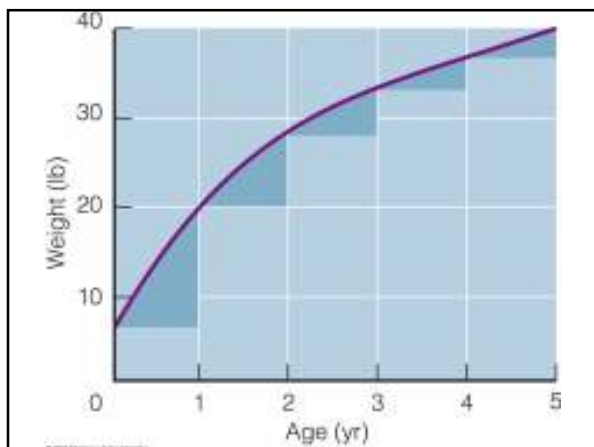


Nutrition during Infancy

- The first year of life is a time of rapid growth and development.
- Breast milk or iron-fortified formula is the primary food the first year with gradual introduction of solids beginning at four to six months of age.
- Preterm infants have very special nutrient needs.
- Mealtimes with toddlers should be a pleasant and relaxed environment.

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Nutrition during Infancy

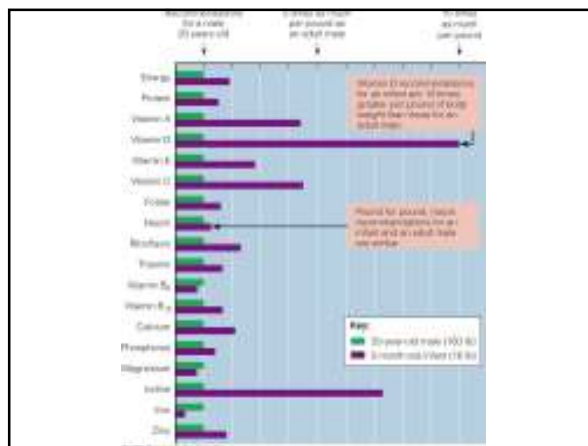
- Energy and Nutrient Needs
 - ✓ Energy Intake and Activity
 - Weight doubles the first five months, triples by one year.
 - High basal metabolic rate
 - Rapid growth
 - 45 kcal/pound body weight
 - ✓ Energy Nutrients
 - Carbohydrates at 60% of energy intake, needed for brain
 - Fat provides most of the energy
 - Protein especially important for growth and development

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Nutrition during Infancy

- Energy and Nutrient Needs
 - ✓ Vitamins and Minerals
 - More than double the needs of an adult in proportion to weight
 - Vitamin A, vitamin C, vitamin D and iodine are especially high
 - ✓ Water
 - Higher % of water compared to adults
 - Found outside the cells and easily lost
 - Dehydration from diarrhea and vomiting is a concern.

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Nutrition during Infancy

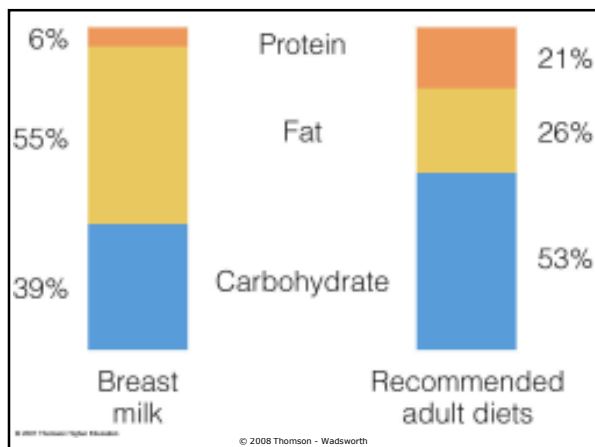
- Breast Milk
 - ✓ Frequency and Duration of Breastfeeding
 - First few weeks: 8-12 feedings per day on demand
 - Every two to three hours
 - 10-15 minutes on each breast

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Nutrition during Infancy

- Breast Milk
 - ✓ Energy Nutrients
 - Lactose, the form of carbohydrate in breast milk, enhances calcium absorption.
 - Alpha-lactalbumin is the form of protein in milk and is easily digested and absorbed.
 - Fat is generous in essential fatty acids.
 - ✓ Vitamins
 - Vitamin D content is low.
 - Vitamin D supplementation is recommended by AAP for breastfed infants.

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Nutrition during Infancy

- Breast Milk
 - ✓ Minerals
 - Calcium is well absorbed
 - High bioavailability of iron and zinc
 - Low in sodium and fluoride
 - ✓ Supplements
 - Vitamin D, iron and fluoride during first year
 - A single dose of vitamin K is given at birth.

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Nutrition during Infancy

- Breast Milk
 - ✓ Immunological Protection
 - Colostrum, the first secretions from the breast, provides antibodies and white blood cells.
 - Bifidus factors allow for the growth of normal flora.
 - Lactoferrin is a protein that binds iron so that bacteria cannot grow.
 - Lactadherin is a protein that fights viruses that cause diarrhea.
 - Breast milk also contains growth factors and lipase enzymes.

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Nutrition during Infancy

- Breast Milk
 - ✓ Allergy and Disease Protection
 - Fewer allergies than formula-fed babies
 - Lower blood pressure as adults
 - Lower blood cholesterol as adults
 - ✓ Other Potential Benefits
 - Less obesity as adults
 - Indications of positive effect on later intelligence

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Nutrition during Infancy

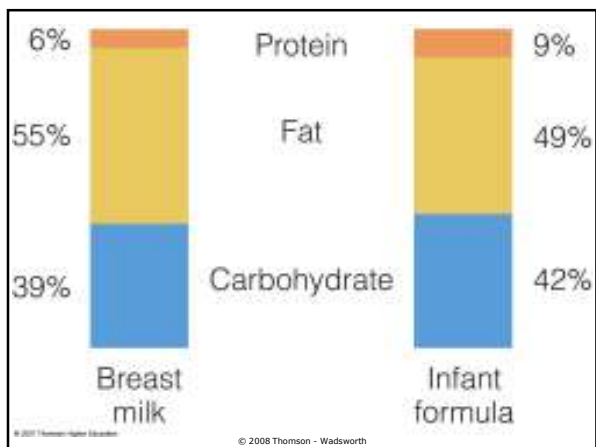
- Breast Milk
 - ✓ Breast Milk Banks
 - Donated milk can be provided to those who are unable to provide sufficient milk to their infant.
 - Cigarette smokers, and those who use illegal drugs, take medications, drink alcoholic beverages (greater than 2 per day), or have communicable diseases are not allowed to donate.
 - Available by prescription
 - May be used for very-low-birthweight infants

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Nutrition during Infancy

- Infant Formula
 - ✓ Infant Formula Composition
 - Infants can be weaned to formula or other appropriate foods when breastfeeding is ended.
 - Copy breast milk if possible
 - Iron-fortified
 - ✓ Risks of Formula Feeding
 - Be careful about lead-contaminated water.
 - Contains no antibodies
 - Use proper food handling techniques.

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Nutrition during Infancy

- Infant Formula
 - ✓ Infant Formula Standards
 - AAP guidelines
 - FDA mandates safety and nutritional qualities
 - ✓ Special Formulas
 - For premature infants or those with inherited diseases
 - Hypoallergenic formulas or soy formulas for infants with allergies
 - Soy formulas for lactose intolerance and vegans

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Nutrition during Infancy

- Infant Formula
 - ✓ Inappropriate Formulas
 - Soy beverages are nutritionally incomplete and inappropriate.
 - Goat's milk is deficient in folate.
 - ✓ Nursing Bottle Tooth Decay
 - Can be caused by formula, milk, or juice
 - Prolonged exposure to formula when sleeping
 - Upper and lower teeth may be affected by decay.

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Nutrition during Infancy

- Special Needs of Preterm Infants
 - ✓ Limited nutrient stores
 - ✓ Physical and metabolic immaturity
 - ✓ Long-chain fatty acids are important for the healthy growth of blood vessels and bones.
 - ✓ Preterm breast milk fortified with preterm formula

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Nutrition during Infancy

- Introducing Cow's Milk
 - ✓ No cow's milk the first year
 - ✓ Contains the protein casein and may cause intestinal bleeding and anemia in the first year of life
 - ✓ Whole cow's milk from 1-2 years of age
 - ✓ Reduced-fat cow's milk gradually introduced between 2-5 years of age

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Nutrition during Infancy

- Introducing Solid Foods
 - ✓ When to Begin
 - 4-6 months
 - Timing varies from infant to infant depending on growth rates, activities, and environmental conditions.
 - Beikost is any nonmilk foods given to an infant.

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Nutrition during Infancy

- Introducing Solid Foods
 - ✓ Food Allergies
 - Introduce single-ingredient foods, one at a time.
 - Period of 4 to 5 days between new foods
 - Rice cereal, then oat and barley, and lastly wheat
 - Allergic reactions include skin rash, digestive upset, or respiratory discomfort.

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Nutrition during Infancy

- Introducing Solid Foods
 - ✓ Choice of Infant Foods
 - Should be provided with variety, balance, and moderation
 - Palatable and nutritious
 - No added salt, sugar, or seasonings
 - Safe and convenient
 - Fat information is not provided on food labels

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Nutrition during Infancy

- Introducing Solid Foods
 - ✓ Foods to Provide Iron
 - Iron-fortified cereals with vitamin C-rich foods and juices
 - Meat or meat alternatives such as legumes
 - ✓ Foods to Provide Vitamin C
 - Vegetables first, then fruits
 - Set limits on fruit juice consumption at 4-6 ounces per day.

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Nutrition during Infancy

- Introducing Solid Foods
 - ✓ Foods to Omit
 - Concentrated sweets
 - Products with sugar alcohols (sorbitol) that may cause diarrhea
 - Canned vegetables contain too much sodium.
 - There is a botulism risk with honey and corn syrup.
 - Choking hazards from carrots, cherries, gum, hard or gel-like candies, hot dogs, marshmallows, nuts, peanut butter, popcorn, raw celery, whole beans, and whole grapes

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Nutrition during Infancy

- Introducing Solid Foods
 - ✓ Vegetarian Diets during Infancy
 - Rice milk is inappropriate for infants and toddlers.
 - Iron-fortified cereals needed until the second year of life
 - Milk products and variety are important to proper nutrition.
 - Deficiencies of vitamin D, vitamin B₁₂, iron, and calcium may develop.
 - Energy-dense foods are required.

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Nutrition during Infancy

- Introducing Solid Foods
 - ✓ Foods at One Year
 - 2-3 cups cow's milk
 - Be careful of milk anemia when milk is consumed excessively.
 - Balance and variety from all food groups
 - Drink liquids from a cup, not a bottle

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SAMPLE MENU

Breakfast	1/2 c iron-fortified, unsweetened breakfast cereal
	1/2 c whole milk (with cereal)
	1/2 c orange juice
Morning snack	1/2 c yogurt
	1/2 c fruit*
Lunch	1 sandwich: 1 slice bread with 2 tbs tuna salad or egg salad
	1/2 c vegetables† (steamed carrots)
	1/2 c whole milk
Afternoon snack	1 slice whole-wheat toast
	1 tbs apple butter
	1/2 c whole milk
Dinner	1 oz chopped meat or 1/2 c well- cooked mashed legumes
	1/2 c potato, rice, or pasta
	1/2 c vegetables† (chopped broccoli)
	1/2 c whole milk

*Include citrus fruits, raisins, and berries.
†Include dark green, leafy and deep yellow vegetables.



Let the child explore and enjoy food.

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Toddlers

- Age 1 to 3 years
 - ✓ Rapid growth rate of infancy begins to slow
 - ✓ Gain 5.5 to 7.5 inches and 9-11 pounds
 - ✓ Higher energy expended for increased activity level

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Toddlers

- **Macronutrients:**
 - ✓ Kcal and grams protein per kg decrease from infancy
 - ✓ **Estimated energy requirement (EER)** is kcal/day = $(89 \times \text{weight}(\text{kg}) - 100) + 20$
 - ✓ 30%-40% of total kcal from fat
 - ✓ 1.1 grams of protein per kg body weight
 - ✓ 130g carbohydrates per day
 - ✓ 14 grams fiber per 1,000 kcal/day

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Toddlers

- **Micronutrients:**
 - ✓ Ensure adequate intake of the micronutrients obtained from fruits and vegetables, including:
 - Vitamins A, C, E, calcium, iron, zinc
 - ✓ Iron deficient anemia is the most common nutrient deficiency in young children



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Nutrition during Infancy

- **Mealtimes with Toddlers**
 - ✓ Discourage unacceptable behavior.
 - ✓ Let toddlers explore and enjoy food.
 - ✓ Don't force foods.
 - ✓ Let children choose nutritious foods.
 - ✓ Limit sweets.
 - ✓ Make mealtimes pleasant.

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Nutrition during Childhood

- Energy needs, nutrient needs, and appetites during childhood vary because of growth and physical activity.
- Hunger and nutrient deficiencies affect behavior.
- Nutrition concerns at this age include lead poisoning, high energy, sugar and fat intakes, iron deficiency, caffeine consumption, food allergies, and food intolerances.
- Adults and schools need to provide children with nutrient-dense foods.

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Nutrition during Childhood

- **Energy and Nutrient Needs**
 - ✓ **Energy Intake and Activity**
 - Needs vary widely because of growth and physical activity.
 - **Energy requirements:**
 - 1 year: 800 kcalories
 - 6 years: 1,600 kcalories
 - 10 years: 2,000 kcalories
 - Inactivity can lead to obesity.
 - Vegans may have difficulty in meeting energy needs.

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Nutrition during Childhood

- **Energy and Nutrient Needs**
 - ✓ **Carbohydrate and Fiber**
 - Carbohydrate recommendations are the same as those for adults.
 - Fiber intakes change with age.
 - ✓ **Fat and Fatty Acids**
 - Children 1-3 years should have 30-40% of energy from fat.
 - Children 4-18 years should have 25-35% of energy from fat.
 - Low-fat diets may have low vitamin and mineral content.

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Nutrition during Childhood

- Energy and Nutrient Needs
 - ✓Protein
 - Needs increase slightly with age
 - Requirement considers nitrogen balance, the quality of protein consumed, and the added needs of growth
 - ✓Vitamins and Minerals
 - Needs increase with age.
 - Balanced diet meets all needs except iron
 - Iron-fortified foods are important.

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Nutrition during Childhood

- Energy and Nutrient Needs
 - ✓Supplements
 - Rely on foods
 - Supplements not needed
 - ✓Planning Children's Meals
 - Variety of foods from each food group
 - Proper portion sizes

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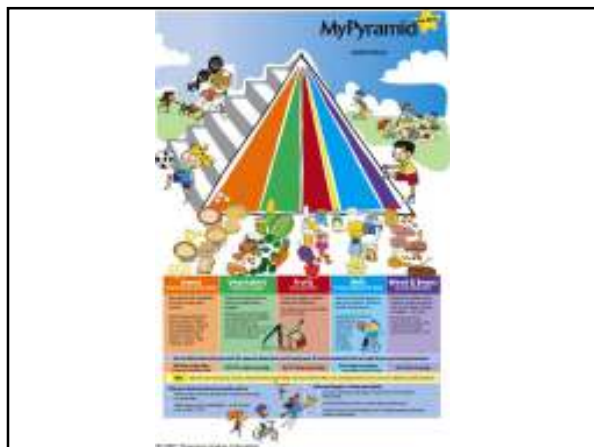


TABLE 16-4 Recommended Daily Amounts from Each Food Group (1000 to 1600 kcalories)

Food Group	1000 kcal	1200 kcal	1400 kcal	1600 kcal
Fruits	1 c	1 c	1½ c	1½ c
Vegetables	3 c	3½ c	4 c	4 c
Grains	3 oz	4 oz	5 oz	5 oz
Meat and legumes	2 oz	3 oz	4 oz	5 oz
Milk	2 c	2 c	2 c	3 c
Oils	3 tsp	3 tsp	3 tsp	4 tsp

NOTE: The discretionary calorie allowance for these patterns is about 100 calories.

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TABLE 16-5 Estimated Daily kcalorie Needs for Children

Children	Sedentary ^a	Active ^b
2 to 3 yr	1000	1400
Females		
4 to 8 yr	1200	1800
9 to 13 yr	1600	2200
Males		
4 to 8 yr	1400	2000
9 to 13 yr	1800	2600

^a Sedentary describes a lifestyle that includes only the activities typical of day-to-day life.
^b Active describes a lifestyle that includes at least 60 minutes per day of moderate physical activity (equivalent to walking more than 3 miles per day at 3 to 4 miles per hour) in addition to the activities of day-to-day life.

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Nutrition during Childhood

- Hunger and Malnutrition in Children
 - ✓Hunger and Behavior
 - Missing meals, especially breakfast, affects behavior and academic performance.
 - Low blood glucose, smaller glycogen stores

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Nutrition during Childhood

- Hunger and Malnutrition in Children
 - ✓Iron Deficiency and Behavior
 - Affects behavior and intellectual performance
 - Affects attention span and learning ability
 - Brain is affected by low iron before the blood is affected.
 - ✓Other Nutrient Deficiencies and Behavior
 - Marginal malnutrition may affect behavior.
 - Affects personal appearance also

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Nutrition during Childhood

- The Malnutrition-Lead Connection
 - ✓Malnourished children are more vulnerable to lead poisoning.
 - ✓Anemia caused by lead may be mistaken for an iron problem.
 - ✓Can develop learning disabilities and behavioral problems
 - ✓Ban on lead in food and the environment has helped



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Nutrition during Childhood

- Hyperactivity and "Hyper" Behavior
 - ✓Hyperactivity, also called attention-deficit/hyperactivity disorder (ADHD)
 - Interferes with social development and academic behavior
 - Dietary changes and alternative therapies do not solve true hyperactivity.
 - No evidence that sugar causes hyperactivity

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Nutrition during Childhood

- Hyperactivity and "Hyper" Behavior
 - ✓Misbehaving children need consistent care.
 - Regular hours of sleep
 - Regular mealtimes
 - Regular outdoor activity

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Nutrition during Childhood

- Food Allergy (also called food-hypersensitivity reactions) and Intolerance
 - ✓Detecting Food Allergy
 - Immunologic response with the production of antibodies, histamines, and other defensive agents
 - 3-5% of children are diagnosed
 - Asymptomatic allergy produces antibodies without symptoms
 - Symptomatic allergy produces antibodies and symptoms

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Nutrition during Childhood

- Food Allergy and Intolerance

- ✓ Anaphylactic Shock

- Life-threatening food allergy reaction
 - Foods may include eggs, milk, soy, peanuts, tree nuts, wheat, fish, and shellfish
 - Often outgrow allergies to eggs, milk, and soy
 - Recognize symptoms
 - Epinephrine injections (adrenalin) can be used to counteract anaphylactic shock.
 - Food labeling to identify common allergens and additives



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Nutrition during Childhood

- Food Allergy and Intolerance

- ✓ Food Labeling

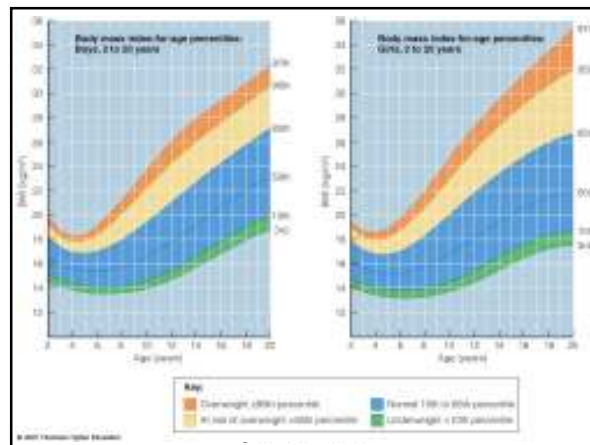
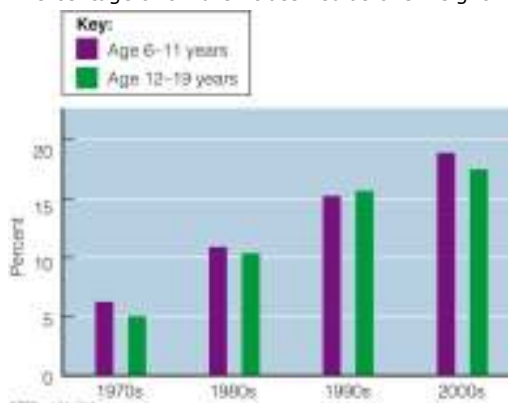
- Eight common allergens must appear on a food label.
 - If cross-contamination is possible, this must be stated on the label.

- ✓ Food Intolerances

- Adverse reactions to foods like stomachaches, headaches, rapid pulse rate, nausea, wheezing, hives, bronchial irritation, coughs, and other discomforts are not all food allergies.
 - Symptoms without antibody production
 - A tolerance level for pesticides has been set based on the effects on development.

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Percentage of children classified as overweight



School-Aged Children

- Age 6 to 13 years
 - ✓ Growth is slow and steady – 2 to 3 inches per year
 - ✓ Children begin to make their own food choices
 - ✓ Activity levels vary

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School-Aged Children

- Macronutrients:
 - ✓ 25%-35% of total energy from fat
 - ✓ 0.95 grams protein per kg body weight
 - ✓ 130 grams carbohydrates
 - ✓ 45%-60% of kcal from carbohydrates
 - ✓ 14 grams fiber per 1000 kcal per day

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School-Aged Children

- **Micronutrients:**
 - ✓The need for most micronutrients increases slightly through age 8.
 - ✓Micronutrient needs rise sharply as children approach puberty.
 - ✓Calcium and iron are still very important

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School-Aged Children

- **Fluid:**
 - ✓Adequate Intake (AI) of fluids varies by age and gender, ranging from 1.7 liters to 2.4 liters per day
- **Supplements:**
 - ✓A vitamin/mineral supplement supplying no more than 100% of the daily values can be used.

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School-Aged Children

- **Nutritious Food Choices:**
 - ✓Peer pressure can influence a child's food choices.
 - ✓Healthy role models, such as athletes, can be used to encourage good choices
 - ✓School lunches must meet USDA guidelines, but this does not control what the child actually eats.

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School-Aged Children

- **Obesity in Children:**
 - ✓Obesity is now epidemic in the US among school-aged children
 - ✓Caused by eating too much and not enough physical activity
 - ✓Dietary Guidelines for Americans recommends that children be very active for at least one hour per day.

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Problems Related to Childhood Obesity

- **CVD risk factors**
 - ✓**Atherosclerosis** begins in childhood
 - High levels of total cholesterol, LDL, triglycerides
 - ✓**High blood pressure**
 - Obesity is leading cause of pediatric hypertension
- **Type 2 diabetes**
 - ✓85% of children with Type 2 diabetes are overweight when diagnosed
 - ✓Family history, race (non-Caucasian) increase risk
- **Respiratory diseases**
 - ✓Prevalence of asthma in obese children is high



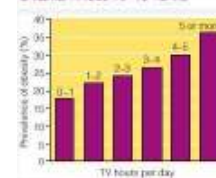
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Inactivity and Childhood Obesity

- ~34 hours a week spent in front of a TV, video game, or computer



PREVALENCE OF OBESITY BY HOURS OF TV PER DAY, CHILDREN AGES 10-15 YEARS



Source: Centers for Disease Control and Prevention, Health Risk Behaviors Survey, 1999, available at www.cdc.gov

Childhood Obesity: Other Contributing Factors


- Inactivity is key
- Excessive snacking
- Fast foods
- Parent neglect
- No safe play areas
- Available food choices
 - ✓ High fat
 - ✓ Energy dense



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Treating Childhood Obesity

- Encourage regular physical activity
 - ✓ > 60 min/day
- Moderate caloric intake
 - ✓ Limit high fat foods
 - ✓ Increase nutrient dense
 - ✓ Healthy snacking



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Treating Childhood Obesity, con't

- Prevent further weight gain
 - Can use stored energy for growth
 - Encourage wt loss after growth
- Behavioral changes
- Psychological support
- Role of parents
 - As gatekeepers
 - As role models
- **"Moderation not deprivation"**



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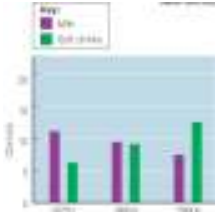
School-Aged Children



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School-Aged Children

- Nutrition Related Concerns:
 - ✓ Body image and appearance become more important to children as puberty approaches.
 - ✓ Inadequate calcium intake can result as children make their own choices and may avoid milk in favor of other beverages.



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Adolescents

- Age 14 to 18 years
 - ✓ Growth spurts begin at age 10 to 11 for girls and 12 to 13 for boys
 - ✓ An average 20%-25% increase in height is expected
 - ✓ Weight and body composition also change

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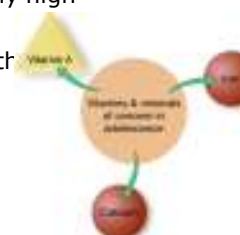
Adolescents

- **Macronutrients:**
 - ✓ Estimated energy requirements (EER) for adolescents is based on gender, age, activity level, height and weight
 - ✓ 25%-35% of total energy from fat
 - ✓ 45%-60% of kcal from carbohydrates
 - ✓ 0.85 gram protein / kg body weight
 - ✓ 26 grams of fiber per day

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Adolescents

- **Micronutrients:**
 - ✓ Calcium intakes must be sufficient for achieving peak bone density
 - ✓ Iron needs are relatively high
 - ✓ Vitamin A is critical for supporting rapid growth and development



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Adolescents

- **Fluid:**
 - ✓ The need to maintain fluid intake is increased by higher activity levels
 - ✓ Boys: 3.3 liters/day
 - ✓ Girls: 2.3 liters/day
- **Supplements:**
 - ✓ A multivitamin can be a safety net, but should not replace a healthful diet

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Adolescents



- **Nutritious Food Choices:**
 - ✓ Peer influences and fast-paced lifestyle can lead adolescents to choose fast foods
 - ✓ Parents can act as role models and keep healthful food choices available
 - ✓ Adequate fruits, vegetables, and whole grains should be encouraged

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Adolescents

- **Nutrition Related Concerns:**
 - ✓ Adequate physical activity is very important in reducing obesity
 - ✓ Disordered eating and eating disorders can begin in these years
 - ✓ Cigarette smoking, alcohol, and illegal drugs can also have an impact on nutrition

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Nutrition during Adolescence

- **Problems Adolescents Face**
 - ✓ **Marijuana**
 - Enhances enjoyment of sweets
 - Affects appetite, pain and memory
 - ✓ **Cocaine**
 - Stimulates nervous system
 - Elicits the stress response
 - Weight loss is common.

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Nutrition during Adolescence

- Problems Adolescents Face
 - ✓ Ecstasy
 - Serotonin flooding alters mood; may also damage nerve cells and impair memory
 - Tend to lose weight
 - ✓ Drug Abuse, in General
 - Use money to buy drugs, not food
 - Lose interest in foods
 - Use drugs that suppress appetite
 - Lifestyles fail to promote good eating
 - Infectious disease affects nutrition.
 - Medications to treat drug abuse alter nutrition status.

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Nutrition during Adolescence

- Problems Adolescents Face
 - ✓ Alcohol Abuse
 - Provides energy, no nutrients
 - Displaces nutritious foods from the diet
 - Alters nutrient absorption and metabolism
 - ✓ Smoking
 - Eases feelings of hunger
 - Lower vitamin and fiber intakes
 - Increases needs for vitamin C
 - Need antioxidant fruits and vegetables to reduce cancer risk
 - ✓ Smokeless tobacco has many drawbacks including cancer of the mouth.

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Childhood Obesity and the Early Development of Chronic Diseases

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Childhood Obesity and the Early Development of Chronic Diseases

- Nutrition and health education programs during childhood and adolescence are effective when combined with heart-healthy meals at home and school, fitness activities and parental involvement.
- Cardiovascular disease (CVD) damages the heart.

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Early Development of Type 2 Diabetes

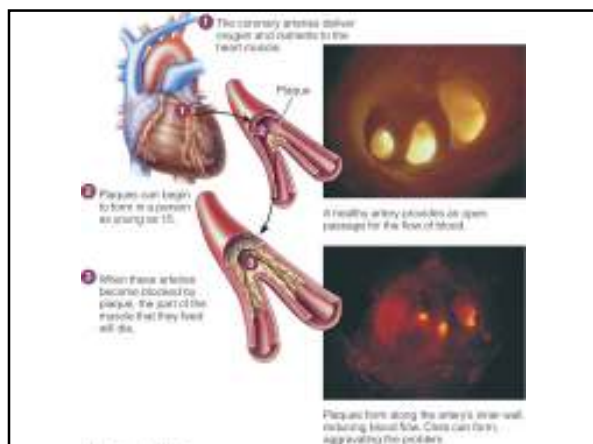
- On the increase in recent years
- Risk factors include obesity, sedentary lifestyle, and family history.
- Insulin resistance
- Increased blood cholesterol and blood pressure leading to atherosclerosis and CVD
- Many complications leading to a shorter life span

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Early Development of Heart Disease

- Atherosclerosis
 - ✓ Is often a part of cardiovascular disease
 - ✓ Artery walls thicken with plaque
 - ✓ Fatty streaks begin to accumulate in fibrous connective tissue
 - ✓ Lesions in the arteries

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Early Development of Heart Disease

- Blood Cholesterol
 - ✓Tends to rise as dietary saturated fat increases
 - ✓Correlation with childhood obesity
 - ✓Family relationship
 - ✓Screening and education are key.
- Blood Pressure
 - ✓May be a sign of underlying disease
 - ✓More common in obese children

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TABLE H16-1 Cholesterol Values for Children and Adolescents

Disease Risk	Total Cholesterol (mg/dL)	LDL Cholesterol (mg/dL)
Acceptable	<170	<100
Borderline	170-199	100-129
High	≥200	≥130

NOTE: Adult values appear in Table 18-4 on p. 630.

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Physical Activity

- Active children have better lipid profiles.
- Habits developed at this age are carried into later life.

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Dietary Recommendations for Children

- Moderation, Not Deprivation
 - ✓Less saturated fat
 - ✓More fruits and vegetables
 - ✓Nuts, vegetable oils, and some fish provide essential fatty acids.
- Treat problems with diet first, then drugs.

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Smoking

- Increases risk for heart disease
- Half of teens who continue to smoke will die of smoking-related causes.

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