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***Lectures 13 and 14 are best watched on LMS**

Lecture 1

What is food?

- Food comes from plants: leaves, fruits, shoots, roots, and seeds
- The meat in our diet comes from animals that eats plants

Why we eat what we eat?

- We are heterotrophs: we cannot make our own food like plants, we have to consumer them from an external source
- 1) Sensual/psychological reasons: the food food smell/taste/look, how you feel (hungry, tired)
- 2) Social/emotional reasons: your emotion drives you to choose the food (depress → eat sweets), or social context (it's traditional food, exp: turkey during Thanksgiving)
- 3) Economic reasons: the price of the food will affect your choice (low SES = eat less organic fresh produce since those are too expensive), food deal (buy one get one, you will choose this)
- 4) Media and marketing: whatever the media say should be your diet (you take vitamins since they are marketed as beneficial) (you cut out carbs since they are harmful)

Double burden of malnutrition

- Coexistence of undernutrition along with overweight and obesity/ diet-related non-communicable diseases (diabetes, CVDs, respiratory, disease), within individuals/household/populations, across their life course
 - o 795 million people are hungry
 - o 1.9 billion people are currently overweight or obese
- Different forms of malnutrition:
 - o Child stunting: low height for age
 - o Child wasting: low weight for age
 - o Child overweight: high weight for height
 - o Adult overweight: excess body fat with a body mass index equal or above 25
 - o Micronutrient deficiency: iron, folic acid, Vitamin A, zinc, iodine below healthy threshold
 - o Adult obesity: Carrying excess body fat with a body mass index equal or above 30
 - o Non-communicable diseases: Diabetes, CVDs, some cancers

Micronutrient Deficiency

- Occur in both developed and developing world
- Micronutrients = Vitamins (essential nutrients) and Minerals
 - o Vitamins: A (essential since our body can't make it), C (ascorbic acid), B1 (thiamin), B3 (niacin), B9 (folate)

Micronutrients effects on the body's function

- Immunity: more severe illness, more infant/maternal deaths
- Stunted growth
- Lower work productivity
- Higher morbidity/mortality
- Lower cognitive ability
- Problems with brain development
- Problems with reproductions

Nearly half of the world population is affected by micronutrient deficiency

- Zinc deficiency: Impaired growth in children
- Vitamin A deficiency: Leading cause of blindness
- Vitamin D deficiency: Affects calcium balance in the body
 - o Cause by lack of skin exposure to sun, and/or a high degree of melanin concentration, different season of the year (amount of sun), time of the day, pollution, location (distance of location from equator)

Solution for micronutrients deficiency

- Prevention:
 - o Dietary diversification: eat different food groups in a balance amount
 - Nutrition education, social marketing, community garden programs, measures to improve food security
 - o Fortification: food enriched with added micronutrients
 - o Biofortification: using biotechnology to add nutrition into crops

- Minerals are added to plants through selective breeding, genetic engineering, and altered agronomic practices (exp: high-iron millet)
- Mineral nutrition depends upon soil composition and bioavailability in the guts
- Supplementation: intake of supplements

Epidemiologic Transition (and Nutrition Transition)

- Change in balance of disease in a population from communicable diseases → non-communicable diseases

Classifying Deaths and Diseases (WHO)

- **Group 1:** Communicable Diseases (death is directly due to action of a communicable agent, exp: Influenza, Tuberculosis, Malaria)
- **Group 2:** Non-communicable Diseases (cancer and diseases of various organ systems, diabetes, mental health)
- **Group 3:** External causes (injuries, poisonings, and violence)

Non-communicable Diseases – A Global Problem

- 2004: 59 million deaths world-wide
- Accounted for 60% of the deaths and injuries and violence 10%
- 2020: estimated that non-communicable disease will account for 73%

Pathway to NDCs: (From broad to specific)

- Underlying drivers: Social Determinants of Health/ Globalization, Urbanization, Population aging
- Behavioural risk factors: Tobacco use, unhealthy diet, physical inactivity, harmful use of alcohol
- Metabolic/physiological risk factors: Raised blood pressure, overweight/obesity, raised blood glucose, raised lipids
- NDCs (top of pyramid)

NDCs are an increasing global challenge:

- 60% death globally (most significant)
- Cause premature deaths under age 60: 13% in high income and 25% in low middle income countries
- NDCs are rising rapidly in African nations exceed communicable, maternal/perinatal, and nutritional diseases

Relationship: NDCs and Modern Disease

- There is a strong connection between diet and chronic disease
- More people are underweight than undernourished globally (65% of the world's population live in countries where death by overweight is higher than underweight)
- 5/10 deaths leading cause of death is related to dietary habits

Cardiovascular Disease (CVDs):

- Number one cause of death globally
- CVDs include stroke, heart attack, atherosclerosis, high blood pressure

- 30% of global deaths = 17.3 million people (2008)
- 23.6 million people (2030)
- Over 80% CVD deaths take place in low and middle income countries

Metabolic Syndrome – Multifaceted Syndrome

- Inflammatory markers
- High blood pressure
- Heart disease, stroke, kidney failure, depression?
- Urine protein
- Abnormal lipid levels
- High blood glucose
- Obesity

CONCLUSION: For millions of years, human have evolved to be broad, opportunistic eaters of diverse, low-calorie plant based diets. Modern diets and too much of the wrong kind of foods, leads to health problems, many stemming from obesity

Lecture 2

Functional Food

- The term was first introduced in Japan mid-1980s and refers to processed foods containing added ingredients that aid specific bodily function
- Food whose health benefits go beyond traditional nutrients are sometimes called functional food
 - o Claim for health benefits beyond conventional nutrition are stringently regulated
 - o In Japan more than 700 functional food are labeled FOSHU (Foods for Specified Health Use)
- Exp: Plant sterols are shown to reduced blood cholesterol, thus reduce CDVs → added to some food like milk, butter

Superfoods

- A marketing term used to describe food that have health benefits. Usually plant food.
- In reality, all natural and whole food could be considered superfood as they all have health benefits

Phytonutrients and Bioactive Compounds

- Can have long term health benefits
- Phytonutrients can be some plant's "secondary metabolites"
 - o First metabolites: core compound found in most organism
 - o Second metabolite: often involved in defense or interactions with pollinators and often in only a few species
- Have not been shown to be essential for human health as vitamins and minerals; however, will be beneficial for long term health