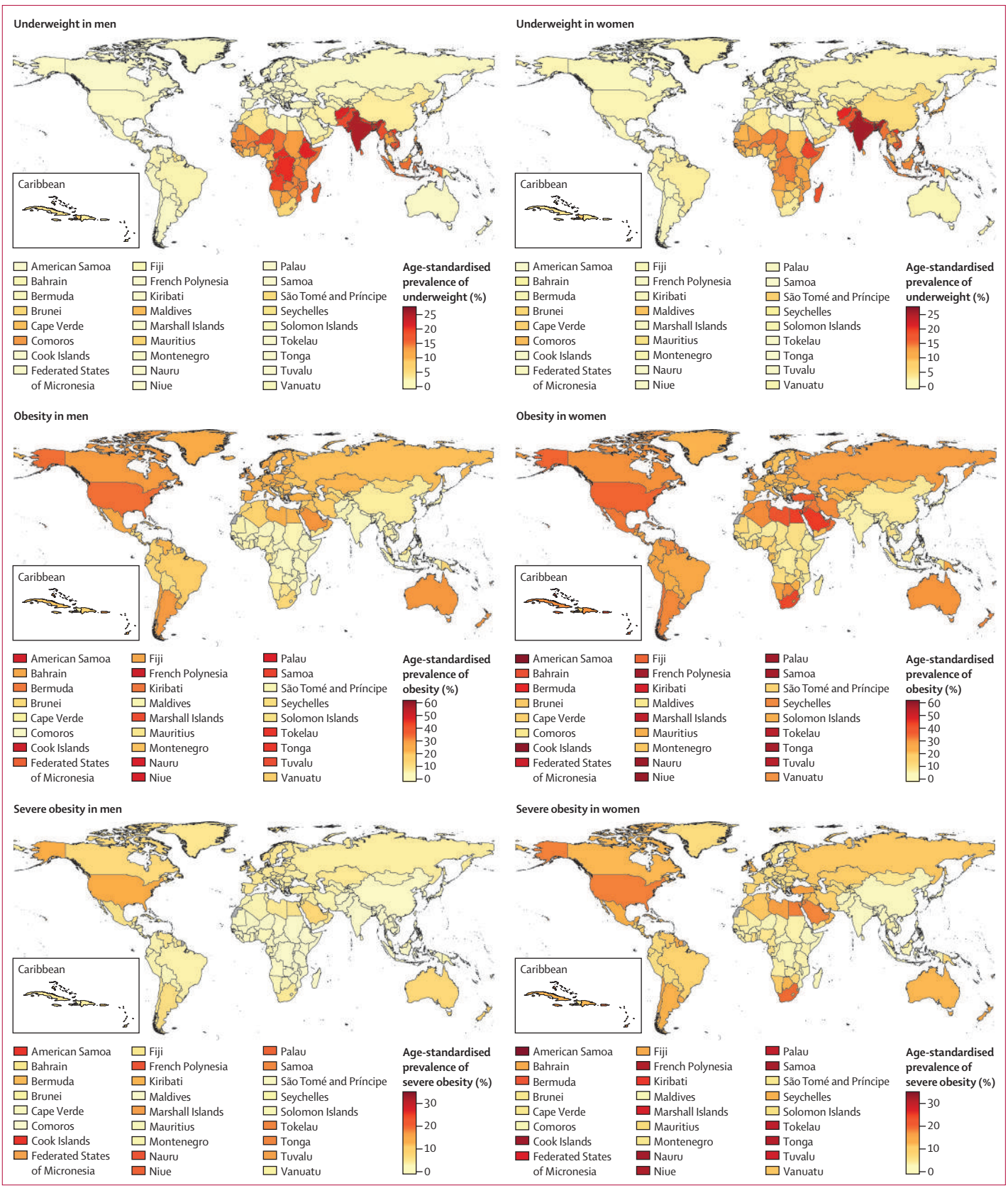
Underweight in men
Caribbean
American Samoa
Bahrain
Bermuda
Brunei
Cape Verde
Comoros
Cook Islands
Federated States of Micronesia
Fiji
French Polynesia
Kiribati
Maldives
Marshall Islands
Mauritius
Montenegro
Nauru
Niue
Palau
Samoa
São Tomé and Príncipe
Seychelles
Solomon Islands
Tokelau
Tonga
Tuvalu
Vanuatu
Age-standardised prevalence of underweight (%)
25
20
15
10
5
0
Underweight in women
Caribbean
American Samoa
Bahrain
Bermuda
Brunei
Cape Verde
Comoros
Cook Islands
Federated States of Micronesia
Fiji
French Polynesia
Kiribati
Maldives
Marshall Islands
Mauritius
Montenegro
Nauru
Niue
Palau
Samoa
São Tomé and Príncipe
Seychelles
Solomon Islands
Tokelau
Tonga
Tuvalu
Vanuatu
Age-standardised prevalence of underweight (%)
25
20
15
10
5
0
Obesity in men
Caribbean
American Samoa
Bahrain
Bermuda
Brunei
Cape Verde
Comoros
Cook Islands
Federated States of Micronesia
Fiji
French Polynesia
Kiribati
Maldives
Marshall Islands
Mauritius
Montenegro
Nauru
Niue
Palau
Samoa
São Tomé and Príncipe
Seychelles
Solomon Islands
Tokelau
Tonga
Tuvalu
Vanuatu
Age-standardised prevalence of obesity (%)
60
50
40
30
20
10
0
Obesity in women
Caribbean
American Samoa
Bahrain
Bermuda
Brunei
Cape Verde
Comoros
Cook Islands
Federated States of Micronesia
Fiji
French Polynesia
Kiribati
Maldives
Marshall Islands
Mauritius
Montenegro
Nauru
Niue
Palau
Samoa
São Tomé and Príncipe
Seychelles
Solomon Islands
Tokelau
Tonga
Tuvalu
Vanuatu
Age-standardised prevalence of obesity (%)
60
50
40
30
20
10
0
Severe obesity in men
Caribbean
American Samoa
Bahrain
Bermuda
Brunei
Cape Verde
Comoros
Cook Islands
Federated States of Micronesia
Fiji
French Polynesia
Kiribati
Maldives
Marshall Islands
Mauritius
Montenegro
Nauru
Niue
Palau
Samoa
São Tomé and Príncipe
Seychelles
Solomon Islands
Tokelau
Tonga
Tuvalu
Vanuatu
Age-standardised prevalence of severe obesity (%)
30
20
10
0
Severe obesity in women
Caribbean
American Samoa
Bahrain
Bermuda
Brunei
Cape Verde
Comoros
Cook Islands
Federated States of Micronesia
Fiji
French Polynesia
Kiribati
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Montenegro
Nauru
Niue
Palau
Samoa
São Tomé and Príncipe
Seychelles
Solomon Islands
Tokelau
Tonga
Tuvalu
Vanuatu
Age-standardised prevalence of severe obesity (%)
30
20
10
0

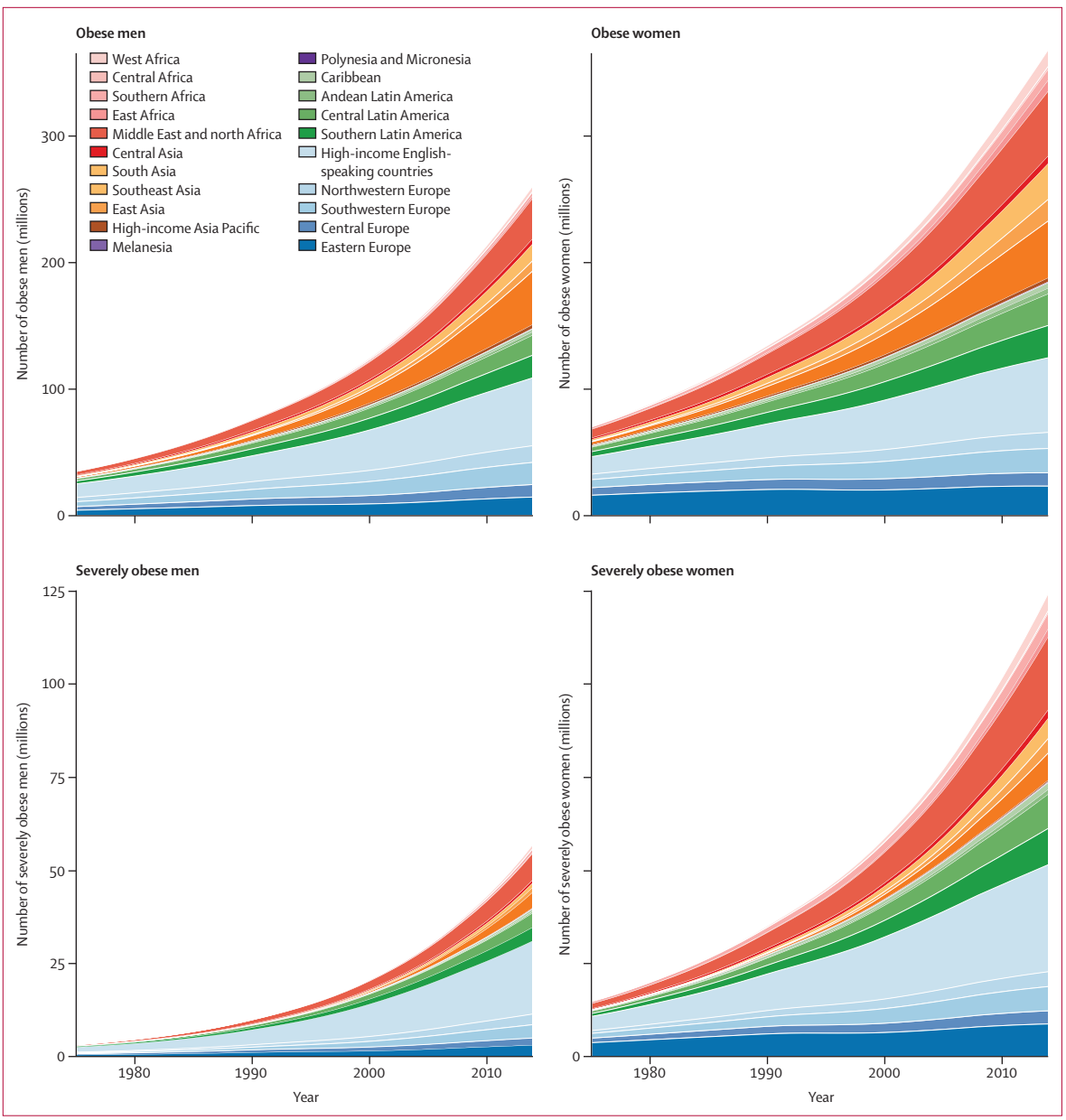


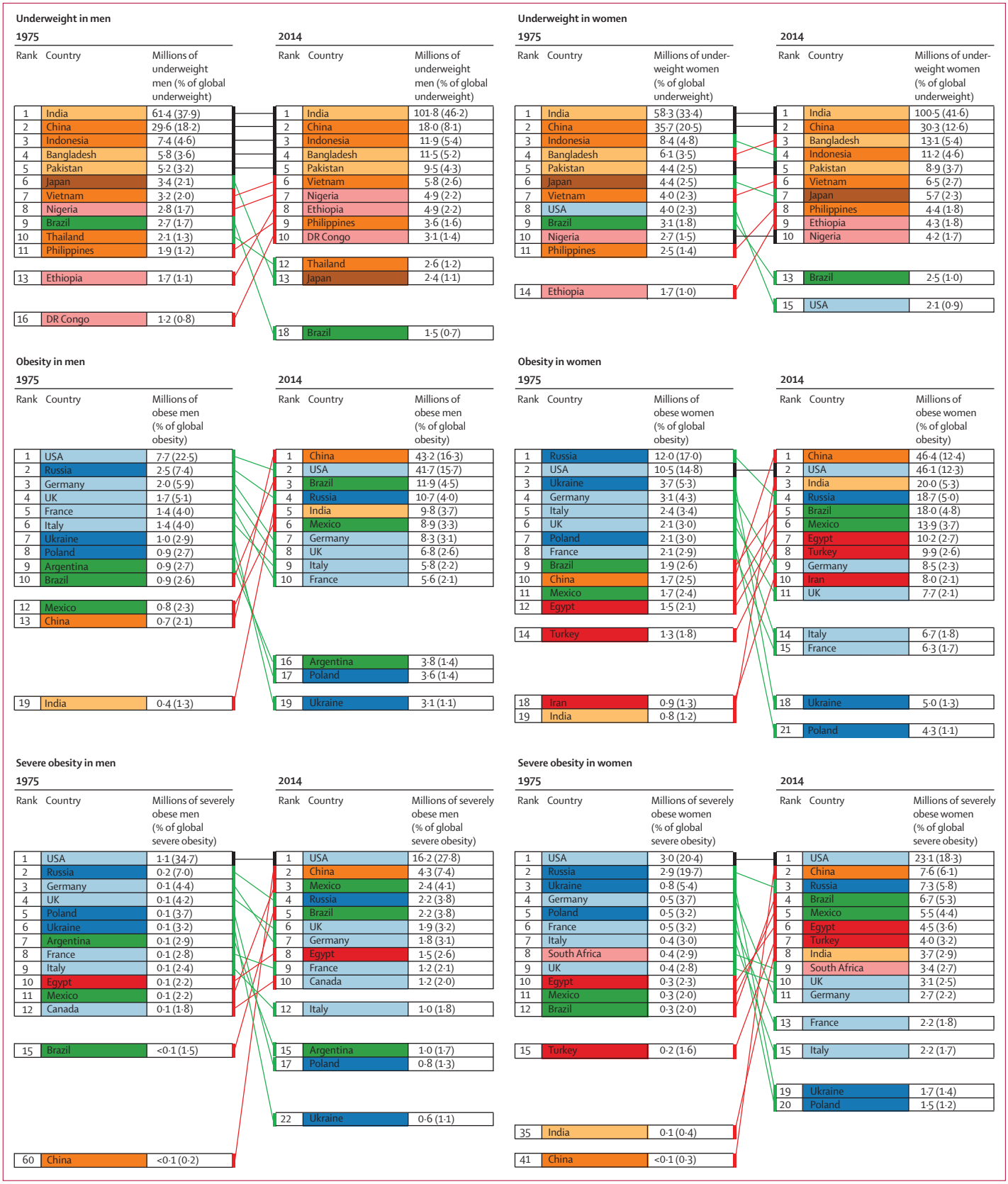
Figure 8: **Trends in the number of obese and severely obese people by region**
A person is obese if they have a body-mass index (BMI) of 30 kg/m² or higher, or is severely obese if they have a BMI of 35 kg/m² or higher.

Age-standardised prevalence of underweight in 2014 was less than 1% in men in 68 countries and in women in 11 countries (figure 7). At the other extreme, more than 20% of men in India, Bangladesh, Timor-Leste, Afghanistan, Eritrea, and Ethiopia, and a quarter or more of women in Bangladesh and India are still underweight.

Figure 7: **Age-standardised prevalence of underweight, obesity, and severe obesity by sex and country in 2014**
Underweight (BMI <18·5 kg/m²); obesity (BMI ≥30 kg/m²); and severe obesity (BMI ≥35 kg/m²). See appendix (pp 65–107) for numerical results for all BMI ranges. BMI=body-mass index.

In 1975, the proportion had been as high as 37% in Indian and Bangladeshi women.

In 2014, more men were obese than underweight in 136 (68%) of 200 countries; in 113 of these countries, more men were severely obese than underweight. For women, obesity surpassed underweight in 165 (83%) countries and severe obesity surpassed underweight in 135 countries. Obesity prevalence was less than 1% in men in Burundi and Timor-Leste and 1–2% in another 15 countries in central, east, and west Africa and in south and southeast Asia. The lowest prevalences in women were in Timor-Leste, Japan,


Underweight in men
1975
Rank Country Millions of underweight men (% of global underweight)
1 India 61·4 (37·9)
2 China 29·6 (18·2)
3 Indonesia 7·4 (4·6)
4 Bangladesh 5·8 (3·6)
5 Pakistan 5·2 (3·2)
6 Japan 3·4 (2·1)
7 Vietnam 3·2 (2·0)
8 Nigeria 2·8 (1·7)
9 Brazil 2·7 (1·7)
10 Thailand 2·1 (1·3)
11 Philippines 1·9 (1·2)
13 Ethiopia 1·7 (1·1)
16 DR Congo 1·2 (0·8)
2014
Rank Country Millions of underweight men (% of global underweight)
1 India 101·8 (46·2)
2 China 18·0 (8·1)
3 Indonesia 11·9 (5·4)
4 Bangladesh 11·5 (5·2)
5 Pakistan 9·5 (4·3)
6 Vietnam 5·8 (2·6)
7 Nigeria 4·9 (2·2)
8 Ethiopia 4·9 (2·2)
9 Philippines 3·6 (1·6)
10 DR Congo 3·1 (1·4)
12 Thailand 2·6 (1·2)
13 Japan 2·4 (1·1)
18 Brazil 1·5 (0·7)
Underweight in women
1975
Rank Country Millions of underweight women (% of global underweight)
1 India 58·3 (33·4)
2 China 35·7 (20·5)
3 Indonesia 8·4 (4·8)
4 Bangladesh 6·1 (3·5)
5 Pakistan 4·4 (2·5)
6 Japan 4·4 (2·5)
7 Vietnam 4·0 (2·3)
8 USA 4·0 (2·3)
9 Brazil 3·1 (1·8)
10 Nigeria 2·7 (1·5)
11 Philippines 2·5 (1·4)
14 Ethiopia 1·7 (1·0)
2014
Rank Country Millions of underweight women (% of global underweight)
1 India 100·5 (41·6)
2 China 30·3 (12·6)
3 Bangladesh 13·1 (5·4)
4 Indonesia 11·2 (4·6)
5 Pakistan 8·9 (3·7)
6 Vietnam 6·5 (2·7)
7 Japan 5·7 (2·3)
8 Philippines 4·4 (1·8)
9 Ethiopia 4·3 (1·8)
10 Nigeria 4·2 (1·7)
13 Brazil 2·5 (1·0)
15 USA 2·1 (0·9)
Obesity in men
1975
Rank Country Millions of obese men (% of global obesity)
1 USA 7·7 (22·5)
2 Russia 2·5 (7·4)
3 Germany 2·0 (5·9)
4 UK 1·7 (5·1)
5 France 1·4 (4·0)
6 Italy 1·4 (4·0)
7 Ukraine 1·0 (2·9)
8 Poland 0·9 (2·7)
9 Argentina 0·9 (2·7)
10 Brazil 0·9 (2·6)
12 Mexico 0·8 (2·3)
13 China 0·7 (2·1)
19 India 0·4 (1·3)
2014
Rank Country Millions of obese men (% of global obesity)
1 China 43·2 (16·3)
2 USA 41·7 (15·7)
3 Brazil 11·9 (4·5)
4 Russia 10·7 (4·0)
5 India 9·8 (3·7)
6 Mexico 8·9 (3·3)
7 Germany 8·3 (3·1)
8 UK 6·8 (2·6)
9 Italy 5·8 (2·2)
10 France 5·6 (2·1)
16 Argentina 3·8 (1·4)
17 Poland 3·6 (1·4)
19 Ukraine 3·1 (1·1)
Obesity in women
1975
Rank Country Millions of obese women (% of global obesity)
1 Russia 12·0 (17·0)
2 USA 10·5 (14·8)
3 Ukraine 3·7 (5·3)
4 Germany 3·1 (4·3)
5 Italy 2·4 (3·4)
6 UK 2·1 (3·0)
7 Poland 2·1 (3·0)
8 France 2·1 (2·9)
9 Brazil 1·9 (2·6)
10 China 1·7 (2·5)
11 Mexico 1·7 (2·4)
12 Egypt 1·5 (2·1)
14 Turkey 1·3 (1·8)
18 Iran 0·9 (1·3)
19 India 0·8 (1·2)
2014
Rank Country Millions of obese women (% of global obesity)
1 China 46·4 (12·4)
2 USA 46·1 (12·3)
3 India 20·0 (5·3)
4 Russia 18·7 (5·0)
5 Brazil 18·0 (4·8)
6 Mexico 13·9 (3·7)
7 Egypt 10·2 (2·7)
8 Turkey 9·9 (2·6)
9 Germany 8·5 (2·3)
10 Iran 8·0 (2·1)
11 UK 7·7 (2·1)
14 Italy 6·7 (1·8)
15 France 6·3 (1·7)
18 Ukraine 5·0 (1·3)
21 Poland 4·3 (1·1)
Severe obesity in men
1975
Rank Country Millions of severely obese men (% of global severe obesity)
1 USA 1·1 (34·7)
2 Russia 0·2 (7·0)
3 Germany 0·1 (4·4)
4 UK 0·1 (4·2)
5 Poland 0·1 (3·7)
6 Ukraine 0·1 (3·2)
7 Argentina 0·1 (2·9)
8 France 0·1 (2·8)
9 Italy 0·1 (2·4)
10 Egypt 0·1 (2·2)
11 Mexico 0·1 (2·2)
12 Canada 0·1 (1·8)
15 Brazil <0·1 (1·5)
60 China <0·1 (0·2)
2014
Rank Country Millions of severely obese men (% of global severe obesity)
1 USA 16·2 (27·8)
2 China 4·3 (7·4)
3 Mexico 2·4 (4·1)
4 Russia 2·2 (3·8)
5 Brazil 2·2 (3·8)
6 UK 1·9 (3·2)
7 Germany 1·8 (3·1)
8 Egypt 1·5 (2·6)
9 France 1·2 (2·1)
10 Canada 1·2 (2·0)
12 Italy 1·0 (1·8)
15 Argentina 1·0 (1·7)
17 Poland 0·8 (1·3)
22 Ukraine 0·6 (1·1)
Severe obesity in women
1975
Rank Country Millions of severely obese women (% of global severe obesity)
1 USA 3·0 (20·4)
2 Russia 2·9 (19·7)
3 Ukraine 0·8 (5·4)
4 Germany 0·5 (3·7)
5 Poland 0·5 (3·2)
6 France 0·5 (3·2)
7 Italy 0·4 (3·0)
8 South Africa 0·4 (2·9)
9 UK 0·4 (2·8)
10 Egypt 0·3 (2·3)
11 Mexico 0·3 (2·0)
12 Brazil 0·3 (2·0)
15 Turkey 0·2 (1·6)
35 India 0·1 (0·4)
41 China <0·1 (0·3)
2014
Rank Country Millions of severely obese women (% of global severe obesity)
1 USA 23·1 (18·3)
2 China 7·6 (6·1)
3 Russia 7·3 (5·8)
4 Brazil 6·7 (5·3)
5 Mexico 5·5 (4·4)
6 Egypt 4·5 (3·6)
7 Turkey 4·0 (3·2)
8 India 3·7 (2·9)
9 South Africa 3·4 (2·7)
10 UK 3·1 (2·5)
11 Germany 2·7 (2·2)
13 France 2·2 (1·8)
15 Italy 2·2 (1·7)
19 Ukraine 1·7 (1·4)
20 Poland 1·5 (1·2)

Vietnam, North Korea, Cambodia, Laos, and Bangladesh, all less than 5%. At the other extreme, more than 45% of men in six island nations in Polynesia and Micronesia, and more than 50% of women in 11 such island nations were obese. The prevalence of obesity in women in several Caribbean and Middle Eastern countries was 40–50%. Severe obesity surpassed 20% in men and 30% in women in some Polynesian and Micronesian islands, reaching 33·4% (95% CrI 23·6–43·5) in American Samoa in 2014. More than 15% of women in Nauru and American Samoa were morbidly obese.

In 2014, about 266 million men (95% CrI 240–295 million) and 375 million women (344–407 million) were obese in the world, compared with 34 million men (26–44 million) and 71 million women (57–87 million) in 1975 (figure 8). 58 million (49–68 million) of these men and 126 million (112–141 million) of these women were severely obese in 2014. 18·4% of the world's obese adults (118 million) lived in high-income English-speaking countries and these countries contained an even larger share of the world's severely obese people (27·1%; 50 million), followed by 13·9% (26 million) in the Middle East and north Africa.

Countries where large numbers of underweight people lived in 1975 and in 2014 were mostly large countries in Asia and sub-Saharan Africa, with an increasing share of underweight people living in south Asia over time (figure 9). By contrast with this stability of underweight geography, countries with the largest number of obese and severely obese people changed over these four decades, with more middle-income countries joining the USA, especially for women. In 2014, slightly more obese men and women lived in China than in the USA, and even for severe obesity, China moved from 60th place for men and 41st place for women in 1975, to 2nd rank for both men and women in 2014. Nonetheless, more than one in four severely obese men and almost one in five severely obese women in the world still live in the USA.

If post-2000 trends continue, every country has a less than 50% probability of meeting the global obesity target, with Nauru having the highest probability of about 45% (appendix pp 153, 154). The probability of achieving the target is less than 10% for men in 194 countries, and for women in 174 countries. At the global level, the probability of meeting the target is virtually zero. Rather, if present trends continue, by 2025, global obesity prevalence will reach 18% in men and surpass 21% in women; severe obesity will surpass 9% in women and 6% in men, and will be larger than the projected prevalence of underweight in women.

Figure 9: **Ten countries with the largest number of underweight, obese, and severely obese men and women in 1975 and 2014**
Colours for each country indicate its region, using the same colour scheme as in figure 4. Underweight (BMI <18·5 kg/m^2); obesity (BMI ≥30 kg/m^2); and severe obesity (BMI ≥35 kg/m^2). BMI=body-mass index.

Discussion

Over the past four decades, we have transitioned from a world in which underweight prevalence was more than double that of obesity, to one in which more people are obese than underweight, both globally and in all regions except parts of sub-Saharan Africa and Asia. The rate of increase in BMI since 2000 has been slower than in the preceding decades in high-income countries, where adiposity became an explicit public health concern around this time,[27,28] and in some middle-income countries. However, because the rate of BMI increase has accelerated in some other regions, the global increase in BMI has not slowed down. If post-2000 trends continue, not only will the world not meet the global target for halting the increase in obesity, but also severe obesity will surpass underweight in women by 2025. Nonetheless, underweight remains a public health problem in south Asia and central and east Africa.

We estimated a slightly larger increase in mean BMI since 1980 than Finucane and colleagues did,[11] especially in men, because our estimates for 1980 were lower, globally and in most regions; this difference might be because our study included substantially more data, from a larger number of countries. Our global estimates of overweight prevalence are similar to those reported by Stevens and colleagues[13] for 2008, and by Ng and colleagues for 2013.[12] Our estimates for obesity for the same years are slightly lower than those of Stevens and colleagues and slightly higher than those of Ng and colleagues. Furthermore, we estimated a lower prevalence of obesity for 1980 than Ng and colleagues had, which means we have attributed a larger role to the rise over the past few decades for the present extent of obesity. Differences between our study and that of Ng and colleagues were greater at the regional level; for example, our estimates for obesity prevalence in men in south Asia and central, east, and west Africa were less than half of those by Ng and colleagues. None of these previous works had estimated underweight or severe and morbid obesity, which are important clinical and public health outcomes.

The strengths of our study include its unique scope of making consistent estimates of mean BMI and the prevalence of all BMI categories with clinical and public health relevance, including the first-ever estimates of underweight and severe and morbid obesity. These estimates helped reveal the details of the transition from underweight to overweight and obesity throughout the world. We also reported on the probability of each country meeting the global obesity target. We put great emphasis on data quality and used only population-based data sources that had measured height and weight to avoid the bias in self-reported data. Characteristics and quality of data sources were verified by Collaborating Group members (appendix pp 2–5). Data were analysed according to a common protocol to obtain the required mean and prevalence by age and sex, which in turn minimised reliance on

models for filling such gaps, as done in previous studies.[11–13] Finally, we pooled data using a statistical model designed to take into account the epidemiological features of outcomes such as BMI, and one that used all available data while giving more weight to national data than subnational and community studies.

Despite our efforts in identifying and accessing country-level data, some countries had few data sources, especially those in Polynesia and Micronesia, the Caribbean, and central Asia. Additionally, only 42% of sources included people older than 70 years. In view of ageing trends throughout the world, older people should be included in health and nutrition surveys, which have traditionally focused on childbearing ages. Even measured height and weight data can have error depending on how closely measurement protocols are followed. Although data held by Collaborating Group members were analysed to provide all needed details by sex and age group and BMI level, individual participant data could not be accessed for 19·4% of data used in our analysis, hence conversions across categories were still needed; nonetheless, the conversion regressions had high predictive accuracy (appendix pp 41–55). A novel component of our study is that we estimated the prevalences of a complete set of BMI categories, but the uncertainty intervals for BMIs of 30 kg/m² or more and 35 kg/m² or more, prevalences that span more than one of the analysed categories, could be affected by the fact that we combined posterior distributions across Bayesian models. We did not estimate trends in measures of adiposity other than BMI, such as waist circumference and waist-to-hip ratio, because these were measured in less than half of all the data sources and their measurement became more common after the 1980s. A systematic review[31] of epidemiological studies reported that, taken together, studies that had measured BMI and either waist circumference or waist-to-hip ratio do not show that any of the measures of adiposity have "superior discriminatory capability" of adverse cardiometabolic outcomes; any reported difference was "too small to be of any clinical relevance". We did not analyse children and adolescents for two reasons. First, because childhood and adolescence is a period of rapid growth, BMI cutoffs used to define underweight, overweight, and obesity for children and adolescents are different from those for adults, and vary by age and sex.[32] Second, time trends in children's and adolescents' obesity are different from those of adults.[33]

Our results have several implications. First, the global focus on the obesity epidemic has largely overshadowed the persistence of underweight in some countries. Our results show the need to address the remaining underweight problem and by doing so reduce risks to pregnant women and their newborn infants,[15] mortality from tuberculosis and other respiratory diseases,[34] and possibly all-cause mortality, which has a J-shaped association.[2,3] To address this problem will require social and food policies that enhance food security in poor households, but also avoid overconsumption of processed carbohydrates and other unhealthy foods. Second, although adiposity has been consistently shown to be an independent risk factor for several NCDs in individual-level epidemiological studies, at the population level, the effect of rising BMI on the course of mortality reduction has so far been somewhat small in high-income countries,[35,36] possibly because pharmacological treatment has helped reduce blood pressure and serum cholesterol and manage diabetes complications, which are mediators of the effects of BMI on cardiovascular diseases. In low-income countries, where health systems might not have the capacity to identify and treat hypertension, dyslipidaemia, and diabetes, adiposity might have a larger effect on population health. Furthermore, we have shown that some high-income and middle-income regions are now facing an epidemic of severe obesity. Even anti-hypertensive drugs, statins, and glucose lowering drugs will not be able to fully address the hazards of such high BMI levels,[7] and bariatric surgery might be the most effective intervention for weight loss and disease prevention and remission.[37] However, long-term health outcomes of bariatric surgery are largely unknown and it is not accessible to most people in low-income and middle-income countries because of financial and health system barriers.

Present interventions and policies have not been able to stop the rise in BMI in most countries.[38–40] The global NCD target on obesity, although ambitious in view of past trends, has engendered a new look at policies that could slow down and stop the worldwide increase in BMI.[40–42] To avoid an epidemic of severe obesity, the next step must be to implement these policies, and to systematically assess their effect.[43]

Contributors

ME designed the study and oversaw research. Members of the Country and Regional Data Group collected and reanalysed data, and checked pooled data for accuracy of information about their study and other studies in their country. MDC and GAS led data collection and JB led the statistical analysis and prepared results. Members of the Pooled Analysis and Writing Group collated data, checked all data sources in consultation with the Country and Regional Data Group, analysed pooled data, and prepared results. ME wrote the first draft of the report with input from other members of Pooled Analysis and Writing Group. Members of Country and Regional Data Group commented on draft report.

NCD Risk Factor Collaboration

*Pooled Analysis and Writing (*equal contribution)*—Mariachiara Di Cesare (Imperial College London, London, UK; Middlesex University, London, UK)*; James Bentham (Imperial College London, London, UK)*; Gretchen A Stevens (World Health Organization, Geneva, Switzerland)*; Bin Zhou (Imperial College London, London, UK); Goodarz Danaei (Harvard T H Chan School of Public Health, Boston, MA, USA); Yuan Lu (Harvard T H Chan School of Public Health, Boston, MA, USA); Honor Bixby (Imperial College London, London, UK); Melanie J Cowan (World Health Organization, Geneva, Switzerland); Leanne M Riley (World Health Organization, Geneva, Switzerland); Kaveh Hajifathalian (Harvard T H Chan School of Public Health, Boston, MA, USA); Léa Fortunato (Imperial College London, London, UK); Cristina Taddei (University of Florence, Florence, Italy); James E Bennett (Imperial College London, London, UK); Nayu Ikeda (National Institute of Health and Nutrition, Tokyo, Japan); Prof Young-Ho Khang