Increased food energy supply as a major driver of the obesity epidemic: a global analysis
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Objective We investigated associations between changes in national food energy supply and in average population body weight.

Methods We collected data from 24 high-, 27 middle- and 18 low-income countries on the average measured body weight from global databases, national health and nutrition survey reports and peer-reviewed papers. Changes in average body weight were derived from study pairs that were at least four years apart (various years, 1971–2010). Selected study pairs were considered to be representative of an adolescent or adult population, at national or subnational scale. Food energy supply data were retrieved from the Food and Agriculture Organization of the United Nations food balance sheets. We estimated the population energy requirements at survey time points using Institute of Medicine equations. Finally, we estimated the change in energy intake that could theoretically account for the observed change in average body weight using an experimentally-validated model.

Findings In 56 countries, an increase in food energy supply was associated with an increase in average body weight. In 45 countries, the increase in food energy supply was higher than the model-predicted increase in energy intake. The association between change in food energy supply and change in body weight was statistically significant overall and for high-income countries (P < 0.001).

Conclusion The findings suggest that increases in food energy supply are sufficient to explain increases in average population body weight, especially in high-income countries. Policy efforts are needed to improve the healthiness of food systems and environments to reduce global obesity.

Introduction
Overweight and obesity have become major global public health problems. Worldwide, the proportion of adults with a body mass index (BMI) of 25 kg/m² or greater increased from 28.8% to 36.9% in men, and from 29.8% to 38.0% in women between 1980 and 2013. 1 Urgent action from governments and the food industry is needed to curb the epidemic. 2 Action needs to be directed at the main drivers of the epidemic to meet the global target of halting the rise in obesity by 2025. 3

The drivers of the obesity epidemic have been much debated. 1–2 An increased food energy supply and the globalisation of the food supply, increasing the availability of obesogenic ultra-processed foods, are arguments for a predominant food system driver 2 of population weight gain. Increasing motorization and mechanization, time spent in front of small screens and a decrease in transport and occupational physical activity, point to reducing physical activity as a predominant driver 2,6 of the obesity epidemic.

A model used to predict body-weight gain, assuming no change in physical activity, follows the simple rule that a sustained increase in energy intake of 100 kJ per day leads to a predicted increase of 1 kg body weight on average, with half of the weight gain being achieved in about one year and 95% in about three years. 5 According to this model, the oversupply of food energy is sufficient to drive the increase in energy intake and increases in body weight observed in the United Kingdom of Great Britain and Northern Ireland and the United States of America. 6–11 This is despite the fact that, in the United States, food waste has increased by approximately 50% since 1974, reaching about 5800 kJ per person per day in 2003. 12 Here we test the hypothesis that an increase in food energy supply is sufficient to explain increasing population body weight, using data from 24 high-income, 27 middle-income and 18 low-income countries.

Methods
Food energy supply
Food balance sheets of the Food and Agriculture Organization of the United Nations (FAO) estimate the food supply of countries, by balancing local production, country-wide stocks and imports with exports, agricultural use for livestock, seed and some components of waste. Waste on the farm, during distribution and processing, as well as technical losses due to transformation of primary commodities into processed products are usually taken into account. However, losses of edible food, e.g. during storage, preparation and cooking, as plate-waste or domestic animal feed, or thrown away, are not considered. The data are expressed as the annual per capita supply of each food item available for human consumption. 13 The FAO’s database contains national level data from 1961 to 2010 for 183 countries. For each country, data on food energy supply were extracted to match the time periods of data on adult body weight.

Measured body weight
Three major strategies were used to collect data on measured average adult body weight. First, an electronic search of major databases on obesity prevalence and BMI was performed, including the World Health Organization’s (WHO) global infobase, 14 WHO’s global database on BMI, 15 the International Association for the Study of Obesity (now World Obesity

References
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Table 1. Countries and surveys included in a global analysis of food energy supply and body weight, 1971–2010

| Country                  | Year 1 | Year 2 | Country                  | Year 1 | Year 2 | Age range, years | Food energy supply, kJ/day | Change | Excess at the first survey |
|--------------------------|--------|--------|--------------------------|--------|--------|------------------|---------------------------|--------|--------------------------|
| Algeria                  | 1986   | 2003   | Cross-sectional survey   | STEPS Survey | 16–65 | 25–64 | 11 385 | 1 464 | 11 464 | 2 998 |
| Australia                | HIC    | 1995   | National Nutrition Survey | National Health Survey | ≥ 18 | ≥ 18 | 12 929 | 594 | 13 523 | 2 978 |
| Bangladesh               | LIC    | 1996   | National Demographic Health Survey | National Demographic Health Survey | 15–49 | 15–49 | 8 849 | 1 423 | 10 272 | 506 |
| Barbados                 | HIC    | 1995   | ICISHIB Study            | Food Consumption and Anthropometric Survey | ≥ 25 | 18–96 | 11 996 | –146 | 12 142 | 2 144 |
| Belgium                  | HIC    | 1986   | WHO MONICA               | WHO MONICA | 25–34 | 25–34 | 14 439 | 515 | 14 954 | 4 008 |
| Benin                    | LIC    | 1996   | National Demographic Health Survey | National Demographic Health Survey | 15–49 | 15–49 | 9 929 | 54 | 10 483 | 715 |
| Bolivia                  | HIC    | 1994   | National Demographic Health Survey | National Demographic Health Survey | 15–49 | 15–49 | 8 376 | 715 | 9 091 | –725 |
| Burkina Faso             | LIC    | 1993   | National Demographic Health Survey | National Demographic Health Survey | 15–49 | 15–49 | 10 092 | –109 | 10 191 | 728 |
| Cambodia                 | LIC    | 2000   | National Demographic Health Survey | STEPS Survey | 15–49 | 15–49 | 8 908 | 1 059 | 10 067 | 1 969 |
| Cameroon                 | Lower-MIC | 1998 | National Demographic Health Survey | National Demographic Health Survey | 15–49 | 15–49 | 8 740 | 774 | 9 514 | –774 |
| Canada                   | HIC    | 1971   | Nutrition Canada Survey  | Canadian Community Health Survey | 15–49 | 15–49 | 12 135 | 2 339 | 14 474 | 2 339 |
| Chad                     | LIC    | 1996   | National Demographic Health Survey | National Demographic Health Survey | 15–49 | 15–49 | 7 410 | 895 | 8 305 | –995 |
| Chile                    | HIC    | 2003   | National Health Survey   | National Health Survey | ≥ 17 | ≥ 15 | 12 067 | 100 | 12 167 | 267 |
| China                    | Upper-MIC | 1991 | China Health and Nutrition Survey | Cross-sectional survey | 20–45 | 35–74 | 10 447 | 1 548 | 12 005 | 1 548 |
| Colombia                 | Upper-MIC | 1995 | National Demographic Health Survey | National Demographic Health Survey | 15–49 | 15–49 | 10 837 | 188 | 11 025 | 1 888 |
| Czech Republic           | HIC    | 1993   | Health Status of the Czech Population Survey | Health Status of the Czech Population Survey | 15–75 | 15–75 | 12 719 | 833 | 13 552 | 833 |
| Denmark                  | HIC    | 1983   | WHO MONICA               | WHO MONICA | 25–64 | 25–64 | 12 740 | 862 | 13 602 | 2 862 |
| Dominican Republic       | Upper-MIC | 1991 | National Demographic Health Survey | National Demographic Health Survey | 15–49 | 15–49 | 9 025 | 301 | 9 326 | 301 |
| Egypt                    | Lower-MIC | 1992 | National Demographic Health Survey | National Demographic Health Survey | 15–49 | 15–49 | 13 142 | 741 | 13 883 | 741 |
| Eritrea                  | LIC    | 1995   | National Demographic Health Survey | National Demographic Health Survey | 15–49 | 15–49 | 6 569 | –63 | 6 632 | –63 |
| Ethiopia                 | LIC    | 2000   | National Demographic Health Survey | National Demographic Health Survey | 15–49 | 15–49 | 7 565 | 761 | 8 326 | 761 |
| Fiji                     | Upper-MIC | 1980 | National Food and Nutrition Survey | National Health Survey | 15–49 | 15–49 | 10 372 | 2 301 | 12 673 | 2 301 |
| Finland                  | HIC    | 1987   | Cross-sectional population survey | National Epidemiological Survey | 15–49 | 15–49 | 12 318 | 849 | 13 167 | 849 |
| France                   | HIC    | 1986   | WHO MONICA               | STEPS Survey | 15–49 | 15–64 | 11 234 | 251 | 11 485 | 251 |
| Gabon                    | Upper-MIC | 2000 | National Demographic Health Survey | Microcensus – Health Questions | 15–49 | 15–49 | 14 267 | 582 | 14 849 | 582 |
| Germany                  | HIC    | 1983   | WHO MONICA               | Microcensus – Health Questions | 15–49 | 15–49 | 14 267 | 582 | 14 849 | 582 |
(continues . . )
| Country                  | Income level of country | Year | First survey | Second survey | Survey 1                                                      | Survey 2                                                      | Age range, years | Food energy supply, kJ/day |
|-------------------------|------------------------|------|--------------|---------------|--------------------------------------------------------------|--------------------------------------------------------------|------------------|---------------------------|
| Ghana                   | Lower-MIC              | 1993 | 2003         | National Demographic Health Survey | National Demographic Health Survey | 15–49 | 15–49 | 9 468 | 1 289 | 213 |
| Haiti                   | LIC                    | 1994 | 2005         | National Demographic Health Survey | National Demographic Health Survey | 15–49 | 15–49 | 7 163 | 703  | −1 929 |
| Hungary                 | Upper-MIC              | 1982 | 1987         | WHO MONICA    | WHO MONICA                                                   | 25–64 | 25–64 | 14 836 | 753  | 4 640 |
| Iceland                 | HIC                    | 1983 | 1993         | WHO MONICA    | WHO MONICA                                                   | 25–64 | 25–64 | 13 334 | −343 | 2 757 |
| India                   | Lower-MIC              | 1998 | 2007         | National Demographic Health Survey | STEPS Survey | 15–49 | 15–64 | 9 657 | 113  | 715 |
| Indonesia               | Lower-MIC              | 1983 | 2001         | Cross-sectional survey | STEPS Survey | 15–49 | 15–65 | 9 615 | 276  | 1 423 |
| Iran                    | Upper-MIC              | 2004 | 2009         | STEPS Survey | STEPS Survey | 15–65 | 15–64 | 13 129 | 25   | 3 540 |
| Ireland                 | HIC                    | 1985 | 2009         | Cross-sectional survey | National Adult Nutrition Survey | 35–64 | 18–64 | 14 966 | 109  | 5 209 |
| Israel                  | HIC                    | 1985 | 2000         | WHO MONICA    | National Health and Nutrition Survey | 25–64 | 25–64 | 13 979 | 728  | 4 284 |
| Italy                   | HIC                    | 1983 | 1993         | WHO MONICA    | WHO MONICA                                                   | 25–64 | 25–64 | 14 493 | 71   | 4 749 |
| Jordan                  | Upper-MIC              | 1997 | 2002         | Cross-sectional survey | National Demographic Health Survey | 15–49 | 15–49 | 11 355 | 720  | 2 778 |
| Kazakhstan              | Upper-MIC              | 1995 | 1999         | National Demographic Health Survey | National Demographic Health Survey | 15–49 | 15–49 | 13 117 | −3 778 | 4 448 |
| Kenya                   | LIC                    | 1993 | 2003         | National Demographic Health Survey | National Demographic Health Survey | 15–49 | 15–49 | 7 954  | 444  | −1 318 |
| Lebanon                 | Upper-MIC              | 1997 | 2009         | National cross-sectional survey | National cross-sectional survey | ≥ 20  | ≥ 20  | 12 924 | 268  | 2 983 |
| Madagascar              | LIC                    | 1997 | 2005         | National Demographic Health Survey | STEPS Survey | 15–49 | 25–64 | 8 732  | 155  | −67 |
| Malawi                  | LIC                    | 1983 | 2009         | Cross-sectional survey | STEPS Survey | ≥ 15 | 25–64 | 9 012  | 686  | −690 |
| Malaysia                | Upper-MIC              | 1996 | 2005         | National Health & Morbidity Survey | STEPS Survey | ≥ 20 | 25–64 | 12 355 | −481 | 3 745 |
| Mali                    | LIC                    | 1995 | 2006         | National Demographic Health Survey | National Demographic Health Survey | 15–49 | 15–49 | 9 021  | 1 155 | −322 |
| Malta                   | HIC                    | 1984 | 2006         | WHO MONICA    | Lifestyle Survey | 25–64 | 18–65 | 12 711 | 1 682 | 3 130 |
| Mauritania              | Lower-MIC              | 2000 | 2006         | National Demographic Health Survey | STEPS Survey | 15–49 | 15–64 | 9 351  | 59   | 1 636 |
| Mongolia                | Lower-MIC              | 2005 | 2009         | STEPS Survey | STEPS Survey | 15–49 | 15–64 | 9 410  | 774  | −891 |
| Morocco                 | Lower-MIC              | 1992 | 2003         | National Demographic Health Survey | National Demographic Health Survey | 15–49 | 15–49 | 12 117 | 1 331 | 2 611 |
| Mozambique              | LIC                    | 1997 | 2003         | National Demographic Health Survey | National Demographic Health Survey | 15–49 | 15–49 | 8 268  | 247  | −728 |
| Nepal                   | LIC                    | 1996 | 2007         | National Demographic Health Survey | STEPS Survey | 15–49 | 15–64 | 9 234  | 674  | 766 |
| Netherlands             | HIC                    | 2000 | 2009         | Health Survey | Health Survey | 15–65 | 15–65 | 13 389 | 255  | 2 941 |
| New Zealand             | HIC                    | 1982 | 2009         | WHO MONICA    | NZ Adult Nutrition Survey | 35–64 | 15–71 | 12 878 | 389  | 3 234 |
| Niger                   | LIC                    | 1992 | 2006         | National Demographic Health Survey | National Demographic Health Survey | 15–49 | 15–49 | 8 142  | 1 598 | −1 025 |
| Nigeria                 | Lower-MIC              | 1999 | 2003         | National Demographic Health Survey | National Demographic Health Survey | 15–49 | 15–49 | 11 109 | −134 | 1 741 |
| Norway                  | HIC                    | 1990 | 2001         | Prospective population-based survey | Prospective population-based survey | ≥ 20 | 20–79 | 13 196 | 992  | 3 280 |
| Peru                    | Upper-MIC              | 1991 | 2009         | National Demographic Health Survey | National Demographic Health Survey | 15–49 | 15–49 | 9 075  | 1 653 | 874 |

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| Country         | Income level of country | Age range, years | Food energy supply, kJ/day | First survey | Second survey | Change first survey to second survey | Note |
|-----------------|-------------------------|------------------|---------------------------|-------------|--------------|-------------------------------------|------|
| Poland          | HIC                     | 15–49            | 35–64                     | 14 046      | 14 046       | 0                                   |      |
| Saudi Arabia    | UC                      | 1983             | 15–49                     | 9 124       | 9 124        | 0                                   |      |
| Senegal         | Upper-MIC               | 2001             | 15–49                     | 12 456      | 12 456       | 0                                   |      |
| South Africa    | HIC                     | 1998             | 15–49                     | 14 006      | 14 006       | 0                                   |      |
| Switzerland     | LC                      | 2009             | 15–49                     | 14 046      | 14 046       | 0                                   |      |
| Turkey          | UC                      | 1998             | 15–49                     | 14 046      | 14 046       | 0                                   |      |
| United Kingdom  | HIC                     | 2001             | 15–49                     | 14 046      | 14 046       | 0                                   |      |
| United States   | LC                      | 2009             | 15–49                     | 14 046      | 14 046       | 0                                   |      |
| Uzbekistan      | LC                      | 1998             | 15–49                     | 14 046      | 14 046       | 0                                   |      |
| LIC: low-income country |
| Saudi Arabia    | UC                      | 1996             | 15–49                     | 9 124       | 9 124        | 0                                   |      |
| Senegal         | HIC                     | 2001             | 15–49                     | 12 456      | 12 456       | 0                                   |      |
| South Africa    | Lower-MIC               | 1998             | 15–49                     | 14 006      | 14 006       | 0                                   |      |
| Switzerland     | HIC                     | 2009             | 15–49                     | 14 046      | 14 046       | 0                                   |      |
| Turkey          | Upper-MIC               | 1998             | 15–49                     | 14 046      | 14 046       | 0                                   |      |
| United Kingdom  | HIC                     | 2001             | 15–49                     | 14 046      | 14 046       | 0                                   |      |
| United States   | LC                      | 2009             | 15–49                     | 14 046      | 14 046       | 0                                   |      |
| Uzbekistan      | LC                      | 1998             | 15–49                     | 14 046      | 14 046       | 0                                   |      |
| Lower-MIC: lower-middle-income country |
| Senegal         | HIC                     | 2001             | 15–49                     | 14 046      | 14 046       | 0                                   |      |
| South Africa    | Upper-MIC               | 1998             | 15–49                     | 14 006      | 14 006       | 0                                   |      |
| Switzerland     | HIC                     | 2009             | 15–49                     | 14 046      | 14 046       | 0                                   |      |
| Turkey          | Upper-MIC               | 1998             | 15–49                     | 14 046      | 14 046       | 0                                   |      |
| United Kingdom  | HIC                     | 2001             | 15–49                     | 14 046      | 14 046       | 0                                   |      |
| United States   | LC                      | 2009             | 15–49                     | 14 046      | 14 046       | 0                                   |      |
| Uzbekistan      | LC                      | 1998             | 15–49                     | 14 046      | 14 046       | 0                                   |      |

Note: Estimations of population energy requirements were performed for each country using the Institute of Medicine equations for males and females. Energy excess was calculated by subtracting energy requirements at the first survey from the energy supply at the same survey.

Demographic data

Demographic data (total population, by age and sex) were retrieved from the United Nations Department of Economic and Social Affairs. Average female and male height at survey time points were derived from http://www.averageheight.co/. For 13 countries, data were not available and average height data from a neighbouring country were used for calculating energy requirements.
Data analysis

Three types of analysis were performed. First, we compared the changes in food energy supply with changes in average body weight over time for each country. Second, estimates of population energy requirements at survey time points were performed for each country using Institute of Medicine equations.22 Low active physical activity levels (1.4 ≤ PAL <1.6) were assumed for high- and upper-middle-income countries. Active physical activity levels (1.6 ≤ PAL <1.9) were used for all other countries. Finally, we used a physiologically-based, experimentally-validated predictive energy intake body-weight model, to estimate the change in average population energy intake that would be required to account for the observed change in average body weight.

Results

In total, 83 countries had at least two surveys with data on measured body weight; 24 countries had more than two surveys at different time points. We excluded countries where the period between surveys was less than four years (eight countries), survey populations were not comparable in terms of area representativeness (eight countries) or FAO food supply data for the country were not available (three countries). Survey pairs from 69 countries were included. Of those, 36 survey pairs included data for women of childbearing age only. One survey pair (Saudi Arabia) included data for men only. Data from 24 high-income, 27 middle-income and 18 low-income countries were included. The average period between the surveys was 12 years (range 4–37 years; Table 1). At the time of the initial survey, food energy supply was greater than the average energy requirements in 52 countries. For 37 of these countries, this excess food energy supply was more than 2000 kJ/day (Table 1).

For 56 countries (81%) both food energy supply and body weight increased between the survey pairs. For 45 of these countries (80%) the increase in food energy supply was more than sufficient to explain the increase in average body weight. This is shown in Fig. 1 with 56/69 countries being in the top right quadrant and 45/56 being to the right of the model-predicted change in energy intake needed to produce the increase in mean body weight for that country. This same pattern was observed for countries of all income levels (Fig. 2, Fig. 3, Fig. 4 and Fig. 5). For 11 countries (Benin, Chile, the Dominican Republic, Gabon, India, Indonesia, Ireland, Italy, Lebanon, Mauritania and New Zealand) in the top right quadrant, the increase in food energy supply was insufficient to account for the observed increase in weight (Fig. 1).

Five countries (Barbados, Burkina Faso, Kazakhstan, Nigeria and Switzerland) experienced reductions in both food energy supply and average body weight. For Kazakhstan the food energy supply decreased by 3778 kJ/day, from 13 117 kJ/day to 9339 kJ/day over a four year period (Table 1), accompanied by a decrease in average body weight of 0.9 kg. For the four other countries, decreases in food energy supply were much more modest (100–300 kJ/day; Table 1).
For five other countries (Eritrea, Iceland, Malaysia, Turkey and Uzbekistan), discordant changes were observed with reductions in food energy supply over the same period as increases in average body weight. The decrease in food energy supply was highest for Uzbekistan (2615 kJ/day) and lowest for Eritrea (63 kJ/day; Table 1). Apart from Eritrea, food energy supply at baseline for those five countries was relatively high (ranging from 12 242 to 15 531 kJ/day) and higher than the values of at least half of the other countries included in this study. In addition, excess food energy supply at baseline was high for those five countries (2757–7251 kJ/day; Table 1).

For three countries (the Islamic Republic of Iran, Rwanda and South Africa) there were discordant changes in the other direction with increases in food energy supply over the same time period as reductions in average body weight. The change in food energy supply was highest for the Islamic Republic of Iran (2615 kJ/day; Table 1) and lowest for South Africa (63 kJ/day). In Rwanda, the reduction in weight was 800 g while the food energy supply over the same time period increased by 674 kJ/day (Table 1).

The correlation between the change in food energy supply and change in average body weight was significant \((P = 0.011)\). When stratifying by type of country, associations were significant for high-income countries \((P < 0.001)\), but not for other country groups.

Discussion

For most of the countries included in this study, the change in per capita food energy supply was greater than the change in food energy intake theoretically required to explain the observed change in average body weight. The associations between changes in food energy supply and average population body weight were significant overall and for high-income countries. This suggests that, in high-income countries, a growing and excessive food supply is contributing to higher energy intake, as well as to increasing food waste.\(^{12}\)

Other factors, such as a decrease in physical activity, may also lead to an increase in body weight and could occur simultaneously with an increase in food energy supply. It has been shown that among 3.7 million participants in the United States at the county level, increased physical activity has only a very small impact on obesity prevalence.\(^{23}\) It is likely that in some countries, such as China, the impact of reduced physical activity on obesity is more important.\(^{24,25}\)

A reduction in physical activity with no compensatory drop in energy intake will cause weight gain until sufficient weight is gained to create energy balance (through both an increased resting metabolic rate and increased energy required to move the larger body). Researchers have suggested additional contributing factors for obesity, such as pollutants, infections and changes in the gut microbiota. These factors have an effect on metabolism, body composition and/or energy balance efficiencies. However, more evidence is needed to understand the importance of these factors in weight gain.\(^{26}\) Ideally, the cause of obesity in humans would be assessed through randomized controlled trials, where food energy availability is increased randomly and average body
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Research

Changes in food energy supply and change in average body weight for 15 upper-middle-income countries, 1980–2009

Upper-MIC: upper-middle-income countries.

Note: The dots representing the modelled data are the estimated change in energy intake required to account for the change in average body weight of the population.

In conclusion, in high-income countries, observed increases in body weight over recent decades may be confounded by changes in physical activity levels, changes in food intake, and changes in the demographic profile of countries. Demographic changes, particularly size, ageing, and racial/ethnic diversification of populations, may contribute to increasing obesity levels. About half the data sets on weight status used in this study are for women only and thus only represent half of the population. A limitation of the energy-balance model is that it assumes that metabolic physiology and physical activity levels are similar globally. This is likely to be true for industrialized countries for which accurate data on the relationship between energy expenditure and body weight are available and for which the model has been calibrated, it is not clear how well this assumption applies for developing countries. The model also assumes that population-wide changes in physical activity are negligible over the periods investigated.

In high-income countries, observed increases in body weight over recent decades may be associated with increased food energy supply. In addition, increases in food energy supply are sufficient to explain increases in average population weight. Due to the nutrition transition and a potential decrease in physical activity,
**Fig. 4.** Change in food energy supply and change in average body weight for 12 lower-middle-income countries, 1983–2009

Lower-MIC: lower-middle-income countries.

Note: The dots representing the modelled data are the estimated change in energy intake required to account for the change in average body weight of the population.

**Fig. 5.** Change in food energy supply and change in average body weight for 18 low-income countries, 1983–2009

LIC: low-income countries.

Note: The dots representing the modelled data are the estimated change in energy intake required to account for the change in average body weight of the population.
the same pattern is expected to occur in low- and middle-income countries in the future. Policy efforts should focus on reducing population energy intake through improving the healthiness of food systems and environments.

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Competing interests: None declared.

Résumé
L’augmentation de la disponibilité énergétique alimentaire comme facteur majeur de l’épidémie d’obésité: une analyse à l'échelle internationale

Objectif Nous avons enquêté sur les associations entre l’évolution des disponibilités énergétiques alimentaires nationales et celle du poids moyen des populations.

Méthodes Nous avons collecté des données de 24 pays à revenu élevé, 27 pays à revenu intermédiaire et 18 pays à faible revenu concernant le poids moyen de la population, tel que renseigné dans les bases de données mondiales, les rapports d’enquêtes nationales sur la santé et la nutrition et des articles examinés par comité de lecture. Les changements de poids ont été déterminés par des paires d'études espacées d'au moins quatre années d'intervalle (diverses années sur la période 1971 à 2010). Les paires d'études sélectionnées sont considérées comme représentatives d'une population adolescente ou adulte, à des échelles nationales ou sous-nationales. Les données relatives aux disponibilités énergétiques alimentaires ont été extraites des bilans des disponibilités alimentaire de l'Organisation des Nations Unies pour l'alimentation et l'agriculture (FAO). Nous avons estimé les besoins caloriques des populations aux moments de réalisation de l'enquêtes en utilisant les équations de l’Institute of Medicine (IOM). Enfin, à l'aide d'un modèle validé expérimentalement, nous avons estimé le changement
de l’apport calorique qui pourrait correspondre théoriquement aux changements observés du poids moyen.

Résultats Dans 56 pays, une augmentation de la disponibilité énergétique alimentaire a été associée à une augmentation du poids moyen. Dans 45 pays, l’augmentation de la disponibilité énergétique alimentaire a été plus importante que l’augmentation de l’apport calorique déduit du modèle. L’association entre l’évolution de la disponibilité énergétique alimentaire et le changement de poids a été statistiquement significative, de manière générale et dans les pays à revenu élevé (P < 0,001).

Conclusion Ces résultats suggèrent que l’accroissement de la disponibilité énergétique alimentaire suffit à expliquer les augmentations du poids moyen de la population, notamment dans les pays à revenu élevé. Des efforts politiques sont nécessaires pour obtenir des environnements et systèmes alimentaires plus sains afin de réduire l’obésité à l’échelle mondiale.
