Epidemiology

Study of the distribution & determinants of cancer in population groups

**Incidence:** The number of new cancers of a specific site or type occurring in a specified population group during 1 year

**Prevalence:** The number or percent of people alive on a certain date in a population group who previously had a diagnosis of cancer

---

**Estimated New Cancer Cases** in the US in 2017

<table>
<thead>
<tr>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>836,150</td>
<td>852,630</td>
</tr>
</tbody>
</table>

Includes both invasive and non-invasive cancers and the ten cancers or cancer categories listed.
The highest incidence of overall cancer occurs among:

a. Young adult Asian/Pacific Islanders
b. Native Americans on reservations in the northwest
c. African-American men
d. None of the above
World Cancer Statistics

- Cancer incidence will rise by 70% in 20 years
- One third of cancer deaths are due to the 5 leading lifestyle risks:
  - high body mass index
  - low fruit & vegetable intake
  - lack of physical activity
  - tobacco
  - alcohol use
- Tobacco use causes 20% of global cancer deaths & 70% of global lung cancer deaths
- Cancer causing viral infections: HBV/HCV & HPV are responsible for 20% of cancer deaths
- 60% of new cases occur in Africa, Asia & Latin America. These regions account for 70% of the world’s cancer deaths

Primary Prevention

- Involves the identification of:
  - genetic, biologic and environmental factors
  - that are etiologic or pathogenic in the development of cancer and
  - subsequent complete or significant interference with their effects on carcinogenesis.
- Prevention strategies focus on modifying environmental & lifestyle risk factors which promote cancer.

Risk

The likelihood that exposure to a certain factor will influence the chance of developing a particular cancer based on the national average

Risk factor: An identifiable trait or habit that is statistically associated with an increased susceptibility for disease, disability or death.
**Principles Guiding Prevention**

- Cancer is caused by complex interactions between genes and external factors
- Mechanisms of carcinogenesis predict that individual susceptibility to cancer may result from several factors
- Recognizing risk factors identifies individuals at greater risk for cancer and provides the opportunity to intervene early to prevent disease
- Changes in lifestyle have the potential to reduce cancer risks
- Reducing exposure to carcinogens may reduce cancer risk

**Cancer Deaths Worldwide**

30% of cancer deaths could be prevented by modifying:

- Tobacco use
- Being overweight or obese
- Unhealthy diet with low fruit & vegetable intake
- Lack of physical activity
- Alcohol use
- Sexually transmitted HPV infection
- Urban air pollution
- Infection by HBV
- Ionizing and non-ionizing radiation
- Indoor smoke from household use of solid fuels

**Tobacco**

- Accounts for at least 30% cancer deaths & 87% of lung cancer deaths
- Increases the risk of: mouth, lips, nose and sinuses, larynx (voice box), pharynx (throat), esophagus (swallowing tube), stomach, pancreas, kidney, bladder, uterus, cervix, colon/rectum, ovary (mucinous), and acute myeloid leukemia
- Cigars contain most of the same carcinogens as cigarettes

**Trends in Tobacco Use and Lung Cancer Death Rates in the US**

Source: National Center for Health Statistics.
Smokeless Tobacco

Dissolvable tobacco products
- Similar to breath strips or Tic Tac’s
- Lack of regulation
- Marketed as less harmful, evidence still lacking
- Easy for youth to hide their use

E-cigarettes
Electronic Nicotine Delivery Systems (ENDS)

Original Pack
The pack that started the e-cig revolution.

- Charges your batteries on the go
- Sleek design is easy to carry
- Holds 5 cartridges
Pros and Cons of ENDS

Pros
- Vaporize a nicotine solution with flavoring
- No tobacco or other carcinogenic additives
- No second hand smoke
- Safer smoking alternative
- Can help smokers quit
- Look cool...

Cons
- Lack of health studies
- No evidence actually helps people quit and may encourage increased nicotine use
- Gets kids addicted to nicotine
- Increase in poison center calls for nicotine liquids
- Interferes with tobacco control efforts
- Marketing techniques the same as for other tobacco products

FDA New Tobacco Rule - 2016
- Extends regulatory authority to all tobacco products including e-cigarettes, cigars, hookah and pipe tobacco, nicotine gels & dissolvables.
- Requires health warnings on roll your own tobacco, cigarette tobacco and newly regulated tobacco products
- Bans free samples
- Prohibits selling to people under age 18
- Prohibits selling in vending machines

Alcohol Consumption
- Somewhat controversial in breast cancer
- Associated with higher risk of:
  - mouth
  - throat
  - voice box
  - esophagus
  - liver
  - colorectal
  - breast cancer
- Synergistic effect with tobacco

Combination of Alcohol and Cigarettes Increases Risk for Cancer of the Esophagus

<table>
<thead>
<tr>
<th>Alcohol (g/d)</th>
<th>Risk Increase</th>
<th>Cigarettes (c/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2+</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>4+</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

Alcohol Consumption

How much is too much?

Diet & Nutritional Factors

- Accounts for 20-42% cancer deaths
- Animal (saturated fat) & red meat associated with cancers of colon, rectum, prostate
- Obesity associated with cancer development
- Cruciferous Vegetables and antioxidants associated with decreased risk
- Vitamin D - no conclusive evidence
Increased Cancer Risk in Obese Individuals

<table>
<thead>
<tr>
<th>Cancer</th>
<th>Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endometrial</td>
<td>2–4 times</td>
</tr>
<tr>
<td>Esophageal Adenocarcinoma</td>
<td>2 times</td>
</tr>
<tr>
<td>Gastric</td>
<td>2 times</td>
</tr>
<tr>
<td>Liver</td>
<td>2 times</td>
</tr>
<tr>
<td>Kidney</td>
<td>2 times</td>
</tr>
<tr>
<td>Meningioma</td>
<td>50%</td>
</tr>
<tr>
<td>Pancreatic</td>
<td>1.5 times</td>
</tr>
<tr>
<td>Colorectal Cancer</td>
<td>30%</td>
</tr>
<tr>
<td>Gall Bladder</td>
<td>60%</td>
</tr>
<tr>
<td>Breast, Postmenopausal</td>
<td>20–40%</td>
</tr>
<tr>
<td>Ovarian</td>
<td>10%</td>
</tr>
<tr>
<td>Thyroid</td>
<td>10%</td>
</tr>
</tbody>
</table>

Occupational Cancer Risks

- Account for about 4% cancers
- Asbestos
  - Single most important known occupational carcinogen
  - Asbestos-related lung cancer peaked during middle to late 1980’s secondary to extensive occupational exposure in shipyards during WWII
  - Synergistic with Cigarette smoking
- 240 agents listed as carcinogens on the list by National Toxicology Program (some are chemotherapy agents)

Environmental Risk Factors

- Contribute to 4% cancer deaths (global)
- UV light (sunlight)
  - Contributes to about 90% skin cancers, including melanoma
  - History of blistering sunburns are of particular risk for melanoma
  - Cumulative sun exposure has more impact on non melanoma cancers
- Electromagnetic field exposures
- Cell phones - inconclusive evidence
- Classified by the International Agency for Research on Cancer as possibly carcinogenic to humans
Indoor Tanning Beds

- Cause melanomas & non-melanoma skin cancers
- Listed as a carcinogen
- The risk is greater in clients under age 25
- Australia, Canada (some provinces) & Europe have banned tanning beds for non-adults.
- Some states in the US have banned for non-adults

Viral Exposures

- Associated with 22% of cancers in developing world, 6% in industrialized countries
- Hepatitis B & C is linked with hepatocellular carcinoma
- HIV infection linked to Kaposi's sarcoma & B-cell lymphomas
- Epstein-Barr virus (EBV) linked to Burkett's lymphoma
- Human papilloma virus (HPV) related to cervical cancer and squamous cell cancers of the head and neck
- Helicobacter pylori linked to stomach cancer

HPV Vaccine

- CDC Recommends HPV vaccine for girls and boys 11 or 12 years of age
- It may be given starting at age 9
- HPV infection is easily acquired, even with only one sex partner
  - HPV vaccine recommended before any sexual contact
  - Response to the vaccine is better at a younger ages (11-12)
- 2 dose series before age 15, 6 months apart

Prevalence of Human Papillomavirus Vaccination*, Adolescents 13 to 17 Years, by Gender and Race/Ethnicity†, US, 2014

- Overall
- White
- Black
- Hispanic
- Asian
- Amer Indian

[Graph showing prevalence by gender and race/ethnicity]
Screening & Early Detection (Secondary Prevention)

- Emphasis on early diagnosis
- Strategies to detect abnormalities before they are clinically apparent
  - Allows for intervention before cancer develops
  - Detect at an early stage when treatment is most effective
- In asymptomatic individuals
- Disease presumed to be localized

Screening Guidelines

- Have to be common enough of a disease to justify screening
- Has to have substantial mortality and morbidity
- Has to have an effective treatment
- Has to have a presymptomatic period
- Has to be easy and acceptable to clients
- Has to be sensitive and specific to the disease

Who Makes The Recommendations?

- U.S. Government Agencies
  - U.S. Preventive Services Task Force (USPSTF)
  - Centers for Disease Control
  - National Cancer Institute
- Community Organizations
  - American Cancer Society
  - Susan Komen Breast Cancer Foundation
- Professional Organizations
  - American College of Radiology

Breast Cancer Screening Guidelines

<table>
<thead>
<tr>
<th>Age 20+</th>
<th>Breast self exam optional Clinical breast exam preferred every 3 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age 40+</td>
<td>Breast self exam optional Clinical breast exam preferred annually Mammogram annually</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>American Cancer Society</th>
<th>US Preventive Services Task Force</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age 40 – 49</td>
<td>No routine mammograms for low risk women Individual decisions about every 2 year mammograms</td>
</tr>
<tr>
<td>Age 50 – 74</td>
<td>Biennial mammograms</td>
</tr>
<tr>
<td>Age 75 +</td>
<td>No benefits to screening</td>
</tr>
<tr>
<td>Clinical Breast exams</td>
<td>No benefit beyond mammography</td>
</tr>
<tr>
<td>Breast self exam</td>
<td>Do not reduce breast cancer mortality</td>
</tr>
</tbody>
</table>
Cervical Cancer Screening Guidelines

<table>
<thead>
<tr>
<th>American Cancer Society</th>
<th>US Preventive Services Task Force</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ages 21 – 29 PAP every 3 years</td>
<td>Ages 21 – 65 PAP every 3 years</td>
</tr>
<tr>
<td>Ages 30 – 65 PAP &amp; HPV every 5 years</td>
<td>OR</td>
</tr>
<tr>
<td>Over 65 – no screening unless high risk</td>
<td>Ages 30 – 65 may have PAP and HPV testing every 5 years</td>
</tr>
<tr>
<td>No screening after hysterectomy</td>
<td>Over 65 – no screening unless high risk</td>
</tr>
<tr>
<td>No screening after hysterectomy</td>
<td></td>
</tr>
</tbody>
</table>

**Prevalence of Mammography** by Race/Ethnicity, Women 40 Years and Older, US, 2013

**Prevalence of Pap Testing** by Race/Ethnicity, Women 21 to 65 Years, US, 2013
ACS Screening Guidelines: Colon & Rectal Cancer

- Age 50+. Stop at 75 or 80
- One of the following 5 testing methods recommended
  - Annually fecal occult blood test (FOBT)
  - Flexible sigmoidoscopy every 5 years
  - FOBT + sigmoidoscopy every 5 years
  - Double-contrast barium enema every 5 years
  - Colonoscopy every 10 years
  - CT colonography every 5 years
- Start earlier than age 50 if personal or family history of colon cancer, polyps, chronic inflammatory bowel disease

Prevalence of Colorectal Cancer Screening*, Adults 50 Years and Older, by Race/Ethnicity*, US, 2013

Lung Cancer Screening with Low Dose Computerized Tomography (CT)

U.S. Preventive Services Task Force (USPSTF)
- Annual screening
- Adults ages 55 to 80 years who have a 30 pack-year smoking history and currently smoke or have quit within the past 15 years
- Discontinue
- Once a person has not smoked for 15 years or develops a health problem that substantially limits life expectancy or the ability or willingness to have curative lung surgery.

American Cancer Society
- Smoking cessation counseling should accompany screenings.
The Prostate Exam

Prostate Screening Guidelines: PSA and Digital Rectal Exam
- **American Cancer Society**
  - Age 50 - 70
  - Men with at least a 10 year life expectancy should make an informed decision with their health care team
- **American Urological Association**
  - Age 70+ not recommended by the AUA
  - Shared decision making about screening 55 - 70
- **USPSTF** - No PSA screening
  - “Many men are harmed, few if any, benefit”

Ovarian Cancer Screening
- CA-125 ineffective as a screening tool
- Misses 50% of early ovarian cancers
  - MANY false elevations, particularly in pre-menopausal women
- Indications:
  - Screening in high risk women
  - With abnormal findings on exam or US
  - Detect recurrent disease
  - Monitor treatment
  - Predict outcome
- Education of symptoms to report
- PAP test does not test for ovarian cancer
- No current recommendations for ovarian cancer

Summary
- Lifestyle changes have the biggest impact in cancer prevention
- Cancer screening is effective but the guidelines are controversial
- Oncology nurses need to promote and model healthy lifestyles and participation in screening