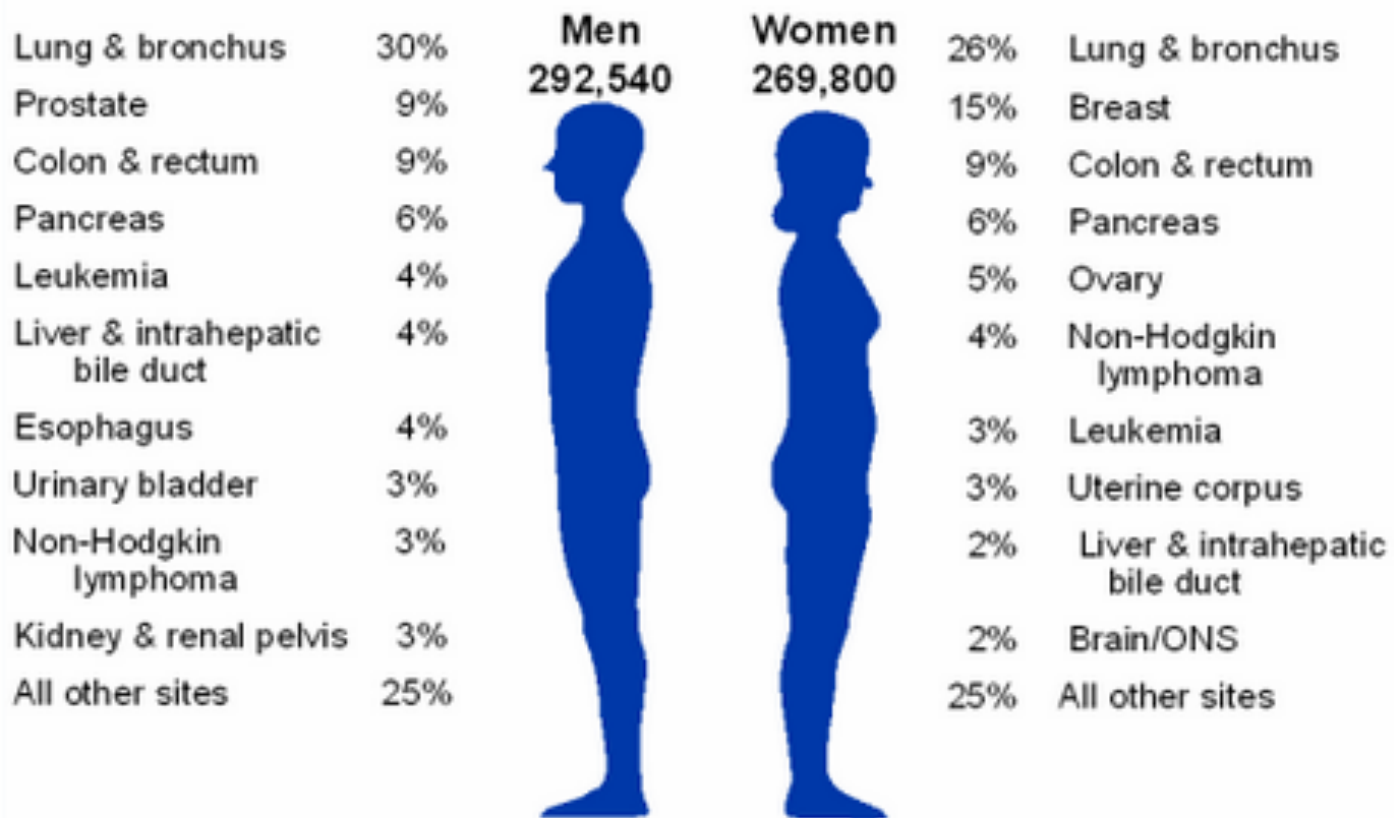


Lec 8: Cancer Risk Factors



2018: ~ 609 K

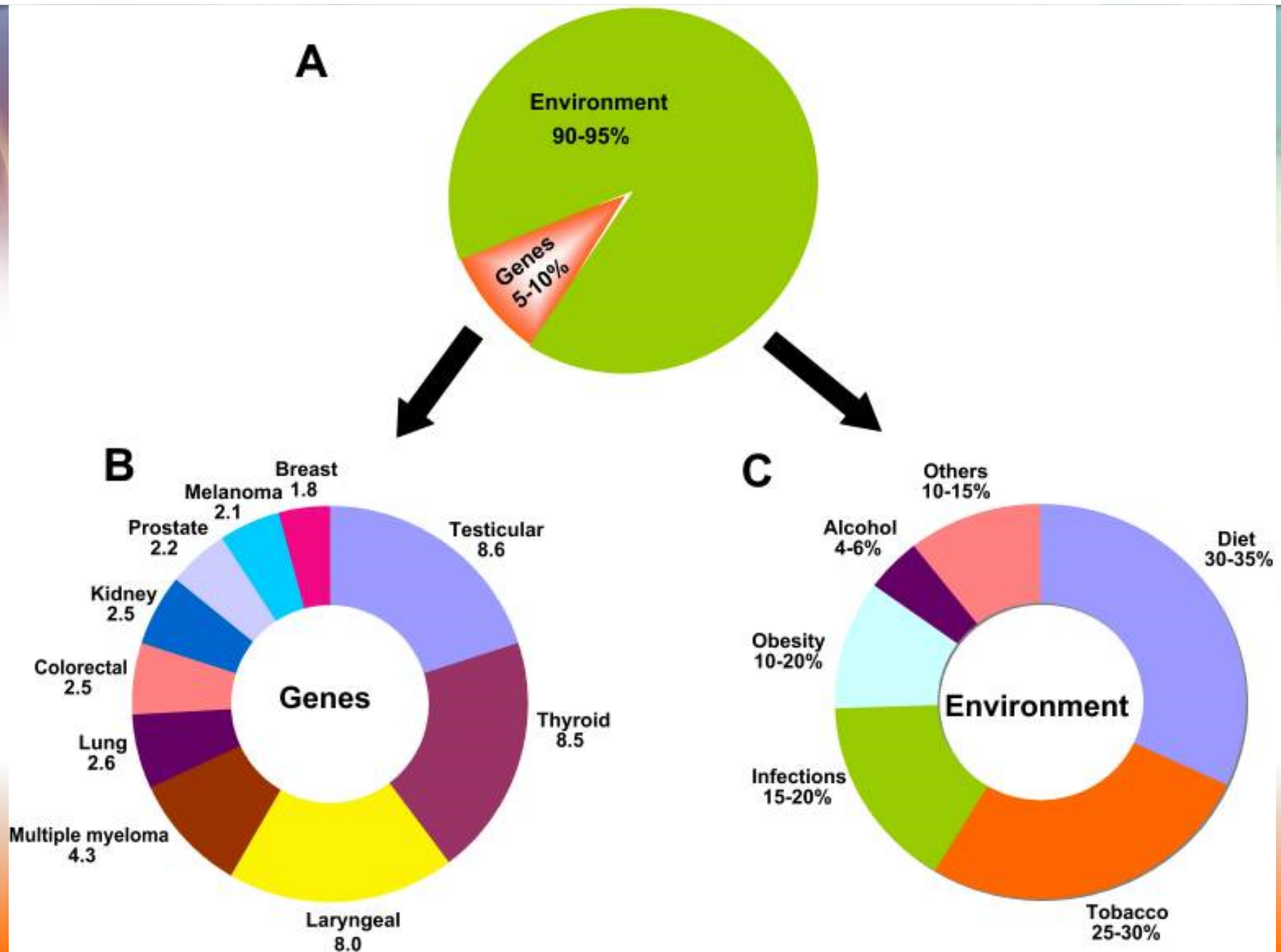
2009 Estimated US Cancer Deaths*



ONS=Other nervous system.

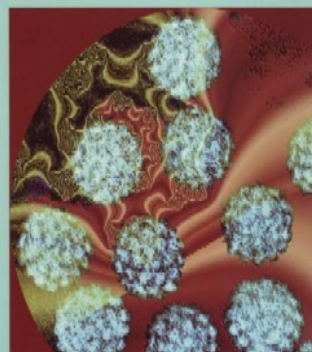
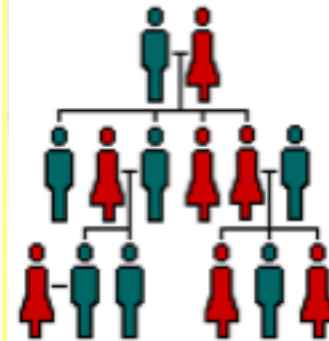
Source: American Cancer Society, 2009.

The Role of Genes & Environment in Cancer Development



Categories of Cancer Causes and Risk Factors

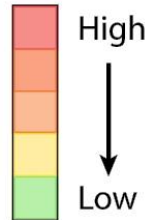
- ☐ Growing older
- ☐ Tobacco
- ☐ Sunlight
- ☐ Ionizing radiation
- ☐ Certain chemicals
- ☐ Viruses & bacteria
- ☐ Certain hormones
- ☐ Family history of cancer
- ☐ Alcohol
- ☐ Poor diet, lack of physical activity, or being overweight



[Click for detailed information about the most common risk factors for cancer.](#)

Ionizing Radiation and Cancer Risk

Sunlight
intensity scale



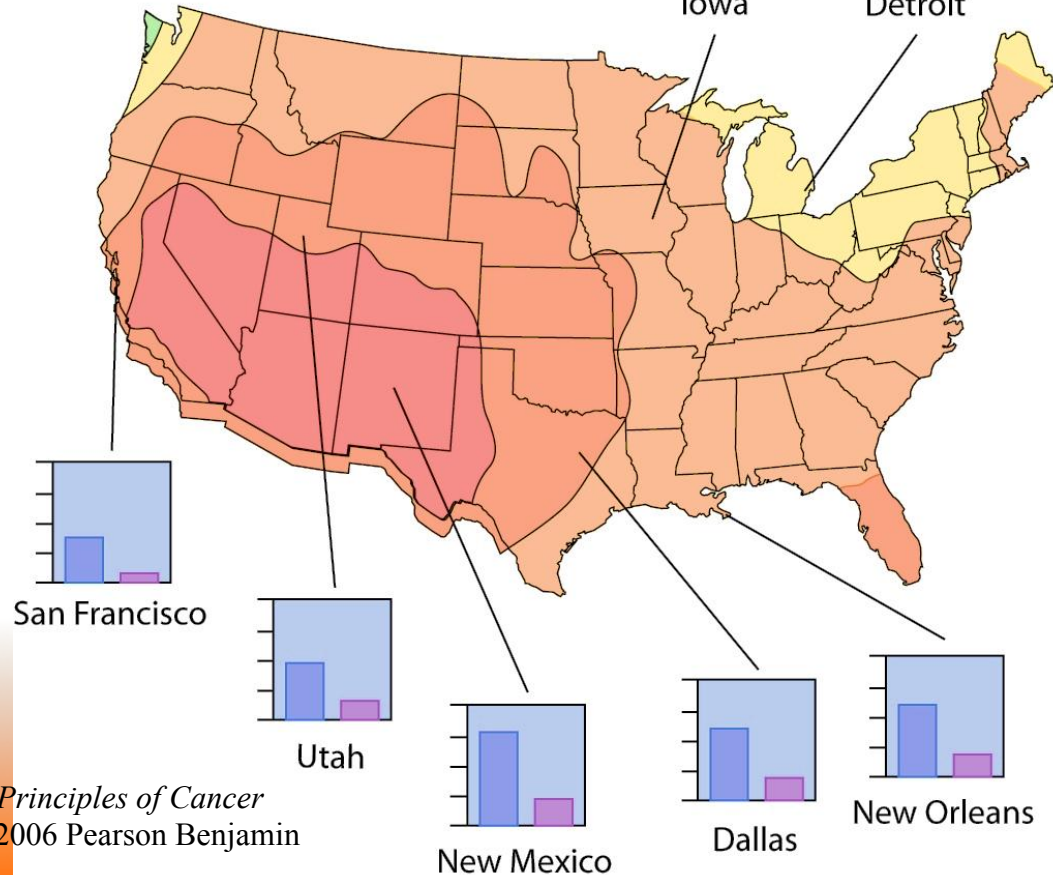
High

Low

Squamous cell
carcinoma

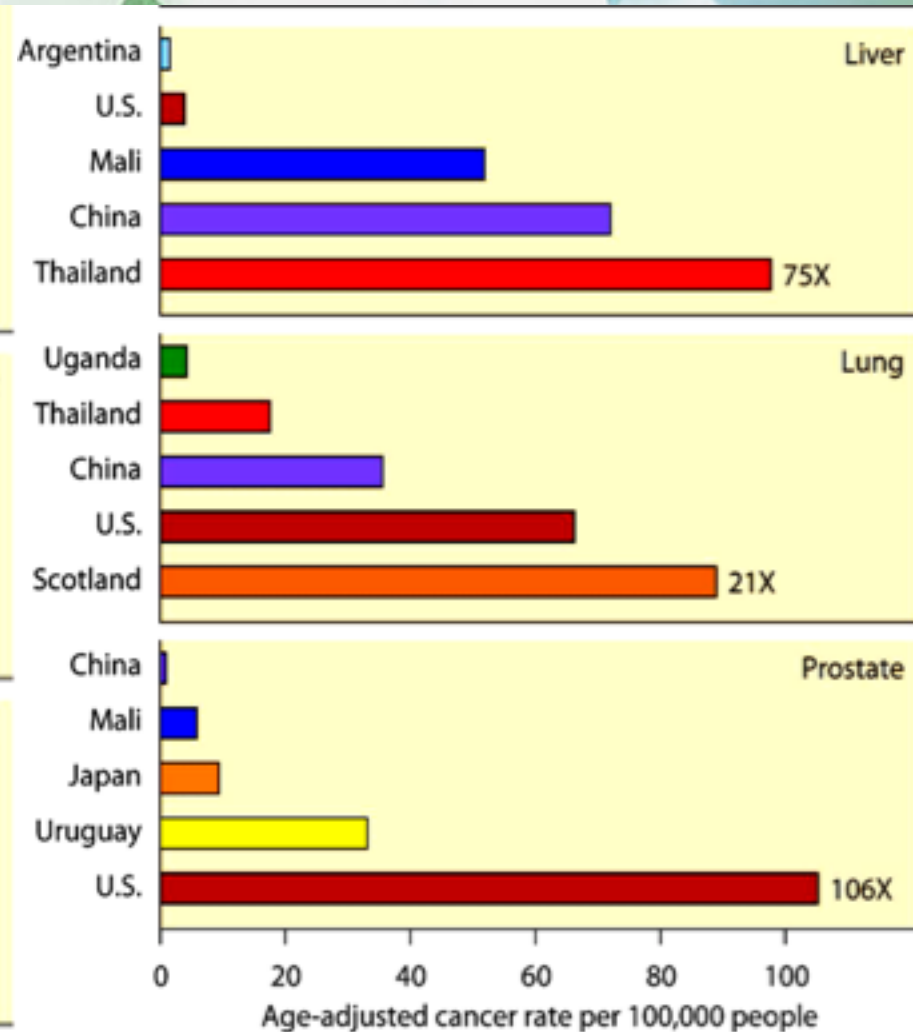
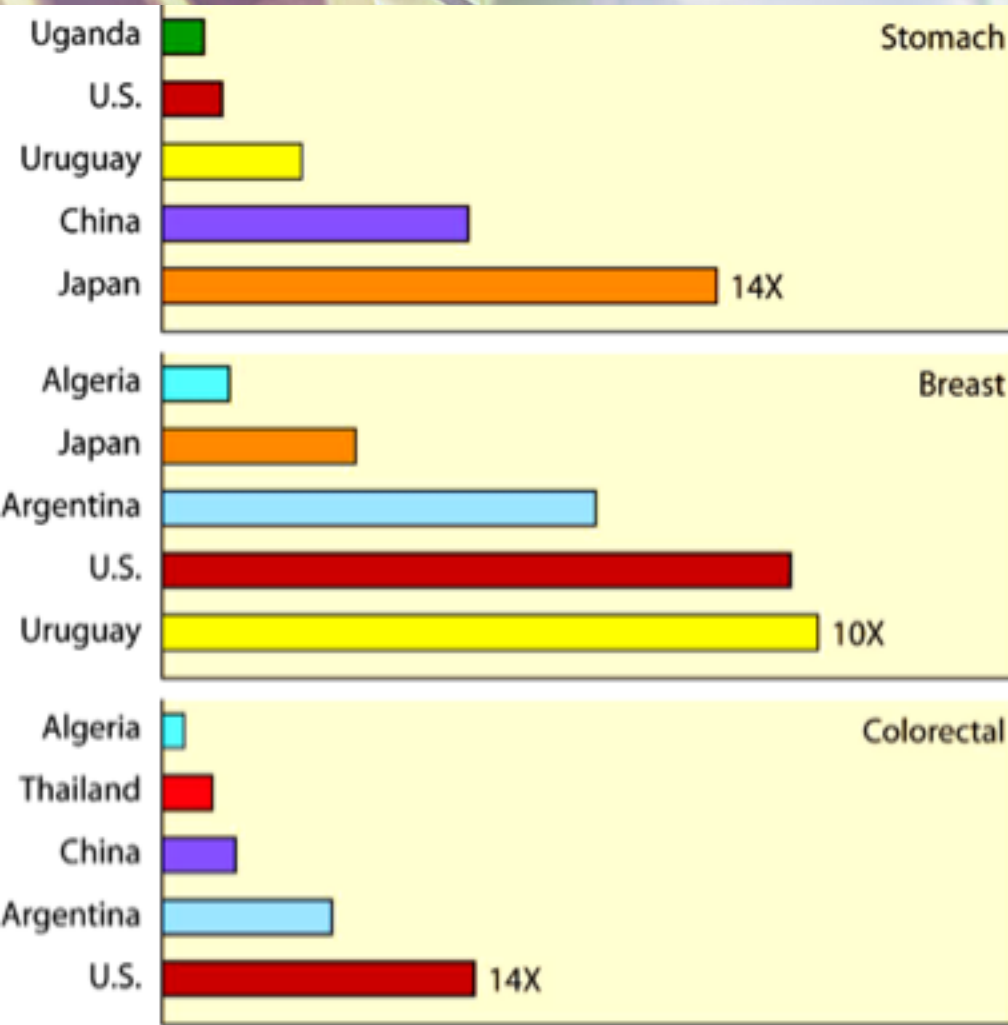
Basal cell
carcinoma

Cancer rates



From L. J. Kleinsmith, *Principles of Cancer Biology*. Copyright (c) 2006 Pearson Benjamin Cummings.

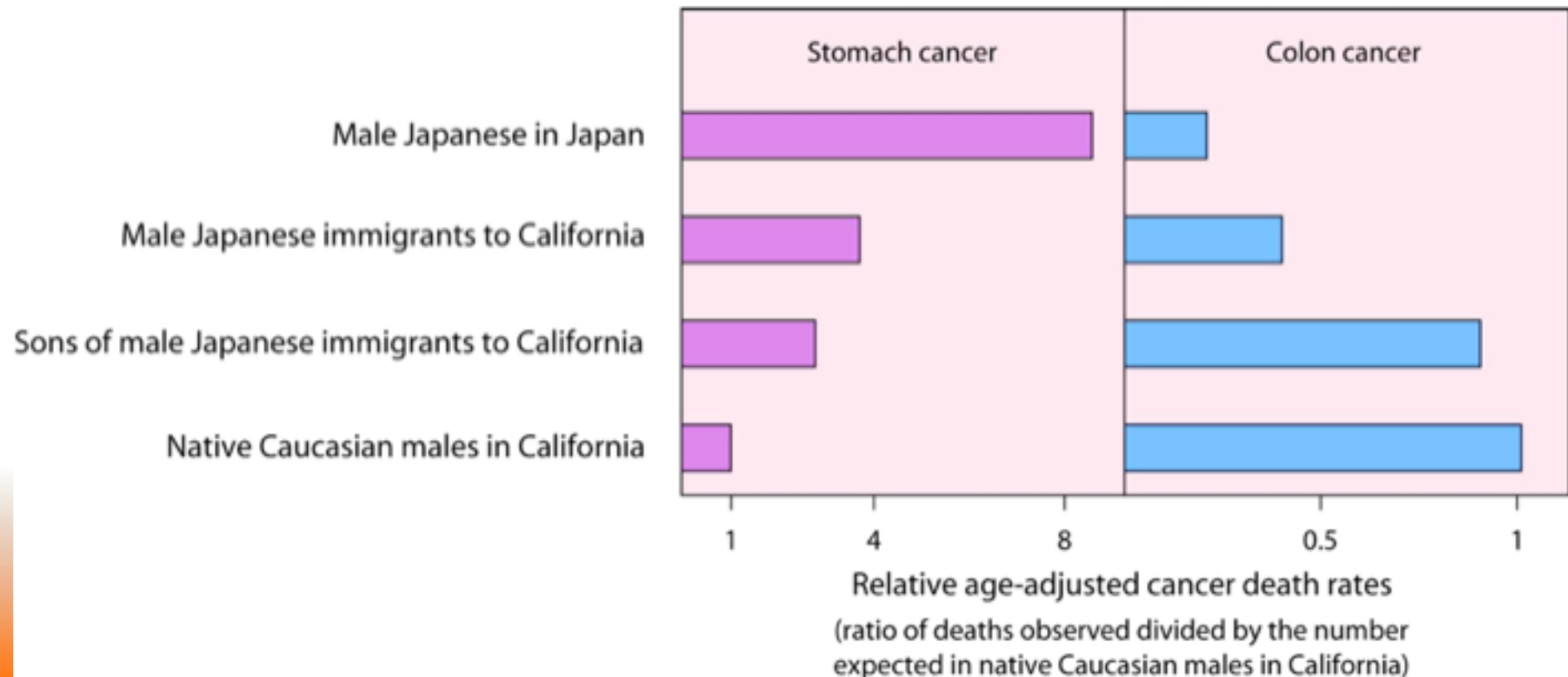
Geographical Differences in Cancer Prevalence



From L. J. Kleinsmith, *Principles of Cancer Biology*. Copyright (c) 2006 Pearson Benjamin Cummings.

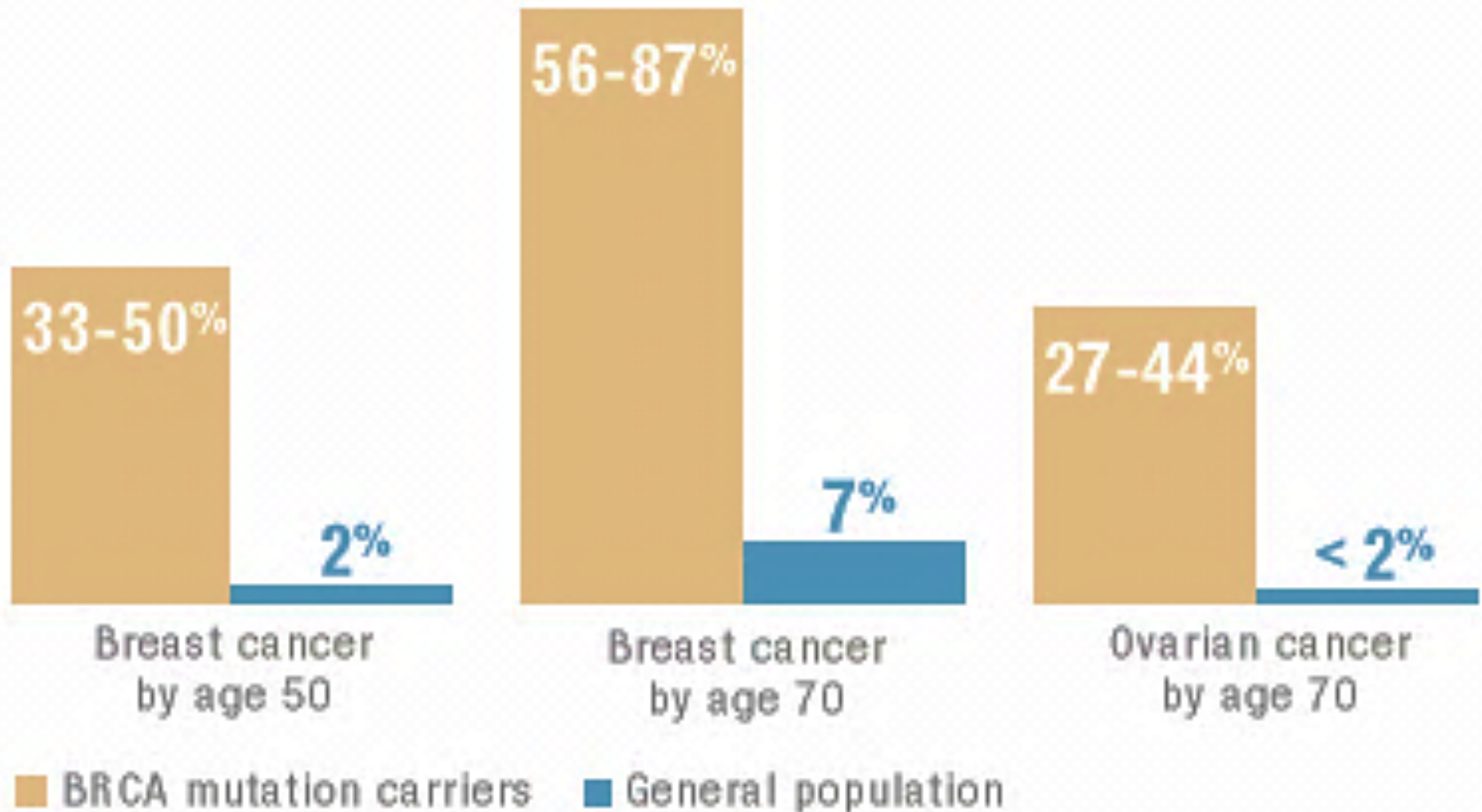


Environmental Factors More Important Than Heredity in Causing Cancer



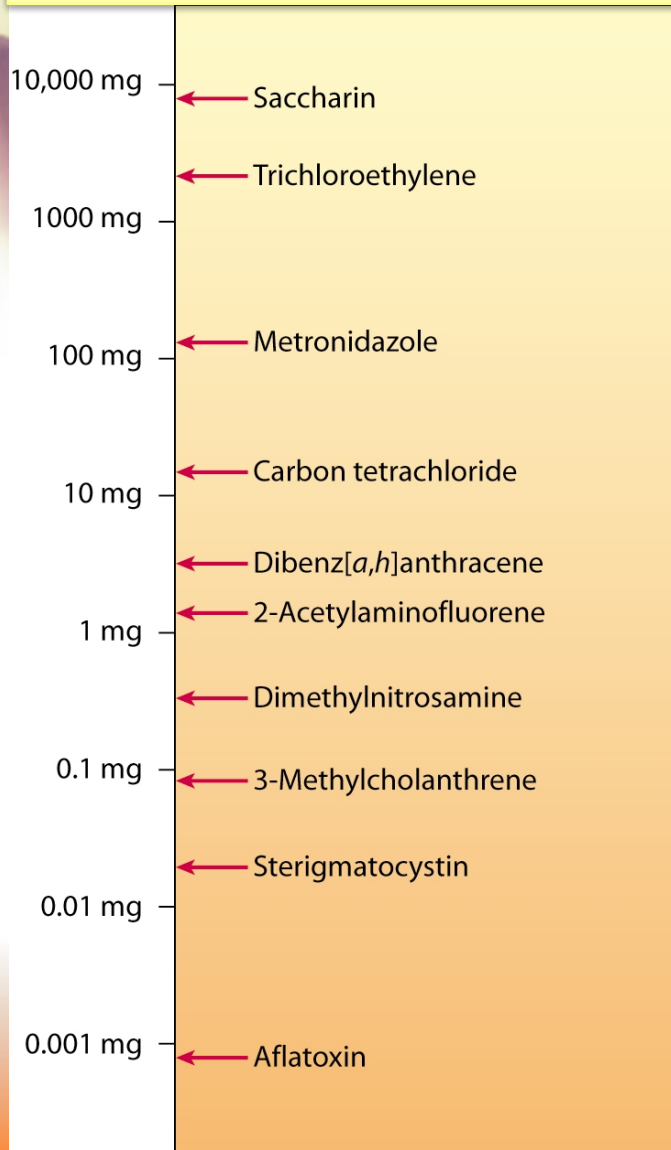
Heredity and Cancer Risks

BRCA Mutation Increases the Risk of Cancer

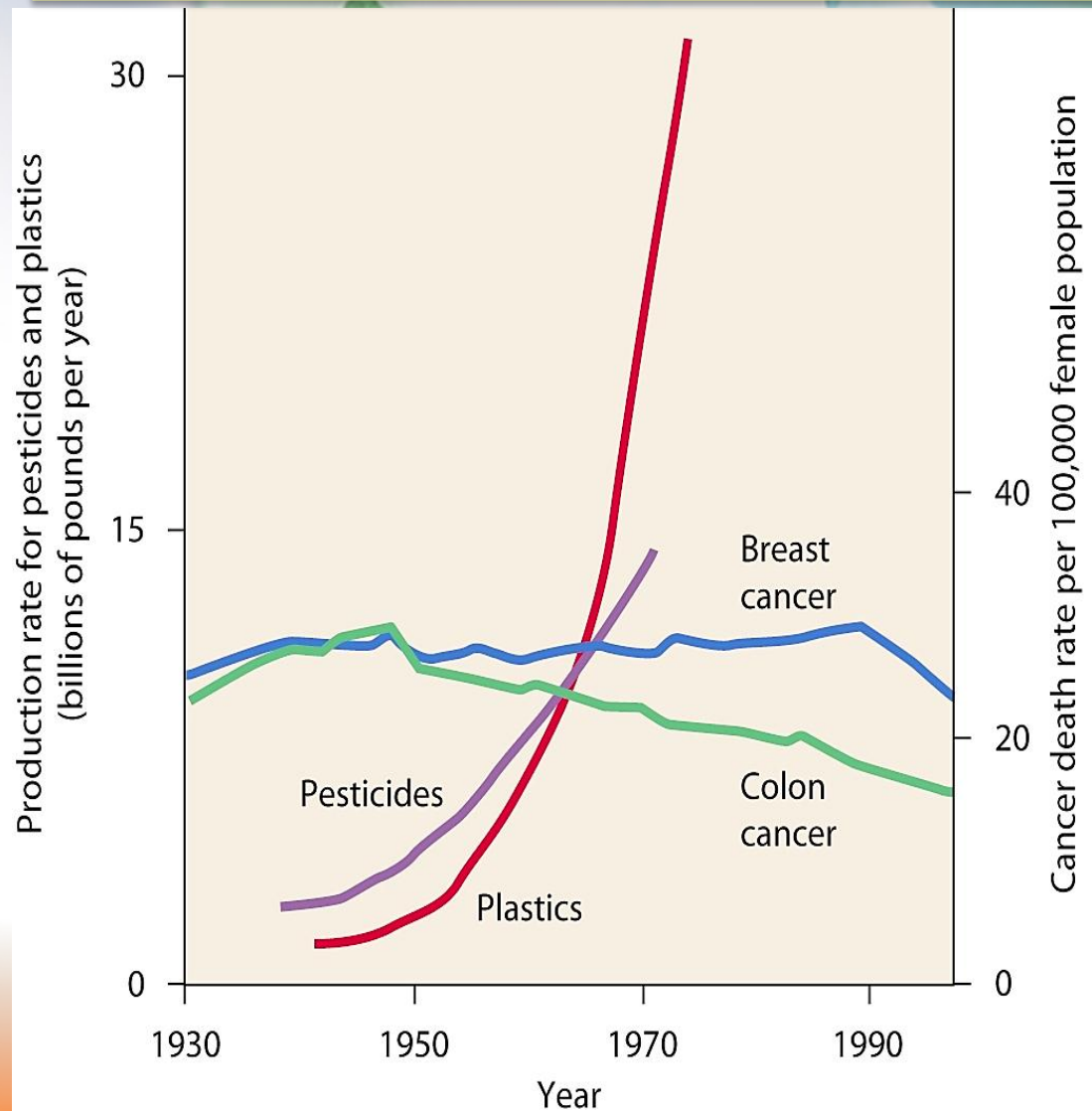


Chemicals and Cancer Risk

Difference in Carcinogenic Potency



Patterns of industrial pollution & Cancer Death Rates





For millennials, cancers fueled by obesity are on rise, study says

By Sandee LaMotte, CNN

🕒 Updated 12:22 PM ET, Mon February 4, 2019



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These
women
into...

Emerging cancer trends among young adults in the USA: analysis of a population-based cancer registry

Hyuna Sung, PhD · Rebecca L Siegel, MPH · Phillip S Rosenberg, PhD · Ahmedin Jemal, PhD

Open Access · Published: February 03, 2019 · DOI: [https://doi.org/10.1016/S2468-2667\(18\)30267-6](https://doi.org/10.1016/S2468-2667(18)30267-6)



Findings

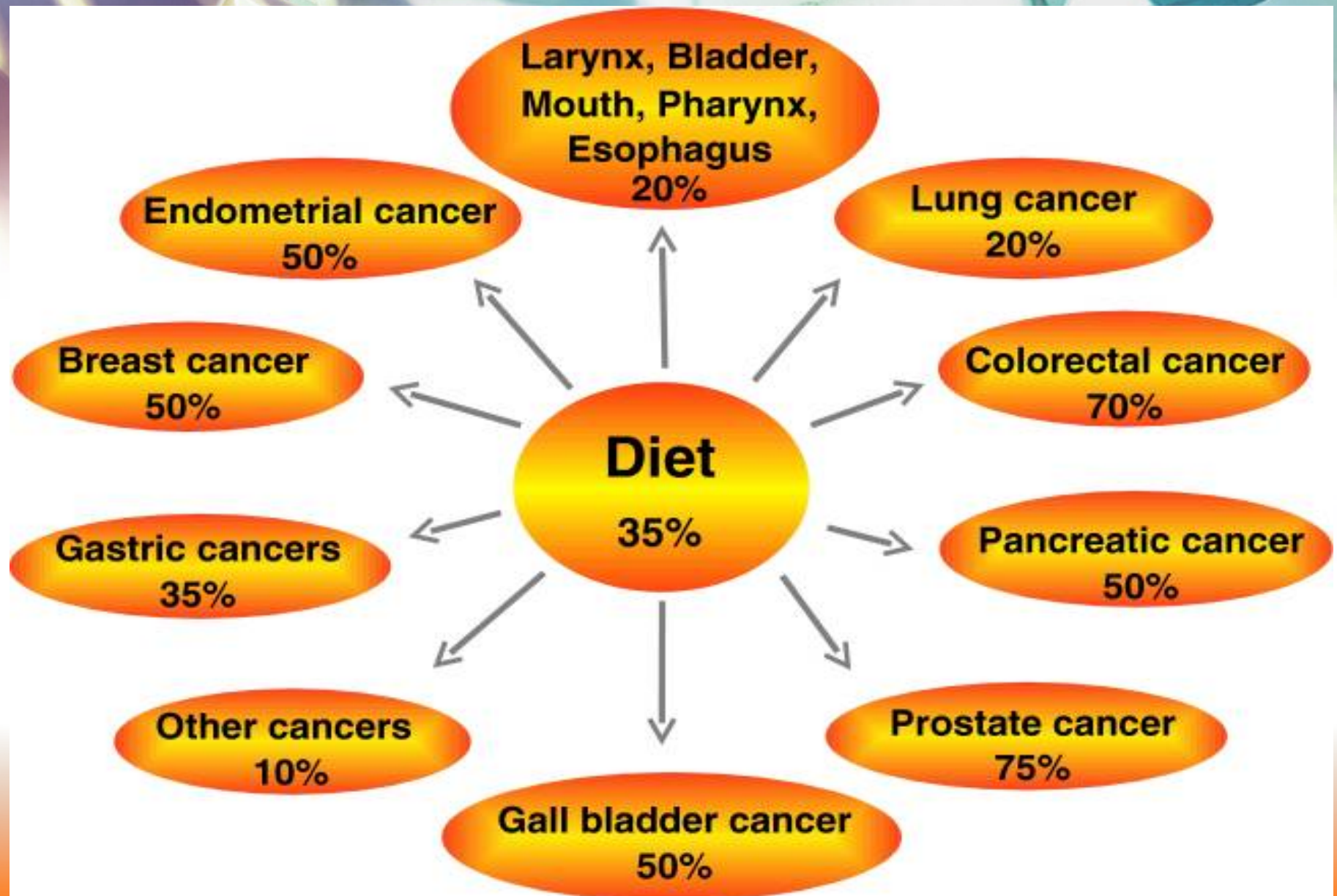
From 1995 to 2014 there were 14 672 409 incident cases for 30 types of cancer. Incidence significantly increased for six of 12 obesity-related cancers (multiple myeloma, colorectal, uterine corpus, gallbladder, kidney, and pancreatic cancer) in young adults (25–49 years) with steeper rises in successively younger generations. Annual increases ranged from 1·44% (95% CI –0·60 to 3·53) for multiple myeloma to 6·23% (5·32–7·14) for kidney cancer at age 25–29 years, and ranged from 0·37% (0·03–0·72) for uterine corpus cancer to 2·95% (2·74–3·16) for kidney cancer at age 45–49 years. Compared with people born around 1950, IRRs for those born around 1985 ranged from 1·59 (95% CI 1·14–2·21) for multiple myeloma to 4·91 (4·27–5·65) for kidney cancer. Conversely, incidence in young adults increased in successively younger generations for only two cancers (gastric non-cardia cancer and leukaemia), and decreased for eight of the 18 additional cancers, including smoking and HIV infection-associated cancers.

Interpretation

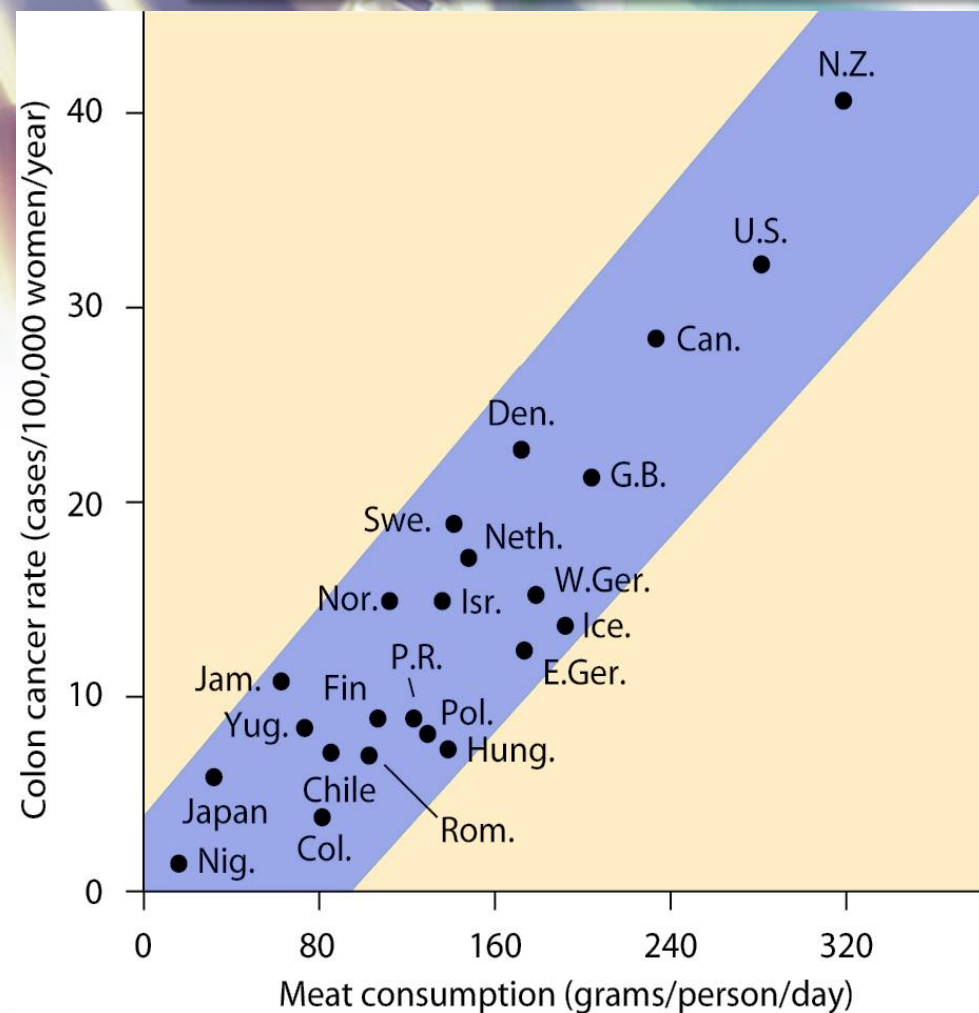
The risk of developing an obesity-related cancer seems to be increasing in a stepwise manner in successively younger birth cohorts in the USA. Further studies are needed to elucidate exposures responsible for these emerging trends, including excess bodyweight and other risk factors.

Increases larger with each generation
Not all cancers
Smoking related cancers going down

Cancer Deaths (%) Linked to Diet



Diet and Cancer Risk



Epidemiologists estimate that diet plays a role in ~30 - 35% of all fatal cancers!

Adapted from B. Armstrong and R. Doll, *Int. Journal of Cancer* 15 (1975):617.

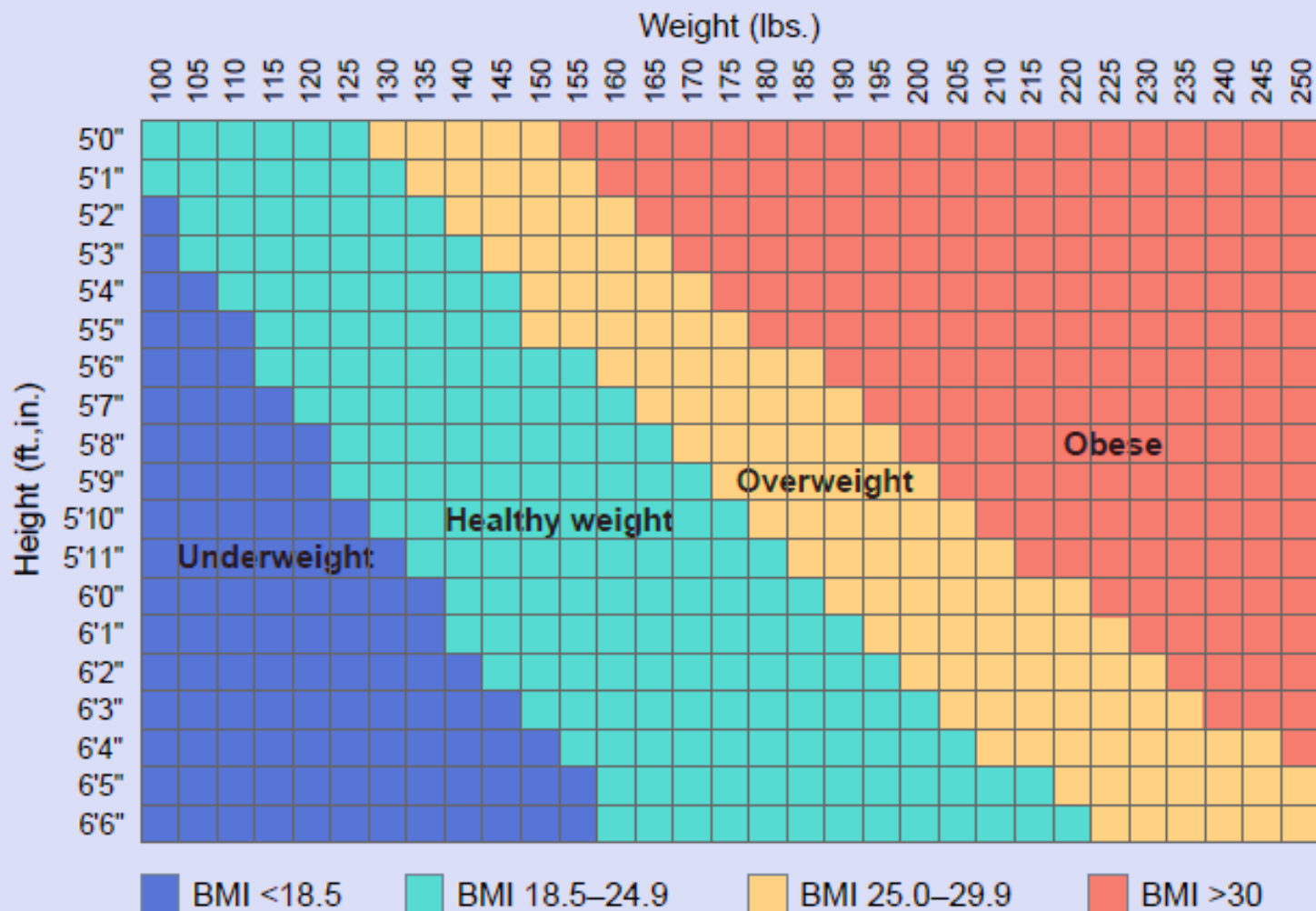
Hot dogs bacon and grilled meat

BMI and Health



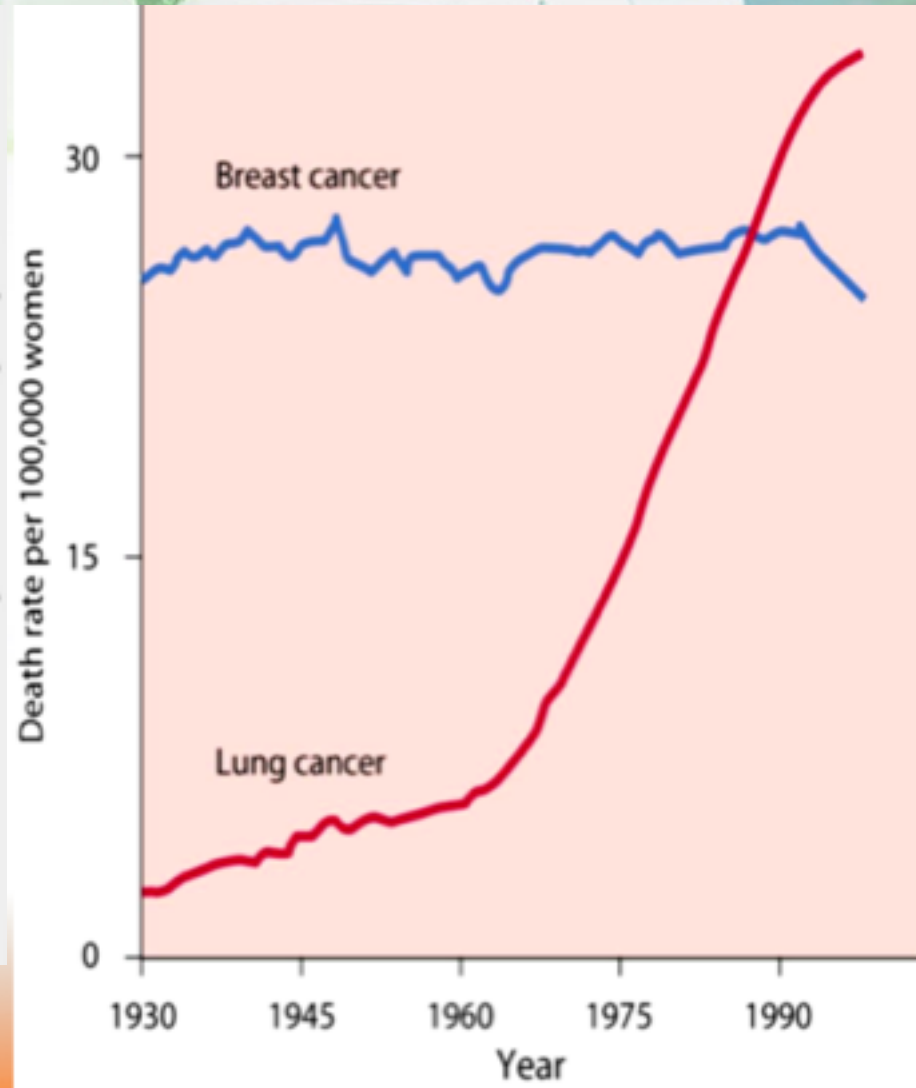
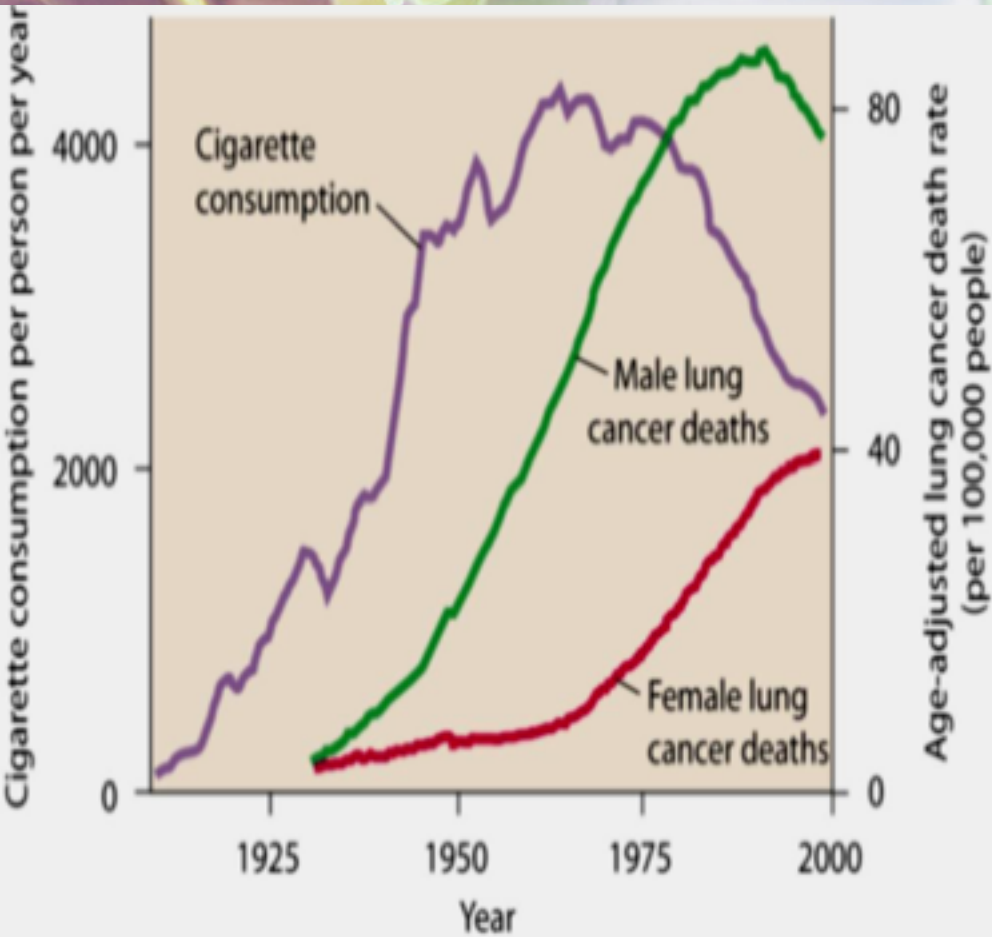
NYT BMI Calculator

BODY MASS INDEX CHART, ADULTS 20 AND OVER



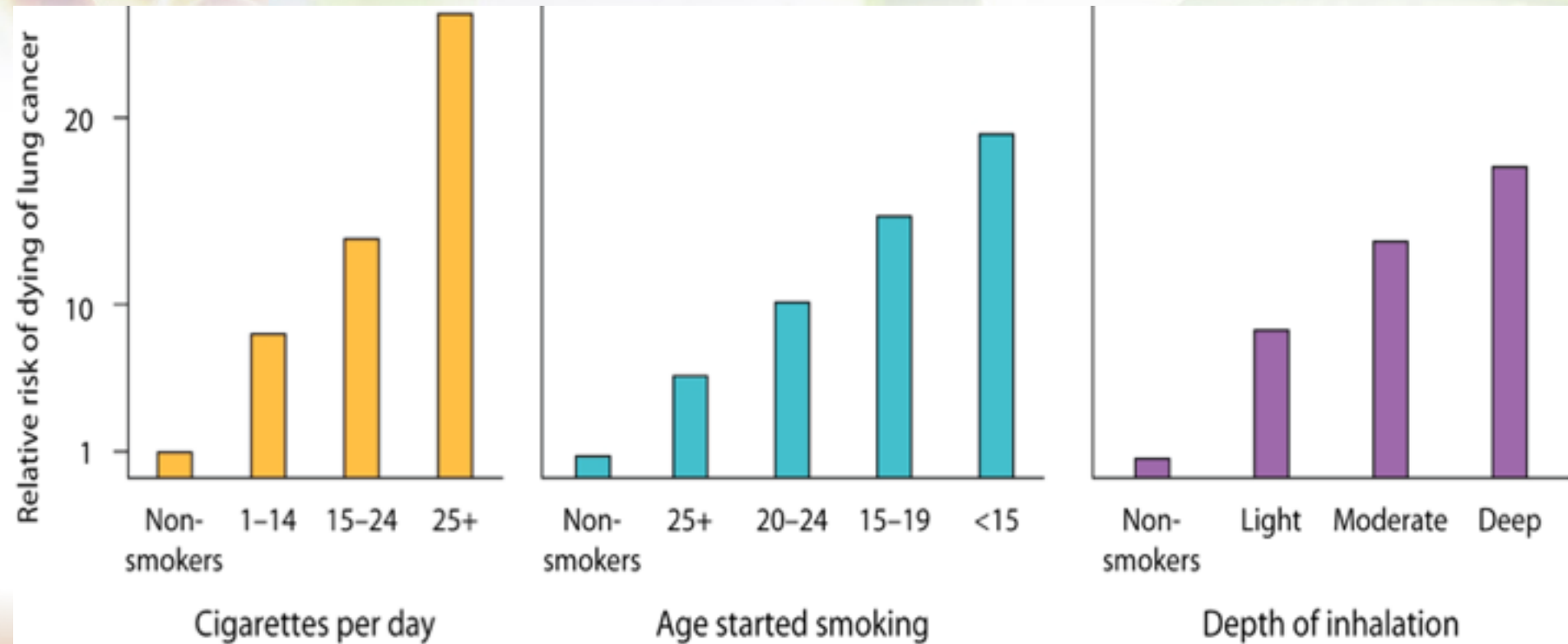
Body Mass Index (BMI) is a number that shows body weight adjusted for height. Based on their BMIs, adults 20 years and older fall into one of the four categories: underweight; healthy weight; overweight; and obese. Individuals in the overweight or obese category have a greater risk than those in the healthy weight category for many diseases, including certain cancers. To find which category you are in, locate your height and move across the chart to your weight.

Cigarette Smoking and Lung Cancer



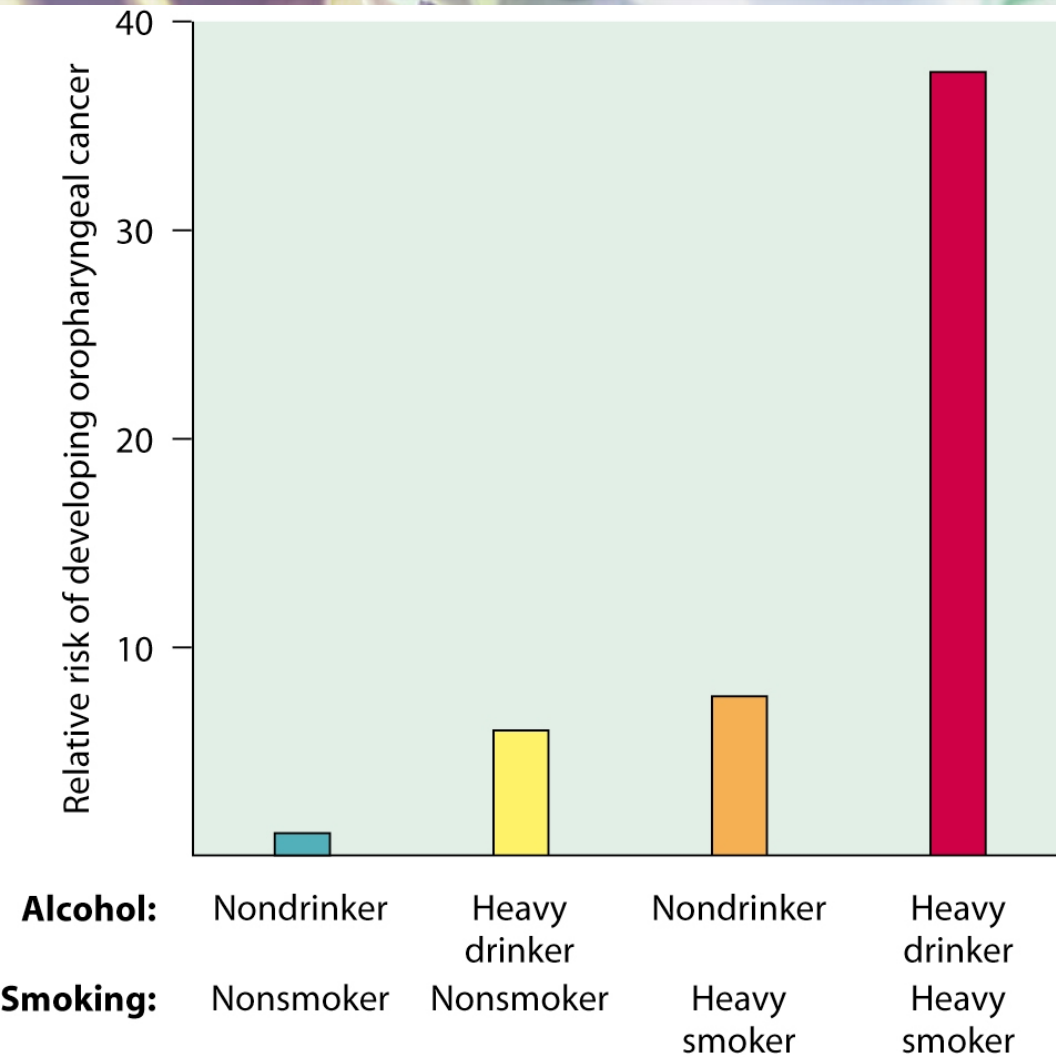
Based on data from *The Health consequences of Smoking – Cancer: A Report of the Surgeon General* -1982 (Rockville, MD: US. Department of Health and Human Services, 1982).

Dose Response Relationship Between Cigarette Smoking and Lung Cancer



From L. J. Kleinsmith, *Principles of Cancer Biology*. Copyright (c) 2006 Pearson Benjamin Cummings.

Interaction of Alcohol and Tobacco Smoke in Causing Mouth and Throat Cancer



Mexican beach attractions promise "50 hours of free drinking" over seven days.

By Victor R. Caivano, AP



Group of teens smoking and drinking
PRT073 BananaStock Royalty Free Photograph

Based on data from W.J. Blot *et al*, *Cancer Research* 48 (1988): 3285 (Table 4).

Alcohol-Attributable Cancer Deaths and Years of Potential Life Lost in the United States

David E. Nelson, MD, MPH, Dwayne W. Jarman, DVM, MPH, Jürgen Rehm, PhD, Thomas K. Greenfield, PhD, Grégoire Rey, PhD, William C. Kerr, PhD, Paige Miller, PhD, MPH, Kevin D. Shield, MHSc, Yu Ye, MA, and Timothy S. Naimi, MD, MPH

David E. Nelson and Paige Miller are with National Cancer Institute, Bethesda, MD. Dwayne W. Jarman is with Food and Drug Administration, Detroit, MI, and US Public Health Service, Rockville, MD. Jürgen Rehm and Kevin D. Shield are with Centre for Addiction and Mental Health, Toronto, Ontario. Thomas K. Greenfield, William C. Kerr, and Yu Ye are with Alcohol Research Group, Public Health Institute, Emeryville, CA. Grégoire Rey is with INSERM, CéciDc, Le Kremlin-Bicêtre, France. Timothy S. Naimi is with Boston University Medical Center, Boston, MA.

ABSTRACT

Objectives. Our goal was to provide current estimates of alcohol-attributable cancer mortality and years of potential life lost (YPLL) in the United States.

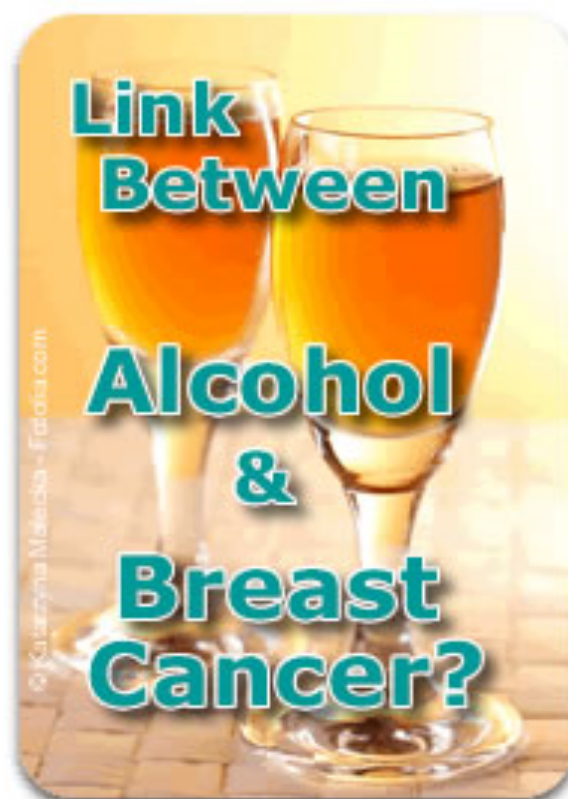
Methods. We used 2 methods to calculate population-attributable fractions. We based relative risks on meta-analyses published since 2000, and adult alcohol consumption on data from the 2009 Alcohol Epidemiologic Data System, 2009 Behavioral Risk Factor Surveillance System, and 2009–2010 National Alcohol Survey.

Results. Alcohol consumption resulted in an estimated 18 200 to 21 300 cancer deaths, or 3.2% to 3.7% of all US cancer deaths. The majority of alcohol-attributable female cancer deaths were from breast cancer (56% to 66%), whereas upper airway and esophageal cancer deaths were more common among men (53% to 71%). Alcohol-attributable cancers resulted in 17.0 to 19.1 YPLL for each death. Daily consumption of up to 20 grams of alcohol (≤ 1.5 drinks) accounted for 26% to 35% of alcohol-attributable cancer deaths.

Conclusions. Alcohol remains a major contributor to cancer mortality and YPLL. Higher consumption increases risk but there is no safe threshold for alcohol and cancer risk. Reducing alcohol consumption is an important and underemphasized cancer prevention strategy. (*Am J Public Health*. Published online ahead of print February 14, 2013: e1–e8. doi:10.2105/AJPH.2012.301199)

Alcohol May Increase Breast Cancer Risk

A woman's history of drinking is directly linked to her chances of developing the most common form of breast cancer and it doesn't matter what form of alcoholic beverage she prefers, either. The largest study ever conducted that matches alcoholic consumption with types of breast cancer says that three drinks a day increases the risk of estrogen- and progesterone-positive cancer by as much as 51%.



Jasmine Q. Lew, a University of Chicago medical student and first author of the study, urges women to evaluate other factors associated with breast cancer, including the history of breast cancer within their families, before indulging in excessive alcoholic consumption, especially when undergoing hormone replacement therapy (HRT). Laboratory studies have proven that alcohol affects estrogen metabolism in such a way that it acts as fuel for a form of cancer that is hormone sensitive. This hormone-sensitive breast cancer, indicated as ER+/PR+ (estrogen receptor positive/progesterone receptor positive) accounts for about 70% of all cases of breast cancer.

Lew and her fellow researchers reviewed data on 184,418 postmenopausal women collected in the NIH-AARP Diet and Health Study, which began assembling data in 1995. Study participants reported their alcoholic consumption as less than one drink per day, one to two drinks per, or three or more drinks per day. After seven years, follow-up

studies identified 70% of the women as drinking every day. Those who drank even moderately faced an increased risk for breast cancer development.

Researchers then isolated 5,461 participants diagnosed with invasive breast cancer of which 2,391 cases were identified by the tumor type as follows:

Mortality due to cirrhosis and liver cancer in the United States, 1999-2016: observational study

BMJ 2018 ; 362 doi: <https://doi.org/10.1136/bmj.k2817> (Published 18 July 2018)

Cite this as: BMJ 2018;362:k2817

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Conclusions Mortality due to cirrhosis has been increasing in the US since 2009. Driven by deaths due to alcoholic cirrhosis, people aged 25-34 have experienced the greatest relative increase in mortality. White Americans, Native Americans, and Hispanic Americans experienced the greatest increase in deaths from cirrhosis. Mortality due to cirrhosis is improving in Maryland but worst in Kentucky, New Mexico, and Arkansas. The rapid increase in death rates among young people due to alcohol highlight new challenges for optimal care of patients with preventable liver disease.

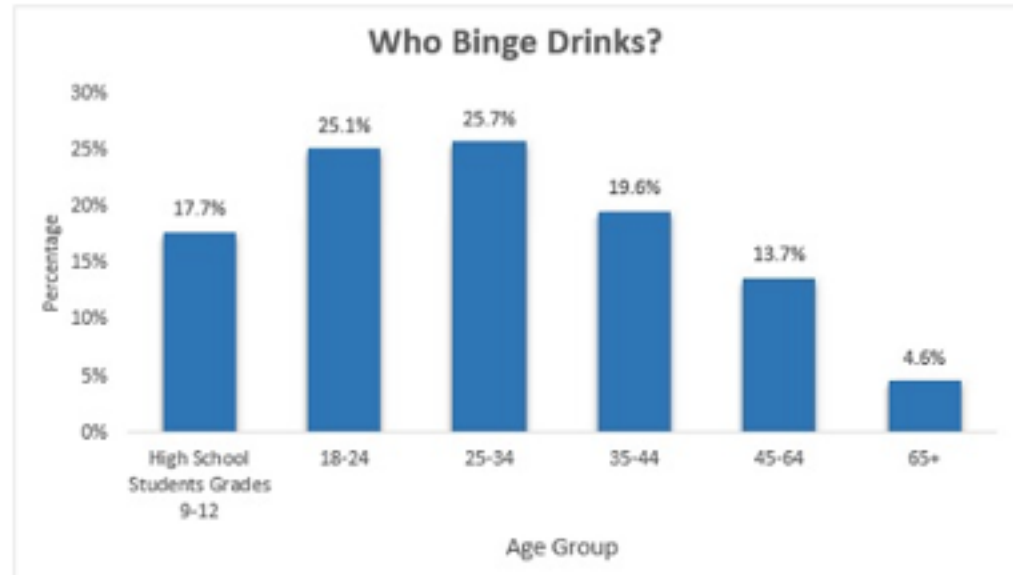


Binge Drinking (CDC.gov)



Who binge drinks?

- One in six US adults binge drinks about four times a month, consuming about seven drinks per binge. This results in 17 billion total binge drinks consumed by adults annually, or 467 binge drinks per binge drinker.⁵
- Binge drinking is most common among younger adults aged 18–34 years, but more than half of the total binge drinks are consumed by those aged 35 and older.⁵
- Binge drinking is twice as common among men than among women. Four in five total binge drinks are consumed by men.⁵
- Binge drinking is more common among people with household incomes of \$75,000 or more and higher educational levels. Binge drinkers with lower incomes and educational levels, however, consume more binge drinks per year.⁵
- Over 90% of U.S. adults who drink [excessively](#) report binge drinking in the past 30 days.¹
- Most people younger than age 21 who drink alcohol report binge drinking, often consuming large amounts.^{6,7}



How does alcohol consumption lead to cancer

Alcohol is a **PROMUTAGEN** converted into acetaldehyde. Acetaldehyde can cause cancer by damaging our DNA and preventing it from being repaired

Alcohol can increase the level of hormones such as estrogen in the body

- Alcohol can cause cirrhosis of the liver, by repeatedly damaging the liver eventually leading to liver cancer
- Alcohol makes it easier for cancer-causing chemicals, such as those found in tobacco, to be absorbed in the mouth or throat
- Alcohol can cause highly reactive molecules known as Reactive Oxygen Species or ROS

Infectious Agents Linked to Cancer

