Malnutrition: part III: the nutrition transition and the obesity epidemic

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Indicators of overnutrition in children and adults

• For adults: BMI fixed cut-points for both sexes*:
  – Underweight is defined as BMI <18.5 kg/m²
  – Normal weight: 18.5 to <25
  – Overweight : 25 to <30
  – Obesity: ≥ 30 kg/m²

• For preschool children (by sex)
  – Weight-for-height >+2zscores and <+3zscores of WHO median = overweight
  – WFH >+3 zscores = obesity
  – BMI for age >+2zsc and <+3zsc (overweight) or >+3 zsc (obese)

• Older children and adolescents (by sex): BMI for age

* Average BMI of adults is also used as an indicator

See: De Onis, 2010 for global trends in preschool children
The nutrition transition and the global epidemic of obesity
What is the nutrition transition*

• Two historic transitions have happened:
  – A **demographic transition** from a pattern of high fertility and high mortality to low fertility and mortality
  – An **epidemiological transition** from a pattern of high prevalence of infectious diseases associated with malnutrition to pattern of high prevalence of non-communicable chronic diseases

• These transitions are associated with shifts in food consumption patterns and lifestyle

* Term coined by B Popkin (1993)
The nutrition transition: changes in food and lifestyle patterns

- Transition from a plant-based diet (with small amounts of meat, dairy, fats and processed foods)
  - to more Westernized diets characterised by:
    - cheap energy-dense foods
    - more fat, sucrose, salt and less fiber
    - more animal products, processed foods, sweetened beverages
  - together with a reduction of physical activity due to a sedentary lifestyle (in work and leisure time) that are often associated with urbanization
- The prevalence of overweight and obesity increases
- The transition is very fast, especially in poor countries with rapid urbanization
Obesity Trends* Among U.S. Adults

BRFSS, 1990

(*BMI ≥ 30, or ~ 30 lbs overweight for 5’4” woman)

Source: Mokdad AH.
Obesity Trends* Among U.S. Adults

BRFSS, 1991

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Source: Centers for Disease Control and Prevention
Obesity Trends* Among U.S. Adults
BRFSS, 1996

(*BMI ≥ 30, or ~ 30 lbs overweight for 5’4” woman)

No Data <10% 10%-14% 15-19% ≥20%

Source: Mokdad AH
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No Data <10% 10%-14% 15-19% ≥20%
Global trends in Body Mass Index of adults
### Global trends in average adult BMI between 1975 and 2014

<table>
<thead>
<tr>
<th>Mean BMI</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>World 1975</td>
<td>21.7 kg/m²</td>
<td>22.1</td>
</tr>
<tr>
<td>World 2014</td>
<td>24.4</td>
<td>24.4</td>
</tr>
<tr>
<td>By region 2014</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sub Saharan Africa</td>
<td>21.4</td>
<td>21.8</td>
</tr>
<tr>
<td>South Asia</td>
<td>21.4</td>
<td>21.8</td>
</tr>
<tr>
<td>Polynesia/Micronesia</td>
<td>29.2</td>
<td>32.2</td>
</tr>
</tbody>
</table>

Source: NCD-RisC, Lancet 2016 (analysis includes 186 countries)  
(Age-standardized BMI)
Mean BMI of adult men in the world in 1975

Source: NCD-RisC, Lancet 2016 (analysis includes 186 countries)
Mean BMI of adult men in the world in 2014
Mean BMI of adult women in the world in 1975
Mean BMI of adult women in the world in 2014
Prevalence of obesity among adults by region and country income level

Source: WHO website, 2013
Prevalence of obesity and overweight among adults in selected countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Overweight men (%)</th>
<th>Obese men (%)</th>
<th>Overweight women (%)</th>
<th>Obese women (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>France 2006</td>
<td>41</td>
<td>16</td>
<td>24</td>
<td>18</td>
</tr>
<tr>
<td>England* 2010</td>
<td>42</td>
<td>26</td>
<td>32</td>
<td>26</td>
</tr>
<tr>
<td>Kuweit 2006</td>
<td>37</td>
<td>36</td>
<td>30</td>
<td>48</td>
</tr>
<tr>
<td>Brazil 2003</td>
<td>32</td>
<td>9</td>
<td>27</td>
<td>13</td>
</tr>
<tr>
<td>Mexico 2006</td>
<td>43</td>
<td>24</td>
<td>37</td>
<td>35</td>
</tr>
</tbody>
</table>

*Source: International Association for the Study of Obesity*

* 16 years and over

Note: Usually % of overweight is greater than % obese but there are some exceptions
Trends in mean BMI tend to mask evolution in the distribution of malnutrition

• Underweight is declining but still prevalent among adults:
  – Globally from 14 to 9% in men, 15 to 10% in women btw 1975 and 2014
  – In South Asia (2014): prevalence is 23% in men and 24% in women

• At the same time prevalence of obesity increased from 1975 to 2014: from 3 to 11% in men, and 6 to 15% in women
Double burden of malnutrition

Undernutrition and overweight can co-exist:

– In a population
– In a household*: Example an overweight mother with a wasted or stunted child
– In the same individual: Example: a woman is overweight and suffers from micronutrient deficiencies (often iron deficiency anemia)

*In a poor country (Cape Verde) 18% of households were classified as underweight, 41% as overweight and 14% were affected by the double burden of malnutrition (Dop et al, 2012)
Early undernutrition and later overnutrition

- Infants exposed to undernutrition during pregnancy or early after birth tend to become obese when they access a better diet in later childhood and adolescence.
- The so-called «1000 day» period between conception and the age of two years is the critical period during which a child needs optimal nutrition to avoid both under and overnutrition in later life.

The 1000 days are the window of opportunity for preventive interventions. After age of two years damage is no longer reversible.
The obesity epidemic affects rich and poor countries

• Approximately 2.2 billion people are affected by overweight and obesity around the world presently.

• More people suffer from overnutrition than from undernourishment or undernutrition globally.

• Among poor people overweight and obesity are often associated with micronutrient deficiencies.
Shifts in food systems associated with the nutrition transition

• Supply side factors:
  – Intensification/industrialization of agriculture:
    • Increases in productivity => increased global food supply
    • Increase in availability of cereals, legumes, oil seeds* and decreasing prices
  – Industrialization of livestock production: decrease in relative price of livestock products
  – Development of markets and globalization
  – Industrialization of food production
    • Increase in supply of processed foods
  – Growth of a powerful multinational retail sector

• Demand side factors:
  – Increase in income of households
  – Urbanization and access to food markets
  – Increased demand for processed foods
  – Increased demand for animal products

* Which are high energy foods
Meat consumption per capita in the World

Source: FAO

Note: Some countries consume too much meat and other countries consume too little
Trends in consumption of animal products

Source: McMichael et al, 2007
Why is the food & nutrition transition affecting poor countries and people?

• Rapid urbanization: social change, new eating habits, increase in out-of-home consumption, less physical activity

• Greater availability of industrially processed foods: richer in fat, sugar and salt

• Rapid growth of supermarket chains in poor countries

• Aggressive marketing policies of food industries in rich and poor countries
Global impact of the nutrition transition

• Health consequences for the affected populations:
  – Cardiovascular diseases (hypertension, heart attacks and stroke) and certain cancers
  – Diabetes and its complications (CVD, renal failure, blindness)

• Heavy burden on health systems and diversion of funds from other important sectors

• Environmental impact of changing food systems:
  – GES emissions of livestock production
  – Degradation of soil
  – Overuse and pollution of water resources by industrial farming systems, etc
Degree of processing of foods and overweight and obesity

• Monteiro et al (2010) classification of foods:
  – Unprocessed or minimally processed
  – Processed culinary or food industry ingredients
  – Ultra-processed food products*

• Population trends towards overweight and obesity are parallel with increase in consumption of ultra-processed foods

• In Brazil food consumption has shifted to high consumption of UPF in parallel with the obesity epidemic

* UPF are often ready-to-eat or ready-to-heat convenience foods, e.g. packaged or fast foods; processes usually include frying, deep-frying, salting; energy density is high as well as sugar, fat and salt contents
Monteiro classification of foods in the context of the nutrition transition

Monteiro classification of foods:

– Group 1: unprocessed or minimally processed foods:
  Ex. Fresh and frozen fruit and vegetables

– Group 2: processed culinary or food industry ingredients
  Ex. Vegetable oils, raw pasta

– Group 3: ultra-processed foods:
  Ex. Biscuits, cereal bars, dehydrated soups, soft drinks

Monteiro et al. 2011
Proportion of energy intake from packaged processed foods in two countries: Mexico and China (Monteiro et al, 2014)

A. Mexico 2012
- Not Processed
  - Mexico City: 34%
  - Urban: 43%
  - Rural: 45%
  - Total: 42%
- Processed
  - Mexico City: 66%
  - Urban: 57%
  - Rural: 55%
  - Total: 58%

B. China 2011
- Home
  - Rural: 65%
  - Small city: 58%
  - Big city: 54%
  - Mega-city: 46%
  - Total: 58%
- Restaurant
  - Rural: 8%
  - Small city: 13%
  - Big city: 13%
  - Mega-city: 19%
  - Total: 12%
- Processed
  - Rural: 27%
  - Small city: 29%
  - Big city: 33%
  - Mega-city: 35%
  - Total: 30%

Conclusion

- Shifts in the food system and changes in lifestyle are causing the nutrition transition worldwide
- Shifts in the food distribution systems towards unhealthy processed foods are very rapid
- The food security, nutrition and agricultural policy communities need to take stock of the health implications of this trend and to find ways of preserving and promoting healthier as well as more sustainable food systems