Nutrition to Optimize Health, Now and in the Future
Demographics of US Older Adults

- Age 65 years and older (16% of US population)
- Age ≥85 years (2% of US population)
  - "Very elderly" or "oldest of the old"
  - Fastest growing US population subgroup.
- Centenarians: 0.01% of US population
- “Super centenarians”: Older than 110 y!
- All numbers and percentages expected to increase greatly over next 30 years
- Average U.S. life expectancy = 78.8 years

Where do YOU fall in this spectrum???
<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Nutrition Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Programmed Theories of Aging</strong></td>
<td>Aging follows a biologically driven time line, similar to that of adolescence.</td>
<td>None evident</td>
</tr>
<tr>
<td><strong>Hayflick theory of aging</strong></td>
<td>Cells have a limited reproductive life span. Each time a cell divides, the telomeres at the ends of its chromosomes shorten; thus, cells can divide only so many times.</td>
<td>None evident</td>
</tr>
<tr>
<td><strong>Theory of programmed longevity</strong></td>
<td>Aging occurs when certain genes are turned on or off; the activation or suppression of these genes then triggers age-related loss of function.</td>
<td>Indirectly, a diet rich in antioxidants, such as vitamins C and E, could lower free-radical damage to DNA.</td>
</tr>
<tr>
<td><strong>Endocrine theory of aging</strong></td>
<td>Senescence is due to hormonal changes, such as declines in growth hormone, DHEA, estrogen, and/or testosterone.</td>
<td>None directly evident</td>
</tr>
<tr>
<td><strong>Immunologic theory of aging</strong></td>
<td>Aging is linked to loss of immune system activity and/or an increase in autoimmune diseases.</td>
<td>Indirectly, adequate protein, zinc, iron, and vitamins A, C, and E help preserve immune function.</td>
</tr>
<tr>
<td><strong>Error Theories of Aging</strong></td>
<td>Senescence occurs as a result of cell and tissue damage caused largely by environmental insults.</td>
<td>Several theoretical benefits of nutrient adequacy or supplementation</td>
</tr>
<tr>
<td><strong>Wear-and-tear theory</strong></td>
<td>Over time, cells simply wear out and eventually die. The greater the exposure to toxins and stressors, the more rapid the rate of decline.</td>
<td>Protein, zinc, and vitamins A and C could theoretically delay the aging process by improving cellular repair and recovery.</td>
</tr>
<tr>
<td><strong>Cross-linkage theory</strong></td>
<td>Abnormal cross-linkages of proteins, such as collagen, damage cells and tissues, impairing the function of organs.</td>
<td>Glycosylation, the abnormal attachment of glucose to proteins, can be limited by controlling blood glucose levels. Adequate intakes of vitamin C, selenium, and copper may reduce other types of protein cross-linkages.</td>
</tr>
<tr>
<td><strong>Free-radical theory</strong></td>
<td>Senescence is due to the cumulative damage caused by various free radicals.</td>
<td>Diets and/or supplements rich in vitamins C and E, selenium, and antioxidant phytochemicals may limit the cellular accumulation of free radicals.</td>
</tr>
<tr>
<td><strong>Rate-of-living theory</strong></td>
<td>In general, the higher the species’ average basal metabolic rate (BMR), the shorter its life span.</td>
<td>Theoretically, energy restriction would lower BMR and prolong life (see the Nutrition Myth or Fact? on pages 767–769).</td>
</tr>
</tbody>
</table>
Aging Process: Lifestyle Factors

- **Biological age** can be influenced by personal choices. Negative influences include:
  - Smoking
  - Excessive alcohol
  - Excessive sun exposure
  - Obesity
  - Sedentary lifestyle
  - Possibly excessive emotional stress
Age Related Changes in Sensory Perception

- **Senescence**: age-related processes that increase risk of disability, disease, and death
- Systems begin to slow and degenerate
- Declined odor, taste, and visual perception
  - **Dysgeusia**: abnormal taste perception
- Loss of visual acuity
- Support of family and friends helps older adults with food selection and preparation techniques
- How might these sensory changes impact food acquisition, preparation, consumption?
Age Related Changes in GI Function

- **Xerostomia:** declined salivary production
- **Dysphagia:** difficulty swallowing foods
- **Achlorhydria:** low gastric HCl production, limits calcium, iron, folate, B₁₂ absorption
- Gut microbiota changes ("aging gut"):  
  - Increased inflammation
  - Decreased gut immunity
  - Impaired gut mucosal cells
- "Anorexia of Aging"
- Lactose intolerance
- How might these changes impact food choices, preparation, consumption?
Age Related Changes in Body Composition

- Increased body fat,
- Decreased muscle and lean tissue
- **Sarcopenic obesity**
- Bone mineral density declines
- **How might these changes impact nutrient needs?**
Macronutrient Guidelines for Healthy Older Adults: Protein, fat, CHO

- Decreased energy needs from loss of muscle mass and lean tissue due to:
  - Lower basal metabolic rate
  - Reduced activity levels
- Recommendations for proportions of fat, carbohydrate, proteins: same as for younger adults
- Likely that older adults need more protein relative to body weight
- Older adults can eat slightly less fiber
<table>
<thead>
<tr>
<th>Changes in Nutrient Recommendations</th>
<th>Rationale for Changes</th>
</tr>
</thead>
</table>
| *Increased need* for vitamin D from 600 IU/day for adults up to age 70, to 800 IU/day for adults over 70 | - Decreased bone density  
- Decreased ability to synthesize vitamin D in the skin |
| *Increased need* for calcium from 1,000 mg/day for all adults up to age 51 and males 51–70 years of age to 1,200 mg/day for females 51 years of age and older and males over age 70 | - Decreased absorption of dietary calcium  
- Decreased bone density (earlier onset in women) |
| *Decreased need* for fiber from 38 g/day for males up to age 51 to 30 g/day for males 51 and older; decreases for females are from 25 g/day for females up to age 51 to 21 g/day for females 51 and older | - Decreased energy intake |
| *Increased need* for vitamin B₆ in both males and females from 1.3 mg/day up to age 51 to 1.7 mg/day in males and 1.5 mg/day in females age 51 and older; need for vitamin B₁₂ from fortified foods or supplements, as opposed to foods of animal origin | - Increased need for these vitamins to maintain blood levels adequate to reduce homocysteine levels and to optimize immune function  
- Lower levels of stomach acid  
- Decreased absorption of food B₁₂ from gastrointestinal tract |
| *Decreased need* for iron for females, from 18 mg/day up to age 51 to 8 mg/day for females 51 and older; no change in 8 mg/day iron recommendations for males | - Cessation of menstruation in women; some loss of muscle and lean tissue in men and women |
Additional Micronutrient Guidelines for Healthy Older Adults

- Zinc recommendations stay the same
- Vitamins C and E recommendations stay the same
- Adequate intake of B-vitamins ($B_{12}$, $B_6$, and folate) is a special concern
- Vitamin A should not be consumed in excess of RDA (tends to accumulate and increase risk of toxicity)
Supplements

• Many/most older adults benefit from multivitamin/multimineral supplement
• AREDS 1 and 2-based supplements for “eye health” (reduces risk of cataract and macular degeneration)
• Single nutrient supplements may be beneficial in some cases
  • Oral or injectable Vitamin B$_{12}$
  • Calcium
  • Vitamin D
• High-potency supplements pose risks
Supplements to Avoid

- Iron (unless prescribed by medical practitioner)
- High potency Vitamin A
- High potency B-complex
- Unproven herbals
**Fluid Guidelines for Older Adults**

- **Impaired thirst mechanism** means most older adults fail to recognize dehydration
- Many medications contribute to dehydration
- Fear of night-time urination contributes to “voluntary dehydration”
- Urine should be color of file folder!!

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Good</td>
</tr>
<tr>
<td>2</td>
<td>Good</td>
</tr>
<tr>
<td>3</td>
<td>Fair</td>
</tr>
<tr>
<td>4</td>
<td>Dehydrated</td>
</tr>
<tr>
<td>5</td>
<td>Dehydrated</td>
</tr>
<tr>
<td>6</td>
<td>Very dehydrated</td>
</tr>
<tr>
<td>7</td>
<td>Severe dehydration</td>
</tr>
</tbody>
</table>
Overweight and Obesity in Older Adults

- Increases severity and consequences of osteoarthritis
- Further increases risk of diabetes, heart disease, high blood pressure and certain cancers
- Limits mobility
- Causes functional declines in daily activities
- Further impairs cognition
- Weight loss improves functional status
- **Dietary intervention, exercise always first intervention.** Medication and surgery appropriate for medically at risk elderly.
Underweight in Older Adults

- Fewer protein reserves for post-surgical or acute illness recovery
- Risk for poor wound healing and a depressed immune response
- Geriatric failure-to-thrive: "the dwindles"
- Rate of death actually higher for inappropriately underweight older adults vs. overweight older adults
• The nine Ds of geriatric weight loss.
Osteoporosis

• In women, often diagnosed after menopause as estrogen levels sharply decline
• In men: linked to declining testosterone levels, steroid therapy, and alcohol abuse
• Most serious risk: hip fracture
• Osteoporosis treatment: vitamin D and calcium supplementation, resistance training, medications

© 2017 Pearson Education, Inc.
Genetic, Dietary Risk Factors

- Lifelong low body weight, small frame
- Asian, Caucasian heritage
- Lifelong inadequacy of Ca, Vit D, F, B, Mg
- Inadequate protein intake; low Vit K
- Excess Vitamin A [usually supplements]
Lifestyle Risk Factors

• Lifelong or recent physical inactivity
• Alcohol abuse, excessive caffeine
  • >2c coffee/d or equivalent caffeine intake/d ↑ urinary Ca [short term]
  • Ca intake <800mg/d plus 2c coffee/d led to increased bone loss.
• Smoking
• Females: Premature menopause; amenorrhea as teen
• Males: Low testosterone production
• Certain medications [corticosteroids]
Low Risk Lifestyle Interventions: Calcium/Vit D Supplements and Exercise!

- “Divide and conquer”: use <500mg Ca/dose; 2-3 times/d. Aim for about 1,000 mg/d (plus what is in your diet). AVOID EXCESS (over 2,000 mg/d)
- Ca carbonate/citrate/malate all well absorbed – found in Ca-fortified orange juice, etc.
- Avoid oyster shell and bone meal supplements – they may be contaminated with lead and/or other heavy metals
- Vit D improves Ca absorption; aim for 1500-2000 IU/d
- Weight bearing exercise on a daily basis (if safe)
- **Medication often needed for optimal bone health**
Dietary Guidelines to Reduce Risk of Late-Life Onset of Cognitive Impairment

- Limit intakes of saturated and trans fats
- Optimize intakes of legumes, fruits, vegetables (Mediterranean Diet)
- Optimize Vit E intake from foods (seeds, nuts, green leafy vegetables, whole grains) vs. pills
- Daily intake of Vit B-12 supplemented foods (eg cereal, soy milk) or B-12 supplements (alone or within MVMM)
- Avoid iron supplements (unless prescribed)
- **OPTIMIZE** physical activity and fitness!!!!!
Medication Usage by Older Adults

- Medications impact nutrient status; nutrient intake/status impact medication effectiveness
- **Polypharmacy**: more than five prescription medications at once
- **Excessive polypharmacy**: more than ten prescription medications at once

© 2017 Pearson Education, Inc.
How Medications Impact Nutrient Status

• Increase or decrease food intake
• Alter taste perception, saliva production
• Decrease nutrient absorption, transport, activation, storage, and/or retention
Nutrient Intake/Status Impacts Medication Effectiveness

• Obesity reduces effectiveness of lipid soluble drug distribution to target tissues

• Specific nutrients, supplements and herbals can increase or decrease normal rate of drug degradation (leads to under- or over-medication). Alcohol delays degradation of many pain medications.

• High fat, protein, fiber meals delay gastric emptying which exposes oral drugs to high acid stomach fluids (decreases drug activity)
<table>
<thead>
<tr>
<th>Category of Drug</th>
<th>Common Nutrient/Food Interactions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antacids</td>
<td>May decrease the absorption of iron, calcium, folate, vitamin $B_{12}$</td>
</tr>
<tr>
<td>Antibiotics</td>
<td>May reduce the absorption of calcium, fat-soluble vitamins; reduce the production of vitamin K by gut bacteria; iron supplementation can reduce drug absorption</td>
</tr>
<tr>
<td>Anticonvulsants</td>
<td>Interfere with the activation of vitamin D</td>
</tr>
<tr>
<td>Anticoagulants (“blood thinners”)</td>
<td>Oppose the clotting activity of vitamin K; vitamin E magnifies effect</td>
</tr>
<tr>
<td>Antidepressants</td>
<td>May cause weight gain as a result of increased appetite</td>
</tr>
<tr>
<td>Antiretroviral agents (treatment of HIV/AIDS)</td>
<td>Reduce the absorption of most nutrients</td>
</tr>
<tr>
<td>Aspirin</td>
<td>Decrease blood folate levels; increase loss of iron due to gastric bleeding</td>
</tr>
<tr>
<td>Diuretics</td>
<td>Some types may increase urinary loss of potassium, sodium, calcium, magnesium; others cause retention of potassium and other electrolytes</td>
</tr>
<tr>
<td>Laxatives</td>
<td>Increase fecal excretion of dietary fat, fat-soluble vitamins, calcium, other minerals</td>
</tr>
</tbody>
</table>
Social Concerns Among Older Adults

- Elder abuse and neglect
- Food insecurity and hunger
- Social isolation
- Unique needs of elderly immigrant populations
“Best” Dietary Patterns for Long Term Health?

• DASH Diet
• Mediterranean Diet
• Flexitarian Diet
• Lacto-ova vegetarian Diet
Food Profile of the Mediterranean Diet

- Fresh fruits and vegetables
- Whole grain breads/cereals/pasta
- Legumes, nuts, seeds
- Olive oil
- Emphasis on fish and poultry vs. red meats
- Inclusion of dairy (yogurt, cheese)
- Inclusion of alcohol in moderate amounts
- Liberal use of herbs and spices in place of salt