

# Biological Changes in Human Aging

Integumentary, Cardiac, Respiratory

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# Objectives

- To demonstrate knowledge of demographic information pertaining to the elderly
- Describe age related changes in each body system presented
- Largemouth vs. Smallmouth
- Utilize this information in your personal and professional lives.

# Contents

- Statistics of aging
- Trauma Triad of Death
- Body systems and aging
  - Integumentary, Circulatory, Respiratory

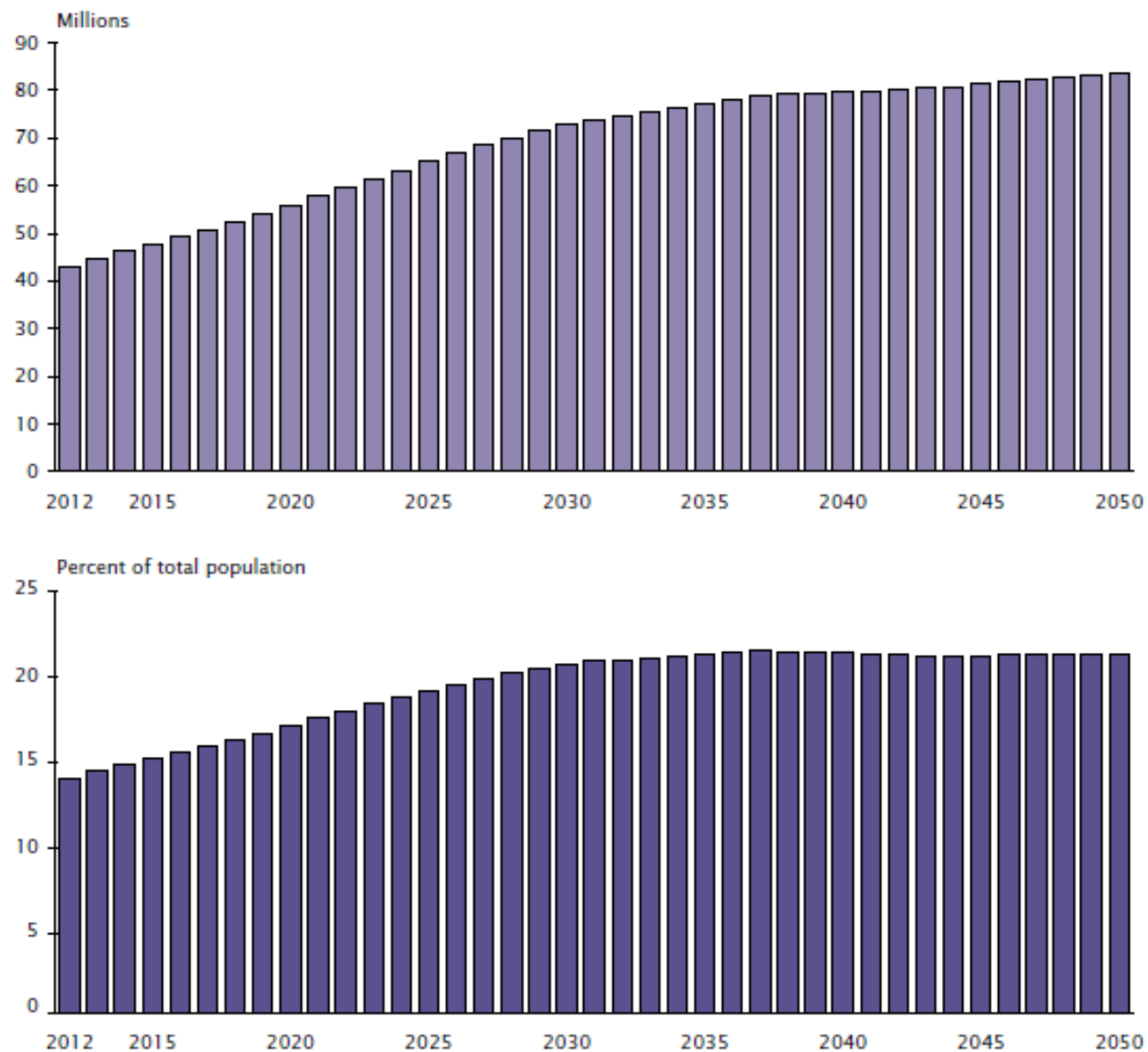
# Aging Statistics

- Current stats based off of 2010 census
  - Next census in 2020
- National Projections
  - 2012: age 65+ was 43.1 million
  - 2050 projections are 83.7 million
  - Darn Baby Boomers!!
    - They began turning 65 in 2011
    - By 2050, the surviving boomers will be over age 85

# Aging Statistics

- U.S Population (all ages)
  - 2012: 314 million
  - 2050: 400 million
  - 27% increase
- 2030
  - More than 20% >65
  - Compared to 13% in 2010 and 9.8% 1970

Figure 1.  
Population Aged 65 and Over for the United States: 2012 to 2050



Source: U.S. Census Bureau, 2012 Population Estimates and 2012 National Projections.

# Aging Statistics

- What is the driver of trends in the older population?
  - Fertility or Mortality??
- Past fertility rates were the main driver influencing the size
- Mortality will influence the pace at which the population declines at older ages

# Largemouth vs. Smallmouth

## Identification

Largemouth bass has bright-green to olive-green head and back; sides are lighter green; usually has a broad, black stripe or line of broken splotches running along the sides from head to tail; belly is white or pale yellow. Dorsal fin sections are deeply notched and nearly separated.



Upper jaw extends beyond the back edge of the eye.

Smallmouth bass has brownish to bronze cast to its back, shading to lighter hues on the sides with dark, vertical bars on sides; belly is white or pale yellow. Dorsal fin sections are separated by a shallow notch.



Upper jaw does not extend beyond the back edge of the eye.

LARGEMOUTH  
BASS



End of mouth  
extends past eye

SMALLMOUTH  
BASS



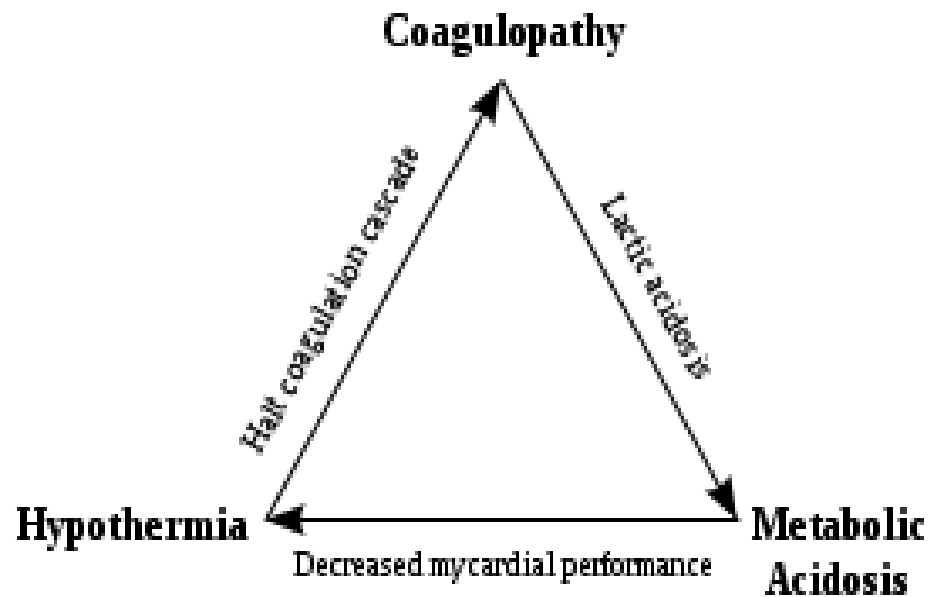
End of mouth  
does NOT extend  
past eye



# Largemouth vs. Smallmouth



# Trauma Triad of Death





# Integumentary System

- Functions as a barrier
  - Microorganisms
  - Chemicals
  - Water
  - Light
  - Trauma
- Provides information
- Temperature regulation

# Integumentary System

- Epidermis—outermost layer
- Dermis—middle layer
- Subcutaneous—inner layer



# Integumentary System

- Age related changes in the Epidermis
  - Overall thickness changes very little
  - Uneven in different parts
  - Increase in the spacing between cells and decrease in the strength of attachment
  - Decrease in the rate of replacement
    - Decreases speed of wound healing
    - Increase risk of infection



# Integumentary System

- Age related changes in the Epidermis
  - Hair
    - Decreased amount of follicles
    - Decreased amount of reproduction
    - All hair is thinner
    - Why is this important??
  - Nails
    - Protect the fingers and toes from traumatic injuries
    - Growth and structural weakening make them susceptible to injury and infection



# Integumentary System

- Age related changes in the Dermis
  - Decrease collagen
    - Skin less able to stretch
  - Elastin fibers
    - Do not alter stretching capability; but tendency to return to normal shape
  - Blood vessels
    - Dermal vessels decrease = decrease blood flow
    - Reduction of blood flow is the main reason for age related decline in skin structures



# Integumentary System

- Age related changes in the Dermis
  - Sweat glands
    - Decrease dramatically resulting in reduced perspiration rate
  - Nerves: Sensory and Motor
    - Little change in number or structure attached to hair follicles
    - Decreased number and poor structure of nerves not attached



# Integumentary System

- Age related changes in the Subcutaneous layer
  - No applicable information
  - Decrease in fatty tissue may result in alterations in thermoregulation

Largemouth or Smallmouth???



# Largemouth or Smallmouth???





# Circulatory System

- Main functions of circulatory system
  - Transportation, defense, temperature control, acid/base balance



# Circulatory System

- Age related changes of the Circulatory System
  - Very adaptable
    - Most detrimental changes in the heart are overshadowed by compensatory changes
    - Increased usage and production of norepi as we age
  - Declining efficiency of the heart
    - Stiffer, thickened and dilated
    - Leads to increased myocardial O<sub>2</sub> consumption during exercise



# Circulatory System

- Age related changes of the Circulatory System
  - Arteries
    - Decline in the ability of the endothelium to regulate blood vessels and blood pressure
  - Middle layers
    - Most age related changes occur here
    - Thickening and stiffening occur as we age
    - Creates problems with systolic pressures
    - Creates problems with temperature regulation

# Circulatory System

- Age related changes of the Circulatory System
  - Veins
    - Several age changes occur
      - Most common are patchy thickening's in the inner and middle layer creating narrowing's
      - Age related changes due not alter the function of veins
        - » Thin walls, large diameters, and several veins draining an area provide ample protection

# Circulatory System

- Age related changes of the Circulatory System
  - Blood
    - Total amount blood (all components) per unit of body mass remain constant throughout life
    - Bone marrow reserve capacity declines, but always retains enough power to supply as many blood cells as needed





# Circulatory System

- Age related changes of the Circulatory System
  - Blood
    - Plasma
      - Chemical composition remains unchanged
      - Increase in waste products
      - Increase in viscosity
        - » Slows blood flow
        - » Increased risk of clot formation
        - » More rapid development of atherosclerosis

# Circulatory System

- Age related changes of the Circulatory System
  - Blood
    - Red Blood Cells
      - Overall, there are no age related changes in the ability of RBC's to function
      - May be some indications of decreased hemoglobin concentration in men >65

# Circulatory System

- Age related changes of the Circulatory System
  - Blood
    - Platelets
      - The number of circulating platelets remains unchanged
      - Age related increase of platelet clumping
      - May cause slight increased risk of thrombus formation



# Circulatory System

- Age related changes of the Circulatory System
  - Blood
    - White Blood Cells
      - Overall decreases in numbers, rate of movement, ability to be chemically attracted to areas, and proportion of capable cells to perform phagocytosis
      - Leads to a decrease in ability to fight infection
        - » Helps to explain age related susceptibility to respiratory, urinary and skin infections

# Largemouth or Smallmouth??



# Largemouth or Smallmouth??



# Largemouth or Smallmouth??





# Respiratory System

- Age related changes of the Respiratory System
  - Disclaimer!!!
    - Age related changes vs. environmental insult





# Respiratory System

- Age related changes of the Respiratory System
  - Mucous production becomes more viscous
  - Motion of cilia decrease
    - Both cause clearance problems
    - Result in narrowing of airways
    - Trapped harmful materials



# Respiratory System

- Age related changes of the Respiratory System
  - Airway structure
    - Age changes in the walls of bronchioles
      - Become narrower
      - Close earlier during expiration
      - Decreases rate of diffusion
    - Larger airways in lungs increase in diameter
      - Negative effect of increased dead space



# Respiratory System

- Age related changes of the Respiratory System
  - Muscles become weaker
    - Coughing
    - Decreases maximum rate of airflow
    - Tidal breathing unaffected at normal minute volumes
  - Skeletal system
    - Weakness/stiffness in cartilage, bones and joints
    - Decline in the maximum minute volume
    - Increased work of breathing



# Respiratory System

- Age related changes of the Respiratory System
  - Lungs
    - No significant age related changes with elastic fibers or surfactant
    - Collagen fibers become limp and less resilient
    - Alveoli become shallower
      - Reduces surface area
      - Results in reduction in surface tension and decreases elastic recoil



# Respiratory System

- Age related changes of the Respiratory System
  - Perfusion
    - There are no age related changes that affect perfusion through the pulmonary arteries and veins
    - Heart disease, certain types of pneumonia and emphysema



# Respiratory System

- Age related changes of the Respiratory System
  - Summary
    - All aspects of respiratory system involved
    - Overall decline of efficiency
    - Adjustment declines
    - Changes occur at steady rate throughout the lifespan

# Largemouth or Smallmouth??



# Largemouth or Smallmouth??





# Largemouth or Smallmouth??





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