

## **CERTIFIED HEALTH & NUTRITION COUNSELOR ONLINE COURSE - SESSION 12:**

### **• Nutrition Status, Food Choices, and Diet Planning**

All the nutrients have been presented and discussed, the food sources of each are known, and the human needs for them have been described. Now, how do you go about determining whether individuals or groups are receiving the nutrients they need? And if they are not, what food choices do they need to change? Then, how do you set about improving the diet while honoring their food preferences? This session addresses these questions.

#### **Nutrition Assessment**

To learn whether a person's nutrient needs are being met, the dietitian or other health professional performs a nutrition assessment. To give all the details of such a procedure would go far beyond the scope of this course (whole graduate courses are taught in this subject, and hundreds of pages of reading are required). However, any student of nutrition should know the basics of a proper nutrition assessment procedure, for two reasons.

For one thing, competent medical care includes attention to nutrition. The doctor should employ a person skilled in nutrition assessment techniques or refer all patients to such a person, to make sure their nutritional health is sound, while the health care organization (hospital or other) should make nutrition assessment a routine part of its workup on every patient so that nutrition handicaps will not hinder the response to medical treatment and the recovery from illness.

Second, because nutrition is such a popular subject today ("everybody's doing it"), fraudulent practices are even more abundant in this area than they have been in the past (and they have always been rampant). The knowledgeable consumer needs to know what procedures he or she can expect in a nutrition assessment, and what kinds of information they can yield.

For these reasons, this session begins with a brief summary of nutrition assessment techniques.

Nutrition assessment involves making an inventory of nutrition assets and liabilities as determined by four techniques:

- History taking.
- Anthropometric measures.
- Physical examination.
- Biochemical analysis (clinical or lab tests).

Each of these involves collecting data by a number of means and interpreting the findings in relation to the total picture.

#### **Historical Data**

A person's history reveals many clues about his present nutrition status. The person making a nutrition assessment explores the history of the subject from a number of different angles: medical, social, and drug history, as well as diet. Many circumstances of a person's life, including the environment he lives in, his cooking facilities, previous illnesses, persons he associates with, and others, have an impact on his nutrition status and provide the assessor with clues to likely problems.

Medical and social histories are often obtained in a nutrition assessment by reference to charts already filled out by the attending physician, nurse, or other worker. The drug history has seldom already been taken in a way that is useful to the nutrition assessor and therefore often requires special attention. Hundreds of drugs interact with nutrients, creating the possibility of imbalances or deficiencies, and they should not be overlooked in assessing a person's nutrition status.

As for the diet history, there are several means of obtaining food intake data, including the 24-hour recall, the usual intake record, the food frequency checklist, and the food diary. Great skill is necessary to obtain accurate food intake data. The dietitian trained in these techniques often uses food models and measuring devices to help clients identify serving sizes of food consumed.

The most commonly used method of obtaining food intake data is the 24-hour recall. To use this method one asks the person to recount everything eaten or drunk in the past 24 hours or for the previous day. Seldom does this method give enough accurate information about an individual's food intake to be valid, however. It is more often used in nutrition surveys to obtain estimates of the typical food intakes of large numbers of people in given populations.

## Food Frequency Checklist

The following information will help us to understand your regular eating habits so that we may offer you the best service possible. If you have any doubt about some items, be sure to underestimate the “goodness” of your habits rather than to overestimate.

1. How many times per week do you eat the following foods? Circle the appropriate number:

Per Week

- Poultry . . . . . 0 <1 1 2 3 4 5 6 7 8 9 >9 \_\_\_\_\_
- Fish . . . . . 0 <1 1 2 3 4 5 6 7 8 9 >9 \_\_\_\_\_
- Hot dogs . . . . . 0 <1 1 2 3 4 5 6 7 8 9 >9 \_\_\_\_\_
- Bacon . . . . . 0 <1 1 2 3 4 5 6 7 8 9 >9 \_\_\_\_\_
- Lunch meat . . . . . 0 <1 1 2 3 4 5 6 7 8 9 >9 \_\_\_\_\_
- Sausage . . . . . 0 <1 1 2 3 4 5 6 7 8 9 >9 \_\_\_\_\_
- Pork or ham . . . . . 0 <1 1 2 3 4 5 6 7 8 9 >9 \_\_\_\_\_
- Salt pork . . . . . 0 <1 1 2 3 4 5 6 7 8 9 >9 \_\_\_\_\_
- Liver . . . . . 0 <1 1 2 3 4 5 6 7 8 9 >9 \_\_\_\_\_
- Beef or veal . . . . . 0 <1 1 2 3 4 5 6 7 8 9 >9 \_\_\_\_\_
- Other meats (which?) \_\_\_\_\_ 0 <1 1 2 3 4 5 6 7 8 9 >9 \_\_\_\_\_
- Eggs . . . . . 0 <1 1 2 3 4 5 6 7 8 9 >9 \_\_\_\_\_
- Fast Foods . . . . . 0 <1 1 2 3 4 5 6 7 8 9 >9 \_\_\_\_\_

2. How many times per day do you eat the following foods? Circle the appropriate number:

Per Day

- Bread, toast, rolls, muffins . . . . . 0 <1 1 2 3 4 5 6 7 8 9 >9 \_\_\_\_\_
- Milk (including on cereal) . . . . . 0 <1 1 2 3 4 5 6 7 8 9 >9 \_\_\_\_\_
- Yogurt or tofu . . . . . 0 <1 1 2 3 4 5 6 7 8 9 >9 \_\_\_\_\_
- Cheese or cheese dishes . . . . . 0 <1 1 2 3 4 5 6 7 8 9 >9 \_\_\_\_\_
- Sugar, jam, jelly, syrup, honey . . . . . 0 <1 1 2 3 4 5 6 7 8 9 >9 \_\_\_\_\_
- Butter or margarine . . . . . 0 <1 1 2 3 4 5 6 7 8 9 >9 \_\_\_\_\_

3. How many times per week do you eat the following foods? Circle the appropriate number:

Per Week

- Fruit or fruit juice . . . . . 0 <1 1 2 3 4 5 6 7 8 9 >9 \_\_\_\_\_
- Vegetables other than potato . . . . . 0 <1 1 2 3 4 5 6 7 8 9 >9 \_\_\_\_\_
- Potatoes and other starchy vegetables . . . . . 0 <1 1 2 3 4 5 6 7 8 9 >9 \_\_\_\_\_
- Salads or raw vegetables . . . . . 0 <1 1 2 3 4 5 6 7 8 9 >9 \_\_\_\_\_
- Cereal (which kind?) \_\_\_\_\_ 0 <1 1 2 3 4 5 6 7 8 9 >9 \_\_\_\_\_
- Pancakes or waffles . . . . . 0 <1 1 2 3 4 5 6 7 8 9 >9 \_\_\_\_\_
- Rice or other cooked grains . . . . . 0 <1 1 2 3 4 5 6 7 8 9 >9 \_\_\_\_\_
- Noodles (macaroni, spaghetti) . . . . . 0 <1 1 2 3 4 5 6 7 8 9 >9 \_\_\_\_\_
- Crackers or pretzels . . . . . 0 <1 1 2 3 4 5 6 7 8 9 >9 \_\_\_\_\_
- Sweet rolls or doughnuts . . . . . 0 <1 1 2 3 4 5 6 7 8 9 >9 \_\_\_\_\_
- Cooked dry beans or peas . . . . . 0 <1 1 2 3 4 5 6 7 8 9 >9 \_\_\_\_\_
- Peanut butter or nuts . . . . . 0 <1 1 2 3 4 5 6 7 8 9 >9 \_\_\_\_\_
- Milk or milk products . . . . . 0 <1 1 2 3 4 5 6 7 8 9 >9 \_\_\_\_\_
- T.V. dinners, pot pies, other prepared meals . . . . . 0 <1 1 2 3 4 5 6 7 8 9 >9 \_\_\_\_\_
- Sweet bakery goods (cake, cookies) . . . . . 0 <1 1 2 3 4 5 6 7 8 9 >9 \_\_\_\_\_
- Snack foods (potato or corn chips) . . . . . 0 <1 1 2 3 4 5 6 7 8 9 >9 \_\_\_\_\_
- Candy . . . . . 0 <1 1 2 3 4 5 6 7 8 9 >9 \_\_\_\_\_
- Soft drinks (which?) \_\_\_\_\_ 0 <1 1 2 3 4 5 6 7 8 9 >9 \_\_\_\_\_
- Coffee or tea . . . . . 0 <1 1 2 3 4 5 6 7 8 9 >9 \_\_\_\_\_
- Frozen sweets (which?) \_\_\_\_\_ 0 <1 1 2 3 4 5 6 7 8 9 >9 \_\_\_\_\_
- Instant meals, such as breakfast bars  
or diet meal beverages (which?) \_\_\_\_\_ 0 <1 1 2 3 4 5 6 7 8 9 >9 \_\_\_\_\_
- Wine . . . . . 0 <1 1 2 3 4 5 6 7 8 9 >9 \_\_\_\_\_
- Beer . . . . . 0 <1 1 2 3 4 5 6 7 8 9 >9 \_\_\_\_\_
- Whiskey, vodka, rum, etc. . . . . 0 <1 1 2 3 4 5 6 7 8 9 >9 \_\_\_\_\_

## Food Frequency Checklist (continued)

4. What specific kinds of the following foods do you eat most often? Include the name of the food; whether it is fresh, canned, or frozen; and how it is prepared.
  - Fruits and fruit juices \_\_\_\_\_
  - Vegetables \_\_\_\_\_
  - Milk and milk products \_\_\_\_\_
  - Meats \_\_\_\_\_
  - Breads and cereals \_\_\_\_\_
  - Desserts \_\_\_\_\_
  - Snack foods \_\_\_\_\_
5. Please list the names of any liquid, powder, or pill form of vitamin or mineral product you take, and state how often you take it. Please list also any diet supplement you use (such as protein milkshakes or brewer's yeast), and how much you use, and how often you use it. \_\_\_\_\_
6. Is there anything else we should know about your food/nutrient intake? \_\_\_\_\_

An average of the 24-hour recall is that it is easy to obtain. It is also less frustrating to elicit information from the past 24 hours than to require a person to estimate his intake over a long period of time. However, the previous day's intake may not be the usual intake; the subject may be unable to estimate the amounts of food eaten; the subject may conceal facts about what she ate; and as a result, sometimes the information gathered in a 24-hour recall is totally meaningless as a reflection of a person's usual intake.

Another method is to obtain a "usual intake pattern." An inquiry on usual intake might begin with "What is the first thing you usually eat or drink during the day?" Similar questions follow until a typical intake pattern is obtained. This method is similar to the 24-hour recall and can be recorded on the same form. A skilled and patient interviewer can obtain much useful information from it. For a person whose intake varies widely from day to day, however, it may be hard to answer the questions, and in such a case the data obtained may be useless in estimating nutrient intake. However, the usual intake method is often useful to verify food intake when the past 24 hours have been atypical.

Another approach is to use a food frequency checklist. The purpose of this record is to ascertain how often an individual eats a specific type of food per day, week, month, or year. Subjects are asked to state how often they eat a certain food or food type, and a long list of foods is used to cover all possibilities. The information obtained can help pinpoint nutrients that may be excessive or deficiency in the diet. If used in conjunction with the usual intake or 24-hour recall, the food frequency record permits double-checking the accuracy of the information obtained.

Still another alternative is the food diary. Completion of a diary often helps to determine factors associated with food intake (time of day, place eaten, mood, and others present). The person keeping the diary is instructed to write down the required information immediately after eating. A food diary works well with cooperative people but requires considerable time and effort on their part.

The advantages of the food diary are several:

- The diary keeper must assume an active role.
- The person may for the first time begin to see and understand his own food habits.
- The assessor obtains an accurate picture of the diary keeper's lifestyle and factors that affect his food intake.

For these reasons food diaries are particularly useful in outpatient counseling for such nutrition problems as weight reduction or food allergy. The major disadvantages stem from poor compliance in recording the data and conscious or unconscious changes in eating habits that may occur while the diary is being kept.

After food intake data have been collected, they are used to determine nutrient intake, if appropriate. Comparison with standards such as the RDA or the Canadian Dietary Standard is the next step. The comparison is made either by estimating or by actually computing the amount of each nutrient obtained from each food on a typical day or in the recall.

This course provides two ways of estimating nutrient intakes from a diet history. One way is to use the information in sessions 8 through 11 to obtain rough estimates of the intakes of the vitamins thiamin, 3

riboflavin, folacin, vitamin B<sub>6</sub>, vitamin C, and vitamin A and the minerals calcium, iron, and zinc.

### Risk Factors for Poor Nutrition Status

	<b>Medical History</b>	
Recent major illness	Alcoholism	Hyperlipidemia
Recent major surgery	Cancer	Hypertension
Surgery of the GI tract	Circulatory problems	Mental retardation
Overweight	Liver disease	Multiple pregnancies
Underweight	Lung disease	Neurologic disorders
Recent weight loss or gain	Kidney disease	Pancreatic insufficiency
Anorexia	Diabetes	Paralysis
Nausea	Heart disease	Physical disability
Vomiting	Heavy smoking	Radiation therapy
Diarrhea	Hormonal imbalance	Teenage pregnancies
<b>Diet History</b>		<b>Social/Economic History</b>
Chewing or swallowing difficulties (including poorly fitted dentures, dental caries, and missing teeth)		Inadequate food budget
Inadequate food intake		Inadequate food preparation facilities
Restricted or fad diets		Elderly
Frequently eating out		Living (eating) alone
No intake for 10 or more days		Poor education
Intravenous fluids (other than total parenteral nutrition) for 10 or more days		
	<b>Drug History</b>	
Antibiotics		Catabolic steroids
Anticancer agents		Oral contraceptives
Anticonvulsants		Vitamin and other nutrient preparations
Antihypertensive agents		

### Food Intake Record (used to obtain either a 24-hour recall or the usual intake pattern)

Name and address \_\_\_\_\_ Date \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Did you take a vitamin/mineral supplement? \_\_\_\_\_  
 If yes, what kind? \_\_\_\_\_ Dose \_\_\_\_\_

Please record the amount and type of foods and beverages consumed today. [Or: Please record the amount and type of foods and beverages you typically consume each day.]

<b>Food</b>	<b>Amount (c, tbsp, or piece)</b>	<b>Description</b>
	(etc.)	

## History

Name \_\_\_\_\_ Today's date \_\_\_\_\_  
Address \_\_\_\_\_ Age \_\_\_\_\_  
\_\_\_\_\_ Sex \_\_\_\_\_  
\_\_\_\_\_ Phone \_\_\_\_\_  
Date of last medical checkup \_\_\_\_\_ Height \_\_\_\_\_  
Reason for coming in \_\_\_\_\_ Weight \_\_\_\_\_  
\_\_\_\_\_ Usual Weight \_\_\_\_\_

## Personal Data

1. Last grade of school completed \_\_\_\_\_ Still in school? \_\_\_\_\_
2. Are you employed? \_\_\_\_\_ Occupation \_\_\_\_\_
3. Does someone else live in your home? \_\_\_\_\_ Who? \_\_\_\_\_
4. Do you smoke in any way? \_\_\_\_\_ How much? \_\_\_\_\_
5. Have you recently lost or gained more than 10 lb? \_\_\_\_\_ If yes, please explain how \_\_\_\_\_
6. Are you pregnant? \_\_\_\_\_ How many months? \_\_\_\_\_
7. How many pregnancies have you carried to term? \_\_\_\_\_
8. Are your menstrual periods normal? \_\_\_\_\_ If not, please explain \_\_\_\_\_
9. Have you been told you have: (check any that apply)  
Diabetes \_\_\_\_\_ High blood pressure \_\_\_\_\_ Hardening of the arteries \_\_\_\_\_  
Lung disease \_\_\_\_\_ Kidney disease \_\_\_\_\_ Liver disease \_\_\_\_\_ Ulcers \_\_\_\_\_  
Cancer \_\_\_\_\_ Other \_\_\_\_\_
10. Do you eat at regular times each day? \_\_\_\_\_ How many times per day? \_\_\_\_\_
11. Do you usually eat snacks? \_\_\_\_\_ When? \_\_\_\_\_
12. Where do you usually eat your meal?  
Morning \_\_\_\_\_ Noon \_\_\_\_\_ Night \_\_\_\_\_  
With whom?  
Morning \_\_\_\_\_ Noon \_\_\_\_\_ Night \_\_\_\_\_
13. Would you say your appetite is good? \_\_\_\_\_ Fair? \_\_\_\_\_ Poor? \_\_\_\_\_  
If poor, please explain \_\_\_\_\_
14. What foods do you particularly dislike? \_\_\_\_\_
15. Are there foods you don't eat for other reasons? \_\_\_\_\_
16. Do you have any difficulty eating? \_\_\_\_\_
17. How would you describe your feelings about food? \_\_\_\_\_
18. Who prepares your meals? \_\_\_\_\_
19. Are you, or is any member of your family, on a special diet? \_\_\_\_\_  
If yes, who and what kind? \_\_\_\_\_
20. Do you drink alcohol? \_\_\_\_\_ How many drinks per day? \_\_\_\_\_  
Do you ever drink alcohol excessively? \_\_\_\_\_ How often? \_\_\_\_\_
21. Do you take any kind of medication, either prescribed by a doctor or over-the-counter, for any condition? \_\_\_\_\_
22. How would you describe your exercise habits? \_\_\_\_\_  
Kind of exercise \_\_\_\_\_ How intense? \_\_\_\_\_  
How long at a time? \_\_\_\_\_ How often? \_\_\_\_\_
23. Are there any other facts about your lifestyle that you think might be related to your nutritional health?  
\_\_\_\_\_ Explain \_\_\_\_\_

## Food Diary

Name \_\_\_\_\_  
Date \_\_\_\_\_

Time	Place	With Whom	Emotional State	Hungry or Not Hungry	Food Eaten (Amount)
		(etc.)			

The other way is to look up every food in the table of food composition and to add up manually the nutrients obtained; or to use a computer program that does the same thing automatically. This is an informative but time-consuming exercise, even when it is done with the help of a computer. It tends to imply an accuracy greater than can actually be obtained from data as uncertain as those that provide the starting information. Foods vary. Not all 200-gram tomatoes contain exactly 1.3 mg of niacin. Nutrient contents of foods are averages. Furthermore, the professionals who make up the tables assume that the foods are stored and prepared in a way that minimizes losses of vitamins.

Even more significantly, the person who reports eating “a serving” of greens may not know the difference between a quarter-cup and two whole cups; only trained individuals can accurately estimate serving sizes. Thus there are many possible sources of error in comparing nutrient intakes with nutrient needs in this way. Most history-takers learn to sue shortcut systems to obtain rough estimates of nutrient intakes and then use the calculation method to pin down any suspected nutrient deficiencies or imbalances.

Once an estimate of nutrient intakes has been obtained by means of a diet history, it has to be combined with other sources of information to confirm or eliminate the possibility of suspected nutrition problems. The assessor must constantly remember that a sufficient intake of a nutrient does not guarantee adequate nutrient status for an individual. The individual's needs may be high or his absorption, utilization, or excretion of the nutrient may be abnormal, so that even though he doesn't have a primary nutrient deficiency, he may have a secondary one.

### **Primary Deficiency**

A nutrient deficiency caused directly by lack of that nutrient in the diet.

### **Secondary Deficiency**

A deficiency caused by the body's inability to digest, absorb, or utilize a nutrient in the normal fashion, or by excess destruction or excretion of the nutrient.

### **Anthropometric Measures**

Anthropometrics are physical measurements that reflect growth and development. The measurements taken on an individual are compared with standards specific for sex and age. Those standards, in turn, are derived from measurements taken on large numbers of people of the same race and geographic location as those being measured.

Height and weight are well-recognized anthropometrics. Others include fatfold measurements and various measures of lean tissue. Some are used in specific situations. In infancy, a head circumference measurement may be useful. In liver disease, a measurement of abdominal girth may be informative. Anthropometrics are particularly useful when they are measured at intervals over time.

Anthropometric measures can be easy to take, and little equipment is required. However, their accuracy and value are limited by the skills of the measurer. Mastering the correct techniques takes time, and plenty of practice is needed before an assessor can use them reliably. Furthermore, significant changes in measurements are slow to occur in adults. When changes do occur in adults, they represent prolonged alterations in nutrient intake.

Among the standards used for anthropometric measures are several already presented. A table of average weights for height is often used as a standard for individual people's weight. To make the use of such a height-weight table meaningful, the assessor refers to a table of frame sizes such as the one based on elbow breadth or the one that compares wrist circumference to height. The table of average weights for height may not be useful in cases where a person has weighed much more or much less than the average all his life; to assess such a person's weight status it may be more informative to compare his weight, not with a supposed “ideal” body weight (IBW), but with his usual body weight (UBW); or to ask the person in a dietary interview, “Have you noticed a change in weight recently?”

The nutrition status of people suspected of being overnourished or undernourished with respect to protein and kcalories can be assessed anthropometrically. The triceps fatfold measurement, as used in assessing obesity, was mentioned in Session 7. To assess undernutrition, one uses not only weight for height and fatfold thickness but also measurements of the body's skeletal muscle and other lean tissue (visceral protein). The following table shows that different compartments are depleted, depending on whether the person has kwashiorkor (from protein deficiency), marasmus (from kcalorie deficiency), or a mixture of the two. The triceps fatfold measure provides an estimate of body fat. The midarm circumference (MAC) provides an index of the arm's total area; and an arithmetical calculation subtracts the fat from the total area, leaving an estimate of the lean tissue in the arm – the mid-arm muscle circumference (MAMC). The MAMC reflects the body's total skeletal muscle mass. The following table shows how these measures are used to help distinguish among different types of protein-kcalorie malnutrition (PCM) in malnourished hospital patients. In conjunction with these;

several lab tests are also used (see table below).

Anthropometric measures are also used to assess growth in children and weight gain in pregnant women.

### Anthropometric and Biochemical Measures Used to Assess PCM

	Body Compartment Measured	Body Compartment Measured	Body Compartment Measured
Measure	Body Fat	Skeletal Muscle	Visceral Protein
<b>Anthropometrics</b>			
Weight	X	X	
Triceps skinfold	X		
Midarm circumference	X	X	
Midarm muscle circumference		X	
<b>Lab Tests</b>			
Serum albumin			X
Serum transferrin			x
Total lymphocyte count			X
Creatine-height index		x	

The amount of creatinine excreted is thought to reflect total skeletal mass. It therefore should be proportional to height. If creatinine excreted (for a person of a given height) is low, this reflects depleted skeletal muscle.

### Physical Examination

Clues to a person's nutrition status can be identified by examining the person for physical signs of malnutrition. However, many of the signs are nonspecific: they can be associated with nutrient deficiencies but may be totally unrelated to nutrition. Physical findings can only be interpreted in light of other assessment findings.

Physical signs of malnutrition appear most rapidly in parts of the body where cells are being replaced at a high rate, such as in the hair, skin and gastrointestinal tract. Sessions 8 to 11 presented many tables of symptoms of vitamin and mineral deficiencies and toxicities indicating the many tissues and organs that would reflect signs of malnutrition. The following table summarizes the signs of vitamin/mineral malnutrition, organized nutrient by nutrient, as well as the biochemical tests used to confirm them.

#### Biochemical (Lab) Tests

Biochemical or clinical lab tests help to determine what is really happening inside the body. Blood and urine samples are most often used to directly measure nutrients or metabolites that are affected by poor nutrition. Biochemical measurements often can be used to detect subclinical malnutrition.

The lab tests most commonly used in hospitals today for nutrition assessment help uncover PCM. These include tests for serum albumin levels, serum transferrin levels, total lymphocyte count, and creatinine excretion. Used together with the anthropometric measures already mentioned, these lab tests help differentiate among different types of PCM:

- **Marasmus:** Somatic protein and fat severely depleted. Indicators: low %IBW or %UBW; fatfold thickness; MAC; MAMC; and creatinine-height index.
- **Kwashiorkor:** Visceral protein severely depleted. Indicators: low total lymphocyte count, serum albumin, and serum transferrin.
- **Kwashiorkor-Marasmus Mix:** Both body compartments depleted. Indicators: all.

Not only blood and urine tests but also skin tests may be used to assess nutrition status in the hospital. Various forms of PCM have been associated with depression of the immune system. The total number of lymphocytes (white blood cells that defend against infection) appears to decrease as protein depletion occurs; and this is why the total lymphocyte count is an index useful in nutrition assessment. Another test of the immune function is antigen skin testing. Organisms (usually three to four kinds) to which most people are immune are injected just under the skin. After 48 hours the sites of the injections are inspected for raised, hardened areas. These will be apparent in well-nourished persons; but in malnourished persons, they will not appear or will be very small, because the body is unable to resist the antigens.

## Selected Physical Findings and Laboratory Tests Useful for Assessing Some Vitamin and Mineral Deficiencies

Vitamins	Physical Findings Associated with Deficiency/Toxicity	Laboratory Tests Used for Assessment
Vitamin A	Triangular gray spots on eye; dryness of eye membranes and skin; night blindness; softening of the cornea; plugging of hair follicles with keratin; diarrhea; infections; bone pain; dental decay; nerve damage; anemia (Toxicity: bone abnormalities; joint pain; bleeding; slowed clotting time; stopping of menstruation; loss of appetite; headache; nausea; loss of hair; brittle nails; enlarged liver; jaundice)	Serum vitamin A Serum carotene
Thiamin	Loss of ankle and knee jerks; calf muscle pain; edema; wasting; mental confusion; weakness; peripheral paralysis; enlarged heart; cardiac failure.	Urinary thiamin Thiamin load test Erythrocyte (red blood cell) transketolase
Riboflavin	Dermatitis around lips and nostrils; cracking at corners of mouth; reddening of eyes; magenta-colored tongue; hypersensitivity to light.	Urinary riboflavin Erythrocyte glutathione reductase Riboflavin load test
Niacin	Bilateral symmetrical dermatitis; swollen, smooth, edematous tongue; mental confusion; irritability; diarrhea.	Urinary N-methylnicotinamide Urinary 2-pyridone
Vitamin B <sub>6</sub>	Dermatitis; cracking of corners of mouth; smooth, red tongue; irritation of sweat glands; abnormal brainwave pattern; confusions.	Tryptophan load test Urinary B <sub>6</sub> Blood transaminase Blood B <sub>6</sub>
Folacin	Smooth, swollen tongue with cracking; diarrhea; macrocytic anemia	Erythrocyte folate Urinary formiminoglutamic acid Serum folate
Vitamin B <sub>12</sub>	Smooth, swollen tongue; heightened sensitivity of skin; loss of sensation in fingers and toes; macrocytic anemia	Serum B <sub>12</sub> B <sub>12</sub> isotope methods Urinary methylmalonic acid Schilling test
Vitamin C	Swollen, spongy, bleeding gums; petechiae; poor wound healing; heart degeneration; rough skin; pain in joints; anemia; depression (Toxicity: nausea, cramps, diarrhea)	Serum vitamin C Urinary vitamin C Vitamin C load test
Vitamin D	Bowing of legs; beading of ribs; knock knees, wrist enlargement; retarded growth; poor tooth formation; protruding abdomen; muscle spasms (Toxicity: loss of appetite; headache; thirst; irritability; stones in soft tissues)	Serum 25-hydroxycholecalciferol Serum alkaline phosphatase Serum calcium and phosphorus
Vitamin E	Edema in infants; hemolysis (Toxicity: impaired blood clotting, GI distress)	Hydrogen peroxide hemolysis test Plasma tocopherol
Vitamin K	Bruising; slowed clotting time	Prothrombin time

Many factors other than nutrition can interfere with the immune response, and the value of skin testing as an index of nutrition status has been questioned. No studies to date have considered all the factors that might affect skin test results. Among known factors are age, certain allergies, and certain drug regimens.

Besides helping to assess PCM, laboratory testing can help assess nutrition status with respect to vitamins and minerals. The tests most often used are listed in the following table by each nutrient. As is true throughout the nutrition assessment procedure, the assessor must use caution in interpreting results of tests like these. Vitamin and mineral levels present in the blood may reflect disease processes, abnormal hormone levels, or other aberrations rather than dietary intake. Even if they reflect dietary intake, they may be affected by what the person has been eating recently, and may not give a true picture of the status of the person's nutrient stores; this sometimes makes it difficult to detect a subclinical deficiency. Furthermore, many nutrients interact. The assessor has to keep in mind that an abnormal lab value for one nutrient may reflect abnormal status with respect to other nutrients.



## Selected Physical Findings and Laboratory Tests Useful for Assessing Some Vitamin and Mineral Deficiencies - continued

Minerals	Physical Findings Associated with Deficiency/Toxicity	Laboratory Tests Used for Assessment
Calcium	Rickets; seizures; osteoporosis; osteomalacia	Serum calcium
Potassium	Muscle weakness (Toxicity: abnormal heart action)	Serum potassium
Magnesium	Tetany (extreme muscle contraction); muscle weakness; hallucinations	Serum magnesium
Iron	Pale nail beds, eye membranes, and palmar creases; fatigue; weakness; headaches; shortened attention span (Toxicity: infections; iron deposits in tissues)	Hemoglobin Hematocrit Iron binding capacity Serum ferritin
Iodine	Enlarged thyroid gland; sluggishness; weight gain	Serum protein-bound iodine Urinary iodine Radioiodine uptake
Zinc	Skin rash; hair loss; growth retardation; loss of taste and smell; weight loss; night blindness; infections; liver enlargement; apathy; irritability; slow wound healing (Toxicity: anemia; diarrhea; fever; pain; nausea; exhaustion)	Serum or plasma zinc Hair zinc concentration

### Nutrition Assessment Completed

Once the assessor has accumulated all the puzzle pieces available from the many types of data, she assembles them into a complete picture. All these pieces are needed to make sense of a person's nutrition status. The ultimate diagnosis is appropriately tentative and is confirmed only after careful remedial steps have been taken and have been shown to successfully alleviate the observed problems.

### Serum Albumin

The chief blood protein used to assess protein nutrition status.

### Serum Transferrin

An iron-carrying protein in the blood. The concentration of this protein increases if the person's iron stores are depleted; it decreases in protein malnutrition.

### Total Lymphocyte Count

A count of white blood cells, a measure of immune function, which may or may not reflect nutrition status.

### Creatinine Excretion

An indicator of lean body mass. Creatinine is a waste product produced by active muscle.

### Somatic Protein

The protein of voluntary muscles.

Soma = body

### Visceral (VISS-er-ul) Protein

The protein of the internal organs.

Viscera = internal organs

### Antigen Skin Testing

A test of the immune system's competence, in which an antigen is applied to the skin. A reaction means the immune system is working normally.

### How Well Do We Eat?

Interest in the nutrition status of our people dates from before World War II, when a food-consumption survey suggested that as many as a third of the population might be poorly fed. Programs to correct nutrition problems have been evolving ever since. Significant among the early ones were:

- **Enrichment of bread and cereal products.** In those states that have enrichment legislation, refined bread and grain products must have iron, thiamin, riboflavin, and niacin added to make them comparable to whole-grain products in their contents of those nutrients.

- **The National School Lunch Program.** The school lunch makes available to public school children (in those districts that have adopted it) lunches that supply at least one-third of the RDA for all of the nutrients.
- **Iodization of salt.** In areas where the soil is iodine-poor, this is an important public health measure.

During the 1940s, 1950s, and 1960s, many surveys of the U.S. population were conducted. Nutrients found lacking in subgroups of the population were the minerals calcium and iron; the B vitamins thiamin and riboflavin; vitamin A; and occasionally vitamin C. Most vulnerable to nutrient deficiencies were girls, women, and elderly men; but no group was without some cases of iron deficiency. Other nutrients now known to be important – vitamin B<sub>6</sub>, folacin, magnesium, and zinc, for example – were not studied in the early surveys.

During the 1970s, public awareness of the nutrition status of U.S. citizens reached a new high. The Senate's Poverty Subcommittee and the Select Committee on Nutrition and Human Needs held hearings, widely broadcast on national television that projected a picture of the poor family unable to feed its children. Hunger and malnutrition in the United States became a controversy and a political issue, disclaimed by some who said the findings were exaggerated, and singled out by others who considered them a scandal and a national disgrace. The findings that generated the controversy arose from the Ten-State Survey, conducted in the late 1960s (1968-1970).

### **The Ten-State (National Nutrition) Survey**

The ten states surveyed were California, Kentucky, Louisiana, Massachusetts, Michigan, South Carolina, Texas, Washington, New York, and West Virginia – chosen to represent geographic, ethnic, economic, and other features of the whole United States. Over 60,000 people were included.

Not only food intake but also other indicators of nutrition status were used: clinical tests using blood and urine samples, physical examinations, anthropometric measures, and medical histories. Interviews were conducted, to gain insight into conditions likely to precipitate nutrient deficiencies or to have been caused by them. The subjects' educational levels and financial status were determined, and information about foods available to them was collected. The results were reported in relation to age, sex, ethnic background, and location (whether the person resided in a low-income or high-income state). The findings from such a survey might be slightly different today, but the kinds of information collected would be the same.

The physical examinations revealed few severe deficiencies – a good sign, indicating that nutrition knowledge and food intakes had improved enough to eliminate most of the worst cases of undernutrition seen in earlier years. Deficiencies were present, however, and it was clear that low-income and uneducated people had poorer nutrition in every respect, although wealthy, well-educated people could also have poor nutrition. Iron nutrition was still a problem in all groups, especially among blacks; vitamin A nutrition status was a major concern especially among teenagers and Spanish Americans. Riboflavin deficiency appeared to be a potential problem, especially among blacks, Spanish Americans, and young people of all ethnic groups. Iodized salt clearly had remained an important part of the diet in the north-central states; iodine deficiencies were not seen. Protein deficiency was not widespread but was seen more often in the poor than in the well to do. Pregnant women and those who were breastfeeding their babies had lower protein intakes and lower blood levels of protein than most other groups.

Indicators of nutrient deficiencies tended to cluster together. A person deficient in iron was likely to lack vitamin A as well, for example. Generally, blacks and Spanish Americans had a higher prevalence of multiple deficiencies; a higher prevalence also occurred in the low-income status. An important finding was that in families where the homemaker had completed fewer years of school, there were more multiple low values in the family members. Importantly, too, trends seen among the children were also seen in adults in the same families.

Anthropometric measures revealed that people with higher incomes had greater height, weight, fatness, skeletal weight, and other indicators of earlier and greater physical development. Blacks were taller than whites and were more advanced in skeletal and dental development, reflecting their genetic endowment. Obesity was more prominent in adult women, especially in black women.

Sugar intakes were high in most groups, and high sugar intakes were often seen together with dental decay, especially in adolescents. Low income accompanied dental decay in all groups.

Overall, several groups were found in need of help regarding their nutrition: obese people, blacks, Spanish and Medical Americans, adolescents, and low-income families. The nutrients of greatest concern were iron, vitamin A, and riboflavin, with protein being a problem for pregnant and lactating women. Many nutrients were not studied, including vitamin B<sub>6</sub>, folacin, magnesium, and zinc.

The Ten-State Survey provided a disturbing answer to the question "How well do U.S. citizens eat?" 10

Clearly, not as well as might be expected in the most prosperous nation in the world. The identification of vulnerable groups confirmed the need for programs of many kinds to decrease the risk and incidence of nutrient deficiencies, and for continued surveillance of the U.S. population's nutrition status.

### **The HANES and the Nationwide Food Consumption Survey**

At about the same time (1971-1974), the U.S. National Center for Health Statistics conducted a study of over 20,000 people at 65 sampling sites in the United States. This study, known as the HANES (Health and Nutrition Examination Survey), avoided the bias of which the Ten-State Survey was accused by adjusting for the effects of oversampling among vulnerable groups. Careful efforts were also made to evaluate protein and kcalorie intakes in relation to height, sex, and age on an individual basis.

The investigators studied intakes of the same seven nutrients as previously, and niacin and kcalories in addition. Nutrient deficiencies were found only for protein, calcium, vitamin A, and iron. As expected, these were more extensive among people below the poverty line than among those above and generally more extensive in blacks than in whites. In particular:

- Protein intakes were low for low-income adolescents, women, and older men and for middle – and upper-income black women, older black men, and older white women.
- Calcium intakes were low for adult black women of all income groups.
- Vitamin A intakes were low for low-income white adolescents and young adult women and for adolescent black girls of all income groups.
- Iron intakes were low for all women and for infant boys regardless of income.

HANES II, undertaken in 1977 as a follow-up to HANES, was designed to collect biochemical and other data, with an emphasis on determining whether the physical condition of the subjects studied reflected the nutrient intakes found earlier. Particularly, the investigators wondered whether the test results would reflect the extensive low iron intakes known to exist in the population. As of 1981, with funding becoming increasingly limited for analysis of data, the results were just becoming available, and indeed, low blood and urine values were found:

- For protein and vitamin A, in less than 3 percent of subjects.
- For thiamin, in 14 percent of white and 29 percent of black subjects.
- For riboflavin, in 3 percent of white and 8 percent of black subjects.
- For iron, by three measures, in 5 to 15 percent of white and 18 to 27 percent of black subjects.

Not everyone with low intakes of a nutrient had low lab values, and the investigators suggested that those with low intakes were “at risk” for malnutrition.

In measuring the heights and weights of people, the HANES researchers observed that there is a continuing trend toward higher amounts of body fat among fatter Americans. It has long been known that improved nutrition, and especially adequate intakes of protein, could alter the average height of a population over several generations. (A well-known example is the case of the Japanese, whose children after World War II grew taller than their parents thanks to the availability of more meat). However, the trend toward higher weights in Americans reflects overnutrition, not “good” nutrition.

### **Persons with Nutrient Intakes at or below 70% of RDA**

<b>Nutrient</b>	<b>Income to \$6,000</b>	<b>Income \$6,000 to \$9,999</b>	<b>Income \$10,000 to \$15,999</b>	<b>Income \$16,000 and Over</b>
Vitamin A	36%	33%	32%	29%
Vitamin B <sub>6</sub>	59%	51%	49%	48%
Vitamin C	30%	29%	27%	23%
Calcium	49%	43%	39%	39%
Iron	29%	31%	33%	33%
Magnesium	48%	40%	36%	35%

## **Food Choices**

Among the reasons why you chose the foods you ate today may be any of the following:

- Personal preference (I like them).
- Habit or tradition (they are familiar; I always eat them).
- Social pressure (they were offered; I couldn't refuse).
- Availability (there were no others to choose from).
- Convenience (I was too rushed to prepare anything else).
- Economy (they were within my means).
- Nutritional value (I thought they were good for me).

Of these seven possible reasons, only one has to do with nutrition directly. Even people who pride themselves on obtaining good nutritional value in their meals will admit that the other six factors listed here also influence their food choices. Such being the case, it would be unrealistic to approach diet planning without taking all these factors into account. The only diet plan that will work is one that is in harmony with a person's preferences, social life, habits, environment, economic status, and lifestyle. No matter how nutritious a meal is, it cannot benefit a person's health until it is eaten.

### **Personal Preference, Habit, Tradition**

Why do we like certain foods? One reason, of course, is our preferences for certain tastes, and two of these preferences are widely shared: the tastes for sugar and salt. The taste sensors probably helped early humans to distinguish between edible and toxic substances, while their enjoyment encouraged them to eat large amounts to keep them alive until they found more food. Once, the tasty flavors of sugar and salt were available only from whole, natural foods; so they promoted behavior that benefited health. The sweet and salty tastes helped people identify life-giving fruits, vegetables, and grains; the liking for the salty taste also ensured that they would consume sufficient quantities of the two important minerals, sodium and chloride. Today, now that sugar and salt are available in pure form, our instinctive liking for them can lead us to overconsume foods to which they have been added —sometimes to the point of doing ourselves harm. Only nutrition education can counter this tendency.

Instinctive liking is one kind, but there are other kinds of liking — some of them almost as deep-seated and often as powerful. You like foods with which you have happy associations — those you eat in the midst of a warm family gathering at traditional holiday times, those someone who loved you gave you as a child, or those eaten by people you admire. By the same token, intense dislike — strong enough to be unalterable — can be attached to foods that you ate when you were sick, or that were forced on you when you weren't hungry, or that are eaten by people you don't respect. Your parents may have taught you to like and dislike certain foods for reasons of their own like these, without even being aware of the reasons. In fact, a parent may say to a child, "Eat that, it's good for you," without realizing that his great-grandparents told their children the same thing, and that what is being passed on is not necessarily wisdom, but generations of family custom.

### **Social Pressure**

Social Pressure is a powerful influence on food behavior. How can you refuse when your friends are going out for pizza and beer (or ice cream, or donuts)? Such pressure operates in all circles and across cultural lines. It is considered rude not to accept food or drink being shared by a group or offered by a host; you are not a member of the social gathering until you do. In today's world, where food is abundant, people are hard-pressed to find polite ways of refusing food that, in their self-interest, they must refuse. Many yield, if not to the temptation of the food itself, then to the pressure of social obligation.

### **Availability, Convenience, Economy**

We live in an era when we can choose our foods from among thousands of items on the supermarket shelf. They have come from all over the world, thanks to the efficiency of modern transportation systems. Modern techniques of processing and preserving foods permit long-term storage; many food items can sit on the shelf for years and still be safe to use. Fast-freezing methods now preserve the freshness of the harvest. Even after long trips in refrigerated trucks, extended time in the freezer section of the grocery store, and more time in your own freezer, spring and summer favorites like strawberries and corn on the cob can be enjoyed in the dead of winter. The cost of this luxury has been kept down by the increased productivity of our farmers. With effective pesticides and fertilizers, farmers have been able to increase their yields so that they not only feed the growing population at home but also keep the United States and Canada among the few remaining exporters of food in the world.

Not only is an abundance of foods available, but many have been made convenient in ways our grandparents never dreamed of — frozen meals, soup mixes, breakfast bars, total nutrition powders. Many foods have also been suited to our tastes by the addition of sugar and salt. These new foods have not been with us 12

long enough to have stood the test of time. As they replace traditional foods, we will need to know to what extent they offer the nutrients we need.

The abundant, low-cost, and constant food supply has not been an unmixed blessing. Artificial fertilizers, mechanization of the farm, and burgeoning transportation needs have put serious drains on our energy supply. Also, to support our growing population, more and more farmland is being covered with concrete highways and with cities that depend on those highways for their food. Pesticides and fertilizers run off into our streams and lakes, polluting the water supply and contaminating the food chain. Among the factors affecting our food choices in the future, two questions must become increasingly important: “How much energy was required to produce this food?” and “How did the production of this food affect the environment?” Up to today, these questions have had little or no bearing on people’s food choices.

## Nutritional Value

People are more nutrition-conscious today than ever before. While the many factors discussed above influence everyone’s food choices, the perceived nutritional value of food also has weight. But people often do not know how to choose among the many delicious, affordable foods available. The next section offers a summary that may be helpful.

## Diet Planning

There is no such thing as “the perfect diet.” And even if one person could devise “the perfect diet” for himself, it would not be suitable for the next person. Planners have to consider many factors in designing diets – all of those just mentioned, and many more. They also have many different foods to deal with, and there may be no overlap at all between the foods acceptable to a person of one nationality and those preferred by another. To complicate the task further, foods are not so simple as they once were. A hundred years ago, wherever you might have looked in the Western world, you would have found people eating the same basic types of foods – milk and dairy products, legumes, nuts, meats, vegetables, fruits, grains. But now we have to contend with TV dinners, veggieburgers, instant fruit drinks, and engineered foods of all descriptions. The guidelines once offered in the past don’t seem to apply to those foods. How does the Four Food Group Plan classify a veggieburger?

It can be done. It is still useful to think in terms of food groups for a start. Having reviewed the information about them from all the previous sessions, we can then add in the new foods with increased awareness and understanding of their place and value. The next few paragraphs review the suggestions offered so far and then put the new foods in their places. (Remember that in the sessions these suggestions were surrounded by discussion of pros and cons. They are only suggestions, not “rules.”)

- **Carbohydrate:** Select foods high in complex carbohydrate, both starch and fiber (grains, seeds, tubers, legumes, starchy vegetables), and in naturally occurring sugars (fruits, vegetables). Avoid the overuse of concentrated sweets (sugar, honey, cola beverages, cakes, candies, and the like).
- **Fat:** Be moderate in the use of fat-rich foods (meats, nuts) and pure fats (butter, margarine, oils), and balance your saturated fat intake with an approximately equal amount of polyunsaturated fat.
- **Protein:** Obtain adequate but not excessive amounts of protein, making sure to get high-quality protein from at least one source (meats, fish, poultry, eggs, cheese, milk). Or, combine protein-containing foods so as to get high-quality protein from the combination (grains and legumes).
- **KCalories:** Control kcalories so that the energy you take in from food equals the energy you expend for daily activities. If you are overweight, reduce calorie intake and increase activity in order to lose weight gradually.
- **Alcohol** (contributes kcalories, so is included here): Use in moderation, if at all.
- **Vitamins and minerals:** Choose foods that will supply ample amounts of all the essential vitamins and minerals, being careful to include a good vitamin A source (a serving of dark-green or deep-orange vegetable or fruit) at least every other day; a good vitamin C source (a serving of citrus fruit or the equivalent) every day; and a good calcium source (2 to 3 cups of milk or the equivalent) every day. Because vitamins and minerals – especially trace minerals – are lost when foods are refined or otherwise processed, emphasize unrefined, unprocessed foods in diet planning.
- **Salt (sodium):** Be moderate in its use, and if you have hypertension in your family, avoid sodium-rich foods and substitute potassium-rich foods (whole, fresh fruits and vegetables).
- **Iodine:** In areas where the soil is poor in iodine, be sure to use iodized salt.

- **Fluoride:** Be aware whether the water supply in your area is fluoridated or contains 1 ppm or more fluoride naturally. If it lacks fluoride, follow your dentist's advice regarding toothpaste or fluoride applications to protect your family's teeth from decay.

All these principles are familiar by now, as is the time-honored plan usually used as a guideline to abide by them: the Four Food Group Plan or its modified version that includes legumes. But the menu planner of today has to answer many questions:

- "Casseroles and soups don't fit in the Four Food Group Plan, but they are nutritious, aren't they?"
- I like to eat Italian-style; is pizza (or lasagna or spaghetti and meatballs) good for you?"
- "I eat in restaurants all the time, usually fast-food places. When I do cook at home its TV dinners or instant meals. Am I dying a slow death from malnutrition?"
- "I don't eat meat, fish, or poultry. How can I make my diet adequate?"

All these different kinds of people can assure themselves of good nutrition by learning a few facts about foods.

To answer the first two questions very briefly: Any combination of conventional foods can be fitted into the food groups with a little thought. A cup of vegetable soup, for example, could be considered to be roughly a serving of vegetables (ignore the broth as if it were mostly water). A cup of cream soup prepared with milk is nearly equal to a cup of milk. A slice of pizza could be counted roughly as a slice of bread and 1 fat (the dough) with the equivalent in calcium and protein of a cup of milk (if it's thickly coated with cheese) and a portion of vegetables (if it has, say, a half-cup or more of tomato and other vegetable topping on it). Basically, you simply use your common sense and your knowledge of what went into each dish.

No matter what country's cuisine you like, a little inspection will show that the custom of that country has evolved a balance of foods that meets people's nutrient needs. In Italy, the milk group is often represented by cheese; meats are included as such; the grains appear as pasta; and the vegetables are similar to those of North America. In China (to give one more example), the milk group is not apparent (Chinese adults don't use milk); rather, liberal uses of soybeans and soybean curd supply the needed calcium. Meats, again, appear as such; the grain is almost invariably rice; and this is an abundance of fruits and vegetables.

This short discussion should serve to answer the first two questions and illustrate the point that there is no one right diet, that many different ways of combining conventional foods can produce adequacy and balance. But the third question is more difficult to answer. What about the new foods?

### **Coping with the New Foods**

The understandings won from learning to read labels can help you to mix and match new and traditional foods to your advantage. Dr. Daniel Rosenfield, director of nutrition affairs at Miles Laboratories, points out that even an imitation food, while inferior to conventional foods by a legal definition, might have desirably lower levels of some components and might be nutritionally superior.

Many people fear that the new foods are inferior, however. Some are so put off by them that they try to avoid them altogether. Most use them with mixed feelings; the pleasure of the really delightful taste sensations sometimes offered is tainted with anxiety and guilt. (Some don't even think about it, of course.) Whatever your feelings on the subject, the chances are that you can't escape the new foods altogether. They are part of modern life, and in many ways a desirable part. They are easy to store and prepare, they save a tremendous amount of time and effort, and they are often tasty. Formulated foods used in school lunches are acceptable to children, who waste less of them, and they are lower in cost than conventional foods. They have won wide acceptance in institutional settings as well as by homemakers and individual consumers, and their use is on the rise. Rather than trying to avoid them altogether, it makes sense to learn to use them to your advantage.

Not all are of equal value. A substitute for hamburger made from textured soy protein, soy flour, wheat germ, and artificial flavors and colors may be lower in fat, higher in fiber, and equal in protein quality to a hamburger – that is, superior for some purposes. On the other hand, a TV dinner may cost twice as much as, and provide fewer nutrients than, the same meal prepared from the raw materials at home; and a fast-food meal may be three times as expensive as its homemade equivalent. The habitual use of a fortified breakfast cereal may prevent iron deficiency in a woman whose calorie intake is low; but the use of toasted, jam-filled, unenriched pastries for breakfast by her children may dilute the nutrients in their day's menus.

A strategy for dealing with the new foods is based on several principles. First, ask yourself how often you eat the food in question. The more often you use a food product, the more impact it will have on your diet, and the more important it is to be aware of the contributions it is, or isn't, making.

Second, consider a food's nutrient contributions in the context of the other foods in your diet. For example, the lack of vitamin C in the potato chips you eat is of no concern to you if you drink plenty of fruit juice, especially citrus juice, every day. But if you are relying on the food as a staple, to provide the nutrients usually contributed by a class of similar foods – for example, if you are regularly using a meat substitute in place of meat or soy milk instead of milk – then you owe it to yourself to be sure that the substitute provides the same nutrients the missing food would provide and is of high quality. (A cup of soymilk contributes only 20 milligrams of calcium whereas a cup of cow's milk contributes almost 300 milligrams.)

Third, keep the kcalories in mind. No matter how attractive, if a food you often use donates more kcalories than you can afford to consume, you have a hard fact to face up to.

Finally, put the spotlight on yourself. No matter how nutritious the food you eat, it cannot compensate for other flaws in your lifestyle. A balanced, health-oriented approach to life including adequate rest, some exercise, and adequate time for meals at appropriate intervals will pay off in dividends no selection of foods by itself can offer you. Within such a context, common sense should help you to avoid unnecessary extremes. It is probably true that you should try to include foods that contribute vitamin C in every day's meals. On the other hand, the idea that you should always eat farm-fresh foods, sitting down, with a placemat under your plate and a linen napkin in your lap, reflects a set of values that you may or may not wish to call your own. Drinking your breakfast or bringing home your family's dinner in a bucket can be part of a satisfactory nutrition picture and of a lifestyle that you find comfortable and acceptable. For ourselves, it seems appropriate to draw the line where adequate, balanced, and safe nutrition is achieved and to be open-minded about all other options.

We have come a long way from the introduction of the term nutrient in Session 1 to the conclusion of this section on diet planning. Students who have followed the path through all its turnings should consider themselves well grounded in the basics of nutrition.

**CERTIFIED HEALTH & NUTRITION COUNSELOR ONLINE COURSE - SESSION 12 – QUESTION & ANSWERS**

NAME: \_\_\_\_\_

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Please be sure to fill out the information above, complete the test and e-mail or fax it back to us at [iridology@netzero.net](mailto:iridology@netzero.net) or 425-955-4639. We will grade your question & answer session and will let you know if we have any questions or concerns.

1.      **What do anthropometric measurements provide?**
  
2.      **What is the purpose for a physical examination?**
  
3.      **What is subclinical malnutrition?**
  
4.      **What is the purpose of iodized salt?**
  
5.      **What is the role of vitamin B<sub>6</sub>?**
  
6.      **Keep a food diary for 7 days using the form included in this session. Evaluate your diet and tell us what you've learned about it from this session.**