New measures of the cost and affordability of healthy diets:

Data and methods

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Food security is when all people, at all times, have physical and economic access to sufficient, safe, nutritious food to meet dietary needs and food preferences for an active and healthy life. – World Food Summit, 1996

How can we be accountable to this vision without understanding availability and affordability of healthy diets?
Aims: what do we want to know?

• If you went to the market in Ethiopia, how much would it cost to obtain a healthy diet?
• How many people in Ethiopia can afford that cost?

Photos: W. A. Masters (Ethiopia, Tanzania, Ghana, Morocco) and S. Kayatsa (Malawi)
Even rural farm families rely on market purchases for healthy, diverse diets

Source of calories consumed by month, rural Ethiopia, 2010-11

Shares of food consumed, by food group, rural Ethiopia, 2010-11

Source: Adapted from Sibhatu and Qaim, 2017
We estimate three least-cost diets

- “Energy sufficient diet” - Cost of Calorie Adequacy (CoCA)
  - Minimum cost to meet energy requirements using the least expensive, available starchy staple food in each country
- “Nutrient adequate diet” - Cost of Nutrient Adequacy (CoNA)
  - Minimum cost to meet energy and nutrient requirements (23 macro and micro-nutrients, with upper as well as lower bounds)
- “Healthy diet” - Cost of Healthy (Recommended) Diet (CoRD)
  - Minimum cost to meet food-based dietary guidelines, based on food group classifications; a behaviorally realistic way to meet nutrient needs and other needs, including proportionality, norms, culture, and protection of health against NCDs
Least-cost diets

• Most affordable (cheapest, lowest cost) combination of foods that meet the criteria of these diets

• No standard “food basket”
  o Foods chosen depend on time and place
  o Seasonal or locally-available foods selected
Composition of a least-cost nutrient adequate diet in Ethiopia over time

Source: Bai, Naumova, and Masters, 2020
Most common items in cost of healthy diet by state in India

<table>
<thead>
<tr>
<th>State name</th>
<th>Starchy staples</th>
<th>Proteins</th>
<th>Dairy</th>
<th>Fruit</th>
<th>Vegetables</th>
<th>Leafy vegetables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andhra Pradesh</td>
<td>Bajra, Ragi, Maize</td>
<td>Peas, Gram, Gram dal</td>
<td>Milk (buffalo), Milk (cow), Curd</td>
<td>Banana, Guava, Papaya (ripe)</td>
<td>Gourd, Onion, Tomato</td>
<td>Gogukura, Amranth (chaulai), Palak</td>
</tr>
<tr>
<td>Assam</td>
<td>Rice (coarse), Paddy, Bread</td>
<td>Peas, Khesari dal, Gram</td>
<td>Milk (cow), Curd, Milk (buffalo)</td>
<td>Banana, Papaya (ripe), Pineapple</td>
<td>Gourd, Pumpkin, Radish</td>
<td>Bhaji sageaves, Mustard leaves, Gogukura</td>
</tr>
<tr>
<td>Bihar</td>
<td>Maize, Paddy, Wheat (coarse)</td>
<td>Peas, Khesari dal, Pea dal</td>
<td>Milk (buffalo), Ghol (lassi)</td>
<td>Banana, Guava, Papaya (ripe)</td>
<td>Radish, Gourd, Pumpkin</td>
<td>Bhaji sageaves, Palak, Amranth (chaulai)</td>
</tr>
<tr>
<td>Chhattisgarh</td>
<td>Bread, Rice (coarse), Wheat (coarse)</td>
<td>Peas, Khesari dal, Gram</td>
<td>Milk (cow), Milk (buffalo), Curd</td>
<td>Banana, Guava, Papaya (ripe)</td>
<td>Radish, Onion, Gourd</td>
<td>Bhaji sageaves, Palak, Amranth (chaulai)</td>
</tr>
<tr>
<td>Delhi</td>
<td>Bajra, Wheat (coarse), Jowar</td>
<td>Gram, Peas, Pea dal</td>
<td>Ghol (lassi), Milk (buffalo), Milk (cow)</td>
<td>Banana, Guava, Pineapple</td>
<td>Radish, Onion, Carrot</td>
<td>Amranth (chaulai), Bhaji sageaves, Mustard leaves</td>
</tr>
<tr>
<td>Gujarat</td>
<td>Bajra, Maize, Jowar</td>
<td>Peas, Gram, Urd (whole)</td>
<td>Milk (buffalo), Milk (cow), Curd</td>
<td>Banana, Papaya (ripe), Guava</td>
<td>Onion, Radish, Tomato</td>
<td>Palak, Bhaji sageaves, Amranth (chaulai)</td>
</tr>
<tr>
<td>Haryana</td>
<td>Bajra, Wheat (coarse), Barley</td>
<td>Gram, Peas, Gram dal</td>
<td>Milk (buffalo), Milk (cow), Curd</td>
<td>Banana, Guava, Papaya (ripe)</td>
<td>Radish, Onion, Carrot</td>
<td>Palak, Mustard leaves, Bhaji sageaves</td>
</tr>
<tr>
<td>Himachal Pradesh</td>
<td>Wheat atta, Maize atta, Rice (coarse)</td>
<td>Gram dal, Besan (ground gram dal), Urd (whole)</td>
<td>Milk (cow), Curd, Ghol (lassi)</td>
<td>Banana, Guava, Mango</td>
<td>Onion, Pumpkin, Carrot</td>
<td>Palak, Bhaji sageaves, Amranth (chaulai)</td>
</tr>
</tbody>
</table>

Source: Raghunathan, Headey, and Herforth, 2020
Least-cost diets

• Most affordable (cheapest, lowest cost) combination of foods that meet the criteria of these diets

• No standard “food basket”
  o Foods chosen depend on time and place
  o Seasonal or locally-available foods selected

• Provide a conservative estimate (lower bound) on the cost per day
  o Preferences or convenience would add to the cost
Food prices create a ladder of affordability

When all diets are affordable, food prices are one of many influences on food choice.

When healthy diets are unaffordable, food prices are an insurmountable barrier to improved diet quality.

Source: Food Prices for Nutrition, October 2020
Food price data and methods
Sources of price data

Prices collected by agri-food agencies

• Market information systems (MIS)
  o Farm-gate or wholesale prices of basic commodities (rarely consumer prices or processed foods)

• Early warning systems (EWS) to guide food aid & emergency interventions
  o Prices of staple or basic foods, at markets in vulnerable areas (fast but few elements)

Prices collected by national statistical organizations

• Consumer Price Index (CPI)
  o Prices of frequently consumed products, collected monthly in various markets

• World Bank International Comparison Program (ICP) has unique global dataset of retail prices
  o Items limited to comparable products sold in multiple countries; national annual average price per item
Food price data: national government CPI data

- Main data are food prices collected by national governments
  - Used for measuring inflation with the Consumer Price Index (CPI)

- Generally, these prices are collected:
  - On a monthly or quarterly basis
  - At representative market locations

- CPI is generally weighted by share of total expenditure, so culturally acceptable, commonly consumed food items are tracked.
Calculating the Cost of Nutrient Adequacy

Food price data

Combine with food composition data

Linear programming to calculate cheapest diet that meets nutrient and energy requirements
Energy and nutrient requirements

- Energy requirements based on age, sex, and level of physical activity
- Acceptable ranges for macronutrients - protein, fats, carbohydrates
- Lower and upper bounds for 23 micronutrients + upper bound for sodium

Calculating the cost of a healthy diet

• Healthy diet is operationalized as a recommended diet, based on quantitative food-based dietary guidelines (FBDG)

• ~100 countries have FBDG; FAO maintains FBDG repository
  - Only some are quantitative
Benin’s quantitative food-based dietary guidelines

**PORTIONS À CONSOMMER PAR JOUR**

<table>
<thead>
<tr>
<th>Groupe d’aliments</th>
<th>Enfants 2-3 ans</th>
<th>Enfants 4-8 ans</th>
<th>Adolescents 9-13 ans</th>
<th>Adolescents 14-18 ans</th>
<th>Adolescents 19 ans et plus</th>
<th>Adultes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Céréales et tubercules</td>
<td>2 a 3</td>
<td>2 a 4</td>
<td>4 a 5</td>
<td>4 a 6</td>
<td>5 a 7</td>
<td>6 a 6</td>
</tr>
<tr>
<td>Viande, poisson, haricots et autres aliments riches en protéines</td>
<td>1 a 2</td>
<td>1 a 2</td>
<td>1 a 2</td>
<td>2 a 3</td>
<td>2 a 3</td>
<td>2 a 3</td>
</tr>
<tr>
<td>Légumes et sauces à base de légumes</td>
<td>2 a 3</td>
<td>3 a 5</td>
<td>4 a 5</td>
<td>4 a 6</td>
<td>5 a 6</td>
<td>6 a 6</td>
</tr>
<tr>
<td>Fruits</td>
<td>1</td>
<td>1 a 3</td>
<td>2 a 3</td>
<td>2 a 3</td>
<td>2 a 3</td>
<td>2 a 3</td>
</tr>
<tr>
<td>Produits laitiers</td>
<td>1</td>
<td>1 a 2</td>
<td>2 a 2</td>
<td>1 a 2</td>
<td>1 a 2</td>
<td>1 a 2</td>
</tr>
</tbody>
</table>

1. Pour le calcium, consommer aussi des poissons fumés séchés, crevettes fumées séchées et canapé de crabe.
2. Les femmes en âge de procréer prennent des suppléments de fer et d’acide folique conformément aux instructions du personnel de santé, car leurs besoins sont difficiles à combler avec l’alimentation seule.

**UNE PORTION CORRESPOND À**

- Food groups
- Number of portions per day
- Grams per portion
Steps to calculate the cost of a healthy diet

1. Categorize each food in food price list according to the food groups in the selected dietary guideline

2. Remove items not required for a healthy diet (e.g., sweets) and duplicate items

3. Calculate price per day for each item
   - price per kilogram x recommended quantity per day (accounting for edible portion)

4. Take the average of the 1-3 lowest cost items (price/day) in each food group

5. Sum the cost for all food groups
Affordability of diets

Affordability is the comparison of cost to a defined income standard

- Poverty lines
  - National
  - International (US $1.90)
- Food expenditures
- Income
- Wages
  - Compared to unskilled wages in India, Ethiopia
How does Food Prices for Nutrition differ from other initiatives?

• Emphasis on monitoring

• Focus on leveraging the abundance of data already collected in existing national and international monitoring systems
  ○ Support countries to calculate metrics within their own data systems

• Moving beyond nutrients to look at healthy diet patterns

• Cost of a Healthy Diet does not rely on linear programming → relative ease of computation
National applications and global results
Affordability of a nutrient adequate diet relative to wages in Ethiopia

- Price data from 120 markets collected by Central Statistical Agency
  - 92 food items
  - Daily wages for unskilled laborers
- Cost as a percentage of wages decreased from 32% (2008) to 22% (2016)
- Affordability improved due to wage increases, rather than less expensive food

Source: Herforth et al., 2020
Rising costs of nutrient-dense foods in Ethiopia

- Price increases from 2002-2016:
  - Pulses increased by about 9x
  - Fruits and vegetables increased by 8x
  - Starchy staples had lowest growth (5-6x)
- With inflation, starchy staples have become cheaper while nutrient-rich food groups have become more expensive (Bachewe and Headey, 2019)

Source: Herforth et al., 2020
Seasonal variation of diet costs in Ethiopia

- Significant seasonality for 27 of 57 zones in Ethiopia; and 72 of 82 food items
- Fruits and vegetables had stronger seasonality than other food groups
  - Animal-source foods have the lowest seasonality
- Reducing & stabilizing cost of nutritious foods is important for consumers and farmers who use markets to complement what they grow
- National average cost: 6.7 ETB or $1.34 (2011 PPP)

Source: Bai, Naumova, and Masters, 2020
<table>
<thead>
<tr>
<th>Country</th>
<th>Energy sufficient diet</th>
<th>Nutrient adequate diet</th>
<th>Healthy diet</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cost (USD) 2017</td>
<td>% of food</td>
<td>% pop. cannot afford</td>
</tr>
<tr>
<td>Burkina Faso</td>
<td>0.45</td>
<td>28.2</td>
<td>0.1</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>0.58</td>
<td>40.5</td>
<td>1.7</td>
</tr>
<tr>
<td>Ghana</td>
<td>0.82</td>
<td>50.1</td>
<td>5.3</td>
</tr>
<tr>
<td>India</td>
<td>0.79</td>
<td>27.3</td>
<td>0.9</td>
</tr>
<tr>
<td>Malawi</td>
<td>0.28</td>
<td>21.9</td>
<td>1.3</td>
</tr>
<tr>
<td>Nigeria</td>
<td>0.94</td>
<td>15.8</td>
<td>33.3</td>
</tr>
<tr>
<td>Pakistan</td>
<td>0.77</td>
<td>20.9</td>
<td>&lt;0.1</td>
</tr>
</tbody>
</table>

“Ladder of affordability” – cost of diet rising

Source: FAO et al., 2020
3 billion people globally lack sufficient income to purchase least-cost healthy diets

- Calorie affordability is still a problem in some countries

Source: FAO, 2020
3 billion people globally lack sufficient income to purchase least-cost healthy diets

- Calorie affordability is still a problem in some countries
- Most people in sub-Saharan Africa cannot afford nutrient adequate diets

Source: FAO, 2020
3 billion people globally lack sufficient income to purchase least-cost healthy diets

- Calorie affordability is still a problem in some countries
- Most people in sub-Saharan Africa cannot afford nutrient adequate diets
- Most people in sub-Saharan Africa and South Asia cannot afford healthy diets

Source: FAO, 2020
Healthy diets by any definition are far more expensive than the entire international poverty line.

Source: FAO, 2020
Next steps in Food Prices for Nutrition

Project purpose: Scale up monitoring and analysis of food prices, to guide agricultural production and food markets for improved nutrition

Develop and disseminate new diet cost metrics
Support use of new metrics by national governments and international agencies
Measure and predict change in affordability of healthy diets

Actively disseminate data and results on food prices, diet costs, and affordability
Forthcoming tools and events

• Generating tools and guides for data holders to compute Cost of a Healthy Diet themselves

• Updated estimates for SOFI 2021 just released (July 2021)

• World Bank eLearning course coming next year, August 2022
Food Prices for Nutrition eLearning course

- Will be hosted on the World Bank’s Open Learning Campus (OLC) platform
- 3-hour self-paced course for government officials, program planners, researchers, and others
- Two modules
  - Construction of diet cost indices
  - Use and potential applications of diet cost indices in relation to policymaking
Stay in touch with us!

• Give us feedback & stay in touch with this Google Form: https://forms.gle/b33oMFqd1FX61kov7

• Visit our website: https://sites.tufts.edu/foodpricesfornutrition/ or Google “Food Prices for Nutrition”

• Contact us with questions or comments, or to join the food price interest groups: Rachel.gilbert@tufts.edu
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Questions?

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References


