



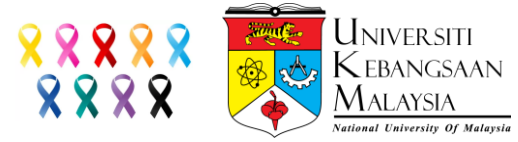
FK6152 CANCER EPIDEMIOLOGY

**CANCER EPIDEMIOLOGY**  
*COMPARISON BETWEEN  
THE EAST, MIDDLE EAST &  
THE WESTERN COUNTRIES*

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DrPH COHORT XI

2 November 2020

# OUTLINE



1. Introduction
2. Epidemiology
3. Current Issues
4. Future Direction
5. Conclusion





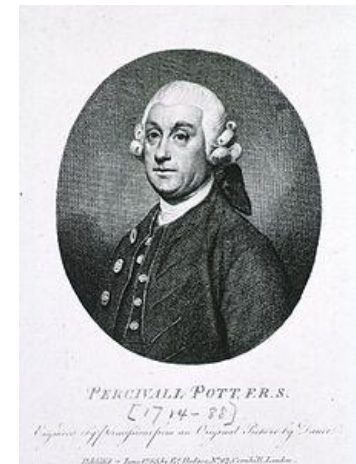
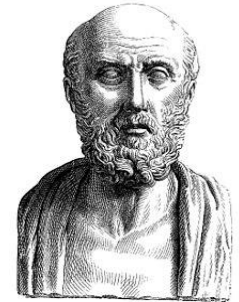
# 1. Introduction



# HISTORY



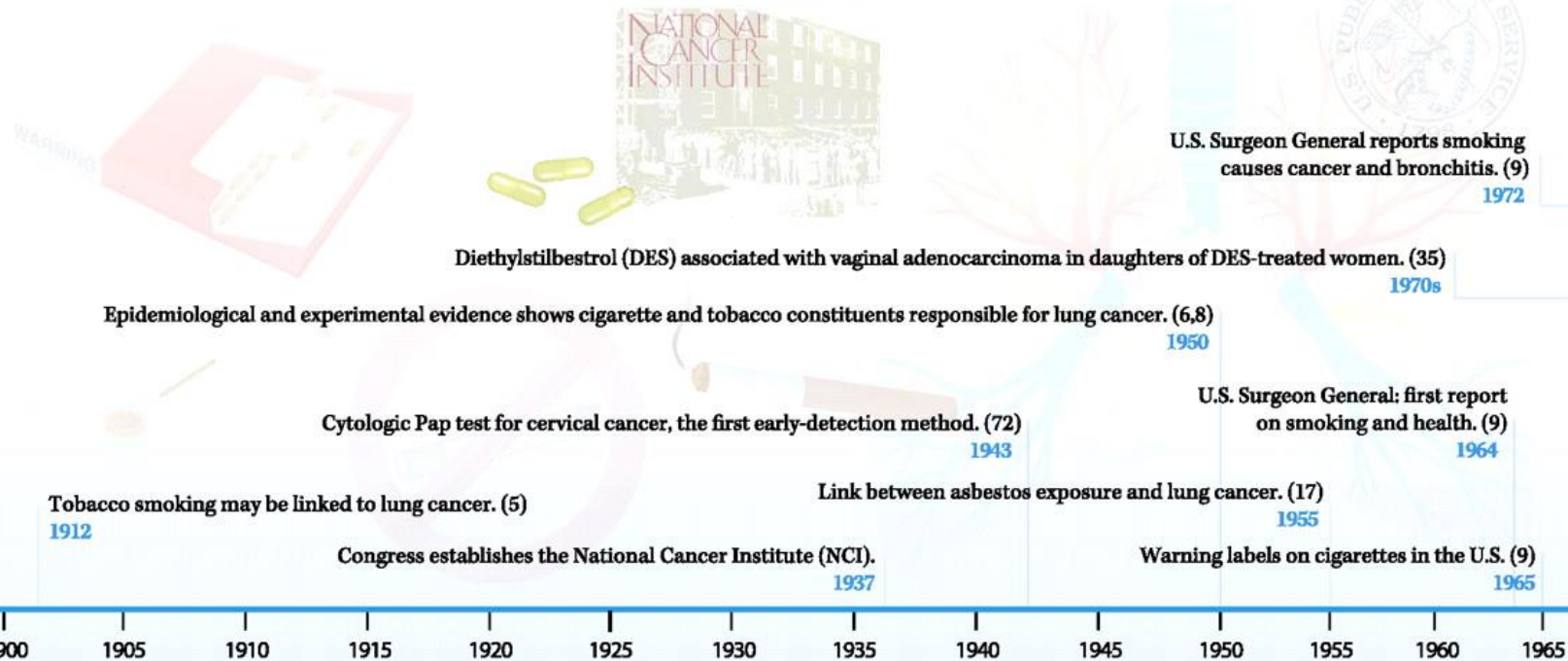
- Autopsies of ancient Egyptian mummies have shown the presence of bone tumours and possibly other neoplasias.
- Hippocrates described several kinds of cancer, referring to them by the term *karkinos*, the Greek word for crab or crayfish.
- In the 16th and 17th centuries, it became more acceptable for doctors to dissect bodies to discover the cause of death.
  - German professor Wilhelm Fabry, believed that breast cancer was caused by a milk clot in a mammary duct.
  - Dutch professor Francois de la Boe Sylvius, believed that all disease was the outcome of chemical processes, and that acidic lymph fluid was the cause of cancer.
  - Nicolaes Tulp believed that cancer was a poison that slowly spreads, and concluded that it was contagious.
  - British surgeon Percivall Pott, identified the first cause of cancer in 1775, when he saw that cancer of the scrotum was a common disease among chimney sweeps.



# LANDMARKS



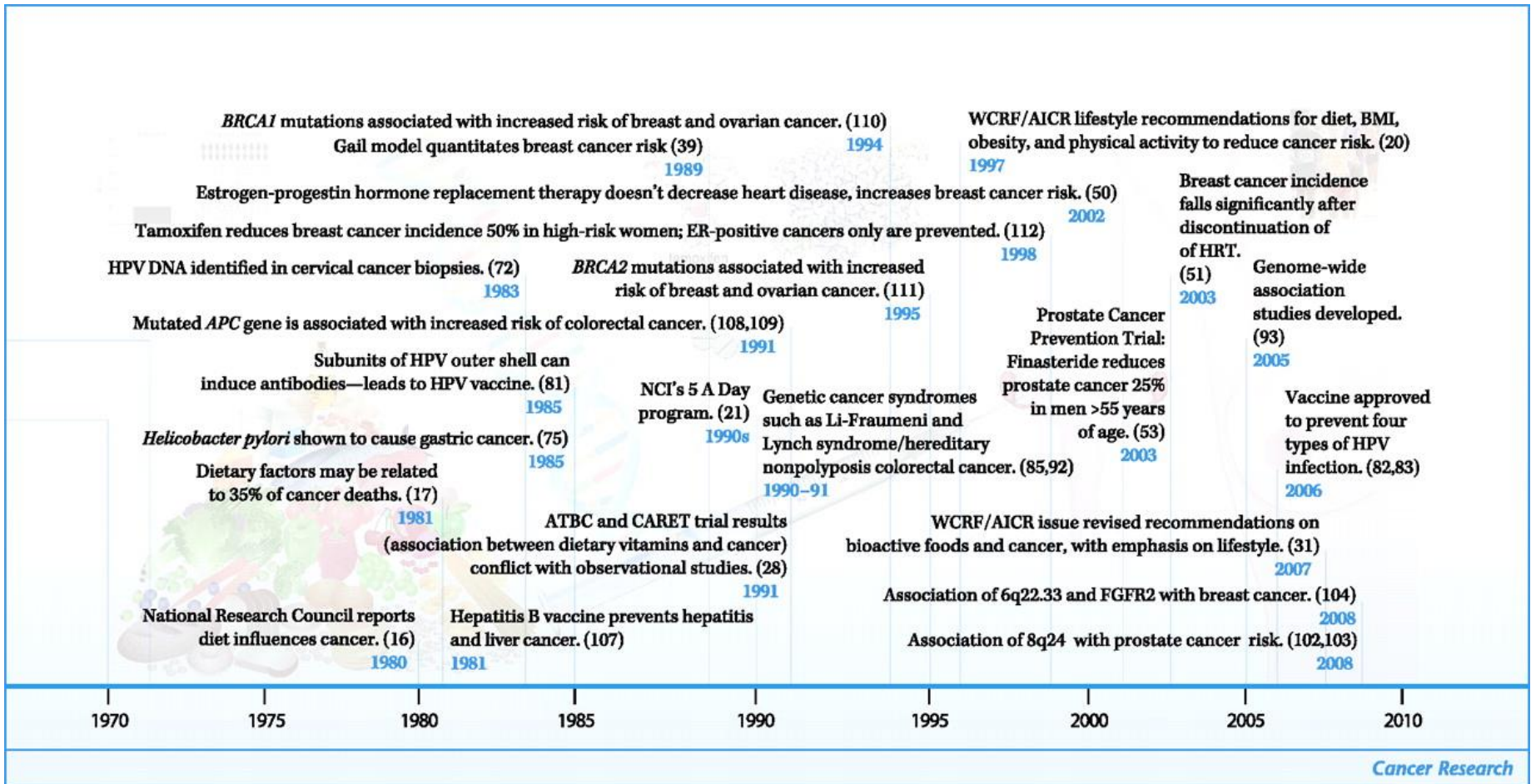
## Landmarks in the History of Cancer Epidemiology: 1900–Present



AACR Centennial Series

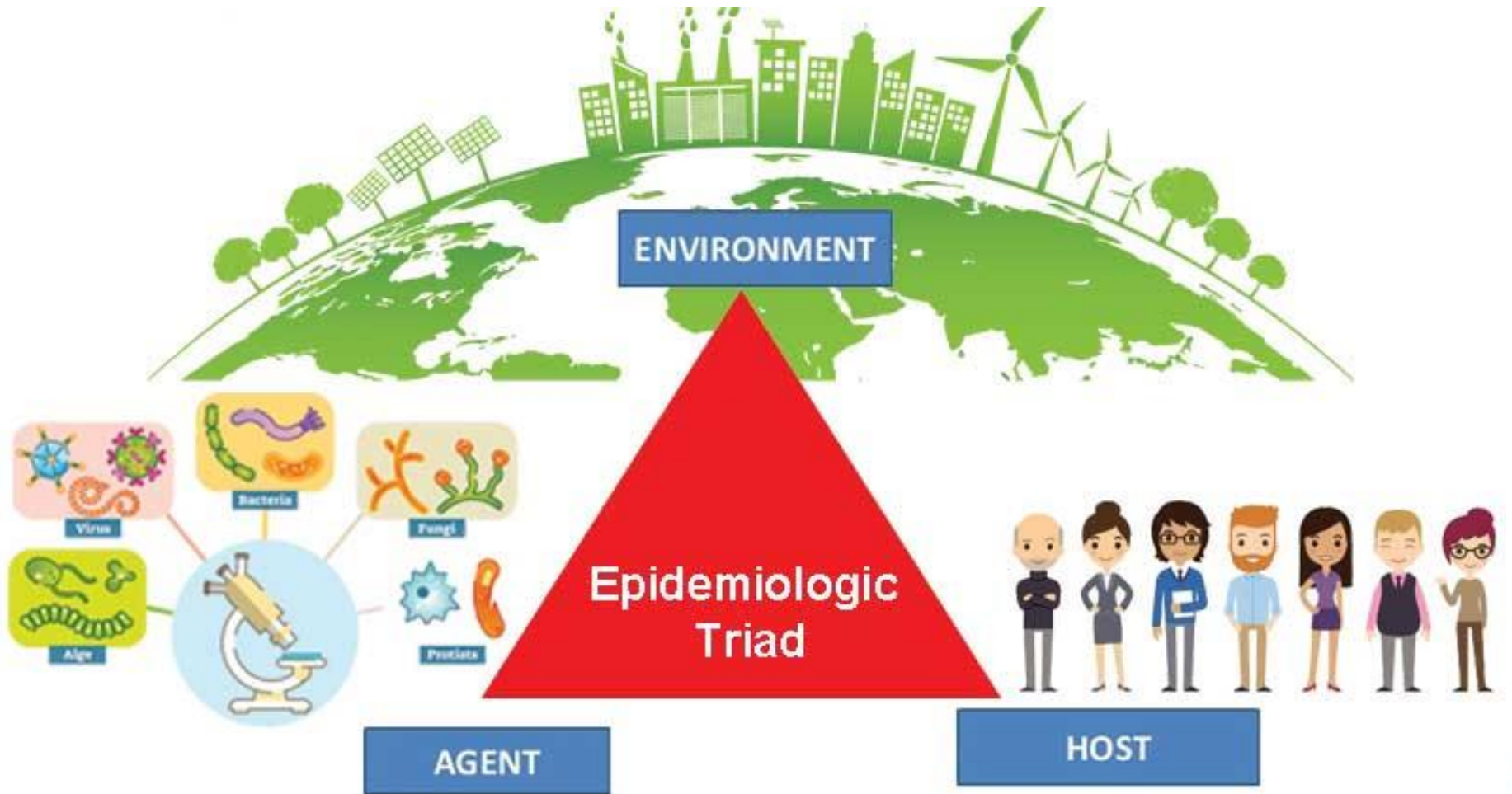


# LANDMARKS

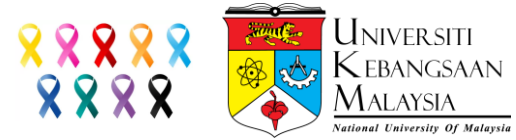


Cancer Research





# EPIDEMIOLOGIC TRIAD

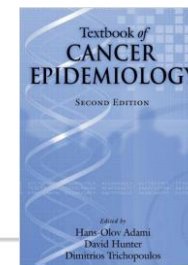


- In a **host**, cancer arises from the transformation of normal cells into tumour cells in a multistage process that generally progresses from a pre-cancerous lesion to a malignant tumour.
- These changes are the result of the interaction between a person's genetic factors and 3 categories of external **agents**:
  1. Physical carcinogens, such as ultraviolet and ionizing radiation;
  2. Chemical carcinogens, such as asbestos, components of tobacco smoke, aflatoxin (a food contaminant), and arsenic (a drinking water contaminant);
  3. Biological carcinogens, such as infections from certain viruses, bacteria, or parasites.
- People can avoid some **environmental** cancer-causing exposures, such as tobacco smoke and the sun's rays. But other ones are harder to avoid, especially if they are in the air we breathe, the water we drink, the food we eat, or the materials we use to do our jobs.





# CANCER BURDEN



**Table 2–1.** Measures of cancer burden, their determinants and limitations.

Measure	Definition	Determinants	Limitations
Incidence	Number of new cases, often per 10 <sup>5</sup> person-years or absolute number of cases per year.	Burden of exposure to causes of cancer, weighted by the risk imparted by each cause.	Population-based cancer registration limited to a small proportion of global population. Affected by diagnostic intensity, screening, and autopsy rates.
Cumulative incidence	Proportion of people who develop cancer before a defined age.	Incidence.	Requires no loss to follow-up, no competing risks, same period of follow-up time for all study subjects and unchanged exposure status throughout follow-up.
Prevalence	Proportion of population with cancer.	Incidence, prognosis and mortality from other causes.	Requires population-based registration and follow-up. Cured patients cannot be readily identified.
Survival	Proportion of cancer patients surviving for a specified time after diagnosis.	Natural history of disease Stage at diagnosis Therapeutic efficacy	Requires long-term follow-up of large number of patients. Spurious patterns may arise due to lead-time bias Influenced by diagnostic intensity. Sometimes difficult to classify causes of death correctly.
Mortality	Number of cancer deaths, often per 10 <sup>5</sup> person-years, or absolute number of deaths per year.	Incidence Prognosis	Influenced by adequacy of death certification, including autopsy rates.
Life-years lost	Number of years lost between age at death and expected (in the absence of this disease) age at death.	Incidence Age at diagnosis Prognosis	Requires reliable population life tables.
Disability adjusted life years (DALY)	Combines impact of cancer on both quality of life and survival.	Incidence Age at diagnosis Prognosis Expected longevity Residual disability	Requires reliable population life tables. Difficult to quantify disability adequately.

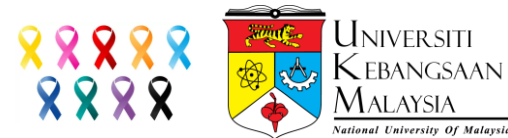




# 2. Epidemiology



# CANCER INCIDENCE



- There will be **18.1 million** new cancer cases (17.0 million excluding NMSC) world wide in 2018.
- The incidence rate for all cancers was about **20% higher** in men (ASR, 218.6 per 100,000) than in women (ASR, 182.6 per 100,000), with the incidence rates varying across regions in both males and females.
- Among males, incidence rates across regions varied almost **6-fold**.
  - From 571.2 per 100,000 in Australia/New Zealand to 95.6 per 100,000 in Western Africa.
- Among females, incidence rates varied nearly **4-fold**.
  - From 362 per 100,000 in Australia/New Zealand to 96.2 per 100,000 in South-Central Asia.
- Cancer incidence and mortality are rapidly growing worldwide, due to:
  1. Both aging and growth of the population
  2. Changes in the prevalence and distribution of the main risk factors for cancer, several of which are associated with socioeconomic development.



# CANCER INCIDENCE



## (Both sexes)

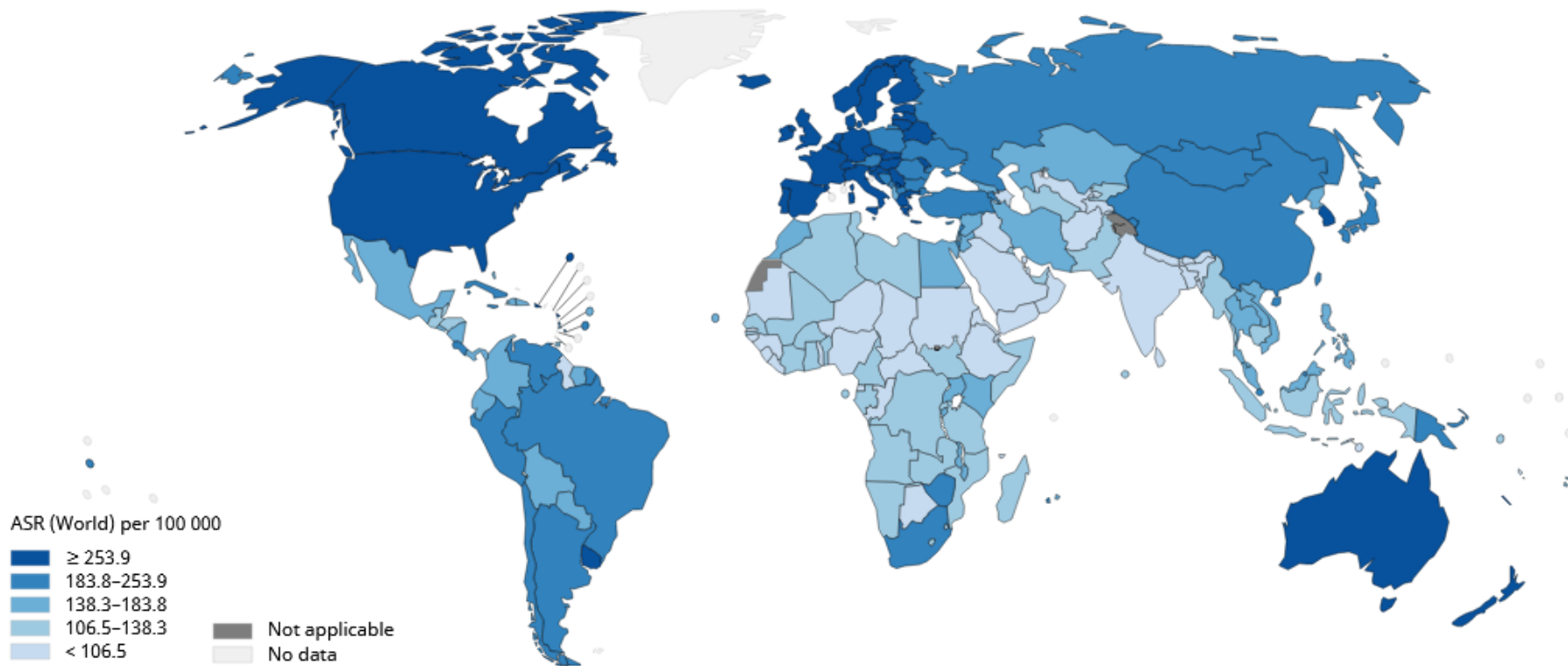
- The highest cancer rate was in **Australia**, at 468.0 people per 100,000.
- The age-standardised rate was at least 320 per 100,000 for 12 countries:
  - Australia, New Zealand, Ireland, Hungary, the US, Belgium, France (metropolitan), Denmark, Norway, the Netherlands, Canada and New Caledonia (France).
- The countries in the top 12 come from **Oceania, Europe and North America**.

Rank ▲	Country	Cancer rate
1	Australia	468.0
2	New Zealand	438.1
3	Ireland	373.7
4	Hungary	368.1
5	United States	352.2
6	Belgium	345.8
7	France	344.1
8	Denmark	340.4
9	Norway	337.8
10	Netherlands	334.1
11	Canada	334.0
12	France (New Caledonia)	324.2
13	United Kingdom	319.2
14	South Korea	313.5
15	Germany	313.1
16	Switzerland	311.0
17	Luxembourg	309.3
18	Serbia	307.9
19	Slovenia	304.9
20	Latvia	302.2
21	Slovakia	297.5
22	Czech Republic	296.7
23	Sweden	294.7
24	Italy	290.6
25	Croatia	287.2
26	Lithuania	285.8
27	Estonia	283.3
28	Greece	279.8
29	Spain	272.3
30	Finland	266.2
31	Uruguay	263.4
32	Belarus	260.7
33	Portugal	259.5
34	Iceland	257.8
35	France (Guadeloupe)	254.6
36	United States (Puerto Rico)	254.5
37	Moldova	254.2
38	Poland	253.8
39	Cyprus	250.8
40	France (Martinique)	250.8
41	Malta	249.4
42	Singapore	248.9
43	Japan	248.0
44	Austria	247.7
45	Barbados	247.5
46	France (French Guiana)	247.0
47	Bulgaria	242.8
48	Lebanon	242.8
49	France (French Polynesia)	240.6
50	Israel	233.6

# CANCER INCIDENCE



Estimated age-standardized incidence rates (World) in 2018, all cancers, both sexes, all ages



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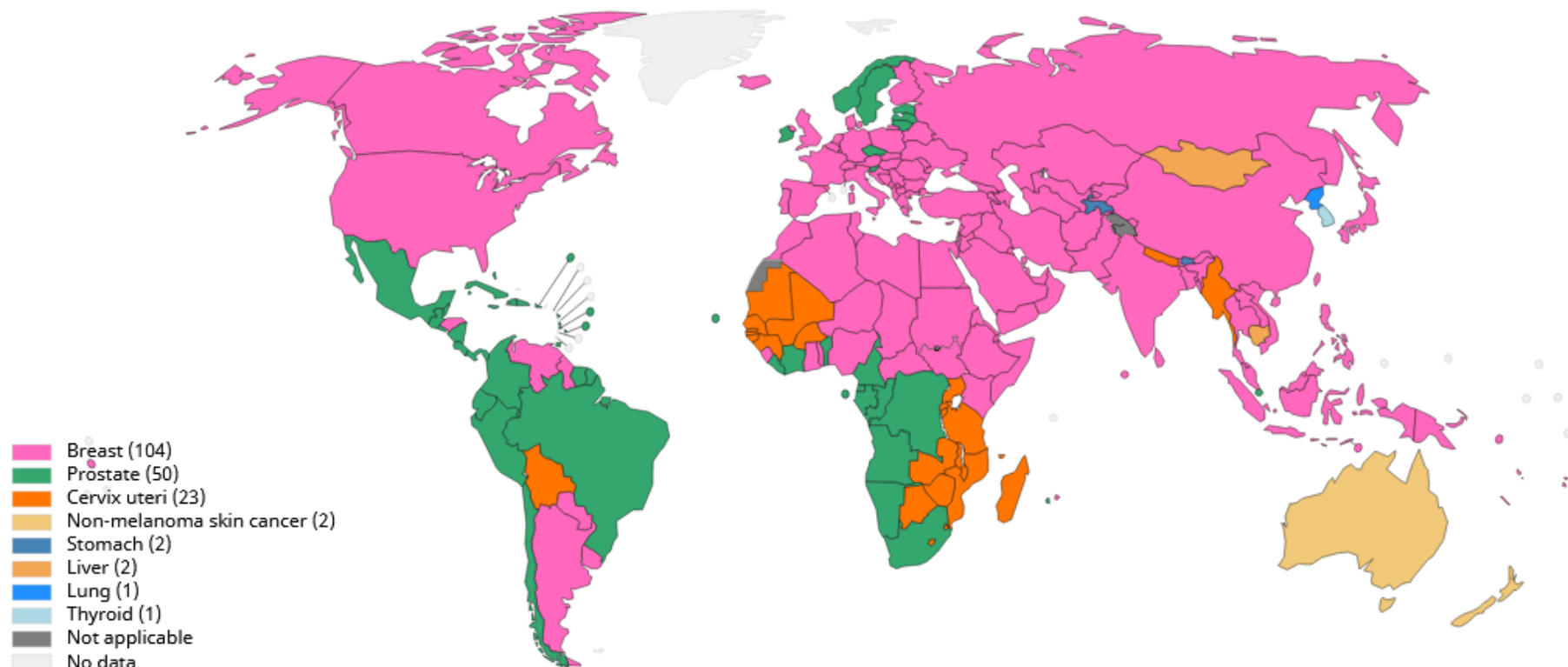
Data source: GLOBOCAN 2018  
Graph production: IARC  
(<http://gco.iarc.fr/today>)  
World Health Organization



# CANCER INCIDENCE



Top cancer per country, estimated age-standardized incidence rates (World) in 2018, both sexes, all ages



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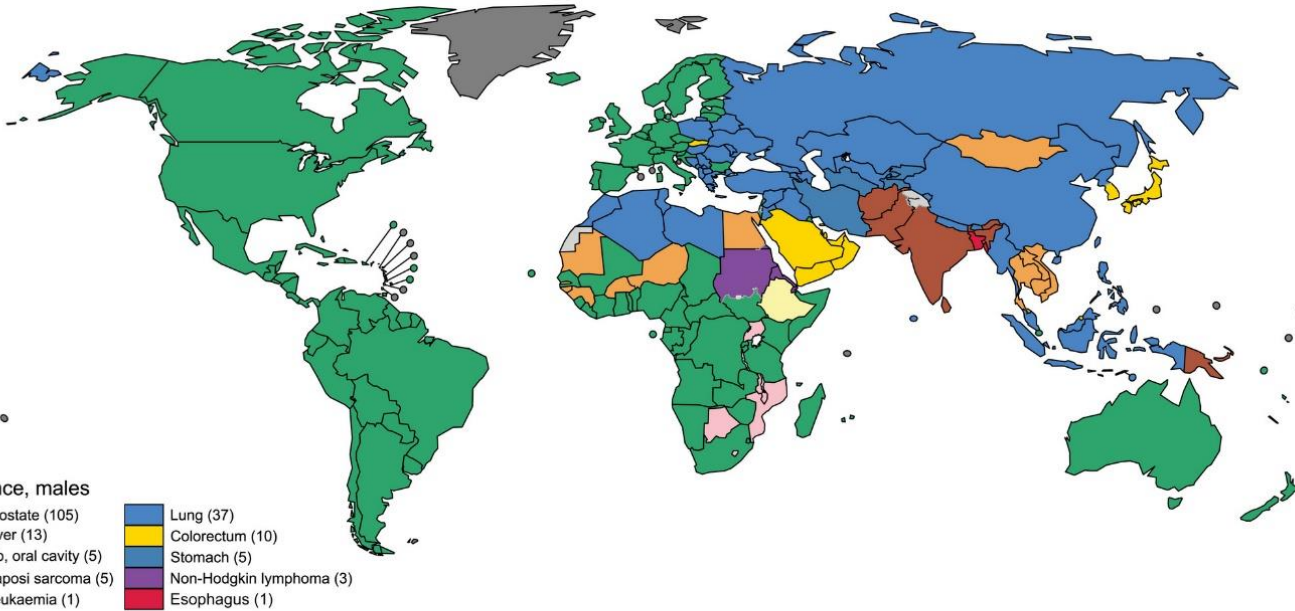
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World Health Organization



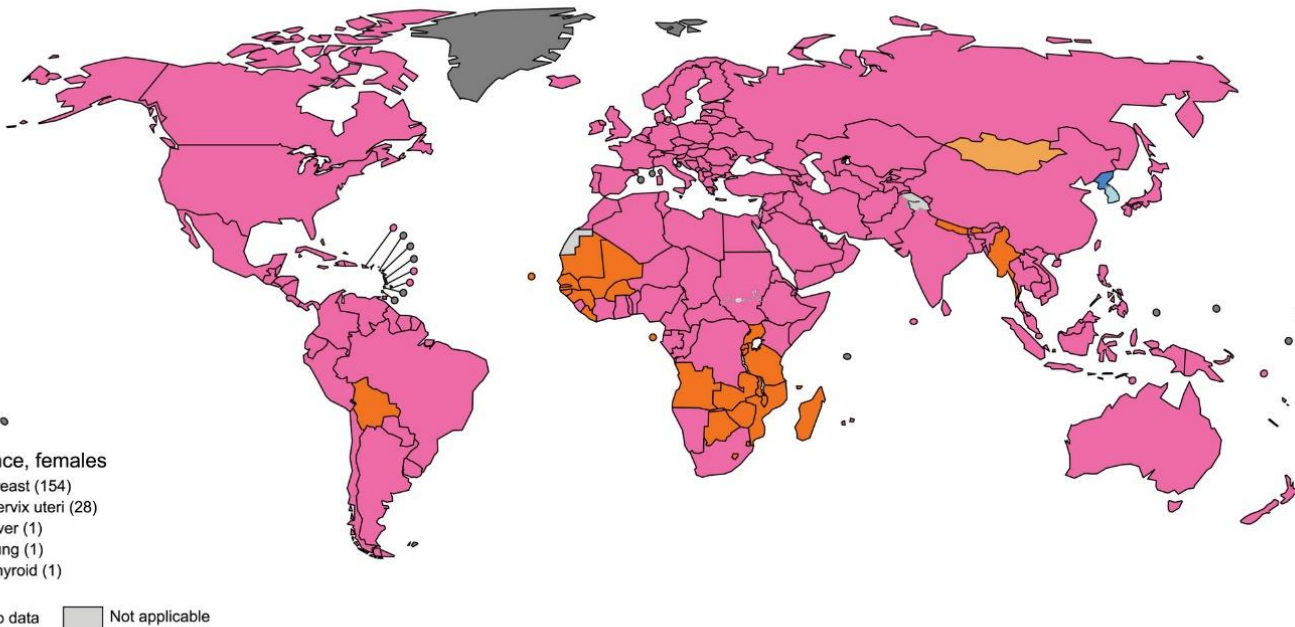


Global Maps Presenting the Most Common Type of Cancer Incidence in 2018 in Each Country Among (A) Men and (B) Women.

A



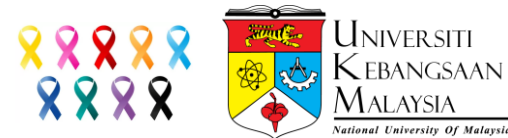
B



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Data source: Globocan 2018  
Map production: IARC  
World Health Organization

# CANCER MORTALITY



## CANCER DEATH RATE

- There will be **9.6 million** cancer deaths (9.5 million excluding NMSC) worldwide in 2018.
- Similar to incidence rates, death rates for all cancers combined worldwide are nearly **50% higher in males** than in females and, within each sex, the rates vary across regions.
- Among males, death rates across regions varied almost **3-fold**.
  - 67.4 per 100,000 persons in Central America to 171.0 per 100,000 persons in Eastern Europe.
- Among female, the estimated cumulative risk of dying from cancer in 2018 varies.
  - Higher in East Africa (11.4%) than the corresponding risks estimated in North America (8.6%), Northern Europe (9.1%), and Australia/New Zealand (8.1%).

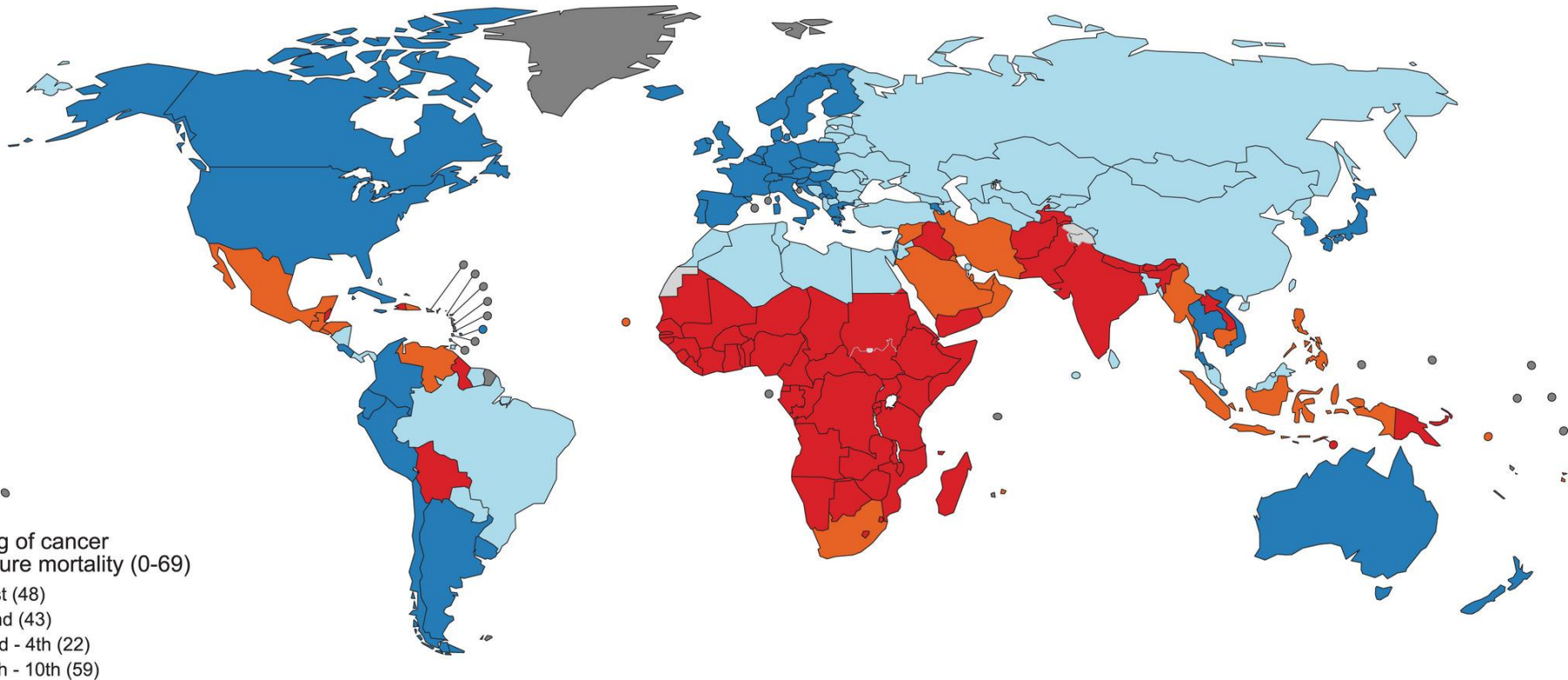




# CANCER MORTALITY



Estimated age-standardized premature mortality rates (World) in 2018, all cancers, both sexes, all ages



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Data source: GHO  
 Map production: CSU  
 World Health Organization

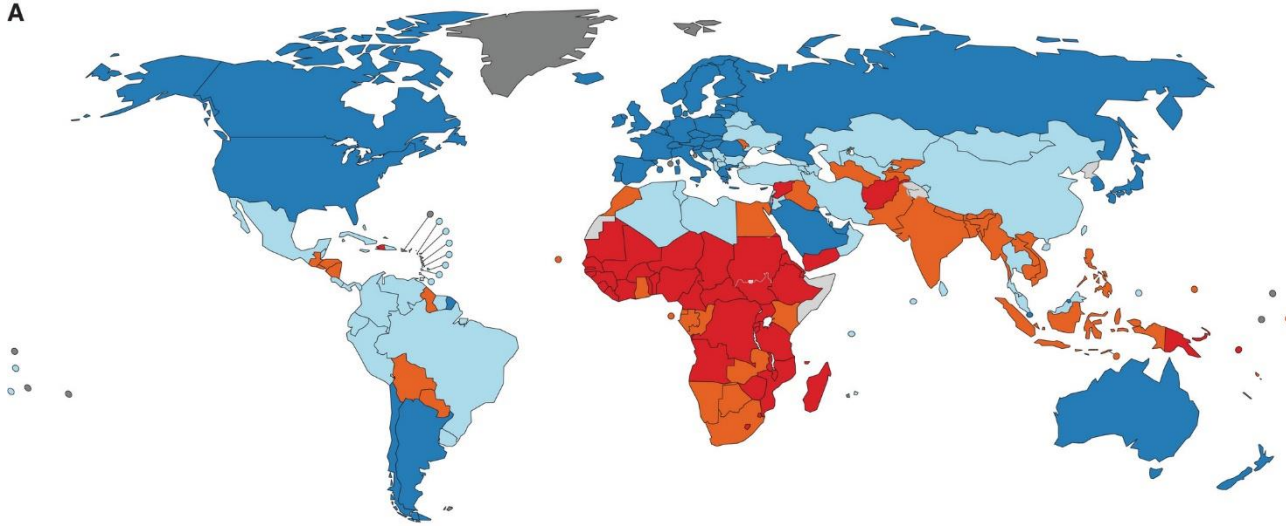


**World Health  
Organization**

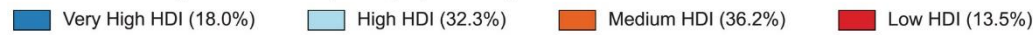
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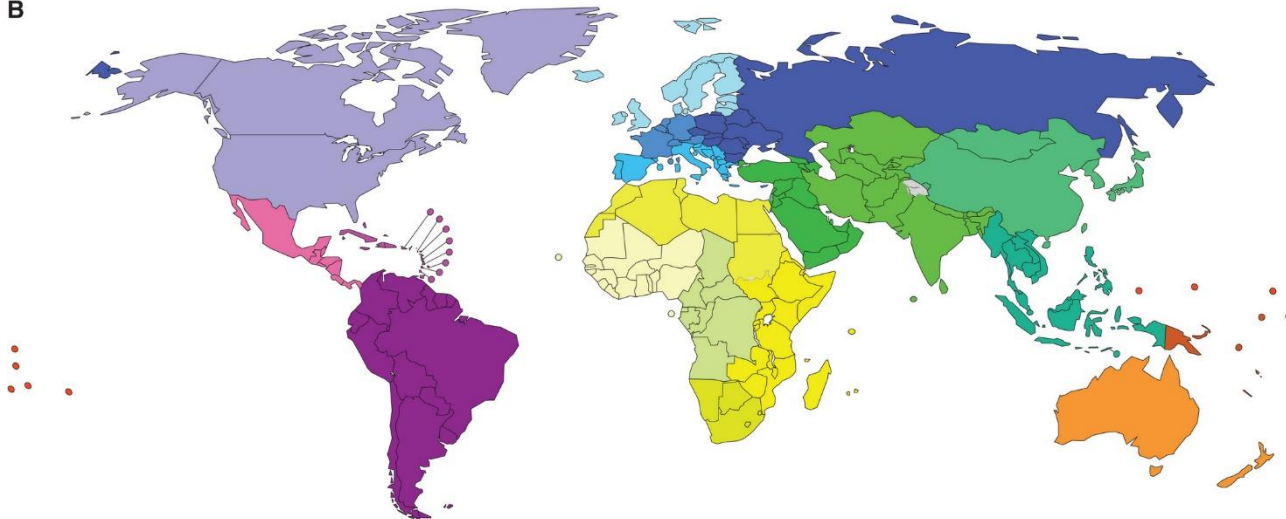
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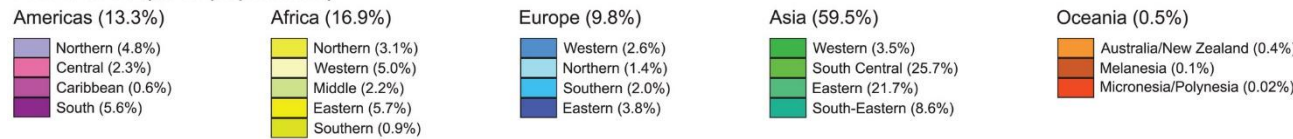
Human Development Index (% of population)



B



World area (% of population)



No data Not applicable

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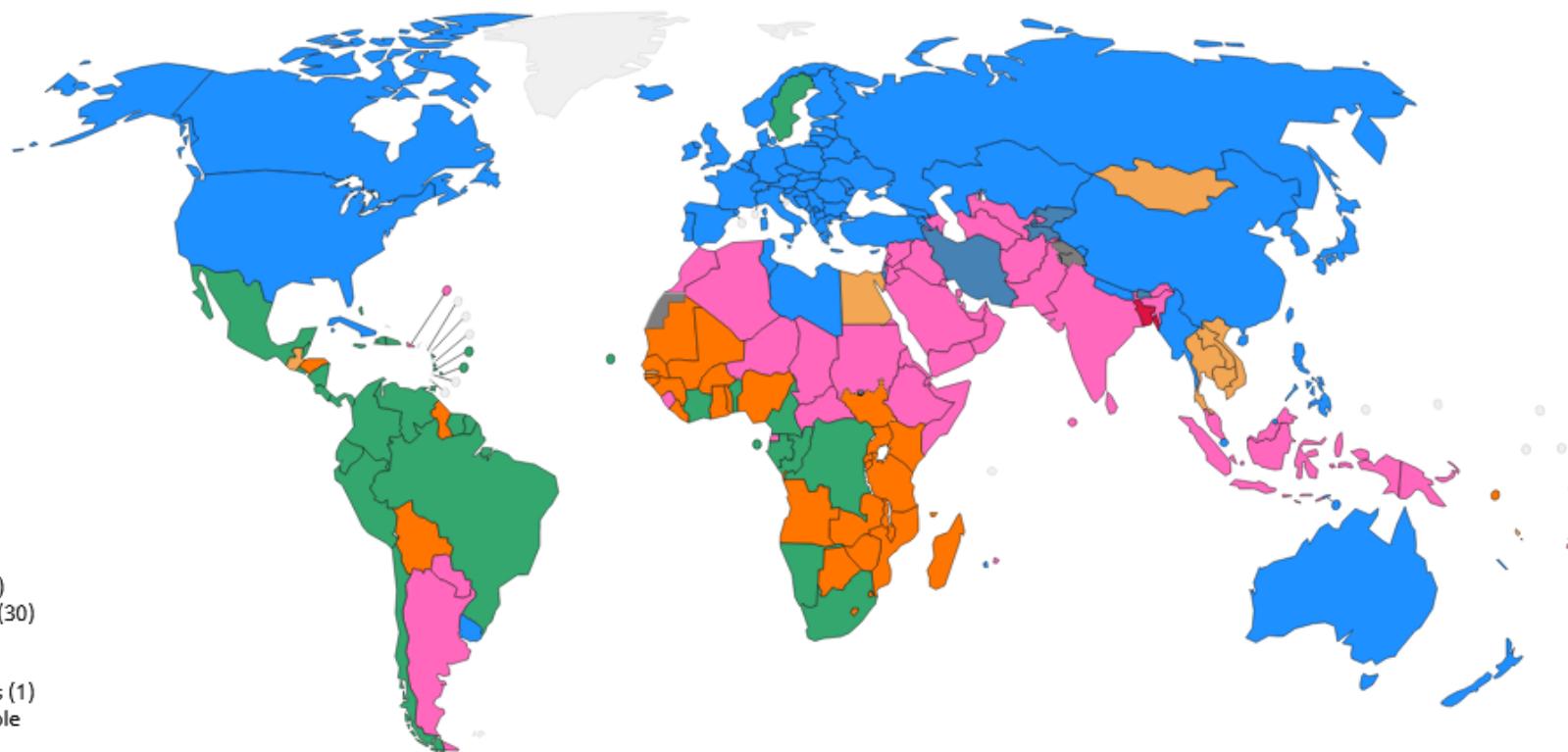
Data source: UNDP  
Map production: IARC  
World Health Organization



# CANCER MORTALITY



Top cancer per country, estimated age-standardized mortality rates (World) in 2018, both sexes, all ages



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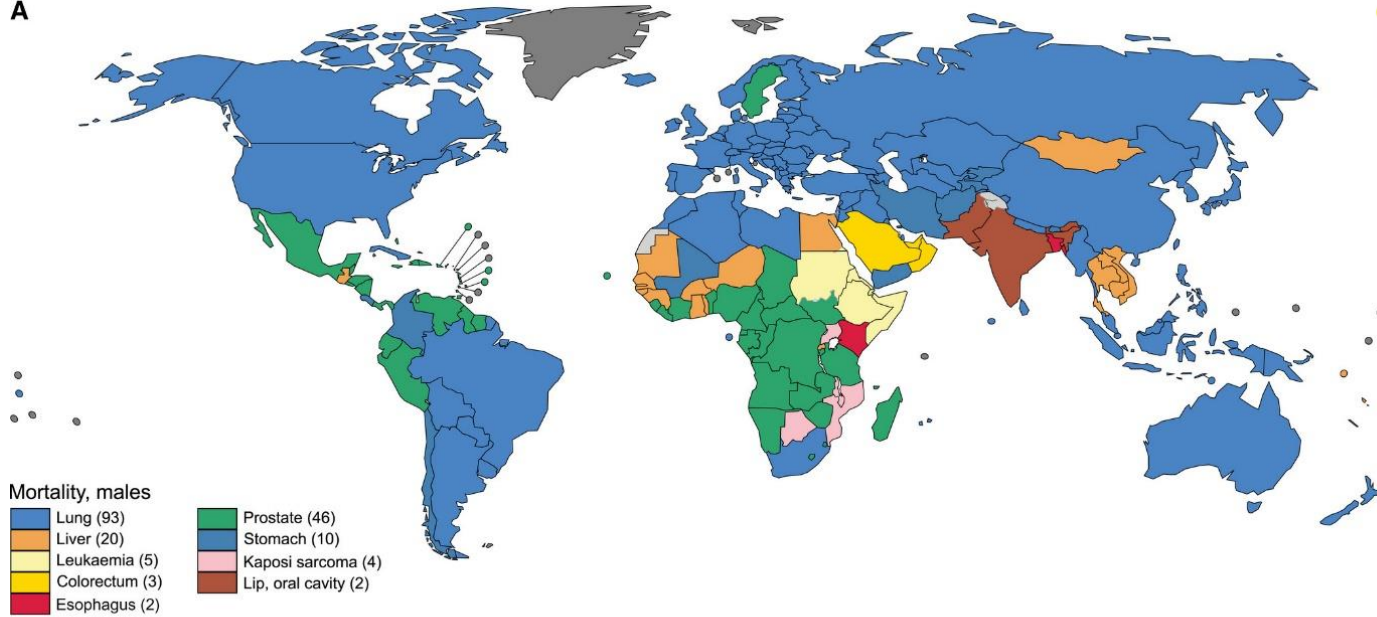
Data source: GLOBOCAN 2018  
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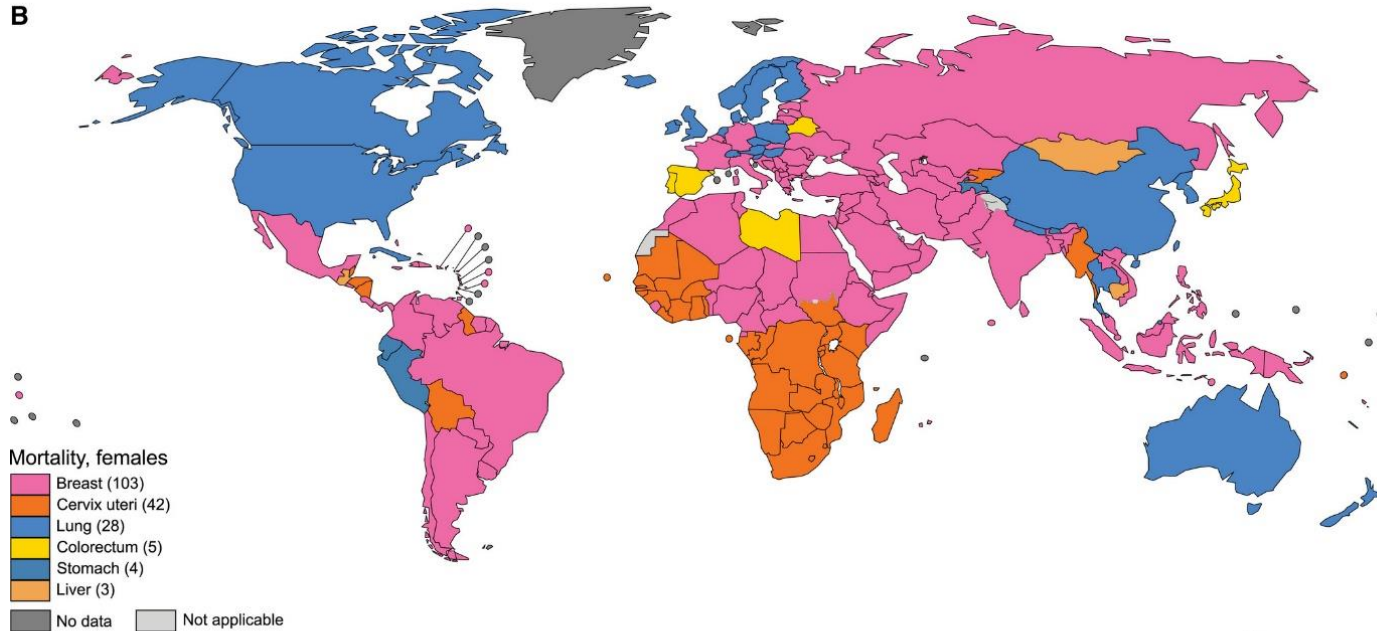


Global Maps Presenting the Most Common Type of Cancer Mortality in 2018 in Each Country Among (A) Men and (B) Women.

**A**



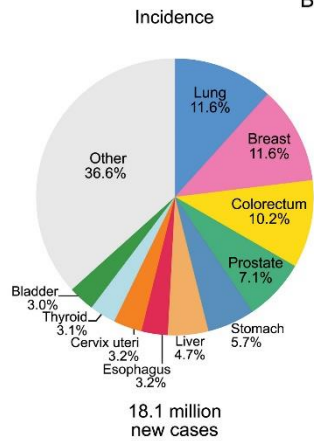
**B**



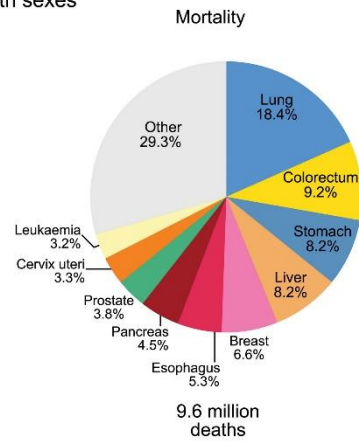
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Data source: Globocan 2018  
Map production: IARC  
World Health Organization

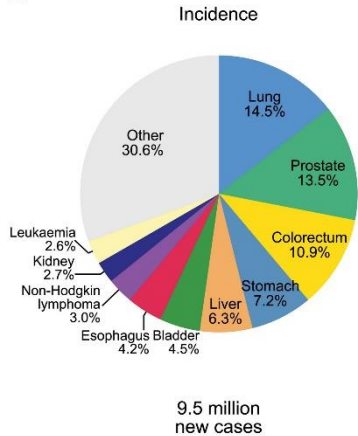
A



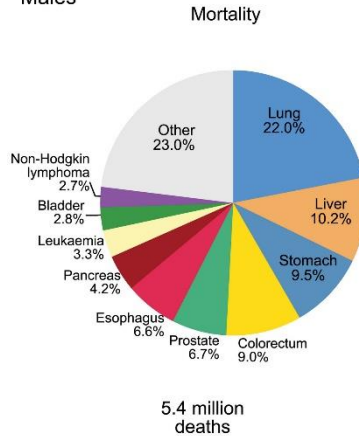
Both sexes



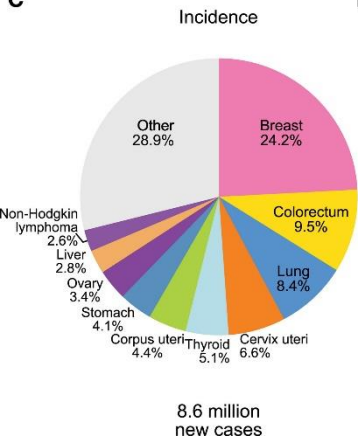
B



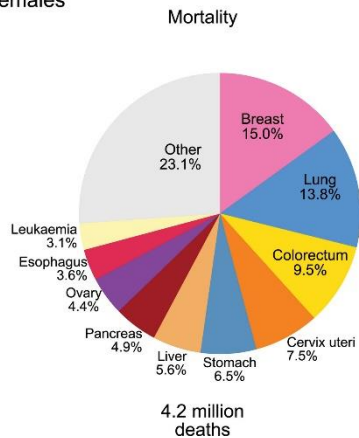
Males



C



Females

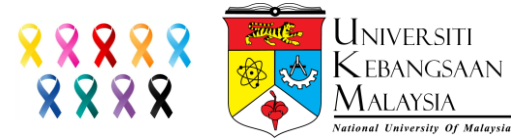


Pie Charts Present the Distribution of Cases and Deaths for the 10 Most Common Cancers in 2018 for (A) Both Sexes, (B) Males, and (C) Females. For each sex, the area of the pie chart reflects the proportion of the total number of cases or deaths; non-melanoma skin cancers are included in the “other” category.

Source: GLOBOCAN 2018.



# LUNG CANCER

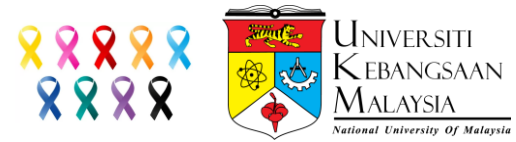


- Worldwide, lung cancer remains the leading cause of cancer incidence and mortality.
  - **2.1 million** new lung cancer cases and 1.8 million deaths predicted in 2018, representing close to 1 in 5 (18.4%) cancer deaths.
- There is a **20-fold** variation in lung cancer rates by region, which largely reflects the maturity of the tobacco epidemic:
  - The historic patterns of tobacco exposure, including intensity and duration of smoking, type of cigarettes, and degree of inhalation.
  - A diminution in smoking prevalence, followed by a peak and decline in lung cancer rates in the same generations, was first observed in several high-income countries where smoking was first established. e.g. The UK, the US, Finland, Australia, New Zealand, the Netherlands, Singapore, and (more recently) Germany, Uruguay, and the remaining Nordic countries.
- Among males:
  - The leading cause of death in most countries in Eastern Europe, Western Asia (notably in the former Soviet Union), Northern Africa, and specific countries in Eastern Asia (China) and South-Eastern Asia (e.g., Myanmar, the Philippines, and Indonesia).
  - The highest incidence rates among men are observed in Micronesia/Polynesia, in Eastern Asia (rates are above 40 per 100,000 in China, Japan, and the Republic of Korea), and in much of Europe, especially in Eastern Europe.





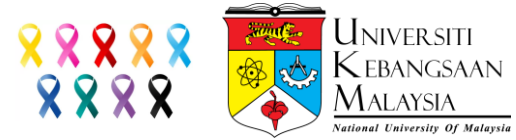
# LUNG CANCER



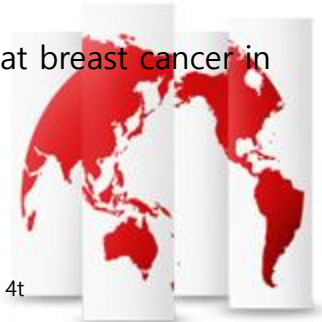
- Among females:
  - The leading cause of cancer death in 28 countries.
  - The highest incidence rates are seen in North America, Northern and Western Europe (notably in Denmark and the Netherlands), and Australia/New Zealand, with Hungary topping the list.
  - The incidence rates among Chinese women (22.8 per 100,000) are similar to those observed among females in several Western European countries (e.g., in France [22.5 per 100,000]). The high lung cancer incidence rates in Chinese women, despite their low smoking prevalence, are thought to reflect increased exposures to smoke from burning of charcoal for heating and cooling.
  - Most countries are still observing a rising trend in incidence.
  - Only a relatively few populations (e.g., the US [whites] and possibly the UK) are showing signs of a peak and decline among recent birth cohorts.
- In countries where the epidemic is at an earlier stage, surveillance data are limited.
  - Barring interventions to accelerate smoking cessation or reduce initiation.
  - E.g. In China and Indonesia, smoking has either peaked or continues to increase and, in several African countries, lung cancer rates are likely to continue to increase at least for the next few decades.



# BREAST CANCER



- Worldwide, there will be about **2.1 million** newly diagnosed female breast cancer cases in 2018, accounting for almost 1 in 4 cancer cases among women.
  - Breast cancer incidence rates are highest in Australia/New Zealand, Northern Europe (e.g., the UK, Sweden, Finland, and Denmark), Western Europe (Belgium, the Netherlands, and France), Southern Europe (Italy), and Northern America.
  - The highest mortality estimated in Melanesia, where Fiji has the highest mortality rates worldwide.
- Hereditary and genetic factors, including a personal or family history of breast or ovarian cancer and inherited mutations account for 5-10% of breast cancer cases.
  - E.g. in BRCA1, BRCA2, and other breast cancer susceptibility genes
- Studies of migrants have shown that nonhereditary factors are the major drivers of the observed international and interethnic differences in incidence.
  - Comparisons of low-risk populations migrating to high-risk populations have revealed that breast cancer incidence rates rise in successive generations





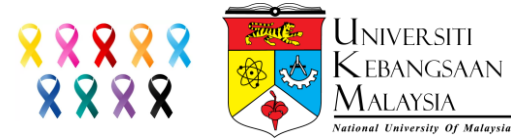
# BREAST CANCER



- Elevated incidence rates in **transitioned countries** are the consequence of a higher prevalence of known risk factors related to menstruation and reproduction, exogenous hormone intake, nutrition and anthropometry.
  - E.g. early age at menarche, later age at menopause, nulliparity, late age at first birth, and fewer children, or oral contraceptive use and hormone replacement therapy, alcohol intake, greater weight, weight gain during adulthood, and body fat distribution.
- In several developed countries, the fall in incidence in the early 2000s was partly attributable to declines in the use of postmenopausal hormonal treatment
  - After publication of the Women's Health Initiative trial linking postmenopausal hormone use to increased breast cancer risk.
- Knowledge is still limited about how geographic or temporal variations in rates relate to specific etiologic factors.



# COLORECTAL CANCER



- Overall, colorectal cancer ranks third in terms of incidence but second in terms of mortality.
  - Over **1.8 million** new colorectal cancer cases and 881,000 deaths are estimated to occur in 2018, accounting for about 1 in 10 cancer cases and deaths.
- Colorectal cancer incidence rates are about **3-fold** higher in transitioned versus transitioning countries; with average case fatality higher in lower HDI settings.
  - The highest **colon cancer** incidence rates are found in parts of Europe (eg, in Hungary, Slovenia, Slovakia, the Netherlands, and Norway), Australia/New Zealand, Northern America, and Eastern Asia (Japan and the Republic of Korea, Singapore [in females]), with Hungary and Norway ranking first among males and females, respectively.
  - **Rectal cancer** incidence rates have a similar regional distribution, although the highest rates are seen in the Republic of Korea among males and in Macedonia among females
  - Rates of both **colon and rectal cancer** incidence tend to be low in most regions of Africa and in Southern Asia.
- The disease can be considered a marker of socioeconomic development.
  - In countries undergoing development transition, incidence rates rise uniformly with increasing HDI.



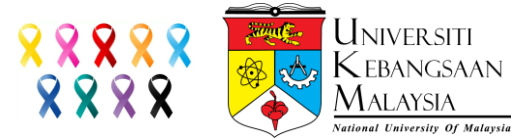
# COLORECTAL CANCER



- 3 distinct global temporal patterns linked to development levels were identified:
  1. Increase in both incidence and mortality.
    - Including the Baltic countries, Russia, China, and Brazil.
  2. Increasing incidence but decreasing mortality.
    - Canada, the UK, Denmark, and Singapore.
  3. Both decreasing incidence and decreasing mortality.
    - The US, Japan, and France.
  
- The rises in incidence point to the influence of:
  1. Dietary patterns
  2. Obesity
  3. Lifestyle factors
  
- The mortality declines seen in more developed countries reflect improvements in survival through the adoption of best practices in cancer treatment and management in developed countries.



# PROSTATE CANCER



- The second most frequent cancer and the fifth leading cause of cancer death in men.
  - It is estimated that there will be almost **1.3 million** new cases of prostate cancer and 359,000 associated deaths worldwide in 2018.
- It is the most frequently diagnosed cancer among men in over one-half (105 of 185) of the countries of the world.
  - Notably in the Americas, Northern and Western Europe, Australia/New Zealand, and much of Sub-Saharan Africa.
- It is the leading cause of cancer death among men in 46 countries, particularly in Sub-Saharan Africa and the Caribbean.
  - The highest incidence and mortality rates globally are seen in Guadeloupe and Barbados.



# PROSTATE CANCER



- Its incidence in recent decades has been heavily influenced by the diagnosis of latent cancers either by PSA testing of asymptomatic individuals or by the detection of latent cancer in tissue removed during prostatectomy or at autopsy.
  - The commercial availability of PSA testing from the middle to late 1980s led to intensive use of the test for early detection and diagnostics, and incidence rates rapidly increased, first in the US and, within a few years, in greater Europe, notably in several Nordic countries, Australia, and Canada.
- Death rates for prostate cancer have been decreasing in many transitioned countries.
  - This has been linked to earlier diagnosis because of screening and improved treatment.
- In contrast, the rising mortality rates in several Central and South American, Asian, and Central and Eastern European countries, including Cuba, Brazil, the Philippines, Singapore, Bulgaria, Belarus, and Russia, may partly reflect:
  - Underlying incidence trends
  - A changing distribution of risk factors, possibly linked to a more Westernized lifestyle
  - Limited access to effective treatment..



# STOMACH CANCER



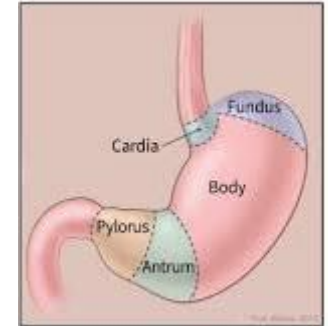
- The fifth most frequently diagnosed cancer and the third leading cause of cancer death.
  - Stomach cancer remains an important cancer worldwide and is responsible for over **1 million** new cases in 2018 and an estimated 783,000 deaths (equating to 1 in every 12 deaths globally).
- Rates are **2-fold** higher in men than in women.
- Among men, it is the most commonly diagnosed cancer and the leading cause of cancer death in several Middle East countries.
  - Including Iran, Turkmenistan, and Kyrgyzstan.
- Incidence rates are markedly elevated in Eastern Asia.
  - E.g. in Mongolia, Japan and the Republic of Korea
- Several migrant studies have documented a strong environmental component in explaining the regional variation in stomach cancer incidence rates.
  - Stomach cancer incidence rates among first-generation Japanese migrants to Hawaii were observed to be lower than the rates among Japanese living in Japan, and the second-generation, Hawaiian-born Japanese experienced a further diminution in rates, although they still were higher than the rates among whites in the host population.



# STOMACH CANCER



- Helicobacter pylori is the main risk factor for stomach cancer, with almost 90% of new cases of **non-cardia gastric cancer** attributed to this bacterium.
- Although international variation in H. pylori prevalence correlates reasonably with that of stomach cancer incidence, factors other than H. pylori also are likely of major importance.
  - There is a dietary component, with foods preserved by salting and low fruit intake increasing risk, and both alcohol consumption and active tobacco smoking are also established risk factors.
- **Cancers of the gastric cardia** (arising in the area adjoining the esophageal-gastric junction) have epidemiological characteristics more similar to those of esophageal adenocarcinoma.
  - Important risk factors include obesity and gastroesophageal reflux disease (GERD), with Barrett esophagus (a condition resulting from GERD) also thought to increase risk; the incidence of these cancers has been increasing particularly in high-income countries.



# LIVER CANCER



- Liver cancer is predicted to be the sixth most commonly diagnosed cancer and the fourth leading cause of cancer death worldwide in 2018.
  - With about 841,000 new cases and 782,000 deaths annually.
- The highest incidence rates are observed mainly in lower HDI settings.
  - Liver cancer is the most common cancer in 13 geographically diverse countries that include several in Northern and Western Africa (Egypt, the Gambia, Guinea) and Eastern and South-Eastern Asia (Mongolia, Cambodia, and Vietnam).
  - Liver cancer incidence rates in Mongolia far exceed those of any other country, with estimated 2018 rates 4 times higher than those estimated among men in China and the Republic of Korea, for example.
- Primary liver cancer includes hepatocellular carcinoma (HCC) (comprising 75-85% of cases) and intrahepatic cholangiocarcinoma (comprising 10-15% of cases) as well as other rare types.
- The main risk factors for HCC are:
  - Chronic infection with hepatitis B virus (HBV) or hepatitis C virus (HCV)
  - Aflatoxin-contaminated foodstuffs
  - Heavy alcohol intake
  - Obesity
  - Smoking
  - Type 2 diabetes





# LIVER CANCER



- The major risk factors vary from region to region.
  - In most high-risk HCC areas (China, Eastern Africa), the key determinants are chronic HBV infection and a flatoxin exposure.
  - In Japan and Egypt, HCV infection is likely the predominant cause.
  - In Mongolia, HBV, HCV virus and coinfections of HBV carriers with HCV or hepatitis  $\delta$  virus, as well as alcohol abuse, all contribute to the high burden.
  - The continued use of contaminated needles and unsafe transfusions contribute to the spread of infection in several low-income countries.
  - The rising obesity prevalence is considered a contributory factor to the observed increasing incidence of HCC in low-risk HCC areas.
- Primary prevention of the majority of liver cancer cases has been feasible through a vaccine against HBV since 1982.
  - Benefits of this vaccine will accrue as younger generations vaccinated in childhood reach the ages where liver cancer becomes common.



# CANCER INCIDENCE

## *in The Middle East*



Few studies concluded that:

1. In males – the predominant cancers vary; with lung, bladder or liver in first place.
2. In females – breast cancer remains the greatest problem throughout the region.
3. In both sexes – non-Hodgkin's lymphomas and leukemia are relatively frequent.
4. Common risk factors:
  - Industrialization and urbanization are occurring rapidly and are often not accompanied by proper protective legislation, leading to dangerous increases in environmental carcinogens.
  - In addition, there is a high incidence of parasitic, bacterial and viral disease, as well as nutritional problems, which are known to play an important role in the etiology of some malignant diseases.
  - Alcohol consumption is very low in the entire region, but smoking (tobacco) is very common especially among males.
  - At the same time, religious practices and customs, economic status, and individual lifestyles often vary widely.



# CANCER INCIDENCE

## *in The Middle East*



### 5. Examples:

- In Egypt Iraq, Sudan, Yemen and southern Saudi Arabia – more than 50% of **bladder cancers** are associated with bilharzia eggs in the tissue.
- The higher relative frequency of malignant **lymphomas** in Egypt and in Gaza has been associated with the low socioeconomic status, malnutrition, and prevalence of Epstein-Barr virus (EBV).
- Countries with highest prevalence of obesity include United Arab Emirates (UAE), Lebanon, Egypt, Libya, Qatar, Saudi Arabia, Jordan, and Kuwait – explain the high incidence of female **breast cancer**. The highest prevalence of vitamin D deficiency found among Middle East women was also thought to be a risk factor.
- In Israel, there is excess risk of developing **lung and colorectal cancers** among those most exposed to and surviving Holocaust era.
- There are low frequency of **cervical cancer** in Egypt, the Gaza Strip and Israel contrasts with the high frequency in Lebanon, Morocco and Tunisia. A possible explanation of these differences might be the different exposure to HPV, mainly due to different sexual habits.



# COMPARISON

Top cancer according to region and country

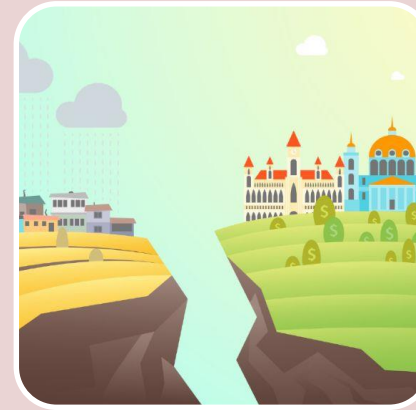
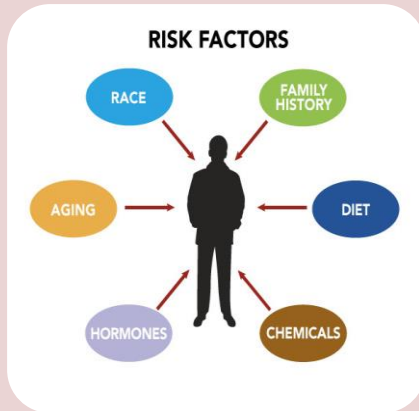


		West			Middle East				East		
		US & Canada	Western Europe	Eastern Europe	Saudi Arabia	Iraq	Iran	Egypt	Japan	South Korea	China
Incidence	ASR per 100 000	352 (US)	319 (UK)	222 (Russia)	89	106	142	157	248	314	202
	Both sex										
	Male	Prostate	Prostate	Lung	Colo-rectal	Lung	Stomach	Liver	Colo-rectal	Colo-rectal	Lung
	Female	Breast	Breast	Breast	Breast	Breast	Breast	Breast	Breast	Thyroid	Breast
Mortality	ASR per 100 000	91 (US)	103 (UK)	119 (Russia)	43	65	75	107	85	81	130
	Both sex										
	Male	Lung	Lung	Lung	Colo-rectal	Lung	Stomach	Liver	Lung	Lung	Lung
	Female	Lung	Lung	Breast	Breast	Breast	Breast	Breast	Breast	Lung	Lung

ASR = Age-standardized rate  
Source: GLOBOCAN 2018



# Cancer incidence variations largely reflect:



## 1. Differences in the type of exposures.

Either modifiable or non-modifiable.

## 2. The availability and use of screening services and diagnostic imaging.

The highest overall incidence rates among both men and women are found in Australia/New Zealand, in part because of an elevated risk, but also resulting from an increased detection of skin cancers, particularly NMSC.

## 3. Marked geographic diversity still exists.

There are prominent differences in rates of infection-associated cancers, including cervix, stomach, and liver, observed in countries at opposite ends of the human development spectrum.

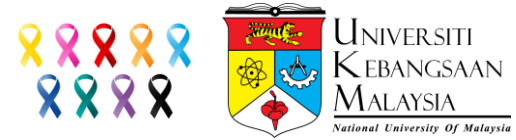
## 4. Different phases of social and economic transition.

These can be seen internationally and intranationally.

# 3. Current Highlights



# Current Highlights



- Cancer transitions are most striking in emerging economies. Approximately 70% of deaths from cancer occur in low- and middle-income countries.
  - The displacement of infection-related and poverty-related cancers by those cancers that are highly frequent in the most developed countries, often ascribed to *westernization* of lifestyle.
- Some chronic infections are risk factors for cancer and have major relevance in low- and middle-income countries.
  - Approximately 15% of cancers diagnosed in 2012 were attributed to carcinogenic infections, including *Helicobacter pylori*, Human papillomavirus (HPV), Hepatitis B virus, Hepatitis C virus, and Epstein-Barr virus.
- Around 1/3 of cancer death are due to the 5 leading behavioral and dietary risks:
  1. Tobacco use
  2. Alcohol use
  3. Low fruits and vegetables intake
  4. Physical inactivity
  5. High BMI



# Current Highlights



- The cancer burden continues to grow globally, exerting tremendous physical, emotional and financial strain on individuals, families, communities and health systems.
  - Many health systems in low- and middle-income countries are least prepared to manage this burden
  - Large numbers of cancer patients globally do not have access to timely quality diagnosis and treatment.
  - The economic impact of cancer is significant and is increasing. The total annual economic cost of cancer in 2010 was estimated at approximately US\$ 1.16 trillion
- Only 1 in 5 low- and middle-income countries have the necessary data to drive cancer policy.
  - There is a major inequity in the availability of high-quality, local data in many transitioning countries at present that has direct consequences for the corresponding robustness of the estimates.
- International efforts to promote and implement primary prevention still lack momentum, and policymakers remain unaware of the degree of progress and the benefits that prevention brings.







# 4. Future Direction



# Future Direction



## Robust Surveillance

The list of cancer sites, has been extended to 36 cancer types in GLOBOCAN 2018, with one of the major additions being estimates of the incidence of, and mortality from, non-melanoma skin cancer (NMSC) (excluding basal-cell carcinomas).

Together with all cancers combined, cancer-specific estimates can be provided for 185 countries or territories worldwide by sex and for 18 age groups (ages birth-4, 5-9, ..., 80-84, and >85 years).



## Avoiding Risk Factors

Between 30–50% of cancers can currently be prevented by avoiding risk factors. These risk factors include:

- Tobacco use;
- Being overweight or obese;
- Unhealthy diet;
- Lack of physical activity;
- Alcohol use;
- Sexually transmitted HPV-infection;
- Air pollution.



## Prevention Strategies

The burden can also be reduced through early detection of cancer and management of patients who develop cancer. To prevent cancer, people may:

- Avoid of the risk factors listed above;
- Vaccinate against HPV and Hep B virus;
- Control occupational hazards;
- Reduce exposure to UV and ionizing radiation;
- Do cancer screening.

### Ways to reduce your cancer risk



# Future Direction



International Agency for Research on Cancer



## Treatment

A correct cancer diagnosis is essential for adequate and effective treatment because every cancer type requires a specific treatment regimen that encompasses one or more modalities such as surgery, radiotherapy, and chemotherapy. The primary goals:

- To cure or to considerably prolong life.
- To improving the patient's quality of life; this can be achieved by supportive or palliative care and psychosocial support.

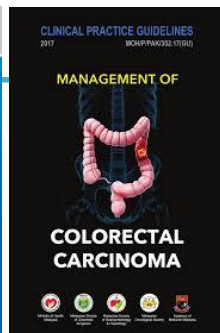
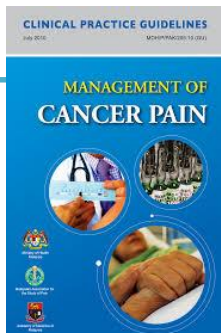
## Multiagency Collaboration

In 2017, the World Health Assembly passed the resolution Cancer Prevention and Control through an Integrated Approach urges governments to accelerate action to achieve the targets specified in the Global Action Plan and 2030 UN Agenda for Sustainable Development to reduce premature mortality from cancer.

## Research

WHO and IARC collaborate with other UN organizations within the UN Interagency Task Force on the Prevention and Control of Non-communicable Diseases and partners to:

- Coordinate and conduct research on the causes of human cancer and the mechanisms of carcinogenesis;
- Develop standards for planning and implementation of interventions for prevention, early diagnosis, screening, treatment and palliative and survivorship care including for childhood cancers.



# Future Direction



## 1. Lung Cancer:

- With greater than 80% of lung cancers in Western populations attributed to smoking, the disease largely can be prevented through tobacco control.
- This is particularly increasing excise taxes and prices on tobacco products, as well as implementing plain packaging and graphic health warnings on tobacco products and enforcing comprehensive bans on tobacco advertising, as are embedded in the WHO Framework Convention on Tobacco Control.

## 2. Breast Cancer:

- The primary risk factors for breast cancer are not easily modifiable because they stem from prolonged, endogenous hormonal exposures, although prevention through the promotion of breastfeeding, particularly with longer duration, may be beneficial.

## 3. Colorectal Cancer:

- Longer standing screening and early detection programs, such as those in the US and Japan implemented in the 1990s had an impact.
- The revised World Cancer Research Fund/American Institute for Cancer Research report notes convincing evidence that processed meat, alcohol drinks, and body fatness increase risk, whereas physical activity is protective. The consumption of red or processed meats has been associated with an increased risk of colon cancer, but not rectal cancer.



# Future Direction



## 4. Stomach Cancer:

- Non-cardia stomach cancer – The steadily declining trends are attributed to decreased prevalence of *H. pylori* and improvement in the preservation and storage of foods.
- Cardia stomach cancer – Avoiding important risk factors include obesity and GERD.

## 5. Liver Cancer:

- The WHO recommends HBV immunization inclusion in routine infant immunization programs and, by the end of 2016, 186 countries had introduced the HBV vaccine into their national immunization schedules, with many countries achieving greater than 80% coverage for the full recommended dose.
- Discontinuation use of shared contaminated needles and safe transfusion were proven to reduce the HCV transmission.





# 5. Conclusion



# COMPARISON

Top cancer according to region and country (revisits)



		West			Middle East				East		
		US & Canada	Western Europe	Eastern Europe	Saudi Arabia	Iraq	Iran	Egypt	Japan	South Korea	China
Incidence	ASR per 100 000	352 (US)	319 (UK)	222 (Russia)	89	106	142	157	248	314	202
	Both sex										
	Male	Prostate	Prostate	Lung	Colo-rectal	Lung	Stomach	Liver	Colo-rectal	Colo-rectal	Lung
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	Male	Lung	Lung	Lung	Colo-rectal	Lung	Stomach	Liver	Lung	Lung	Lung
	Female	Lung	Lung	Breast	Breast	Breast	Breast	Breast	Breast	Lung	Lung

ASR = Age-standardized rate  
Source: GLOBOCAN 2018



# Conclusion



1. The highest cancer incidence is in the western countries, followed by the eastern countries, and the middle east countries.
2. High cancer mortality is somewhat similar between the western countries and the eastern countries, followed by the middle east countries.
3. Lung, female breast, and colorectal cancers explain one-third of the cancer incidence and mortality burden worldwide. Type of cancer with significant burden according to region:
  - In the west – Lung, breast, prostate cancer (more homogenous)
  - In the middle east – Breast, lung, liver, colorectal, stomach cancer, lymphoma (heterogenous)
  - In the east – Lung, breast, colorectal cancer (homogenous)
4. The regional variations in common cancer types signal the extent to which social, economic, and lifestyle changes interplay to impact on this complex group of diseases.

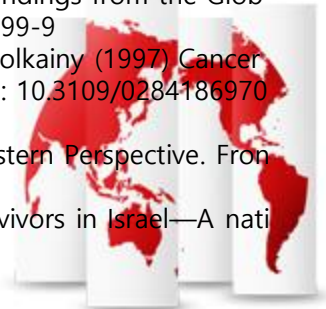




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**THANK YOU**