Kronkosky Charitable Foundation

Research Brief

Cancer

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Cancer is a generic term that is used to describe over 100 different diseases. When the DNA of a cell becomes changed or damaged, mutations occur that affect normal cell growth resulting in uncontrollable cell division. Abnormal cell division oftentimes results in a mass of tissue called a tumor. When the tissue cells of the tumor remain in the same place where the cells originated and cell division simply enlarges the tumor, the condition is considered to be benign (not cancerous). Cancer occurs when the abnormally dividing cells migrate and invade other body cells. The condition is considered malignant because the migrating cells "take over" and the invaded cells die. Although tumors can be a classic symptom of cancer, not all tumors are cancerous and not all cancers form tumors (National Cancer Institute (NCI), 2021c).

Cancers are generally categorized according to type:

- **Carcinoma** - cancer that begins in the skin or in tissues that line or cover internal organs
- **Sarcoma** - cancer that begins in bone, cartilage, fat, muscle, blood vessels, lymph vessels, or other connective or supportive tissue
- **Leukemia** - cancer that starts in blood-forming tissue such as the bone marrow and causes large numbers of abnormal blood cells to be produced and enter the blood
- **Lymphoma and myeloma** - cancers that begin in the cells of the immune system
- **Central nervous system cancers** -cancers that begin in the tissues of the brain and spinal cord

(NCI, 2021c)

LEADING CANCERS IN THE U.S. AND TEXAS

Among the various cancers, research has concluded that lung and bronchus, colon and rectum, breast (female) and prostate account for nearly half of cancer diagnoses and deaths (American Cancer Society [ACS], 2021a).

The most recent statistical information reported to the Texas Department of State Health Services (DSHS) regarding statewide mortality rates related to cancer covers the years from 2014-2018. Based on this data DSHS projects a total of 46,353 fatalities due to cancer in Texas in 2021. DSHS believes that lung and bronchus cancer will continue to be the leading cause of mortality with an estimated 15,668 new cases and 10,602 deaths. Prostate and breast cancer are anticipated to have the highest incidence of new cases with approximately 15,459 and 19,177 new diagnoses respectively. DSHS predicts 3,325 women to pass away from breast cancer and 2,215 males from prostate cancer in 2021 (DSHS, 2021b).

However, the second highest number of expected deaths for the year will likely be caused by colon cancer; though only 8,411 people are estimated to be newly diagnosed with this form of cancer, 3,503 mortalities are predicted. Cancer of the esophagus appears to have the closest connection between new diagnoses and fatalities with 1,289 new cases predicted and 1,012 deaths expected for 2021 (DSHS, 2021b).

The following table lists the most recent five-year survival statistics for the state of Texas and the nation for reporting year 2018:

Five-Year Relative Survival		
	Texas %	**U.S. %**
All Sites	66.2	67.5
Breast (Female only)	89.4	90.1
Cervix uteri	68.1	66.8
Colon & Rectum	64.1	65.0
Corpus & Uterus, NOS	81.2	81.3
Kidney & Renal Pelvis	76.0	75.4
Leukemia	64.1	63.9
Liver and IH Bile Duct	19.3	19.4
Lung & Bronchus	20.5	20.5
Melanoma of the Skin	88.6	92.8
Myeloma	56.5	54.0
Non-Hodgkin Lymphoma	72.3	72.6
Oral Cavity & Pharynx	65.3	66.2
Ovary	50.5	48.5
Pancreas	13.0	9.9
Prostate	97.2	98.0
Stomach	32.9	32.1
Thyroid	98.3	98.2
Urinary Bladder	75.8	77.1
(DSHS, 2021a)		

Risk Factors

There is oftentimes no identifiable cause for cancer. Factors such as age (80% of all cancers are diagnosed in people aged 55 and older) (ACS, 2021a), tobacco use, sunlight (UV rays), certain chemicals and other substances, ionizing radiation, some viruses and bacteria, hormones, family history and poor diet can all play a role. Some risk factors can be avoided, but others, like age, cannot (NCI, 2021b). While some cancers are strongly hereditary (colorectal, breast, and prostate) it is now thought that it is the interplay between common gene variations and environmental risk factors/lifestyle that lead to the genetic damage that results in cancer. "Excluding non-melanoma skin cancer, at least 42% of newly diagnosed cancers in the US – about 797,000 cases in 2021 – are potentially avoidable, including the 19% of cancers caused by smoking and at least 18% caused by a combination of excess body weight, alcohol consumption, poor nutrition, and physical inactivity" (ACS, 2021a, p.1).

Some of the major risk factors that are strongly linked to an increased risk for specific cancers include:

- *Tobacco use* is linked to many cancers such as lung, kidney, bladder, oral cavity, esophageal, pancreatic, and stomach; it is thought that cigarette smoking causes about 30% of all cancer deaths in the U.S.
- *Infections* from certain viruses and bacteria are able to cause cancer
  - Human papillomavirus (HPV) is linked to cancers of the cervix, penis, vagina, anus, and oropharynx
  - Hepatitis B and C viruses are linked to liver cancer
  - Epstein-Barr virus is linked to Burkitt lymphoma
  - Helicobacter pylori is linked to gastric (stomach/esophageal) cancer
- *Ionizing radiation* causes leukemia and cancers of the thyroid, breast, lung, stomach, colon, esophagus, bladder, and ovaries and myeloma
- *Alcohol consumption* has been linked to increased risk of oral, esophageal, breast and colorectal cancers
- *Obesity* is linked to higher risk of postmenopausal breast cancer as well as colorectal, endometrial, esophageal, kidney and pancreatic cancers; It is not known if losing weight lowers the risk of cancers that have been linked to obesity.
- *Environmental* chemical exposure has been linked to lung cancer (air pollution, second hand smoke, and asbestos) and skin and bladder cancers (arsenic in drinking water)

(NCI, 2021b)

Prevention

Researchers estimate that up to two-thirds of all cancers can be prevented. The Mayo Clinic advocates some simple steps that everyone can take to prevent cancer:

- Eliminate tobacco use
- Eat healthy
- Stay active and maintain a healthy weight
- Protect yourself from the sun
- Get immunized (Hepatitis B and HPV)

- Avoid risky behaviors (HIV prevention)
- Get cancer screenings

(Mayo Clinic, 2021)

The first five goals of the Texas Cancer Plan are related to primary prevention and risk reduction of cancer through "promoting change in behavior, policy, environment, or other systems to prevent or reduce the risk of developing cancer" (Cancer Prevention & Research Institute of Texas [CPRIT], 2018, p.4). Those goals relate to the same lifestyle changes as listed above.

Treatment

There are a variety of treatment options available, depending on the type of cancer diagnosed. The basic treatments include:

- Chemotherapy – drug used to kill cancer cells, stop the cancer cell growth or to slow the growth of cancer cells, or kill cancer cells that have spread to other parts of the body
- Radiation therapy – injures or destroys cells in the area being treated by damaging their genetic material, making it difficult for these cells to continue to grow and divide, causing them to die
- Surgery – in most cases, the surgeon removes the tumor and some tissue around it which may help prevent the tumor from growing back – nearby lymph nodes may also be removed

(ACS, 2021b)

Treatment generally depends upon the spread of the cancer at the time of diagnosis. Localized cancers respond well to surgery and radiation, which are focused treatments aimed at removing and destroying cancer cells, respectively. Treatments are often used in conjunction with each other; for example, radiation used after surgery to help prevent cancer from returning, called adjuvant therapy, or radiation used before surgery to shrink the size of a tumor, called pre-operative therapy or neoadjuvant therapy (ACS, 2021c).

Chemotherapy is given either alone or in combination with other drugs and treatments that work together to destroy cancer cells. The primary advantage of chemotherapy is that it treats the entire body, not a localized area. Since cancer cells can spread from the primary site through blood or lymph vessels to secondary sites, localized treatments may not be thorough enough to cure the cancer that is diagnosed (ACS, 2021d).

Although chemo, radiation and surgery have been the traditional courses of treatment, newer treatment options such as targeted therapy (where drugs attack specific cancer cells), and immunotherapy (also called biological therapy, helps the immune system attack cancer cells), can be used to work with the chemo and radiation, or used as a primary source of treatment. Numerous other therapy options exist including: hormone therapy, hyperthermia (use of heat), stem cell transplant, and photodynamic therapy (uses photosensitizing drugs and light). Many more cancer treatments, such as gene therapy, are still in clinical trials and not yet available to everyone (Mayo Clinic, 2017; NCI, 2021a).

Cost of Cancer Treatment

One of the biggest expenses associated with cancer is the treatment itself. "The National Cancer Institute estimates that cancer-related direct medical costs in the US were $183 billion in 2015 and are projected to increase to $246 billion by 2030, a 34% increase based only on population growth and aging" (ACS, 2021a, p.9). In Texas, the 2020 direct medical costs and costs for morbidity and mortality losses were $44.7 billion.

Additionally, estimates for cancer cost to the Texas economy were $234.5 billion in reduced annual spending; $115.6 billion in output losses, and 1,125,833 jobs lost due to cancer treatment, morbidity, and mortality. The Texas government spent nearly $1.4 billion in health-related expenditure related to cancer treatments through the CHIP, Medicaid, Teacher Retirement and Employee Retirement systems in 2019 (CPRIT, 2020).

Insurance coverage helps cancer patients keep their cancer costs lower compared to uninsured cancer patients, but this doesn't completely address issues that arise when factoring in costs like out-of-pocket expenses, balance billing, or treatments that aren't covered by a patient's insurance (American Cancer Society Action Network [ACS

CAN], 2020, pp. 5-9). The out-of-pocket costs for cancer treatments for patients and their families in 2018 in the U.S. was $5.6 billion, and included surgical procedures, radiation treatments, and chemotherapy drugs (ACS CAN, 2020, p. 3).

Another factor making health care expensive is the cost of new cancer treatments. "Most agents launched between 2009 and 2014 cost more than $100,000 USD per year. More recently developed agents, such as CAR T-cell therapy, may cost up to almost $500,000 USD per year" (Leighl, et al., 2021). The new treatments typically drive up the cost of prescription drugs and health care becomes less accessible. It is believed that with the disparity in the health care system, those who cannot afford to pay for their care end up with higher medical costs, poorer outcomes, and could possibly face premature death.

Social and Emotional Impacts of Cancer

It is estimated that 70% of cancer survivors experience depression at some point in their treatment. Some may experience survivor guilt after surviving cancer, or find that friends, coworkers, and family treat them differently after being diagnosed with cancer. The fear of recurrence is also common, with milestone events in their cancer journeys potentially triggering these feelings of fear (University of Texas MD Anderson Cancer Center, 2021a).

In many cases the social aspect can be as daunting as the emotional. It is not uncommon for cancer survivors to experience amputations, disfigurement and loss of organs like the colon or bladder. How other people react to someone's illness is perhaps the biggest challenge faced by cancer survivors. Re-entering social and professional life can often be difficult. Many times worries of infection, fatigue from treatments, and anxiety about not being able to think clearly because of "chemobrain" or memory loss can make the transition from patient to ordinary person stressful (University of Texas MD Anderson Cancer Center, 2021b).

Survivorship

"Due to advances in early detection and treatment, today there are more cancer survivors, living longer after diagnosis, than ever before" (CPRIT, 2018, p.18). A recent study showed that rehabilitative referrals are endorsed through oncology guidelines, yet there is low utilization of rehabilitation services for those with cancer (Stout, et al., 2021). Providing "survivorship programs and services such as patient navigation, treatment and care plans, culturally and linguistically appropriate outreach and education, and effective symptom management" (CPRIT, 2018, p.18) is a critical component of the Texas Care Plan.

COVID-19

The COVID-19 pandemic has impacted cancer patients, cancer treatment, and cancer diagnosis in many ways. More recent studies showed that having cancer did not increase a cancer patient's odds at having more severe COVID-19 complications compared to those without cancer, but the risk factors associated with both COVID-19 and cancer are similar. The risk factors that can cause an increased risk of cancer, like smoking, obesity, and old age, are similar to those risk factors associated with severe disease and/or death from COVID-19 (ACS, 2021e).

The shortages of personal protective equipment, hospital personnel, hospital and intensive care unit beds, and ventilators has resulted in surgical oncologists being forced to triage and ration cancer surgery cases, deferring some surgeries for 3 months (Bartlett, et al., 2020). The Centers for Medicare & Medicaid Services classified screening as a low-priority service in 2020, and the American Society of Radiation Oncology issued guidance that recommends prioritizing radiation therapy for patients with fast-growing tumors (Richards, et al., 2020).

The pandemic resulted in widespread job losses, which cut access to employer-based health insurance for millions of Americans. "According to the US Bureau of Labor and Statistics, the unemployment rate rose from a 50-year low of 3.5% in February 2020 to 14.7% in April overall, 16.7% among Black individuals, and 18.9% among Hispanic individuals" (ACS, 2021e). Uninsured Americans are less likely to get cancer screening, more likely to be at an advanced stage at diagnosis, and have poorer

survival outcomes than insured patients (ACS CAN, 2020).

The Future

The future for research and prevention continues to broaden both on a national and state level. The Cancer Genome Atlas (TCGA), a project of the National Institutes of Health (NIH), "has helped establish the importance of cancer genomics, transformed our understanding of cancer, and even begun to change how the disease is treated in the clinic" (NIH, 2019).

In 2007, the Texas legislature approved the establishment of the Cancer Prevention and Research Institute of Texas (CPRIT, 2018). Through August 2018, CPRIT has "funded 1,024 academic research projects totaling $1.44 billion at 35 institutions and organizations across the state" (CPRIT, 2018, p.24).

Despite the decline of cancer incidence and mortality in recent years, it still remains a prevalent threat today. Researchers feel that with enough funding there is the possibility of a cure in the coming years. Until then, prevention awareness, early detection and effective treatment will be the only means of preventing or treating someone with cancer. Additionally, "developing the philosophical, ethical, and political framework necessary to balance the benefits of future advances with our ability to pay for them is one of the next great challenges for health policy" (Kaiser Family Foundation, 2012, p. 32).

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