

A New Era of Cancer Prevention

Addressing Social Determinants of Health

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Objectives



Summarize the impact of social determinants of health on cancer, including factors like healthcare access, genetic risk, smoking, environmental exposure, and diet.



Highlight the significance of specific risk factors in cancer prevention and management.



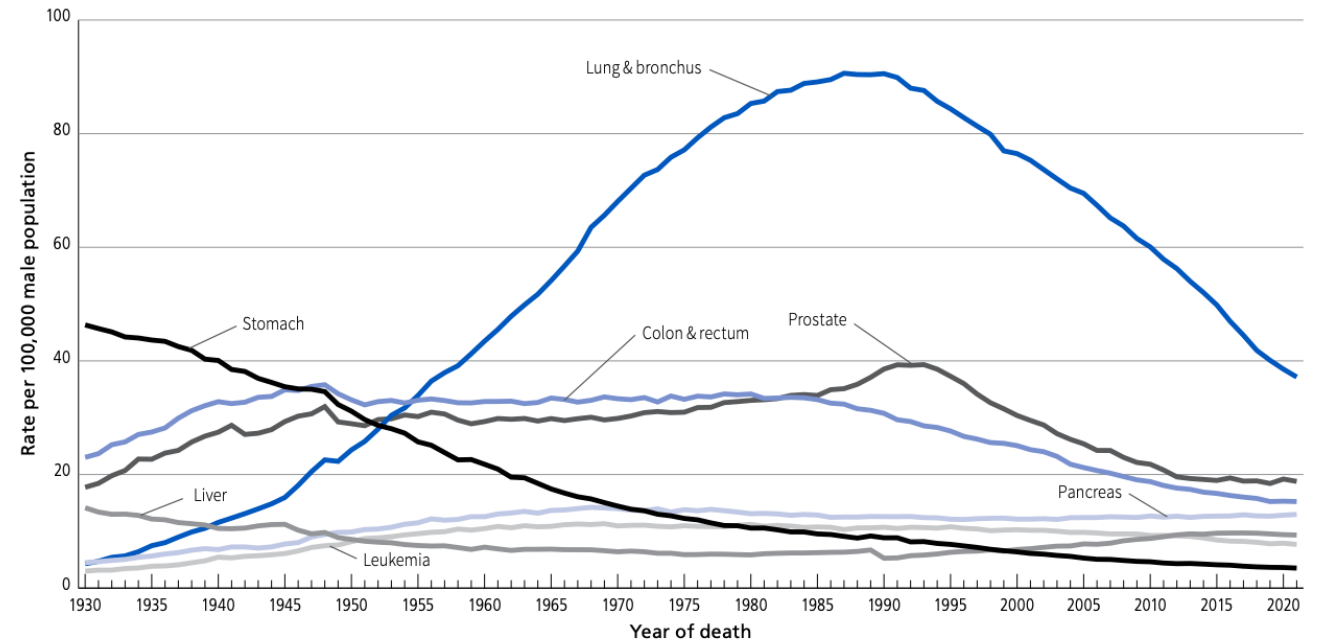
Identify new cancer screening tools and methods, emphasizing their role in early detection and intervention to improve health outcomes particularly those affected by social determinants of health.

A Snapshot of Cancer in America

Cancer Death Rates: Males (1930-2021)

The cancer death rate has dropped 1.6% per year (2012-2021) in the general population

Figure 1. Trends in Age-adjusted Cancer Death Rates by Site, Males, US, 1930-2021



Rates are age adjusted to the 2000 US standard and exclude deaths in Puerto Rico and other US territories. Note: Due to changes in ICD coding, numerator information differs from contemporary data for cancers of the liver, lung and bronchus, and colon and rectum.

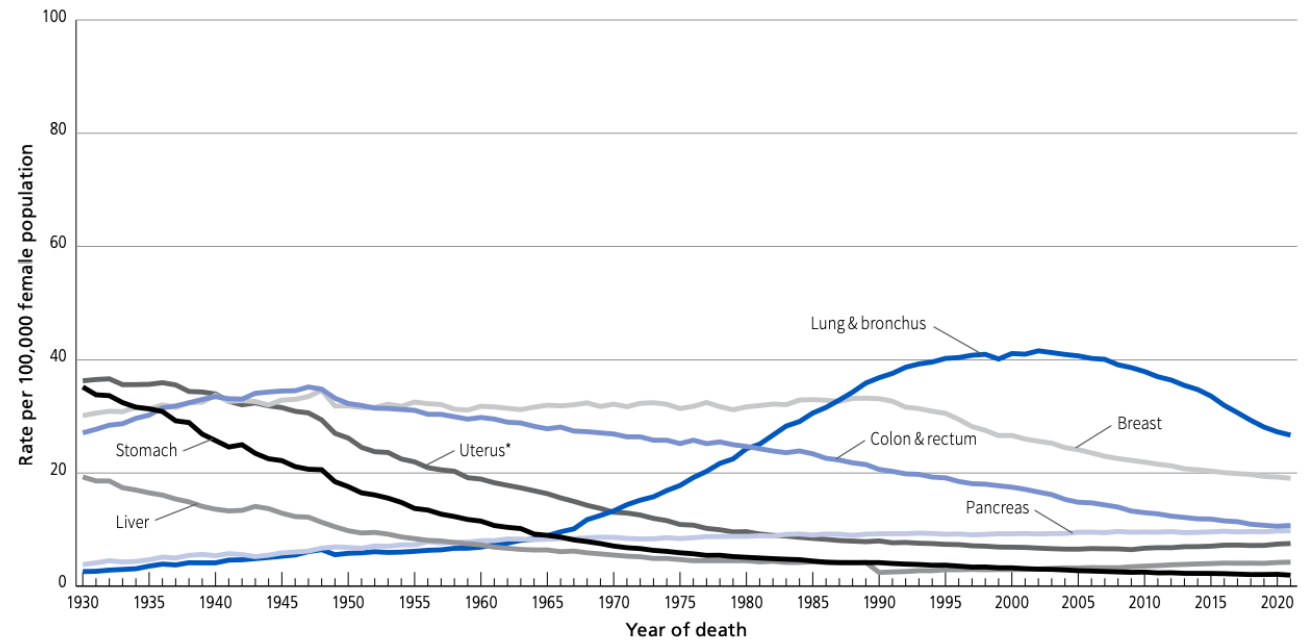
Source: US Mortality Volumes 1930 to 1959, US Mortality Data 1960 to 2021, National Center for Health Statistics, Centers for Disease Control and Prevention.

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Cancer Death Rates: Females (1930-2021)

The cancer death rate has dropped 1.6% per year (2012-2021) in the general population

Figure 2. Trends in Age-adjusted Cancer Death Rates by Site, Females, US, 1930-2021



Rates are age adjusted to the 2000 US standard population and exclude deaths in Puerto Rico and other US territories. *Uterus refers to uterine cervix and uterine corpus combined. Note: Due to changes in ICD coding, numerator information differs from contemporary data for cancers of the liver, lung and bronchus, colon and rectum, and uterus.

Source: US Mortality Volumes 1930 to 1959, US Mortality Data 1960 to 2020, National Center for Health Statistics, Centers for Disease Control and Prevention.

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Cancer Incidence Rates

In contrast to decreasing death rates, the likelihood of developing cancer has increased in women over the past decade, due to increases in breast, endometrial, and skin cancer (offsetting decreases in lung and colorectal cancers)

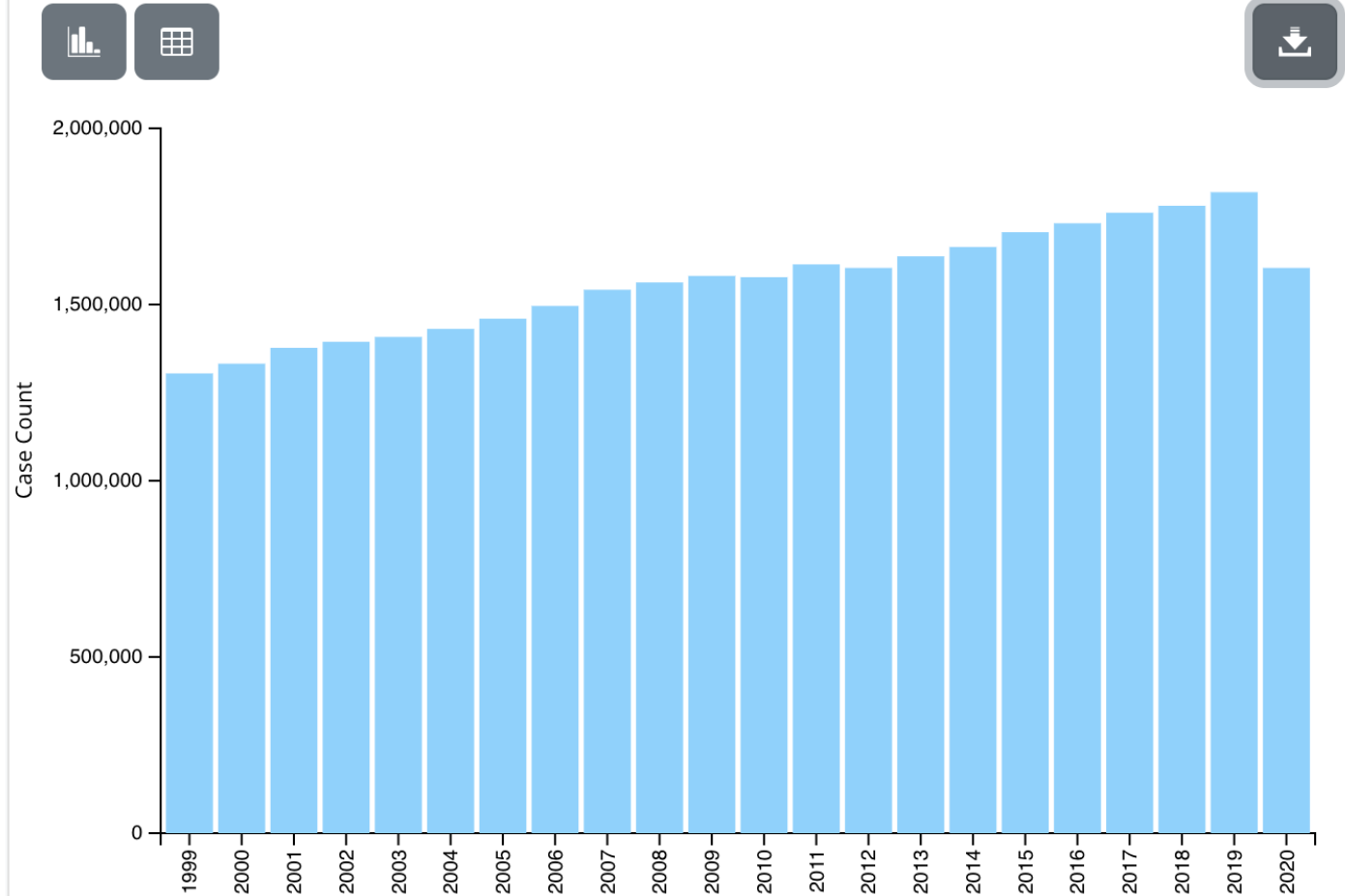
In men, incidence rates had stabilized until around 2013 largely driven by trends in prostate cancer, which has increased in recent years

Cancer Changes Over Time



Annual Number of New Cancers, 1999-2020

United States, All Types of Cancer, Male and Female, All Races and Ethnicities



Who Is at Risk of Developing Cancer?

Table 6. Probability (%) of Developing Invasive Cancer During Selected Age Intervals by Sex, US, 2017-2019*

Site	Sex	0-49	50-64	65-84	85+	Birth to death
All sites [†]	Male	3.5 (1 in 29)	11.8 (1 in 8)	31.9 (1 in 3)	19.1 (1 in 5)	41.6 (1 in 2)
	Female	5.9 (1 in 17)	10.8 (1 in 9)	24.3 (1 in 4)	14.4 (1 in 7)	39.6 (1 in 3)
Breast	Female	2.1 (1 in 48)	4.0 (1 in 25)	7.2 (1 in 14)	2.6 (1 in 38)	13.0 (1 in 8)
Colon & rectum	Male	0.4 (1 in 239)	1.2 (1 in 83)	2.7 (1 in 37)	1.8 (1 in 57)	4.3 (1 in 23)
	Female	0.4 (1 in 265)	0.9 (1 in 117)	2.2 (1 in 46)	1.7 (1 in 60)	3.9 (1 in 25)
Kidney & renal pelvis	Male	0.3 (1 in 384)	0.7 (1 in 142)	1.5 (1 in 67)	0.6 (1 in 178)	2.3 (1 in 43)
	Female	0.2 (1 in 603)	0.3 (1 in 287)	0.8 (1 in 126)	0.3 (1 in 303)	1.4 (1 in 73)
Leukemia	Male	0.3 (1 in 375)	0.3 (1 in 287)	1.2 (1 in 82)	0.9 (1 in 117)	1.9 (1 in 53)
	Female	0.2 (1 in 488)	0.2 (1 in 448)	0.7 (1 in 136)	0.5 (1 in 196)	1.3 (1 in 75)
Lung & bronchus	Male	0.1 (1 in 840)	1.2 (1 in 82)	5.1 (1 in 20)	2.7 (1 in 37)	6.3 (1 in 16)
	Female	0.1 (1 in 738)	1.1 (1 in 90)	4.3 (1 in 23)	1.9 (1 in 52)	5.9 (1 in 17)
Melanoma of the skin [‡]	Male	0.4 (1 in 243)	0.9 (1 in 116)	2.4 (1 in 42)	1.4 (1 in 73)	3.6 (1 in 28)
	Female	0.6 (1 in 160)	0.7 (1 in 153)	1.1 (1 in 92)	0.5 (1 in 188)	2.5 (1 in 41)
Non-Hodgkin lymphoma	Male	0.3 (1 in 395)	0.5 (1 in 196)	1.6 (1 in 63)	0.9 (1 in 105)	2.4 (1 in 42)
	Female	0.2 (1 in 528)	0.4 (1 in 264)	1.2 (1 in 86)	0.7 (1 in 153)	1.9 (1 in 52)
Prostate	Male	0.2 (1 in 449)	3.9 (1 in 26)	10.4 (1 in 10)	3.1 (1 in 32)	12.9 (1 in 8)
Thyroid	Male	0.2 (1 in 483)	0.2 (1 in 480)	0.3 (1 in 354)	0.1 (1 in 1429)	0.7 (1 in 153)
	Female	0.8 (1 in 124)	0.5 (1 in 200)	0.5 (1 in 217)	0.1 (1 in 1194)	1.7 (1 in 58)
Uterine cervix	Female	0.3 (1 in 337)	0.2 (1 in 554)	0.2 (1 in 564)	0.1 (1 in 1535)	0.7 (1 in 152)
Uterine corpus	Female	0.3 (1 in 303)	1.1 (1 in 91)	1.7 (1 in 58)	0.4 (1 in 239)	3.1 (1 in 32)

*For those who are free of cancer at the beginning of each age interval. †All sites excludes basal and squamous cell skin cancers and in situ cancers except urinary bladder. ‡Statistic is for non-Hispanic White individuals.

Source: DevCan: Probability of Developing or Dying of Cancer Software, Version 6.9.0. Statistical Research and Applications Branch, National Cancer Institute, 2023. surveillance.cancer.gov/devcan/.

Please note: The probability of developing cancer for additional sites, as well as the probability of cancer death, can be found in Supplemental Data at cancer.org/research/cancer-facts-statistics.html.

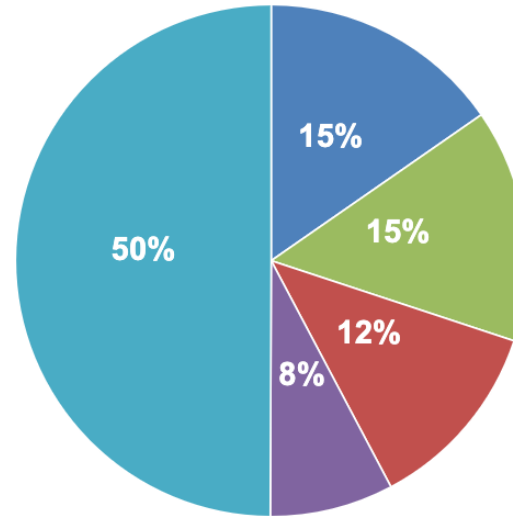
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- Incidence increases greatly with age
- 88% of people diagnosed with cancer in the US are 50+ years
- In the US, an estimated 42 out of 100 men and 40 out of 100 women will develop cancer during their lifetime

Most Common Cancers in the US

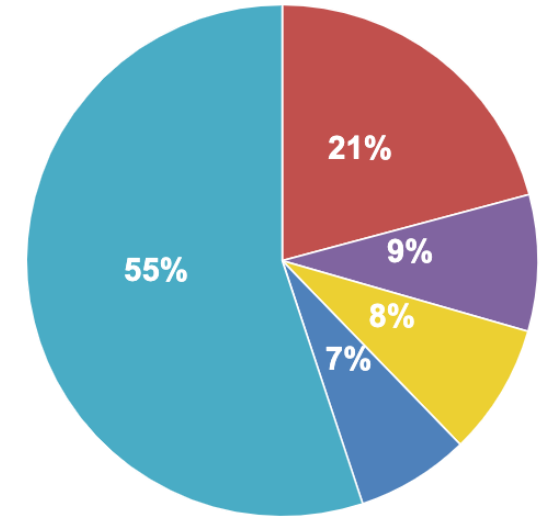
- Lung and bronchus, prostate, breast, and colorectal cancers account for approximately 50% of all newly diagnosed U.S. cancer cases.
- Lung and bronchus, breast, colorectal, and pancreatic cancers account for approximately 50% of all deaths.

New Cancer Cases, 2023



- Breast: 300,590 (15%)
- Prostate: 288,300 (15%)
- Lung and bronchus: 238,340 (12%)
- Colon and rectum: 153,020 (8%)
- Other: 978,060 (50%)

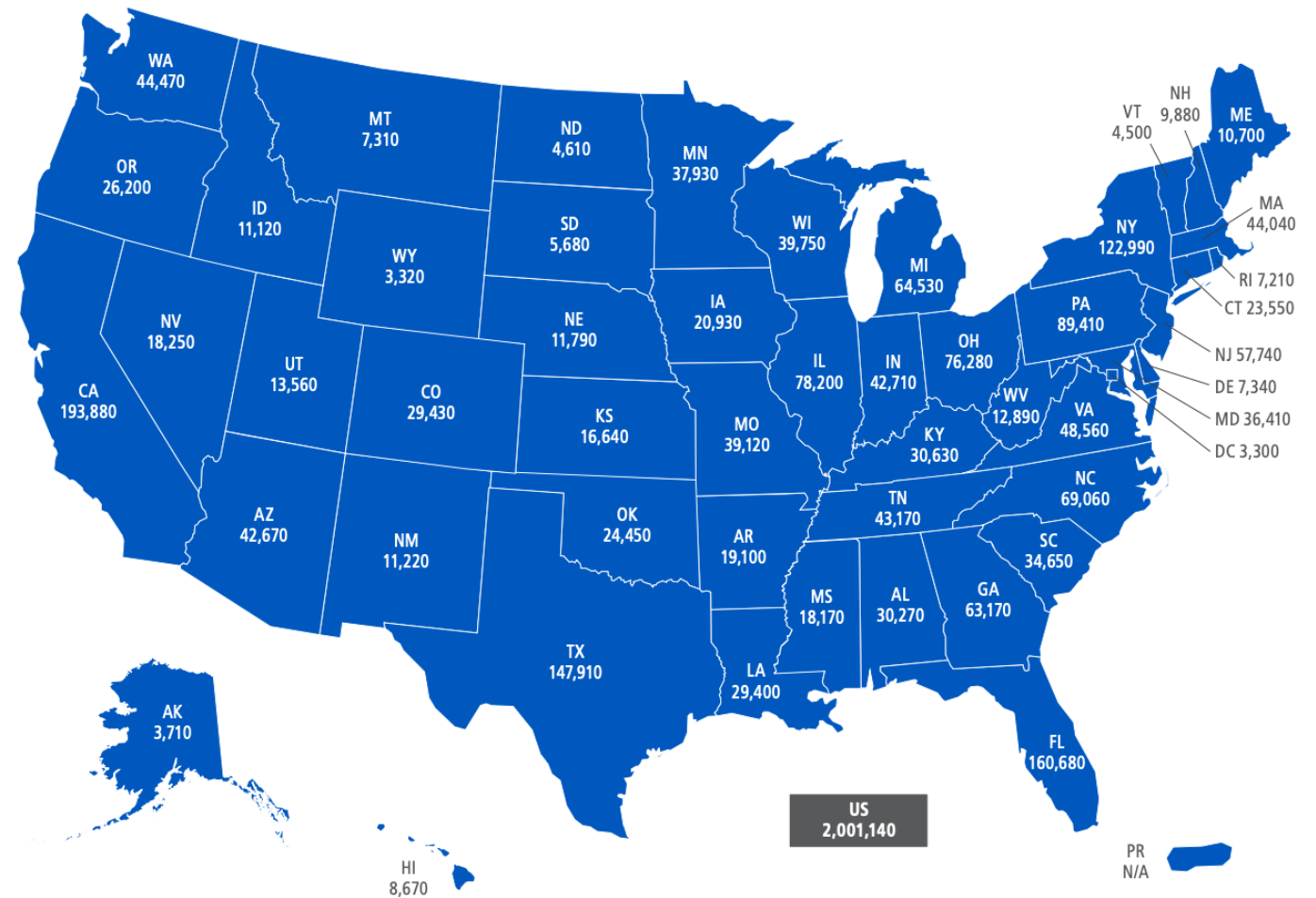
Cancer Deaths, 2023



- Lung and bronchus: 127,070 (21%)
- Colon and rectum: 52,550 (9%)
- Pancreas: 50,550 (8%)
- Breast: 43,700 (7%)
- Other: 335,950 (55%)

Estimated Cancer Cases in Nebraska (2024)

- Lung: 700
- Colon & rectum: 380
- Pancreas: 320
- Female breast: 270
- Prostate: 230
- Liver: 160
- Leukemia: 150
- Brain/nervous system: 140
- Non-Hodgkin lymphoma: 120
- Ovary: 70



Estimated number of new cancer cases for 2024, excluding basal cell and squamous cell skin cancers and in situ carcinoma except urinary bladder. Estimates are not available for Puerto Rico.

Note: Incidence counts are model-based projections and should be interpreted with caution. State estimates may not equal US total due to rounding.

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Financial Costs of Cancer

- The financial costs of cancer is a combination of direct costs (total health care expenditure) and indirect costs (lost earnings from work absenteeism)
- The National Cancer Institute estimates cancer-related costs in the US to be \$208.9B
- Cancer costs to patients are estimated around \$21.1B
 - \$16.2B direct costs and \$4.9B indirect costs



Cancer Health Inequities

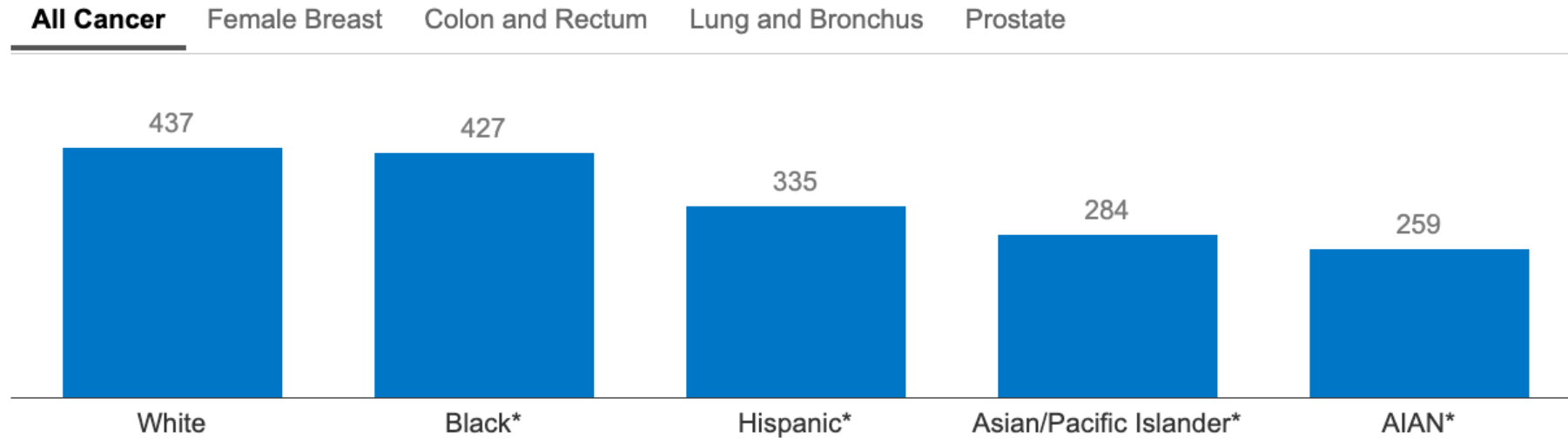


Patterns of cancer incidence by race and ethnicity vary across cancer types

- Female breast cancer
 - White people had the highest rate of new female breast cancers, followed by Black people. American Indian and Alaska Native people have half the cancer rate compared to White people.
 - Prostate cancer
 - Black people had the highest rate of new prostate cancers, with Asian and Pacific Islander, and AI/AN people substantially less likely to have a new prostate cancer case
 - Lung and bronchus cancer
 - Rates of new lung and bronchus cancers were similar for White and Black people
 - Colon and rectal cancer
 - Black people had the highest rate of new colon and rectal cancer, followed by White and Hispanic people.
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Figure 2

Age-Adjusted Rate of Cancer Incidence per 100,000 by Race/Ethnicity, 2018

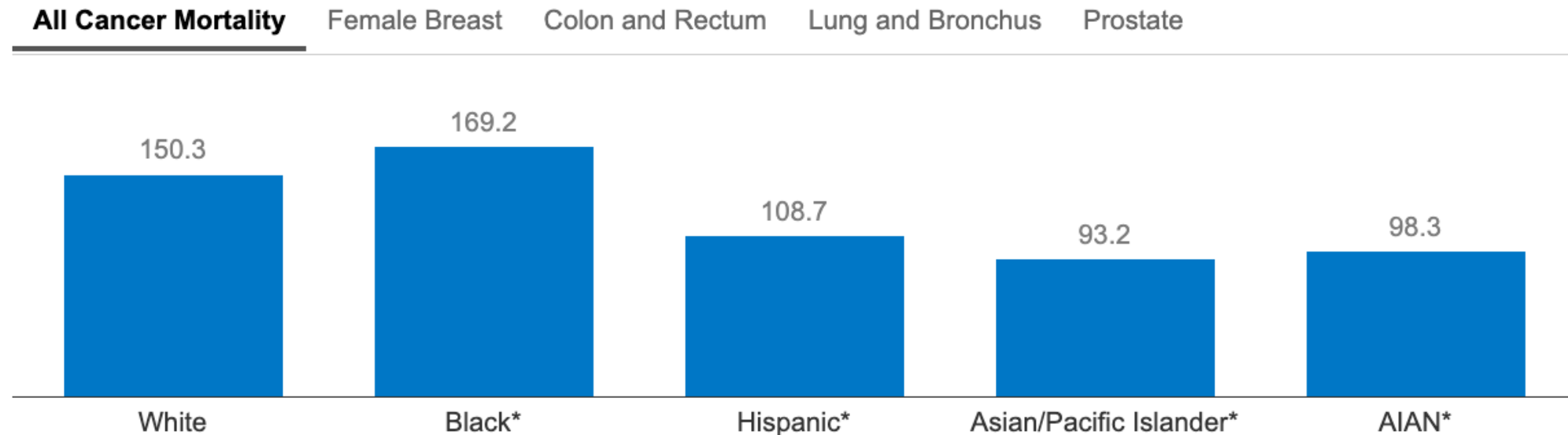


NOTE: * Indicates statistically significant difference from White people at the $p < 0.05$ level. AIAN refers to American Indian or Alaska Native. Data for Native Hawaiian or Other Pacific Islander could not be separated from Asian. Persons of Hispanic origin may be of any race; other groups may include individuals reporting Hispanic ethnicity. Data for groups other than White and Black should be interpreted with caution; see source technical notes for more information. Includes individuals of all ages.

SOURCE: U.S. Cancer Statistics Working Group. U.S. Cancer Statistics Data Visualizations Tool, based on 2020 submission data (1999-2018); U.S. Department of Health and Human Services, Centers for Disease Control and Prevention and National Cancer Institute; www.cdc.gov/cancer/dataviz, released in June 2021. • PNG

Figure 4

Age-Adjusted Rate of Cancer Deaths per 100,000 by Race/Ethnicity, 2018



NOTE: * Indicates statistically significant difference from White people at the $p < 0.05$ level. AIAN refers to American Indian and Alaska Native. Data for Native Hawaiian or Other Pacific Islander could not be separated from Asian. Persons of Hispanic origin may be of any race; other groups may include individuals reporting Hispanic ethnicity. Data for groups other than White and Black should be interpreted with caution; see source technical notes for more information. Includes individuals of all ages.

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Sexual Orientation and Mental Health Among Cancer Survivors

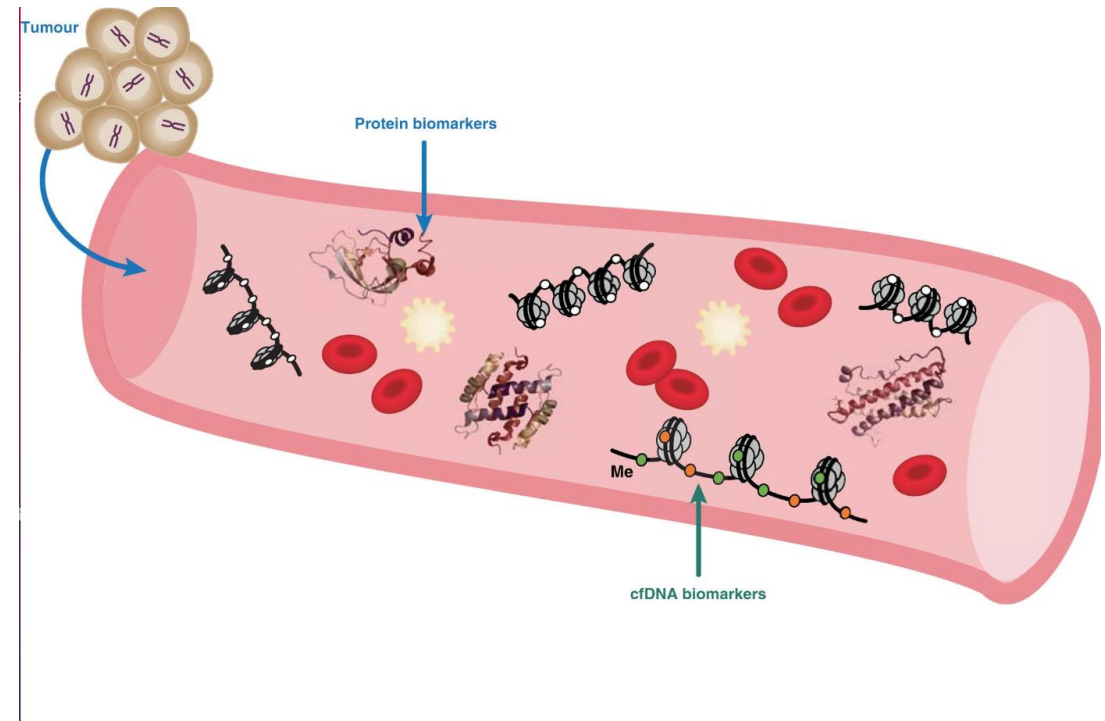
LGBTQA cancer survivors have 2 to 3 times greater odds of depression and poor mental health among White, Black, and Hispanic survivors

Among White women, LGBTQA individuals reported greater odds of fair or poor health, poor physical health, and poor activity

Cancer Mitigation & Innovation

Multi-Cancer Early Detection (MCED) Tests

- A noninvasive test that aims to determine whether and where in the body a person has early-stage cancer
- Scans for multiple cancers by detecting a shared cancer signals from a single blood sample
- If a cancer signal is detected, the test can often pinpoint its origin in the body
- Currently, there are around 20 tests in development
- Grail, one of the most well-known MCED tests, is already commercially available (\$900+)



Benefits of an MCED Test

- Early diagnosis enables timely treatment, leading to better survival rates and patient outcome
- Tests could allow for more target treatments
- Early detection could reduce the need for advance-stage treatments




Risks of Utilizing MCEDs

- Risk of false positives
- Existing concerns that early-stage tumors will not provide enough detectable DNA
- Any positive tests will require subsequent diagnostic evaluations
- Not approved yet by the FDA
- The accuracy of MCED tests is still being researched, and as the test targets multiple cancers the accuracy for each will likely be different

Might Have Cancer, Test Company Says

Grail, which makes a blood test for cancer, said a vendor's software issue caused inaccurate letters to be sent to about 400 customers last month.

 Share full article



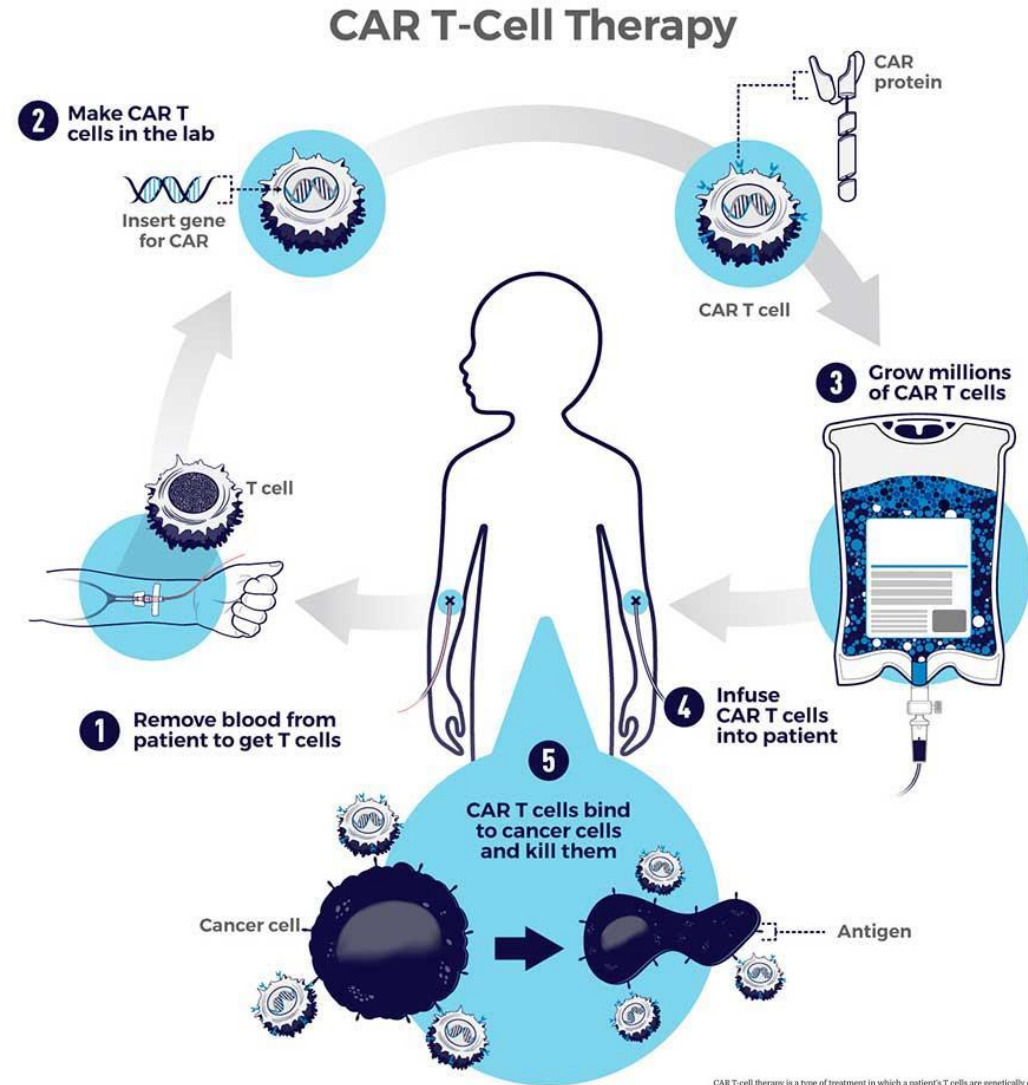
Precision Cancer Therapy – Checkpoint Inhibitors

- A type of immunotherapy, checkpoint inhibitors blocks the protein that stops the immune system from attacking cancer cells
- Prevents the “off” signal from being sent, allowing the T cells to kill cancer cells



Precision Cancer Therapy – CAR T-cells

- Chimeric antigen receptor (CAR) T-cell therapy involves altering genes of T cells to destroy cancer cells
- Utilize white blood cells from the patient's blood
- Takes several weeks to create enough CAR T cells needed for therapy



CAR T-cell therapy is a type of treatment in which a patient's T cells are genetically engineered in the laboratory so they will bind to specific proteins (antigens) on cancer cells and kill them. (1) A patient's T cells are removed from their blood. Then, (2) the gene for a special receptor called a chimeric antigen receptor (CAR) is inserted into the T cells in the laboratory. The gene encodes the engineered CAR protein that is expressed on the surface of the patient's T cells, creating a CAR T cell. (3) Millions of CAR T cells are grown in the laboratory. (4) They are then given to the patient by intravenous infusion. (5) The CAR T cells bind to antigens on the cancer cells and kill them.

Cancer & Artificial Intelligence

- AI technology can be used to analyze X-rays to identify cancer cells
- AI-based risk profiling can assist in common cancer screening
- MIT-developed AI learning model can predict a person's likelihood of developing lung cancer in the next six years, utilizing a low-dose CT scan



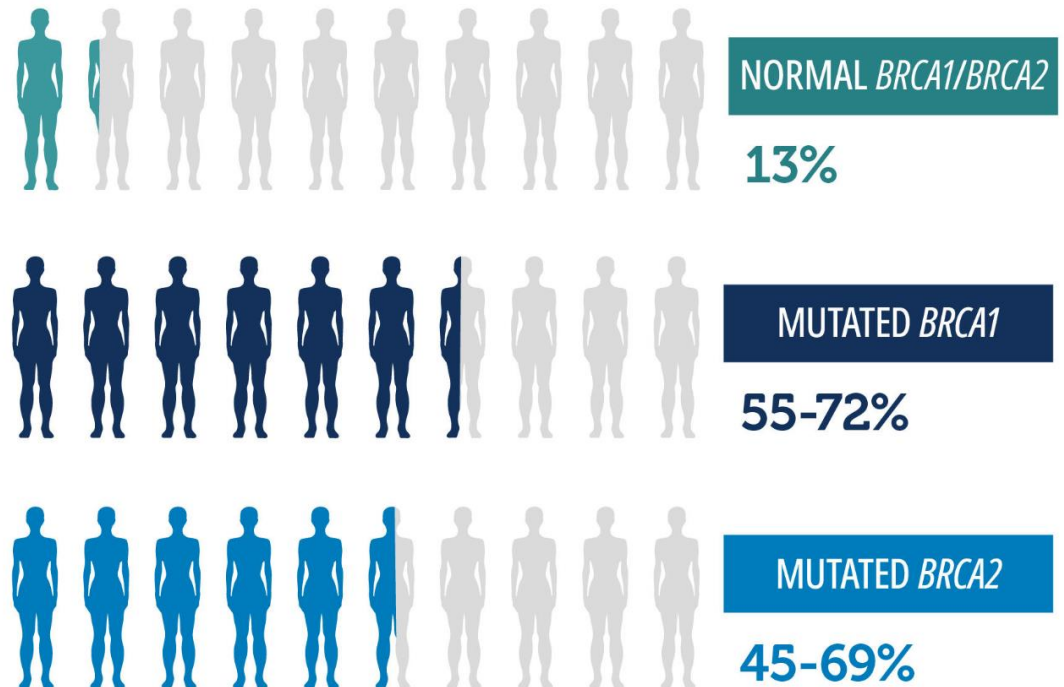
Cancer Prevention

Is Cancer Hereditary?

- Cancer cannot be passed down directly from parent to child
- Genetic changes can be inherited
 - *BRCA1* or *BRCA2* can be passed down from parent to offspring, and the child will have an increased risk of developing breast cancer
- Inherited genetic changes may cause up to 10% of cancers

CHANCES OF DEVELOPING BREAST CANCER BY AGE 70 TO 80*

Women who have inherited a harmful mutation in the *BRCA1* or *BRCA2* genes have a higher risk of breast and other cancers. Genetic testing can show if you have inherited a *BRCA1* or *BRCA2* mutation. Experts recommend testing only if you have a higher likelihood of having a harmful *BRCA1* or *BRCA2* mutation, such as if you have a family history of certain cancers.



*These percentages come from a combination of studies that followed women up to age 70 or 80.

+

○

42% of newly-
diagnosed
cancer cases are
preventable

●

- Including 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
- Cancers caused by infectious agents (ex. HPV, HBV, HCV, and H. pylori) could be prevented through behavioral changes, like vaccination
- 5+ million skin cancer cases could be prevented by proper skin protection and not utilizing indoor tanning devices

Levels of Prevention

Primary Prevention

- Practicing healthy behaviors to limit one's risk of developing certain types of cancer (ex. smoking)

Secondary Prevention

- Screening and regular exams can detect disease in earliest stages

Tertiary Prevention

- Measures and treatments that can slow the effects of cancer



Recommended Cancer Screening Tests

Breast Cancer

- Recommended screening start at age 50 for women of average risk

Cervical Cancer

- Testing begin at age 21, ending at age 65

Colorectal Cancer

- One screening test (colonoscopy, sigmoidoscopy, stool test) every 10 years starting at age 45-50

Lung Cancer

- Screening for former or current heavy smokers at age 50

Other Tests (for those with increased risk)

- Breast MRI
- Alpha-fetoprotein test
- CA-125 test
- PSA test

State of Lung Cancer

2022 Report

Nebraska Lags Behind in Lung Cancer Screening

- The 2022 “State of Lung Cancer report reveals that Nebraska ranks 30th in the nation in lung cancer survival
- Nebraska’s lung cancer survival rate (23.2%) is below the national average at 25%
- The report found Nebraska ranked:
 - 19th in the nation of new lung cancer cases at 55.2 per 100,000 (national rate is 56.7)
 - 15th in the nation for early diagnosis at 27.2% (national rate is 25.8%)
 - 27th in the nation for lung cancer screening at 6.2% (national rate is 5.8%)

About 70% of cancer deaths come from cancers without proven screening tests




Primary Prevention

- Stop smoking
- Keep vaccination up to date
 - HPV, Hepatitis B
- Consume a healthy and balanced diet
- Exercise often



Accelerated U.S. Children and Adult Hepatitis B Vaccine Schedules



For children ≥ 1 and adults

Note: the first dose should be given as soon as possible. Additional doses require minimum time intervals required between doses in order for the vaccine to be effective.

Vaccine	Dose 1	Dose 2	Dose 3	Dose 4
 4 dose vaccine series Brand name: Engerix-B	Now ✓	1 month after dose 1 ✓	2 months after dose 1 ✓	1 year after dose 1 ✓
 4 dose combination hepatitis A & B vaccine Adults ≥ 18 Years Brand name: Twinrix	Now ✓	1 week after dose 1 ✓	1 month after dose 1 ✓	1 year after dose 1 ✓
 2 dose vaccine Adults ≥ 18 Years Brand name: Heplisav-B	Now ✓	1 month after dose 1 ✓		

Key

 = Monovalent hepatitis B vaccine (protection against hepatitis B only)
  = Approved for adults

 = Combination vaccine (protection against hepatitis B + other diseases)
  = Approved for children

The Big Healthy 5



Walk daily



Eat the rainbow



Sleep 8 hours



Find a purpose, and maintain healthy friendships



Limit unhealthy lifestyle practices



The Mediterranean Diet (MD)

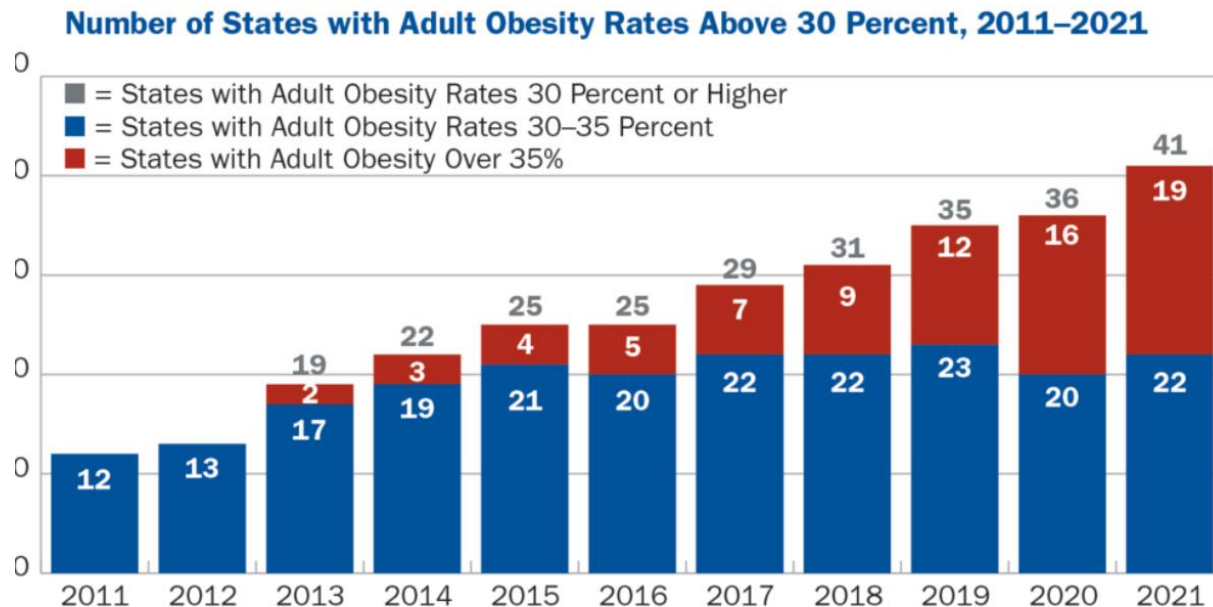
- High in vegetables, fruits, legumes, nuts, beans, non-refined cereals, grains, fish, and olive oil, moderate consumption of fish and dairy, and low intake of red meats
- The positive relationship between MD and cancer is attributed to the high contents of antioxidants and anti-inflammatory nutrients which have a protective effect in fighting cell degeneration and proliferation of cancer cells



Link Between MD and Cancer

- The protective effects of MD may be attributed to the high polyphenol concentration contained in olive oil, wine, and vegetables
- Fruits and vegetables have high levels of carotenoids and vitamins allowing for the prevention of DNA damages
- Omega-3, abundant in fish and nuts, helps slow cancer development affecting cell proliferation and survival

Obesity & Cancer



Source: TFAH analysis of BRFSS data

- Obesity has been linked to cancers such as breast, colorectal, kidney, gallbladder, pancreatic, esophageal, and liver cancer
- 4-8% of all cancers can be attributed to obesity
- In high-income populations, severe obesity is expected to double in prevalence from 10 to 20% between 2020 and 2035

Mental Health & Cancer Survivorship

- There is evidence that providing psychosocial cancer care reduces distress and fosters a better quality of life during and after treatment, even leading to increased survival



Hobbies Can Lead to Increased Mood and Potentially Better Survivorship!

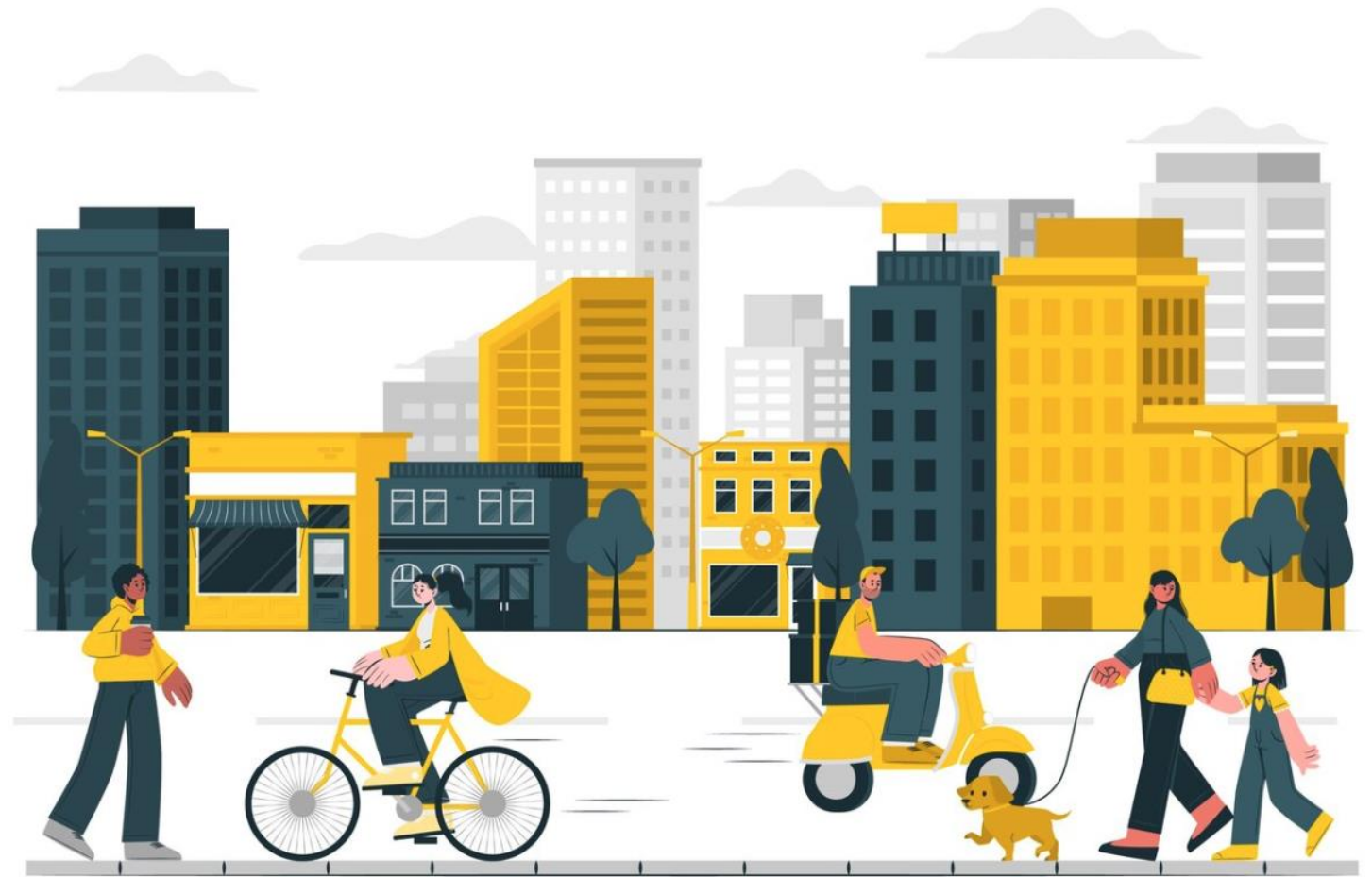
- Yoga-based interventions are associated with the mitigation of depression and anxiety symptoms
- Pets can offer unconditional love and companionship leading to decreased levels of depression, anxiety, and stress
- Gardening may help increase physical functioning in cancer survivors
 - Increased fruit and vegetable consumption and physical activity

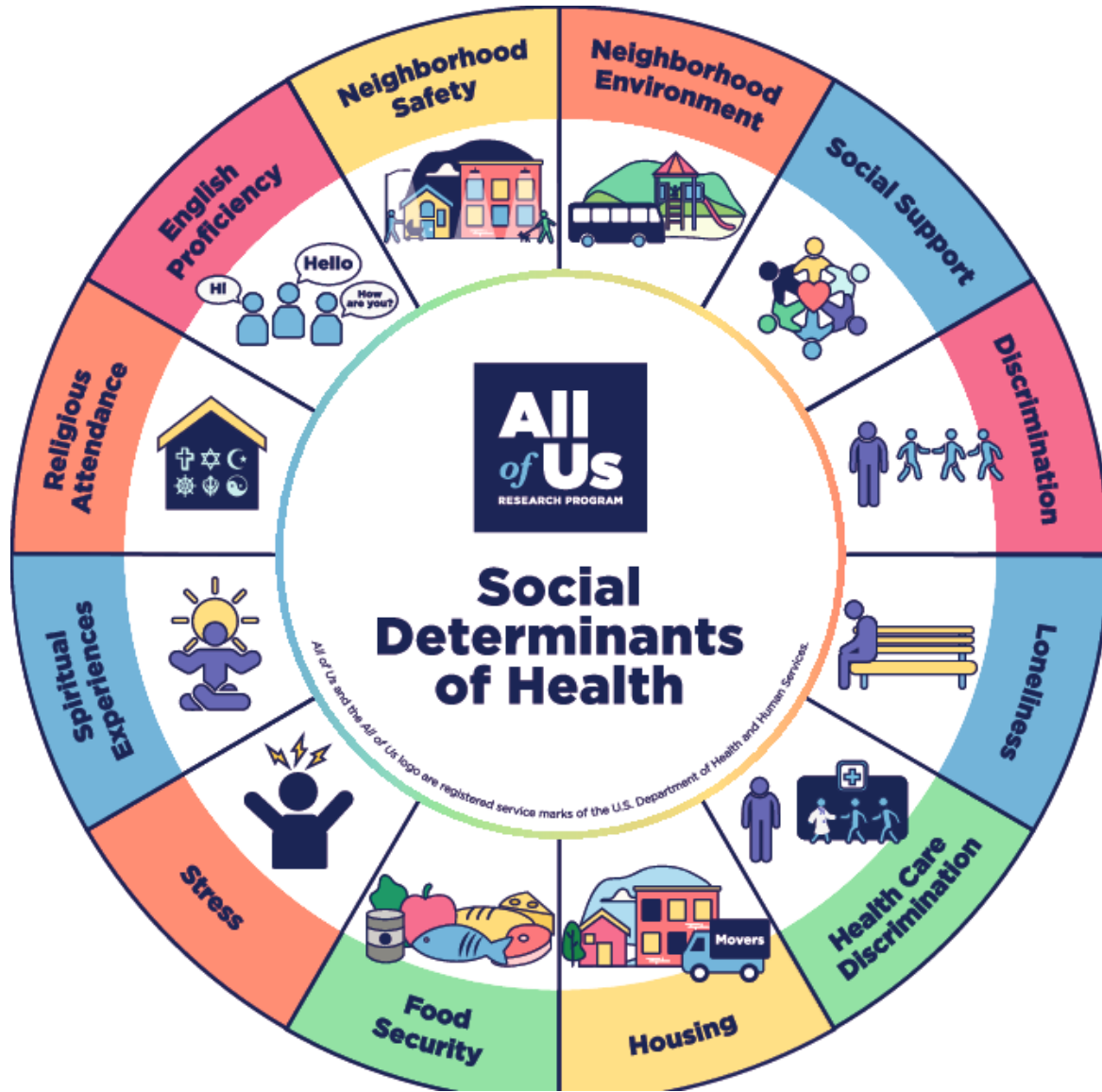


Social Determinants of Health & Cancer

Social Determinants of Health

- The conditions in which people are born, grow, work, live and age, and the wider set of forces and systems shaping the conditions of daily life





SDOH can impact health, affecting as much as 50% of health outcomes, both positively and negatively.





Social Determinants of Health

- Food insecurity leads to consumption of a nutrient-poor diet, which may lead to cancer risk factors such as obesity and diabetes
- Patients with housing insecurity have higher rates of chronic conditions (ex. depression) and are more likely to miss scheduled office visits
- Social isolation has been associated with poorer quality of life among cancer patients
- Educational attainment, geographic location, or sexual/gender minority status can inhibit access to cancer screening, leading to a late-stage cancer diagnosis



Physicians on SDOHs

- 93% of physicians agreed SDOH had a significant impact on patient health outcomes
- 83% cited financial security/lack of insurance as the greatest barrier to care
- 81% indicated having limited time to assist patients with social needs
- 76% reported assistance programs were not readily-accessible

Incorporating SDOH into Oncology

SDOH Frameworks and Tools



- Protocol for Responding to and Assessing Patients' Assets, Risks, and Experiences (PRAPARE)
 - Standardized patient risk assessment tool designed to engage patients in assessing and addressing SDOH.
 - PRAPARE Screening Tool
 - PRAPARE Implementation and Action Toolkit

Social and Emotional Health

16. How often do you see or talk to people that you care about and feel close to? (For example: talking to friends on the phone, visiting friends or family, going to church or club meetings)

	Less than once a week	1 or 2 times a week
	3 to 5 times a week	6 or more times a week
	I choose not to answer this question	

Family & Home

6. How many family members, including yourself, do you currently live with? _____

	I choose not to answer this question
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7. What is your housing situation today?

	I have housing
	I do not have housing (staying with others, in a hotel, in a shelter, living outside on the street, on a beach, in a car, or in a park)
	I choose not to answer this question

SDOH Frameworks and Tools (cont.)

- National Academics of Sciences, Engineering, and Medicine Framework
 - Framework for integrating social care, defined as services that address health-related social risk factor/needs, into clinical practice
 - Authors identified five areas that can incorporate SDOH into healthcare: awareness, adjustment, assistance, alignment, and advocacy

Table 2. Example Health Care System Activities That Strengthen Social Care Integration

Activity	Definition	Transportation-Related Example
Awareness	Activities that identify the social risks and assets of defined patients and populations	Asking patients about their access to transportation
Adjustment	Activities that focus on altering clinical care to accommodate identified social barriers	Reduce the need for in-person health care appointments by using other options (eg, telehealth)
Assistance	Activities that reduce social risk by providing assistance in connecting patients with relevant social care resources	Provide transportation vouchers (eg, for ride-sharing or public transit) so that patients can travel to health care appointments
Alignment	Activities undertaken by health care systems to understand existing social care assets in the community, organize them to facilitate synergies, and invest in and deploy them to positively affect health outcomes	Invest in community ride-sharing or time-bank programs
Advocacy	Activities in which health care organizations work with partner social care organizations to promote policies that facilitate the creation and redeployment of assets or resources to address HRSNs	Work to promote policies that fundamentally change the transportation infrastructure within the community

Issues with SDOH Healthcare Integration

- While there is a consensus on the importance of SDOH in healthcare, there is also a persisting view that SDOH should be considered as an 'add-on' and not always central to clinical care delivery
- Therefore, social care programs are often fragmented, less effective, and inaccessible
- Overall lack of standardized SDOH collection and documentation within electronic health records
- Lack of financial incentives for considering SDOH in patient care

Policy Recommendations for SDOH-Integration

State Legislative Recommendations

- State Medicaid programs should research/invest in programs screening for social needs (ex. food availability, housing, transportation)
- Offer financial incentives to healthcare entities for SDOH programs and screening

Federal Legislative Recommendations

- Establish an infrastructure to collect SDOH data and research interventions
- Centers for Medicare & Medicaid Services should establish payment models for oncology supporting screening, intervention, and evaluation

Precision Public Health. From Measurement to Intervention

- Precision oncology studies the genetic makeup of cancers in individual patients, allowing for pin-point effective treatment with fewer side effects, as opposed to chemotherapy
- However, this type of medicine fails to account for nonbiological factors, including SDOH
- Consider developing and tailoring interventions towards a specific community/geographical area
 - If food insecurity is observed as an issue, recommend interventions addressing basic food needs (ex. food vouchers, home grocery delivery, food pantries)



Good Magic

1. Irrational Optimism
2. Connect with Family and Friends
3. Never Lose Hope



HOPE!