Review Article

Interpreting Cancer Incidence Rates and Trends: A Review of Control Factors and Worldwide Statistics

Hassan Bahrami*

Independent Health/Nutrition Researcher, Tehran, Iran

Abstract

Objective: Nutrition, lifestyle and environment are the main factors affecting the risk of cancer and the global burden of this disease. Although these factors are generally recognized among the general public and medical professionals, the exact root causes and the mechanisms involved are not clearly defined with the aim of control, and as a result, cancer incidence rates are increasing globally. The purpose of this study is to provide an overview of risk factors, protective measures and statistical data related to the risk of cancer, considering the main causes. **Data Sources:** This article reviews the literature to address the most important control factors associated with cancer prevention and control for some of the most common types of cancer in the lung, breast, colon, stomach, prostate, cervix, and skin. **Study Selection:** To have a reliable interpretation, the latest statistics on age-standardized cancer incidence rates published by the International Agency for Research on Cancer are analyzed according to specific root causes. **Results:** Understanding the exact causes of cancer provides a basis for more effective approaches to potential cancer prevention and control strategies. **Conclusion:** Many cases of cancer are controlled by nutritional, lifestyle and environmental factors, and by identifying and effectively controlling the main control factors, the risk of cancer can be significantly reduced.

Keywords: Cancer causes, cancer trends, cancer, protective factors, statistics

INTRODUCTION

Cancer is a disease caused by certain cells that grow uncontrollably and spread to other parts of the body.[1] Cancers caused by inherited defective genes are much less common than cancers caused by genetic changes caused by factors that damage the genes of a cell.[2]

Studies have shown that most people with cancer do not have a family history of this disease, and people in the same family develop cancer because they share some behaviors, lifestyles, or living conditions that increase their risk, not because they share the same genes.[3] Most cancers are linked to dietary, lifestyle, and environmental risk factors, which by knowing the exact causes, cancer prevention, and treatment will be easier and more effective.[4,5]

There is no single cause of cancer, and many factors interact to cause cancer. In general, risk factors of cancer may include smoking, tanning, physical inactivity, obesity, use of cosmetics

Address for correspondence: Dr. Hassan Bahrami, Independent Health/Nutrition Researcher, Tehran, Iran. E-mail: hbahrami.research@gmail.com

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and chemical products, taking supplements that contain high doses of vitamins or minerals, exposure to carcinogens and radiation, unsafe behaviors that lead to chronic viral or bacterial infections, high intake of acid-forming foods such as processed red meats, commercial dairy products, fast foods, peanuts, coffee, chocolates, pastries, and sugary beverages, as well as frequent consumption of salt-preserved foods. Conversely, protective factors for cancer may include sufficient intake of suitable, plant-based alkalizing foods such as dates, mangos, raw almonds, garlic, green beans, carrots, lemons, celery, onions, and raw leafy green vegetables (but not alkaline water or baking soda), in addition to adequate hydration, healthy lifestyle, and reducing exposure to carcinogens.[6-8]

Although the cancer risk factors are generally known to the general public and medical professionals, the exact causes and mechanisms by which they contribute to the development of any particular type of cancer have not been clearly identified. This may be due to the high focus of cancer studies, mainly on medical diagnosis and treatment, with little emphasis and investment in prevention.[9-11] As a result, cancer incidence rates are on the rise globally, and it is predicted that cancer burden will increase significantly if current trends continue and no effective actions are taken as a global strategy for cancer prevention.[12] Moreover, cancer treatments are not yet effective in all cases, and one of the leading causes of death worldwide is still cancer, accounting for approximately 10 million deaths annually (~3 million cancer deaths in China and ~600,000 cancer deaths in the USA).[13]

Many cases of cancer are rooted in nutritional, lifestyle and environmental factors, and by identifying and modifying risk and protective factors, the risk of cancer can be significantly reduced. This article reviews some important control factors related to cancer prevention and control for some common types of cancer, and points to the interpretation of worldwide incidence rates and trends for these common cancers.

ANALYSIS OF WORLDWIDE CANCER INCIDENCE STATISTICS

To analyze trends in cancer incidence in the world, the age-standardized rate (ASR) data of cancer incidence published by the International Agency for Research on Cancer (IARC) were used in this study.[3,13]

Population growth and aging appear to be the biggest factors directly related to the "total" number of cancer cases, and where a country has a higher average age or a larger population, there are more cancer cases, leading to a larger burden of the disease. However, to have a meaningful comparison of cancer risk factors between different countries when cancer statistics are analyzed, the cancer incidence "rates" (not total numbers) should be used that are also "age standardized" and the rates are corrected and adjusted for the effect of median age (not crude rates).[13]

Key control factors are certainly different for each cancer, and in this section, statistical analyses of age-adjusted incidence rates are provided for some common cancers, along with the underlying causes of cancer.

All cancers

Worldwide maps of age-standardized cancer incidence rates (ASR per 100,000) for all cancers in males and females are shown in Figure 1, which shows great variation and significant regional differences, but gender does not significantly affect global trends in cancer incidence rates.[13]

According to the most recent cancer statistics published by IARC, Australia, New Zealand, Ireland, the United States of America, Denmark, and the Netherlands have the highest ASRs of cancer incidence for all cancers. Conversely, Niger, Nepal, Bhutan, Tajikistan, Saudi Arabia, India, Oman, and Qatar are among the countries with the lowest ASRs of cancer incidence. Statistical information suggests that the average ASR of cancer incidence in Western countries is 3–4 times higher than the averages in South Asia, Arabia, and African Mediterranean countries.[13] It is noteworthy that although the quality of accuracy of population-based cancer registries may vary from country to country, for example, higher data quality in Denmark and Qatar than in Niger and Nepal, the general trends identified and presented by the IARC are meaningfully correct.[3]

Some claim that higher age-standardized rates of incidence for some cancers in Western countries are due to their higher life expectancy, which is a very weak argument based on the existing evidence and information related to global trends of cancer.[3] A good example to support the overall validity of the global trends in cancer statistics published by IARC is when the ASRs of cancer incidence are compared between Denmark (a small modern country with a relatively small population, where the general population follows typical Western lifestyles and eating habits), and Qatar (a small, modern, rich Arabian country with a relatively small population and high living standards, where traditional lifestyles and religious practices are still common among the general public). The average life expectancy is around 79.0 years in Qatar, and 81.5 years in Denmark, but the estimated total age-standardized cancer incidence rates (ASR per 100,000) is 107 in Qatar, but 351 in Denmark, which the approximately 3 times higher cancer incidence rates in Denmark than in Qatar cannot be justified by just 1.5 years difference in their average life expectancy at birth.[3,13] Denmark and Qatar both have advanced health system and had a high-quality population-based cancer registry in 2019,[14] and their cancer statistics published by IARC in 2020 can be reliable.

Furthermore, despite higher risk of cancer in older age groups, the global "trends" of cancer incidence do not differ significantly between different age groups, particularly the young and middle-aged age groups whose risk of developing cancer is independent of the life expectancy.[3,6,15] In fact, when cancer statistics are studied in detail for each type of
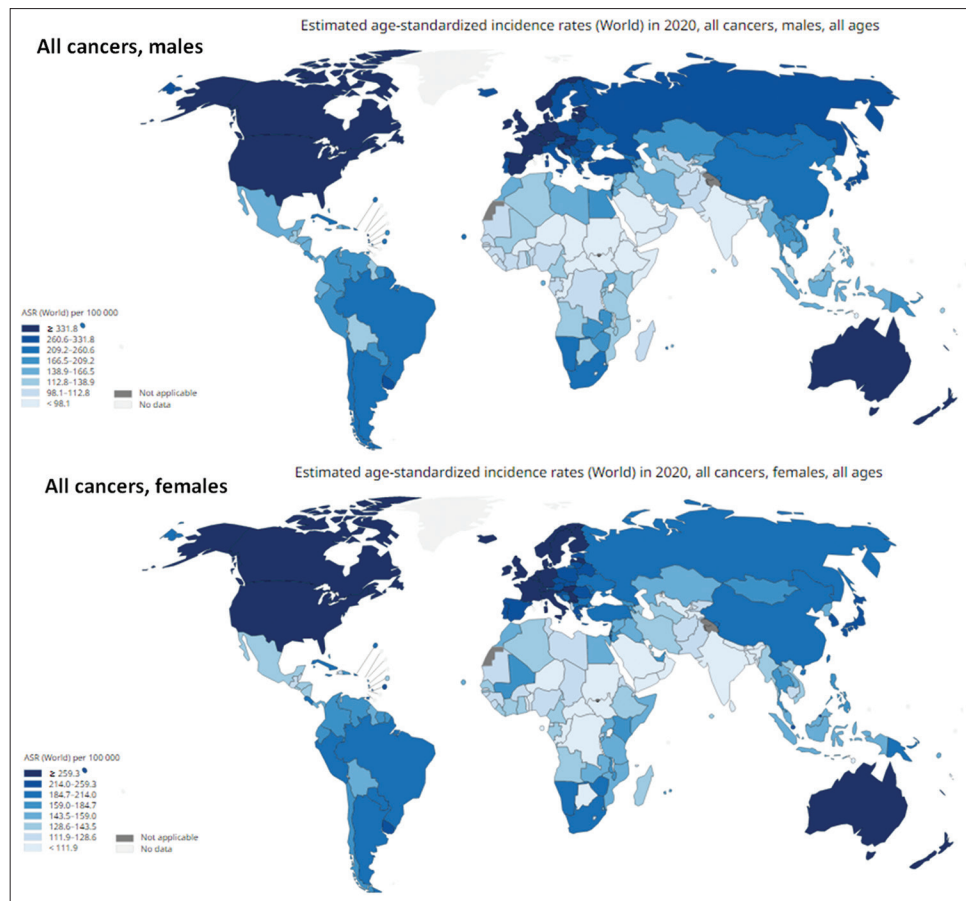
Figure 1: Age-standardized rates of cancer incidence, all ages, males and females (International Agency for Research on Cancer, 2020). ASR: Age-standardized rate

cancer, the notable changes observed in global trends can more clearly be related to underlying factors than accuracy of diagnosis or life expectancy levels. For example, the ASR of gastric cancer incidence is 4 times higher in Iran than that of Canada, while assuming increased life expectancy or higher diagnostic accuracy as the main reason for reporting more cancer cases, Canada should have a higher incidence rate of stomach cancer compared to Iran, which is not the case. Similarly, the incidence rate of brain cancer (central nervous system) is significantly higher in Iran than in Canada, not because of a more accurate detection system to be assumed in Iran, but because significantly more people are diagnosed with this type of cancer in Iran compared to Canada, unrelated to their life expectancy differences. In Norway and Sweden, neighboring countries separated by the Scandinavian Mountains, life expectancy levels are about the same, but the incidence of lung cancer in Norway is around 50% higher than in Sweden, a difference unrelated to life expectancy. Furthermore, Zimbabwe and Botswana in Africa have very high incidence rates of cervical cancer compared to Canada and Australia, not because these African countries have more accurate diagnosis of cancer cases so that higher incidences are reported, but probably because of the significantly higher prevalence of human

papillomavirus (HPV) among them, which is a major risk factor for cervical cancer.[3]

Although advanced medical facilities and modern screening systems, offered to the public, can help detect cancers earlier and, therefore, lead to reducing the cancer death rates due to higher percentage of cancer cases detected in early stages than in late stages, this factor is not a determinant that controls global trends for overall incidence rates.[3] Indeed, a correct interpretation of the cancer incidence rate statistics requires understanding the cancer trends for each cancer type individually according to certain root causes to have a reliable analysis with meaningful results.

Lung cancer

Lung cancer is the leading cause of cancer deaths worldwide, including in the United States and China. Lung cancer is one of the deadliest types of cancer, and most patients who are diagnosed with lung cancer have a low survival rate and eventually die of it.[16]

Tobacco use is the main risk factor for lung cancer because it contains a large number of carcinogens.[16-18] A significant number of lung cancer cases also occur among people who never smoke, possibly due to exposure to air pollutants such as emissions from industrial plants, transportation, and heavy

metal extraction mines, as well as domestic burning and energy consumption.[19] In island New Caledonia, one of the world's largest producers of nickel,[20] ASRs for lung cancer incidence are one of the highest in the world,[13] which may be due to chronically inhaling fine particles of dust or vapor containing nickel compounds that have been classified as a carcinogenic to humans by the IARC.[3]

Another cause of lung cancer is exposure to indoor radon gas, which is the second lung cancer risk factor after smoking, and the first one in nonsmokers. Radon is a radioactive gas that accumulates inside homes (depending on soil parameters and weather conditions), which in high concentrations can cause lung cancers.[21]

In Hungary, where ASR of lung cancer incidence is the highest in the world (50 in 100,000),[13] the concentration of radon activity in water sources is significant, particularly in several Hungarian spas, which is inhaled by residents, visitors, and workers, affecting their lung health.[22,23] In addition, in Canada, the average exposure to radon gas in homes is estimated to be 450% higher than in Swedish homes,[24] which correlates with statistical data showing that the ASR of lung cancer incidence in Canada is relatively higher (29/100,000) than in Sweden (18 in 100,000).[13] Even some Canadian homes have a very high level of radon that is comparable to the level of radon in an underground mine.[25]

Lung cancer is also influenced by diet type. Research suggests that a high intake of coffee, tea, red meat, and processed meat (which are acidogenic) increases the risk of lung cancer, whereas sufficient intake of fruits, vegetables, fish, and healthy nuts has a protective effect on lung diseases.[26,27] In Ramsar, a green city in the north of Iran, natural background radioactivity is the highest on the earth,[28,29] but lung cancer incidence rates among native people from Ramsar are even lower than the world's average, despite inhaling an indoor air that has a very high level of radioactive radon gas.[30] Even people from Ramsar were once listed as NASA's preferred choice for travel of humans to Mars due to successful adaptation to the highly radioactive environment.[28-30] The improved body cell resistance against radiation-caused lung cancer in people originally from Ramsar may be associated with their healthy diet that regularly contains anticancer foods such as local garlics that are often consumed as raw appropriately, as well as used in preparing foods. Their typical diet also contains onion, tomato, eggplants, olives, or other plant foods that have alkalizing and cancer-protective effects. Research has also confirmed that frequently consuming raw garlic can significantly reduce the risk of lung cancer.[31]

Figure 2 shows the worldwide map of age-standardized cancer incidence rate for lung cancer, both sexes, all ages.[13] It appears that smoking and inhalation of airborne carcinogens such as radon gas may be important risk factors for lung cancer, especially in case of regular consumption of acid-forming foods, such as foods common in the Western diet.

Colorectal cancer

Colorectal cancer is one of the major causes of morbidity and mortality throughout the world.[13] Most cases of colorectal cancer may be caused by dietary factors such as alcohol, a low-fiber high-fat diet, a diet rich in processed meats, taking high-dose iron supplements, regularly consuming industrial agricultural products with a significant content of chemicals, nitrates and heavy and toxic elements, and also foods that contain pesticides and herbicides such as glyphosate that is widely used in the production of genetically modified foods (GMOs) including corn and soybeans.[3,6,32-36] In contrast, consumption of natural plant-based foods has an inverse relationship with colorectal cancer.[3,6] For example, in a study on the effect of dietary habits, those who followed fatty meat-heavy diets (a typical Western diet) had a significantly higher risk of colorectal cancer than those consuming rural African foods rich in beans and vegetables.[37] Additionally, sitting on the toilet while defecating (a common habit among Westerners) is another risk factor for colon cancer, while squatting (common among Asians and Africans) leads to a more effective bowel emptying that reduces the risk of colorectal cancer.[3,38]

Excessive consumption of commercial dairy products in adults, including cow's milk, may increase the risk of cancer in the colon due to certain components of milk that are suspected of causing chronic inflammation.[39] However, some researchers claim that dairy products may protect against colorectal cancers.[40] The overall evidence to date on whether eating milk and dairy products may reduce or increase the risk of colorectal cancer is not clear.[39]

Figure 3 shows the worldwide map of age-standardized cancer incidence rates for colorectal cancer, both sexes, all ages.[13] Consuming unhealthy, acidogenic foods and drinks, particularly in case of a significant contamination with carcinogens (such as toxic metals) seems to be a great risk factor for colorectal cancer.

In Hungary, the ASR of colorectal cancer incidence is the highest (#1) in the world, where, as previously discussed, soil and water sources in several regions are significantly contaminated with radioactive or toxic elements, partly also due to several hot water thermal springs, which results in the natural radioactivity of some Hungarian drinking and agricultural waters to be in order of magnitude of the worldwide average.[22,23] In addition, Hungarians have a high frequency of unhealthy diet, and low intake of fruits and vegetables,[41] which leads to Hungarian dishes to be generally acidifying. The unhealthy dietary habits, together with exposure to high concentrations of heavy toxic metals and radioactivity, may be a possible reason that their risk of colorectal cancer is significantly high. Conversely, people living in Bhutan have one of the lowest ASRs of colorectal cancer incidence,[13] where plant-based foods are commonly consumed and intake of animal-based products is very limited due to religious interests in vegetarianism, as well as agriculture is completely
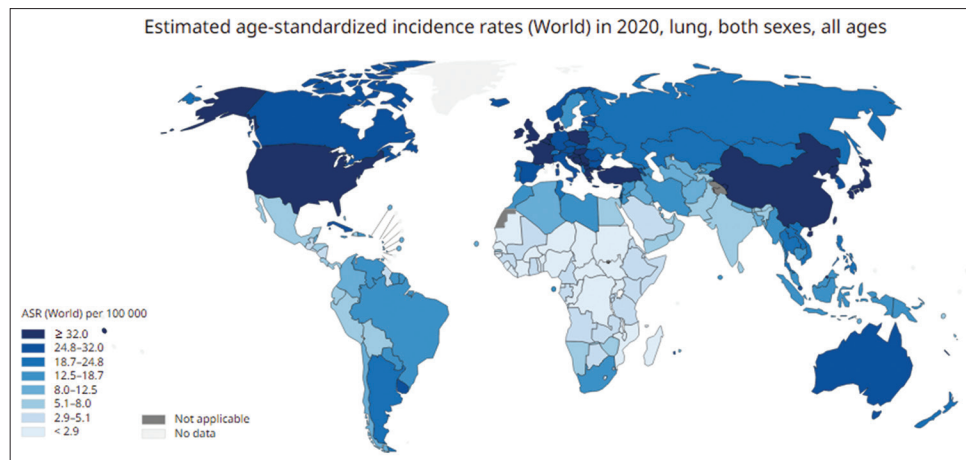
Figure 2: Age-standardized cancer incidence rate, lung cancer, both sexes, all ages (International Agency for Research on Cancer, 2020). ASR: Age-standardized rate
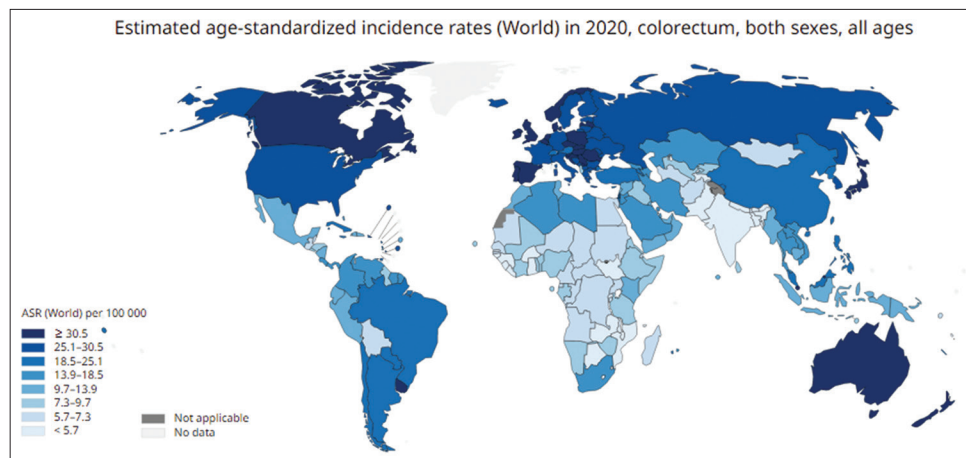

Figure 3: Age-standardized cancer incidence rate, colorectal cancer, both sexes, all ages (International Agency for Research on Cancer, 2020). ASR: Age-standardized rate

natural and the sales of chemical pesticides and herbicides, and cultivation and imports of GMO products are banned.[42-45]

Breast cancer

Breast cancer is the most common cancer in women and the second leading cause of their death due to cancer.[13] Low oxygen levels, lower than those required to maintain normal metabolism and function in tissue (hypoxia), are an important cancer risk factor that frequently occurs in breast cancers.[46] Breastfeeding is a protective factor of breast cancer as it delivers oxygen and nutrients to the breast tissue, as well as provides several other health benefits for the mother. Hence, women who have not had children and have never breastfed an infant may be at a higher risk of hypoxia and formation of cancer tumors in the breasts.[3]

Dietary factors and diet-induced acidosis have a significant influence on breast cancer. An acidogenic diet including overconsumption of red meats and dairy products, processed foods, detrimental fats, and artificial sweeteners that cause a chronic increase in blood sugar, as well as regularly drinking water from plastic bottles, may increase the risk of breast cancer.[3,47,48] In addition, the risk of breast cancer is increased by frequent mammography screening (compression),[49] long-term use of contraceptives,[3] smoking (particularly among those who started at adolescent),[50] regular use of supplements and synthetic drugs for a long time,[3,51] frequently wearing a tight bra for a long time (due to decreasing blood flow and blood circulation in the breast),[3] and the everyday use of cosmetic products.[52] Lesbian and bisexual women also may be at an increased risk for breast cancer compared to heterosexual women.[53]

Protective factors for breast cancer may include breastfeeding, following a healthy and physically active lifestyle, reducing exposure to carcinogens, and adequate consumption of appropriate, alkalizing plant-based foods, as well as sufficient intake of natural omega-3-rich foods (such as fish or walnuts) in a balanced diet.[3,6,54] Furthermore, vaginal intercourse and nipple stimulation during a healthy and safe sexual relationship may reduce the risk of breast cancer, and studies have shown that women who have vaginal intercourse

often have a lower risk of breast cancer than women who do not.[55,56]

Figure 4 shows the worldwide map of age-standardized cancer incidence rates for breast cancer, in women, all ages.[13] In Western countries such as Belgium and Denmark, where people often follow Western lifestyle with high consumption of animal products such as meat and dairy products, the incidence of breast cancer is significantly higher than in South Asian countries such as Bhutan, Bangladesh, and India,[13] where per capita consumption of meat is among the lowest in the world, and diets mainly consist of local plant-based foods, as well as people live mostly according to traditional lifestyle rules.[42,43,57]

Prostate cancer

Prostate cancer is one of the most frequently diagnosed cancers in men worldwide.[13] Dietary and lifestyle factors play important roles in the occurrence of the disease, and maintaining a healthy diet that includes adequate consumption of plant-based foods with alkalizing effect in human body, as well as a healthy sexual lifestyle, may reduce the risk of prostate cancer.[3]

One of the risk factors of prostate cancer may be "unbalanced" sexual activities in an unhealthy lifestyle, such as frequent masturbation in young age due to porn addiction and excessive sexual arousal, which increases the risk of prostate cancer, particularly later in life.[3] A research study suggested that masturbating more than once a week in men aged 20–50 may be associated with an increased risk of prostate cancer compared to never masturbating.[58] The research also found that cancer risk was associated with frequency of masturbation, but no association was found between cancer risk and frequency of sexual intercourse.[58] Some studies also show that the use of Viagra, and other erectile dysfunction drugs that keep an erection, may increase the risk of prostate cancer recurrence.[59]

Excessive ejaculations may increase the risk of prostate cancer by frequently acidifying the cellular environment around the prostate gland, which is a major cancer risk factor. On the other hand, lack of sexual activity in adults also may increase the risk of prostate cancer by creating persistent poor blood flow in the tissues of the prostate gland.[3] It appears that a natural lifestyle including healthy and moderate sexual activity may protect against prostate cancer.[3,58]

Another risk factor for prostate cancer may be the Western diet that includes high consumption of acid-forming foods such as processed meats, dairy products, saturated animal fats, chocolate, and alcoholic beverages, which may cause chronic low-grade acidosis around the prostate gland, aggravated during ejaculation, increasing the risk of prostate cancer.[3] In particular, drinking too much milk in adults is a major risk factor for prostate cancer, and several studies have shown that chronic or high consumption of cow's milk, whole milk, and low-fat milk may increase the risk of invasive prostate cancer in men. Moreover, the risk of cancer recurrence after diagnosis and treatment of prostate cancer is higher in men who regularly consume milk.[60-62]

In addition to the effect of sexual lifestyle and acidogenic dietary habits, other risk factors of prostate cancer include smoking, alcohol abuse, and exposure to environmental carcinogens and chemicals.[3] For gay and bisexual men in sexual relationships with other men, there are no definitive studies precisely comparing their risk and incidence rate of prostate cancer compared to heterosexual men in a healthy relationship,[63] but compared to heterosexual population, gay and bisexual men are at higher risk for certain types of cancer and cancer-related viral infections, such as anal cancer that is much more common in gay and bisexual men, especially if they are infected with high-risk types of HPV.[64]

Figure 5 shows the worldwide map of age-standardized cancer incidence rates for prostate cancer, in men, all ages.[13] In South Asian countries such as Bhutan, India, Bangladesh, and Pakistan, as well as in Arabian countries such as Saudi Arabia, where plant foods such as beans, whole grains, vegetables, and fruits such as dates or mangoes are generally included in the diet, as well as traditional lifestyle rules are normally followed
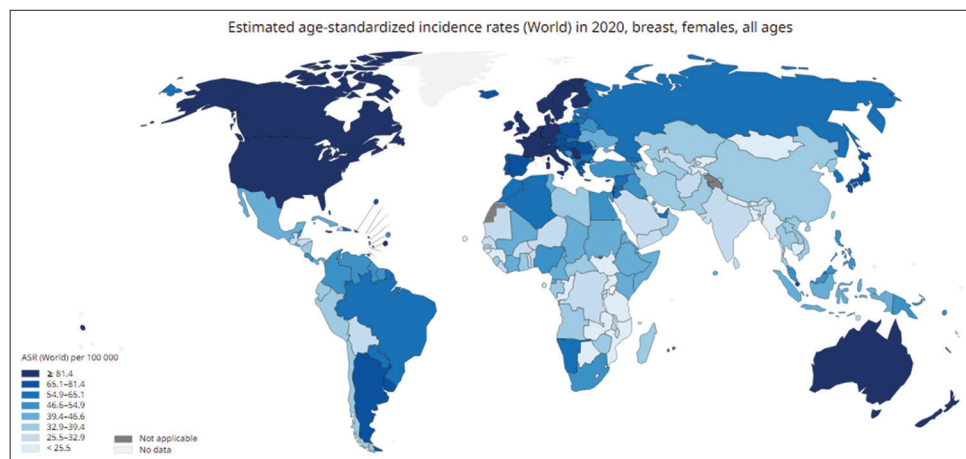

Figure 4: Age-standardized cancer incidence rate, breast cancer, women, all ages (International Agency for Research on Cancer, 2020). ASR: Age-standardized rate
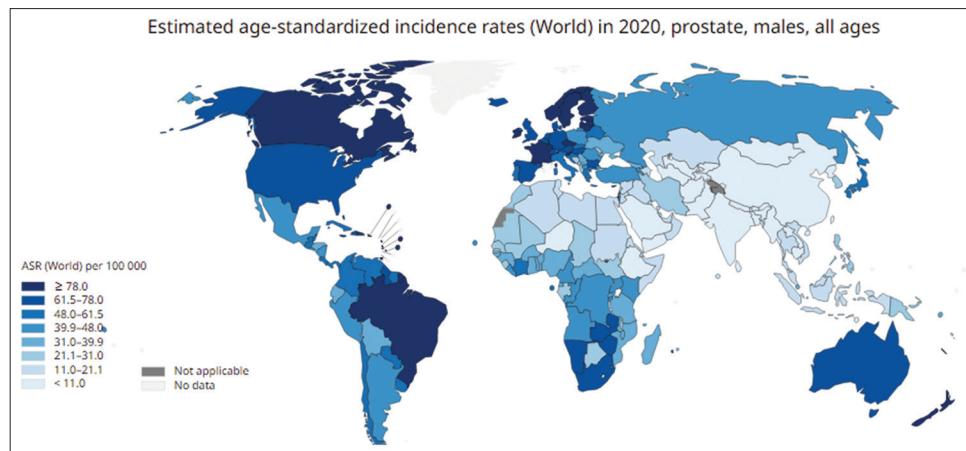
Figure 5: Age-standardized cancer incidence rate, prostate cancer, men, all ages (International Agency for Research on Cancer, 2020). ASR: Age-standardized rate

including regular sex through marriage, ASR of prostate cancer incidence[13] is significantly lower (on average, 5–10 times less) than in Western countries such as in Scandinavia where people often have an unhealthy sexual lifestyle and an acid-forming diet including high intake of dairy products, red meat, and drinking alcohol.[3]

In Sweden, where consumption of dairy products and milk is high (a possible dietary risk factor for prostate cancer), as well as access to pornographic websites is not banned with almost no censorship of sexual content on the Internet,[65] and it has been found that one in three men masturbates several times a week[66] (a possible lifestyle risk factor for prostate cancer), ASR of prostate cancer incidence is one of the highest in the world. Prostate cancer incidence is also relatively high in southern African countries such as Zimbabwe, Zambia, South Africa, and Namibia,[13] possibly due to the unhealthy sexual lifestyle and high-risk sexual behaviors, which have also led to a relatively high rate of infections caused by sexually transmitted diseases among them.[67]

Stomach cancer

One of the main risk factors for stomach cancer is the frequent consumption of foods preserved by salt, such as pickled vegetables and salted fish, which can gradually damage the stomach lining.[3,68] Infection with *Helicobacter pylori* in case of stomach ulcers or stomach injuries also increases the risk of stomach cancer.[69] *H. pylori* is normally harmless, and most people may asymptomatically have it in their stomach, but in case of a damaged stomach lining, it may develop severe gastric diseases and stomach cancer.[3,68,69] Even Saudi Arabia and Nigeria, despite their very high prevalence of *H. pylori*, have one of the lowest incidences of stomach cancer in the world.[13,70] Other stomach cancer risk factors include alcohol, a frequent acidogenic diet and excessive consumption of red meats, and food microbial level associated with storage method that has an influence on the carcinogens that might be produced by the food, and also concentration of nitrate and nitrite as additives in processed foods and meats.[6,71,72]

Figure 6 shows the worldwide map of age-standardized cancer incidence rate for stomach cancer, both sexes, all ages.[13] In countries such as Japan, Korea, Belarus, Bhutan, and Iran, the incidence rate of stomach cancer is considerably higher,[13] where salted preserved foods or pickled vegetables are often consumed as a side dish.[73,74] However, in countries such as the USA, Canada, and Australia, the incidence rate of stomach cancer is significantly lower,[13] where salt preservation is not very common anymore and it has been mostly replaced by refrigeration.[75]

Skin cancer

Skin cancer, the abnormal growth of skin cells, may be primarily due to exposure to cosmic rays and/or ultraviolet (UV) rays, which are more harmful at higher latitudes (above 37° north of the earth's equatorial plane, such as Scandinavian countries), as well as where significant depletion of the ozone layer has occurred (particularly around Australia and New Zealand).[3]

Skin cancers may also be associated with development of acidic hypoxic regions in the skin, as human skin is slightly acidic to act as a barrier to bacteria and other potential contaminants and also slightly hypoxic and prone to oxygen tension. Hence, an acidogenic diet[76] may increase the risk of skin cancer associated with diet-induced acidosis, especially when the sun exposure is intense, or in case of a reduced blood flow to the skin in response to cold temperatures, or direct exposure of the skin to cold winds.[3,77-79]

Skin color may be an important genetically related risk factor for skin cancer, including melanoma. Skin cancer affects people of all colors; however, skin cancers are less common in people with naturally darker skin than in Caucasians and people with white skin, because darker skin has a higher melanin content that provides better protection against harmful UV rays. Hence, UV radiation, the most important predisposing factor for skin cancer in Caucasians, plays a lesser role in people of color.[80]

Certain medications are also associated with an increased risk of skin cancer. For example, according to studies, men who take Viagra may be at a significantly higher risk of

developing skin cancer, especially melanoma, a deadly type of skin cancer, because Viagra and similar drugs may suppress natural cancer-fighting factors and affect the body's ability to fight skin cancer, making melanoma and other forms of cancer more aggressive.[81-83]

Figure 7 shows the worldwide map of age-standardized cancer incidence rates for skin cancer, nonmelanoma, and melanoma of skin, both sexes, all ages.[13] As can be seen, skin cancer is less common in regions with a latitude <37° north of the earth's equatorial plane (such as Arabia and South Asia), particularly where people generally use protective clothing in their lifestyle, as well as normally have sufficient intake of fruits and other plant-based foods in their diet. However, the risk of developing skin cancer, especially in white people, is higher where exposure to harmful cosmic rays and UV radiation is significant, as well as in high-latitude cold locations, or in locations with ozone depletion. This risk is increased by having a Western lifestyle that includes following an acidic diet, as well as regularly using sunscreen instead of covering the body with long sleeves and a hat.[3]

Cervical cancer

Cervical cancer is due to the growth of abnormal cells in the lining of the cervix, the lower part of the uterus that connects to the vagina. Figure 8 shows the worldwide map of age-standardized cancer incidence rates for cervical cancer, females, all ages.[13] The incidence of cervical cancer in some African countries such as Zimbabwe and Tanzania is significantly higher than in Western countries such as Canada and Australia,[3] unrelated to life expectancy levels, but probably associated with unsafe sexual contacts and prevalence of HPV-related infections that is a major risk factor for cervical cancer.[84,85]

Cancer risk associated with immigration

The incidence rate of certain cancers in immigrants may be more similar to their place of immigration than to their country of origin.[3] For example, Japanese women who have immigrated to the United States have a significantly lower incidence of stomach cancer and a significantly increased incidence of breast cancer compared to Japanese women in Japan.[86] Similarly, the incidence of breast cancer is
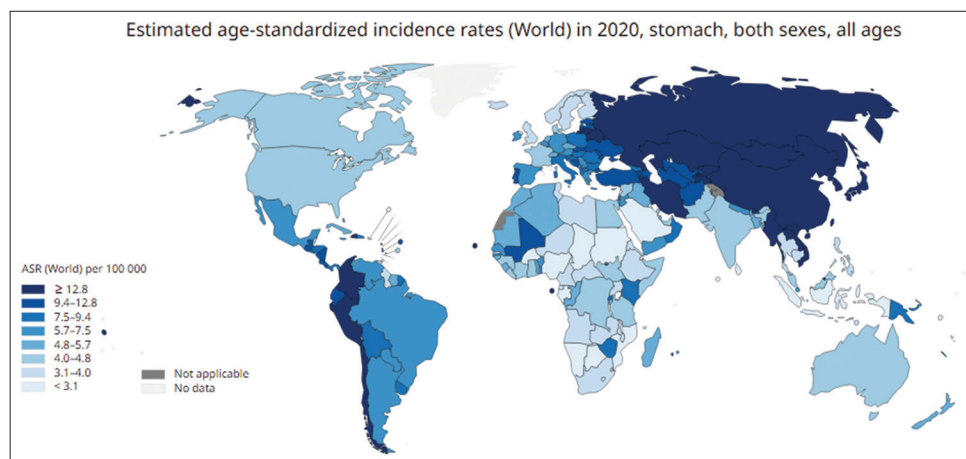

Figure 6: Age-standardized cancer incidence rate, stomach cancer, both sexes, all ages (International Agency for Research on Cancer, 2020). ASR: Age-standardized rate
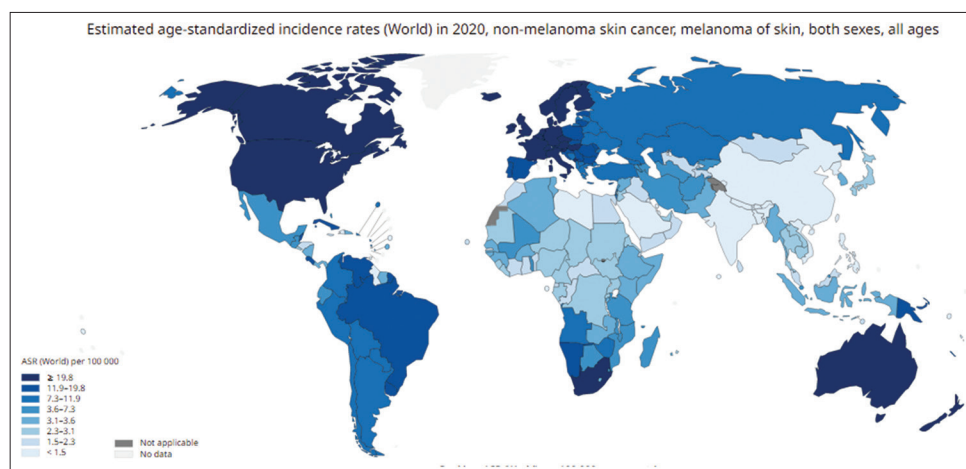

Figure 7: Age standardized incidence rate, melanoma and nonmelanoma skin cancers, both sexes, all ages (International Agency for Research on Cancer, 2020). ASR: Age standardized rate
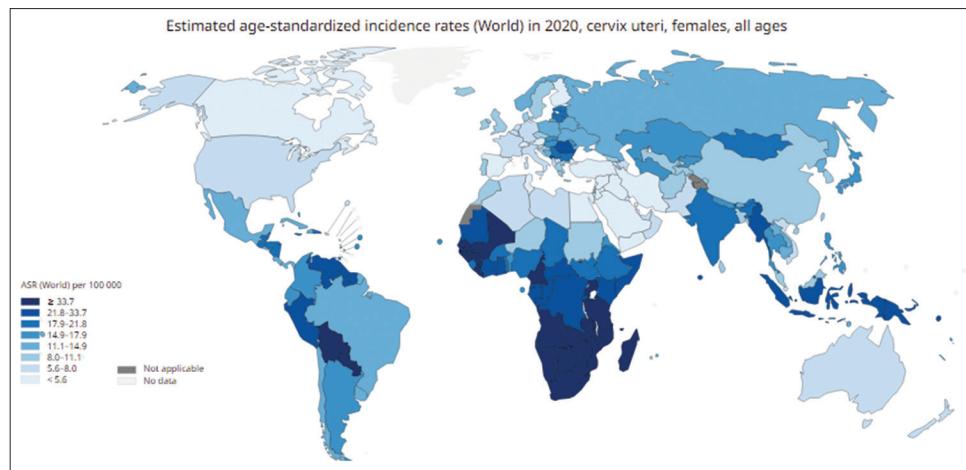
Figure 8: Age-standardized incidence rate, cervical cancer, females, all ages (International Agency for Research on Cancer, 2020). ASR: Age-standardized rate

significantly higher among Chinese women living in the United States than among Chinese women in Asia.[87] IARC cancer statistics data for China, Japan, and the United States also show that the age-standardized breast cancer incidence rate is significantly higher in the United States, but the incidence rate of stomach cancer is significantly higher in Japan and China.[3]

Moreover, a study of Iranian immigrants to Canada found that cancer rates among Iranian immigrant women living permanently in Canada were increased compared to Iranian women in Iran, approaching that of the Canadian general population. For Iranian immigrant women, the incidence of breast cancer has increased 4 times and colorectal cancer has increased 2 times compared to Iranian women in Iran, while a significant decrease in the incidence of stomach and esophageal cancer has been observed in Iranian immigrants. IARC cancer statistical data for Iran and Canada also show that the incidence of breast cancer and colon cancer is significantly higher in Canada (on average, about 2 times), but the incidence of stomach cancer is significantly higher in Iran (on average, about 4 times).[88]

Comparison of data from different sources for age-standardized cancer incidence rates in immigrants confirms the important role of environmental and lifestyle factors in cancer risk rather than the role of genes or life expectancy alone.

CONCLUSION

Global trends in cancer incidence for each type of cancer are significantly related to some specific dietary, lifestyle, and environmental factors rather than just the role of genes or life expectancy being determinants.

Adhering to a proper diet and a healthy lifestyle, as well as reducing exposure to carcinogens, the details of which are different for each type of cancer, may be effective in preventing and controlling cancers.

A healthy diet rich in whole fruits, fresh vegetables, whole grains, legumes, and nuts that have alkalizing effects on the human body (but not vitamin/mineral supplements, alkaline

water, or baking soda), as well as regular and "appropriate" consumption of anticancer foods such as raw garlic, raw almonds, and dates, may be associated with a reduced risk of cancer. Conversely, high consumption of acid-forming products such as processed red meat, commercial dairy products, and caffeinated or alcoholic beverages may be significantly associated with some cancers.

The incidence of certain cancers in immigrants may be more similar to their place of immigration than their country of origin.

Conflicts of interest

There are no conflicts of interest.

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