

It's been estimated that if people followed all the current recommendations for cancer prevention, the total mortality from cancer could decrease by 50 percent."

Cancer is multifactorial—that is, it usually results from a combination of causes. These include genetic predisposition, increased risks due to lifestyle, such as smoking, diet and exercise, and exposure to cancer-causing agents.

"Cancer prevention requires a systematic approach that addresses each of the factors that increases the risk, and also takes into account those factors which may be protective, such as a healthy diet and screening tests," says Dr. Shike, who directs the Cancer Prevention and Wellness Program at New York's Memorial Sloan-Kettering Cancer Center.

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What Causes Cancer?

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Understanding the various causes of cancer has been an ongoing challenge. For instance, getting an X-ray was once considered completely safe. Today scientists know that prolonged exposure to the type of radiation in X-rays can lead to cancer.

Cancer develops from changes in the DNA, or genetic material, of the body's cells, causing them to grow and reproduce uncontrollably. Scientists believe four factors can promote these cellular changes: environment, diet, heredity and lifestyle.

Environment

Ultraviolet light or solar radiation is the leading cause of skin cancer. The most common skin cancers are non-melanomas, which spread slowly and, if detected in time, are likely curable. Excessive sun exposure is also associated with melanoma, a serious form of skin cancer, which can spread rapidly to other body sites.

Of all skin color types, fair-skin people are most sensitive to skin cancers, but dark-skin people, too, should take these precautions:

- limit amount of sun exposure, especially between 10 a.m. and 3 p.m.
- wear sunscreen
- wear protective clothing

Radiation such as the kind in X-rays, nuclear power plants, and nuclear weapons also can cause cancer. The risk of getting cancer depends on how much exposure an individual gets. The average radiation dose in a single X-ray is low, so the risk is small. However, because effects of radiation can accumulate over time, people should avoid unnecessary exposures.

We have launched some cancer-causing chemicals into the environment through air pollution. These cancer-causing chemicals include benzene and vinyl chloride, which some factories discharge into streams, rivers and other bodies of water. Though the amounts are small in human terms, they become concentrated in fish and can cause cancer in them. When people are in areas

of high industrial pollution, water purification is advised. Do not eat fish caught in polluted waters, since the fish might also contain large amounts of the chemicals.

Some people are exposed to carcinogens at work. The first link between occupation and cancer was noted in 18th-century England where physicians saw high rates of cancer in men who were chimney sweeps in their youth. The physicians determined exposure to soot in the chimneys had caused the cancer. Once the sweeps wore protective clothing and routinely cleaned the soot off their bodies, the cancer rate dropped.

Asbestos is another occupational carcinogen. The association between lung cancer and asbestos became clear in the 1950s; 10 years later, regulations limiting asbestos in the workplace were enacted. Occupational exposure might be related to up to 5 percent of cancer deaths.

Diet

Foods such as hot dogs, bacon, ham and pickled meats and fish have preservatives called nitrites. Nitrites convert to another chemical called nitrosamines, which are known cancer-causing agents. Researchers have linked an increased risk of stomach cancer to overconsumption of smoked or cured foods. Eating such foods only occasionally is not harmful.

Researchers have linked a diet high in calories and fat to an increase in cancer. People in the United States consume more fat than in other countries, resulting in a higher incidence of breast cancer and colon cancer. Consuming large amounts of refined sugars with a high-fat diet increases the risk of developing colon cancer. Cutting back on fatty foods or using low-fat substitutes lowers the risk of contracting these kinds of cancer.

Fruits, vegetables and whole grain breads and cereals are low in fats, high in nutrients, and contain ingredients that may reduce cancer risk. Carrots are high in beta-carotene, which metabolizes to form vitamin A. Diets rich in beta-carotene have reduced the occurrence of some cancers, including lung, esophagus, stomach, bladder and breast. Vitamins C and E, found in lettuce and salad greens, help reduce cancer risks by decreasing the formation of the carcinogenic nitrosamines.

Fruits, vegetables and grains might protect against colon and rectal cancer because they contain much dietary fiber. Fiber is indigestible plant material that helps clean out the large intestine, preventing accumulation of fecal material that might promote cancerous cell growth.

Heredity

Although people cannot inherit most cancers, they can pass down a susceptibility to developing cancer. Careful cancer screening, cancer tests and preventive measures are advised if the family history includes cancer.

Lifestyle

Cigarette smoking is the major cause of cancer in the United States and leads to almost one-third of cancer deaths in the United States. Researchers directly link smoking to cancer of the lung, mouth, throat, bladder, kidney and pancreas. Tobacco contains many carcinogens that promote cell mutation and growth. Even breathing secondhand smoke may be associated with an increase in lung cancer.

Too much alcohol can lead to cirrhosis, a liver disease resulting from chronic liver tissue damage. Cirrhosis can lead to liver cancer. Researchers also relate excess alcohol consumption to mouth and throat cancers. Excessive drinking combined with smoking increases this incidence.

People who exercise have lower death rates from cancer than do people who do not exercise. Exercise reduces a person's fat ratio and improves immune system function. Some studies show that exercise may prevent malignant cells from spreading.

AMERICAN CANCER SOCIETY WEBSITE

BASIC FACTS

What Is Cancer?

Cancer is a group of diseases characterized by uncontrolled growth and spread of abnormal cells. If the spread is not controlled, it can result in death. Cancer is caused by both external (chemicals, radiation, and viruses) and internal (hormones, immune conditions, and inherited mutations) factors. Causal factors may act together or in sequence to initiate or promote carcinogenesis. Ten or more years often pass between exposures or mutations and detectable cancer. Cancer is treated by surgery, radiation, chemotherapy, hormones, and immunotherapy.

Can Cancer Be Prevented?

All cancers caused by cigarette smoking and heavy use of alcohol could be prevented completely. The ACS estimates that in 2000 about 171,000 cancer deaths are expected to be caused by tobacco use, and about 19,000 cancer deaths may be related to excessive alcohol use, frequently in combination with tobacco use.

Scientific evidence suggests that about one-third of the 552,200 cancer deaths expected to occur in 2000 are expected to be related to nutrition and other lifestyle factors and could also be prevented. Certain cancers are related to viral infections—for example, hepatitis B virus (HBV), human papillomavirus (HPV), human immunodeficiency virus (HIV), human T-cell leukemia/lymphoma virus-I (HTLV-I), and others—and could be prevented through behavioral changes. In addition, many of the 1.3 million skin cancers that are expected to be diagnosed in 2000 could have been prevented by protection from the sun's rays.

Regular screening examinations by a health care professional can result in the detection of cancers of the breast, colon, rectum, cervix, prostate, testis, oral cavity, and skin at earlier stages, when treatment is more likely to be successful. Self examinations for cancers of the breast and skin may also result in detection of tumors at earlier stages. The screening-accessible cancers listed above account for about half of all new cancer cases.

The 5-year relative survival rate for these cancers is about 80%. If all Americans participated in regular cancer screenings, this rate could increase to 95%.

Who Is at Risk of Developing Cancer?

Anyone. Since the occurrence of cancer increases as individuals age, most cases affect adults middle-aged or older. Nearly 80% of all cancers are diagnosed at ages 55 and older. Cancer researchers use the word risk in different ways. Lifetime risk refers to the probability that an individual, over the course of a lifetime, will develop cancer or die from it. In the US, men have a 1 in 2 lifetime risk of developing cancer, and for women the risk is 1 in 3.

Relative risk is a measure of the strength of the relationship between risk factors and the particular cancer. It compares the risk of developing cancer in persons with a certain exposure or trait to the risk in persons who do not have this exposure or trait. For example, smokers have a 10-fold relative risk of developing lung cancer compared with nonsmokers. This means that smokers are about 10 times more likely to develop lung cancer (or have a 900% increased risk) than nonsmokers. Most relative risks are not this large. For example, women who have a first-degree (mother, sister, or daughter) family history of breast cancer have about a 2-fold increased risk of developing breast cancer compared with women who do not have a family history. This means that women with a first-degree family history are about two times or 100% more likely to develop breast cancer than women who do not have a family history of the disease.

All cancers involve the malfunction of genes that control cell growth and division. About 5% to 10% of cancers are clearly hereditary, in that an inherited faulty gene predisposes the person to a very high risk of particular cancers. The remainder of cancers are not hereditary, but result from damage to genes (mutations) that occurs throughout our lifetime, either due to internal factors, such as hormones or the digestion of nutrients within cells, or external factors, such as chemicals and sunlight.

How Many People Alive Today Have Ever Had Cancer?

The National Cancer Institute estimates that approximately 8.4 million Americans alive today have a history of cancer. Some of these individuals can be considered cured, while others still have evidence of cancer and may be undergoing treatment.

How Many New Cases Are Expected to Occur This Year?

About 1,220,100 new cancer cases are expected to be diagnosed in 2000. Since 1990, approximately 13 million new cancer cases have been diagnosed. These estimates do not include carcinoma in situ

(noninvasive cancer) of any site except urinary bladder, and do not include basal and squamous cell skin cancers. Approximately 1.3 million cases of basal and squamous cell skin cancers are expected to be diagnosed this year.

How Many People Are Expected to Die of Cancer This Year?

This year about 552,200 Americans are expected to die of cancer—more than 1,500 people a day. Cancer is the second leading cause of death in the US, exceeded only by heart disease. In the US, 1 of every 4 deaths is from cancer.

What Percentage of People Survive Cancer?

Five-year relative survival rates are commonly used to monitor progress in the early detection and treatment of cancer. The relative survival rate is the survival rate observed for a group of cancer patients compared to the survival rate for persons in the general population who are similar to the patient group with respect to age, gender, race, and calendar year of observation. Relative survival adjusts for normal life expectancy (factors such as dying of heart disease, accidents, and diseases of old age). Five-year relative survival rates include persons who are living five years after diagnosis, whether in remission, disease-free, or under treatment. While these rates provide some indication about the average survival experience of cancer patients in a given population, they are less informative when used to predict individual prognosis and should be interpreted with caution. First, 5-year relative survival rates are based on patients who were diagnosed and treated at least eight years ago and do not reflect recent advances in treatment. Second, information about detection methods, treatment protocols, additional illnesses, and behaviors that influence survival are not taken into account in the estimation of survival rates. The 5-year relative survival rate for all cancers combined is 59%.

How is Cancer Staged?

Staging is the process of describing the extent of the disease or the spread of cancer from the site of origin. Staging is essential in determining the choice of therapy and assessing prognosis. A cancer's stage is based on information about the primary tumor's size and location in the body and whether or not it has spread to other areas of the body. A number of different staging systems are currently being used to classify tumors. The TNM staging system assesses tumors in three ways: extent of the primary tumor (T), absence or presence of regional lymph node involvement (N), and absence or presence of distant metastases (M). Once the T, N, and M are determined, a "stage" of I, II, III, or IV is assigned, with stage I being early stage and IV being advanced stage. Summary staging (in situ, local, regional, and distant) has been useful for descriptive and statistical analysis of tumor registry data. If cancer cells are present only in the layer of cells they developed in and they have not spread to other parts of that organ or elsewhere in the body, then the stage is in situ. If cancer cells have spread beyond the original layer of tissue, then the cancer is considered invasive. Please see Five-Year Relative Survival Rates* by Stage at Diagnosis, 1989-1995 for a description of the other summary stage categories.

What Are the Costs of Cancer?

The National Institutes of Health estimate overall annual costs for cancer at \$107 billion; \$37 billion for direct medical costs (total of all health expenditures), \$11 billion for indirect morbidity costs (cost of lost productivity due to illness), and \$59 billion for indirect mortality costs (cost of lost productivity due to premature death). Treatment of breast, lung, and prostate cancers account for over half of the direct medical costs. Insurance status and barriers to health care may affect the cost of treating cancer in this country. According to 1996 data, about 19% of Americans under age 65 have no health insurance, and about 26% of older persons have only Medicare coverage. During 1996, almost 18% of Americans reported not having a usual source of health care. Also, 12% of American families had members who experienced difficulty or delay in obtaining care or did not receive needed health care services.