BIOE 301

Lecture 4:

Leading Causes of Mortality, Ages 45-60

Global Health Challenges

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Summary of Lecture 3: Leading Causes of Mortality Ages 15-44

- Developing World
  1. HIV/AIDS
  2. Unintentional injuries
  3. Cardiovascular diseases
  4. Tuberculosis
- Developed World
  1. Unintentional injuries
  2. Cardiovascular diseases
  3. Cancer
  4. Self-inflicted injuries

1. HIV/AIDS

- While working at an outreach clinic in Africa, you encounter an HIV-positive woman with a positive pregnancy test.
  - By what routes can her baby contract HIV?
  - What can you do to lower this risk?
  - How effective are the measures you propose?

1. HIV/AIDS

2. Unintentional Injuries

- Do unintentional injuries account for more deaths in developed or developing countries? Give several reasons why.

3. Cancer and Cardiovascular Diseases

- Will be discussed today!

4. Tuberculosis

- If your next PPD skin test is positive, what will your doctor do next?

4. Tuberculosis

- Primary or latent?

- Do you worry about resistance?

4. Self-Inflicted Injuries

- What disease ranks #1 in DALYs in developed countries?
- How can we prevent these injuries?

Lecture 4:
Leading Causes of Mortality Ages 45-60

- Developing World
  1. Cardiovascular diseases
  2. Cancer (malignant neoplasms)
  3. Unintentional injuries
  4. HIV/AIDS
- Developed World
  1. Cardiovascular diseases
  2. Cancer (malignant neoplasms)
  3. Unintentional injuries
  4. Digestive Diseases

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Combined Impact of Health Behaviours and Mortality in Men and Women: The EPIC-Norfolk Prospective Population Study

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ABSTRACT

Background

There is overwhelming evidence that behavioural factors influence health, but thei combined impact on the general population is less well documented. We aimed to quantify th potential combined impact of four health behaviours on mortality in men and women living i the general community.

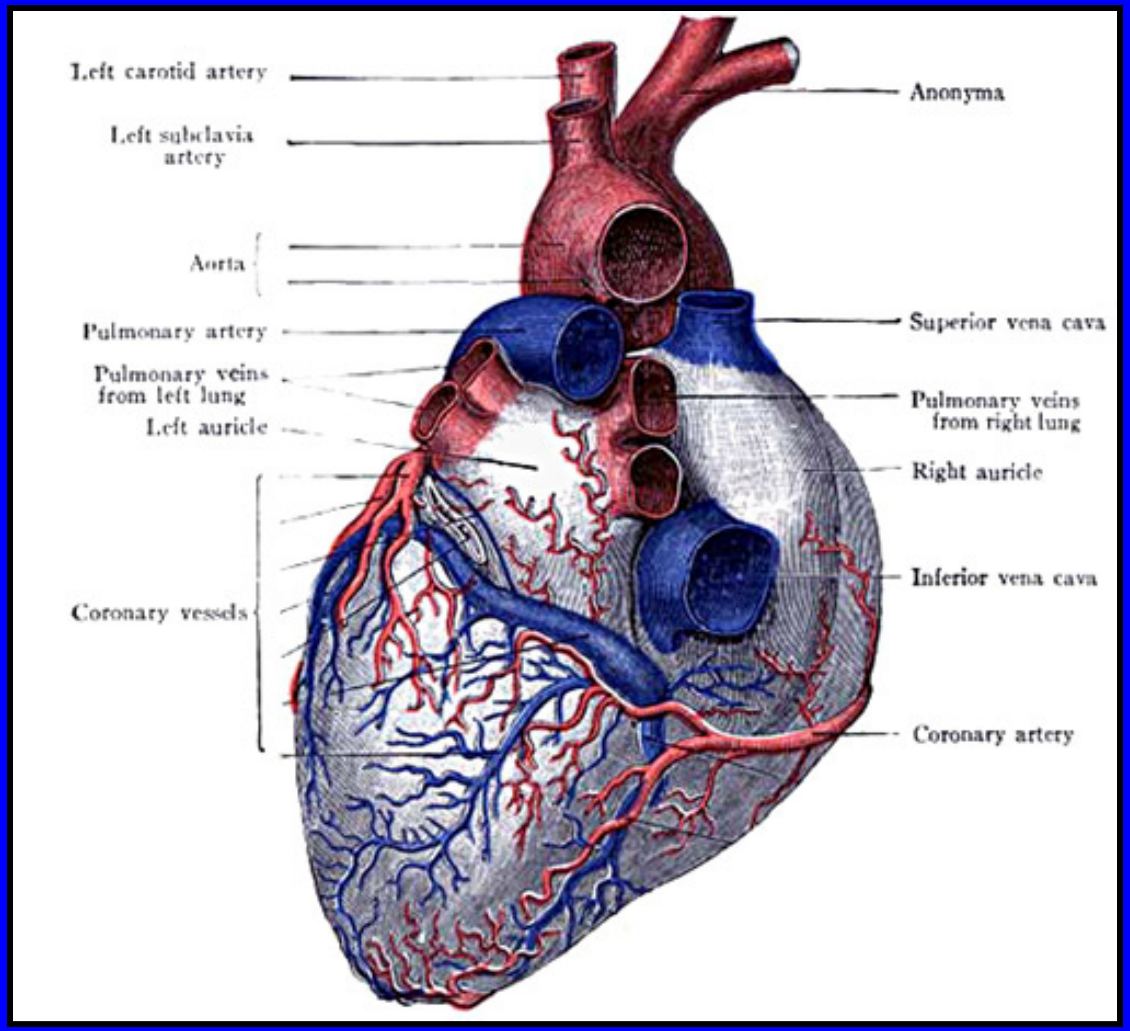
Methods and Findings

We examined the prospective relationship between lifestyle and mortality in a prospectiv population study of 20,244 men and women aged 45–79 y with no known cardiovascula disease or cancer at baseline survey in 1993–1997, living in the general community in th United Kingdom, and followed up to 2006. Participants scored one point for each healt behaviour: current non-smoking, not physically inactive, moderate alcohol intake (1–14 units week) and plasma vitamin C >50 mmol/l indicating fruit and vegetable intake of at least fiv servings a day, for a total score ranging from zero to four. After an average 11 y follow-up, th age-, sex-, body mass–, and social class–adjusted relative risks (95% confidence intervals) for al cause mortality(1,987 deaths) for men and women who had three, two, one, and zer compared to four health behaviours were respectively, 1.39 (1.21–1.60), 1.95 (1.70—2.25), 2.5 (2.13–3.00), and 4.04 (2.95–5.54) $p < 0.001$ trend. The relationships were consistent i subgroups stratified by sex, age, body mass index, and social class, and after excluding death within 2 y. The trends were strongest for cardiovascular causes. The mortality risk for those wit four compared to zero health behaviours was equivalent to being 14 y younger i chronological age.

Conclusions

Four health behaviours combined predict a 4-fold difference in total mortality in men an women, with an estimated impact equivalent to 14 y in chronological age.

1. Cardiovascular Diseases



70ml per beat... 1.3 gallons per minute... 1,900 gallons per day... 700,000 gallons per year... 48 million gallons by age 70...

1. Cardiovascular Diseases

- Burden of Cardiovascular Diseases
- Ischemic Heart Disease
  - Epidemiology
  - Pathogenesis
  - Diagnosis
  - Treatment
- Cerebrovascular Disease
  - Epidemiology
  - Pathogenesis
  - Diagnosis
  - Treatment

Burden of Cardiovascular Diseases: Ages 15-44

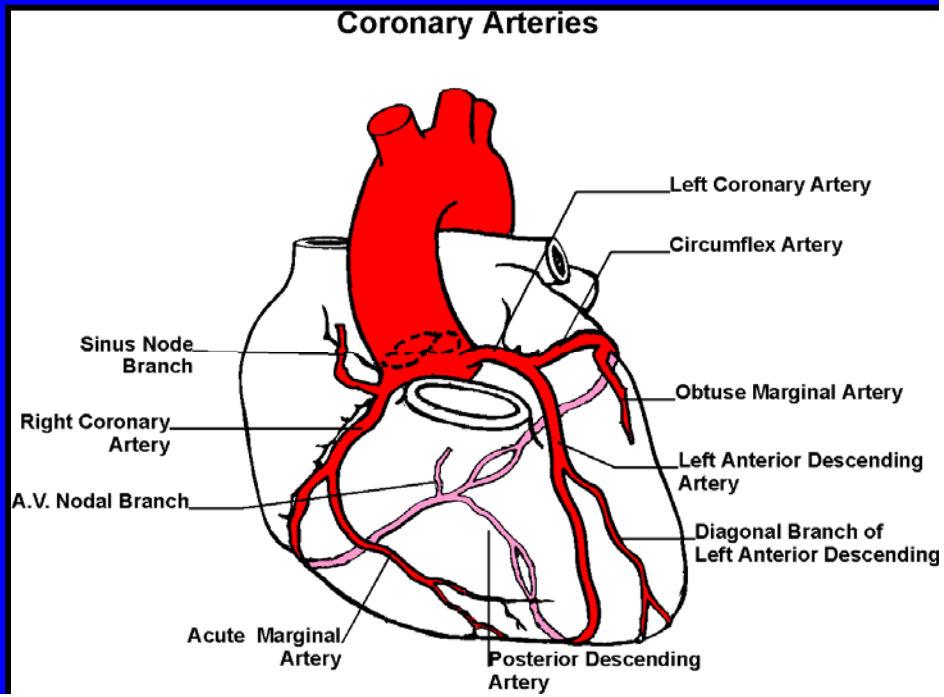
- 768,000 people ages 15-44 die as a result of cardiovascular disease every year
- Most common causes:
  - Ischemic heart disease (286,000 deaths)
  - Cerebrovascular disease (159,000 deaths)

Burden of Cardiovascular Diseases: Ages 45-60

- 2 million people ages 45-60 die as a result of cardiovascular disease every year
- Most common causes:
  - Ischemic heart disease (1 million deaths)
  - Cerebrovascular disease (625,000 deaths)

Ischemic Heart Disease: Epidemiology

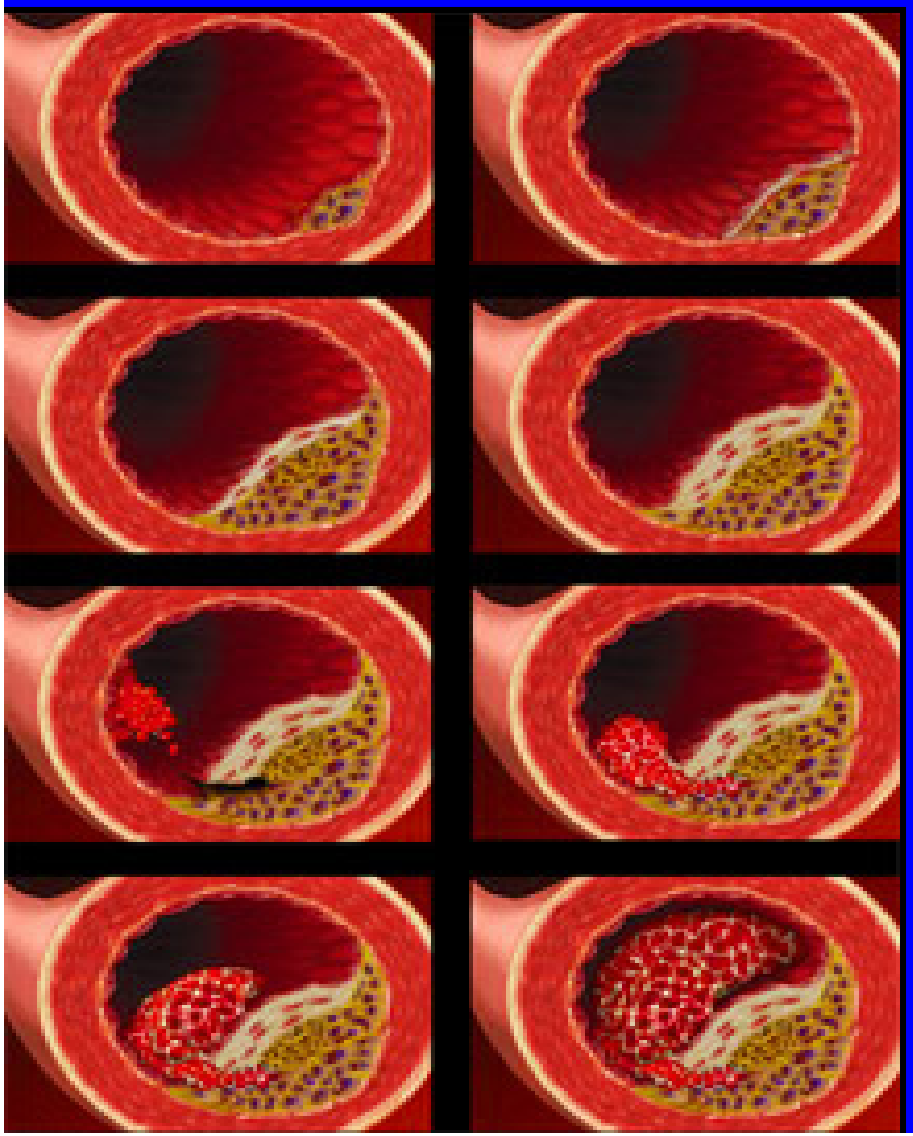
- United States
  - 12 million people have coronary artery disease
  - Causes more deaths, disability and economic cost than any other illness
- Risk factors
  - Positive family history
  - Diabetes
  - Hyperlipidemia
  - Hypertension
  - Smoking



Ischemic Heart Disease: Pathogenesis

- Atherosclerosis
  - Causes decrease in myocardial perfusion
  - Most common symptom is angina
    - Stable angina (75% lumen blockage)
      - Typically a 50-60 yo man or 65-75 yo woman
      - Heaviness, pressure, squeezing, smothering or choking
      - Localized to chest, may radiate to left shoulder and arms
      - Lasts 1-5 minutes
    - Unstable angina (more than 80% blockage)
      - Patients with angina that is:
        - New onset and severe and frequent
        - Accelerating
        - Angina at rest

Ischemic Heart Disease: Pathogenesis



Evolution of a heart attack:

1. Endothelial injury
2. Fatty deposits
3. Fibrous cap with necrotic core
4. Unstable plaques rupture, thrombogenic core causes blood clots
5. Blood clots can lead to complete occlusion
6. Heart muscle supplied by occluded artery dies
7. If patient survives, affected heart muscle is replaced by scar tissue

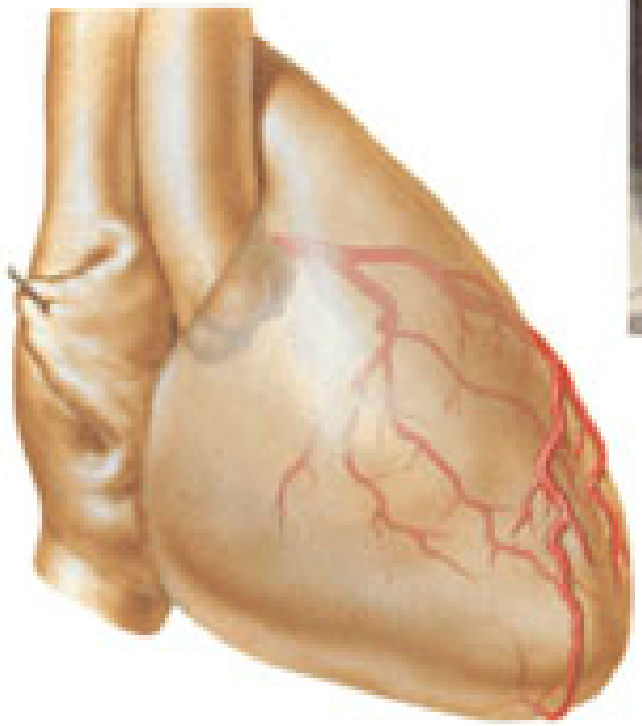
- ***In the US, 30% of patients do not survive a first heart attack***
- ***For 50% of CAD patients, their first symptom is a heart attack***

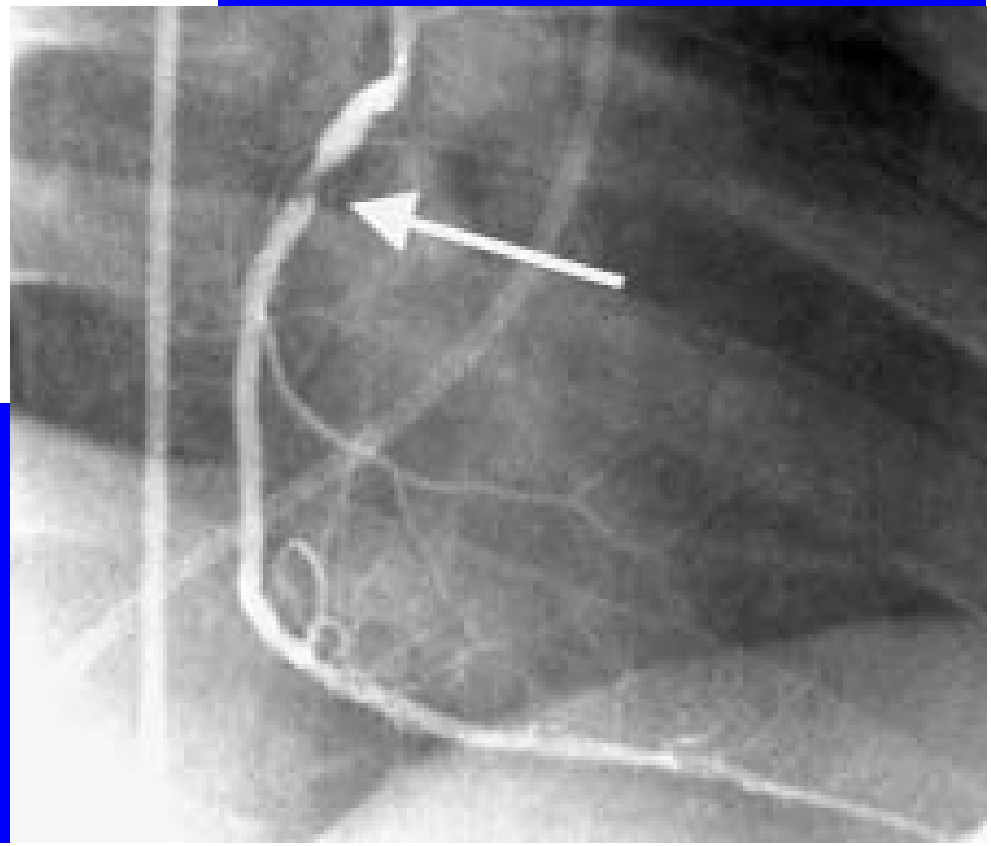
Ischemic Heart Disease: Diagnosis

- Usually made by history
- Physical exam may reveal other disorders
  - Lipid disorders
  - Hypertension
  - Diabetes
- Testing
  - EKG
  - Stress Testing
  - Coronary arteriography

Left Coronary Artery

Arteriographic View 2



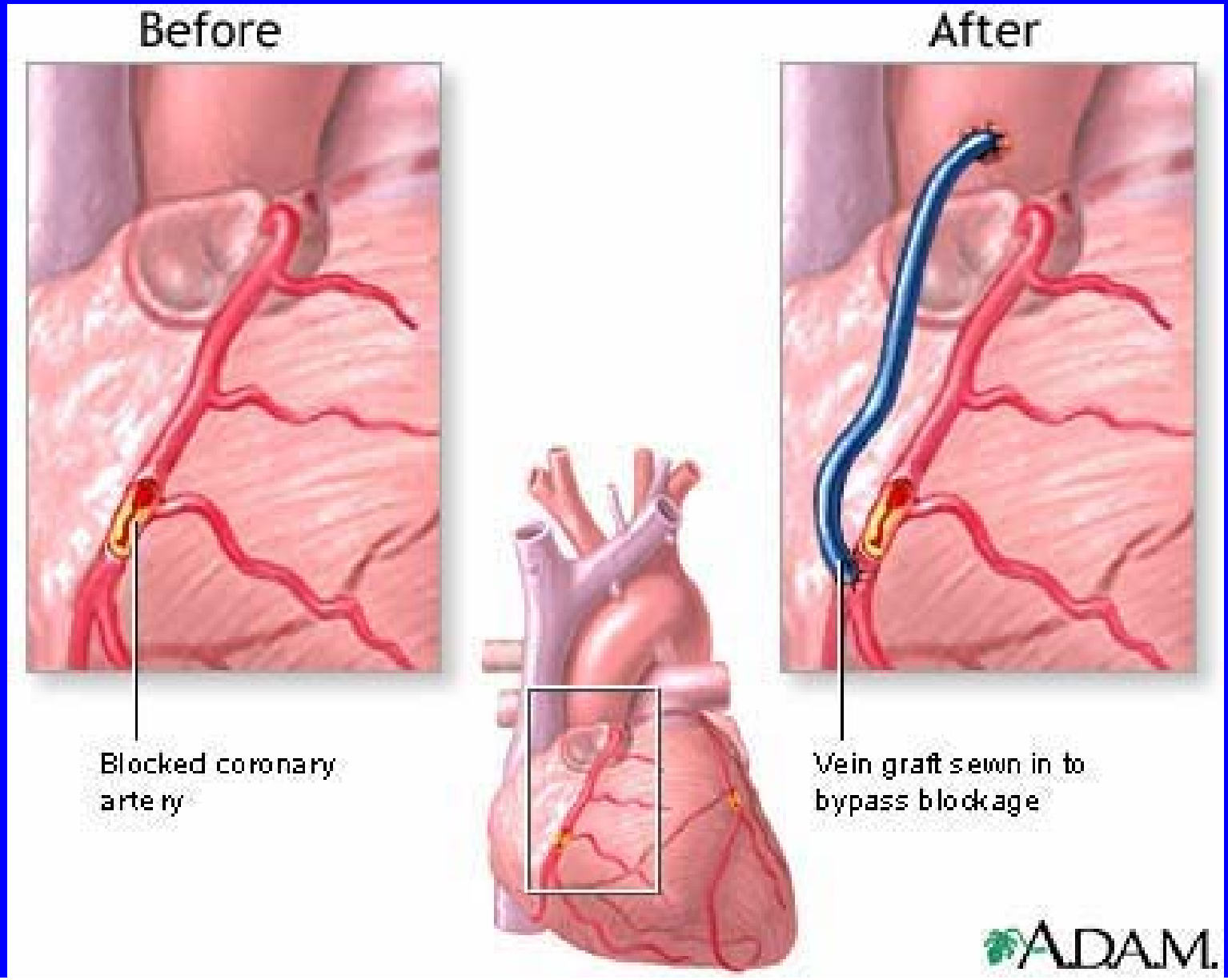


http://www.columbiasurgery.org/divisions/cardiac/images/novartis_207B.jpg

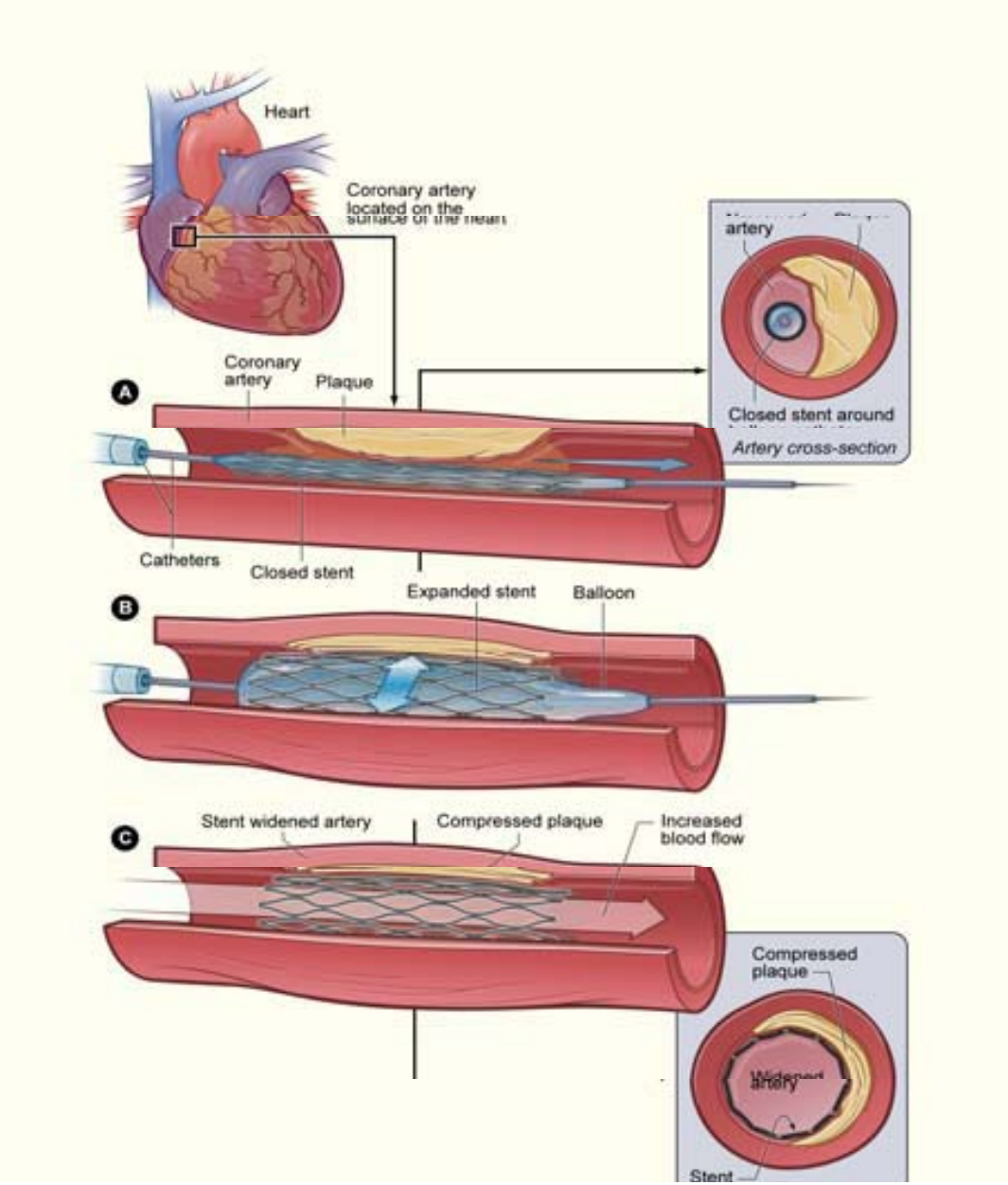
Ischemic Heart Disease: Treatment

- Medical management (may relieve symptoms of CAD, but does not reduce coronary blockage)
  - Nitrates
    - Increase myocardial oxygen supply, systemic vasodilation
  - Beta blockers
    - Inhibit increases in heart rate and contractility
    - Decrease myocardial oxygen demand
  - Calcium channel agonists
    - Coronary vasodilators
- Thrombolysis
- CABG (Coronary Artery Bypass Grafting)
- PTCA (Percutaneous Transluminal Coronary Angioplasty)

CABG


Before
After
Blocked coronary artery
Vein graft sewn in to bypass blockage
A.D.A.M.

PTCA

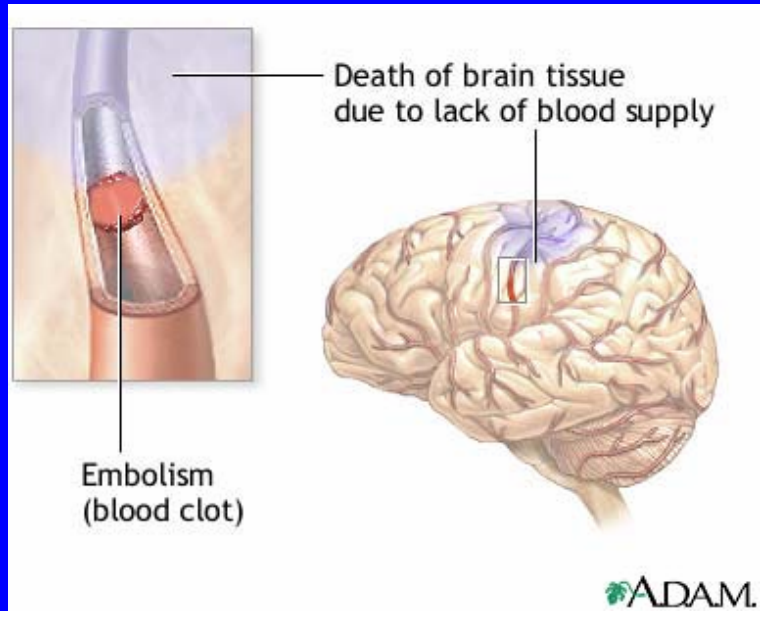

Heart
Coronary artery located on the
artery
Coronary artery
Plaque
A
Closed stent around
Artery cross-section
Catheters
Closed stent
Expanded stent
Balloon
B
Stent widened artery
Compressed plaque
Increased blood flow
C
Compressed plaque
Stent

Cerebrovascular Disease: Epidemiology

- Third leading cause of death in the US
- Most prevalent neurologic disorder
- 87% caused by ischemia and resulting infarction

Cerebrovascular Disease: Pathogenesis

- Causes of stroke:
  - Blood vessel supplying the brain is blocked
  - Thrombosis (clot in vessel)
  - Embolism (clot breaks off and lodges in blood vessel in brain)
  - Vasoconstriction or spasm
  - Venous collapse



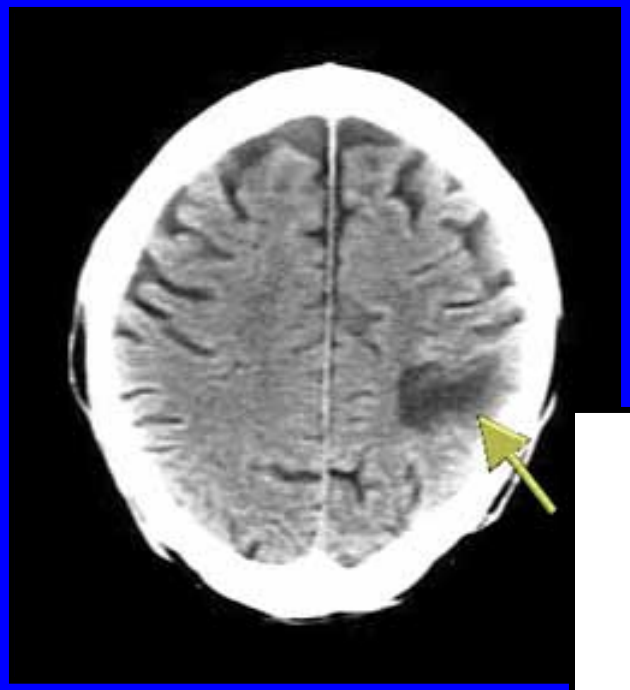
Cerebrovascular Disease: Pathogenesis

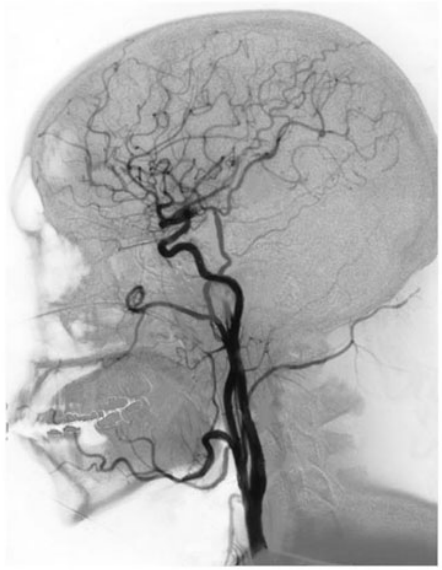
- Abrupt onset with focal neurologic deficit
  - Usually mini-event or warning signs
    - 15% Transient Ischemic Attacks (TIAs)
  - Reversible ischemia
    - Some lasting 24-72 hours
  - Completed stroke
    - Maximal deficit within hours
    - Often patient awakens with completed stroke
    - Usually preceded by TIA Progressive stroke
    - Ischemia worsens min. to min. or hour to hour

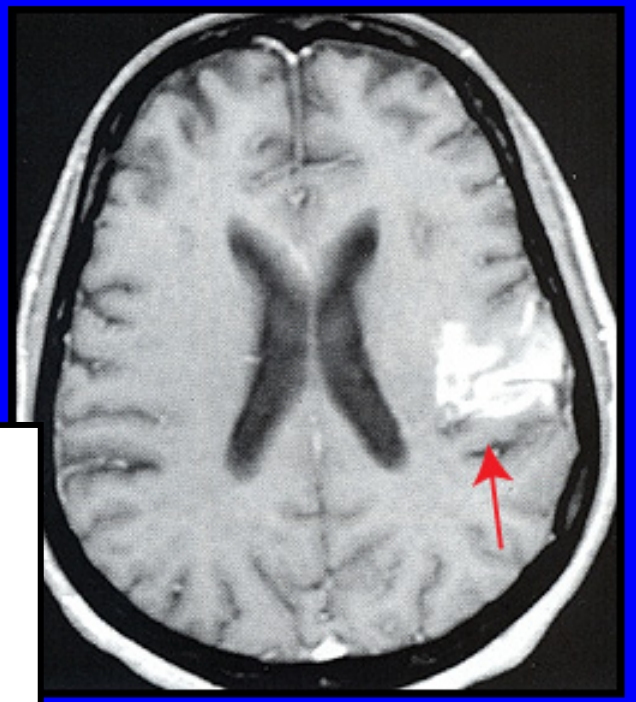
Cerebrovascular Disease: Diagnosis

- History
- Exam
- Imaging
  - CT Scan
  - MRI
  - MR Angiography

Cerebrovascular Disease: Diagnosis

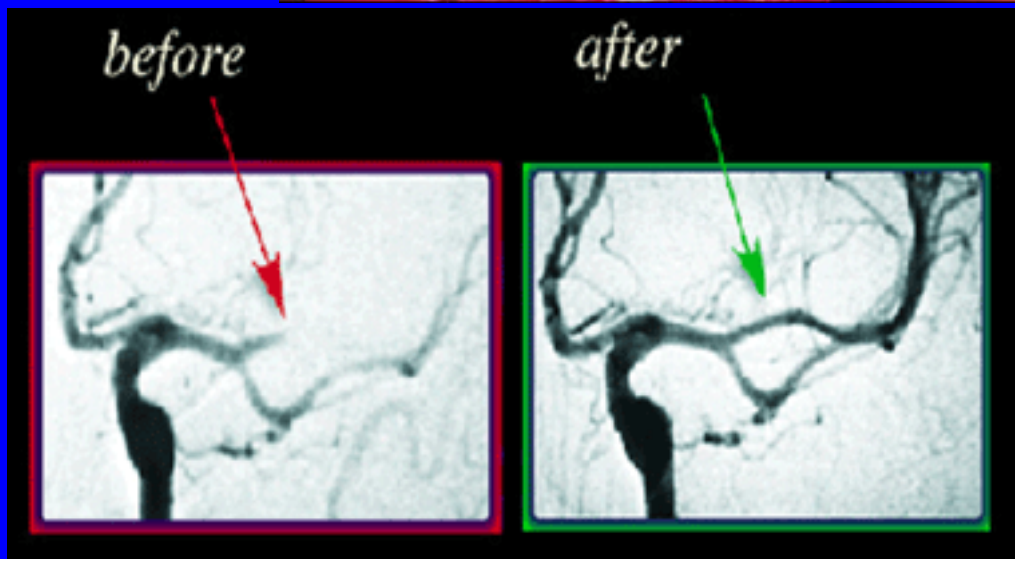






Cerebrovascular Disease: Treatment

- Thrombolysis
- Rehabilitation
- Experimental
  - Angioplasty
  - Heparin
  - Coumarin
  - Aspirin



2. Cancer

- Cancer Overview
- Burden of Cancer
- Pathogenesis of Cancer
- Cancer Diagnosis
- Treatment of Cancer
- Cancer and Infectious Diseases
- Lung Cancer
  - Epidemiology
  - Clinical Manifestations
  - Treatment

Cancer Overview

- Cancer is a group of diseases characterized by uncontrolled cell growth
- Cancer cells usually form a tumor
  - Abnormal mass of tissue
  - Growth exceeds that of normal tissue
  - Purposeless and preys on host
  - Two types of tumors: Benign, Malignant
- Disease results from:
  - Abnormal growth, loss of normal function
  - Invasion, compression of adjacent tissues
  - Metastases to distant sites in the body

Burden of Cancer

- 2nd leading cause of death in US
- 1 of every 4 deaths is from cancer
- Nearly 1/2 of all men and 1/3 of all women will develop cancer at some point in their lives
- 5-year survival rate: 59%
- Annual costs: $107 billion

Burden of Cancer, Ages 15-44

- Cancer kills 580,000 people ages 15-44 each year throughout the world
- Most common causes, ages 15-44:
  - Liver Cancer (68,000 deaths per year)
  - Leukemias (65,000)
  - Stomach Cancer (58,000)
  - Breast Cancer (57,000)

Burden of Cancer, Ages 45-60

- Cancer kills 1.5 million people ages 45-60 each year throughout the world
- Most common causes, ages 45-60:
  - Lung cancer (263,000 deaths per year)
  - Stomach cancer (185,000)
  - Liver cancer (179,000)
  - Breast cancer (148,000)

2007 Estimated US Cancer Deaths

Men 291,270		Women 273,560	
Lung & bronchus	31%	26%	Lung & bronchus
Prostate	9%	15%	Breast
Colon & Rectum	9%	10%	Colon & rectum
Pancreas	6%	6%	Ovary
Leukemia	4%	6%	Pancreas
Esophagus	4%	4%	Leukemia
Liver & intrahepatic bile duct	4%	3%	Non-Hodgkin lymphoma
Non-Hodgkin lymphoma	3%	3%	Uterine corpus
Urinary bladder	3%	2%	Multiple myeloma
Kidney	3%	2%	Brain/other nervous system
All other sites	24%	23%	All other sites

Source: American Cancer Society, 2007.

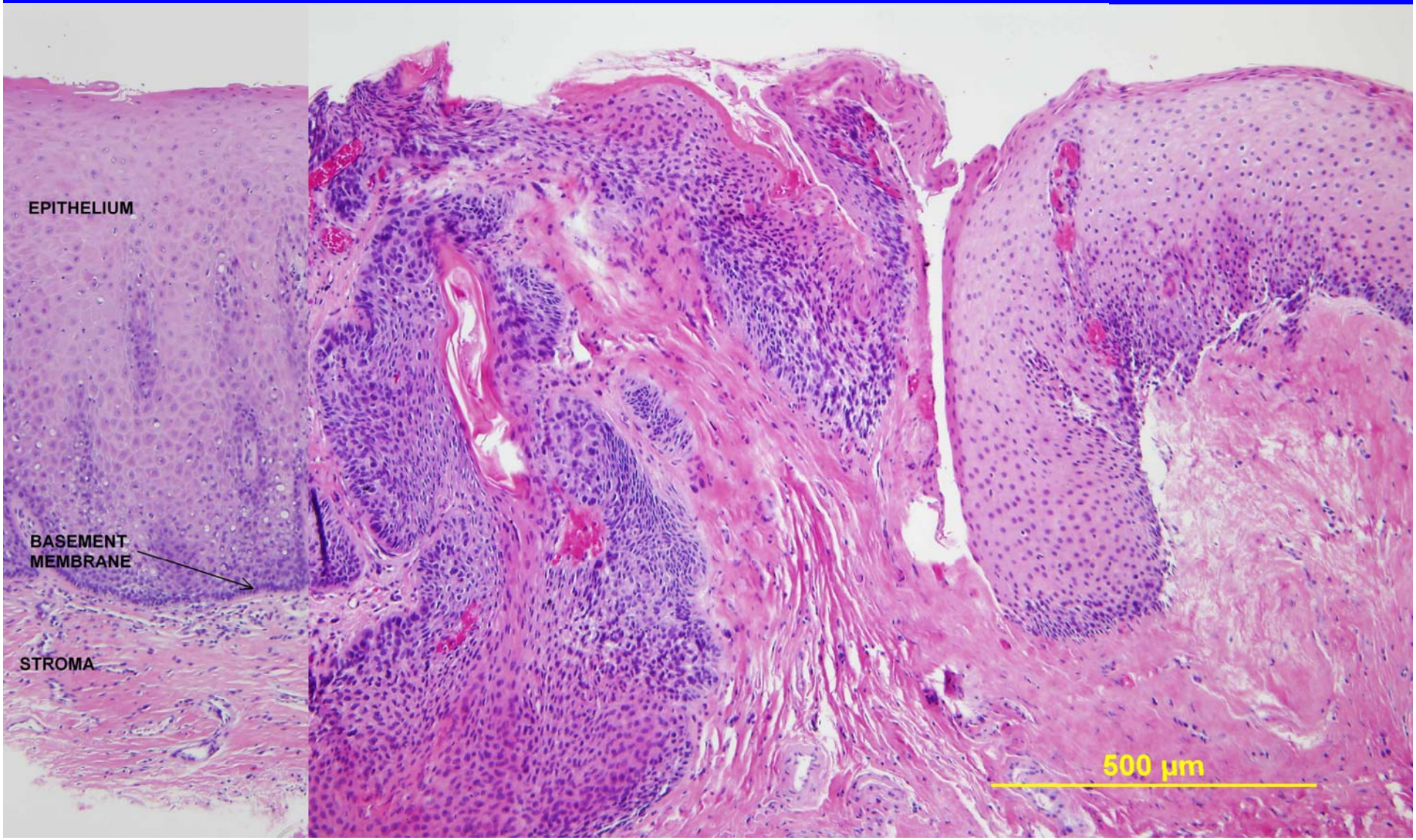
Pathogenesis of Cancer

- Natural history of most cancers include sequential phases:
  - Malignant transformation in target cell
  - Growth of transformed cells
  - Local invasion
  - Distant metastases

Pathogenesis of Cancer

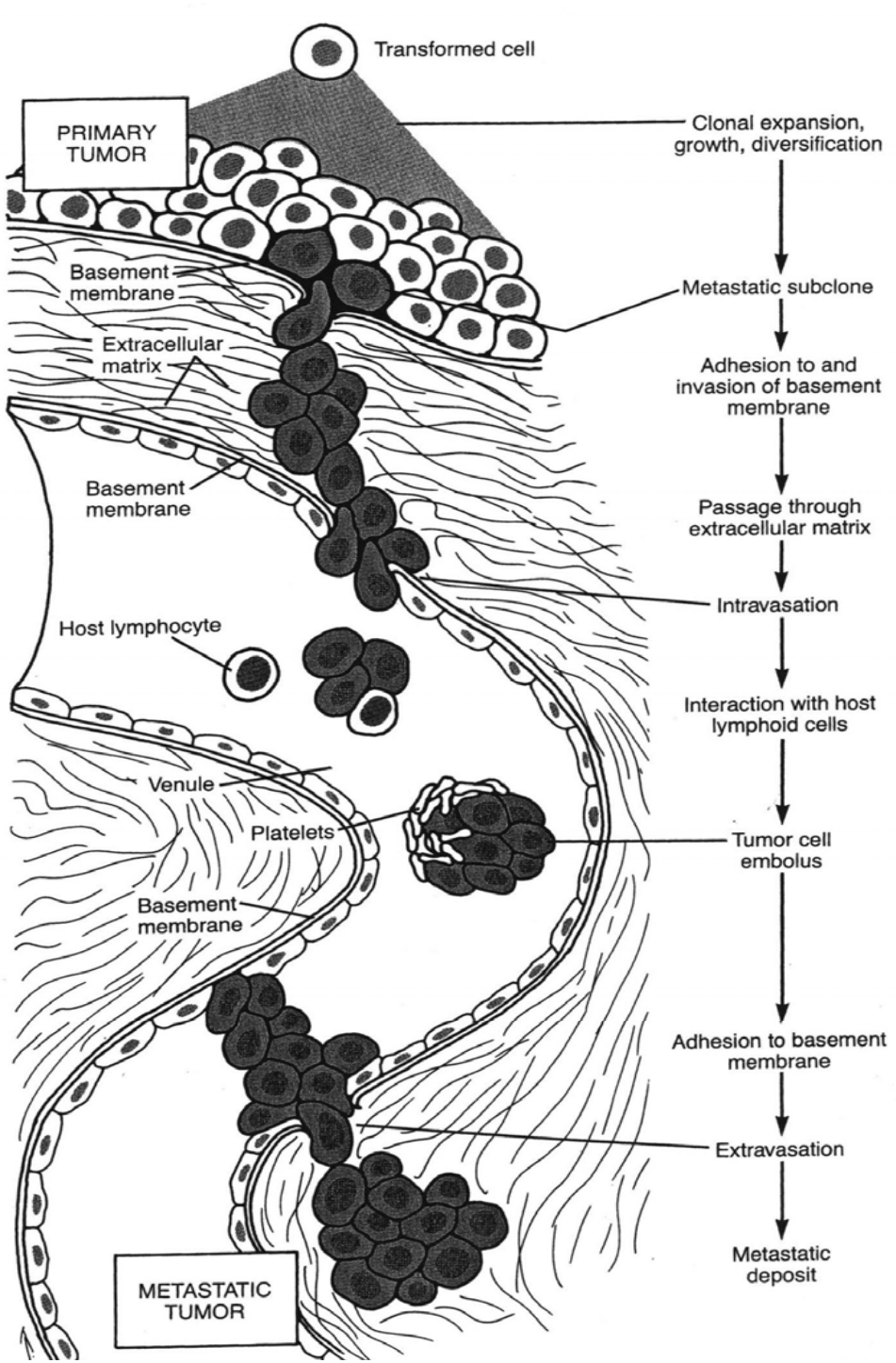
- Malignant Transformation, AKA Carcinogenesis:
  - Result of non-lethal genetic damage
    - Carcinogens, hereditary defects, or both
  - Tumor masses result from the clonal expansion of a single progenitor cell that has incurred genetic damage
  - Often, the host immune system is able to detect and eliminate the abnormally proliferating cells. But when these cells escape destruction...

Pathogenesis of Cancer



Pathogenesis of Cancer

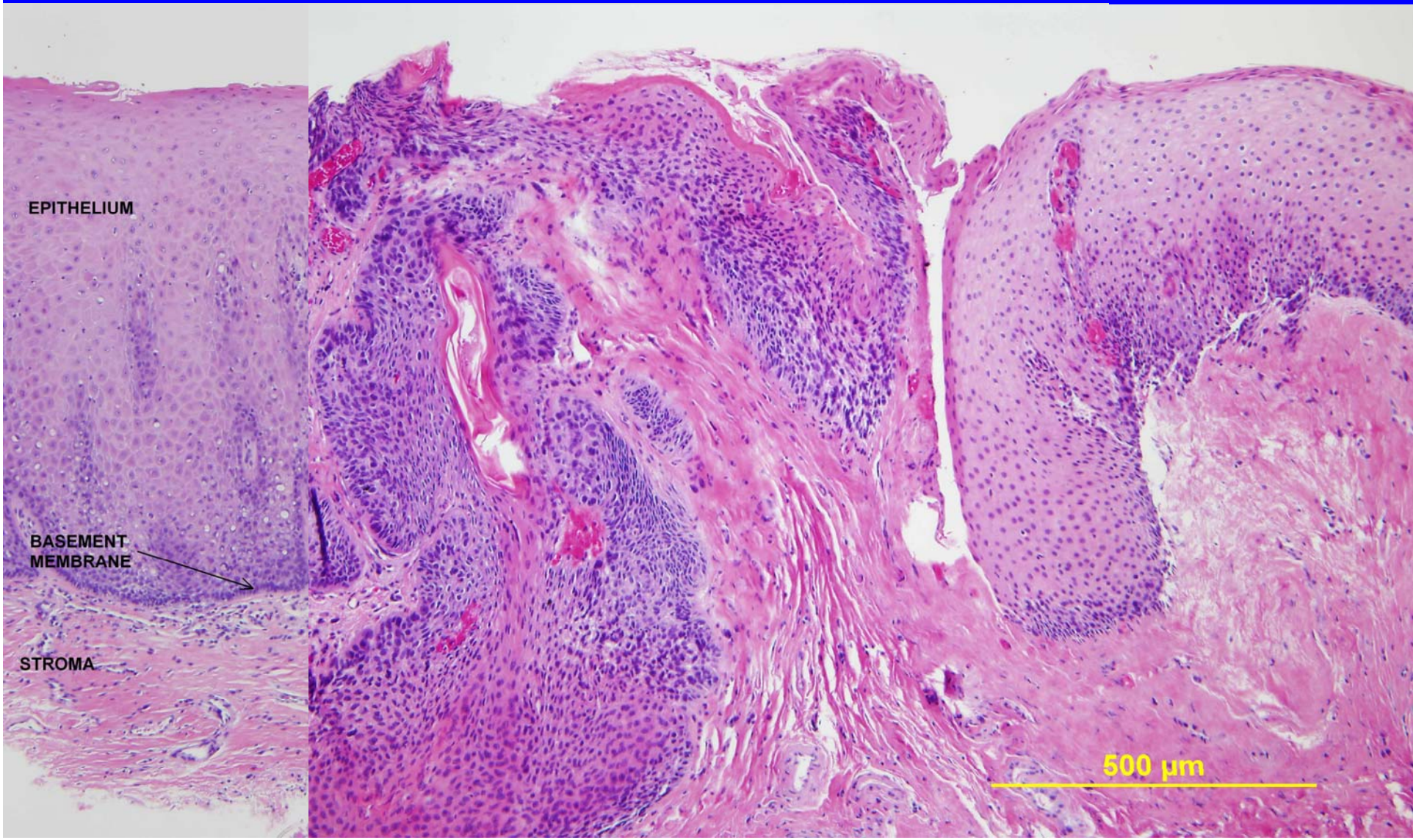
- How do tumors invade?
  - Detach from primary tumor
  - Degrade surrounding matrix
  - Migrate via blood or lymphatic vessels
- Metastasis causes 90% of cancer death


Transformed cell
PRIMARY TUMOR
Clonal expansion, growth, diversification
Basement membrane
Metastatic subclone
Extracellular matrix
Adhesion to and invasion of basement membrane
Basement membrane
Passage through extracellular matrix
Intravasation
Host lymphocyte
Interaction with host lymphoid cells
Venule
Platelets
Tumor cell embolus
Basement membrane
Adhesion to basement membrane
Extravasation
Metastatic deposit
METASTATIC TUMOR

Cancer Diagnosis

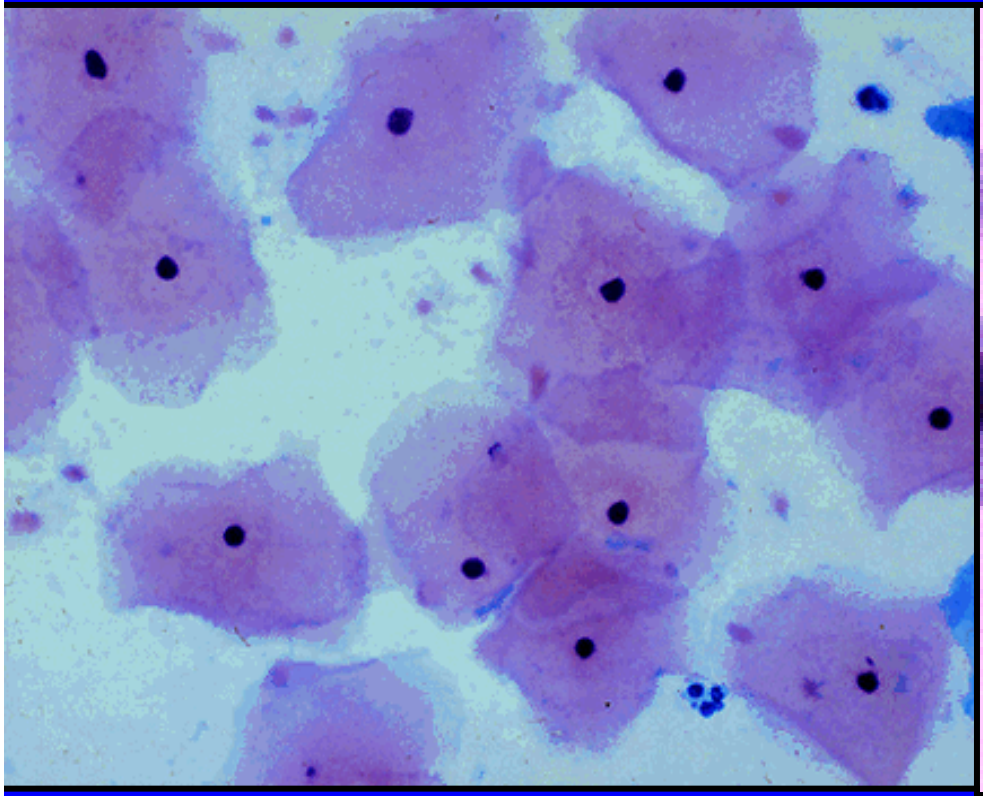
- Benign tumors
  - Well differentiated
  - Dysplasia
    - Precancerous condition in epithelial tissue
    - Anaplastic cells in epithelium
    - Dysplasia does not always progress to cancer
- Malignant tumors
  - Range from well to poorly differentiated
  - Anaplasia:
    - Cells and nuclei show pleomorphism
    - Cells contain abundant DNA, coarse, clumped chromatin
    - Large NC ratio (1:1) rather than 1:4 or less
    - Large nucleoli
    - Large # of mitoses

Cancer Diagnosis

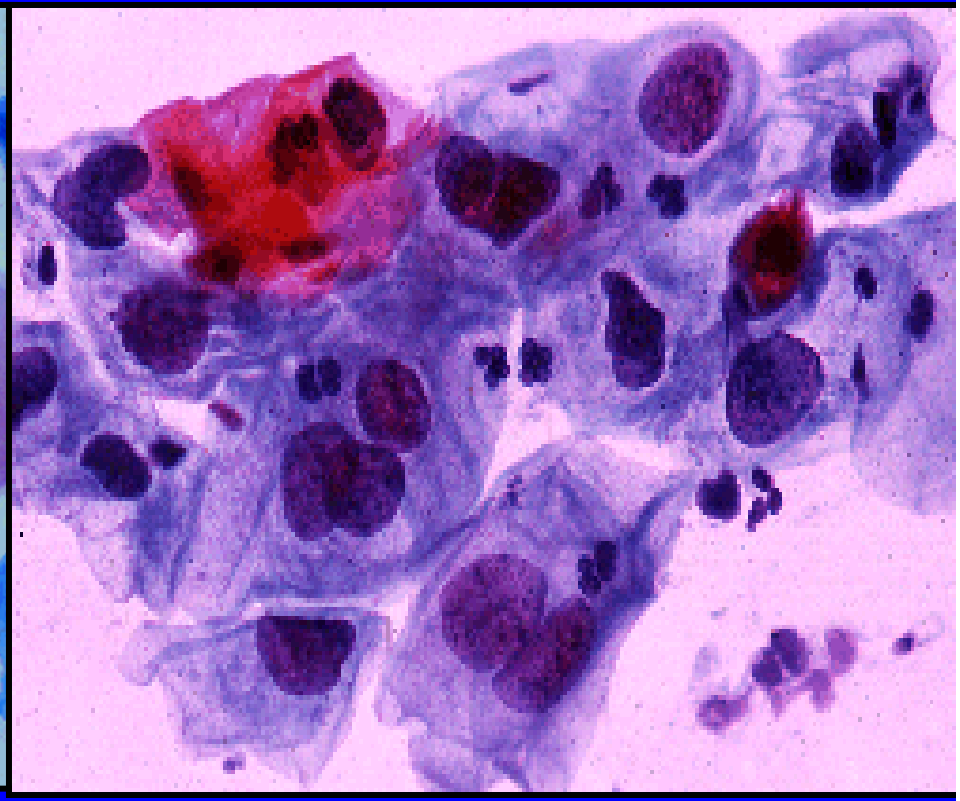


Cancer Diagnosis

Normal Pap smear

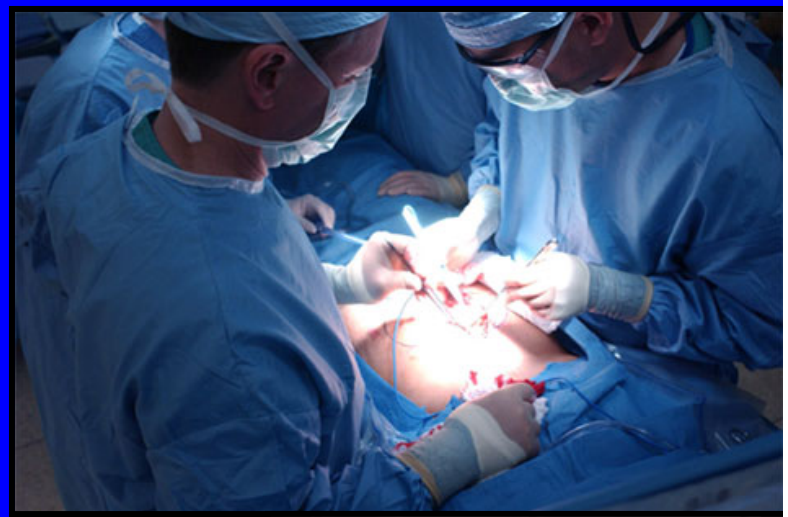


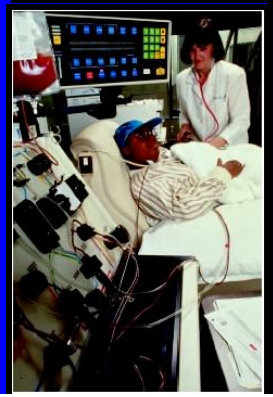
Cervical cancer



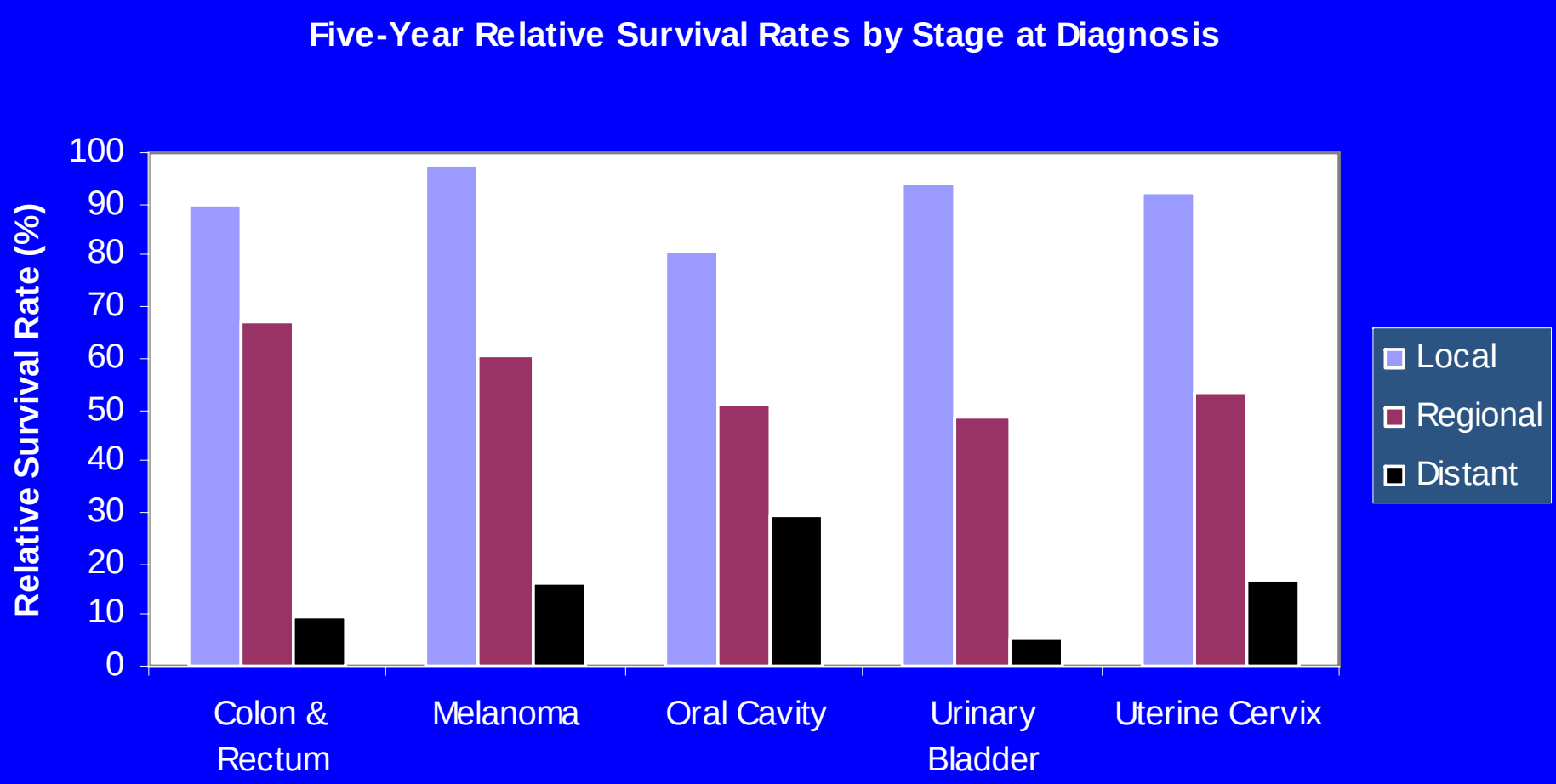
Treatment of Cancer

- Surgical excision
  - The most effective therapy, IF the entire tumor can be resected
  - 90% 5-year survival
  - Often, metastasis has already occurred
- Radiation/Chemotherapy
  - Side effects





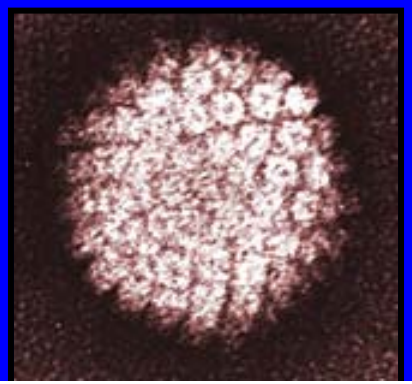
Importance of Cancer Screening



Cancer and Infectious Diseases

- Worldwide 15-20% of cancers are linked to infectious diseases
- These cancers can be avoided by preventing the infection associated with them

HPV, cervical cancer



H. pylori, stomach cancer

HBV, liver cancer

Lung Cancer: Epidemiology

- United States
  - 89,510 males die per year
  - 70,880 females die per year
  - Five year survival: 16%
  - Only 16% of patients are diagnosed with localized disease
- Risk factors
  - Smoking
    - Active: increases relative risk 13X
    - Passive: increases relative risk 1.5X

Lung Cancer: Clinical Manifestations

- Signs and symptoms
  - Coughing, wheezing, difficulty breathing, recurrent pneumonia
- Diagnosis:
  - Screening:
    - Trials of CXR, sputum cytology NOT SUCCESSFUL
  - Diagnostic:
    - CXR
    - CT directed biopsy
    - Bronchoscopically directed biopsy
  - Staging: localized vs. distant disease

Lung Cancer: Treatment

- Localized
  - Small: Possibly surgery
  - Large: Surgery + Adjunct Chemo or Radiation Therapy
- Metastatic:
  - Chemo + Radiation Therapy

3. Unintentional Injuries

- More than 618,000 people ages 45-60 die from unintentional injuries each year
- Leading cause is *road accidents*:
  - 222,000 deaths per year in this age group
- Covered in *Lecture 3*

4. HIV/AIDS

- In the developing world, causes 386,000 deaths in people ages 45-60 per year
- Covered in *Lecture 3*

4. Digestive Diseases

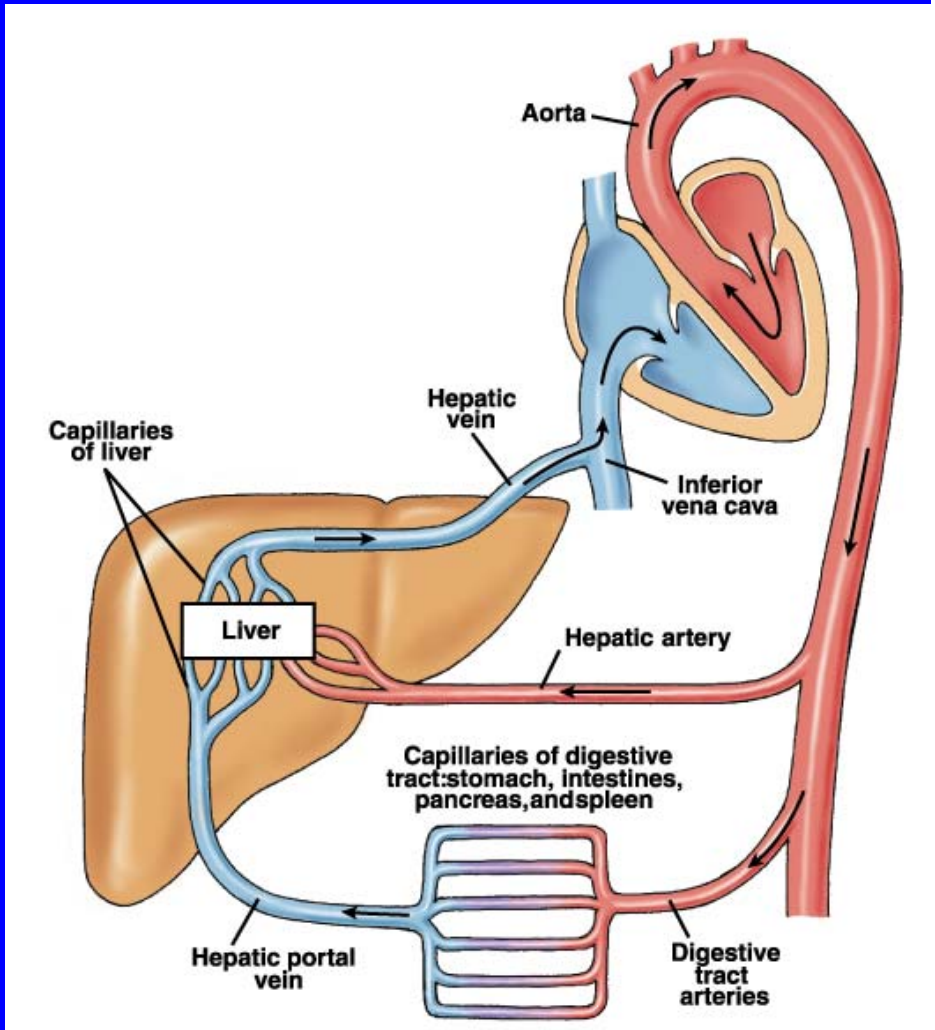
- Burden of digestive diseases
- Normal liver
- Cirrhosis
- Hepatitis

Burden of Digestive Diseases

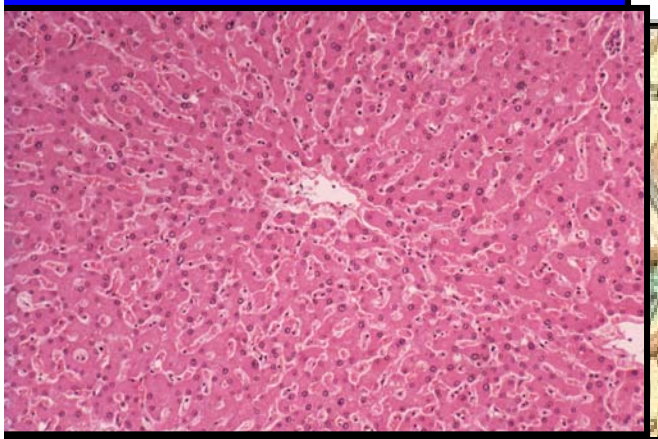
- Worldwide, 456,000 people aged 45-60 die each year from digestive diseases
- Cirrhosis of the liver
  - Kills 250,000 people each year between the ages of 45 and 60

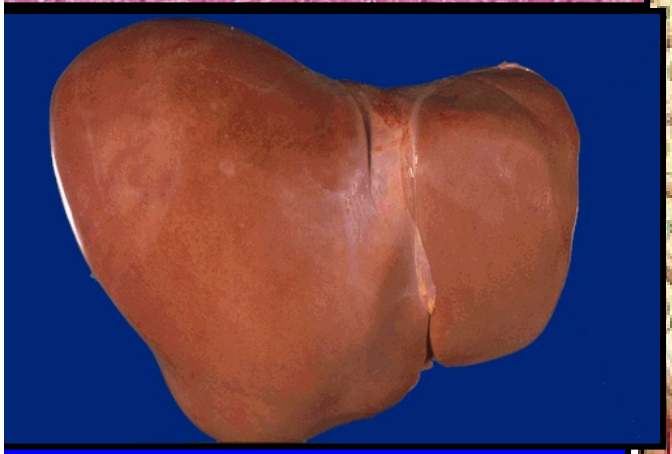
Normal Liver

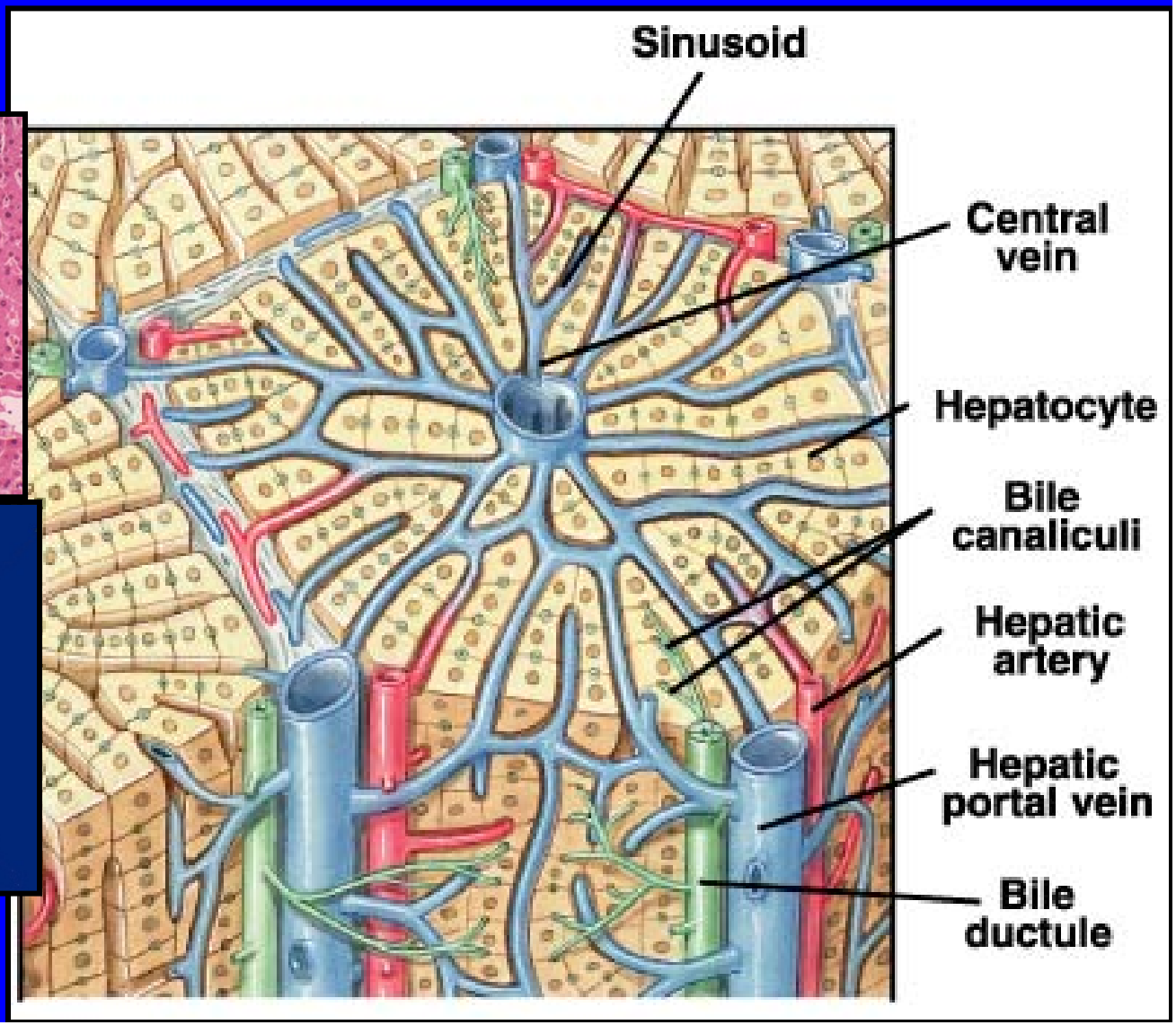
- Largest organ in the body
  - Metabolizes fat and glucose
  - Helps remove toxic substances from blood
  - Produces:
    - Bile to help absorb fats
    - Proteins that regulate blood clotting
    - Immune agents
- Loss of liver function can produce severe disease and death



Normal Liver

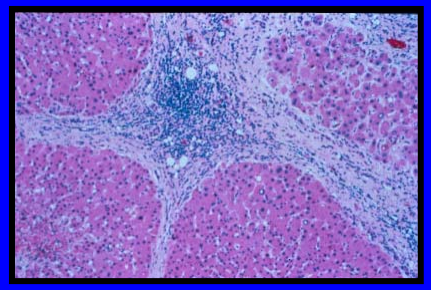


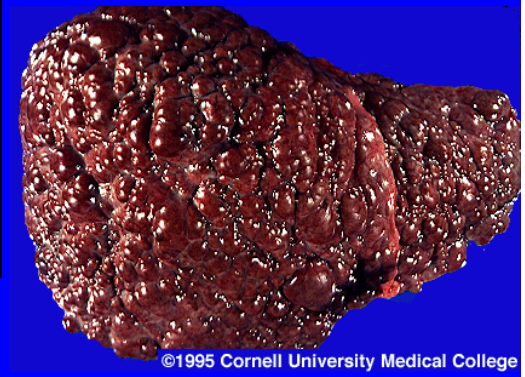




Cirrhosis

- Normal liver is replaced with scar tissue as a result of chronic injury, interfering with liver function
- Causes of cirrhosis:
  - Chronic alcoholism
  - Viral hepatitis infection





- Symptoms of cirrhosis:
  - Exhaustion, loss of appetite, nausea, vomiting blood, weakness, weight loss, and abdominal pain.
  - Patients bruise and bleed easily and become highly sensitive to medicines with increasing loss of liver functions.
- Diagnosis: needle biopsy

Hepatitis

- Infection which can also lead to cirrhosis
- Caused by hepatitis viruses A, B, C, D, and E
  - HBV most common worldwide
  - HCV most common in the US
- Acute HBV infection leads to chronic hepatitis in 5%, some of whom will develop cirrhosis
- Acute HCV infection leads to chronic hepatitis in 80%, 30% of whom will develop cirrhosis
- Vaccines available for HAV, HBV

Summary of Lecture Four

- Developing World
  1. Cardiovascular diseases
  2. Cancer (malignant neoplasms)
  3. Unintentional injuries
  4. HIV/AIDS
- Developed World
  1. Cardiovascular diseases
  2. Cancer (malignant neoplasms)
  3. Unintentional injuries
  4. Digestive Diseases

Leading Causes of Death

Ages 0-4:
Perinatal conditions
Lower respiratory infections
Diarrheal diseases
Malaria

Perinatal conditions
Congenital anomalies
Lower respiratory infections
Unintentional injuries

Ages 15-44:
HIV/AIDS
Unintentional injuries
Cardiovascular diseases
Tuberculosis

Unintentional injuries
Cardiovascular disease
Cancer
Self-Inflicted Injuries

Ages 45-59:
Cardiovascular diseases
Cancers
Unintentional injuries
HIV/AIDS

Cardiovascular diseases
Cancer
Unintentional injuries
Digestive Diseases

BY SPECIFIC DISEASE

Ages 0-4

Developing Countries			Developed Countries		
Cause of Disability	# DALYs	% of Total DALYs	Cause of Disability	# DALYs	% of Total DALYs
Lower respiratory infections	60,236,694	14.3%	Low birth weight	1,337,103	10.3%
Diarrhoeal diseases	55,543,335	13.2%	Congenital heart anomalies	1,327,944	10.2%
Low birth weight	44,997,007	10.7%	Birth asphyxia and birth trauma	1,310,241	10.1%
Malaria	42,244,474	10.0%	Lower respiratory infections	1,138,923	8.8%
Birth asphyxia and birth trauma	33,133,613	7.9%	Diarrhoeal diseases	537,438	4.1%
Measles	18,618,263	4.4%	Iodine deficiency	495,378	3.8%
Protein-energy malnutrition	14,718,970	3.5%	Mental retardation, lead-caused	467,625	3.6%
Congenital heart anomalies	12,851,427	3.1%	Meningitis	367,281	2.8%
Pertussis	12,264,915	2.9%	Down syndrome	367,109	2.8%
HIV/AIDS	12,181,146	2.9%	Asthma	259,845	2.0%

Total DALYs	420,827,539	Total DALYs	13,003,994
Total Population	536,962,742	Total Population	81,206,312
DALYs Rate	78.4%	DALYs Rate	16.0%

Ages 15-44

Developing Countries			Developed Countries		
Cause of Disability	# DALYs	% of Total DALYs	Cause of Disability	# DALYs	% of Total DALYs
HIV/AIDS	59,382,428	13.3%	Unipolar depressive disorders	10,484,105	13.7%
Unipolar depressive disorders	35,978,376	8.1%	Alcohol use disorders	6,308,519	8.3%
Tuberculosis	19,848,813	4.5%	Road traffic accidents	3,804,331	5.0%
Road traffic accidents	19,151,250	4.3%	Self-inflicted injuries	3,144,909	4.1%
Violence	14,923,499	3.3%	Violence	2,285,286	3.0%
Self-inflicted injuries	12,189,495	2.7%	Bipolar disorder	2,209,104	2.9%
Schizophrenia	12,074,350	2.7%	Drug use disorders	2,037,084	2.7%
Bipolar disorder	10,977,659	2.5%	Schizophrenia	1,944,628	2.5%
Alcohol use disorders	10,664,330	2.4%	Ischaemic heart disease	1,916,252	2.5%
Hearing loss, adult onset	9,186,758	2.1%	Hearing loss, adult onset	1,523,616	2.0%

Total DALYs	445,613,527	Total DALYs	76,416,610
Total Population	2,312,272,679	Total Population	597,682,683
DALYs Rate	19.3%	DALYs Rate	12.8%

Ages 45-59	Developing Countries		Developed Countries		
Cause of Disability	# DALYs	% of Total DALYs	Cause of Disability	# DALYs	% of Total DALYs
Ischaemic heart disease	12,050,270	7.6%	Ischaemic heart disease	5,286,352	11.3%
Cerebrovascular disease	10,212,640	6.4%	Cerebrovascular disease	3,123,891	6.7%
Cataracts	9,735,678	6.1%	Unipolar depressive disorders	3,006,141	6.4%
Unipolar depressive disorders	8,374,876	5.3%	Hearing loss, adult onset	1,884,097	4.0%
Chronic obstructive pulmonary disease	7,287,981	4.6%	Trachea, bronchus, lung cancers	1,770,453	3.8%
Hearing loss, adult onset	6,891,572	4.3%	Chronic obstructive pulmonary disease	1,762,640	3.8%
HIV/AIDS	6,703,167	4.2%	Osteoarthritis	1,545,250	3.3%
Tuberculosis	6,504,260	4.1%	Cirrhosis of the liver	1,438,096	3.1%
Vision disorders, age-related	4,787,811	3.0%	Diabetes mellitus	1,388,386	3.0%
Diabetes mellitus	4,045,375	2.5%	Alcohol use disorders	1,086,926	2.3%

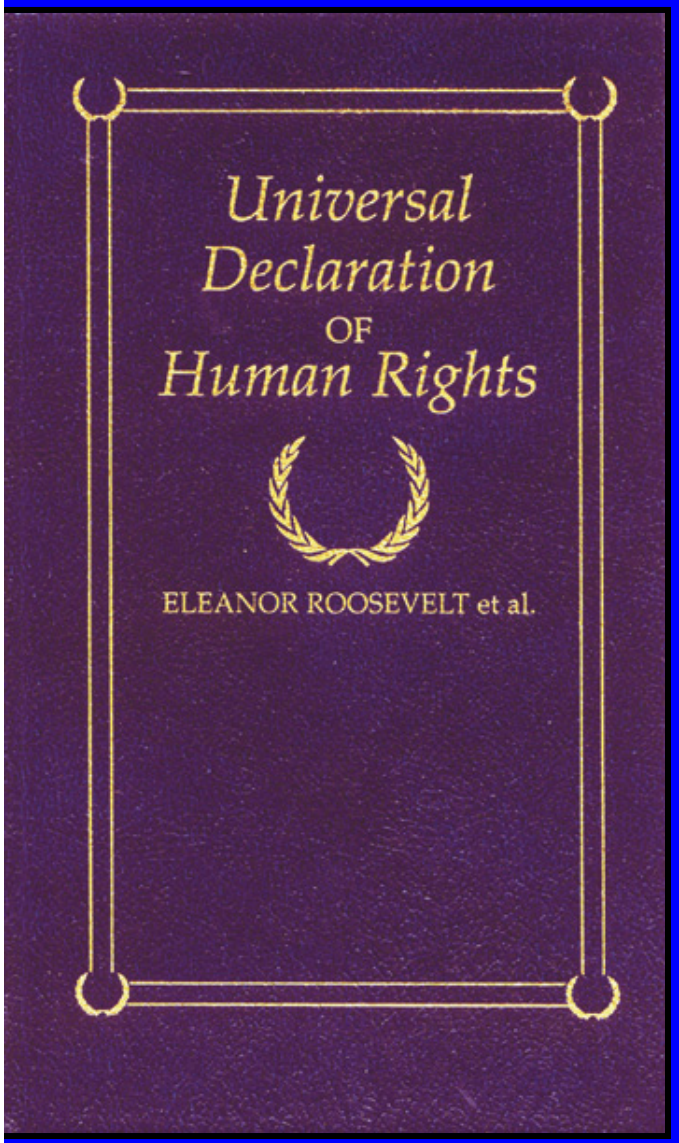
Total DALYs	159,380,182	Total DALYs	46,615,959
Total Population	600,316,766	Total Population	254,600,864
DALYs Rate	26.5%	DALYs Rate	18.3%

Structural Violence

Discussion: Structural Violence

Structural Violence

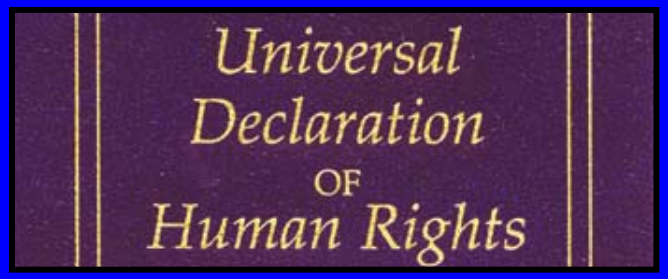
Structural Violence



“It’s not just a treaty… it may well become the international Magna Carta”

--Eleanor Roosevelt

Structural Violence



ARTICLE 25

Everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including food, clothing, housing and medical care, and necessary social services, and the right to security in the event of unemployment, sickness, disability, widowhood, old age or other lack of livelihood in circumstances beyond his control.

ARTICLE 27

Everyone has the right freely to participate in the cultural life of the community, to enjoy the arts and to share in scientific advancement and its benefits. Everyone has the right to the protection of the moral and material interests resulting from any scientific, literary or artistic production of which he is the author.

New World of Global Health

- Bill and Melinda Gates Foundation
  - $14.4 billion since 1999 to global health issues
  - August 24, 2006 gift from Warren Buffett
  - Exceeds the WHO budget during the same time
- Global Fund to Fight AIDS, TB and Malaria
  - $10 billion to 136 countries since 2002
- President's Emergency Plan for HIV/AIDS Relief (PEPFAR)
  - $18.8 billion since 2004

Challenges Faced

- Countries struggle with procurement policies, hard to convert $$ to drugs
- Shortages of trained health care workers
  - See *The World Health Report 2006*, WHO
- Corruption
- Lack of coherent approach

What is a Grand Challenge in Global Health?

- Scientific or technical innovation that:
  - Removes a critical barrier to solving an important health problem in developing world
  - High likelihood of global impact and feasibility
- Different than:
  - Simple statement of a “big problem” in global health
    - HIV/AIDS, malnutrition, lack of access to medical care, lack of resources
- Meant to:
  - Direct investigators to specific breakthrough that provides solution to a significant health problem(s)
- See http://www.gcgh.org/

Grand Challenges in Global Health

- $200 million medical research initiative
  - Bill and Melinda Gates Foundation
  - National Institutes of Health (NIH)
  - Encourage scientific and technological solutions to diseases that disproportionately affect the developing world
  - Announced in January 2003

Call for Grand Challenges

- Call For Ideas I (May 2003)
  - 1048 submissions from scientists and institutions in 75 countries
- Scientific Board heard proposals (August 2004)
  - Problem
  - Roadblock (obstacle to progress)
  - Challenge
  - List of potential benefits
- Funding increased to $450 million

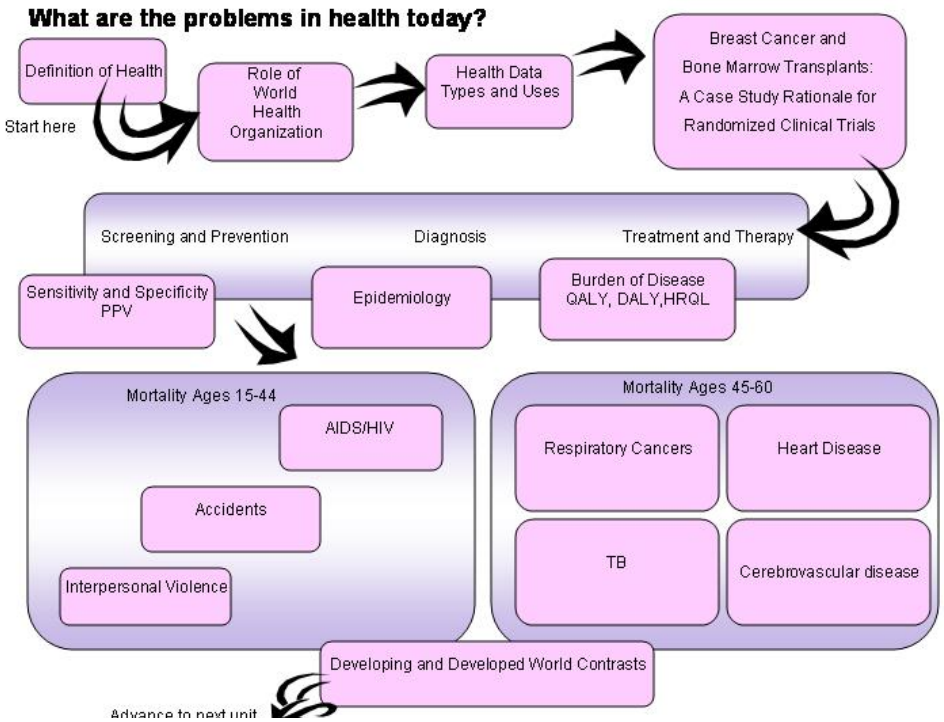
Goals and Grand Challenges

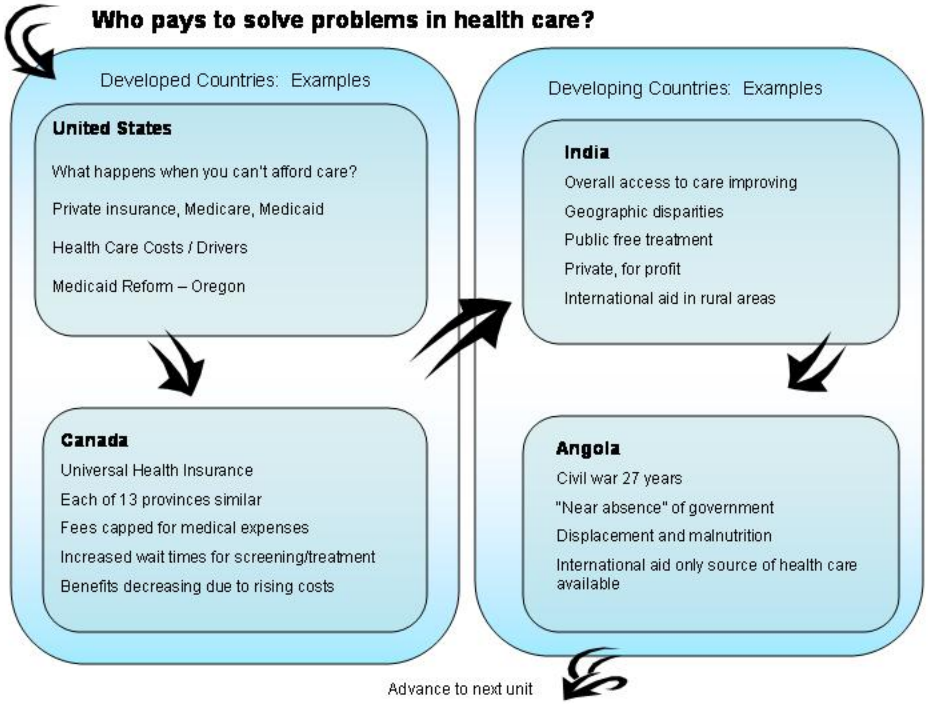
- Seven Long Range Goals
- 14 Grand Challenges
- Heavily oriented toward infectious disease
  - Infectious diseases account for the most profound discrepancies between advanced and developing economies
  - Causes of infectious diseases are well-known
  - Can more easily formulate technical and scientific obstacles to progress

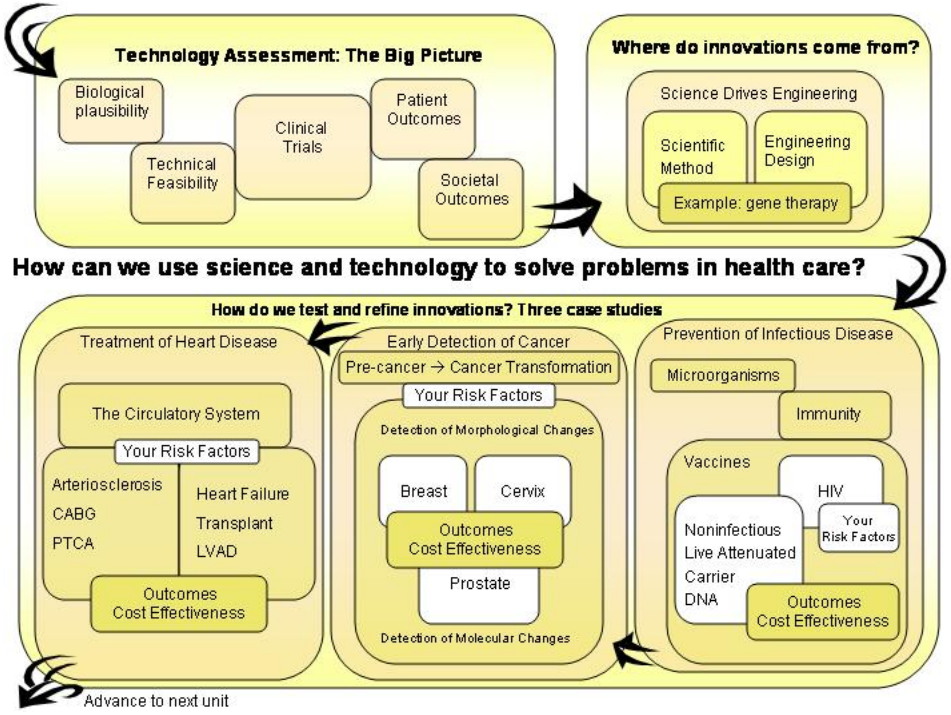
Grand Challenge Proposals

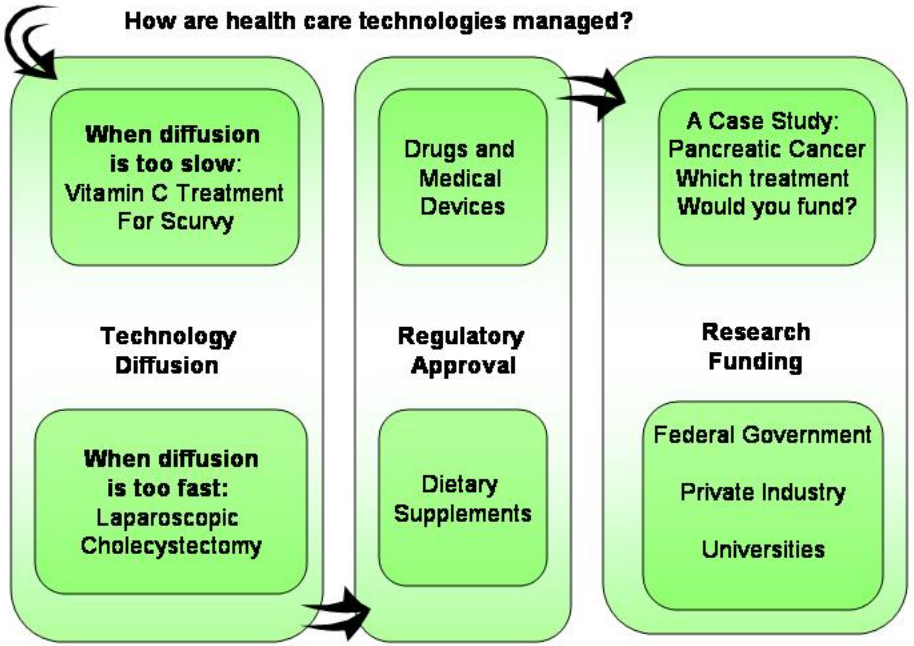
- NIH issued request for proposals to address challenges
  - Grants of up to $20M over five years or less
- http://www.gcgh.org/
- Results reported in Science (Oct 17, 2003)

GOAL: To improve childhood vaccines:
GC #1 Create effective single-dose vaccines that can be used soon after birth
GC#2 Prepare vaccines that do not require refrigeration
GC#3 Develop needle-free delivery systems for vaccines
GOAL: To create new vaccines:
GC#4 Devise reliable tests in model systems to evaluate live attenuated vaccines
GC#5 Solve how to design antigens for effective, protective immunity
GC#6 Learn which immunological responses provide protective immunity
GOAL: To control insects that transmit agents of disease:
GC#7 Develop a genetic strategy to deplete or incapacitate a disease-transmitting insect population
GC#8 Develop a chemical strategy to deplete or incapacitate a disease-transmitting insect population
GOAL: To improve nutrition to promote health:
GC#9 Create a full range of optimal, bioavailable nutrients in a single staple plant species
GOAL: To improve drug treatment of infectious diseases:
GC#10 Discover drugs and delivery systems that minimize the likelihood of drug resistant micro-organisms
GOAL: To cure latent and chronic infections:
GC#11 Create therapies that can cure latent infections
GC#12 Create immunological methods that can cure chronic infections
GOAL: To measure disease and health status accurately and economically in developing countries:
GC#13 Develop technologies that permit quantitative assessment of population health status
GC#14 Develop technologies that allow assessment of individuals for multiple conditions or pathogens at point-of-care

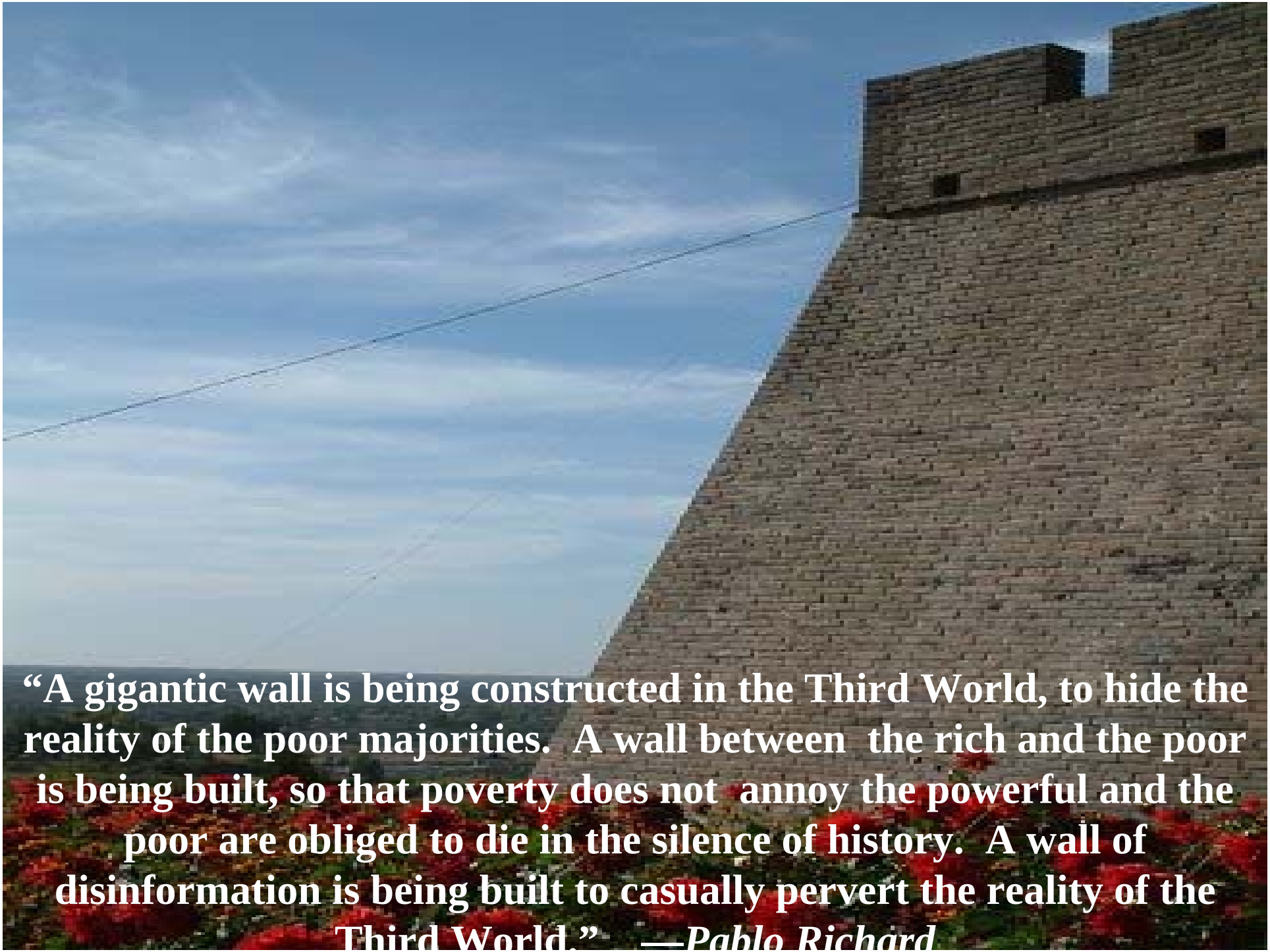

What are the problems in health today?
Definition of Health
Start here
Role of World Health Organization
Health Data Types and Uses
Breast Cancer and Bone Marrow Transplants: A Case Study Rationale for Randomized Clinical Trials
Screening and Prevention
Diagnosis
Treatment and Therapy
Sensitivity and Specificity PPV
Epidemiology
Burden of Disease QALY, DALY,HRQL
Mortality Ages 15-44
AIDS/HIV
Accidents
Interpersonal Violence
Mortality Ages 45-60
Respiratory Cancers
Heart Disease
TB
Cerebrovascular disease
Developing and Developed World Contrasts
Advance to next unit


Who pays to solve problems in health care?
Developed Countries: Examples
United States
What happens when you can't afford care?
Private insurance, Medicare, Medicaid
Health Care Costs / Drivers
Medicaid Reform – Oregon
Canada
Universal Health Insurance
Each of 13 provinces similar
Fees capped for medical expenses
Increased wait times for screening/treatment
Benefits decreasing due to rising costs
Developing Countries: Examples
India
Overall access to care improving
Geographic disparities
Public free treatment
Private, for profit
International aid in rural areas
Angola
Civil war 27 years
"Near absence" of government
Displacement and malnutrition
International aid only source of health care available
Advance to next unit

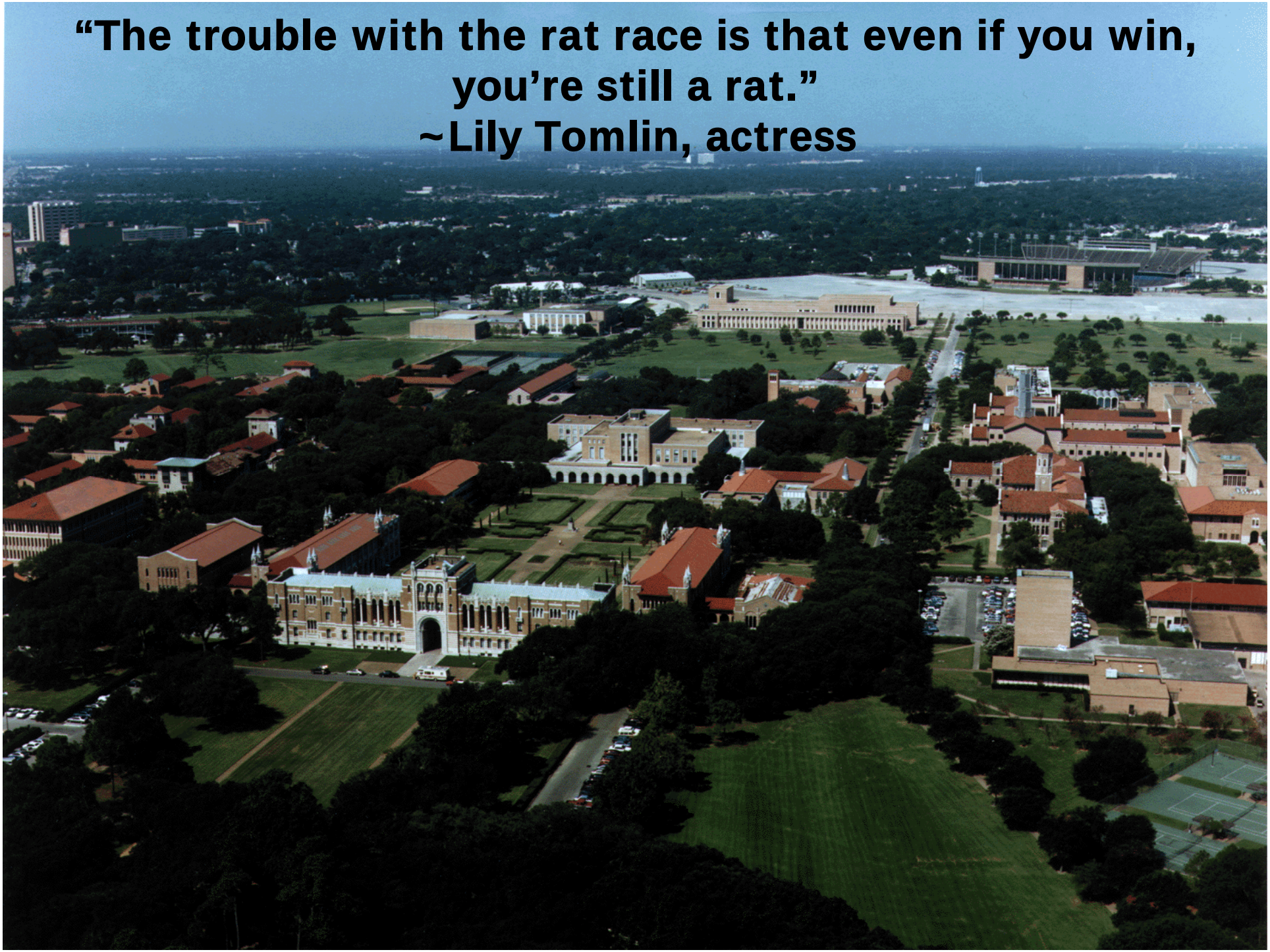

Technology Assessment: The Big Picture
Biological plausibility
Technical Feasibility
Clinical Trials
Patient Outcomes
Societal Outcomes
Where do innovations come from?
Science Drives Engineering
Scientific Method
Engineering Design
Example: gene therapy
How can we use science and technology to solve problems in health care?
How do we test and refine innovations? Three case studies
Treatment of Heart Disease
The Circulatory System
Your Risk Factors
Arteriosclerosis
CABG
PTCA
Heart Failure
Transplant
LVAD
Outcomes Cost Effectiveness
Early Detection of Cancer
Pre-cancer → Cancer Transformation
Your Risk Factors
Detection of Morphological Changes
Breast
Cervix
Outcomes Cost Effectiveness
Prostate
Detection of Molecular Changes
Prevention of Infectious Disease
Microorganisms
Immunity
Vaccines
HIV
Your Risk Factors
Noninfectious
Live Attenuated
Carrier
DNA
Outcomes Cost Effectiveness
Advance to next unit


How are health care technologies managed?
When diffusion is too slow: Vitamin C Treatment For Scurvy
When diffusion is too fast: Laparoscopic Cholecystectomy
Technology Diffusion
Drugs and Medical Devices
Dietary Supplements
Regulatory Approval
A Case Study: Pancreatic Cancer Which treatment Would you fund?
Federal Government
Private Industry
Universities
Research Funding

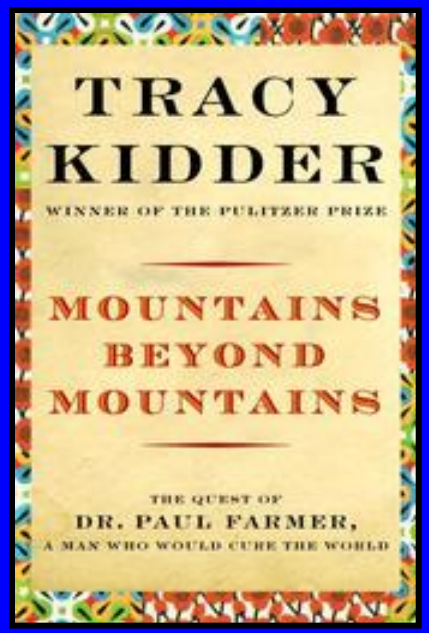
Closing Thoughts


“A gigantic wall is being constructed in the Third World, to hide the reality of the poor majorities. A wall between the rich and the poor is being built, so that poverty does not annoy the powerful and the poor are obliged to die in the silence of history. A wall of disinformation is being built to casually pervert the reality of the Third World.” —Pablo Richard

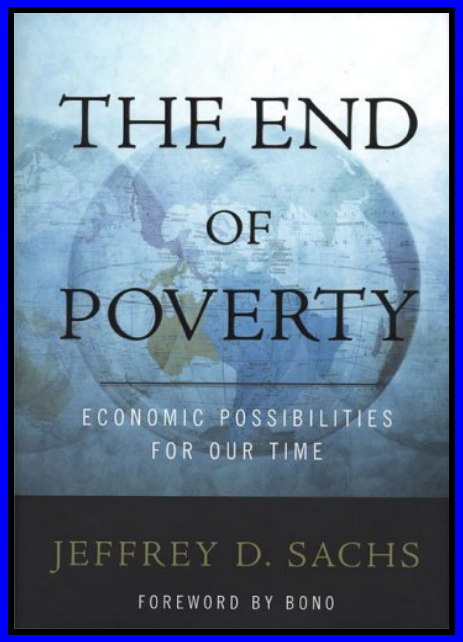
“Poverty wields its destructive influence, from the moment of conception to the grave. It conspires with the most deadly and painful diseases to bring a wretched existence to all who suffer from it.” ~World Health Organization


“The trouble with the rat race is that even if you win, you’re still a rat.”
~Lily Tomlin, actress

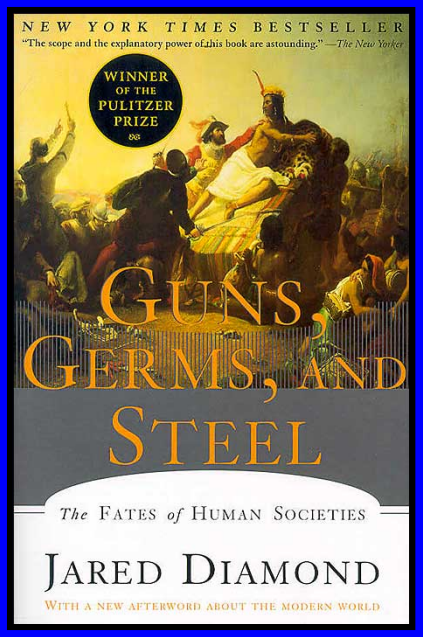
Warmly Recommended Reading



Mountains Beyond Mountains
by Tracy Kidder



The End of Poverty
by Jeffrey Sachs



Guns, Germs, and Steel
by Jared Diamond

Assignments Due Next Time

- HW2
- Project Task 1 due one week from today