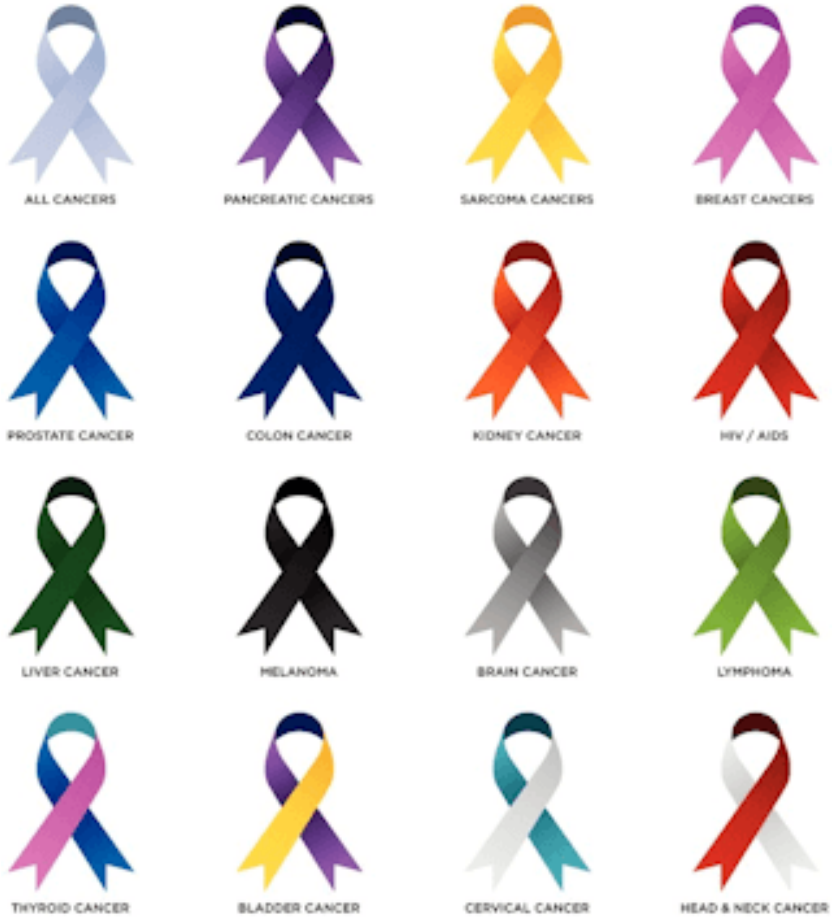
Cancer: Epidemiology and Risk Factors

Yüksel ÜRÜN, MD
Professor of Medicine
Dept. of Medical Oncology



@DrYukselUrun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Treasurer of the United States.
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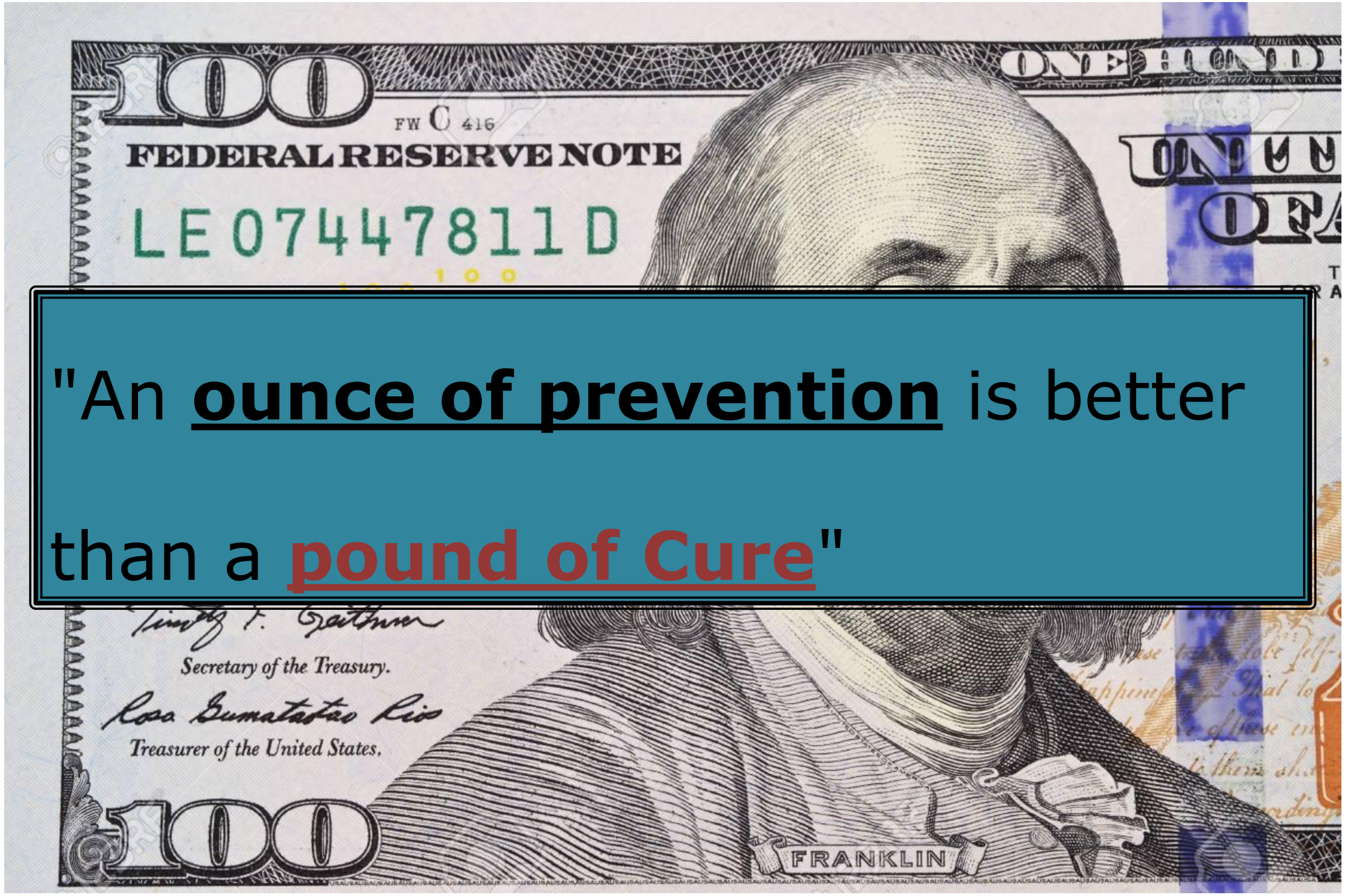


"An **ounce of prevention** is better

than a **pound of Cure**"

Urging Affordable Access to High-Value Cancer Drugs

Drug Costs Are a Burden on Cancer Patients

90% 90% of Americans say cancer drugs are too expensive

Most new cancer drugs are priced higher than $100,000 per patient per year

Financial Toxicity: Harmful Effects of Care Costs on Patients' Well Being

Financial toxicity can lead to:

Shortened survival

Skipped medication doses

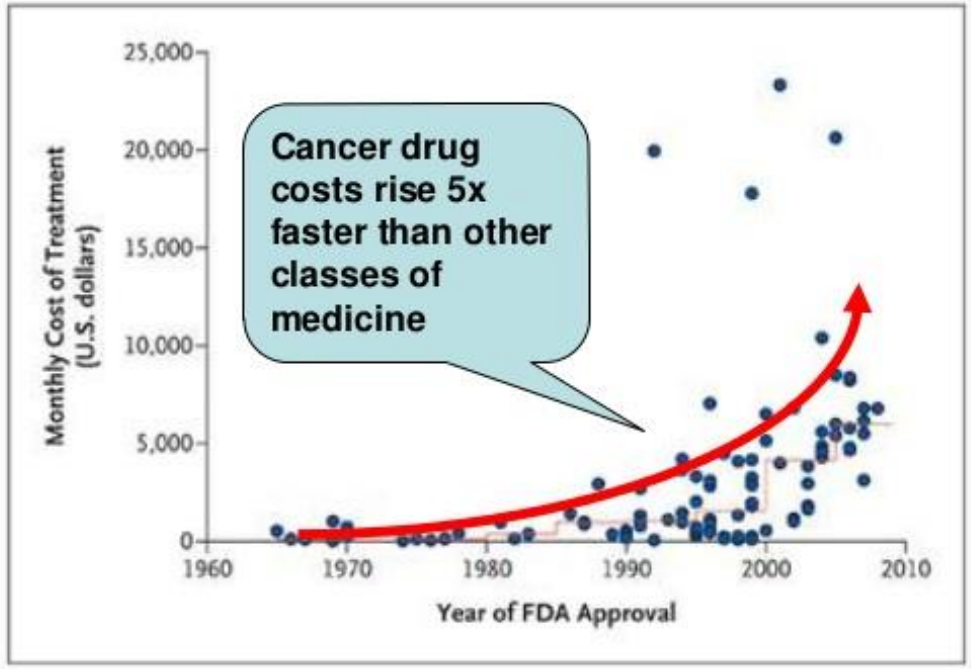
Debt, depleted savings, and bankruptcy

Discussions About Cost and Value May Help Patients

66% Nearly 66% of cancer patients express interest in talking with their doctors about costs

27% 27% of cancer patients and less than half of oncologists report having had cost-related discussions

Cost of cancer drugs by year of approval



Limits on Medicare's ability to control rising spending on cancer drugs

Bach P. N Engl J Med 2009; 360:626-633

Bach P. NEJM. 2009 Feb 7

- ✓ **Prevention and treatment of cancer and the economic value of lives lost and disability caused, cost the world about $1.16 trillion in 2010**
- ✓ **In 2015, the same year that the direct medical costs of cancer care were $80.2 billion, the budget for the NIH was just $30.36 billion, of which $4.93 billion went to the NCI.**

https://www.cancerprogressreport.org/Pages/cpr19-cancer-in-2019.aspx

Global Cancer Statistics at a Glance

- Noncommunicable diseases are now responsible for the majority of global deaths
- Cancer is expected to rank as the leading cause of death
- Approximately 38.4% of men and women will be diagnosed with cancer at some point during their lifetimes
- Most important barrier to increasing life in the 21st century.
- Cancer incidence and mortality are rapidly growing worldwide.

CA: Cancer J Clin. 2018;68:394-424

Global Cancer Statistics 2018

- Noncommunicable diseases are now responsible for the majority of global deaths
- Cancer is expected to rank as the leading cause of death
- Most important barrier to increasing life in the 21st century.
- Cancer incidence and mortality are rapidly growing worldwide.

- *More than half of global cancer cases are a result of preventable causes !!!*

CA: Cancer J Clin. 2018;68:394-424

CANCER SITE	NO. OF NEW CASES (% OF ALL SITES)	NO. OF DEATHS (% OF ALL SITES)
Lung	2,093,876 (11.6)	1,761,007 (18.4)
Breast	2,088,849 (11.6)	626,679 (6.6)
Prostate	1,276,106 (7.1)	358,989 (3.8)
Colon	1,096,601 (6.1)	551,269 (5.8)
Nonmelanoma of skin	1,042,056 (5.8)	65,155 (0.7)
Stomach	1,033,701 (5.7)	782,685 (8.2)
Liver	841,080 (4.7)	781,631 (8.2)
Rectum	704,376 (3.9)	310,394 (3.2)
Esophagus	572,034 (3.2)	508,585 (5.3)
Cervix uteri	569,847 (3.2)	311,365 (3.3)
Thyroid	567,233 (3.1)	41,071 (0.4)
Bladder	549,393 (3.0)	199,922 (2.1)
Non-Hodgkin lymphoma	509,590 (2.8)	248,724 (2.6)
Pancreas	458,918 (2.5)	432,242 (4.5)
Leukemia	437,033 (2.4)	309,006 (3.2)
Kidney	403,262 (2.2)	175,098 (1.8)
Corpus uteri	382,069 (2.1)	89,929 (0.9)
Lip, oral cavity	354,864 (2.0)	177,384 (1.9)
Brain, nervous system	296,851 (1.6)	241,037 (2.5)
Ovary	295,414 (1.6)	184,799 (1.9)
Melanoma of skin	287,723 (1.6)	60,712 (0.6)
Gallbladder	219,420 (1.2)	165,087 (1.7)
Larynx	177,422 (1.0)	94,771 (1.0)
Multiple myeloma	159,985 (0.9)	106,105 (1.1)
Nasopharynx	129,079 (0.7)	72,987 (0.8)
Oropharynx	92,887 (0.5)	51,005 (0.5)
Hypopharynx	80,608 (0.4)	34,984 (0.4)
Hodgkin lymphoma	79,990 (0.4)	26,167 (0.3)
Testis	71,105 (0.4)	9,507 (0.1)
Salivary glands	52,799 (0.3)	22,176 (0.2)
Anus	48,541 (0.3)	19,129 (0.2)
Vulva	44,235 (0.2)	15,222 (0.2)
Kaposi sarcoma	41,799 (0.2)	19,902 (0.2)
Penis	34,475 (0.2)	15,138 (0.2%)
Mesothelioma	30,443 (0.2)	25,576 (0.3)
Vagina	17,600 (0.1)	8,062 (0.1)
All sites excluding skin	17,036,901	9,489,872
All sites	**18,078,957**	**9,555,027**

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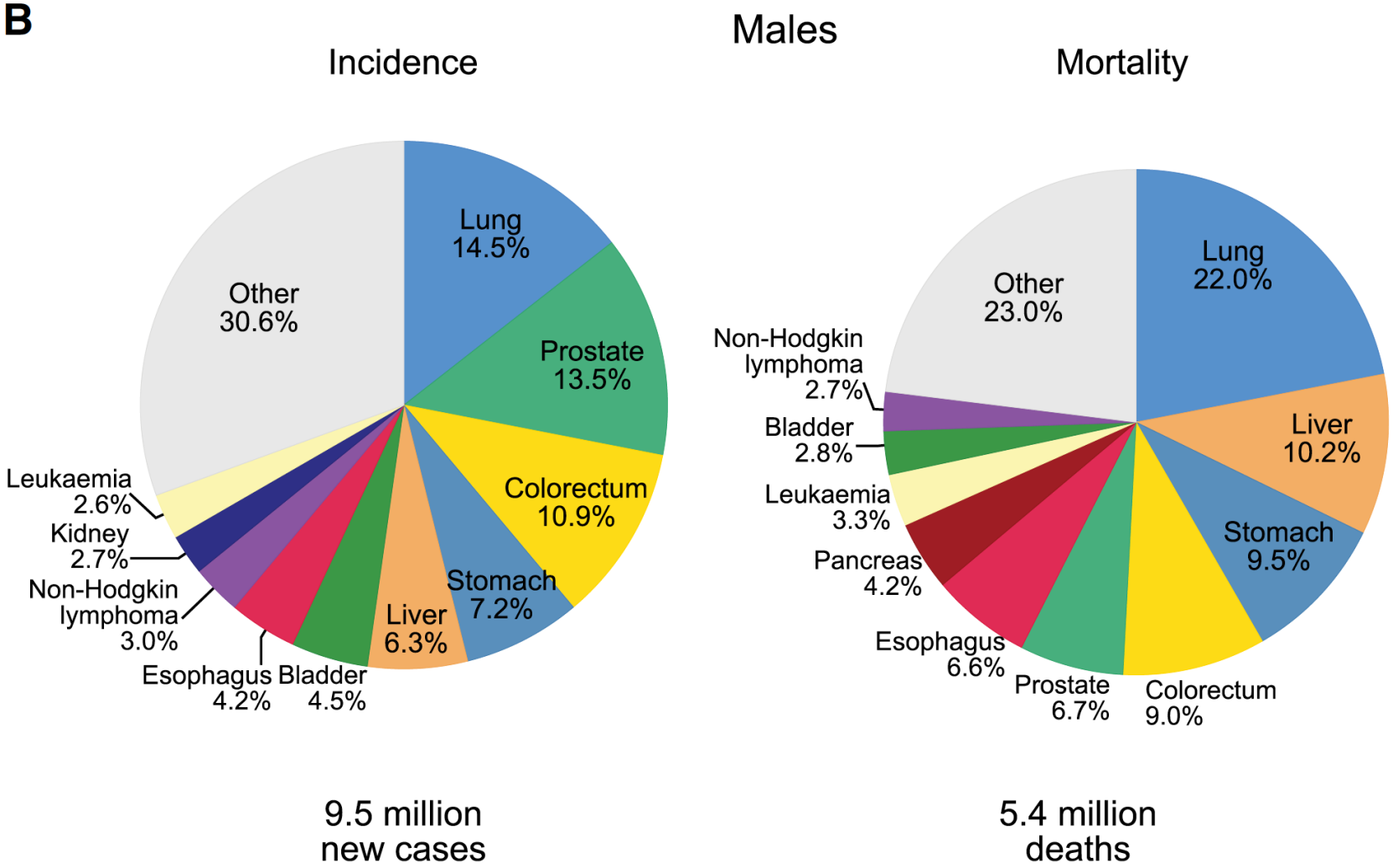
Source: GLOBOCAN 2018.

CA: Cancer J Clin. 2018;68:394-424

B

Males

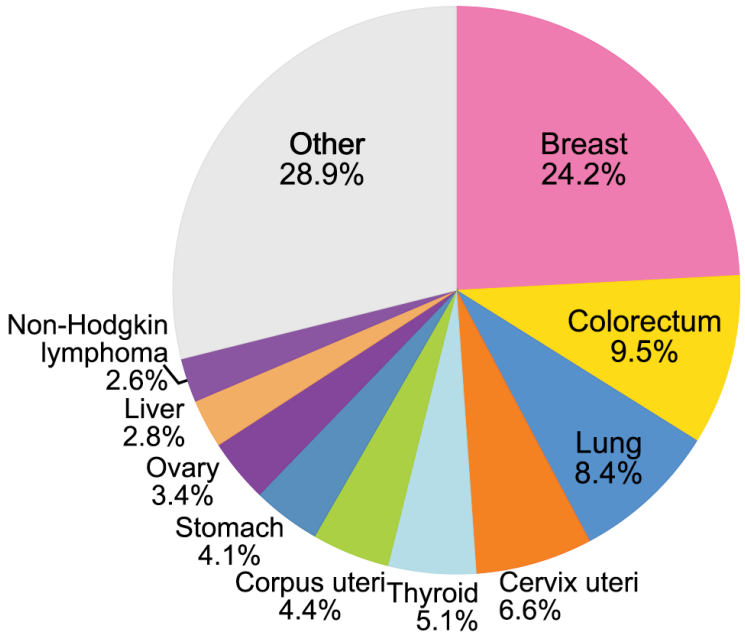


CA: Cancer J Clin. 2018;68:394-424

C

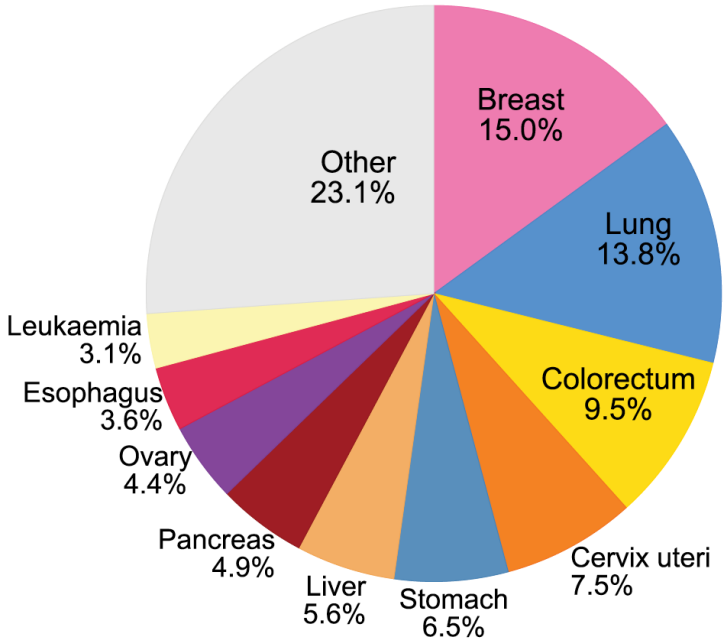
Females

Incidence



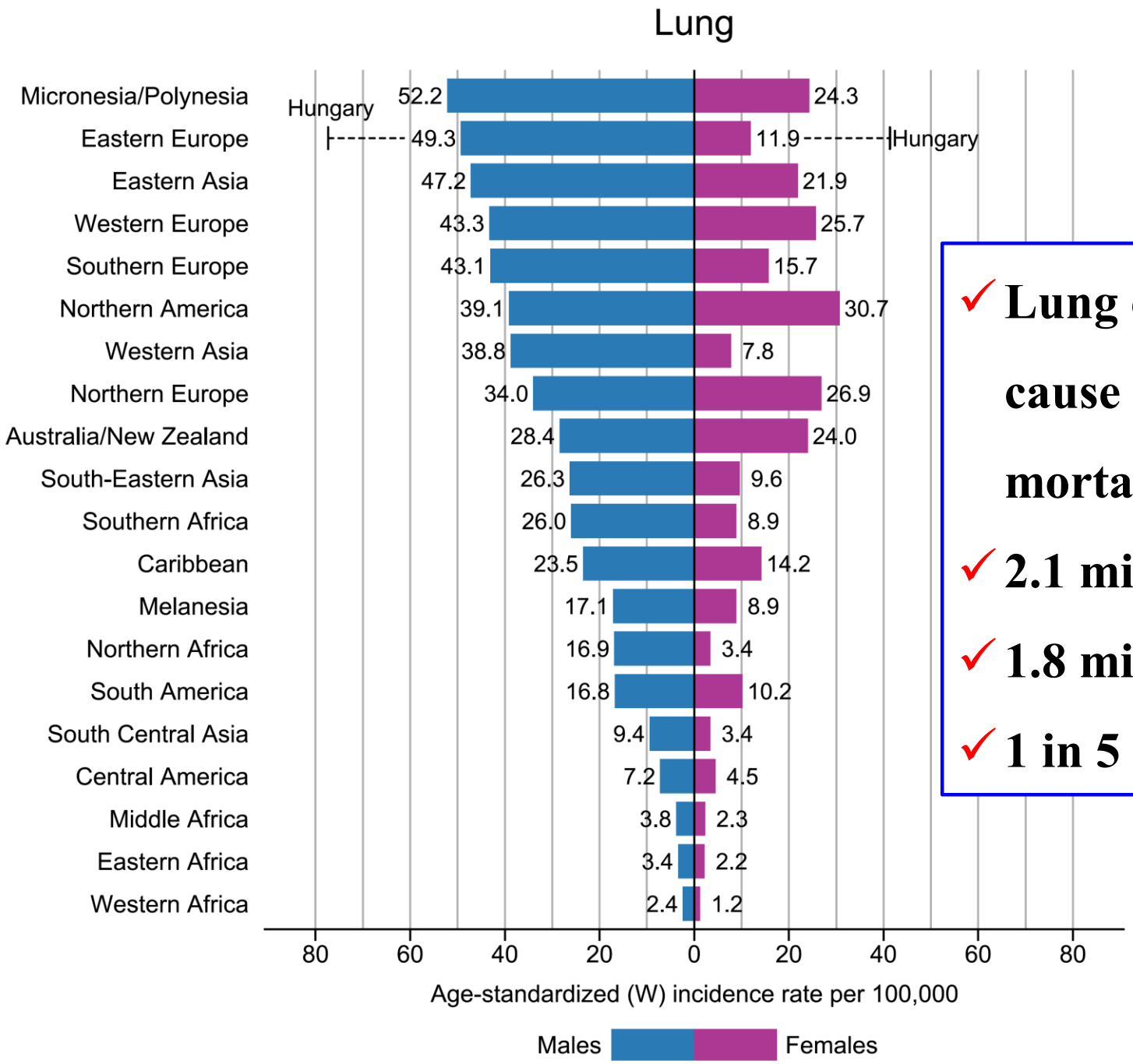
8.6 million
new cases

Mortality

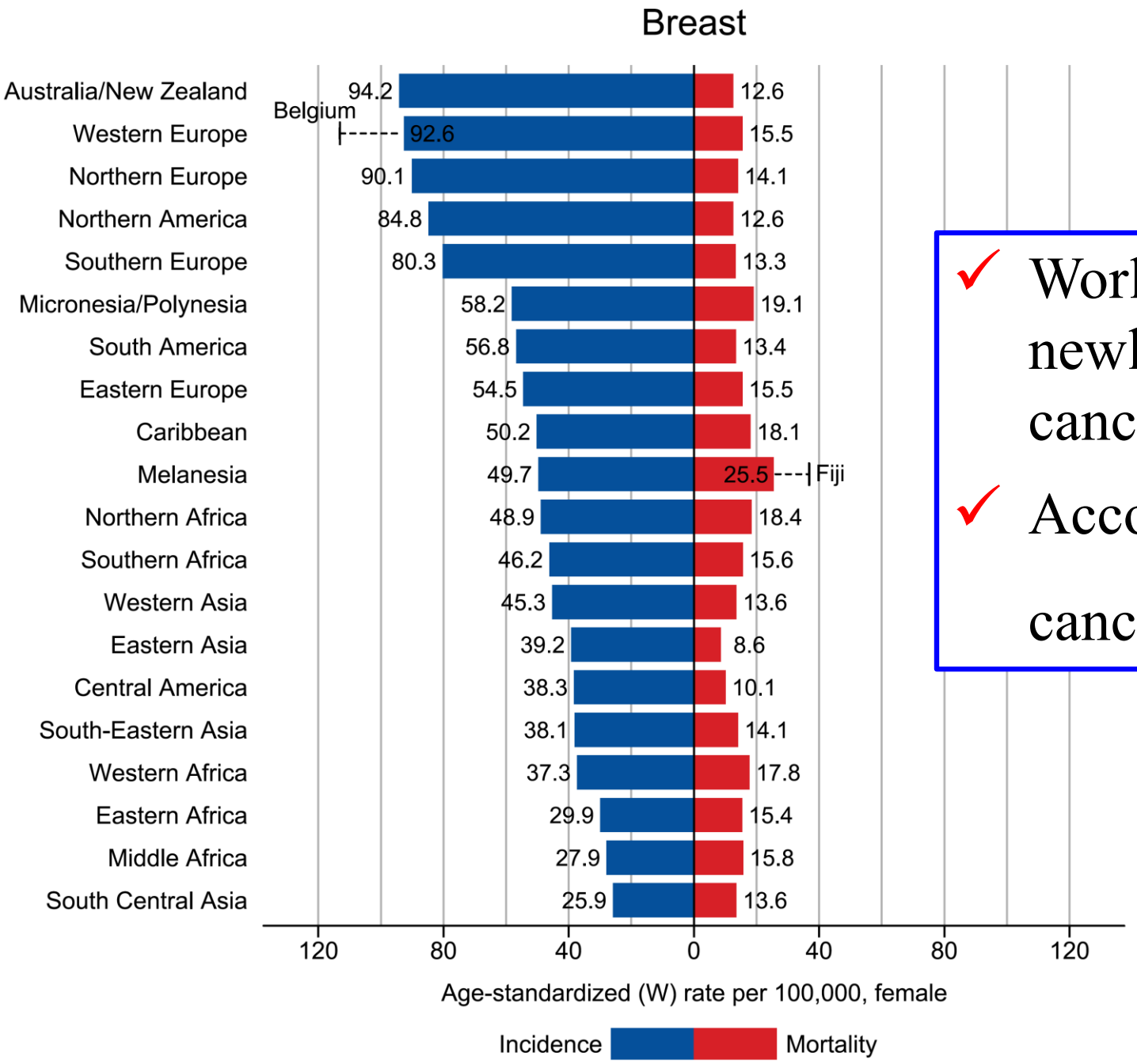


4.2 million
deaths

CA: Cancer J Clin. 2018;68:394-424



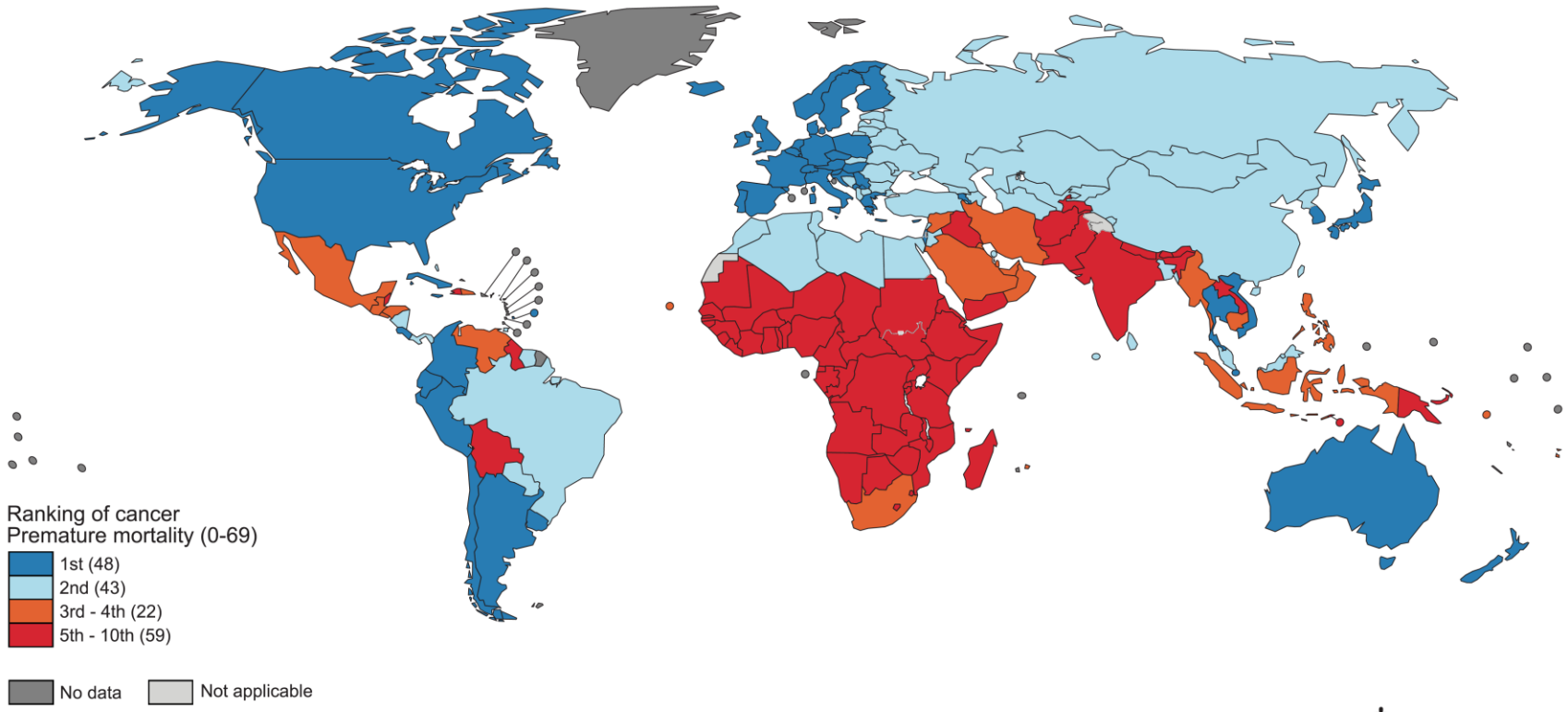
- ✓ **Lung cancer remains the leading cause of cancer incidence and mortality**
- ✓ **2.1 million new lung cancer cases**
- ✓ **1.8 million deaths predicted in 2018**
- ✓ **1 in 5 (18.4%) cancer deaths**



- ✓ Worldwide, about 2.1 million newly diagnosed female breast cancer cases in 2018,
- ✓ Accounting for almost 1 in 4 cancer cases among women

National Ranking of Cancer as a Cause of Death at Ages Below 70 Years in 2015

Global Cancer Statistics 2018



The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not yet be full agreement.

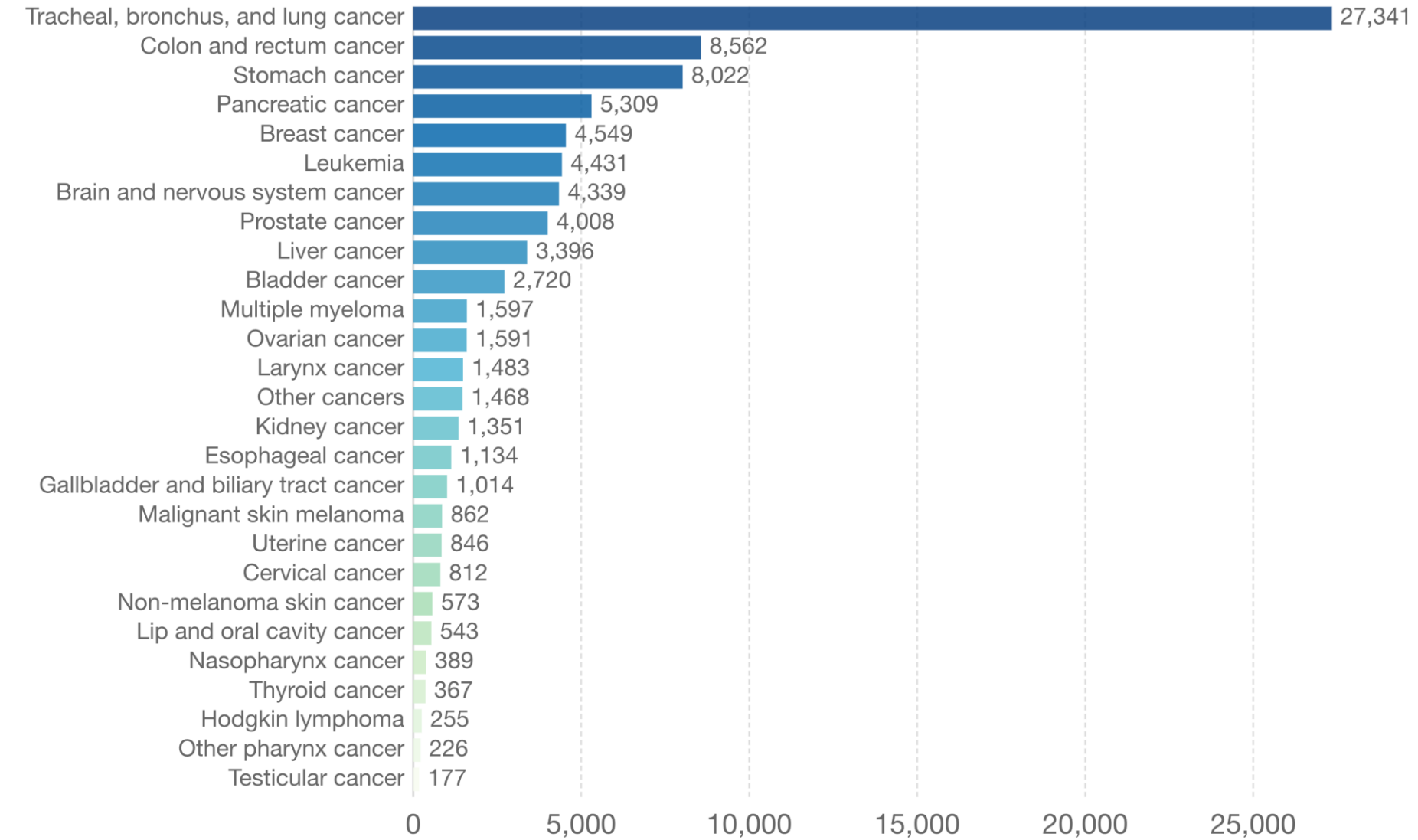
Data source: GHO
Map production: CSU
World Health Organization

World Health Organization

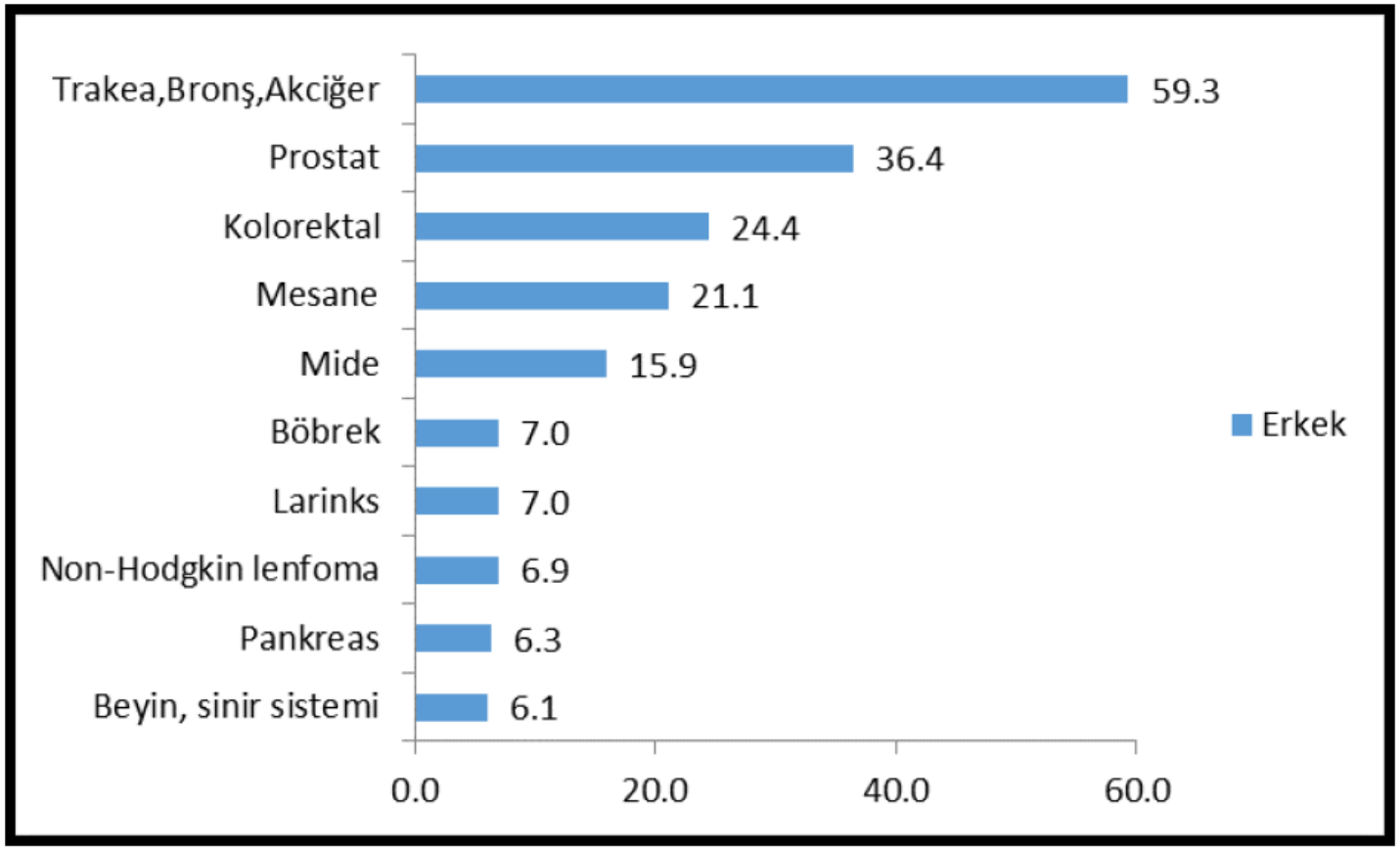
Cancer deaths by type, Turkey, 2017

Total annual number of deaths from cancers across all ages and both sexes, broken down by cancer type.

Our World in Data

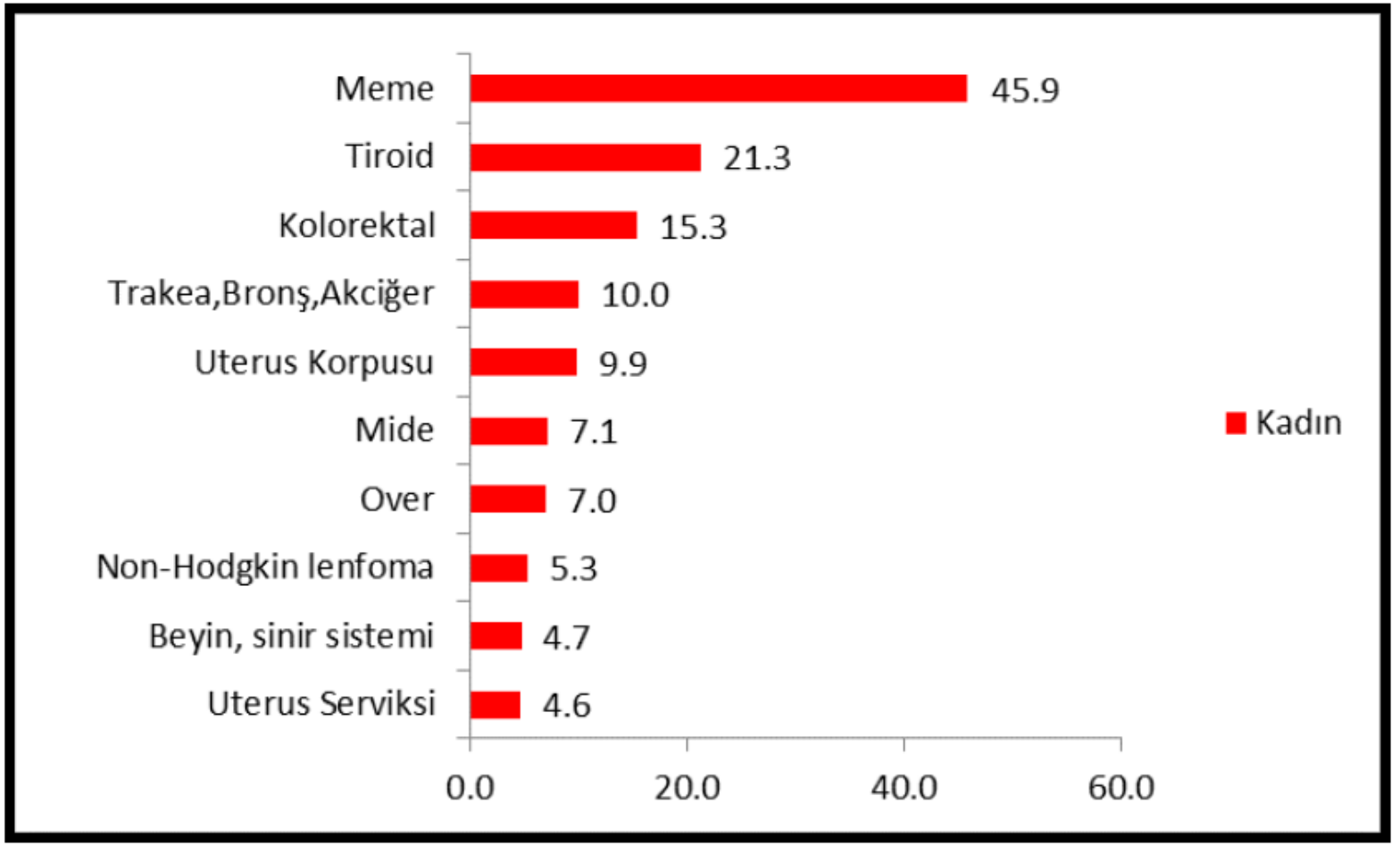


Source: IHME, Global Burden of Disease (GBD)



Şekil 7. Erkeklerde En Sık Görülen 10 Kanserin Yaşa Göre Standardize Edilmiş Hızları (Türkiye Birleşik Veri Tabanı, 2013) (Dünya Standart Nüfusu, 100.000 Kişide)

http://kanser.gov.tr/Dosya/ca_istatistik/ANA_rapor_2013v01_2.pdf



Şekil 8. Kadınlarda En Sık Görülen 10 Kanserin Yaşa Göre Standardize Edilmiş Hızları (Türkiye Birleşik Veri Tabanı, 2013) (Dünya Standart Nüfusu, 100.000 Kişide)

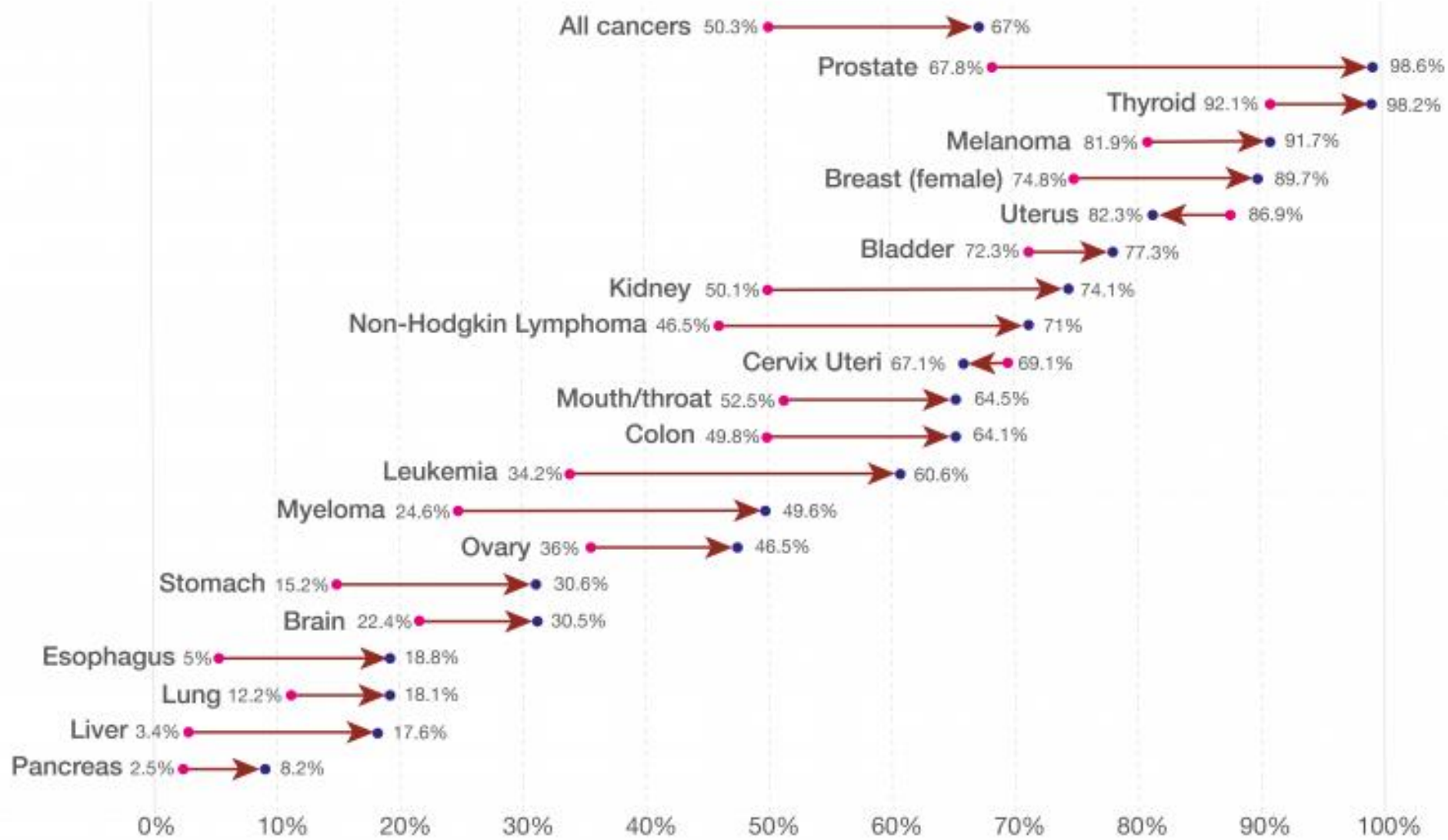
http://kanser.gov.tr/Dosya/ca_istatistik/ANA_rapor_2013v01_2.pdf

Five-year cancer survival rates in the USA

Average five-year survival rates from common cancer types in the United States, shown as the rate over the period 1970-77 [•] and over the period 2007-2013 [•]: 1970-77 → 2007-2013

This five-year interval indicates the percentage of people who live longer than five years following diagnosis.

Our World in Data



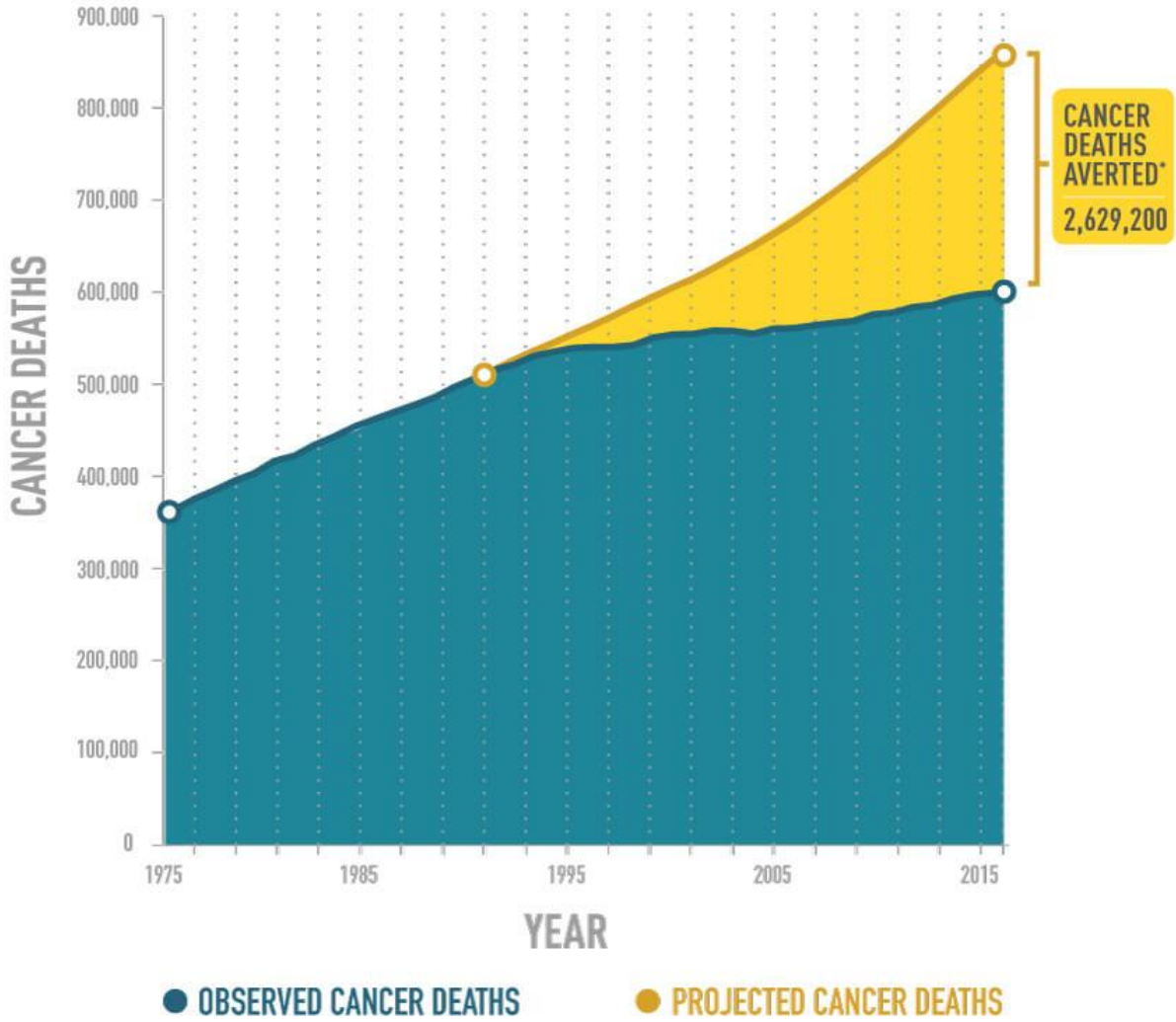
Based on data by Journal of the National Cancer Institute; Surveillance, Epidemiology and End Results Program.
The data visualization is available at OurWorldinData.org. There you find research and more visualizations on this topic.

US Five-year survival rates have increased

- Is that cancer prevalence is falling (i.e. less people have cancer)?
  - slowly increasing in recent decades
- There are two key factors which could contribute to improved 5-Y survival rates:
  - earlier detection and/or
  - improved treatment?

https://ourworldindata.org/cancer

US Cancer Deaths Averted in Men & Women from 1991 to 2016



*Represents the difference between the number of observed cancer deaths and the number of projected cancer deaths that would have occurred had cancer death rates remained at their peak.

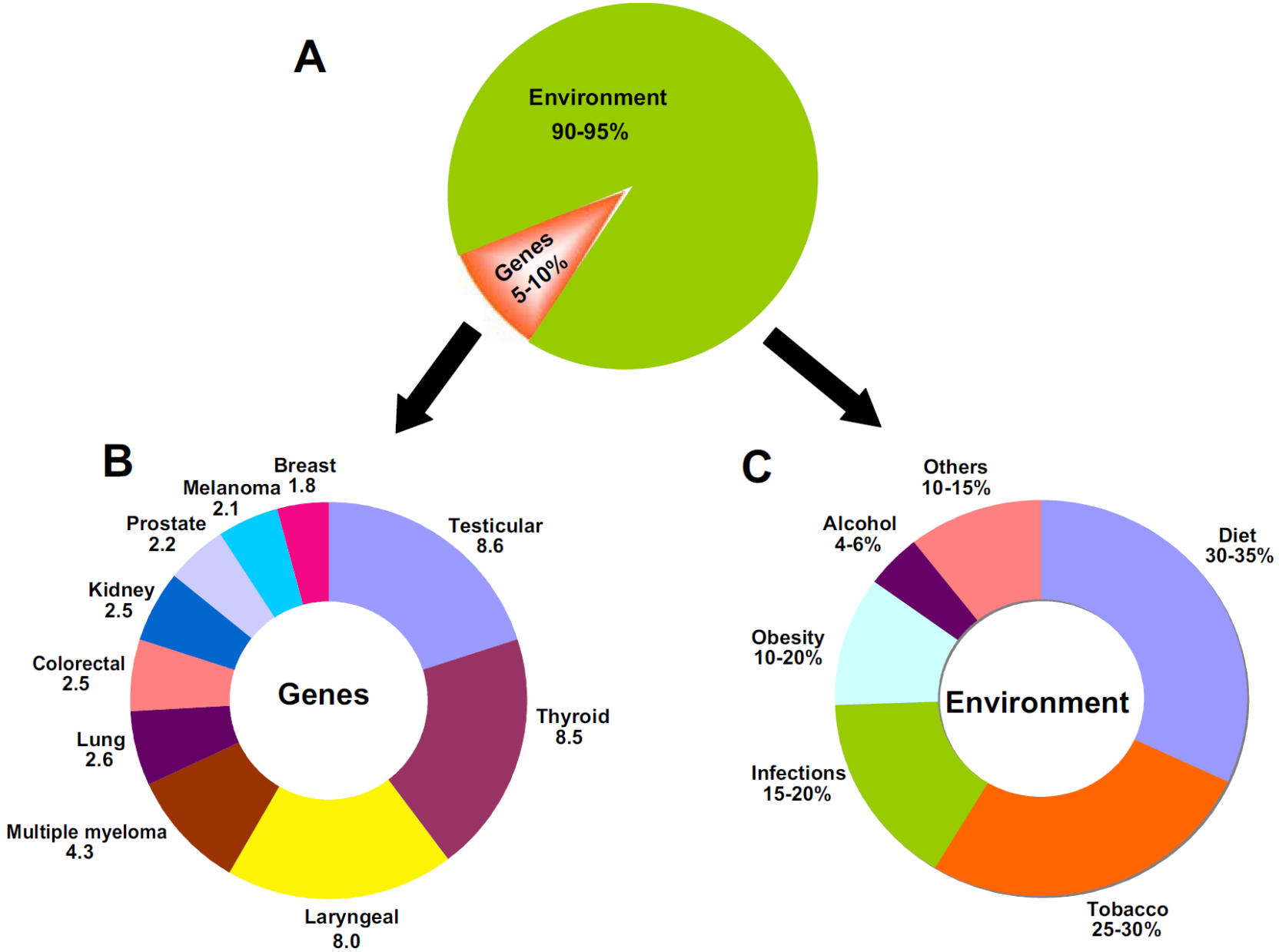
Source: Data provided by the American Cancer Society, Inc.

cancer.gov

CANCER RISK FACTORS

- Age
- Alcohol
- Cancer-Causing Substances
- Chronic Inflammation
- Diet
- Hormones
- Immunosuppression
- Infectious Agents
- Obesity
- Radiation
- Sunlight
- Tobacco

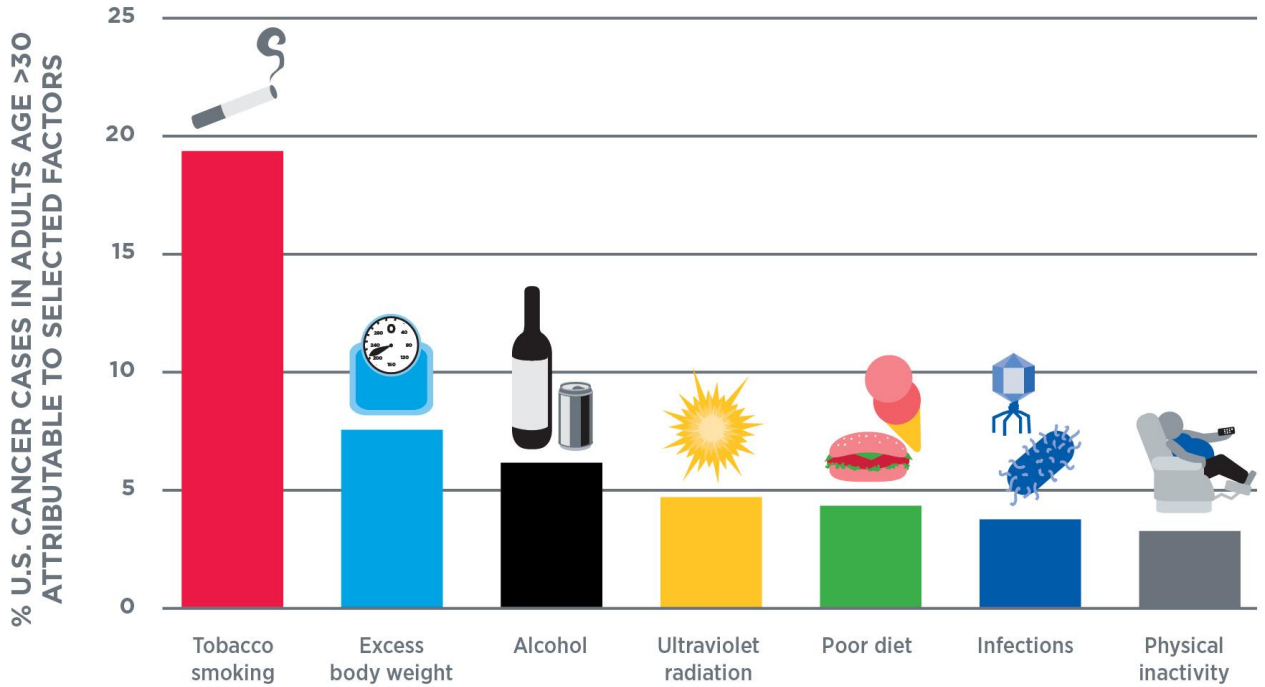
https://www.cancer.gov/about-cancer/causes-prevention/risk



Pharmaceutical Research, Vol. 25, No. 9, September 2008

FIGURE 2

INCREASING CANCER RISK



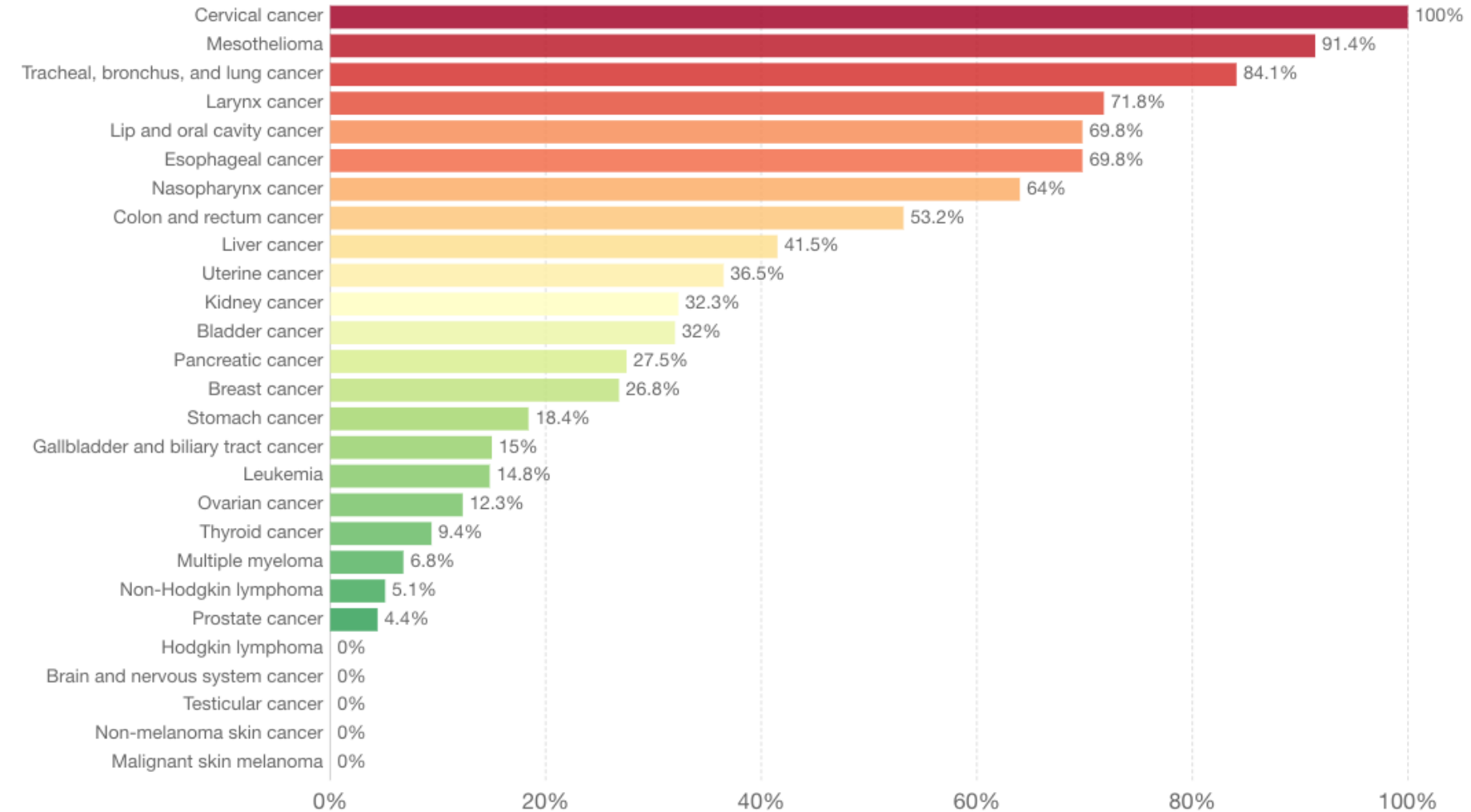
Research has identified numerous factors that increase an individual's risk for developing cancer. By modifying behavior, individuals can eliminate or reduce many of these risks and thereby reduce their risk of cancer. Developing and implementing additional public education and policy initiatives could help further reduce the burden of cancers related to preventable cancer risk factors.

Data from (46). Figure adapted from (15)

Share of cancer deaths attributed to risk factors, 2016

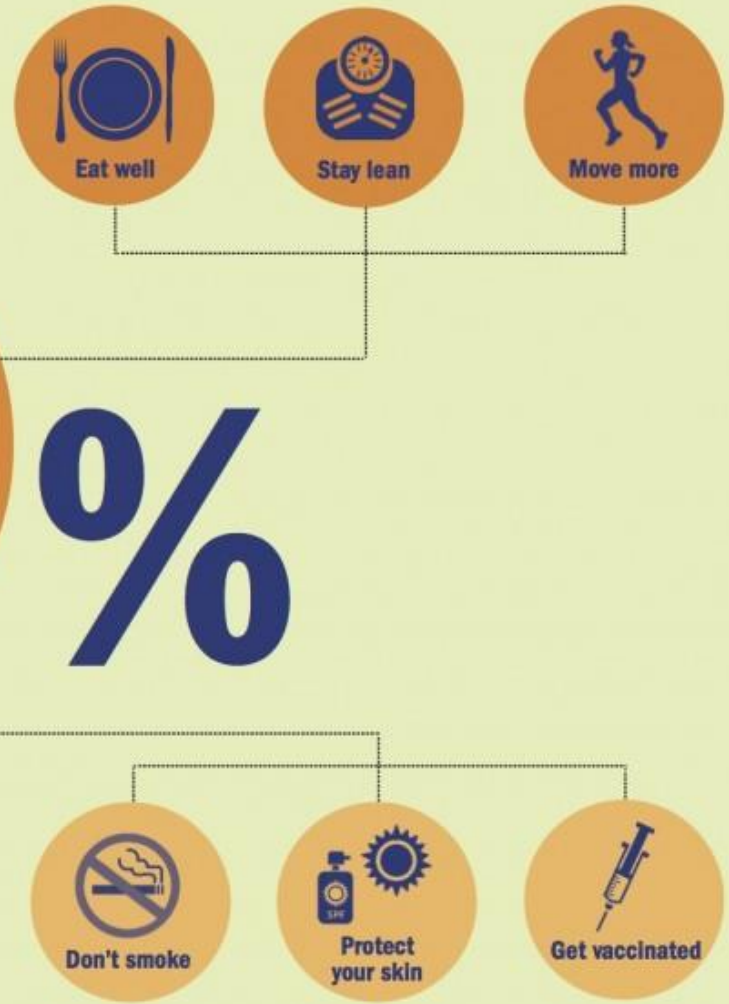
Global share of cancer deaths are attributed to the range of linked risk factors. These include known risks such as smoking, diet and nutrition, obesity, physical inactivity, alcohol consumption, air pollution, and environmental exposures. Sun exposure (linked to skin cancer) is not included in IHME estimates. The remaining share therefore represents deaths which would be expected to have occurred in the absence of any risk factors.

Our World in Data



Source: IHME, Global Burden of Disease

NEARLY 50% of the most common cancers CAN BE PREVENTED



SOURCES: Colditz GA et al. Sci Transl Med. Applying what we know to accelerate cancer prevention. Sci Transl Med. 2012 Mar 28;4(127); AICR/WRCF's, *Food, Nutrition, Physical Activity and the Prevention of Cancer: a Global Perspective* (2007), *Policy and Action for Cancer Prevention* (2009), Continuous Update Project reports (ongoing).

American Institute for Cancer Research
1759 R Street, NW · Washington DC · 20009
Phone: 202.328.7744 · Email: Communications@aicr.org · www.aicr.org

Not using tobacco is the single best way a person can prevent cancer from developing.

The NEW ENGLAND JOURNAL of MEDICINE

IMAGES IN CLINICAL MEDICINE

Radiographic Evidence Linking Tobacco Use and Lung Cancer

A 72-YEAR-OLD MAN PRESENTED FOR EVALUATION OF PROGRESSIVE DYSPNEA and cough. He reported smoking one to two packs of cigarettes a day since the age of 15 years. Standard chest radiography showed a suspicious lesion in the right thoracic cavity. Computed tomography of his chest revealed bullous emphysema (thick arrow), a tumor involving the middle lobe of the right lung (thin arrow), and a pack of cigarettes in his shirt pocket (asterisk). Biopsy of the lesion confirmed the presence of non–small-cell lung cancer.

David Michael McMullan, M.D.
Gordon Alan Cohen, M.D., Ph.D.

University of Washington
Seattle, WA 98195

N Engl J Med 2006; 354:397

DISEASES AND HEALTH PROBLEMS

LINKED TO SMOKING

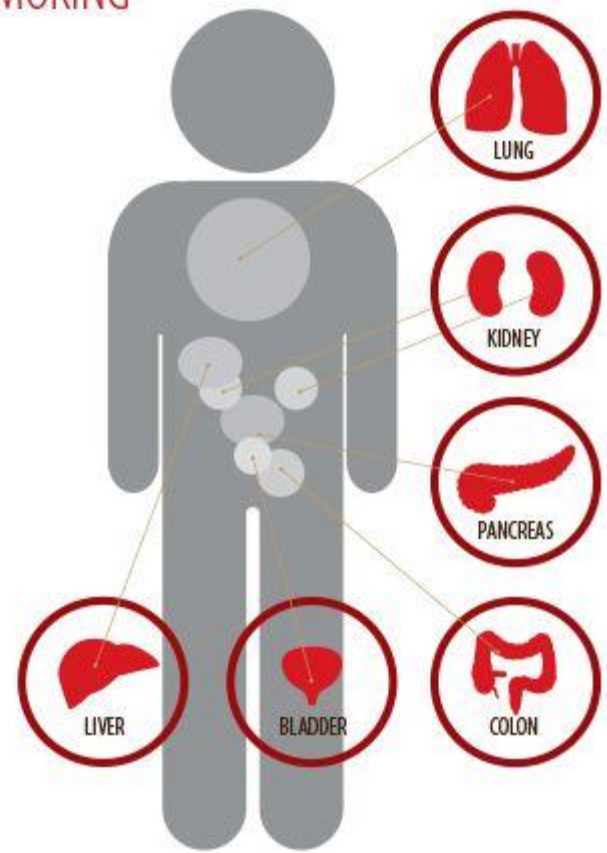
1 OUT OF 3
CANCER DEATHS COULD BE PREVENTED

SMOKING CAUSES CANCER

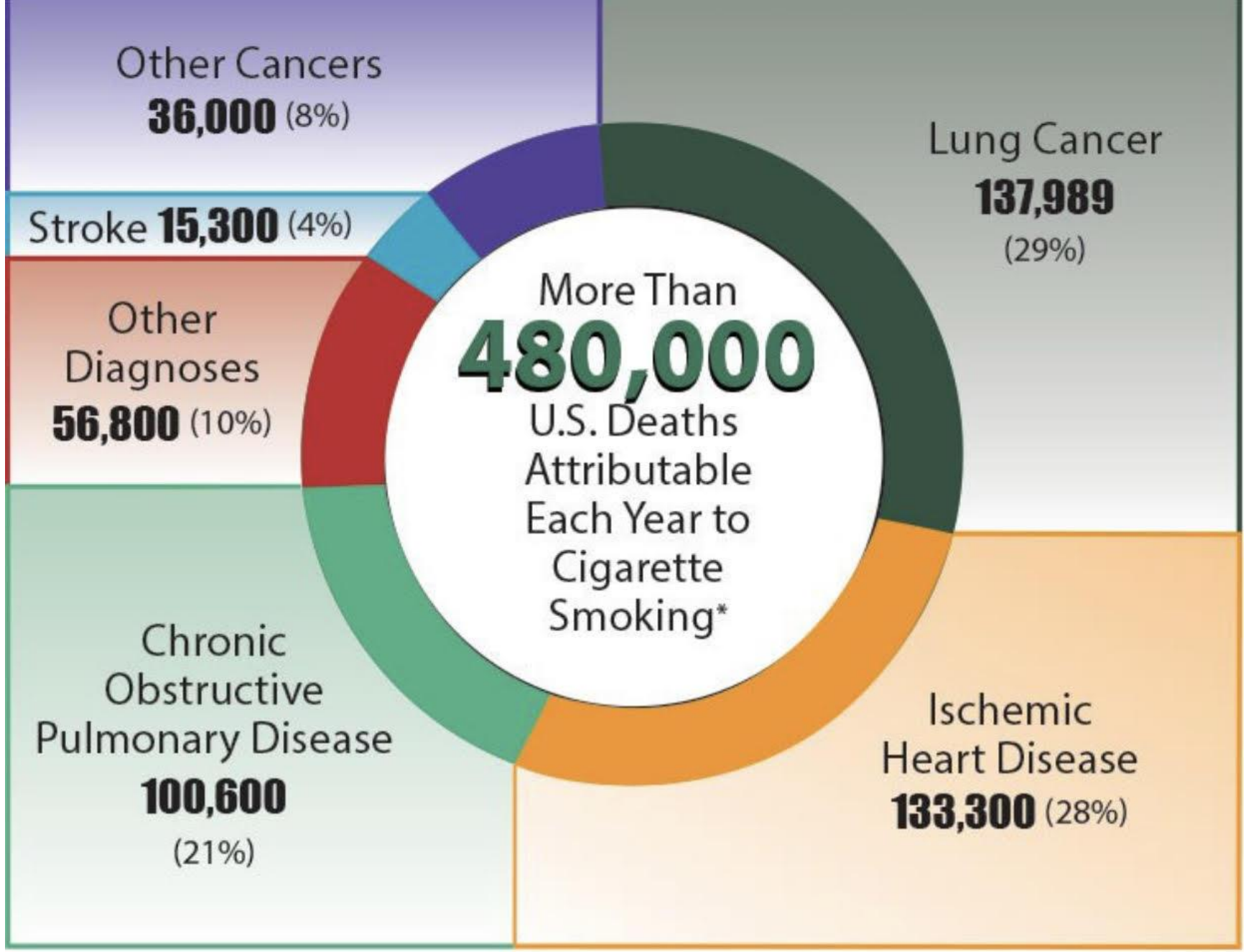
—IN THE—

LUNGS • TRACHEA
BRONCHUS • ESOPHAGUS
ORAL CAVITY • LIP
NASOPHARYNX
NASAL CAVITY • LARYNX
STOMACH • BLADDER
PANCREAS • KIDNEY
LIVER • UTERINE CERVIX
COLON AND RECTUM
AND CAUSES LEUKEMIA

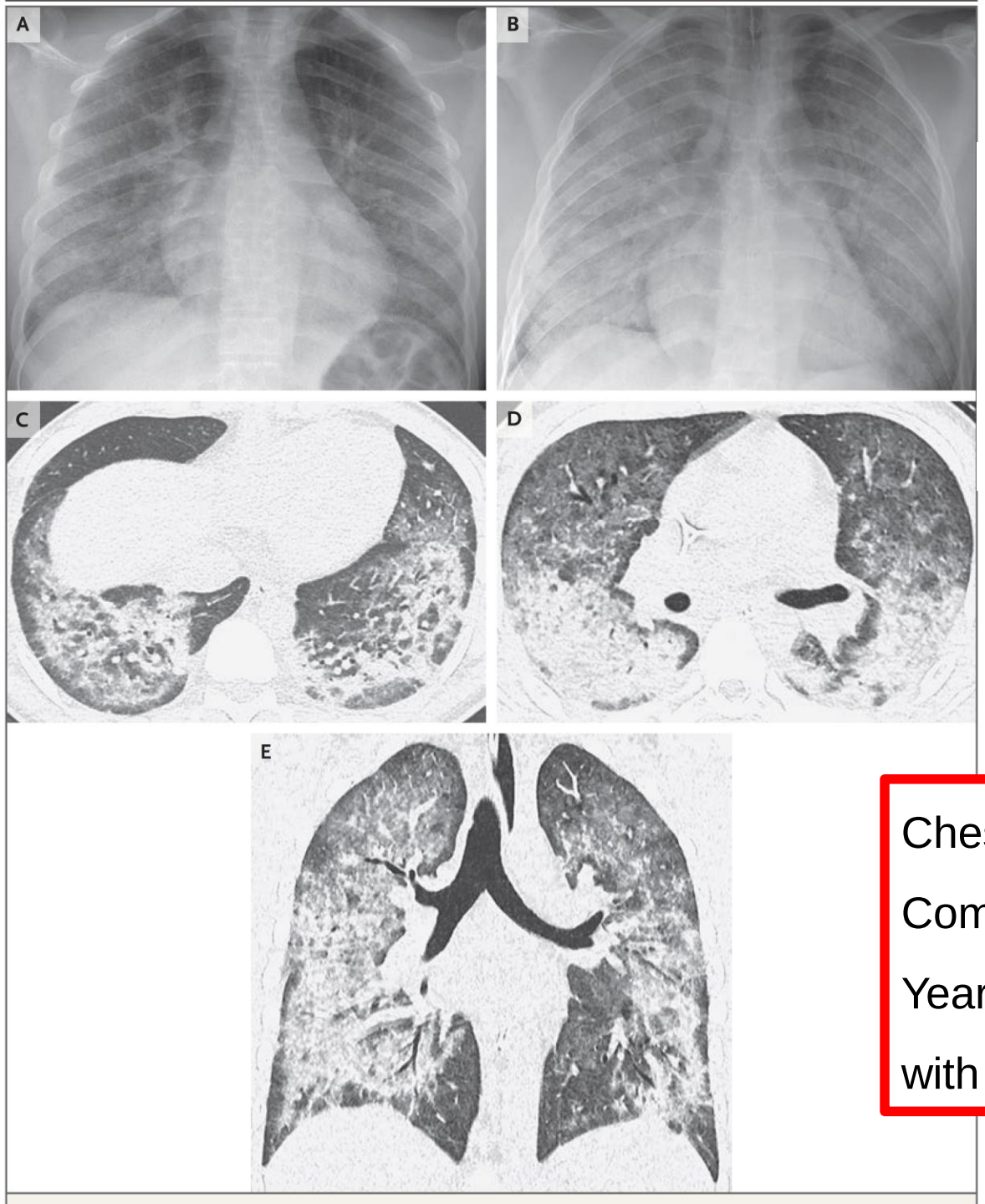
Smoking can cause cancer almost anywhere in the body.



CDC


Other Cancers
36,000 (8%)
Lung Cancer
137,989
(29%)
Stroke 15,300 (4%)
Other
Diagnoses
56,800 (10%)
More Than
480,000
U.S. Deaths
Attributable
Each Year to
Cigarette
Smoking*
Chronic
Obstructive
Pulmonary Disease
100,600
(21%)
Ischemic
Heart Disease
133,300 (28%)


Over 20%
of all deaths in the US
are from
TOBACCO.
ASH
ACTION
ON SMOKING & HEALTH
That's more than murders, car
accidents, & HIV/AIDs...combined.



ORIGINAL ARTICLE

Pulmonary Illness Related to E-Cigarette Use in Illinois and Wisconsin — Preliminary Report

Jennifer E. Layden, M.D., Ph.D., Isaac Ghinai, M.B., B.S., Ian Pray, Ph.D., Anne Kimball, M.D., Mark Layer, M.D., Mark Tenforde, M.D., Ph.D., Livia Navon, M.S., Brooke Hoots, Ph.D., Phillip P. Salvatore, Ph.D., Megan Elderbrook, M.P.H., Thomas Haupt, M.S., Jeffrey Kanne, M.D., Megan T. Patel, M.P.H., Lori Saathoff-Huber, M.P.H., Brian A. King, Ph.D., M.P.H., Josh G. Schier, M.D., Christina A. Mikosz, M.D., M.P.H., and Jonathan Meiman, M.D.

Chest Radiographs and High-Resolution Computed Tomographic Imaging in a 17-Year-Old Male Patient with Diffuse Lung Disease.

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onsin —

n.D.,
D.,
n, M.D.

NO SAFE SMOKING

adiographs and
igh-Resolution
Computed Tomographic
Imaging in a 17-Year-Old
Male Patient
with Diffuse Lung
Disease.

Smoking as a Health Disparity

- Low education
- Below the poverty level
- Unemployed or in the service/blue collar
- Psychiatric comorbidity
- Physical disabled
- Some ethnic minorities

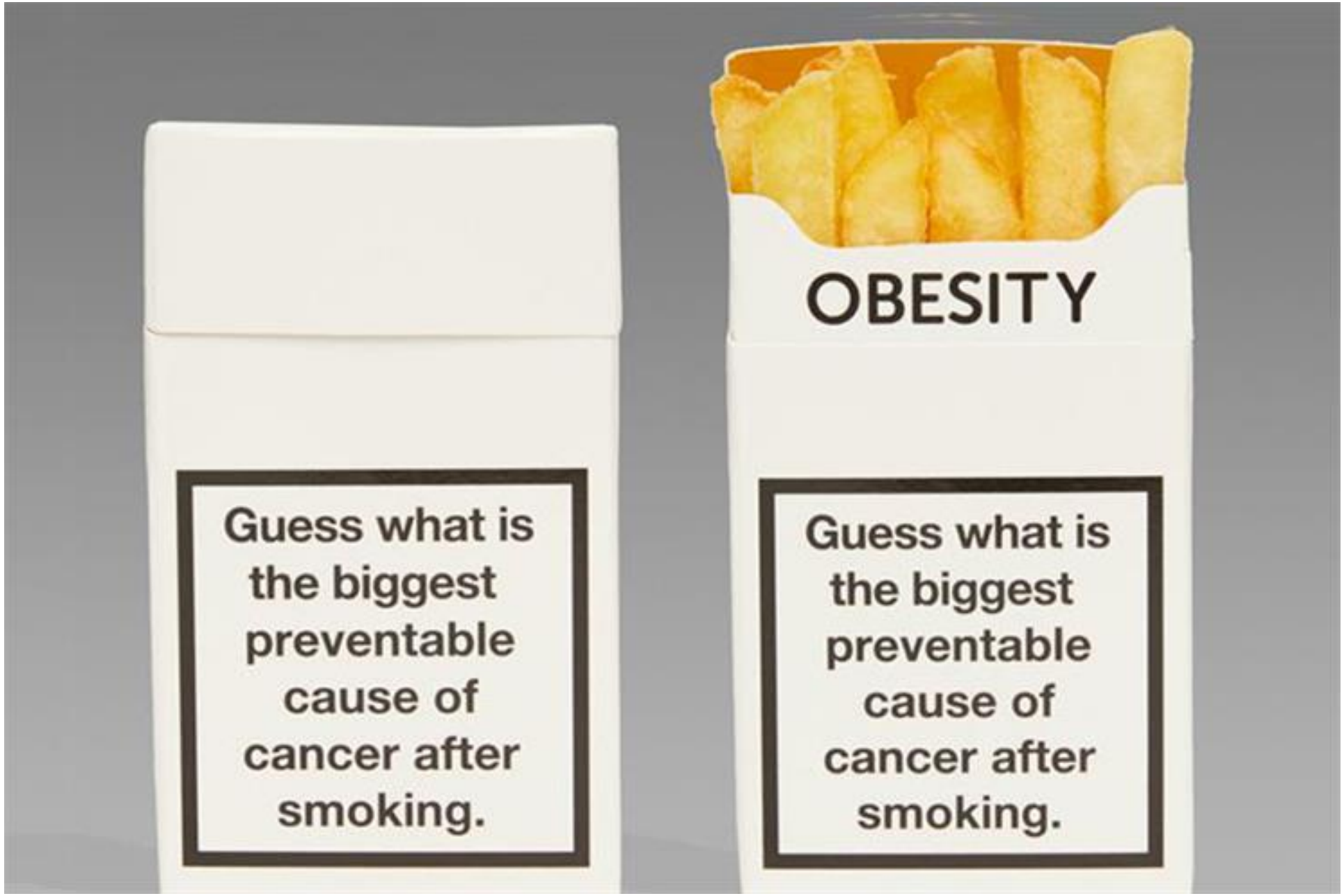
OBESITY

IS A CAUSE OF CANCER TOO

Like smoking, obesity puts millions of adults at greater risk of cancer

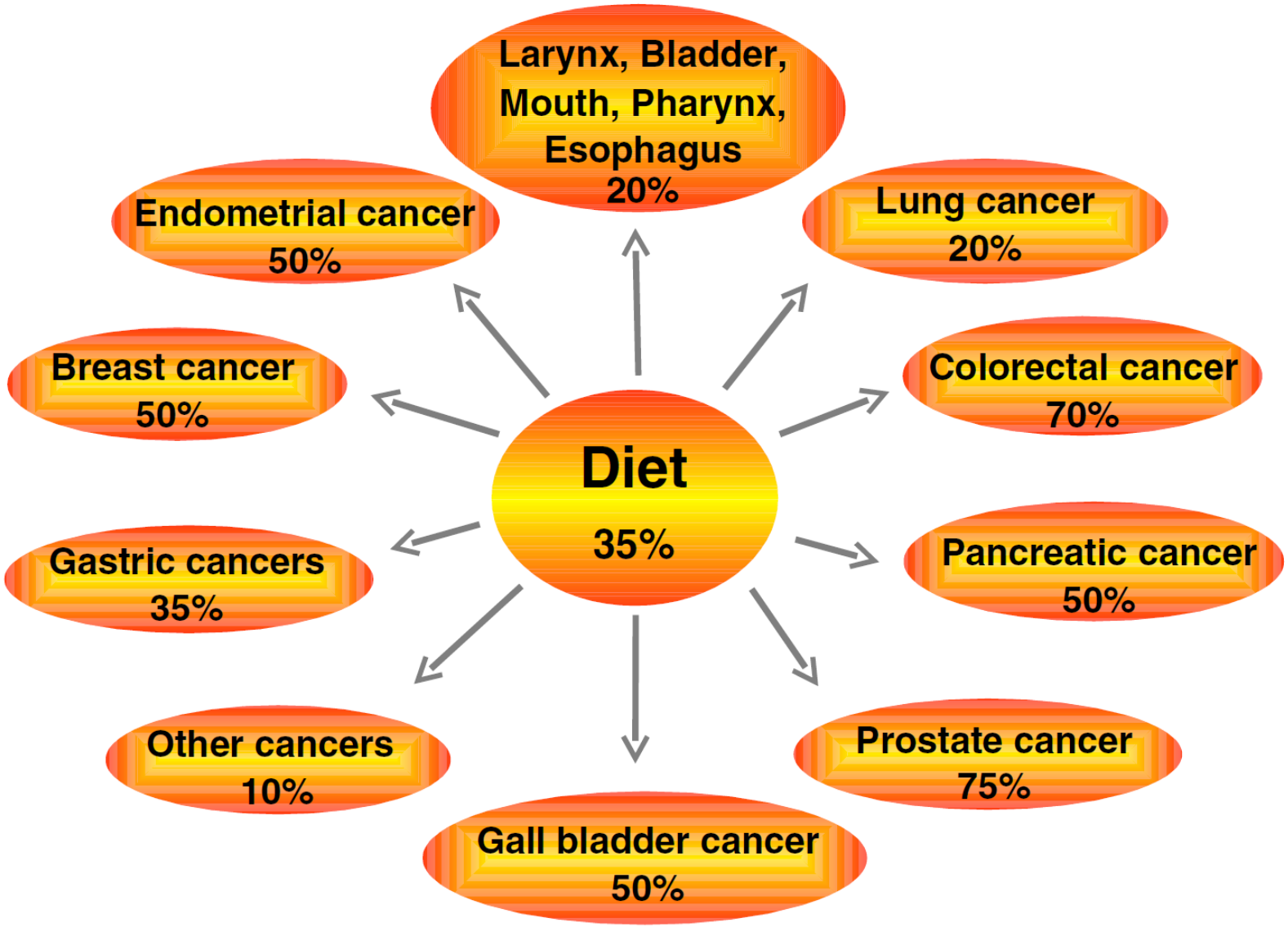
CANCER RESEARCH UK

cruk.org/EndJunkFoodAdsToKids


Guess what is the biggest preventable cause of cancer after smoking.
OBESITY
Guess what is the biggest preventable cause of cancer after smoking.

20% of U.S. cancer diagnoses are related to people being overweight or obese, being physically inactive, and/or consuming a poor diet.


International Agency for Research on Cancer
World Health Organization
MENINGIOMA
THYROID GLAND
BREAST
IN POSTMENOPAUSAL WOMEN
OESOPHAGUS
LIVER
STOMACH
CARDIA
OBESITY
INCREASES
THE RISK OF
THESE
CANCERS
GALLBLADDER
KIDNEY
OVARY AND
ENDOMETRIUM
MULTIPLE MYELOMA
COLORECTUM
PANCREAS



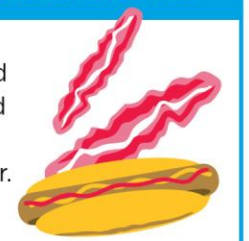
Pharmaceutical Research, Vol. 25, No. 9, September 2008

REDUCE YOUR RISK FOR CANCER BY MAINTAINING A HEALTHY WEIGHT, BEING PHYSICALLY ACTIVE, AND CONSUMING A BALANCED DIET

Research shows that about one-fifth of all cancers diagnosed in the United States can be attributed to being overweight or obese, being physically inactive, eating poorly, and drinking excessively. Based on current evidence experts from the World Cancer Research Fund International recommend people:

Maintain a healthy weight (body mass index [BMI] between 18.5 and 24.9) because 15 types of cancer have been causally linked to being obese or overweight (see **Figure 4,** p. 30).

Limit intake of red and processed meats (e.g., hot dogs, bacon, and salami) because these foods can increase risk for colorectal cancer.



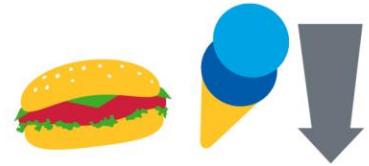
Be physically active as part of everyday life; regular physical activity can decrease risk for eight types of cancer (see **Figure 4,** p. 30, and sidebar on **Physical Activity Guidelines,** p. 32).

Limit intake of sugar-sweetened drinks since these lead to weight gain; drink mostly water.

Eat a diet rich in vegetables, fruits, whole grains, and beans, because these foods have a low energy density and, therefore, promote healthy weight.

If consumed at all, limit alcoholic drinks, because alcohol consumption can increase risk for six types of cancer (see **Figure 5,** p 33).

Limit consumption of "fast foods" and other processed foods high in fat, starches, or sugars because these contribute to weight gain.



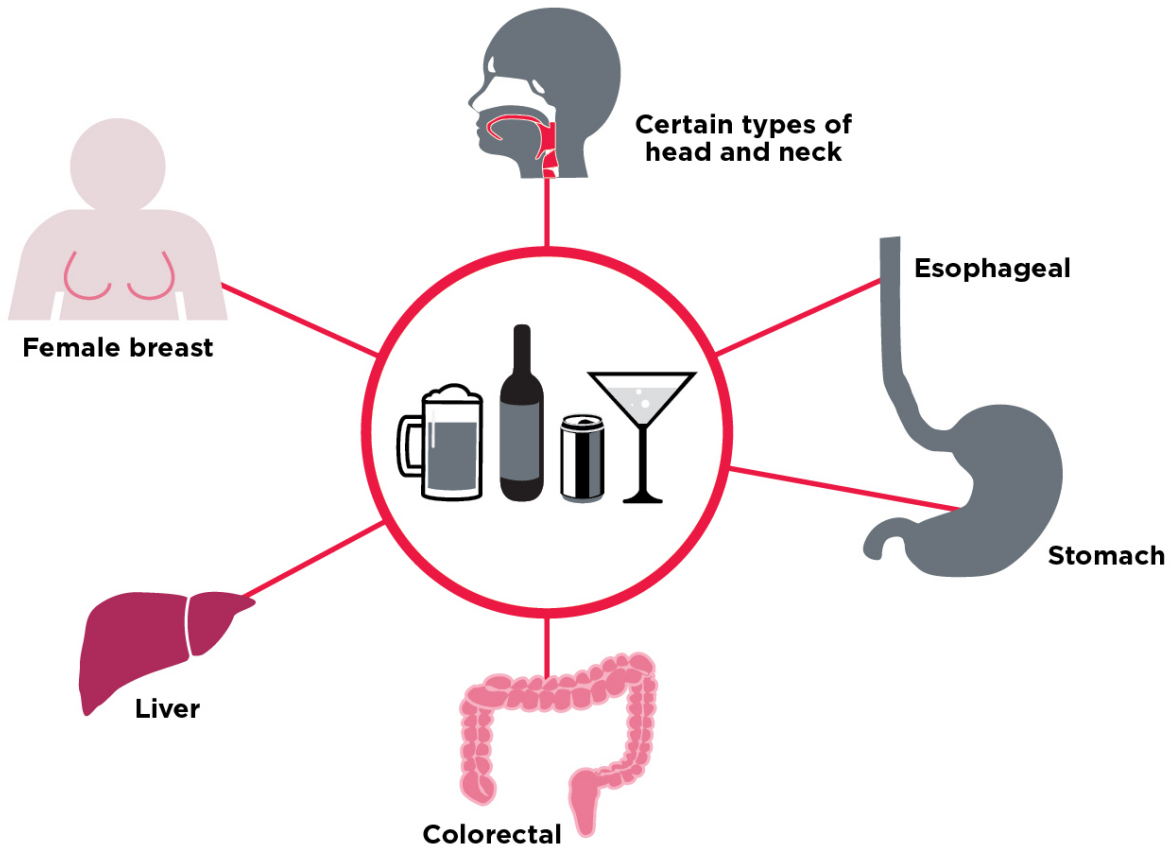
Source: https://www.wcrf.org/dietandcancer/resources-and-toolkit

Alcohol Consumption

- First classified as carcinogenic to humans in **1987!**
- In 2014, among men and women
  - 40.9% of oral cavity/pharynx cancers,
  - 23.2% of larynx cancers,
  - 21.6% of liver cancers,
  - 21% of esophageal cancers, and
  - 12.8% of colorectal cancers were attributed to alcohol.
- Among women,
  - One of the major modifiable RF for breast cancer, accounting for 16.4% (ie, 39,060) of all cases

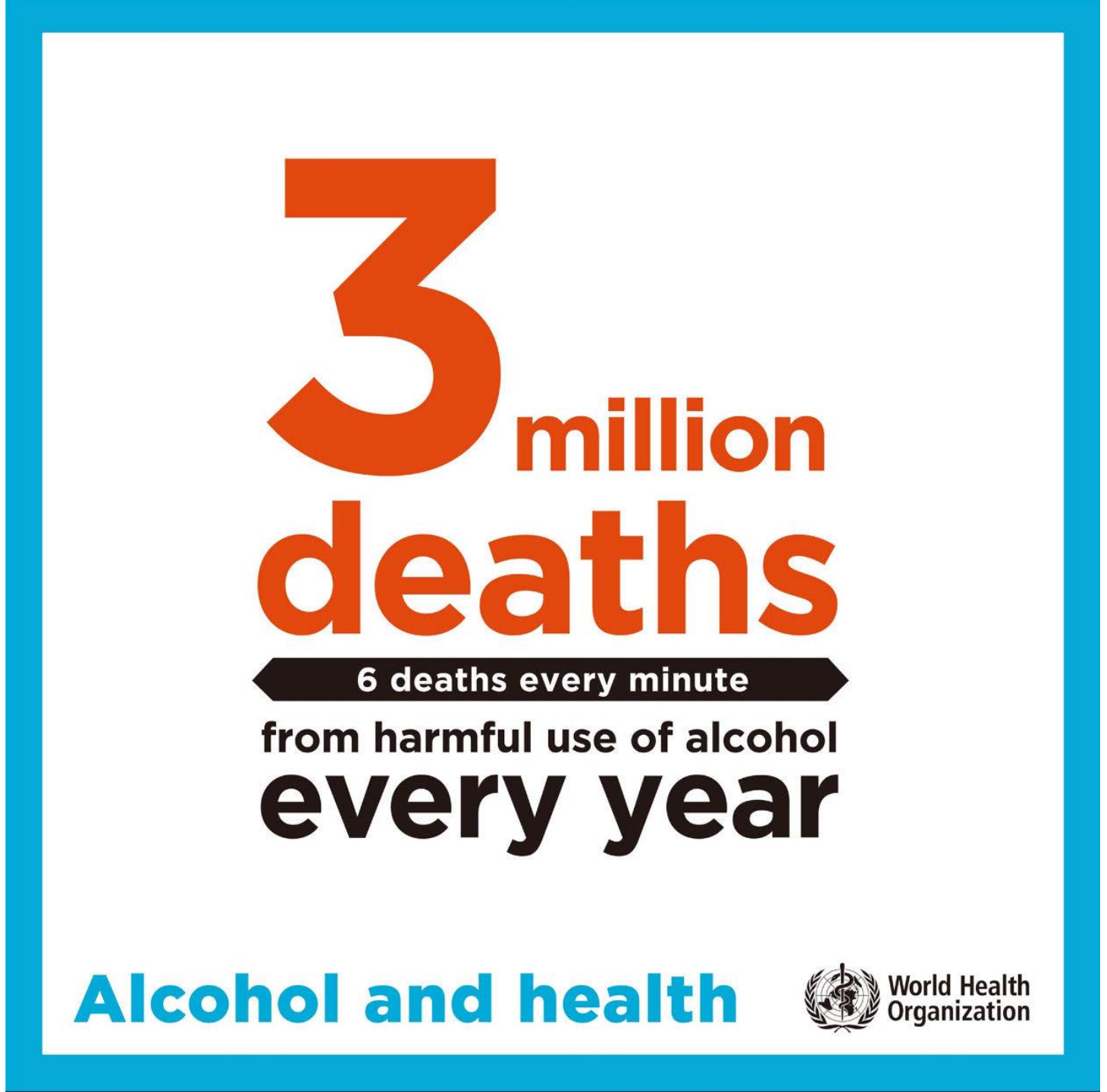
FIGURE 5

ALCOHOL AND CANCER RISK



Consumption of alcohol increases an individual's risk of developing six types of cancer—certain types of head and neck cancer, esophageal squamous cell carcinoma, and breast, colorectal, liver, and stomach cancers (97).

American Association for Cancer Research (AACR) Cancer Progress Report 2019


3 million
deaths
6 deaths every minute
from harmful use of alcohol
every year
Alcohol and health
World Health Organization

Alcohol use and burden for 195 countries and territories, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016

*GBD 2016 Alcohol Collaborators**

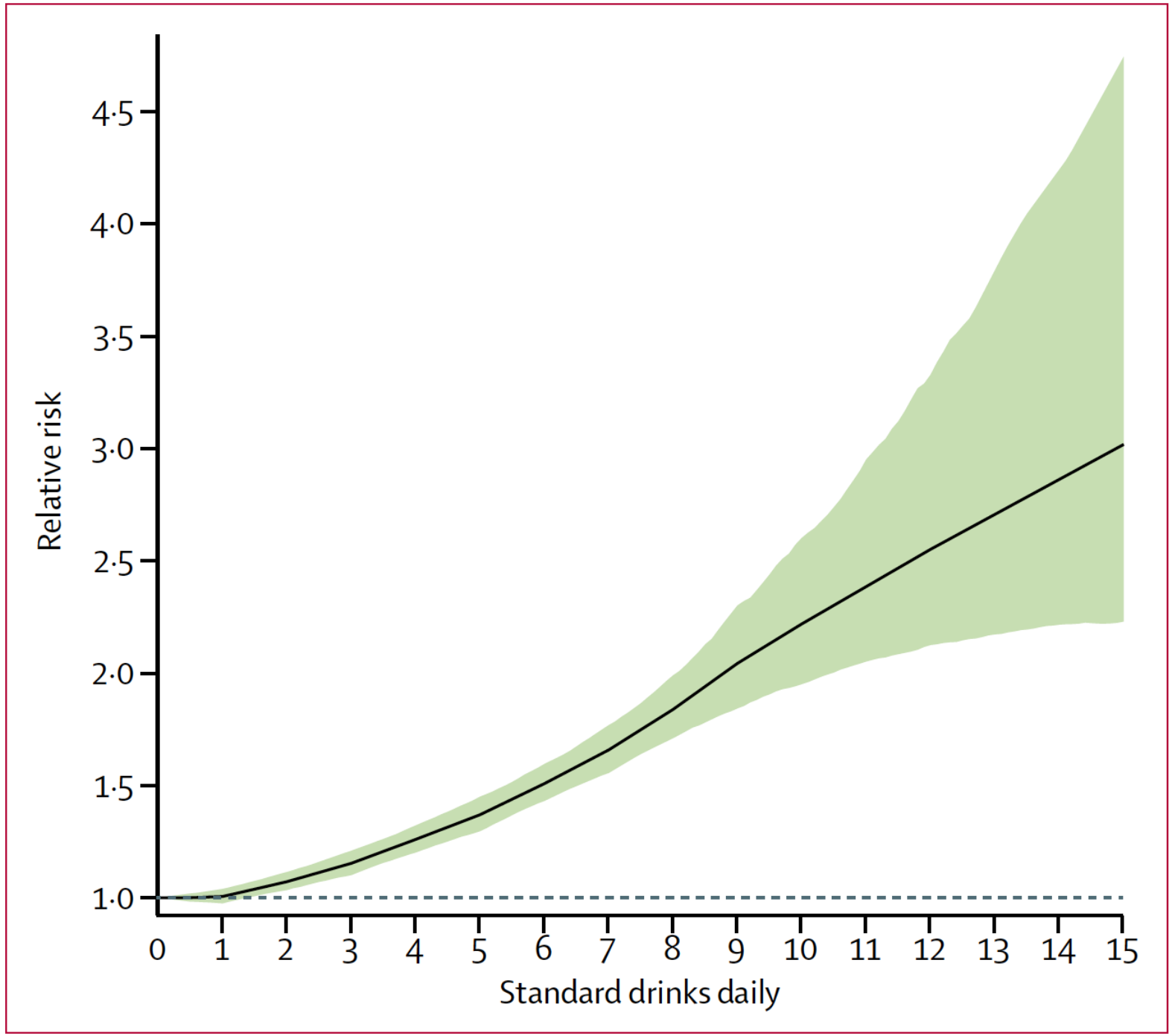
Summary

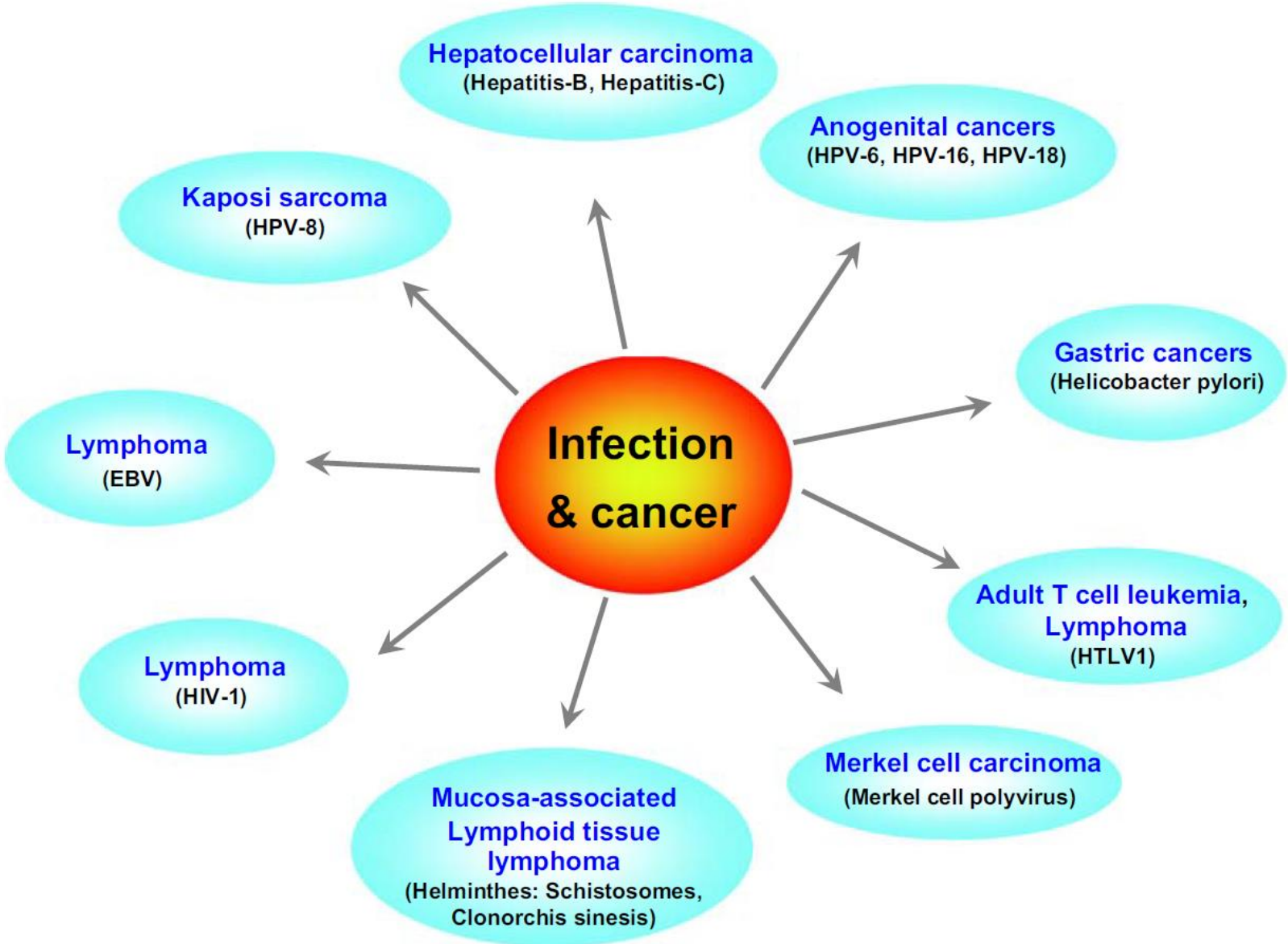
Background Alcohol use is a leading risk factor for death and disability, but its overall association with health remains complex given the possible protective effects of moderate alcohol consumption on some conditions. With our comprehensive approach to health accounting within the Global Burden of Diseases, Injuries, and Risk Factors Study 2016, we generated improved estimates of alcohol use and alcohol-attributable deaths and disability-adjusted life-years (DALYs) for 195 locations from 1990 to 2016, for both sexes and for 5-year age groups between the ages of 15 years and 95 years and older.

Published Online
August 23, 2018
http://dx.doi.org/10.1016/S0140-6736(18)31310-2
See Online/Comment
http://dx.doi.org/10.1016/S0140-6736(18)31571-X

Global patterns in alcohol-attributable deaths and disease burden

- **2.8 million** deaths were attributed to alcohol
- This corresponds to **6.8%** of total age standardised deaths among males.
- Among the population aged 15–49 years,
  - 3.8% (95% UI 3.2–4.3) of female deaths
  - **12.2%** (10.8–13.6) of male deaths were attributable to alcohol.


Relative risk
4·5
4·0
3·5
3·0
2·5
2·0
1·5
1·0
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Standard drinks daily



Pharmaceutical Research, Vol. 25, No. 9, September 2008

Infectious Agents - 11

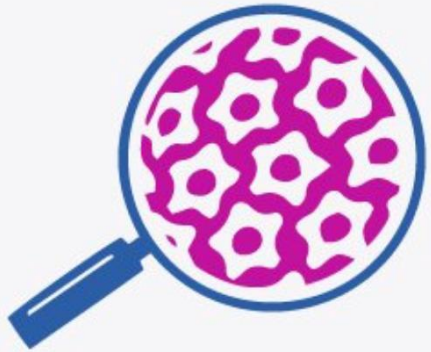
- **1 bacterium (helicobacter pylori)**
- **7 viruses**
  - Hepatitis B virus [HBV],
  - Hepatitis C virüs [HCV],
  - Human papillomavirus [HPV],
  - Epstein-barr virüs [EBV],
  - Human immunodeficiency virus-1 [HIV-1]
  - Kaposi sarcoma herpes virus [KSHV]
  - Human t-cell leukemia virus type 1 [HTLV-1])

- **3 parasites**
  - Opisthorchis viverrini,
  - Clonorchis sinensis,
  - Schistosoma hematobium
- **2 additional agents have been classified as probable carcinogens:**
  - Merkel cell polyomavirus
  - Plasmodium falciparum.

CA CANCER J CLIN 2018;68:446–470

N Engl J Med 2018;378:1029-41.

ALMOST ALL CASES OF CERVICAL CANCER ARE CAUSED BY

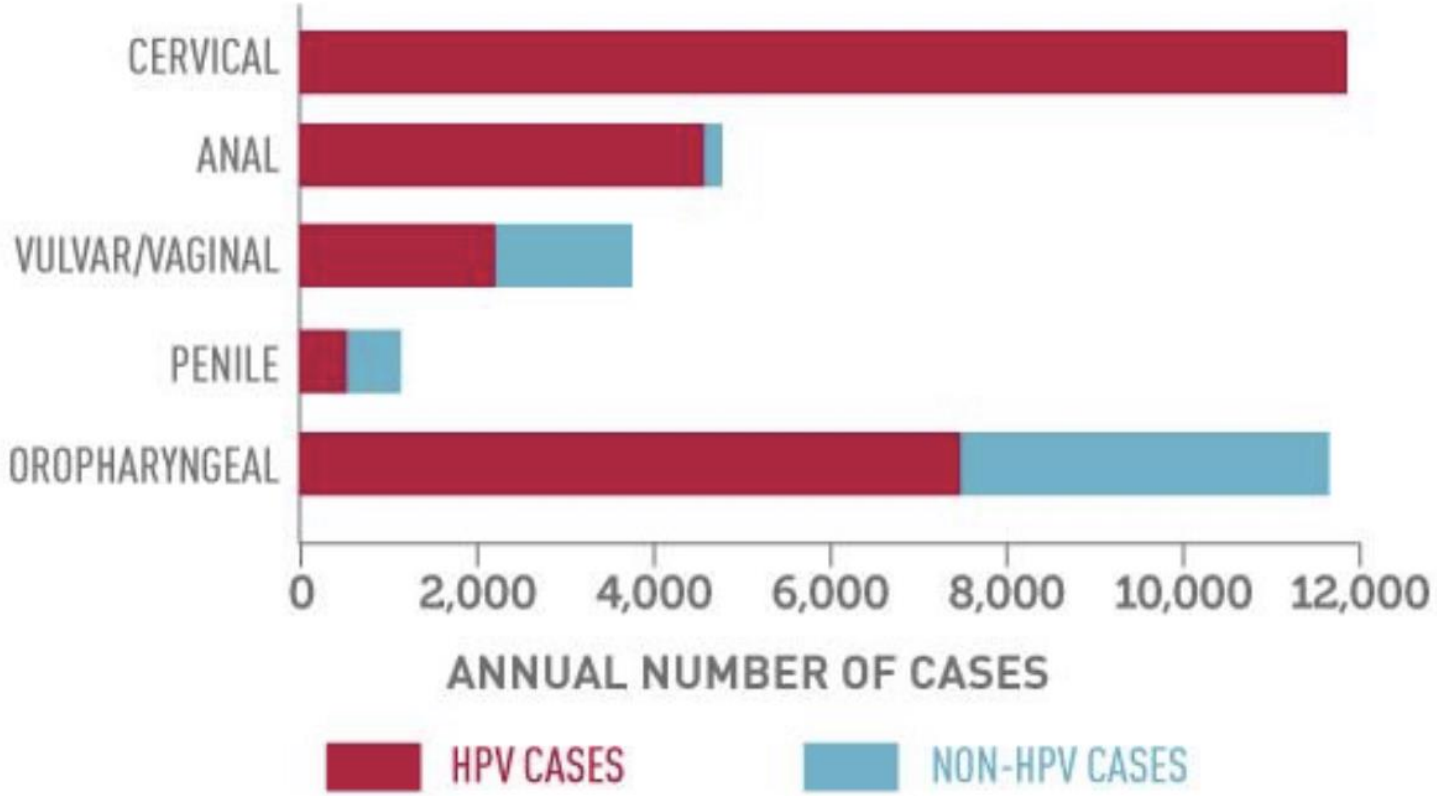


HPV

cancer.gov/hpv

PROPORTION OF CANCERS CAUSED BY HPV IN THE UNITED STATES

HPV infection causes virtually all cases of cervical cancer and a substantial proportion of several other cancers.



www.cancer.gov

Source: Schiller JT and Lowy DR. Understanding and learning from the success of prophylactic human papillomavirus vaccines. ***Nat Rev Microbiol*** 2012; 10(10): 681-692.

Human Papillomavirus (HPV) vaccination

- ✓ The first 2 HPV vaccines were introduced in 2006
- ✓ Against the 2 HPV types (HPV16 and HPV18)
  - ✓ Responsible for 70% of all cervical cancers
- ✓ In 2014 a new HPV vaccine was approved by the FDA that targets 9 types of HPV
  - ✓ Types 6, 11, 16, 18, 31, 33, 45, 52, and 58)
- ✓ The 9V vaccine is given in 2 or 3 doses
- ✓ Current recommendations advise HPV vaccination for girls and boys
  - ✓ At age 11 or 12 years,
- ✓ 9-valent vaccine is 97.4% effective!

CA CANCER J CLIN 2018;68:446–470

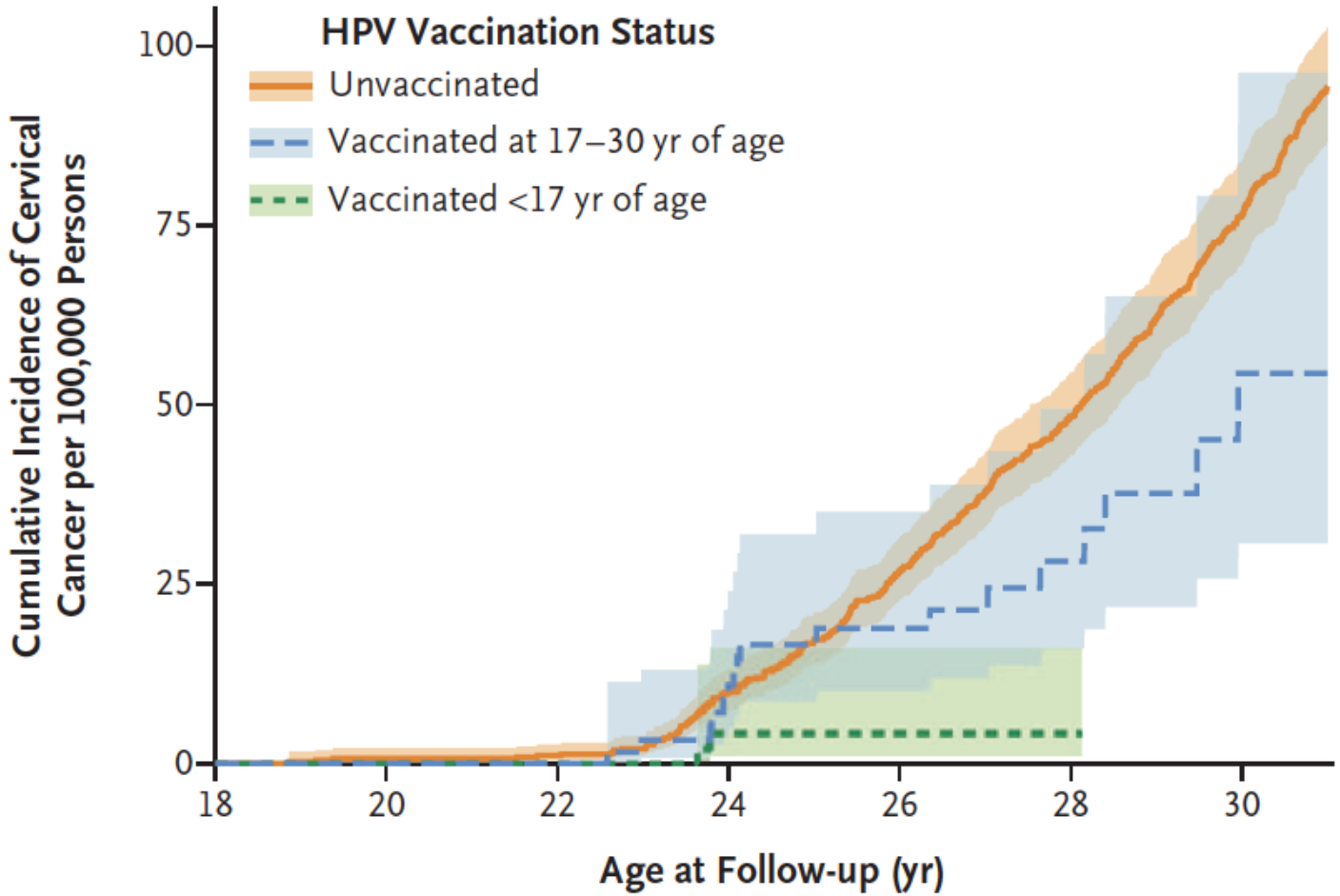


Figure 2. Cumulative Incidence of Invasive Cervical Cancer According to HPV Vaccination Status.

Age at follow-up is truncated in the graph because no cases of cervical cancer were observed in girls younger than 18 years of age.

N Engl J Med 2020; 383:1340-13

Table 2. HPV Vaccination and Invasive Cervical Cancer.

HPV Vaccination Status	No. of Cases of Cervical Cancer	Crude Incidence Rate per 100,000 Person-Yr (95% CI)	Age-Adjusted Incidence Rate Ratio (95% CI)	Adjusted Incidence Rate Ratio (95% CI)*
Unvaccinated	538	5.27 (4.84–5.73)	Reference	Reference
Vaccinated	19	0.73 (0.47–1.14)	0.51 (0.32–0.82)	0.37 (0.21–0.57)
Status according to age cutoff of 17 yr				
Vaccinated before age 17 yr	2	0.10 (0.02–0.39)	0.19 (0.05–0.75)	0.12 (0.00–0.34)
Vaccinated at age 17–30 yr	17	3.02 (1.88–4.86)	0.64 (0.39–1.04)	0.47 (0.27–0.75)
Status according to age cutoff of 20 yr				
Vaccinated before age 20 yr	12	0.49 (0.28–5.73)	0.52 (0.29–0.94)	0.36 (0.18–0.61)
Vaccinated at age 20–30 yr	7	5.16 (2.46–10.83)	0.50 (0.24–1.06)	0.38 (0.12–0.72)

N Engl J Med 2020; 383:1340-13

THE LANCET
Oncology

Available online 26 September 2022

In Press, Corrected Proof

Articles

Evidence-based impact projections of single-dose human papillomavirus vaccination in India: a modelling study

Irene Man PhD [a], Damien Georges MSc [a], Tiago M de Carvalho PhD [b, c], Lopamudra Ray Saraswati MPhil [d], Prince Bhandari MSc [d], Ishu Kataria PhD [e], Mariam Siddiqui MPH [d], Richard Muwonge PhD [a], Eric Lucas MSc [a], Prof Johannes Berkhof PhD [b, c], Rengaswamy Sankaranarayanan MD [f], Johannes A Bogaards PhD [b, c], Partha Basu MD [a], Iacopo Baussano MD [a]

If it allows more people to be vaccinated single-dose HPV vaccination could be more efficient and could eliminate #cervicalcancer as a public health problem in India and low-income and middle-income countries.

NATIONAL CANCER INSTITUTE

There are vaccines that can prevent cancer and reduce cancer risk

Vaccines against the hepatitis B virus can prevent chronic hepatitis B infection that can lead to liver cirrhosis and liver cancer.

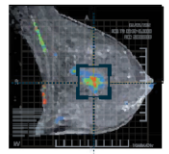
Human papillomavirus (HPV) vaccines can prevent infection with viruses that can cause cervical cancer and many other cancers.

prevention.cancer.gov
Division of Cancer Prevention

HOW CAN WE SCREEN FOR CANCER?

Highlighted here are some of the most commonly used cancer screening tests. When to use these tests and in whom is discussed elsewhere (see **Consensus on Cancer Screening,** p. 40).

Breast Cancer



Screening mammogram: Uses X-rays to image the breast.

The information generated by the procedure can be stored on film (a conventional mammogram) or electronically (a digital mammogram).

In most cases, the image is 2-dimensional, but some machines generate 3-dimensional images in a process called breast tomosynthesis.

Can detect breast cancers at any stage of development, but the aim of screening is to find them at the earliest possible stage.

Cervical Cancer

Pap test: Samples cervical cells, which are analyzed under a microscope to look for abnormalities.

Can detect precancerous or cancerous cervical lesions, but the aim of screening is to find them at the earliest possible stage.

HPV test: Detects the presence of certain cervical cancer–causing types of human papillomavirus (HPV).

Does not directly detect precancerous or cancerous cervical lesions, but identifies people for whom further testing is recommended.

Prostate Cancer

PSA test: Measures the level of a protein called prostate-specific antigen (PSA) in blood.

Does not directly detect prostate cancer, but the blood level of PSA is often elevated in men with prostate cancer. Thus, the test identifies men for whom further testing is recommended.

Colorectal Cancer

Stool tests: Some test for the presence of red blood cells in stool samples. Others test for both red blood cells and certain genetic mutations linked to colorectal cancer.

Do not directly detect colorectal precancerous lesions or cancers, but identify people for whom further testing is recommended.

Flexible sigmoidoscopy and colonoscopy: Both use a thin, flexible, lighted tube with a small video camera on the end to allow physicians to look at the lining of certain parts of the colon and rectum.

Can detect colorectal precancerous lesions or cancers at any stage; the aim of screening is to find and remove them before cancer develops.

Computed tomography (CT) colonography (virtual colonoscopy) and double-contrast barium enema: Use X-rays to image the colon and rectum.

Can detect colorectal precancerous lesions or cancers, but the aim of screening is to find them at the earliest possible stage.

Blood test: Detects epigenetic abnormalities linked to colorectal cancer in blood.

Does not directly detect colorectal precancerous lesions or cancers, but identifies people for whom further testing is recommended.

Lung Cancer

Low-dose CT scan: Uses low doses of X-rays to image the lungs.

Can detect lung cancers at any stage of development, but the aim of screening is to find them at the earliest possible stage.

Adapted from (109)

Cancer prevention interventions available today include:

- **Medications** proven to reduce risk of breast and colon cancers in those at increased risk.
- **Lifestyle choices** such as avoid or quit tobacco, limit alcohol, avoid known carcinogens, keep active & avoid obesity.
- **Treatments for infections** known to increase cancer risk, including hepatitis C, HIV, and H. pylori.
- **Screening tests** that allow removal of precancerous lesions, such as colon polyps.
- **Vaccines** to protect against infection with human papillomavirus (HPV) and hepatitis B.
- **Surgery** to remove tissues at risk, such as for women with increased risk of breast and ovarian cancer.

https://prevention.cancer.gov/news-and-events/infographics/cancer-prevention-0

@DrYukselUrun