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Methods
We obtained retail price observations used by the World Bank to measure poverty, and identified the most affordable foods to meet EAT-Lancet targets. We compared total cost per day to each country's gross national income, computed the fraction of people for whom the most affordable EAT-Lancet diet exceeds household income, and measured affordability relative to a least-cost diet with only essential nutrients.

Findings
We found prices for 744 items across 159 countries, revealing that the most affordable EAT-Lancet diets cost a global average of $2·89 per day (IQR: 2·41-3·16) in 2011, of which the largest share was the cost of fruits and vegetables (31·2 %), followed by legumes and nuts (18·7 %), meat, eggs & fish (15·2 %) and dairy (13·2 %). This diet costs a small fraction of available resources in high-income countries, but is not affordable for the world's poor. We estimated that the cost of an EAT-Lancet diet exceeded household income for at least 1·56 billion people. The EAT-Lancet diet is also more expensive than the minimum cost of sufficient nutrients; on average, by a factor of 1·64 (IQR: 1·41-1·78).

Interpretation
Current diets differ greatly from EAT-Lancet targets. Improving diets is affordable in many countries, but for many people would require some combination of higher income, nutrition assistance, and lower prices. Data and analysis on the cost of healthier foods is needed to inform both local interventions and systemic changes.

Cost and affordability of the EAT-*Lancet* diet in 159 countries

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Research in context

Evidence before this study

'Food in the Anthropocene: the EAT-*Lancet* Commission on healthy diets from sustainable food systems' was published on January 16, 2019, providing the first evidence-based targets for the quantities of each food group needed for both human health and environmental sustainability. The Commission did not address cost or affordability, and a PubMed search for "EAT *Lancet*" on June 13, 2019 reveals no other research on that.

Added value of this study

This is the first study to calculate the cost of foods needed for a healthy and sustainable diet across the globe. Using standardized data on availability and prices for 744 food items in 159 countries, the minimum daily cost of an EAT-*Lancet* diet in 2011 ranged from an average of $2·43 in low-income countries to $2·77 in high-income countries. These diets are affordable for a majority of the world's people, but not in low-income countries where a day's worth of the lowest-cost way to meet EAT-*Lancet* targets would cost more than 70 % of daily national income. For at least 1·56 billion people, mostly in sub-Saharan Africa and South Asia, the cost of this diet would exceed their total income. Reaching EAT-*Lancet* targets would cost an average of 64 % more than achieving minimally adequate levels of essential nutrients and is currently unaffordable in low-income countries, because it requires larger quantities of higher-cost food groups such as dairy, eggs, meat, fish, fruits and vegetables than the near-subsistence diets that are currently consumed by very low-income people.

Implications of all the available evidence

Our findings indicate that a widespread global shift to the EAT-*Lancet* diet recommendation is feasible only through some combination of higher earnings, more favorable market prices and nutrition assistance for low-income people, in addition to changes in local and global food systems that drive food choice among more affluent populations. Meeting EAT-*Lancet* targets in low-income areas will require higher farm productivity and improved access to markets, plus greater nonfarm earnings and social safety nets, allowing people to shift consumption away from starchy staples and increase their intake of more nutritious but currently unaffordable animal-sourced and vegetal foods.

1. Introduction

More than 2·5 billion people worldwide suffer from at least one form of malnutrition, with approximately 800 million people undernourished, around two billion adults overweight or obese,[1] and over two billion people with micronutrient deficiencies.[2] Poor quality diets are now the leading cause of morbidity and mortality in the world,[3] due to both inadequate consumption of nutritious foods and excess consumption of harmful ones. Current food production methods pose risks to the health of the planet as well. The agricultural sector now accounts for 20 to 30 % of global greenhouse-gas emissions, and is a major cause of freshwater pollution, soil degradation and loss of biodiversity.[4,5,6] The global food system falls far short of achieving global goals for both health and the environment.

Realigning food systems to deliver better health and environmental outcomes is therefore among the most important global challenges of the 21st Century. To help guide change, the EAT-*Lancet* Commission was tasked with using the best available evidence to determine a universal reference diet that is healthy for both humans and the planet, minimizing chronic disease risks and maximizing human wellbeing.[7] The EAT-*Lancet* diet is rich in fruits and vegetables, with protein and fats sourced mainly from plant-based foods and fish with unsaturated oils, and carbohydrates from whole grains. Combined with improved agricultural production practices and reduction of food waste and loss, shifting to this diet permits feeding the estimated 10 billion people in 2050 within planetary boundaries that restrict global warming, land-systems change, freshwater expansion, biodiversity loss, and nitrogen and phosphorus cycling.[7]

As noted in the EAT-*Lancet* report, a shift to healthier diets requires that they be both available and affordable based on local food prices, especially among low-income populations.[8,9] To improve dietary intake, the EAT-*Lancet* commission calls for a Great Food Transformation: "a substantial change in the structure and function of the global food system so that it operates with different core processes and feedback". The evidence presented here can help guide those changes, by calculating the most affordable way to meet EAT-*Lancet* diet recommendations using available foods in every country of the world, and comparing the resulting dietary cost to prevailing incomes in each country.

This study aims to answer four key questions raised by the EAT-*Lancet* recommendations. First, what is the current cost per day of sufficient foods to meet EAT-*Lancet* targets, using the most affordable items now available in each country? Second, for whom would that total cost be (un)affordable, given national average incomes and household expenditures? Third, how much more costly are EAT-*Lancet* recommendations than the foods needed to meet minimal nutrient requirements?[10] And finally, how much does each of the specific food groups in EAT-*Lancet* diets contribute to their overall cost and affordability? Answers to these questions can guide efforts at dietary improvement globally and within each country, by identifying obstacles to change and what actions might be needed for both systemic transformation and assistance to specific populations.

2. Methods

Overview

The analysis took place in three stages. In the first stage, we used detailed information on locally available foods in all countries for which data was available to identify the lowest-cost items needed to meet EAT-*Lancet* recommendations (table 1). In the second stage, we compared the resulting daily cost to average daily gross national income (GNI), and used survey evidence on income distributions to calculate the number of people for whom the daily cost of an EAT-*Lancet* diet is not currently affordable. In the third stage, we compared the local cost of EAT-*Lancet* diets in each country to the least-cost combination of foods that just meet daily requirements of 20 essential nutrients. Taken together, these results identify the specific regions and food groups in which locally-available items needed to meet EAT-*Lancet* targets are (not) affordable, to inform both local interventions and systemic changes.

The EAT-Lancet diet

The reference diet recommended by Willett et al[7] is described in the first column of table 1. This EAT-*Lancet* diet provides 2,503 kcal per day, corresponding to the average energy needs of a 30-year old woman weighing 60 kg and whose physical activity level is between moderate and high. The specific serving sizes for each food group are derived from the best available scientific evidence about both health risks and environmental impacts of different foods. The EAT-*Lancet* report also specifies which food groups might substitute for each other, based on nutritional content and environmental impact. For example, poultry is exchangeable with fish and eggs, and various plant-based protein sources are interchangeable. The resulting food groups (table 1) combine red meat (beef, lamb and pork), white meat, fish and eggs (poultry, fish and eggs), and legumes and nuts (dry beans, soy foods and peanuts).

Food prices and availability by country

The availability and cost of acquiring goods and services around the world is monitored by the International Comparison Program (ICP), a collaboration between the World Bank and country statistical agencies charged with collecting nationally representative prices for widely consumed goods and services. The purpose of the ICP is to standardize price collection, for use in measuring economic activity, poverty rates, and purchasing power parity (PPP) exchange rates between currencies.[11] The ICP aims for global coverage and includes sufficient data for this project from 159 countries accounting for 95% of the world's population (appendix 1).

The most recent available ICP data are from 2011, with prices for a globally standardized list of 199 foods and non-alcoholic beverages, which we supplemented with an additional 545 region-specific items for which the ICP regional authorities collated prices within Africa, Asia and the Pacific, Latin America and the Caribbean, and Western Asia. The resulting list of 744 items in 159 countries yielded 21,121 price observations. Almost all items without price observations were considered not available for purchase. The only exception is that 38 of the higher-income countries did not report any price for basic starchy staples such as potatoes or rice, for which we imputed their cost as the mean price from a country's geographical sub-region (appendix 2).

We then matched each ICP item to its food group, recorded the item's edible portion and energy contents (kcal) from the United States Department of Agriculture (USDA) National Nutrient Database,[12] and computed the most affordable way to meet EAT-*Lancet* targets from locally available foods using the least expensive item within each food group. In rare cases where a country reported no prices for any item within one of the EAT-*Lancet* groups, we substituted the lowest cost item within the closest other food category (appendix 2). For some countries, the ICP data include prices for whole animals such as fish and poultry that are not in the USDA product list. In these instances, we obtained estimates of edible portions from FAO/INFOODS[13] (appendix 3).

Income and affordability by country

To assess affordability, we first compared the cost of an EAT-*Lancet* diet to the total value of all goods and services available per person in each country, as measured by the country's gross national income (GNI). GNI counts the total value of goods and services produced in the country, plus net income from abroad.[14] For 2011, World Bank estimates of GNI were available for 156 countries (appendix 4). GNI includes both household spending and public services, so this measure of affordability includes the potential for nutrition assistance under existing aid programs. To measure affordability from household resources, taking account of income distribution, we used survey evidence from the World Bank's PovcalNet system[15] to compute the number of people in each country for whom the lowest-cost way to meet EAT-*Lancet* diet recommendations exceeds the total value of all household consumption or income. We were able to estimate this prevalence for 140 countries (appendix 4).

Our second benchmark of affordability is to compare EAT-*Lancet* diets against the least-cost way to obtain adequate levels of just essential nutrients, without consideration of additional attributes associated with EAT-*Lancet* food groups. This cost of nutrient adequacy (CoNA) is an updated version of the least-cost diet concept originally developed by Stigler[16], computed from food prices and nutrient composition for a wide range of purposes.[8,17-19] For comparison with the EAT-*Lancet* diet, we defined CoNA as the lowest-cost combination of foods needed to meet all requirements of 20 essential nutrients for a healthy 60-kg woman at 30 years of age, in energy balance at 2,503 kcal/day (appendix 5). The quantity of each food needed to deliver nutrients in the required proportions was calculated by linear programming, to give a lower bound on the daily cost of meeting a healthy woman's minimum estimated average requirements (EARs), while staying below the maximum upper limit (UL) of toxicity for each micronutrient and within acceptable macronutrient distribution range (AMDR) for protein, fats and carbohydrates.[10] The foods selected for CoNA are not a recommended diet because it makes no provision for attributes other than

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essential nutrients, so it serves as a useful benchmark to measure the additional cost beyond just nutrients of meeting EAT-*Lancet* targets in each country.

Finally, to compare results across countries we converted local currency prices to 2011 international dollars using PPP exchange rates for household consumption, which measure the amount of local currency units needed to purchase the same bundle of goods and services in each country. PPP conversions are based on the same price data used to compute diet costs, but are an average over all food and non-food items in proportion to their importance for the country's total spending.

Statistical analyses

We presented the data using box-and-whisker diagrams, ranked-order plots, maps and tables. In our box-and-whiskers diagrams, the size of the box indicates the difference between the 25th percentile (the left-hand side of the box) and the 75th percentile (the right-hand side of the box) of the distribution. The bottom and top rule marks the bottom 5th and top 5th percentiles of the full distribution, respectively. The vertical bar rule inside the box marks the mean value. Countries in the diagrams and tables were grouped by the size of their economy (high, upper-middle, lower-middle and low-income countries) and by their geographical location (East Asia and Pacific, Europe and Central Asia, Latin America & the Caribbean, Middle East and North Africa, North America, South Asia, sub-Saharan Africa) using World Bank classifications (see appendix 6 for the definitions of these income groups and the list of countries in each group). Selected results were also presented using heat maps in which the cost or affordability estimates were binned into quintiles of the full distribution. We used Stata (version 15) for all statistical analyses.

Role of the funding source

The funder had no role in the study design, data analysis, interpretation, or writing of the report. All authors had full access to all the data in the study and had final responsibility for the decision to submit for publication.

3. Results

The daily cost of an EAT-*Lancet* diet was estimated to be $2·89 (IQR: 2·41–3·16) in 2011. The cost was larger in high-income countries ($2·77, IQR: 2·39-3.02) than in low-income countries ($2·43, IQR: 2·07–2·72), and among geographic regions cost was highest in the Latin America & Caribbean region ($3·48, IQR: 2·41–3·16) and lowest in sub-Saharan Africa ($2·50, IQR: 2·17–2·84), with considerable variation within regions and income groups (figure 1).

The food group whose quantities and prices accounted for the largest share of total cost is fruits and vegetables (table 2). In high-income countries, this share was on average 35·1 %, in upper-middle income countries 30·3%, in lower-middle income countries 29·7 % and low-income countries 26·7 %. Adding together all animal sourced food groups (dairy, plus meat, eggs and fish), their share of total cost was largest in low-income countries (32·8 %) and smallest in upper middle-income countries (26·2 %).

The affordability of EAT-*Lancet* diets, as a fraction of total gross national income (GNI), was an average of 3.0 % (IQR: 2·09–3·99) of GNI in high-income countries, 9·6 % (IQR: 6·11-11·84) in upper-middle income countries, 25·8 % (IQR: 18·21–31·79) in lower-middle income countries, and 73.2 % (IQR: 48.73–83.11) in low-income countries (figure 2). Among regions, diet cost as a fraction of GNI was lowest in North America (2.1 %; IQR: 1.92–2.35) and highest in sub-Saharan Africa (48·7 %; IQR: 23·39–73·63). There was considerable geographic variation even within regions (figure 3), and the estimated cost of an EAT-*Lancet* diet exceeded the entire daily per capita GNI in the three poorest African countries (Burundi, Democratic Republic of Congo, and Liberia).

Measuring affordability relative to household expenditure, we estimated that the cost of an EAT-*Lancet* diet exceeds total spending on all goods and services for at least 1·56 billion people (table 3). The prevalence of individuals with total expenditure per person below the estimated least-cost of the EAT-*Lancet* diet is highest in sub-Saharan Africa (57·6%) followed by South-Asia (38·4%).

Measuring affordability relative to alternative sources of essential nutrients, an EAT-*Lancet* diet is more expensive by a factor of 1·64 (IQR: 1·41–1·78). The minimal cost of nutrient adequacy (CoNA) also spans a narrower range than the cost of EAT-*Lancet* diets (figure 4), and the added cost of meeting EAT-*Lancet* standards varies widely across income levels and geographic regions (figure 5). The main cost differences between the EAT-*Lancet* diet and

the least-cost source of nutrients largely originate from the larger quantity of animal source foods in the EAT-*Lancet* diet than would be required for nutrient adequacy alone (table 4).

4. Discussion

Our study revealed that EAT-*Lancet* diets are not affordable for much of the world's low-income population. In the 26 countries (0.73 billion people) classified as low-income by the World Bank, obtaining enough of the least expensive locally available items to meet EAT-*Lancet* targets would require 73 % of national income. In the 47 countries (2.97 billion people) classified as lower-middle income, these diets would cost 25.8 % of national income.

Using survey evidence on household income and consumption, we estimated that at least 1·56 billion individuals, mostly located in sub-Saharan Africa and South Asia, face a daily cost of meeting EAT-*Lancet* targets in their country that exceeds the value of all goods and services they now obtain. Though large in itself, this 1·56 billion estimate is a lower bound since many more people would be unable to afford EAT-*Lancet* diets after paying for other necessities such as housing, transportation, education and health care. Furthermore, we found that EAT-*Lancet* diets were on average 64 % more costly than the foods needed for nutrient adequacy, due in part to larger quantities of animal-source foods as well as fruits and vegetables. The EAT-*Lancet* recommends less meat than what richer people currently consume, but includes more of these high-cost foods than the world's poor can now afford.

Making the EAT-*Lancet* diet more affordable for the poor would require some combination of higher incomes and lower prices, without which individuals cannot obtain sufficient quantities from each food group. Lower prices could come from improvements in local production, marketing and trade, and expanding the range of lower-cost options in each food group. The higher income needed to acquire larger quantities could come from economic growth that raises farm and non-farm earnings, or nutritional assistance and social safety nets. The World Bank estimates that social safety nets now serve approximately 2·5 billion people worldwide,[20] but only 20 % of people in low-income countries, suggesting an urgent need to expand social protection for the world's poorest.[20]

Beyond affordability for the world's poor, many other changes would be needed for people to choose an EAT-*Lancet* diet.[8,21,22] Drivers of choice among affordable items include individually modifiable factors such as time use and convenience, nutrition knowledge, and acquired tastes and habits, which in turn are shaped by societal factors such as marketing practices, as well as forces outside the food system such as child care, housing and transportation. The Great Food Transformation described in the EAT-*Lancet* report rightly calls for change not just in prices and purchasing power, but also in many other factors described in the rich literature on food choice.[23]

Looking across food groups, our analysis shows that fruits and vegetables and animal source foods are the most expensive components of a nutritious diet, especially in lower-income countries. Other analyses of ICP price data confirm this pattern, as more nutritious foods are more expensive in lower income countries, especially when compared to the cost of starchy staples.[24,25] This finding could be explained by the perishability and high transport cost of fruits, vegetables and animal-sourced foods, for which richer countries have invested heavily in specialized production and marketing systems that are typically considerably less developed in poorer countries.[26] Moreover, while reducing the prices of animal-sourced foods may be desirable, our analysis also suggests that poor adults could still achieve their requirements for essential nutrients through purchasing fewer animal-sourced foods than the EAT-*Lancet* diet recommends.

This study has several limitations. First, for each country we provide only a lower bound on the cost of EAT-*Lancet* diets, based on most affordable item in each food group. Even low-income consumers might choose a variety of more expensive foods in each group, consuming an EAT-*Lancet* diet that also meets other goals such as speed and ease of preparation as well as cultural preferences. Second, our cost and affordability estimates are designed to provide national and global totals for the most recent available year, masking spatial heterogeneity within countries as well as variation over time. There are often substantial cost-of-living differences between rural and urban areas,[27] that are further complicated by differences in availability of different items.[28] Farming households may access to their own production some of the year, and seasonality plays an important role in food prices and availability for food buyers as well.[29] A third kind of limitation concerns variation in nutritional needs, as the EAT-*Lancet* diet and our cost of nutrient adequacy calculations pertain only to a typical adult women, and would differ among women depending on their height, weight, physical activity and pregnancy and lactation status, and be different for males and people of different ages or disease status. Demographically disaggregated analyses would improve the precision of these dietary affordability metrics. Finally, there is uncertainty about the nutritional content of each item for which a price is reported, and while our list of 744 distinct foods includes many diverse foods, there may exist other

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foods that would be less costly than those for which prices are reported to the ICP. These limitations suggest the need for more advanced analyses of dietary costs that capture differences in the affordability of an extensive range of foods measured across locations and over time, and over individuals with different calorie requirements.

Economic extensions to the EAT-*Lancet* research agenda can offer important insights into the specific interventions and systemic changes needed to improve diets. Even if many poor consumers were to aspire to consume healthier and more environmentally sustainable foods, income and price constraints frequently render this diet unaffordable, and measures to alleviate these constraints will be essential for moving this diet within reach of the world's poor.

Contributors

KH conceived the study. DH and WAM contributed to the design, secured funding and access to price data. YB contributed the data and analysis on nutrient adequacy. KH performed data analysis, in consultation with DH and WAM. KH, DH and WAM wrote the Article. All authors approved the final version of the manuscript.

Declaration of interests

None.

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Tables and Figures

Table 1: Composition of the EAT-*Lancet* diet, by food group

EAT-*Lancet* groups	Serving (kcal/d)	Functional category	Serving (kcal/d)	Broad food groups	Serving (kcal/d)
Rice, wheat, corn, and other	811	Rice, wheat, corn, and other	811	Starchy staples	850
Potatoes and cassava	39	Potatoes and cassava	39		
Dark green vegetables	23	Dark green vegetables	23	Fruits & vegetables	204
Red and orange vegetables	30	Red and orange vegetables	30		
Other vegetables	25	Other vegetables	25		
All fruits	126	All fruits	126		
Whole milk or equivalents	153	Whole milk or equivalents	153	Dairy	153
Beef and lamb	15	Beef, lamb and pork	30	Meat, eggs & fish	151
Pork	15				
Chicken and other poultry	62	Poultry, eggs and fish	121		
Eggs	19				
Fish	40				
Dry beans, lentils, and peas	172	Legumes, nuts & soy foods	575	Legumes & nuts	575
Soy foods	112				
Peanuts	142				
Tree nuts	149				
Palm oil	60	Palm oil	60	Oils & fats	450
Unsaturated oils	354	Unsaturated oils	354		
Dairy fats	0	Dairy fats	0		
Lard or tallow	36	Lard or tallow	36		
All sweeteners	120	All sweeteners	120	Sweeteners	120
Total	**2,503**	**Total**	**2,503**	**Total**	**2,503**

Data are daily servings in kcal. The healthy reference diet described by Willett et al[7] is reported in the first column ('EAT-*Lancet* groups'). The second column ('Functional category') allows for exchangeability across certain EAT-*Lancet* food groups. The last column ('Broad food groups') provides the broad aggregations of the EAT-*Lancet* food groups.
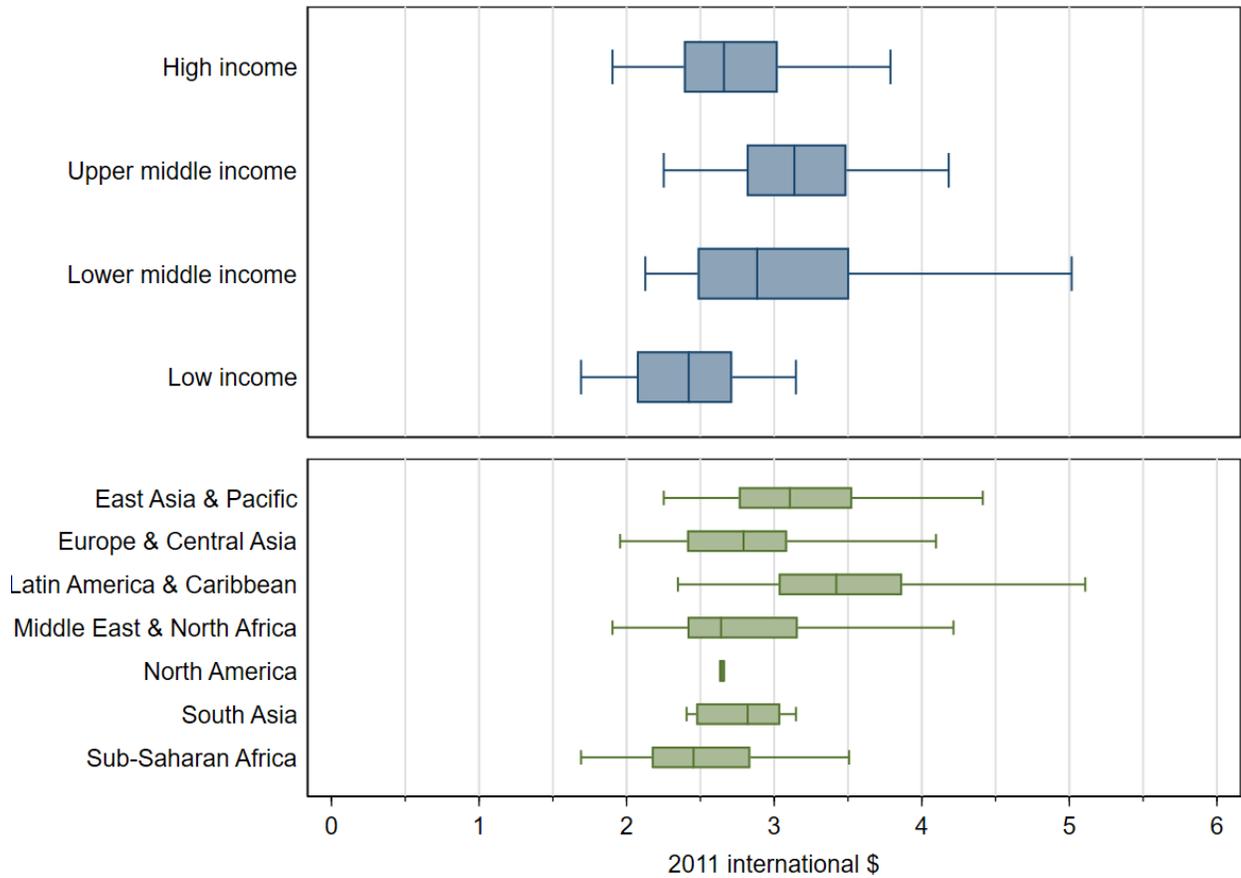
Figure 1. Cost of the EAT-*Lancet* diet in 2011 international dollars, by country income levels and major regions

We used price data from the International Comparison Program (ICP) to estimate the cost of the EAT-*Lancet* diet in 159 countries. Cost estimates are reported in 2011 international dollars based on the Purchasing Power Parity (PPP) for household consumption. The size of the box indicates the difference between the 25th percentile (the left-hand side of the box) and the 75th percentile (the right-hand side of the box) of the distribution. The bottom and top rule marks the bottom 5th and top 5th percentiles, respectively. The vertical bar rule inside the box shows the mean value for the income group or geographic region.

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Table 2. Cost components of the EAT-*Lancet* diet, by EAT-*Lancet* food groups in 2011 international dollars, by country income levels and major regions

Broad food group:		Starchy staples	Legumes & nuts	Fruits & vegetables	Dairy	Meat, eggs & fish	Oils & fats	Sweete-ners	Total
Serving (kcal/day):		850	204	153	151	575	450	120	2,503
Global (N=159)	$	0·32	0·54	0·90	0·38	0·44	0·23	0·07	2·89
	%	*11·2*	*18·7*	*31·2*	*13·2*	*15·2*	*8·0*	*2·5*	*100*
By country income level:									
High income (N=52)	$	0·30	0·55	0·97	0·33	0·41	0·16	0·05	2·77
	%	*11·0*	*19·7*	*35·1*	*11·8*	*14·7*	*5·8*	*1·9*	*100*
Upper middle income (N=40)	$	0·37	0·66	0·97	0·38	0·45	0·27	0·08	3·20
	%	*11·7*	*20·7*	*30·3*	*12·0*	*14·2*	*8·6*	*2·4*	*100*
Lower middle income (N=41)	$	0·34	0·53	0·91	0·46	0·48	0·25	0·08	3·05
	%	*11·3*	*17·6*	*29·7*	*15·0*	*15·6*	*8·2*	*2·6*	*100*
Low income (N=26)	$	0·25	0·35	0·65	0·38	0·42	0·28	0·10	2·43
	%	*10·1*	*14·6*	*26·7*	*15·4*	*17·4*	*11·7*	*4·2*	*100*
By geographic region:									
East Asia & Pacific (N=20)	$	0·36	0·54	1·17	0·58	0·38	0·18	0·07	3·27
	%	*11·1*	*16·5*	*35·9*	*17·6*	*11·5*	*5·5*	*2·0*	*100*
Europe & Central Asia (N=45)	$	0·27	0·55	0·94	0·35	0·47	0·22	0·06	2·86
	%	*9·5*	*19·4*	*32·8*	*12·2*	*16·4*	*7·7*	*2·1*	*100*
Latin America & Caribbean (N=23)	$	0·46	0·90	1·02	0·34	0·46	0·22	0·08	3·48
	%	*13·3*	*25·9*	*29·2*	*9·6*	*13·3*	*6·4*	*2·4*	*100*
Middle East & North Africa (N=17)	$	0·47	0·40	0·68	0·33	0·35	0·36	0·07	2·65
	%	*17·7*	*15·0*	*25·8*	*12·3*	*13·1*	*13·6*	*2·5*	*100*
North America (N=2)	$	0·47	0·40	0·68	0·33	0·35	0·36	0·07	2·65
	%	*17·7*	*15·0*	*25·8*	*12·3*	*13·1*	*13·6*	*2·5*	*100*
South Asia (N=7)	$	0·29	0·46	0·88	0·39	0·53	0·19	0·07	2·80
	%	*10·2*	*16·6*	*31·3*	*13·8*	*18·9*	*6·8*	*2·4*	*100*
Sub-Saharan Africa (N=45)	$	0·27	0·38	0·74	0·36	0·39	0·27	0·09	2·50
	%	*10·9*	*15·2*	*29·6*	*14·6*	*15·4*	*10·7*	*3·6*	*100*

Data are 2011 international dollars ($) based on the Purchasing Power Parity (PPP) for household consumption. The numbers in italics are percentages of the total cost. The food grouping is based on the broad food groups reported in Table 1. N=159 countries.
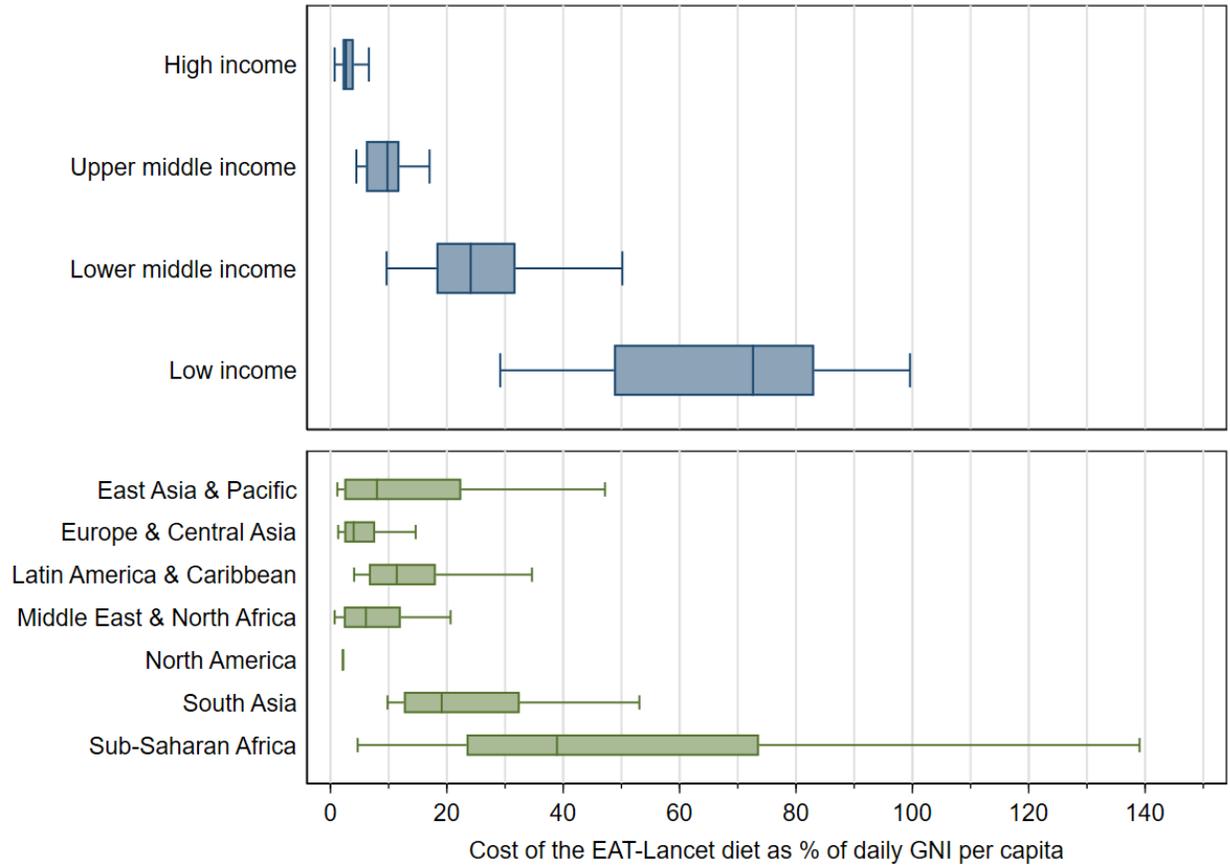
Figure 2. Cost of the EAT-*Lancet* diet relative to daily GNI per capita by country income levels and major regions

We used price data from the International Comparison Program (ICP) to estimate the cost of the EAT-*Lancet* diet and compared these estimates to daily Gross National Income per capita. Data are percentages. The size of the box indicates the difference between the 25th percentile (the left-hand side of the box) and the 75th percentile (the right-hand side of the box) of the distribution. The bottom and top rule marks the bottom 5th and top 5th percentiles, respectively. The vertical bar rule inside the box shows the mean value for the income group or geographic region. N=156 countries; GNI estimates were not available for Cuba, Djibouti and Taiwan.
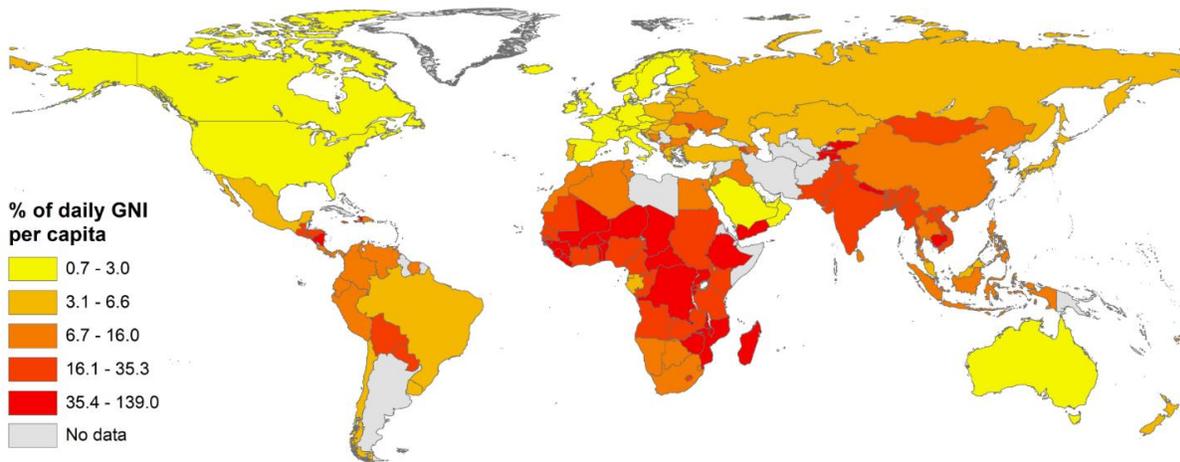
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Figure 3. Cost of the EAT-*Lancet* diet relative to Gross National Income (GNI) per capita

We used price data from the International Comparison Program (ICP) to estimate the cost of the EAT-*Lancet* diet in 159 countries and compared these estimates to daily Gross National Income per capita. Estimates are reported in percentages. Countries are grouped by quintiles of the full cost relative to GNI per capita distribution. N=156 countries; GNI estimates were not available for Cuba, Djibouti and Taiwan.

Table 3. Number and share of people with daily income below the cost of the EAT-*Lancet* diet, by country income levels and major regions

	N	Population (in millions)	Share (%)
Global:	140	1,564·749	23·6%
By country income level:			
High income	38	9·052	0·8%
Upper middle income	37	252·090	10·7%
Lower middle income	39	992·200	36·7%
Low income	26	311·407	62·5%
By geographic region:			
East Asia & Pacific	13	319·709	15·0%
Europe & Central Asia	44	12·677	1·5%
Latin America & Caribbean	19	61·972	11·4%
Middle East & North Africa	11	36·767	14·8%
North America	2	4·038	1·2%
South Asia	7	626·914	38·4%
Sub-Saharan Africa	44	502·673	57·6%

We used the World Bank's PovcalNet system to calculate the share of people in each country whose daily income was less than the estimated cost of the EAT-*Lancet* diet. N=140 countries; PovcalNet data were not available for 19 countries.
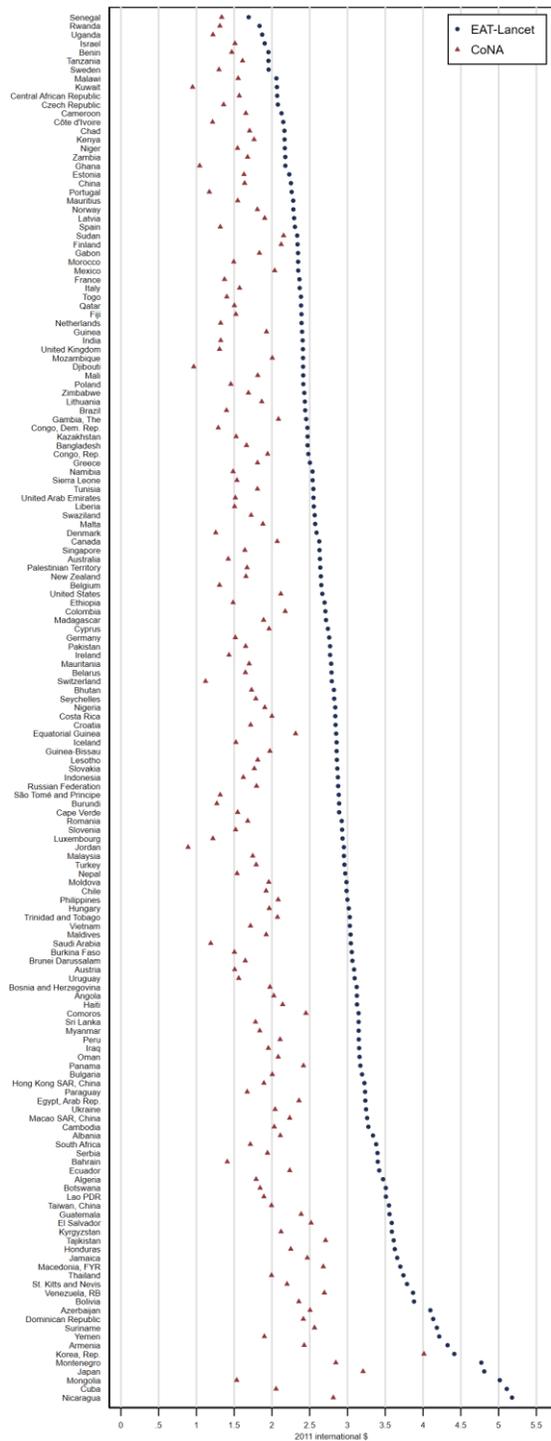
Figure 4. Cost of EAT-*Lancet* diets and the minimum cost of nutrient adequacy (CoNA), by country

We used price data from the International Comparison Program (ICP) to estimate the cost of the EAT-*Lancet* diet in 159 countries, and also to compute the cost of meeting only estimated average requirements, upper limits and average macronutrient distribution ranges for essential nutrients. Data are in 2011 international dollars per day.
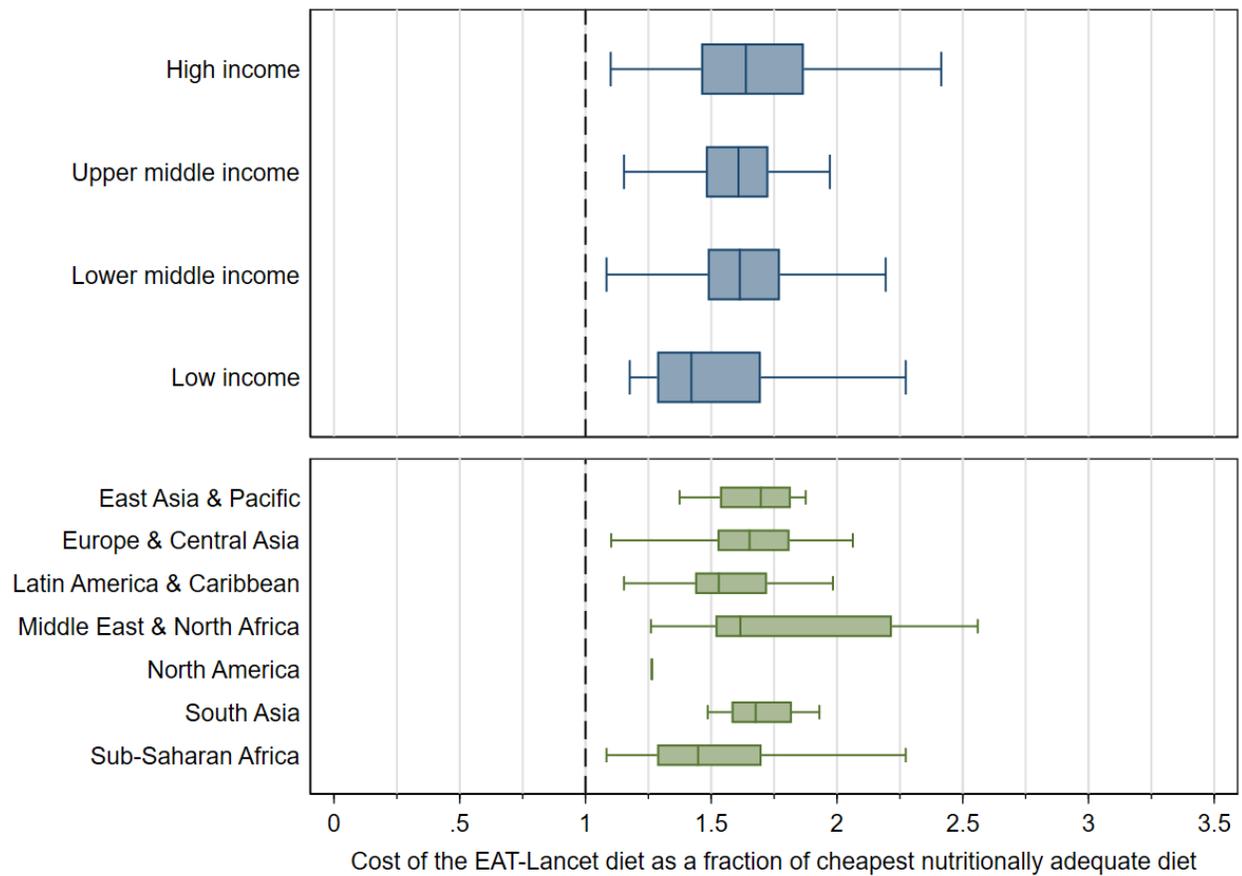
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Figure 5. Comparing the cost of EAT-*Lancet* diets to the minimum cost of nutrient adequacy, by level of national income and geographic region

We used price data from the International Comparison Program (ICP) to estimate the cost of the EAT-*Lancet* diet in 159 countries, and computed the cost of meeting only estimated average requirements, upper limits and average macronutrient distribution ranges for essential nutrients. Data are fractions. The size of the box indicates the difference between the 25th percentile (the left-hand side of the box) and the 75th percentile (the right-hand side of the box) of the distribution. The bottom and top rule marks the bottom 5th and top 5th percentiles, respectively. The vertical dashed line represents equality between the two diet costs.

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Table 4. Composition of diets for EAT-*Lancet* and to reach the minimum cost of nutrient adequacy, by national income and geographic regions

Broad food group:	Starchy staples	Legumes & nuts	Fruits & vegetables	Dairy	Meat, eggs & fish	Oils & fats	Sweeteners	Total
EAT-*Lancet* diet	850	204	153	151	575	450	120	2,503
Minimal cost of nutrient adequacy (CoNA)								
Global	1,498	348	113	149	37	332	25	2,503
By country income level								
High income	1,631	227	35	206	10	387	6	2,503
Upper middle income	1,515	259	67	203	32	358	69	2,503
Lower middle income	1,422	497	144	92	26	299	23	2,503
Low income	1,324	498	290	42	113	236	0	2,503
By geographic region								
East Asia & Pacific	1,550	410	75	72	23	363	10	2,503
Europe & Central Asia	1,580	310	48	210	10	345	0	2,503
Latin America & Caribbean	1,312	210	72	303	48	406	152	2,503
Middle East & North Africa	1,730	214	66	121	11	361	0	2,503
North America	1,155	719	30	135	23	441	0	2,503
South Asia	1,771	205	74	146	6	262	39	2,503
Sub-Saharan Africa	1,380	482	241	56	79	265	0	2,503

Data show total dietary energy (kcal/day), by food group as specified for EAT-*Lancet* diets in the first row. Intake levels required to reach minimal cost of nutrient adequacy meet the same energy balance of 2,503 calories, and meet essential nutrient needs for a typical healthy woman specified as estimated average requirements, upper limits and average macronutrient distribution ranges for 20 essential nutrients. The nutrient-based diet may not meet requirements for other attributes specified in the EAT-*Lancet* food groups such as the phytochemicals in fruits & vegetables, or the bioavailability of nutrients in flesh foods.

Supplementary Material