Introduction to Public Health Nutrition

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Adapted from: Krause’s Food & Nutrition Therapy
“The science/study of nutrients that come from **food**, their action, interaction, and balance in relation to health and disease; and the process by which the organism (body) ingests, digests, absorbs, transports, utilizes and excretes food substances.”
Public Health

Public Health is defined as “the art and science of preventing disease, prolonging life and promoting health through the organized efforts of society” (Acheson, 1988; WHO).

The main mission of public health is "to assure conditions in which people can be healthy" (Institute of Medicine, The Future of Public Health).
Since nutrition is an essential aspect of the conditions in which people can be healthy, public health nutrition is part of the public health system.
Nutrition
Assessing Eating Behaviors

What drives people to eat?
- Hunger
- Appetite
- Cultural and social meaning of food
- Habit or custom
- Emotional Comfort
- Convenience and advertising
- Nutritional value
- Social interactions
**Nutrients**: “Chemical substances in food that nourish the body by providing energy, building materials, and factors to regulate needed chemical reactions.”

**Essential nutrients**: Must be provided by food because the body does not produce them in sufficient quantities or can not make them at all.

**Nonessential nutrients**: Healthy, well-nourished bodies can make them in sufficient quantities to satisfy their needs.
Nutrients are essential to the human diet if they meet two characteristics.

- First, omitting the nutrient from the diet leads to a nutritional deficiency and a decline in some aspect of health.

- Second, if the omitted nutrient is put back into the diet, the symptoms of nutritional deficiency will decline and the individual will return to normal, barring any permanent damage caused by its absence.
Essential Nutrients cont’d:

The essential nutrients are:

- Some forms of carbohydrate (glucose)
- Certain constituents of fat [the essential fatty acids: linoleic acid (omega-6) and linolenic acid (omega-3)]
- Certain constituents of protein (the essential amino acids such as lysine, histidine, etc)
- 15 vitamins
- About 25 minerals
- Water
Functions of nutrients in food:

a. Provide energy sources

b. Build tissue

c. Regulate metabolic processes
Six categories of nutrients

1. **Carbohydrates**: contain carbon, hydrogen, and oxygen combined in small molecules called sugars and large molecules represented mainly by starch.

2. **Lipids (fats and oils)**: contain carbon, hydrogen, and oxygen as do carbohydrates, but the amount of oxygen is much less. Triglyceride is the main form of food fat.

3. **Proteins**: contain carbon, hydrogen, and oxygen, plus nitrogen and sometimes sulfur atoms arranged in small compounds called amino acids. Chains of amino acids make up dietary proteins.
Six categories of nutrients (cont’d):

4. **Vitamins**: are organic compounds that serve to catalyze or support a number of biochemical reactions in the body.

5. **Minerals**: are inorganic elements or compounds that play important roles in metabolic reactions and serve as structural components in body tissues such as bone.

6. **Water**: is vital to the body as a solvent and lubricant and as a medium for transporting nutrients and waste.
Nutrients are classified into:

A. Macronutrients (carbohydrates, fats, and proteins).
   - Provide calories for energy
   - Needed in large quantities

B. Micronutrients (vitamins, minerals, and water).
   - Needed in smaller amounts
Nutrient Classification

There are six major classes of nutrients in food:

- Carbohydrates
- Proteins
- Lipids (fats and oils)
- Vitamins (both fat-soluble and water-soluble)
- Minerals
- Water

Macronutrient Breakdown

- Carbohydrates: 55-65%
- Fat: 25-30%
- Protein: 10-15%
Figure 1: Conceptual model of food security in the Pacific
Dietary guidelines for the population

- Eat a variety of foods.
- Maintain a healthy weight.
- Choose a diet low in saturated fat.
- Choose a diet with plenty of vegetables, fruits, and grains.
- Use sugars only in moderation.
- Use salt and sodium only in moderation.
FACTORS AFFECTING NUTRITION

- Age and gender
- Lifestyle
- Food habits
- Ethnicity, Culture, and Religious Practices
- Social Interaction
- Availability of food
- Peer pressures
- Economy
Social Determinants (factors) of Nutrition

Demographic characteristics of those with a more healthful diet vary with the nutrient or food studied. However, most people need to improve some aspects of their diet.

Social factors thought to influence diet include:

- Knowledge and attitudes
- Skills
- Social support
- Societal and cultural norms
- Food and agricultural policies
- Food assistance programs
- Economic price systems
Components of a nutritional assessment

- Historical data: Medical history and diet history (24 hour recall, Food Frequency Questionnaire).
- Anthropometric measurements [height, weight, body mass index (BMI), waist circumference, hip circumference, etc..].
- Clinical assessment (physical examinations).
- Biochemical analyses (laboratory).
Functions of Public Health

Nutrition

- To assure conditions in which people have access to adequate and appropriate food.

- To assure conditions in which people can achieve optimal nutritional health.
Public health nutrition

- Public Health Nutrition strives to improve or maintain optimum nutritional health of the whole population and high risk or vulnerable subgroups within the population.

- Public Health uses multiple, coordinated strategies to reach and influence the community, and organizations and individuals that make up the community.... with leadership provided by the government.
Community nutrition efforts involve a wide range of programs that provide:

- increased access to food resources
- nutrition information and education
- health-related care
- efforts to change behavior and environments
- initiate policy
Core Responsibilities of Public Health

- **Assessment**
  - Systematically assessing nutrition-related needs of the population, identifying priority areas, and monitoring nutrition status of the population and at-risk groups

- **Policy Development**
  - Developing policies, programs and standards that address highest priority nutrition problems and needs

- **Assurance**
  - Implementing effective nutrition strategies by encouraging or enabling other entities, requiring action through regulation or providing services directly
Three Levels of Prevention

- **Primary**
  - Reducing or removing risk factors by environmental or community change

- **Secondary**
  - Strategies to stop or slow down disease progression by targeting at-risk groups

- **Tertiary**
  - Managing and rehabilitating individuals with diagnosed health conditions to improve quality of life
Three Levels of Intervention

- **Individual**
  - Produce changes in knowledge, behavior or health outcomes of individuals or small groups

- **Community**
  - Targeted toward large groups or populations but cannot be personalized

- **System**
  - Changes in organizations, policies, laws, or structures of the systems that serve individuals and communities
## Intervention Matrix

<table>
<thead>
<tr>
<th>System/Policy</th>
<th>Primary</th>
<th>Secondary</th>
<th>Tertiary</th>
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<tbody>
<tr>
<td>Individual</td>
<td></td>
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<tr>
<td>Community</td>
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What's the difference between community nutrition and public health nutrition?

- The term **community nutrition** is often used to reflect the wide range of delivery settings and sponsoring organizations for nutrition-related programs and services. Community nutrition services tend to be directed to individuals and groups in the community.

- The term **public health nutrition** has historically been used for the responsibilities carried out by health departments at local, state and central governmental levels. The programs offered by public health agencies are usually directed to communities, organizations and systems and have as their goal health promotion and disease prevention.

- **Public health nutrition** is often involved in policy development. In practice the terms public health nutrition and community nutrition tend to be used interchangeably.
## Public Health Practice Compared to Clinical Nutrition Practice

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<tr>
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<th>Public Health Practice</th>
<th>Clinical Nutrition Practice</th>
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<tr>
<td><strong>Focus</strong></td>
<td>Prevention</td>
<td>Disease treatment</td>
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<tr>
<td><strong>Target</strong></td>
<td>Populations</td>
<td>Individuals</td>
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<tr>
<td><strong>Setting</strong></td>
<td>Country, district &amp; Communities</td>
<td>Clinics &amp; Hospitals</td>
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<tr>
<td><strong>Strategies</strong></td>
<td>Multiple, Reinforcing</td>
<td>Counseling and education</td>
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Ecological Framework for Influences on What People Eat

- Home
  - Work sites
  - School, after school
  - Child care
  - Neighborhoods and communities
- Restaurants and fast food outlets
- Supermarkets
- Convenience and corner stores

- Access
  - Availability
  - Barriers
  - Opportunities

- Practices
  - Legislative, regulatory, or policy actions

- Societal and cultural norms and values
- Food and beverage industry
- Food marketing and media
- Food and agriculture policies
- Economic systems
- Food production and distribution systems
- Government and political structures and policies
- Food assistance programs
- Health care systems
- Land use and transportation

- Cognitions (e.g., attitudes, preferences, knowledge, values)
- Skills and behaviors
- Lifestyle
- Biological (e.g., genes, gender, age)
- Demographics (e.g., income, race/ethnicity)

- Outcome expectations
- Motivations
- Self-efficacy
- Behavioral capability

- Role modeling
- Social support
- Social norms

- Family
- Friends
- Peers

Annu. Rev. Public Health. 29:253–72*
Nutrition is essential in Public Health

- Adequate food and balanced nutrient intake are basic necessities for life, health and well being. Nutrition affects health from conception to old age.

- Adequate nutrition is especially important in periods of rapid growth and development.

- Poor nutrition during pregnancy, infancy, childhood and adolescence can mean stunted physical, mental and social development with lifelong consequences.

- Chronic dietary deficiency, excess or imbalance predisposes individuals to or aggravates a spectrum of disease conditions, and ultimately affect the quality and length of life.
Nutrition is an important determinant of health in any population. The right of individuals to adequate nutrition is crucial.

- As part of national plans of action, governments should generally develop measurable goals and objectives to reduce starvation and nutritional deficiencies.
- It is also imperative that basic issues related to health and nutrition should be addressed as part of these plans.
Basic issues related to health and nutrition

These issues include:
- Iodine and vitamin A deficiencies.
- Starvation and widespread chronic hunger.
- Under-nutrition, especially among children, women and the elderly.
- Other important micronutrient deficiencies including iron.
- Diet-related communicable and non-communicable diseases.
- Impediments to optimal breastfeeding.
- Inadequate sanitation and poor hygiene, including unsafe drinking water.
A food and nutrition policy is a policy with a preventative and clinical health perspectives based on human rights.

The basic idea is that all members of the society should be granted enough food to grow and develop without disorders due to malnutrition (under or over nutrition).

The food and nutrition policy should adopt an integrated approach with collaboration among all relevant government ministries, non-governmental organizations (NGOs) and UN agencies.

Improving nutritional status is a global health challenge

- Globally, between 2 and 3 billion people are malnourished—they experience some form of undernutrition, are overweight or obese, or have some sort of micronutrient deficiency.

- The faces of poor nutrition are many: from children living under famine conditions who appear to be made of skin and bone, to adults who have trouble breathing owing to obesity, to infants who do not live to see their first birthday as a result of a combination of poor diets, poor infant feeding practices, and exposure to infectious disease.
Improving nutritional status is a global health challenge

- It is a challenge that requires effective action across a number of sectors and areas (food, health, social welfare, education, water, sanitation, and gender equity).
- and across a number of actors (government, civil society, private sector, research, and international development partners).
Improving nutritional status is a global health challenge

Poor nutrition is a challenge that casts a long-term shadow: its consequences flow throughout the life cycle and cascade down the generations affecting everyone—especially children, adolescent girls, and women—and include mortality, infection, cognitive impairment, lower work productivity, early onset and higher risk of noncommunicable diseases (NCDs), stigma, and depression.
General Factors Affecting Nutrition

- Age and gender
- Lifestyle
- Food habits
- Ethnicity, Culture, and Religious Practices
- Social Interaction
- Availability of food
- Peer pressures
- Economy
Demographic characteristics of those with a more healthful diet vary with the nutrient or food studied. However, most people need to improve some aspects of their diet.

Social factors thought to influence diet include:

- Knowledge and attitudes
- Skills
- Social support
- Societal and cultural norms
- Food and agricultural policies
- Food assistance programs
- Economic price systems
Dietary factors are associated with five of the ten leading causes of death

- Coronary heart disease, some types of cancer, stroke, non-insulin dependent diabetes (type 2 diabetes), and atherosclerosis are associated with dietary factors. Dietary excesses and imbalances contribute to the development of these diseases.

- Currently attention is focused on total caloric intake; amount and type of fat; vitamins such as folic acid and the antioxidants of vitamins A, C and E; minerals such as calcium; and other nutritive substances such as fiber and omega3.

- Overweight and obesity which are estimated to affect nearly one third of the world population and it is an important contributing factor for disease and disability.
Nutritional assessment

It defines nutritional problems that need attention, it is the first step in the nutrition program planning and management cycle. It provides baseline data for planning and evaluation of programs. It helps in identifying priorities in of the public health system.

Methods of nutritional assessment:

- **Historical data:** Medical history and diet history (24 hour recall, Food Frequency Questionnaire).
- **Anthropometric measurements** [height, weight, body mass index (BMI), waist circumference, hip circumference, etc..].
- **Clinical assessment** (physical examinations).
- **Biochemical analyses** (laboratory).
Nutritional Surveillance

- Continuous monitoring of the nutritional status of selected population groups.
- Data is collected, analyzed, and utilized in an extended period of time.
- Useful in identifying causes of malnutrition, hence can be used in formulating and initiating intervention measures.
Major Nutritional Problems in Childhood
Overweight/Obesity

- Increasing prevalence
- Influence of access to food, eating tied to leisure activities, children making food decisions, portion sizes, and inactivity.
- Consequences: discrimination, negative self-image, depression, decreased socialization.
- Increases cardiovascular risk factors (hyperlipidemia, hypertension, and hyperinsulinemia) and type 2 diabetes.
Interventions for Childhood Obesity

- Family involvement
- Dietary modifications
- Nutrition information
- Physical activity
- Behavioral strategies
- Prevention
Iron Deficiency

- One of the most common nutrient disorders of childhood
- Affects approximately 9% of toddlers
- Linked to lower test scores
- Dietary factors
Dental Caries

- Composition of the diet and an individual’s eating habits are significant factors in developing dental caries
- Frequent use of sweetened drinks in bottles
- Fewer cariogenic snacks should be emphasized
- Protein foods such as cheese, nuts, and meat should be eaten with sticky foods
- Dental hygiene and fluoride
Allergies

- Food allergies usually manifest in infancy and childhood
- Allergic responses include respiratory or gastrointestinal symptoms, skin reactions, fatigue, or behavior changes

Foods that most often cause allergies
- Nuts
- Eggs
- Milk
- Soybeans
- Wheat
- Peanuts
- Fish, shellfish, mollusks, and chicken
Inability to digest the milk sugar, lactose, due to inactivity or insufficiency of the enzyme lactase.

Symptoms are: gas, abdominal cramping, nausea, watery stools after ingestion of lactose (either in milk, or in other dairy foods).
Focal Points

- Children’s diets should provide enough energy to support optimal growth and development without causing excessive weight gain.

- For children’s diets emphasis should be placed on fruits and vegetables, whole-grain products, low-fat dairy products, and lean meat, fish, and poultry.

- Nutrition education and resources for families and children can help establish healthy, positive eating and activity patterns that carry through during adolescence and adulthood.
Nutrition and Nutritional Problems in Adolescence
Growth and Development

- Physiologic changes
- Puberty, sexual maturity
- Growth velocity
- Independence and autonomy
- Body image
Cognitive and Emotional Development

- Early adolescence (ages 13 to 15)
- Middle adolescence (ages 15 to 17)
- Late adolescence (ages 18 to 21)
Nutrient Requirements

- Energy
- Protein
- Carbohydrates and fiber
- Fat
- Minerals and vitamins: calcium, iron, zinc, folic acid
Food Habits

- Irregular meals
- Excessive snacking
- Eating away from home (especially fast foods)
- Dieting and meal skipping
Factors Influencing Food Habits

- Decreasing influence of family
- Increasing influence of peers
- Increasing media exposure
- Increasing prevalence of employment outside home
- Increasing responsibilities (less time to eat with families)
Dieting and Body Image

- Disturbance in body image
- High prevalence of dieting
Nutrition Screening, Assessment, and Counseling

- Recommend annual screening
- Include weight, height, and BMI
- Nutritional assessment should include an evaluation of the nutritional environment, including parental, peer, school, cultural, and personal lifestyle factors
Vegetarian Dietary Patterns

- Well-planned vegetarians diets can provide adequate nutrients
- Very restrictive diets may signal disordered eating
- Vegan diets do not provide vitamin $B_{12}$ and may be low in calcium, vitamin D, zinc, and iron
- Inappropriately selected vegetarian diets can result in malnutrition
Eating Disorders

- Anorexia nervosa
- Bulimia nervosa
- Eating disorders not otherwise specified
Obesity

- Increasing prevalence of overweight and obese teenagers
- Multifactorial health issues
- Short-term and long-term health outcomes
- Importance of early identification and intervention
Hyperlipidemia and Hypertension

- Onset of CVDs during youth
- Many risk factors are comorbid conditions
- Diagnosis and treatment
Physical Activity

- Decline in physical activity during adolescence
- Numerous health benefits from physical activity

Sports Nutrition
- Unique nutrient needs
- Adequate fluid intake to prevent dehydration
- Vulnerable to eating disorders
Adolescence is a period of tremendous physical and cognitive changes.

Teens are nutritionally vulnerable because of increased need for all nutrients at a time when changes in lifestyle and food habits greatly affect nutrient intake.

Adolescents with special needs, such as those who participate in sports, have a chronic illness, are pregnant, diet excessively, or use alcohol and drugs, are at high risk for nutritional inadequacies and have the greatest need for nutrition education and counseling.

Educating adolescents about the optimal energy and fat intake and level of physical activity helps them to develop a healthy body and lifestyle and avoid overweight, obesity and its co-morbidities of hypertension and hyperlipidemia.
Nutrition in Aging
Aging Issues

- Life expectancy
- Percent of population: increasing rapidly
- Women live longer than men
Ageism

- Any prejudice or discrimination against or in favor of an age group
- Negative stereotypes
- Unrelenting quest for youth; death denial
- Positive attitude to aging can increase life span
- Heterogeneity of older adults
- Ageist language
Role of Nutrition

- Primary prevention
- Secondary prevention: slow progression of chronic nutrition-related diseases; maintain functionality, quality of life, fitness, and mental health
- Tertiary prevention: medical nutrition therapy
Physiologic Changes

- **Body composition:** sarcopenia *the loss of skeletal muscle mass and strength as a result of ageing.*
- Sedentary lifestyle
- Sensory losses
- Oral health
- Gastrointestinal: dysphagia *difficult swallowing*, achlorhydria *less acid production for digestion*, diverticulosis *intestine inflammation*, constipation
- Cardiovascular
Physiologic Changes–cont’d

► Renal disease
► Neurologic function: normal decline, dementia, memory issues
► Depression
► Pressure ulcers
► Frailty and failure to thrive
Physiologic Changes—cont’d

- Hearing and eyesight decline
  - Immuno-incompetence
  - Lower quality of life
  - Lower functionality: activities of daily living
  - Weight maintenance difficulty: obesity, underweight and malnutrition
Factors That Influence Quality of Life of Adults Age 60+ Years
Nutrition Needs

- Energy: decreases ~3% per decade
- Protein: effects of chronic disease
- Carbohydrates: 45% to 65% of kcals
- Lipids: 20% to 35% of kcals
- Vitamins and minerals: vitamin B₁₂, vitamin D, vitamin E, folate, calcium, potassium, sodium, zinc
- Water: dehydration
Focal Points

- Functionality, independence and quality of life of older adults are dramatically affected by malnutrition, and many of its causes are avoidable or remediable.

- Nutritional care for health promotion, risk reduction and disease prevention can benefit all older adults; the positive role of nutrition in daily food choices is an important concept.

- More than any other age group, older adults want nutrition and health information and are willing to make changes to maintain their independence and quality of life; they want to know how to eat healthier, exercise safely, and stay motivated to do both.

- Nutrition screening, assessment, intervention, and monitoring are key elements of the total health package that should be available to all older persons.