

Neoplasia III: Epidemiology

Epidemiology Lecture Objectives

- List the most common type of cancer in men and women, and the cancer responsible for the most deaths.
- List the seven most important environmental factors that contribute to the development of carcinoma, and describe a little about each one (e.g., types of associated cancers).
- Define, compare and contrast the three types of hereditary cancer.
- Briefly describe the genetic mutations in Li-Fraumeni syndrome and xeroderma pigmentosum, and explain how they lead to the development of cancer in each disorder.

Epidemiology Lecture Outline

- Cancer facts
- Environmental factors
- Hereditary cancer

Cancer Facts

Every year there are:
1.5 million new cases of cancer
>500,000 cancer deaths

Cancer is the 2nd leading cause of death (after heart disease)

Most common cancers

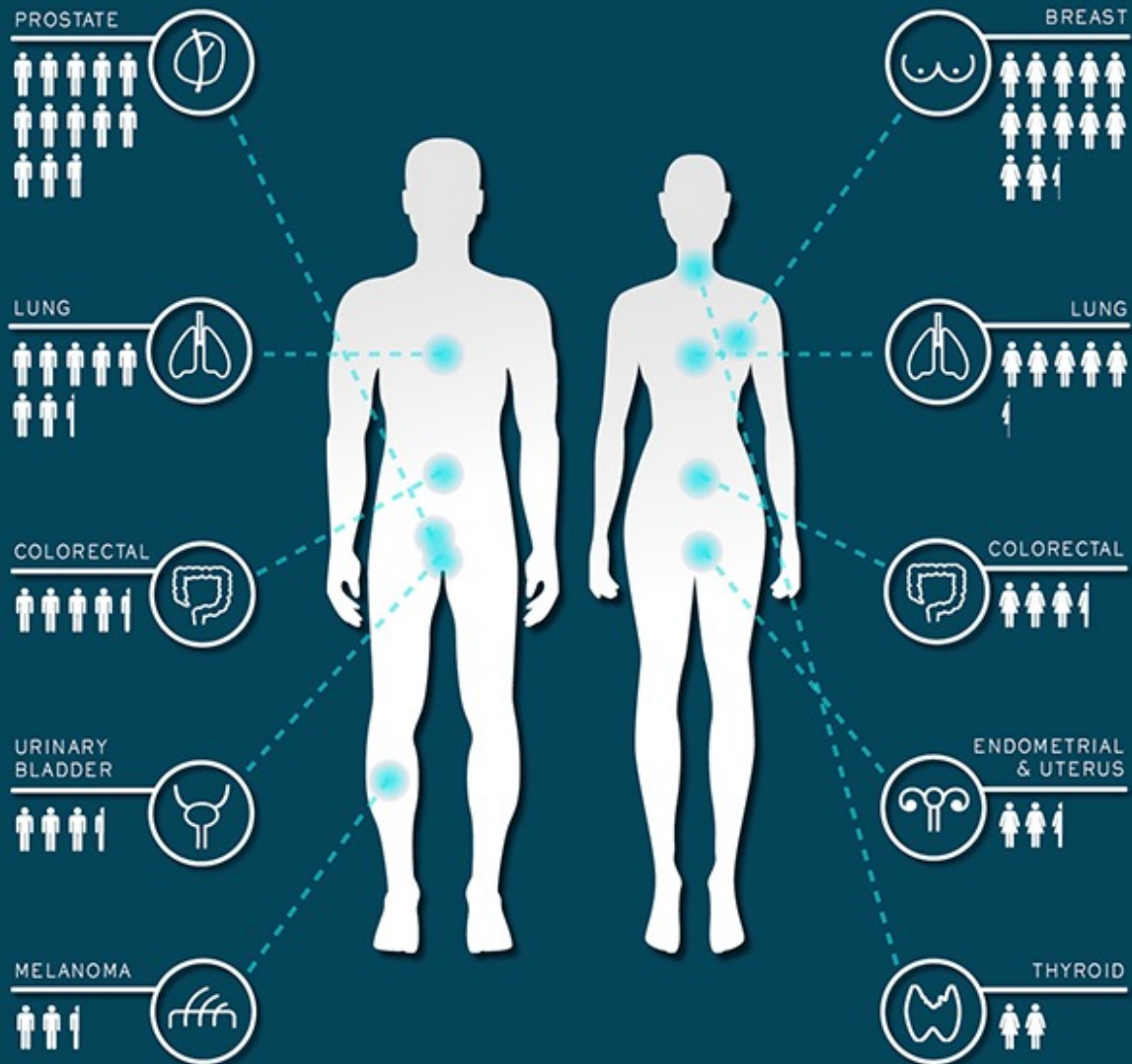
Men: Prostate
Women: Breast


Cancers causing the most deaths

Men: Lung
Women: Lung

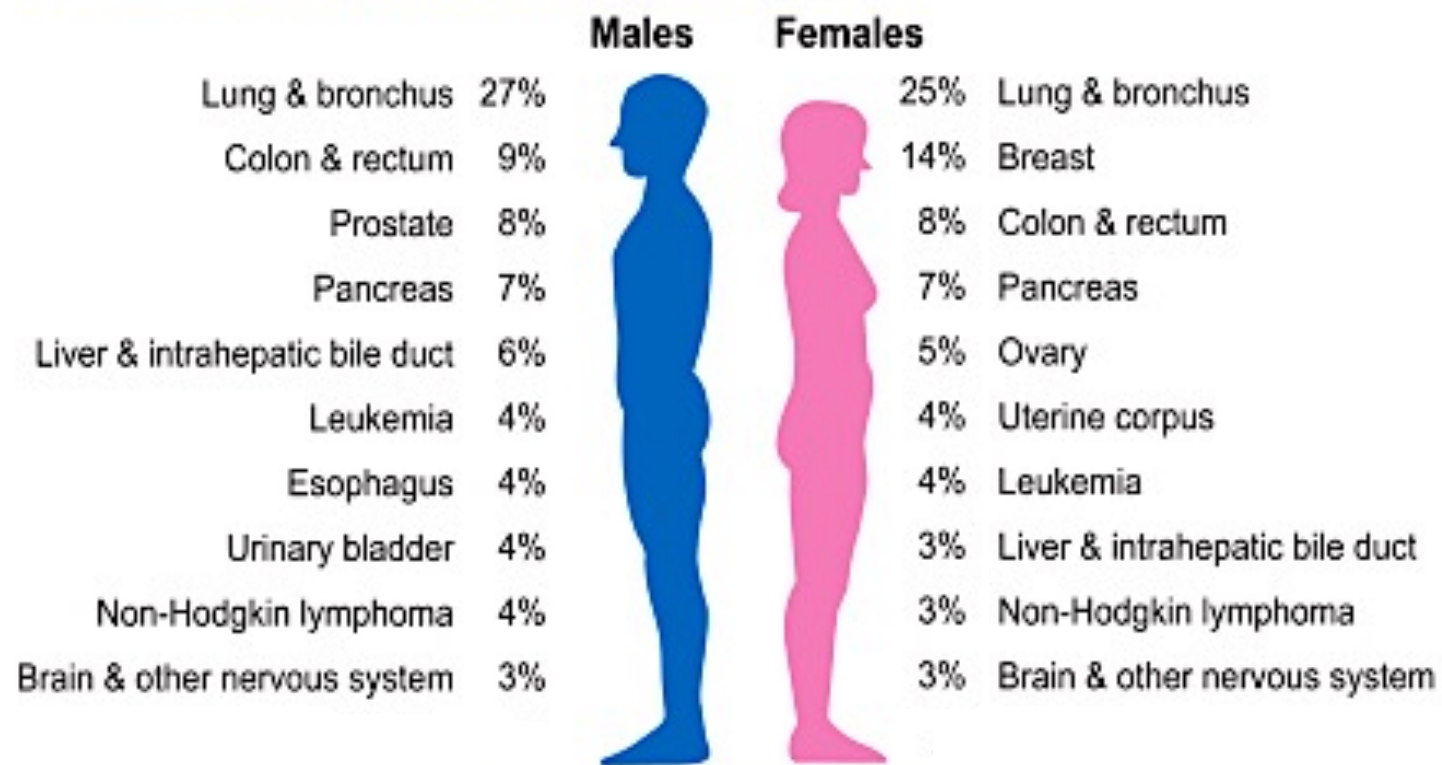
WHAT ARE THE
MOST COMMON CANCERS IN

Men vs Women?



 = 10 per 100,000

Cancer Deaths



Five-year survival rates



Glioblastoma
Multiforme



Lung Cancer



Triple-Negative
Breast Cancer



Pancreatic
Cancer



Ovarian
Cancer

Environmental Factors

HPV (cervical and oropharyngeal cancers)

“The single most important environmental factor contributing to premature death in the US.”

- Infectious agents

Lung, but also oral cavity and pancreatic cancers

- Smoking

Liver, oral cavity, breast

- Alcohol

- Diet → Colon, prostate, breast

“The most overweight people in the US have over 50% higher death rates from cancer”

- Obesity

↑ estrogen exposure

- Reproductive history

↓
↑ breast and endometrial cancer

- Environmental carcinogens

- UV light (skin)

- Arsenic (lung, skin)

- Asbestos (mesothelioma)

- Benzene (leukemia)

- Radon (Lung)

Three Types of Hereditary Cancer

- Familial cancers
- Inherited cancer syndromes
- Syndromes of defective DNA repair

Familial Cancers

- Most cases of cancer are sporadic (random)
- A small number are familial (related to specific germline gene mutations)
- Example: certain BRCA1 gene mutations increase risk of breast, colon, ovary, and pancreatic cancers
- Familial cancers occur earlier and are more aggressive than their sporadic counterparts

Inherited Cancer Syndromes

- Usually autosomal dominant
- Each has a specific gene mutation that increases risk of getting *multiple* cancers
- Example: Li-Fraumeni syndrome
 - mutation in p53 gene
 - 25x ↑ risk of sarcomas, breast cancer, leukemia, and brain tumors
 - cancers usually appear before age 50

Syndromes of Defective DNA Repair

- Inherited mutations in genes encoding DNA repair systems
- Greatly enhance the occurrence of mutations in *other* genes (“genomic instability”)
- Example: xeroderma pigmentosum
 - Mutations in genes in “nucleotide excision repair” pathway (fixes UV-damaged DNA)
 - Extreme sensitivity to sunlight
 - ↑↑↑ risk of skin cancer (in childhood!)

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THE
OTHERS

