# Geography IB Course IB2: Geography of food and health

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#### Geography of food and health - Syllabus

#### **Definitions:**



- Food miles a measure of the distance that food travels from its source to the consumer. This can be given either in units of actual distance or of energy consumed during transport
- HALE Health-adjusted life expectancy, based on life expectancy at birth but including an adjustment for time spent in poor health (due to disease and/or injury). It is the equivalent number of years in full health that a newborn can expect to live, based on current rates of health and mortality
- **Transnational corporation (TNC)** a firm that owns or controls productive operations in more than one country through foreign direct investment
- + detailed case studies

#### The underlying concept:

• The health of a population is the direct consequence of having enough food, a balanced diet and reduced susceptibility to disease.

## Health - Syllabus

#### <u>Tasks:</u>



#### Variations in health

- Describe the variations in health as reflected by changes in life expectancy at national and global scales since 1950
- Explain the patterns and trends in terms of differences in income and lifestyle

#### Measuring health

- Evaluate life expectancy, infant mortality rate (IMR) and child mortality (CMR), HALE (health-adjusted life expectancy), calorie intake, access to safe water and access to health services as indicators of health
- Prevention relative to treatment
- Discuss the geographic factors that determine the relative emphasis placed by policy-makers, in one country or region, on prevention as opposed to treatment of disease

#### Quick reminder from Core 1

- Infant Mortality Rate?
- Child Mortality Rate?
- Life Expectancy?

#### Population growth measurements / statistics

- Infant Mortality Rate (IMR) the number of deaths of infants (children less than one year old) per 1,000 live births in a year
- Current (2015) IMR is 31.7 deaths / 1,000 live births
- Max: Angola (96), Central African Republic (92), Sierra Leone (87), Chad (85), Somalia (85), DRC (75)
- Min: Luxembourg, Iceland, Finland, Norway, Japan, Slovenia, Singapore (2); EU (4)
- <u>http://data.worldbank.org/indicator/SP.DYN.IMRT.IN?view=map&year\_high\_desc=true</u>
- Child Mortality Rate (CMR) the number of deaths of children under 5 years old per 1,000 children (IB definition) in a year or per 1,000 live births in a year (World Bank / UN definition)
- Current (2015) CMR is 42.5 deaths / 1,000 live births
- Max: Angola (157), Chad (139), Somalia (137), Central African Republic (130), Sierra Leone (120), Mali (115)
- Min: Luxembourg, Iceland, Finland (2), Slovenia, Norway, Japan (3); EU (4)
- <a href="http://data.worldbank.org/indicator/SH.DYN.MORT?view=map&year\_high\_desc=true">http://data.worldbank.org/indicator/SH.DYN.MORT?view=map&year\_high\_desc=true</a>

#### Life expectancy

- Life expectancy average number of years that a person can be expected to live (usually in a given country), if demographic factors remain unchanged (life expectancy at birth, at age 10, etc.)
- Life expectancy rose rapidly in the twentieth century due to improvements in public health, nutrition and medicine. It's likely that life expectancy of the most developed countries will slowly advance and then reach a peak in the range of the mid-80s of age.
- In 1900 the world life expectancy was approximately 30 years, in 1960 - 52.5, in 1990 - 65.4 and currently it is 71.9
- The differences between regions and countries are quite severe
- <u>http://data.worldbank.org/indicator/SP.DYN.LE00.IN?view=map&year\_high\_desc=true</u>
- There are also differences between men (69.8) and women (74.1)
- http://data.worldbank.org/indicator/SP.DYN.LE00.MA.IN?view=map&year\_high\_desc=true
- <u>http://data.worldbank.org/indicator/SP.DYN.LE00.FE.IN?view=map&year\_high\_desc=true</u>

#### Other important concepts

- Access to safe drinking water access to water that is affordable, in sufficient quantity and available without excessive effort and time
- Access to health services usually measured in the number of people per doctor, health worker or clinic/hospital in a given area
- YLDs years lived with disability
- **DALYs (disability-adjusted life years)** the sum of years of potential life lost due to premature mortality and the years of productive life lost due to disability
- HALE (health-adjusted life expectancy) the number of expected years of life equivalent to years lived in full health; it is not only a measure of quantity of life but also quality of life

#### Detailed case studies to be prepared

- Shifting cultivation reasons and environmental factors, spatial pattern, impact
- The Green Revolution brief history, consequences in Asia (especially India), challenges in Africa, criticism
- Food insecurity and famine in Ethiopia (and Horn of Africa) reasons (not only drought), historical waves (1983-1985, 2006, 2009/10, 2011/12, 2016)
- Farm subsidies (in USA + EU's Common Agricultural Policy), agribusiness and Fair Trade - negative consequences and attempts to overcome them
- HIV/AIDS diffusion, global pattern, impact (especially in Sub-Saharan Africa)
- Malaria spatial pattern, geographical factors, methods of control, impact
- West African Ebola epidemic of 2013-2016 overview, spatial pattern, effects
- **Obesity in Mexico** reasons, scope, impact on society

#### **UNDP** Regions



#### Millennium Development Goals



- http://www.un.org/millenniumgoals/
- <u>http://www.undp.org/content/undp/en/home/sdgoverview/mdg\_goals.html</u>

#### Millennium Development Goals

# The Millennium Development Goals Report 2015





http://www.undp.org/conten t/undp/en/home/librarypage /mdg/the-millenniumdevelopment-goals-report-2015.html 11

#### Proportion of undernourished people, 1990-1992 and 2014-2016 (percentage)



#### MDG 1

Number and proportion of undernourished people in the developing regions, from 1990-1992 to 2014-2016



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#### Under-five mortality rate, 1990 and 2015 (deaths per 1,000 live births)



# MDG 4 13

Maternal mortality ratio, 1990, 2000 and 2013 (maternal deaths per 100,000 live births, women aged 15–49)



Percentage change between 1990 and 2013 (based on unrounded numbers)

#### MDG 5

#### Estimated number of new HIV infections, 2000 and 2013 (thousands)

(incusanas	~		
Southern Afri	ca*		
	1,370		
700			
Eastern Africa	*		
650			
400			
West Africa*			
550			
290			
Central Africa	*		
74			
North Africat			
13			
Southern Asia	1		
310			
160			
South-Eastern	n Asia and Oceania	1	
120			
120			
Latin America	1		
96			
94			
Eastern Asia			
63			
Caribbean			
12			
	Control Acia		
10	i Central Asia		
8.3			
Western Asia			
0.9			
1.9			
Developed reg	gions		
170			
190			
Developing re	gions		
		1040	3,340
		1,940	
0	1000	2000	3000

2000

2013

4000

#### MDG 6

Number of people receiving antiretroviral therapy, 2003–2015, number of deaths from AIDS-related causes and number of people newly infected with HIV, 2001–2013 (millions)



Estimated change in malaria incidence rate (cases per 1,000 population at risk) and malaria mortality rate (deaths per 100,000 persons at risk), 2000–2015



MDG 6

#### MDG 6

Proportion of children under age five sleeping under insecticide-treated mosquito nets for selected countries in sub-Saharan Africa, around 2001 and 2013 (percentage)



Note: 'Around 2001' refers to a survey conducted during 1999–2003. 'Around 2013' refers to a survey conducted during 2012–2014.

#### Sustainable Development Goals





https://sustainabledevelopment.un.org/sdgs

Key organizations





Food and Agriculture Organization of the United Nations

#### Key indicators & data

- Infant Mortality Rate, Child Mortality Rate, Life Expectancy
- HALE:
  - <a href="http://www.who.int/gho/mortality\_burden\_disease/life\_tables/hale\_text/en/">http://www.who.int/gho/mortality\_burden\_disease/life\_tables/hale\_text/en/</a>
  - <a href="http://www.who.int/gho/mortality\_burden\_disease/life\_tables/hale/en/">http://www.who.int/gho/mortality\_burden\_disease/life\_tables/hale/en/</a>
- Access to health services:
  - number of doctors per 1 thousand people
  - number of hospital beds per 1 thousand people
  - health expenditure
- WHO database: <a href="http://apps.who.int/gho/data/node.sdg.tp-1?lang=en">http://apps.who.int/gho/data/node.sdg.tp-1?lang=en</a>
- Access to safe water and sanitation:
  - <u>http://bit.ly/2abAffj</u>
- Calorie intake (per person per day):
  - http://www.who.int/nutrition/topics/3\_foodconsumption/en/
  - http://www.fao.org/faostat/en/#data/FBS/visualize
  - https://ourworldindata.org/food-per-person/#world-maps-of-food-supply-kcal-per-capita-per-day-1961-2009-max-roserref
  - http://www.businessinsider.com/these-countries-consume-the-most-calories-2015-11?IR=T
  - <u>http://bit.ly/2fhMmrW</u>
- FAO database: <u>http://www.fao.org/faostat/en/#home</u>
- FAO hunger info: <u>http://www.fao.org/hunger/en/</u>
- Definitions: <u>https://quizlet.com/11648738/ib-geography-food-and-health-flash-cards/</u>

## Food - Syllabus

#### <u>Tasks:</u>



#### Global availability of food

- Identify global patterns of calorie intake as one measure of food availability
- Distinguish between malnutrition, temporary hunger, chronic hunger and famine
- Discuss the concept of food security

#### Areas of food sufficiency and deficiency

- Explain how changes in agricultural systems, scientific and technological innovations, the expansion of the area under agriculture and the growth of agribusiness have increased the availability of food in some areas, starting with the Green Revolution and continuing since
- Examine the environmental, demographic, political, social and economic factors that have caused areas of food deficiency and food insecurity

## Food - Syllabus

#### <u>Tasks:</u>



#### Case study

• Examine the variety of causes responsible for a recent famine

#### **Production and markets**

• Examine the impacts at a variety of scales of trade barriers, agricultural subsidies, bilateral and multilateral agreements, and transnational corporations (TNCs) on the production and availability of food

#### Addressing imbalances

- Evaluate the relative importance of food aid, free trade and fair trade in alleviating food shortages
- Sustainable agriculture
- Examine the concept of sustainable agriculture in terms of energy efficiency ratios and sustainable yields
- Examine the concept of food miles as an indicator of environmental impact

#### Calories intake

## World trends in daily calorie consumption



#### Key concepts

- Malnutrition (p. 257) a state of poor nutrition, resulting from a deficiency or imbalance of proteins, energy and minerals. Mineral deficiency may lead to diseases such as kwashiorkor, and calorie/energy deficiency to marasmus. Calorie/energy excess may result in obesity.
- But also... Malnutrition (p. 33) poor (bad) nutrition. It can be overor undernutrition
- Starvation limited or non-existent food intake
- **Deficiency diseases** caused by lack of specific vitamins or minerals
- Kwashiorkor caused by a lack of protein
- Marasmus a lack of calories/energy food
- Obesity too much energy and/or protein foods; an unhealthy condition where excess body fat has accumulated and the body mass index (BMI) exceeds 30 (calculated: weight in kilograms divided by height in centimeters, squared). BMI has limitations, however, because of racial variation in human physique. Obesity may be linked to diseases of affluence such as cardiovascular disease and cancer<sub>24</sub>

#### Food access and security

- Food access an adequate supply of food does not in itself guarantee household level food security. Access to food is primarily determined by incomes, food prices and the ability of households and individuals to obtain access to social support. Individuals' access to food is also heavily influenced by social variables, including gender positioning and power hierarchies within households. In addition to economic affordability, physical access to food is also facilitated by adequate infrastructure, such as railway lines and paved roads and the environment
- Food security (FAO definition) food security exists when all people, at all times, have access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life
- FAD food availability deficit not enough food mostly due to physical factors
- FED food entitlement deficit food is available, but not accessibles

## **IB** definitions

 Starvation - a state of extreme hunger resulting from lack of food over a prolonged period of time



- Temporary hunger a short-term physiological need for food, resulting from deprivation
- Famine an extreme shortage of food, resulting in mortality. Famine can occur where food is available, but people lack the means to buy it

#### According to the UN World Food Program:

- A famine can be declared only when certain measures of mortality, malnutrition and hunger are met. They are:
   At least 20% of the population has fewer than 2,100 calories of food a day
  - Prevalence of acute malnutrition must exceed 30 percent of children
  - The death rate must exceed two deaths per 10,000 people per day

#### FAO key facts

- 815 million people suffer from chronic hunger; around 650 million people have limited or no access to safe drinking water
- 155 million children under the age of five are stunted
- At the same time around 40 million of children under the age of five are overweight
- 3.4 million people die each year due to overweight and obesity
- The cost of malnutrition is of about 3.5 trillion USD per year
- Undernourishment is a state, lasting for at least one year, of inability to acquire enough food, defined as a level of food intake insufficient to meet dietary energy requirements. About 815 million people just over one in every nine people in the world still lack sufficient food for conducting an active and healthy life

#### FAO data



World

Africa

Asia

Caribbean

Oceania

Developed countries

Developing countries

Latin America and the

18.6

< 5.0

23.3

27.6

23.6

14.7

15.7

10.8

< 5.0

12.9

19.8

12.1

5.5

14.2



people who suffer from hunger

#### Food availability > agriculture

#### Subsistence agriculture

- System in which farmers consume all they produce
  - Example: shifting cultivation, nomadic herding
  - But also: intensive subsistence agriculture

#### Commercial agriculture

• System in which farmers produce crops and animals primarily for sale rather than for direct consumption

#### Subsistence Agriculture

#### Growing food products to eat

Generally small

Use of machinery and technology

Purpose

Size of farm

Ties to other parts of the economy

Little or none (human and animal power)

#### **Commercial Agriculture**

Growing products to sell

Larger

Lots (tractors, fertilizer, pesticides and herbicides, genetically modified and hybrid seeds, antibiotics) Many: "Agribusiness" (suppliers, processors, storage, shipping, packaging)

Few



#### Types of commercial agriculture

- Livestock Ranching the commercial counterpart to nomadic herding
- Mediterranean Agriculture closely associated with the Mediterranean climate region; some characteristic crops include grains, especially wheat, and olives + grapes
- **Commercial Grain Farming** the use of land for a single grain; common grain crops include corn, wheat, barley, soybeans, and rice (economies of scale!)
- **Mixed Livestock and Crop Farming** a combination of ranching with commercial grain farming
- Dairy Farming when cows are kept with the principal goal of selling their milk
- Fruit and Vegetable Gardening
- Plantation Agriculture mostly in LEDCs (the developing world) where certain types of crops are grown in favorable conditions (usually tropical or subtropical climates) for export to more developed countries (e.g. bananas, sugarcane)
- Important related link: <a href="http://www.geog100.org/p/6-agriculture.html">http://www.geog100.org/p/6-agriculture.html</a>



Related links:

- https://www.nationalgeographic.com/foodfeatures/feeding-9-billion/

- https://news.nationalgeographic.com/2015/07/150701-hunger-food-agriculture-population-ngbooktalk/

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#### Global agriculture pattern at the beginning of the 21<sup>st</sup> century



Source: Knox P.L., Marston S.A., 2004, Human Geography, Pearson Education, Upper Saddle River

#### Food production

- Food production is at an all time high
- It does not mean it is available everywhere
- Recent years experience food prices increase





#### Food production

#### **Cereal Yields (in metric tons per hectare)**





Sources: http://ow.ly/rpfMN

#### Food production

- In 2008 and again in 2011 and 2014, world food prices reached high levels and sparked riots and protests in many middle and low income countries
- The graph below shows the nominal and real ('actual price compared to income') cost of food



#### Areas of food sufficiency

Due to population growth and economic growth - growing production for domestic and export purposes related with more affluence and changing lifestyles/habits resulting in growing demand for meat and diary - there are different methods of increasing food output:

- High-yielding varieties (HYVs) mostly wheat, maize, and rice
- Fertilizers and pesticides
- Irrigation
- Introducing the economies of scale by increasing the scale of operations by bringing together fragmented land holdings
- **Biotechnology** capacity to create another green revolution
- Case study > Shifting cultivation and the Green Revolution
- Case study > Organic Agriculture: <u>http://www.fao.org/organicag/oa-faq/oa-faq1/en/</u> <u>ttps://www.organicconsumers.org/sites/default/files/what\_is\_organic\_farming.pdf</u> <u>http://ofrf.org/organic-faqs</u>

- Areas of food deficiency Rising demand global population growth and more affluent societies (e.g.: in China and India) changing their food habits and buying more meat, eggs and diary
- **Oil and energy prices** influence the price of fertilizers and the usage of machinery
- The push for biofuels farming wheat, corn, sugar beets, sugar cane, molasses, soy, canola for fuel production instead of food; so called "food vs. fuel"

(https://www.theguardian.com/global-development/poverty-matters/2011/jun/01/biofuels-driving-food-prices-higher)

- **Underinvestment in agriculture** more investments in industry, infrastructure and urban environments
- Speculative trading in agricultural commodities fluctuation in market prices of food commodities has not been related in changes in supply and demand
- Natural hazards e.g. droughts and floods (e.g.: 2008 Nargis cyclone in Myanmar reduced world supply of grain)
- **Climate change** some areas becoming more arid, facing water shortages, experiencing more extreme weather conditions; there are FAO estimates that by 2050 half of the global arable land will be note suitable for food production

#### Land grabbing case study

- Land grabbing intro: <u>https://www.theguardian.com/environment/2014/jun/27/land-grabbing-food-biofuels-crops</u>
- Land grabbing as neo-colonialism?: <u>http://thisisafrica.me/land-grabbing-africa-new-colonialism/</u>
- Article on Uganda: <u>https://www.theguardian.com/global-</u> <u>development/2015/mar/03/ugandan-farmers-take-on-palm-oil-giants-</u> <u>over-land-grab-claims</u>
- Documentary on Mali: <u>https://www.youtube.com/watch?v=0\_pKnP-2mOQ</u>

#### Food and trade

- The agricultural products were not priority to free trade deals
- On the other hand agribusiness (large farming companies) are TNCs in favor of free trade and having a major impact on trade and trading arrangements
- There might be multilateral and bilateral arrangements and agreements with regard to food trade



Figure 10.11 The unfair terms of global trade and the effect upon LEDC farmers

#### Food and TNCs

- TNCs are accused of demanding higher production from farmers, causing environmental degradation
- Meanwhile, they encourage a move away from diversification towards monoculture. This means that instead of producing a diverse range of crops (which is generally good for the environment and especially the soil), farmers are encouraged to grow a single crop to maximise the amount they can sell to the TNC. This is because often the climate and physical geography of an area makes it excellent at growing certain products e.g. rice; this gives the area a comparative advantage over other producers
- TNCs dominate the end market too. The campaign <u>http://www.behindthebrands.org/</u> is an excellent source that shows just how much of a market is controlled by a major brand
- The result is that TNCs have a huge role in selling the food and therefore also controlling how much is produced, and in what form it is sold
- Related link: <u>https://youtu.be/KTZYgRVI\_6k</u>

#### Food and TNCs

• <u>Related link: https://www.cargill.com/about/cargill-at-a-glance</u>



# In a world with 7 billion food consumers and 1.5 billion food producers, no more than 500 companies control 70% of food choice.

The Big 10 are the most visible industry players within the global food system and wield immense power. Collectively, they generate revenues of more than \$1.1bn a day. Their annual revenues of more than \$450bn are equivalent to the GDP of the world's low-income countries combined. A shift in policies and practices from the Big 10 would reverberate across the value chain. Input companies

#### Food and trade

- LEDCs traditionally have been highly dependent on agriculturerelated export (usually with poor terms-of trade)
- MEDCs usually use some sort of protectionism (restrictions to trade aimed at protecting internal market and domestic producers) dedicated to food production
- The best example is **Common Agriculture Policy of the EU** (59 billion EUR annually) mostly based on direct payments (subsidies)
- In the past (1980s and early 1990s) CAP and the US subsidies led to overproduction and destabilizing the world market
- Related link: <a href="http://www.oxfam.org.hk/en/unfairtrade.aspx">http://www.oxfam.org.hk/en/unfairtrade.aspx</a>
- One of the alternative concepts is fair trade trade that attempts to be socially, economically and environmentally responsible and sustainable





• Case study > Fair trade and farm subsidies

#### Food insecurity

 One of the paradoxes of the globalized world: food surplus is accompanied with food insecurity

In order to meet the challenge of food insecurity there are different steps to be taken:

- Technological solutions:
  - GM crops
  - Expanding irrigation

- Appropriate technology - sometimes small-scale, not capitalintensive

- Seeds and fertilizers - making sure about the next season's production

- Sustainable practices - producing food without damage to the ecosystem

- Socio-economic solutions:
  - Proper agricultural investment
  - Better credit (including the idea of micro loans)
  - Improved infrastructure

- Food aid - emergency vs. the threat of introducing dependency 45 and destroying local farming in the long perspective

#### Food insecurity

Case study > Food insecurity and famine in Ethiopia (and Horn of Africa)

#### Additional information:

- <u>http://geographylaunchpad.weebly.com/recent-famine-case-study.html</u>
- Related link on food aid (and food assistance) and the role of World Food Program:
  - http://publications.wfp.org/en/annual-report/2015/
  - <u>http://publications.wfp.org/en/annual-report/2016/</u>

 But also let's have fun on daily calories intake: <u>https://www.youtube.com/watch?v=rgaqwFPU7cc</u>

#### Food insecurity

- Socio-economic and political solutions:
  - Land reform connected with land ownership

- Trade reform - lowering farm subsidies in the USA and undoing some of the protectionism of the CAP in the EU

- Social and cultural solutions:
  - Diet change



# GLOBAL DEMAND FOR MEAT

(in tonnes)



Source: Food and Agriculture Organization of the United Nations, ESA Working Paper No. 12-03, p. 131

• Over 100% growth of meat demand between 1990 and 2020

#### • Related link:

48 https://www.theguardian.com/environment/2017/oct/05/vast-animal-feed-crops-meat-needs-destroying-planet?CMP=fb\_gu



Example: <u>http://www.cargill.com/company/glance/index.jsp</u>

#### Commercial food production

- The major challenge is to satisfy growing human demand without destroying ecosystems, landscapes and resources
- Increasing and commercial food production has led to:
  - greater reliance on mechanization, the use of of fertilizers and pesticides related with growing demand for oil
  - increase in energy consumption
  - environmental pollution
  - modifying landscapes including deforestation, hedgerow
  - clearance, drainage of wetlands
  - reducing biodiversity

- bioaccumulation of e.g. organochlorines (drainage system > soil > food chain > humans)

 ...but at the same time increased productivity, efficiency and supply of food



#### Commercial food production





Thank you for your attention Robert Łuczak robert@robertluczak.eu