

WHAT IS PUBLIC HEALTH NUTRITION?

- Problems related to inadequate quantity and quality of the habitual diet
- Problems related to excessive intake of quantity of the habitual diet and food additives and supplements
- Food safety problems that affect the health and function of a large percent of the general population
- Nutrition problems prevented or ameliorated by identification of risk factors and early detection by screening when feasible, in contrast to only specific nutrient treatment
- Environmental and life style risk factors.
- Global warming, as well as natural disasters (flooding, droughts, civil strife, etc.)

COMMUNITY-LEVEL NUTRITION EQUATION

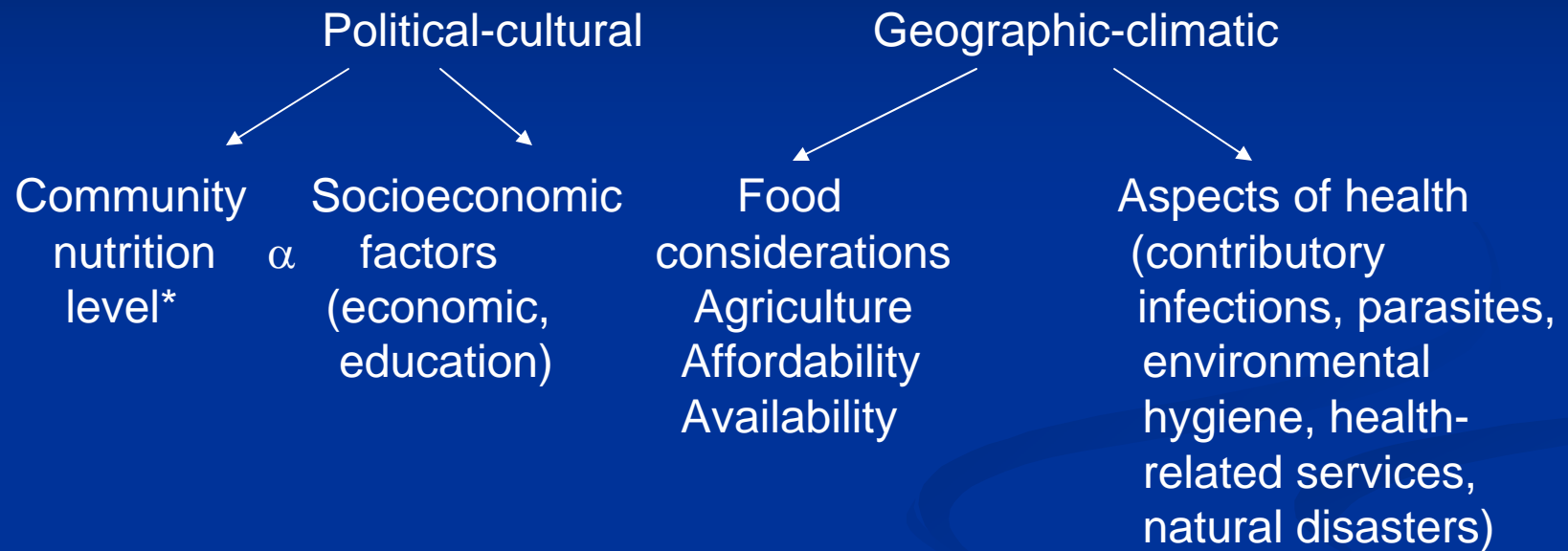
Will focus on interconnected areas of the world global outlook -- the Nutrition Transition

Developing countries with predominately poor people plus an increasingly wealthy, middle-class, urbanized population with adaptation of physical activity, stress, etc.), over-nutrition with high-energy diets, alcohol, high intake of refined sugars, etc.

AND

Industrialized, wealthy countries with growing disadvantaged populations with growing food security, income and hunger and malnutrition

Community Nutrition Level Equation



Community nutrition level (CNL) 'equation'

*Especially vulnerable groups

Socio-economic factors

- Poverty, Education level, and Government policies, etc.
- Lack of nutrition information
- Cultural factors

Food considerations

- Availability, accessibility, and affordability (3 A's)
- Consumption, Utilization, Negative Impact of Infection
- Adequacy- quantity and quality

Aspects of health

- Co-existing infections and health-related services
- Environmental sanitation

Demographic issues

- family size (i.e. children under 5)

Geographic and climactic influences

- Global warming, flooding, drought, etc.
- Massive insect plagues
- Overgrazing

Civil upheaval and strife: i.e. people forced to leave their farms

- massive migration to refugee camps

EXCESSIVE INTAKE OF FOOD AND NUTRIENTS

- Food intake above physiological needs for normal function and growth in children
- Intake of vitamins, minerals and other micronutrients far in excess of nutritional needs

EXAMPLES:

- ❖ Fast food addiction and calorie-dense snacks
- ❖ Megadoses of vitamins and other micronutrients and untested “natural supplements”

INADEQUACY

- Low quantity of food to meet macro and micro nutrient requirements
- Poor absorption of nutrients
 - High phytate and fiber content of predominantly plant-based diets blocking micronutrient absorption.
 - Competition of nutrients (i.e., iron and zinc and iron and calcium)
- Infection and intestinal parasites
- Malabsorption due to enzyme deficiencies, structural damage to intestinal surfaces
- Drug-nutrient interactions, etc.

OVERNUTRITION

Obesity

Marked increase in obesity, particularly in urban areas of poor countries and the USA among poor populations.
Childhood obesity leads to adult obesity

Type II diabetes

Complications: cardiac morbidity

Retinal with blindness

Gangrene- i.e. amputations

Elevated cholesterol and triglycerides

Risk factors for cardiovascular diseases

MAIN DEFICIENCY SYNDROMES AND CONDITIONS

PROTEIN-ENERGY MALNUTRITION, from mild to severe

- KWASHIORKOR (protein deficiency: mainly seen in young children)
 - Low-serum albumin
 - Severe edema (hair discoloration and burn-like skin lesions)
 - Severe apathy and lethargy
 - Precipitated by measles or other severe infection
 - Abrupt weaning after birth of a new baby
 - Decreased cell-mediated immune function with high infection complications: return to normal with treatment
 - Rapid reversal of all signs and symptoms two weeks after with high protein diet
- MARASMUS (total energy depletion)
 - Seen in both young children and adults
 - Children alert, ravenous, and irritable
 - Often seen with HIV/AIDS, tuberculosis, malignancies, etc.
 - High energy and protein diet required over many months for recovery
 - Early weaning under 6 months with poor breast milk substitute major risk factor
 - Cognitive impairment

More Main Deficiencies

- Stunting
- Mental deficiency as in iodine deficiency
- Iron deficiency (Anemia and Cognitive problems)
- Folate deficiency (Anemia and Risk of Neural Tube defects)
- B12 (Severe Anemia and Impaired Cognition)





PRINCIPAL PROBLEMS IN THE SO-CALLED DEVELOPING COUNTRIES OR THE “EMERGING NATIONS”

(and to a lesser degree, in the industrialized nations)

Maternal malnutrition with:

- Poor nutrition and anemia in preconception period and pregnancy
- Maternal depletion, poor pregnancy weight gain, and depletion of meager nutrient stores (fat and muscle mass, iron, calcium, zinc, vitamin A, etc.)
- Vitamin D and Calcium causing small pelvic outlet and from protein energy malnutrition
- Women “eat down” hoping to have small baby for easier delivery
- Low birth weight, mainly small for dates (i.e., low BW term newborns (high mortality, CNS damage, poor resistance to infection, possible risk for adult CV and diabetes (Barker’s Hypotheses))
- Breast milk may be deficient in vitamins (B12 ,folate, A, and other vitamins).
- Deficient milk output in severe malnutrition

INFANT FEEDING

Exclusive breast feeding (EBF) for first 4-6 months

- Those not EBF have double the infant mortality rate as breast fed infants in developing countries

Breast milk

- Sterile with multiple anti-infective mechanisms
- Nutrients tailored to needs and developmental stage of infant
- Promotes brain and visual development
- Growth-stimulating factors of digestive tract
- Psychological benefits for maternal infant pair
- Few safe alternatives in poor countries and among HIV positive mothers.
- Enhances child spacing called “lactational ammenorrhä” (Suppresses ovulation —but imperfectly)

WEANING CHALLENGE – FEEDING THE TODDLER

NEED TO ADD SOLID FOODS TO SUPPLY MORE ENERGY 6> MONTHS, PROTEIN, IRON, AND OTHER MICRONUTRIENTS

- AFTER ONE YEAR, CHILD OUTGROWS THE MILK SUPPLY

Need for energy-dense food (small stomachs!) with high-quality complete protein, energy, essential vitamins and minerals

- Iron, zinc, iodine, calcium, vitamins A, C, B, D, esp. B12
- Supplied by local legumes, cereals, dairy products, and need for modest amounts of animal foods; i.e., meat, fish, fowl

For vitamins C and A, use of green and orange fruit and vegetables.

NOTE: Death rates around weaning time 30-50-fold higher in developing countries than in rich nations, due to combination of malnutrition and infection

MICRONUTRIENT DEFICIENCIES

Iron deficiency – Global Problem

- Anemia
- Impaired cognitive function
- Decreased physical activity
- Decreased work capacity in older children and adults
- Decreased appetite
- Impaired cellular immune function and increased infections

Animal source foods needed- absorption from cereals and legumes increased when mixed with meat (any type)

Vitamin A Deficiency

- Irreversible blindness
- Increased morbidity and mortality from infection, especially pneumonia and diarrhea
- Loss of structure and function of epithelial linings of the body
- Impaired cellular immune function
- Sources: preformed retinol from animal source foods - carotene from orange yellow red F and V
- Massive dosing with Vitamin A capsules (200,000 IU every 6 mos. in <5 y.o. children in developing countries effective)

Zinc deficiency

- Part of many enzyme systems
- Stunting
- Loss of appetite associated with loss of taste
- Loss of resistance to infection
- Delayed puberty
- Impaired wound healing
- Decreased activity

Sources:

Animal source foods (meat/fish) - cereal legumes mixed with meat and vitamin C will enhance absorption

VITAMIN B12 DEFICIENCY

- Seen in vegetarians, or those on low animal source foods
- Key role
 - Brain and CNS development
 - Red blood cell formation
 - Immune function
- Recently found to play a role in brain development and cognitive function in children
- Low breast milk B12 is of risk to an infant

Approach: Promote animal source foods in diet, containing milk and/or meat of any variety

Folic acid

- Neural tube defects from poor folate intake in first trimester of pregnancy
- Anemia (macrocytic)
- Sources: orange juice, meat (especially organ parts), dark green leafy vegetables
- Supplements required (400 $\mu\text{m}/\text{day}$)
- Needed before women realizes she is pregnant (policy is for all young women to take folate daily and food fortification)

Calcium

- Bone calcification
- Needed early and throughout life to prevent osteoporosis
- Prevents rickets post-weaning, even in tropics
- Prevents hypertension (especially in pregnancy)

Source: milk products, small fish

Vitamin D Deficiency

- Vitamin D deficiency, now known to be widespread, both in developing and developed countries
- At risk groups: those with dark skin, and limited exposure of all to sunlight (fear of melanoma)
- Older recommendations for Vitamin D extremely low
- Vitamin D deficiency, and sub-clinical and clinical rickets seen in northern and extremely southern latitudes throughout the world
- Vitamin D plays a vital role in protection against malignancy, immune abnormalities, and other body functions (under active research)
- Prevention: Exposure to sunlight and Vitamin D supplementation

Iodine Deficiency

- Iodine deficiency still a significant global problem, with negative socioeconomic impact
 - Impaired intellectual capacity, decreased productivity, marked growth retardation, and initiative
- Significant cause of poor pregnancy outcome, severely retarded infants, children, and adults
- Globally due to lack of iodine in the food, soil, and water supply
 - Seen in land areas away from the sea
 - Highly prevalent in mountainous areas receiving water from melted snow and ice
 - Entire food chain also affected with low iodine content

Iodine Deficiency Disorders



Goiter



Cretinism

Manifestations of iodine deficiency

- High pregnancy wastage, appearance of goiters in pregnant women, teenage girls > boys
- Severely affected infant at birth with cretinism
 - Severe growth and mental retardation- irreversible
 - Less severe forms of iodine deficiency
 - Poor growth and development
 - Poor school performance, and varying degrees of mild mental retardation
 - Poor pregnancy outcome
- Main approaches
 - Iodization of salt, universally
 - If commercial water not available, drops of iodine placed in household or school drinking water
 - Or iodine injections in oil annually or more frequently by oral pills
- Still an unsolved, but greatly improved, problem calling for collaboration between local populations, industry, and government
- In U.S.A., iodine deficiency mostly due to metabolic errors or thyroid disease
- Hyperthyroidism induced by excessive iodine intake

Public health approaches to modifying intake in the prevention and control of micronutrient deficiencies

Food-based (esp in poor countries)

Dietary diversification

- Home gardening
- Nutrition education
- Development of high carotenoid varieties
- Raising of small animals (including fish) for milk, meat, and eggs for household consumption
- Greater sustainability through food-based approaches than relying on micronutrient distribution by pills, etc. particularly to rural and isolated communities

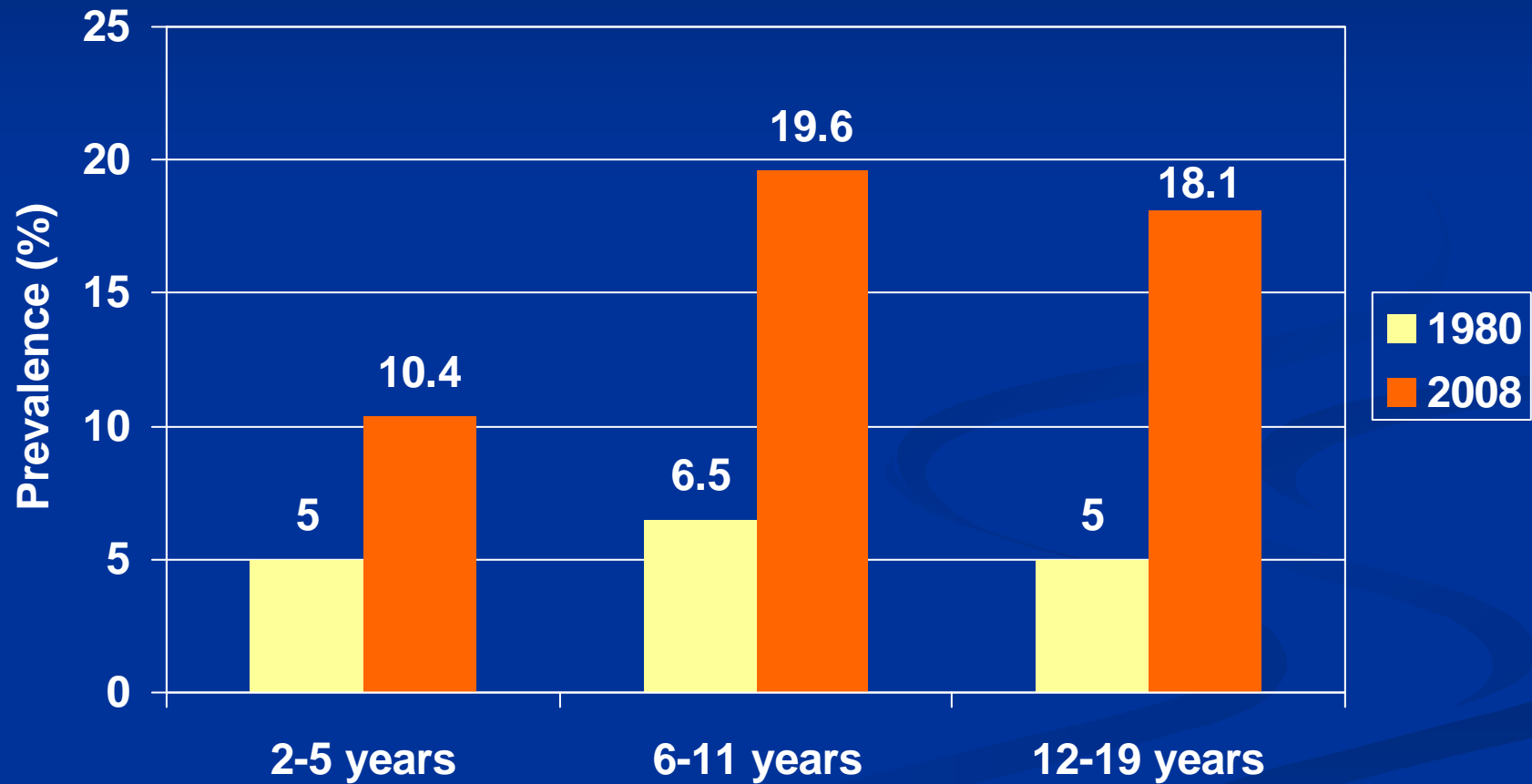
Micronutrient Fortification (where feasible and affordable)

- Sugar, flour, margarine, edible oils, noodles, condiments i.e. soy, etc.

Supplementation (particularly in developing countries)

- National immunization days and micronutrient distribution days
- Distribution through health centers, including mothers and children
- Postpartum supplementation
- Vitamin A capsule distribution programs in developing countries (mega-doses every 6 months for children under 5)

Childhood Obesity- U.S.



Source: www.cdc.gov/obesity

Childhood Obesity - World

	Year of Survey	Age Range	Boys (%)	Girls (%)
WHO Africa Region				
Algeria	2006	6-10	10.3	8.7
South Africa	2001-2004	6-13	14.0	17.9
Zimbabwe	1990-2004	5-17	1.7	2.4
WHO Americas Region				
Bolivia (urban)	2003	14-17	15.6	27.5
Brazil	2002	7-10	23.0	21.1
Chile	2002	6	28.6	27.1
Mexico	2006	15-17	30.5	31.5
WHO South East Asia Region				
India	2002	5-17*	12.9	8.2
Sri Lanka	2003	10-15	1.7	2.7
Thailand	1997	5-15	21.1	12.6

*5-15y for girls

Source: International Obesity Taskforce, 2010

(<http://www.ietf.org/database/documents/GlobalChildhoodOverweightMay2010.pdf>)

Comments on childhood obesity

- Staggering economic and health burden and child and adult obesity in the U.S.A.
 - This proportionately high prevalence in lower socioeconomic groups i.e. Hispanic, African-American, and Native American populations
 - Poor neighborhoods have few safe parks or recreation areas for physical activity
 - Lacking in affordable food stores with nutritious, low-calorie foods, and abundance of fast food and junk food stores
 - School-based and after school physical activity programs
 - School food services, although improving, have a long way to go to offer nutritious, low-calorie foods
 - Salad bars are increasing and school meals are now healthier
 - Banning of vending machines for soft drinks and sweet snacks
- Type II Diabetes widespread in all obese groups, but now even in preteen children
 - Multiple, but inadequate, numbers of school and community programs in safe environments are increasing

Nutrition transition in developing countries

- Double burden of malnutrition and over-nutrition and obesity in urban areas of developing countries
- Change in lifestyle and shift to cash economy, with movement to urban areas
 - No longer grow own food in cash economy, and relying on high-fat, street foods and fast foods
 - No longer access to fruits and vegetables, and milk produced on own homesteads
 - Decreased physical labor and physical activity in urban settings
 - Accompanying cardiovascular diseases with obesity, causing high mortality and morbidity among adults
 - Increased stress and alcohol consumption

Fetal programming and origins of adult chronic disease

- The Barker Hypothesis (seen globally)
 - Intrauterine malnutrition with low-birth weight in numerous epidemiological studies, associated with increased risks of coronary heart disease, stroke, hypertension, and type II diabetes in surviving adults
 - Associations seen globally
 - Effects may be due to “fetal programming,” presumably due to insult at critical, sensitive periods in fetal development, with permanent adverse effects on structure, physiology, metabolism, and hormonal function
 - Adaptations invoked by maternal placental failure of nutrient supply to meet fetal demand.
 - Maternal body composition and nutrient balance before and during pregnancy of key importance, and under active research
- Barker Hypothesis has stimulated large number of studies on possible intrauterine mechanisms

U.S. Federal Nutrition Assistance Programs

- Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)
 - Largest Nutrition Assistance Program Globally
 - Funded by USDA
 - Provides food assistance, nutrition education and referrals to health care services
 - Low-income (<185% FPL) pregnant, postpartum, and breastfeeding women and infants and children up to age 5 who are at nutritional risk
 - Broad reach – serves ~53% of all infants in the U.S.
 - New food package since 2009 to encourage breastfeeding and healthy eating

U.S. Federal Nutrition Assistance Programs

- Supplemental Nutrition Assistant Program (SNAP, formerly Food Stamp Program)
 - Largest domestic program
 - 46 million Americans served in March 2012
 - Financial assistance for low-income families (<130% FPL) to purchase food items
 - Uses Electronic Benefits Transfer (EBT) cards
 - Benefits vary based on income and household size

***Benefits now being significantly reduced
by current congress***