Appendix 1. Detailed Methods and Data Sources

With our first set of data sources, the Demographic and Health Surveys (DHS), we developed an understanding of the typology of double burden households at the nationally representative level. For all years these countries collected anthropometry on women of childbearing age and preschoolers. We linked these data with gross domestic product (GDP) per capita to examine the relationship at the country level between the double burden and 1 measure of national income. With our second set of data sources we created measures of the double burden for all nations, but for the most recent period of available data with age-specific under- and overnutrition measures these are only estimates.

COUNTRY ESTIMATES OF THE DOUBLE BURDEN

We include both overweight and obesity as risk factors for all NCDs and many other related health problems in SSA. We have strong evidence from Asian, Latin American, and African subpopulations that hypertension and diabetes incidence becomes very high even at body mass indexes (BMIs) below 25, the level determining overweight, whereas for white people in the United States and Europe the incidence occurs only at a BMI of 30 or more, the criterion for obesity [1-9]

Supplemental Table 2 outlines the surveys we used in our analyses of the DBM at the household level. We used surveys available through January 1, 2020, for which we could access the raw data. We cleaned the data and calculated identical anthropometric measures of under- and overnutrition. To compare trends in the prevalence of underweight and overweight, we calculated an annualized percentage point change in the prevalence rates for each country. We also show the DBM of wasting/stunting combined with overweight/obesity across countries. The data on micronutrient malnutrition are of inadequate quality for SSA, so we do not report data on that.

To define high-severity DBM in children at the country level we used the recent World Health Organization-UNICEF-World Bank guidelines for severe anemia and high levels of overweight/obesity, wasting, and stunting [10]. We used prevalence levels of ≥ 15% and ≥ 30% to designate a country's population as high in wasting or stunting, respectively. Since overweight/obesity is so prevalent in the region and no clear overweight/obesity prevalence cut-off for women exists, we established a 40% cut-off. We focused on two key longer-term measures of nutritional status: stunting in preschoolers and overweight/obesity in women ages 15–49.

Country-level anthropometry

We used data from the Institute for Health Metrics and Evaluation recently published in *Lancet*.[11] These publicly available data include anthropometric measures of weight and height to estimate age-specific prevalence of wasting, stunting, and overweight in all age groups. The only measure they exclude is thinness (body mass index [BMI] < 18.5) for women 19 and older.[11] We added adult thinness in our analysis. The countries and their regions, populations, and anthropometric levels for the measures noted above are in Supplemental Table S1.

For changes in the DBM, we used only countries with two surveys with mother-child pairs, so we could study prevalence levels and trends. We selected the earliest and latest surveys spanning roughly 1990s, "latest" roughly the 2010s (with a few exceptions). Details of the DHS sampling methodology are described elsewhere.[12-14] Data are available for two time periods for most countries in the region with the exception of South Africa. That country has not released earlier DHS surveys for use; therefore no information is available on trends in South Arica.

The DBM at the country level was defined as having a high prevalence of both undernutrition and overweight/obesity in at least one population group. We examined which countries had DBM [DBM; prevalence wasting >15% or stunting > 30% or women's thinness (prevalence >20%)]and adult or child overweight(prevalence >20, 30, 40%). The cutoffs for undernutrition ares defined as wasting (WHZ<-2) or stunting (HAZ<-2) for children age 0-4 . and thinness (BMI<18.5) for adult women. For overweight (BMI Z >+2 in children under age 18 and BMI>25 for adults [15]) exceeds 20%, 30%, or 40% prevalence (Figure 1 and Supplemental Tables S1 and S2). We use a combination of overweight and obesity because extensive epidemiological research associates BMI of 25 or even lower to the risks of noncommunicable diseases (NCDs) across LMICs.[5,7,9,16-19]

MEASURES FOR HOUSEHOLD AND GLOBAL ANALYSES

Global estimates for all ages for anthropometry

For children ages 6–18 and adults we used estimates for all low- and middle-income countries (LMIC) from a recent study NCD-RisC group[11] In many cases this group used complex statistical algorithms to estimate the levels of stunting and overweight/obesity. The only data missing are the distributions of stunting in adults for each country. For children ages 0–5 we used a data set developed by the joint UNICEF-WHO-The World Bank group.[20] These preschooler data are based on the WHO Child Growth Standards of -2 standard deviations (SDs) from the standard for wasting and stunting and +2 SDs for overweight and obesity. We collected these data from disparate surveys and estimates that cover all countries, like the adult and child data. The only LMIC missing is South Sudan, so we used Sudanese data for both Sudan and South Sudan.

For the earlier period there are no data in the 1990's for many countries. UNICEF data provided the aged 0-4 data for the most recent decade but had much missing data for the 1990's so we utilized data from DHS as much as possible for the anthropometry in the 1990's for ages 0-4.

Household and national estimates

We used the final DHS data sets and calculated all measures to ensure data quality. All the surveys we used had standardized protocols to measure weight and height.[21] We calculated BMI as weight in kilograms divided by height in meters squared (kg/m^2). We defined thinness and overweight according to the WHO recommendations, thinness at BMI < 18.5 kg/m^2 and overweight at BMI ≥ 25 kg/m^2.[22,23] We adjusted BMI for women ages 15.0–17.9 according to the International Obesity Task Force definitions.

We assessed children's anthropometric statuses by comparing data with the WHO Child Growth Standards. We used the WHO igrowup macro to calculate z-scores and excluded children with invalid z-scores for ages 0-4. We excluded 2 countries, Benin and Pakistan, from this study entirely due to their high percentages of invalid z-scores. For iron status we followed WHO cutoffs for children and women.[24]

We calculated the annualized change in prevalence by dividing the absolute change in levels by the number of years between surveys to provide a comparable measure of positive or negative change for all measures of malnutrition in countries for which we have 2 years of data. For a detailed presentation of the observed heterogeneity, we selected a set of countries for which we had pre-1997 and post-2011 data and time spans from 16 to 24 years as examples.

Country-level burden of malnutrition

For the severity of the double burden in children at the country level we used the recent WHO/UNICEF guidelines for high levels of overweight/obesity, wasting, and stunting.[20] The prevalence levels we used to designate a country's population as high in wasting, overweight, or stunting are ≥15%, ≥ 15%, and ≥ 30%, respectively. Meeting any of these criteria meant a country faced undernutrition according to anthropometric status.

For women there is no clear cutoff for overweight and obesity. Thus, we present data based on 40%, 30%, and 30% cutoffs for overweight prevalence in the population. We designated ≥ 20% as the underweight cutoff for thinness prevalence. There is no global agreement on what constitutes a country with excessive overweight and obesity or thinness, so we selected these based-on distribution and where we found major breaks and excessively high burdens. The countries who fit these criteria for the double burden spelled out above are found in Supplemental tables S1 and S2.

Measures of undernutrition included wasting (WHZ<-2) and stunting (HAZ<-2) for children age 0-4 and thinness (BMI<18.5) for adult women. Cutoffs for overweight/obesity were BMI Z >+2 in children under age 18 and BMI>25 for adults.[15]

Some might argue from a high-income perspective that we should consider only obesity in the DBM definition. However, extensive epidemiological research significantly associates body mass indexes (BMIs) of 22 or 23 with the risks of noncommunicable diseases (NCDs) and the risk of becoming overweight (BMI ≥ 25 kilograms per square meter (kg/m^2) World Health Organization (WHO) across LMICs.[5,7,9,16-19] We also acknowledge the role of poor dietary quality as a common determinant of the DBM and potentially an element contributing to other dimensions of poor health, independently of the anthropometric variables. However, these dimensions will not be covered by this series.

Map of DBM countries. To provide data comparable with other regions, we used UNICEF, the WHO, the World Bank, and NCD-RisC estimates, which we supplemented with selected DHS and other direct measures for countries with no preschooler data.[25-27] These global data are presented in a separate publication,[28] and we analyze them for SSA here.

HOUSEHOLD-LEVEL ANALYSIS

Data sources

Most of our data are from the DHS, a series of nationally representative surveys typically conducted every 5 years (available at http://www.measuredhs.com). Details of the DHS sampling methodology are described elsewhere.[29] Additional data are from the 1993 and 2014 Indonesian Family Life Survey (representative of 83% of the Indonesian population),[30,31] the 1991 and 2015

China Health and Nutrition Survey (representative of 56% of the Chinese population),[32] the 2013 Brazil National Health Survey (1996 data from the DHS),[33,34] the 1988 and 2012 Mexico National Survey of Health and Nutrition (ENSANUT, nationally representative),[35-38] and the 1992 and 2002 Vietnam Living Standards Surveys. [39] For Mexico we eliminated the small ENSANUT 2016, which was collected in a different season than the other surveys.

The sample data for the earliest and the most recent surveys available for each country are in Supplemental Table S3. The supplemental tables include the data discussed below—population size, GDP per capita based on purchasing power parity (GDP [PPP]), and sample size.

Study population and sample size

We restricted all analyses to nonpregnant women ages 15–49 and children ages 0–4. Pregnancy status was available for all countries. The countries for which data were available and the sample sizes are in Supplemental Table S1. Our arrangement of countries into regions follows the World Bank's.[40] For countries with only 1 survey, we included that single survey (Supplemental Table S1). For countries with more than 3 surveys, we included only the oldest and the most recent. The overall total sample size was 469,564 households with at least 1 child age 0–4 and 816,469 households with a nonpregnant woman age 15–49. Additionally, 438,877 households had both a child age 0–4 and a woman age 15–49. In total the analyses included 1,098,378 women 15–49 and 664,547 children 0–4.

We conducted direct measurements of the data sets available to us so we could apply the same measures noted below to all and the same cutoffs for erroneous measurements and weigh the data to be nationally representative (except China, which is representative of 56% of the population). Lacking adequate population coverage to present regional averages, we focused on country results and selected countries in which the most recent survey was after 2011 and the earliest survey was before 1997 (yielding intervals of 16–24 years) to give some sense of the heterogeneity of long-term trends (Supplemental Figure 6). The UNICEF-WHO-The World Bank Joint Child Malnutrition Estimates are the best recent regional estimates.[27]

GDP per capita based on purchasing power parity

GDP (PPP) is a measure of GDP divided by the midyear population (GDP/capita) for each country.[40] For our GDP (PPP) measures we used World Bank data, which evaluate the cost of a given basket of goods to equalize exchange rates and ascertain exact values in purchasing terms for each country.[41]

Statistical analysis

We used STATA version 14.2 (StataCorp, College Station, Texas) for all statistical analyses. All results are nationally weighted to be representative of the country. We adjusted age to the world age structure and felt that it did not significantly impact the results, so we present only the nationally representative weighted results. We weighted regional results by each country's 2010 population for the most recent period and by its 1990 population for the earlier period.

For the regression results we used ordinary least squares with controls for population size and for the GDP/capita relationship. For each outcome we tested linear, quadratic (second-degree polynomial), and cubic polynomial (third-degree polynomial) versions of GDP/capita. We kept the most appropriate relationship in terms of statistical significance.

Equity: Does overweight differ by socioeconomic status?

We followed a method that our group published earlier.[42] Our outcomes of interest were (1) overweight prevalence difference defined by the difference in overweight prevalence between the lowest and the highest wealth or education quintiles for each survey wave and (2) the annualized difference in the rate of overweight prevalence growth for the lowest and highest wealth or education quintiles between the first and last survey waves. We calculated overweight prevalence difference in each survey wave in each country for wealth quintiles by $\text{Overweight Prevalence}_{\text{lowest quintile}} - \text{Overweight Prevalence}_{\text{highest quintile}}$. A positive overweight prevalence difference indicates that the lower wealth quintile had a higher prevalence of overweight compared to the higher wealth quintile. To obtain the annualized difference in overweight prevalence growth rates between wealth quintiles, we took the difference between the change in overweight prevalence in the lowest group over the survey period and the change in the highest group over the survey period: (Overweight lowest,last wave – Overweight lowest,first wave) – (Overweight highest,last wave – Overweight highest,first wave). We annualized this result for each country. A positive difference in prevalence growth rates indicates that the lowest wealth quintile had a higher prevalence growth rate than did the highest quintile, and this gap is growing.

Data sources for the supply side of processed foods

We used three data sources on the supply of processed foods. First, we reviewed the scant African literature presenting survey studies of SME food processors. Second, we reviewed the literature and web resources on large-scale processors, such as Bakhresa based in Tanzania. Third, we reviewed the literature on SME processed food retail from both consumer surveys and some retail surveys. We analyzed data from Edge by Ascential on supermarket and fast-food chain sales. Edge by Ascential has followed around 7,000 of the leading national, regional, and global retailers in 211 countries since 2001. We selected the SSA countries and the edible grocery sales. These data from Edge by Ascential, formerly called Planet Retail, and Euromonitor come from approximately the same set of modern chains and do not present data for SMEs

Examining the processed food consumption literature and the SME retail studies noted below, we found that even the SME food stores sell substantial amounts of ultra-processed food. Consequently, the trends from Edge by Ascential and Euromonitor reflect the broader national-level sales trends and are a proxy for national consumption trends of purchased processed foods

Data sources for consumption of processed foods

We used two data sources for consumption of processed foods. First, for household and individual consumption of the full range of processed foods as defined above we reviewed available literature based on comprehensive surveys, such as the Living Standards Measurement Surveys (LSMS) in a number of African countries and the Household Budget Survey (HBS) in Tanzania. We included literature on similar surveys focused on a specific area, such as rural zones or a city or set of cities, as in the Göttingen University surveys in Kenya. The data sets are usually cross-sectional, but some are panel sets. These comprehensive surveys permit many of the studies we reviewed to analyze processed food consumption by type, such as low- versus high- or ultra-processed, by income strata, by rural versus urban, by gender, and by employment status.

Second, we used Euromonitor International data on sales of SSBs and other ultra-processed foods in large and medium convenience stores and supermarkets by country and over years [43]. Retailers who generate computerized data on sales, such as modern convenience food and supermarket chains, and modern fast-food chains in the food service sector report these data, which represent well the food sale and purchase trends in higher-income countries and in Latin America. We used them as a rough approximation of national trends in sales of these products to compare with DBM data estimates discussed below. From Euromonitor we have nonmodeled data from 2004 to 2018 for only Nigeria and South Africa (**Supplemental Table 1**). We did not use Euromonitor modeled data for other SSA countries; rather we focus only on actual sales from the limited countries with such data. We selected categories that are mainly ultra-processed foods and beverages.

Diet analysis data and methods

Because very few large-scale dietary surveys have been conducted in the SSA region and no ongoing national diet surveys exist, we were forced to rely on a range of other data. These are shown in the table above.

Euromonitor International. We used data on global sales of beverages and less healthy foods from the Euromonitor International Passport database,[43,44] which has been used in other studies on sugar-sweetened beverages (SSBs).[45] We defined as SSBs caloric soft drinks (carbonated, noncarbonated); fruit drinks (sweetened beverages of diluted fruit juice and often other caloric sweeteners and flavoring); and the fast-growing categories of energy drinks, sports drinks, and sugar-sweetened (often flavored) waters, which we combined in our figures as sports and energy drinks. We combined sales for off-trade volume (i.e., supermarkets, retailers) and on-trade volume (i.e., restaurants, cafeterias) reported in milliliters (ml) per capita per day. The caloric data are available only for off-trade volume.

The Euromonitor data leave an important gap, as they report actual sales for only a few large countries, excluding most SSA countries. In addition, although Euromonitor does not collect data on total sales, it does fairly represent the trends in each country for which data are available.

FAOSTAT. We also used food balance data available from the Food and Agricultural Organization (FAO) of the United Nations.[46] These are aggregate data compiled from each country's estimates of production minus waste, imports, and exports, so the data essentially represent food available for consumption. FAOSTAT is the only major global source for reasonably comparable data on food consumption trends. We present them per capita. While the Euromonitor data have been shown to capture trends quite accurately, the FAOSTAT data can miss changes that affect estimates of production, waste, exports, and imports. Despite weaknesses and their aggregate nature, which does not allow us to look at socioeconomic status (SES) or demographic subpopulations, these data are critical. FAOSTAT's are the only available data on many factors for all SSA countries, and we used them in specific instances.

Edge by Ascential (Formerly Planet Retail). The data for modern retail chain sales over years are drawn from our analysis of raw data available at https://retailinsight.ascentialedge.com/. The site includes all the retail firms and restaurant chains that Edge follows per country. For the retail firms we limited our analysis to those that sold at least some food but excluded gas stations. Edge by Ascential primarily follows the leading national chains but not the local and regional chains. The totals in the tables are an underestimate of the overall food sales of modern retail and restaurant chains in the SSA countries. Because most of the SSA retail and restaurant sectors are still somewhat fragmented, this may be a significant underestimate. No official data are available for comparison. Details of the companies followed are noted in the tables.

Euromonitor data: Country-level sales of sugar-sweetened beverages and nonessential or junk foods

Comparable data on sales of sugar-sweetened beverages (SSBs) are available for hundreds of countries from Euromonitor International Passport.[47] In a new database Euromonitor collected caloric information for most beverages on a country by country basis. With these data we estimated kilocalorie/capita/day trends in sales for a limited number of years (2009–2014). We were the beta tester of the new Euromonitor data, which are now publicly available to subscribers. Longer-term trends from 2000 are available for volume in milliliters (ml). In both cases we combined sales of what Euromonitor terms off-trade volume (i.e., supermarkets, retailers) and on-trade volume (i.e., restaurants, cafeterias). All volume data are reported in ml/capita/day. We suspect these Euromonitor data omit many small local bottlers, but no rigorous study has evaluated the completeness of the data. We define SSBs as regular cola carbonates, noncola carbonates (e.g., lemon/lime and orange carbonates, ginger ale, mixers), liquid and powder concentrates, juice drinks (up to 24% juice), nectars (25–99% juice), ready-to-drink coffees and teas, sports and energy drinks, and Asian specialty drinks.

Nonessential or "junk" foods include cakes, pastries, chocolate and sugar confectioneries, chilled and shelf-stable desserts, frozen baked goods, frozen desserts, ice cream, sweet biscuits, snack bars, processed fruit snacks, salty snacks, savory biscuits, popcorn, pretzels, and other savory snacks. Clearly, these are aggregate measures, and we omit many items and likely include some that would be termed healthful foods and not ultra-processed junk foods.

COMTRADE data on import shares in total food consumption and imports by processing categorization

The table shows estimates of the import share in total food expenditure by a commodity x processing level categorization of foods. All import data are for 2008 – 2014 from COMTRADE. All values are in 2011 PPP USD. Expenditure data are population-weighted estimates from nationally representative household expenditure surveys. For each country, the first table shows import values, the second shows estimated expenditure values, and the third shows import shares, computed from the previous two tables.

Mapping of COMTRADE-reported items into processing level categories was based on 430 COMTRADE HSC codes at 3 (92 cases), 4 (151 cases), 5 (36 cases) and 6 (150 cases) digit levels. Decisions on number of digits were based on the number needed to make a clear classification into processing categories. The full mapping of the 430 COMTRADE items into our processing categories is available upon request.

Values in individual cells of the commodity x processing level matrices can exceed 1.0 for several reasons: (1) measurement error when absolute values of expenditure or imports are very low; this accounts for the majority of cases; (2) differential classification between import and expenditure data, e.g. when whole maize grain is imported it is classified as unprocessed non-perishable, but most consumption will be reported in household surveys as maize meal, which is classified as low processed non-perishable.

Data from the Tanzania Household Budget Survey (HBS): Sauer et al. (2019) use the HBS data set. HBS is a detailed cross-sectional, nationally representative survey conducted from October 2011 to October 2012 covering 9,788 households in mainland Tanzania. Beside household characteristics, the data include household expenditure on and consumption of food products (both food purchased and consumed at home, as well as food consumed away from home) and non-food goods and services. The household-level food consumption data are drawn from a 28-day diary. Respondents were instructed to record all food consumed (in unit and value terms) and the source of the food (own-production, purchased, or received as a gift, payment in kind, or food aid) by members of the household during the day, for 28 consecutive days. The product set was 183 items. Households were also asked to record the value of food consumed away from home (FAFH) each day. For illiterate households, enumerators visited daily to record consumption; for other households, enumerators checked in every few days. For food that was not purchased, the household was asked to estimate the monetary value of the food in Tanzanian shillings.

Data from the Nigeria LSMS: Dolislager et al. (2019) use the data of the LSMS 2015/2016 General Household Survey of Nigeria. The sample size was 3113 rural households and 1468 urban households. This LSMS (Living standard measurement survey) is a multi-dimensional nationally representative survey with detailed information about households' assets, demographic characteristics, consumption, and household practices including agricultural production, businesses, and other non-farm activities. We used the detailed individual and household data on food consumption, employment, and demographics including spatial identifiers. Household food consumption and purchase data of 116 food items were collected during two interviews throughout the year by seven-day recall. Market values of food consumption were calculated using imputed prices from purchased items.

Data from the Tanzania LSMS. Dhar and Tschirley (2019) use individual level data from the first three waves (2008/09, 2010/11 and 2012/13) of the Tanzania National Panel Survey (NPS) to explore the determinants of overweight and obesity. The final wave, conducted in 2014/15, was a new sample and we exclude it to take advantage of panel estimation methods. They removed any individuals that did not appear in all 3 waves to ensure a balanced panel. This left them with 17,340 total observations (5780 individuals). Their analysis is limited to adults (3742 individuals), as disentangling drivers of overweight and obesity is notoriously difficult in younger individuals. Overweight and obesity use standard WHO definitions. Both average BMI and the proportion of overweight/obese individuals increased slightly in each successive wave.

1. Albrecht SS, Mayer-Davis E, Popkin BM. Secular and race/ethnic trends in glycemic outcomes by BMI in US adults: the role of waist circumference. *Diabetes/Metabolism Research and Reviews*. 2017;33(5).
2. Bell AC, Adair LS, Popkin BM. Ethnic differences in the association between body mass index and hypertension. *American Journal of Epidemiology*. 2002;155(4):346-353.
3. Cooper R. Hypertension prevalence in seven populations of African origin. *Am J Pub Health*. 1997;87:160-168.
4. Cooper RS, Rotimi CN, Kaufman JS, et al. Prevalence of NIDDM among populations of the African diaspora. *Diabetes care*. 1997;20(3):343-348.
5. Joshi P, Islam S, Pais P, et al. Risk factors for early myocardial infarction in South Asians compared with individuals in other countries. *Jama*. 2007;297(3):286-294.
6. Misra A. Ethnic-Specific Criteria for Classification of Body Mass Index: A Perspective for Asian Indians and American Diabetes Association Position Statement. *Diabetes technology & therapeutics*. 2015;17(9):667-671.
7. Nair M, Prabhakaran D. Why do South Asians have high risk for CAD? *Global Heart*. 2012;7(4):307-314.
8. Wells JC, Pomeroy E, Walimbe SR, Popkin BM, Yajnik CS. The elevated susceptibility to diabetes in India: an evolutionary perspective. *Frontiers in public health*. 2016;4:145.
9. WHO Expert Consultation. Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. *Lancet*. 2004;363(9403):157-163.
10. UNICEF-WHO-World Bank. Ranges of prevalence levels for wasting, overweight and stunting. 2017 https://data.unicef.org/topic/nutrition/malnutrition/. Accessed
11. Abarca-Gómez L, Abdeen ZA, Hamid ZA, et al. Worldwide trends in body-mass index, underweight, overweight, and obesity from 1975 to 2016: a pooled analysis of 2416 population-based measurement studies in 128.9 million children, adolescents, and adults. *The Lancet*. 2017;390(10113):2627-2642.
12. Razak F, Corsi DJ, Sv S. Change in the body mass index distribution for women: analysis of surveys from 37 low- and middle-income countries. *PLoS Med*. 2013;10(1):e1001367.
13. Subramanian SV, Perkins JM, Ozaltin E, Davey Smith G. Weight of nations: a socioeconomic analysis of women in low- to middle-income countries. *Am J Clin Nutr*. 2011;93(2):413-421.
14. Subramanian SV, Smith GD. Patterns, distribution, and determinants of under- and overnutrition: a population-based study of women in India. *Am J Clin Nutr*. 2006;84(3):633-640.
15. de Onis M, Borghi E, Arimond M, et al. Prevalence thresholds for wasting, overweight and stunting in children under 5 years. *Public Health Nutr*. 2018;22(1):175-179.
16. Colin Bell A, Adair LS, Popkin BM. Ethnic differences in the association between body mass index and hypertension. *Am J Epidemiol*. 2002;155(4):346-353.
17. Albrecht SS, Mayer-Davis E, Popkin BM. Secular and race/ethnic trends in glycemic outcomes by BMI in US adults: the role of waist circumference. *Diabetes Metab Res Rev*. 2017;33(5).
18. Wells JC, Pomeroy E, Walimbe SR, Popkin BM, Yajnik CS. The elevated susceptibility to diabetes in India: an evolutionary perspective. *Front Public Health*. 2016;4(145).
19. Misra A. Ethnic-specific criteria for classification of body mass index: a perspective for Asian Indians and American Diabetes Association position statement. *Diabetes Technol Ther*. 2015;17(9):667-671.
20. UNICEF, WHO, World Bank Group. Ranges of prevalence levels for wasting, overweight and stunting. 2017 https://data.unicef.org/topic/nutrition/malnutrition/. Accessed Nov 10 2017.
21. USAID. MEASURE DHS Biomarker Field Manual: Demographic and health surveys methodology 2012; https://dhsprogram.com/pubs/pdf/DHSM7/DHS6_Biomarker_Manual_9Jan2012.pdf. Accessed Jan 10, 2017.
22. World Health Organization. Diet, nutrition, and the prevention of chronic diseases. Paper presented at: WHO Technical Report Series2003; Geneva.

23. World Health Organization. Physical Status: The Use and Interpretation of Anthropometry - Report of a WHO Expert Committee. In: Anthropometry WECoPSTUaIo, ed. *WHO Technical Report series 854*. Geneva: WHO; 1995: http://helid.digicollection.org/en/d/Jh0211e/.
24. WHO. Haemoglobin concentrations for the diagnosis of anaemia and assessment of severity. In: Nutrition, ed. Geneva: World Health Organization; 2011:6.
25. 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 128.9 million participants. *The Lancet.* 2016;387(10026):1377-1396.
26. UNICEF WaWBG. Ranges of prevalence levels for wasting, overweight and stunting. 2017 https://data.unicef.org/topic/nutrition/malnutrition/. Accessed
27. UNICEF-WHO-The World Bank. levels and trends in child malnutrition: Joint Child Malnutrition Estimates. In: UNICEF-WHO-The World Bank, ed. Vol 2017 edition. Geneva, Switzerland: UNICEF-WHO-The World Bank,; 2017.
28. Popkin BM, Camila Corvalan, Laurence Grummer-Strawn, . The rapid shifts in the stages of the Nutrition Transition and the Double Burden of Malnutrition in low and middle income countries *The Lancet.* 2019(in press).
29. Corsi DJ, Neuman M, Finlay JE, Subramanian SV. Demographic and health surveys: A profile. *Int J Epidemiol.* 2012;41(6):1602-1613.
30. Rand Labor and Population Division. The Indonesia Family Life Survey (IFLS). 2014; https://www.rand.org/labor/FLS/IFLS.html. Accessed March 1, 2014.
31. Indonesia Family Life Surveys (IFLS). RAND Corporation. Indonesia Family Life Survey. 2005; www.rand.org/FLS/IFLS. Accessed May 1, 2005.
32. Popkin BM, Du S, Zhai F, Zhang B. Cohort Profile: The China Health and Nutrition Survey—monitoring and understanding socio-economic and health change in China, 1989–2011. *Int J Epidemiol.* 2010;39(6):1435-1440.
33. IBGE - Instituto Brasileiro de Geografia e Estatística. *Pesquisa de Orçamentos Familiares, 2008-2009: Análise do Consumo Alimentar Pessoal no Brasil.* Rio de Janeiro: Instituto Brasileiro de Geografia e Estatística.;2011.
34. Instituto Brasileiro de Geografia e Estatística. Pesquisa de orçamentos familiares 2008-2009: antropometria e estado nutricional de crianças, adolescentes e adultos no Brasil. 2010; http://www.ibge.gov.br/home/estatistica/populacao/condicaodevida/pof/2008_2009_encaa/pof_20082009_encaa.pdf Accessed 22 May, 2013.
35. Gutiérrez J, Rivera-Dommarco J, Shamah-Levy T, et al. Encuesta Nacional de Salud y Nutrición 2012. Resultados Nacionales. Cuernavaca, México: Instituto Nacional de Salud Pública (MX), 2012. *Psicología y Salud.* 2012;25(1):111-122.
36. Olaiz-Fernández G, Rivera-Dommarco J, Shamah-Levy T, et al. Encuesta Nacional de Salud y Nutrición 2006. Cuernavaca, México: Instituto Nacional de Salud Pública. 2007.
37. Resano-Pérez E, Méndez-Ramírez I, Shamah-Levy T, Rivera JA, Sepúlveda-Amor J. Methods of the national nutrition survey 1999. *salud pública de méxico.* 2003;45:558-564.
38. Romero-Martínez M, Shamah-Levy T, Franco-Núñez A, et al. Encuesta Nacional de Salud y Nutrición 2012: diseño y cobertura. *salud pública de méxico.* 2013;55:S332-S340.
39. Tuan N, Tuong P, Popkin B. Body mass index (BMI) dynamics in Vietnam. *Eur J Clin Nutr.* 2008;62(1):78-86.
40. World Bank. DataBank: World Development Indicators. In: Bank W, ed. Washington, DC2017.
41. Rogoff K. The purchasing power parity puzzle. *J Econ Lit.* 1996;34(2):647-668.
42. Jones-Smith JC, Gordon-Larsen P, Siddiqi A, Popkin BM. Is the burden of overweight shifting to the poor across the globe? Time trends among women in 39 low- and middle-income countries (1991-2008). *Int J Obes.* 2012;36(8):1114-1120.
43. Euromonitor International. Passport Nutrition. 2019; http://www.euromonitor.com/. Accessed April 5, 2015.

44. Euromonitor International. *Soft Drinks in Latin America: Keeping a Global Bright Spot Bright.* London: Euromonitor International;2014.
45. Popkin BM, Hawkes C. Sweetening of the global diet, particularly beverages: patterns, trends, and policy responses. *Lancet Diabetes & Endocrinology.* 2015;4(2):174-186.
46. FAOSTAT. Food Balance/Food Balance Sheets. 2017; http://www.fao.org/faostat/en/. Accessed July 28, 2017, 2017.
47. Euromonitor International. Passport Nutrition. 2020; http://www.euromonitor.com/. Accessed January 4, 2018.