

# Cancer surveillance and data visualization



*GW T32 Cancer Biology Training Program Seminar  
December 13, 2023*

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**Cancer Center**

*Director, Cancer Epidemiology Shared Resource  
GW Cancer Center*

# ***NIH/NCI PAR-21-321 Cancer Center Support Grants (CCSGs) for NCI-designated Cancer Centers (P30)***

## **Community Outreach and Engagement**

“Cancer Centers occupy a unique role in their communities. They are expected to perform research of particular relevance to their catchment area and engage the populations within their catchment area in the research they conduct. To facilitate this, Centers **thoroughly analyze the demographics and cancer burden of their catchment area**. In addition, Centers are expected to engage communities within their catchment area to decrease their cancer burden, particularly among minority and underrepresented populations. To facilitate these activities, Centers establish community advisory board(s) and partnerships with other healthcare delivery systems and state and community agencies and coalitions for dissemination of evidence-based findings.”

# Surveillance



Ongoing, systematic collection, analysis, interpretation and dissemination of data regarding a health-event for use in public health action to reduce morbidity and mortality and to improve health.

- *Centers for Disease Control and Prevention, 2001*



Centers for Disease Control and Prevention  
CDC 24/7: Saving Lives, Protecting People™

CDC engages in surveillance activities in order to:

- Collect data to better understand the extent of health risk behaviors, preventive care practices and the burden of chronic diseases
- Monitor the progress of prevention efforts
- Help public health professionals and policymakers make more timely and effective decisions

<https://www.cdc.gov>

# CDC's Chronic Disease Surveillance Systems

Including:

- National Health and Nutrition Examination Survey (NHANES)
- Behavioral Risk Factor Surveillance System (BRFSS)
- Youth Risk Behavior Surveillance System (YRBSS)
- Chronic Disease Indicators
- Chronic Disease State Policy Tracking System
- National Diabetes Surveillance System
- National Health Interview Survey (NHIS)
- **US Cancer Statistics (USCS)**

Using Surveillance Systems to Prevent and Control Chronic Diseases



<https://www.cdc.gov/chronicdisease/data/surveillance.htm>



# CDC: National Notifiable Diseases Surveillance System (NNDSS)

Local public health departments are required **by law** to report disease data to the CDC on about 120 infectious and non-infectious diseases

Cancer is one of the non-infectious diseases



CDC Centers for Disease Control and Prevention  
CDC 24/7: Saving Lives, Protecting People™

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## National Notifiable Diseases Surveillance System (NNDSS)

f t in y

NNDSS Supports the  
**COVID-19 Response**

Learn More

Collaborating on disease surveillance to keep America healthy

- What is Case Surveillance?
- Case Surveillance in Action
- Data and Statistics
- Case Definitions

[cdc.gov/nndss/](https://cdc.gov/nndss/)

## **1935**

First population-based cancer registry in the United States established in Connecticut

## **1956**

The American College of Surgeons requires a cancer registry as a component of an approved cancer program

## **1971**

The U.S. National Cancer Act budgets monies to the National Cancer Institute for research, detection, and treatment of cancer

## **1973**

The Surveillance, Epidemiology and End Results (SEER) Program of NCI establishes the first national cancer registry program

## **1992**

U.S. Public Law 102-515 establishes the National Program of Cancer Registries (NPCR) and is administered by the US Centers for Disease Control and Prevention (CDC)

## **1993**

Many state laws make cancer a reportable disease

# Cancer registrars

- data management experts who report cancer statistics for various healthcare agencies
- work closely with physicians, administrators, researchers, and health care planners
- primary responsibility is to ensure that timely, accurate, and complete data is incorporated and maintained on all types of cancer diagnosed and/or treated within an institution or other defined population
- Starting January 1, 2024, the credential name for Certified Tumor Registrars (CTR) will be changing to Oncology Data Specialists (ODS)



Healthcare  
organization

State Department  
of Health

CDC



# United States Cancer Statistics: Data Visualizations

At a Glance ▾ Geography ▾ Trends ▾ Stage/Survival ▾ Prevalence ▾ Screening and Risk Factors ▾ Special Analysis ▾

CDC > Cancer Home > U.S. Cancer Statistics Home > Data Viz Tool



## Cancer Statistics At a Glance

Area: United States ▾  
 New Cases (Incidence) or Deaths (Mortality): Rate of New Cancers ▾  
 Sex:  Female  Male  Male and Female  
 Cancer Type: All Types of Cancer ▾  
 Year:  2019  2015-2019  
 Race and Ethnicity: All Races and Ethnicities ▾

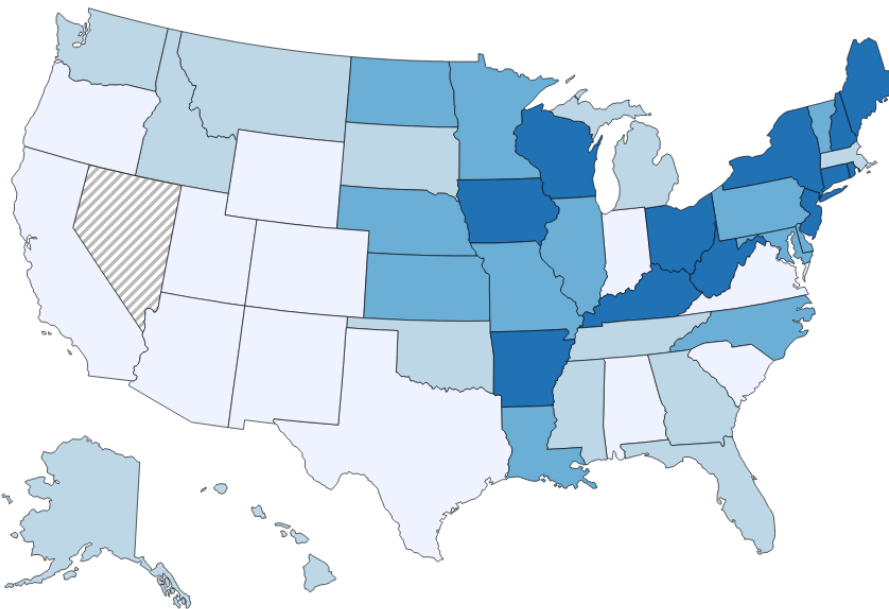
### Leading Cancer Cases and Deaths, All Races and Ethnicities, Female, 2019

In **2019**, the latest year for which incidence data are available, in the **United States**, **863,830 new cases of cancer** were reported among **women**, and **283,722 women died** of cancer. For every 100,000 **women**, **415 new cancer cases** were reported and **126 women died** of cancer.

Cancer is the second leading cause of death in the United States, exceeded only by heart disease. **One of every four deaths in the United States is due to cancer.**

### Rate of New Cancers in the United States, 2019

All Types of Cancer, All Ages, All Races and Ethnicities, Female  
 Rate per 100,000 women






Home / About SEER / Program Overview

# Overview of the SEER Program

## About SEER

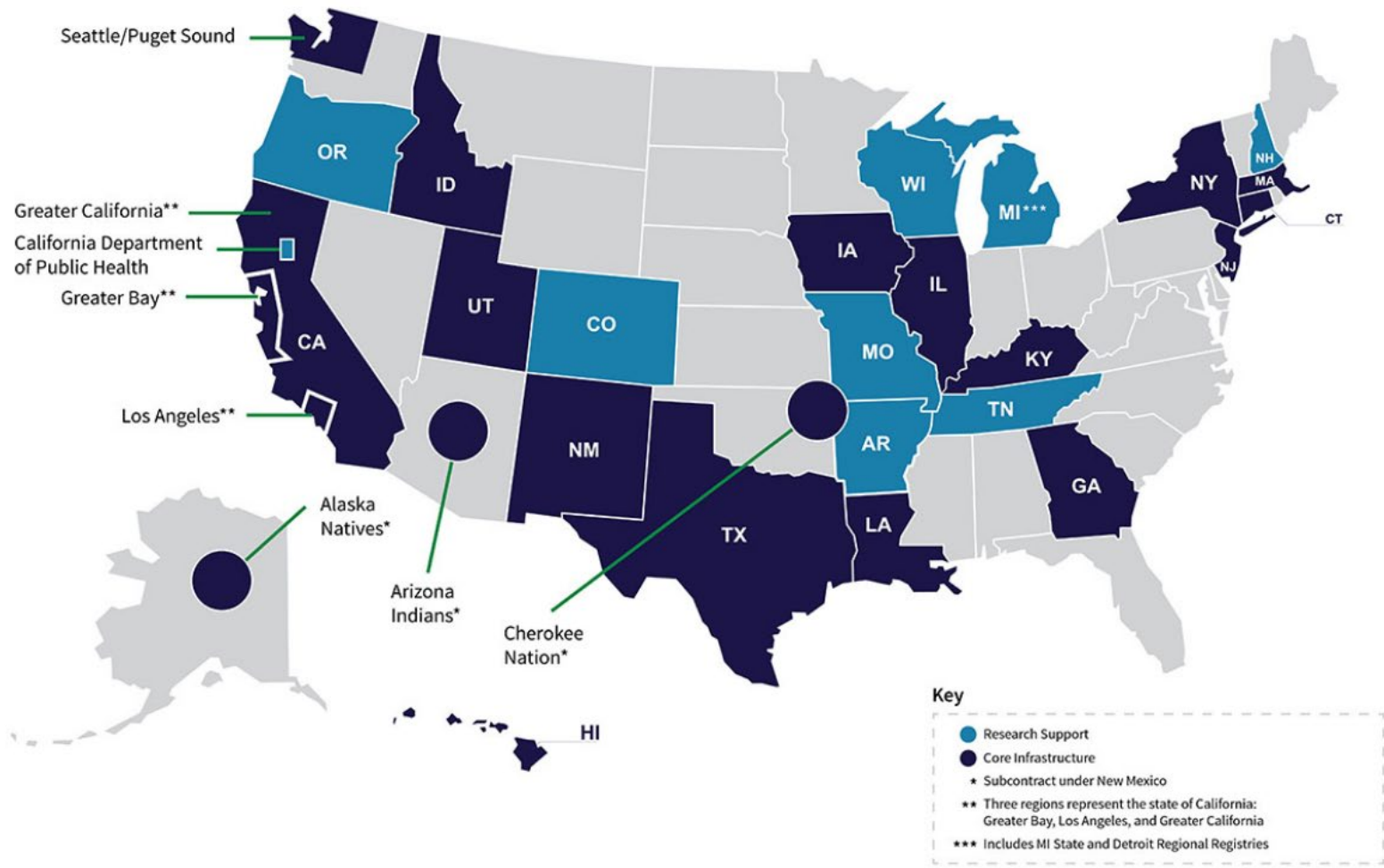
- Program Overview —
- SEER 50th Anniversary
- Goals of the SEER Program
- Fact Sheets & Brochures
- Collaborating Organizations
- SEER Registries +
- Research Activities +
- SEER Quality Improvement +

The Surveillance, Epidemiology, and End Results (SEER) Program of the National Cancer Institute (NCI) is an authoritative source of information on cancer incidence and survival in the United States. SEER currently collects and publishes cancer incidence and survival data from population-based cancer registries covering approximately 48.0 percent of the U.S. population. For more information on this, please view the [SEER Research Data](#). SEER coverage includes 42.0 percent of Whites, 44.7 percent of African Americans, 66.3 percent of Hispanics, 59.9 percent of American Indians and Alaska Natives, 70.7 percent of Asians, and 70.3 percent of Hawaiian/Pacific Islanders. (Details are provided in the table: [Number of Persons by Race and Hispanic Ethnicity for SEER Participants](#).)

The SEER Program registries routinely collect data on patient demographics, primary tumor site, tumor morphology and stage at diagnosis, first course of treatment, and follow-up for vital status. The SEER Program is the only comprehensive source of population-based information in the United States that includes stage of cancer at the time of diagnosis and patient survival data. The mortality data reported by SEER are provided by the [National Center for Health Statistics](#). The population data used in calculating cancer rates is obtained periodically from the [Census Bureau](#). Updated annually and provided as a public service in print and electronic formats, SEER data are used by thousands of researchers, clinicians, public health officials, legislators, policymakers, community groups, and the public.



# NCI SEER Registries



<https://seer.cancer.gov/registries/>

# Cancer Facts and Statistics

The American Cancer Society projects the numbers of new cancer cases and deaths expected each year in order to estimate the contemporary cancer burden, because cancer incidence and mortality data lag 2 to 4 years behind the current year. In addition, the regularly updated Facts & Figures publications present the most current trends in cancer occurrence and survival, as well as information on symptoms, prevention, early detection and treatment.



## Cancer Facts & Figures, Annual Reports

ACS has published Cancer Facts & Figures annually since 1951. This annual report provides the most current information about cancer. A unique feature of these publications is their projections of the number of cancer cases and deaths expected in each state and in the nation in the current year. These widely cited projections serve as a basis for research and are also readily understood by the public. Each edition of Cancer Facts & Figures includes a Special Section of in-depth focus on a specific cancer, group of cancers, or population.

[Current Cancer Facts & Figures \(PDF\)](#)

[Current Statistics Article](#)

[News Story: Risk of Dying from Cancer Continues to Drop at an Accelerated Pace](#)



## See if the Quit2Heal clinical trial is for you

If you smoke and have been diagnosed with cancer in the last 12 months, you may be eligible to participate in a research study that will test a smartphone app to help you quit smoking.

Learn more at: [Quit2heal.org](https://www.Quit2heal.org)

# Additional data needed for cancer control planning

Data type	Definition	Example
Vital statistics	Systematically tabulated information concerning births, marriages, divorces, separations and death based on registration of these vital events	Census data, National Death Index
Demographic data	Socioeconomic information expressed statistically, including employment, education, income, marriage rates, birth and death rates, and more.	American Community Survey
Data on health behaviors	Data on actions taken by individuals that impact their health, such as smoking, physical activity, diet, vaccinations, or being screened for certain types of cancer (e.g. colonoscopy, mammograms, Pap smears)	Behavioral Risk Factor Surveillance Survey (BRFSS)



# American Community Survey

- Ongoing survey conducted by the US Census Bureau that provides data every year
- Gives communities the current information they need to plan investments and services
- Samples 3.5 million residences (approximately 1 in 38 US households) each year
- Respondents can complete the survey by paper, internet, telephone, or home visit





# Types of data collected by the ACS

## Social

- Ancestry
- Citizenship & Year of Entry
- Disability Status
- Educational Attainment
- Field of Degree
- Health Insurance
- Grandparents
- Fertility
- Language
- Marital Status & History
- Place of Birth
- Migration
- Relationship
- School Enrollment
- Veteran Status

## Economic

- Employment & Work Status
- Income & Earnings
- Industry & Occupation
- Class of Worker
- Commuting
- Poverty Status
- SNAP Receipt

## Demographic

- Age & Sex
- Race & Hispanic Origin

# Explore Census Data

Learn about America's People, Places, and Economy

Find Tables, Maps, and more ...



[Help](#) [Feedback](#) [Advanced Search](#)

Try searching for [poverty](#) in [Georgia](#) in [2020](#)

# find tables

Economic Census  
 EC1700BASIC | All Sectors: Summary Statistics for the U.S., States, and Selected Geographies: 2017

2017 ECN Core Statistics Summary Statistics for the U.S., States, and Selected Geographies: 2017

Notes Data Years Topics Summary Codes Hide Filter Restore Excel CSV PDF Print More Data Map

Geographic Area Name	Meaning of NAICS code	Meaning of Tax status co...	Number of Firms	Sales, value of shipments...	First quarter payroll (\$...
United States	Mining, quarrying, and oil & gas extraction	All establishments	16,818	400,405,610	12,398
United States	Mining, quarrying, and oil & gas extraction	All establishments	16,818	400,405,610	12,398
United States	Utilities	All establishments	5,886	677,000,452	20,661
United States	Construction	All establishments	701,229	1,044,166,047	88,419
United States	Manufacturing	All establishments	249,014	6,548,798,869	198,056
United States	Wholesale trade	All establishments	297,279	6,754,807,041	107,979
United States	Wholesale trade	All establishments	262,679	5,709,396,914	83,174
United States	Wholesale trade	All establishments	2,384	2,231,281,412	212,101
United States	Retail trade	All establishments	647,480	4,848,605,481	108,214
United States	Transportation and warehousing	All establishments	184,735	490,205,491	60,277
United States	Information	All establishments	78,418	1,582,097,911	95,850
United States	Finance and insurance	All establishments	236,950	4,340,093,907	294,830
United States	Real estate and rental and leasing	All establishments	302,389	676,142,020	28,126
United States	Professional, scientific, and technical services	All establishments	816,210	1,844,780,952	179,189
United States	Professional, scientific, and technical services	Establishments subject to tax	807,017	1,792,588,791	173,855
United States	Professional, scientific, and technical services	Establishments exempt from tax	3,193	48,192,161	5,334
United States	Management of companies and enterprises	All establishments	28,219	121,526,125	105,193
United States	Administrative and support and waste removal and remediation services	All establishments	345,762	600,094,853	164,047
United States	Educational services	All establishments	102,054	65,712,456	5,242
United States	Educational services	Establishments subject to tax	96,711	48,139,857	3,762

Search  
 Geographic identifier code  
 Geographic area name  
 2017 NAICS code  
 Meaning of NAICS code  
 Type of operation code  
 Meaning of type of operation code  
 Tax status code  
 Meaning of the status code  
 Year  
 Number of firms  
 Number of establishments  
 Sales, value of shipments, or revenue (\$)  
 Annual payroll (\$/1,000)  
 Row Groups  
 Drag here to re-order groups  
 Select  
 Drag here to aggregate  
 The 28 of 31 Page 1 of 1

Explore the thousands of tables we have. We are adding new tables every week.

[Explore Tables](#)

build  
maps

<https://data.census.gov/cedsci/>

# CDC: Behavioral Risk Factors Surveillance System (BRFSS)

- Collects data on individual level behavioral risk factors from adults.
- First conducted in 1984, it is the largest continuously conducted health survey system in the world.
- Data collected at the state and local level in all 50 states, the District of Columbia, Puerto Rico, the U.S. Virgin Islands, Guam, American Samoa, and Palau.
- Primary conducted by computer-assisted telephone interviews (CATI) - landline, cell phone. Internet and mail contact for non-responders.
- More than 400,000 interviews are conducted each year
- Set of core questions that are asked each year.
- States can select from a panel of optional question modules.



# Colonoscopy

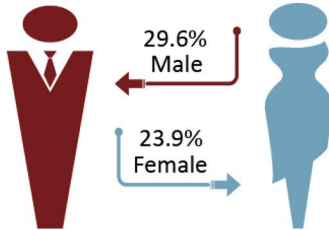
Calculated variable from  
 "Have you ever had a colonoscopy?" and  
 "How long has it been since you had this test?"



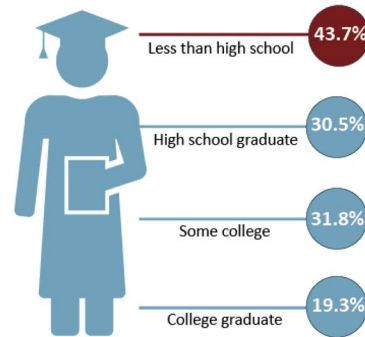
## 26.6%

District Adults Who Did  
 Not have a Colonoscopy Within  
 the Past 10 Years  
 (Aged 50-75 Years )  
 DC BRFS 2020

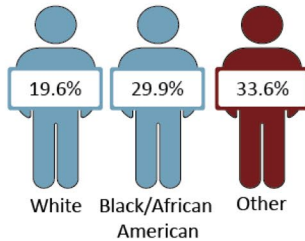
**District Adults Aged 50-75 Years Old Who Did Not have a Colonoscopy Within the Past 10 Years by Gender**  
 DC BRFS 2020



**District Adults Aged 50-75 Years Old Who Did Not have a Colonoscopy Within the Past 10 Years by Education**  
 DC BRFS 2020

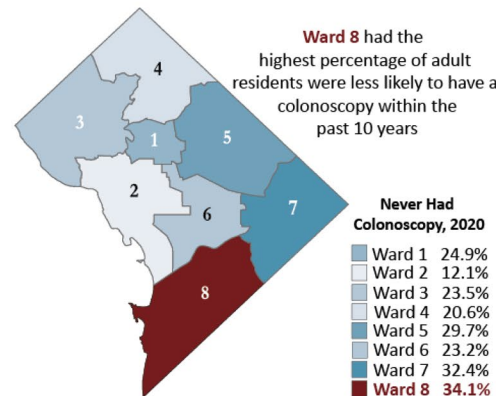


**District Adults Aged 50-75 Years Old Who Did Not have a Colonoscopy Within the Past 10 Years by Race/Ethnicity**  
 DC BRFS 2020



Race/ethnic group Hispanic/Latino suppressed, RSC >3-%

**District Adults Aged 50-75 Years Old Who Did Not have a Colonoscopy Within the Past 10 Years by Ward**  
 DC BRFS 2020



**District Adults Aged 50-75 Years Old Who Did Not have a Colonoscopy Within the Past 10 Years by Income Status**  
 DC BRFS 2020



## PLACES: Local Data for Better Health



The PLACES Project is a collaboration between CDC, the Robert Wood Johnson Foundation (RWJF), and the CDC Foundation (CDCF). PLACES will allow counties, places, and local health departments regardless of population size and urban-rural status to better understand the burden and geographic distribution of health-related outcomes in their jurisdictions and assist them in planning public health interventions.

[Learn more about PLACES](#)

PLACES is an extension of the original [500 Cities Project](#) that provided city and census tract estimates for chronic disease risk factors, health outcomes, and clinical preventive services use for the 500 largest US cities. The PLACES Project provides model-based population-level analysis and community estimates to all counties, places (incorporated and census designated places), census tracts, and ZIP Code Tabulation Areas (ZCTAs) across the United States. See a [Notice to Data Users](#) and learn more [about the PLACES Project](#).



<https://www.cdc.gov/places/>



Health Outcomes

Prevention

Unhealthy Behaviors

Help



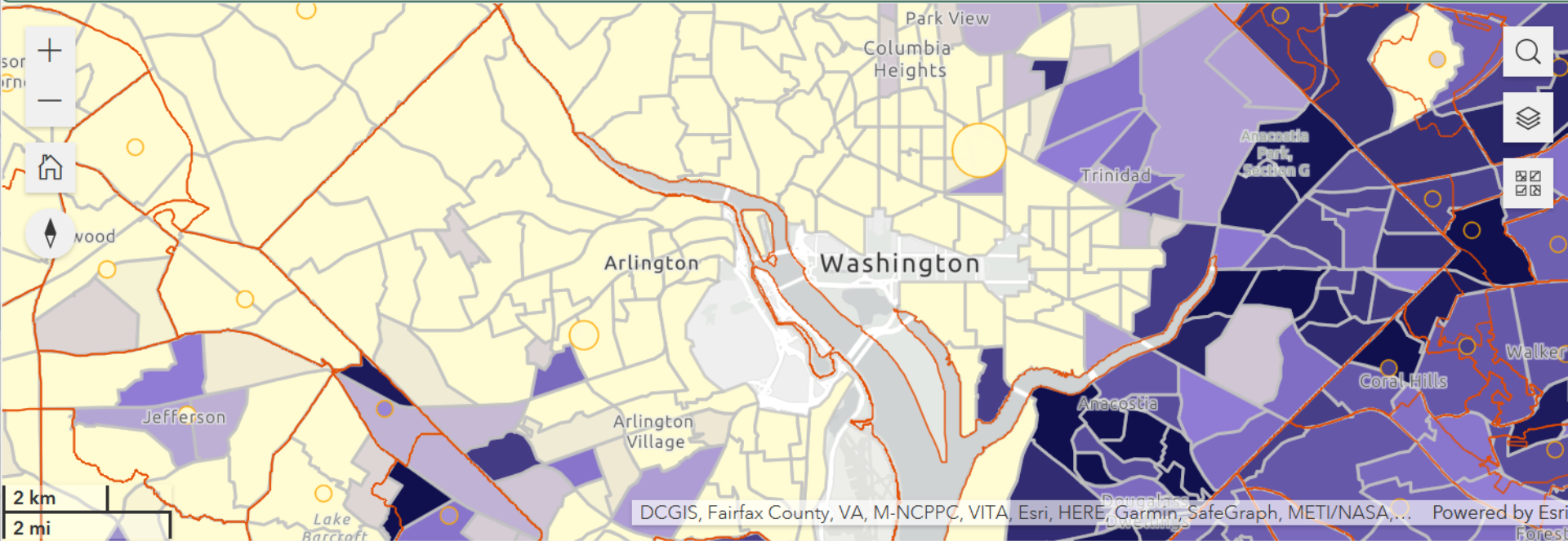
Binge Drinking

Current Smoking

Physical Inactivity

Obesity

Sleep <7 hours



DCGIS, Fairfax County, VA, M-NCPPC, VITA, Esri, HERE, Garmin, SafeGraph, METI/NASA,...

Powered by Esri

Data sources: The model-based estimates were generated using BRFSS 2018 or 2017, Census 2010 population counts or census county population estimates of 2018 or 2017, and ACS 2014-2018 or ACS 2013-2017.

Credit: Centers for Disease Control and Prevention, National Center for Chronic Disease and Health Promotion, Division of Population Health, Atlanta,



<https://www.cdc.gov/places/>



# Putting it all together for the GW Cancer Center Catchment Area



# Data visualization

Presentation of data/information visually, for example, by using charts, diagrams, figures pictures, or maps.

*Commonly used data visualization software programs include: Tableau, ArcGIS, R Shiny*



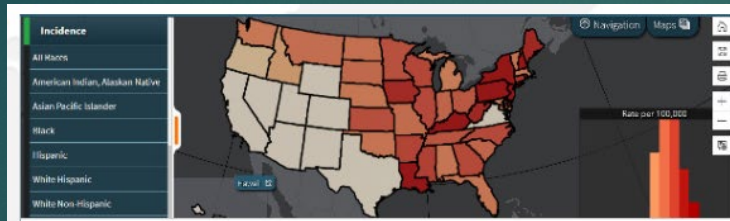
The background features a dark blue and black color scheme with abstract data visualization elements. A white line graph with circular markers is visible on the left side. In the center, there are vertical bars of varying heights, with the number '289.33' displayed next to one of them. The overall aesthetic is modern and technical.

# The George Washington Cancer Data Visualizer

BROOKE BURGESS, MS



# NCI GIS Portal for Cancer Research



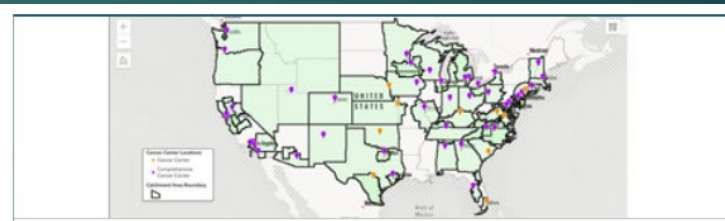
**Incidence**

- All Races
- American Indian, Alaskan Native
- Asian Pacific Islander
- Black
- Hispanic
- White Hispanic
- White Non Hispanic

**NCI Cancer Atlas**

An interactive digital atlas that enables users to generate geographic maps of cancer rates, risk factors for cancer, screening statistics, and other geographically based data related to cancer.

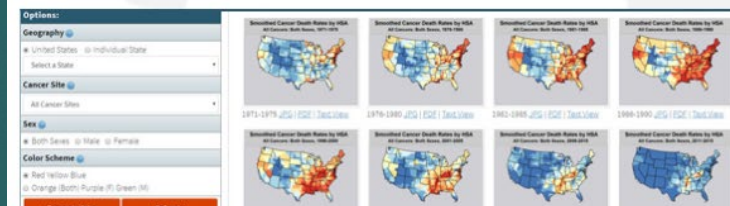
Launch the Atlas →



**NCI-Designated Cancer Centers**

This web-based application serves as a visualization tool for the geographically defined catchment areas of NCI-designated Cancer Centers.

View the Tool →



**Options:**

- Geography: United States | Individual State
- Cancer Site: All Cancer Sites
- Sex: Both Sexes | Male | Female
- Color Scheme: Red Yellow Blue | Orange (Both Purple & Green Mix)

**Animated Historical Cancer Atlas**

A tool that allows the users to animate smoothed age-adjusted death rates over time and view them at the national or state level.

Launch the Atlas →



**State Laws**

- 100% Smoke-Free
- 80% Smoke-Free
- 60% Smoke-Free
- 40% Smoke-Free
- 20% Smoke-Free
- 0% Smoke-Free

**Social Laws**

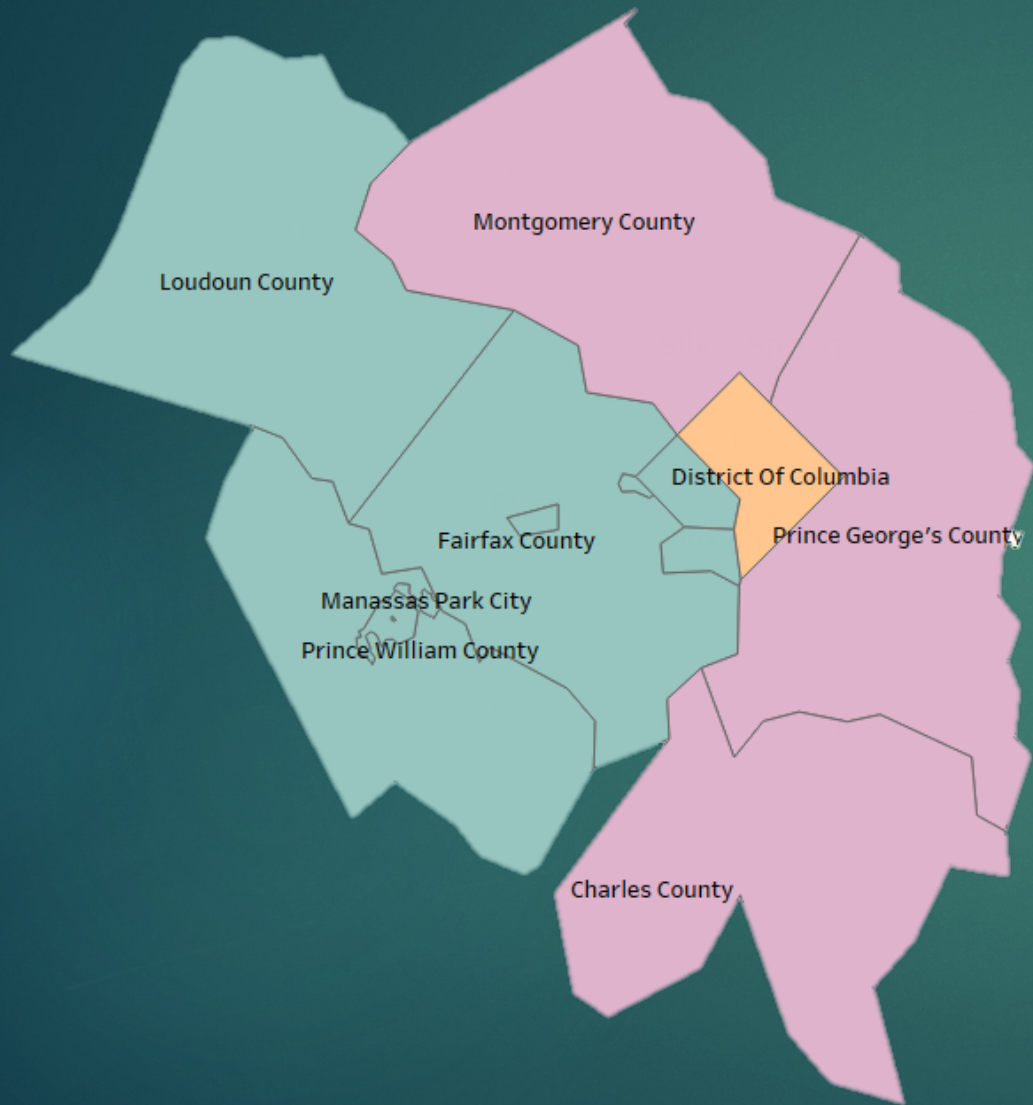
- Complete Smoke-Free
- Partial Smoke-Free
- None
- Other
- Unknown
- Other

**Tobacco Policy Viewer**

An interactive web resource for mapping, query, and download of historical smoke-free policy data in the United States.

Explore the Viewer →

Why create a new cancer visualizer?



- ▶ GW catchment area spans across DC, Virginia and Maryland
- ▶ Ability to use multiple data sources and customize for our needs
- ▶ Makes it easier for our researchers to identify disparities



**#1**  
**Define**  
**Catchment**  
**Area**

**#2**  
**Data**  
**Collection**  
Web scrape  
publically  
available datasets  
for data within  
catchment area

**#3**  
**Data**  
**Manipulation**  
Organize and  
format data for  
readability

**#4**  
**Create Data**  
**Visualization**  
**Tool**  
Build interactive  
maps and graphs in  
Tableau

**#5**  
**Catchment**  
**Area Analysis**

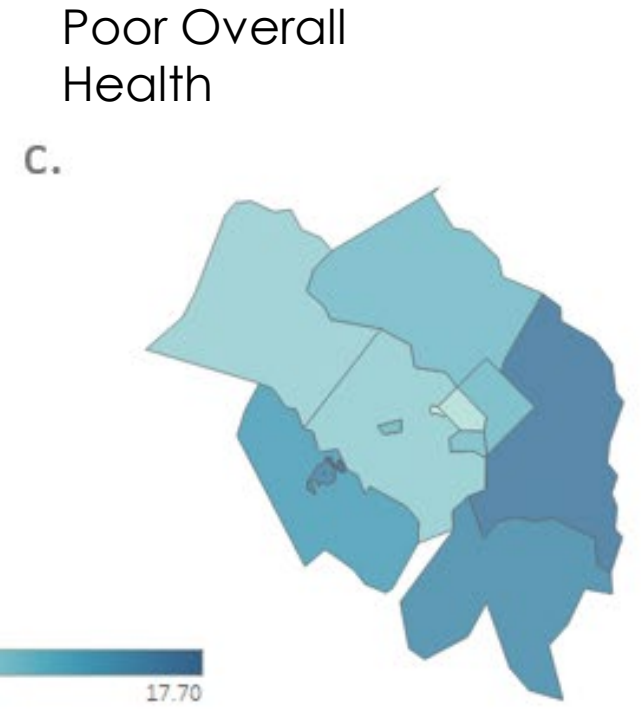
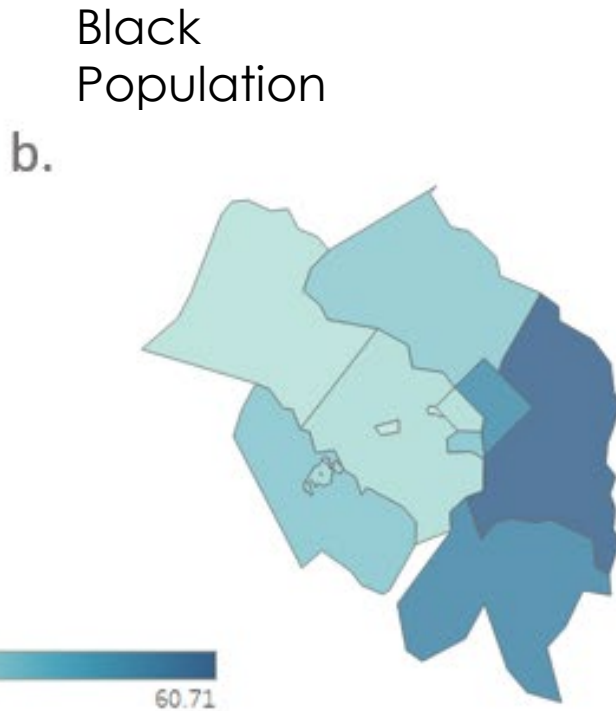




## NCI Programs That Address Disparities in Cancer Prevention and Care

- NCORP
- CRCHD
- PACHE
- GMaP





*Figure 2. Residents in Northwest counties have a predominately-higher median household income (a). Residents in Southeast counties have a higher percent of population identifying as Black (b) and a higher number of adults who report having poor overall health (c).*

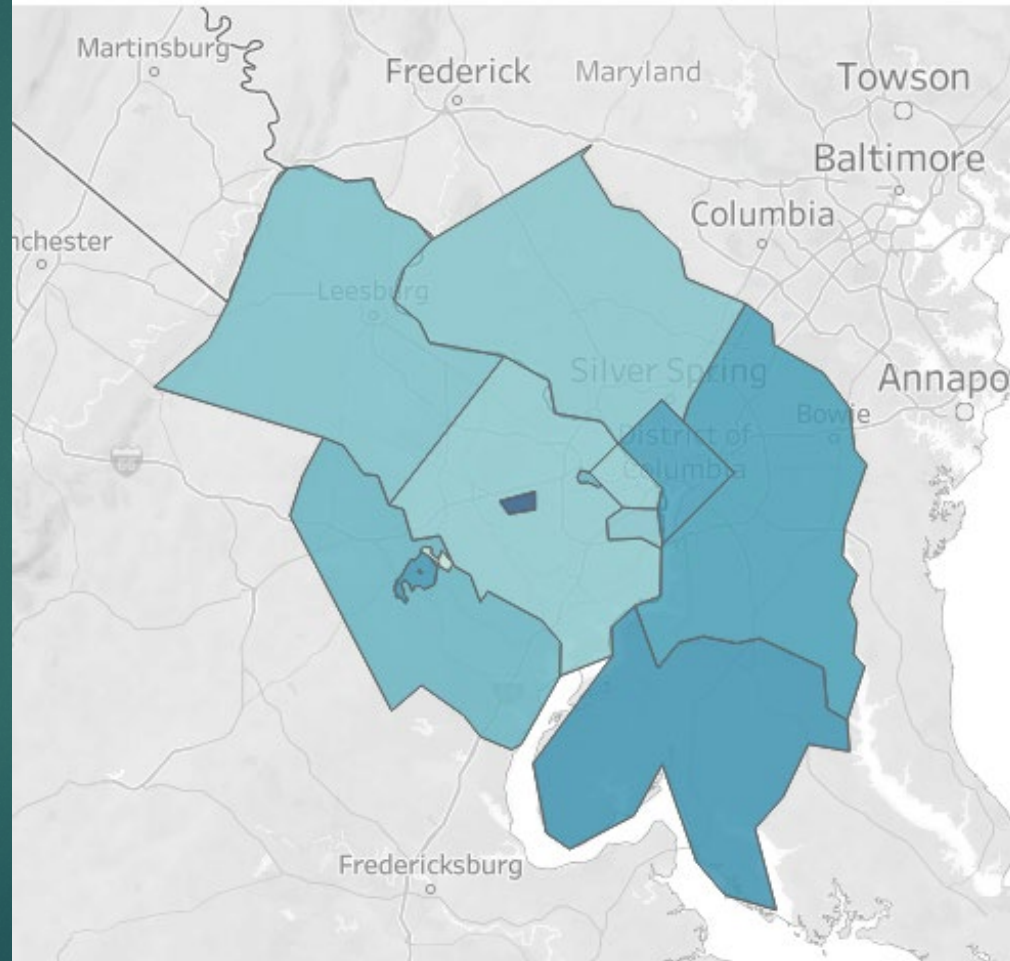


## Mortality

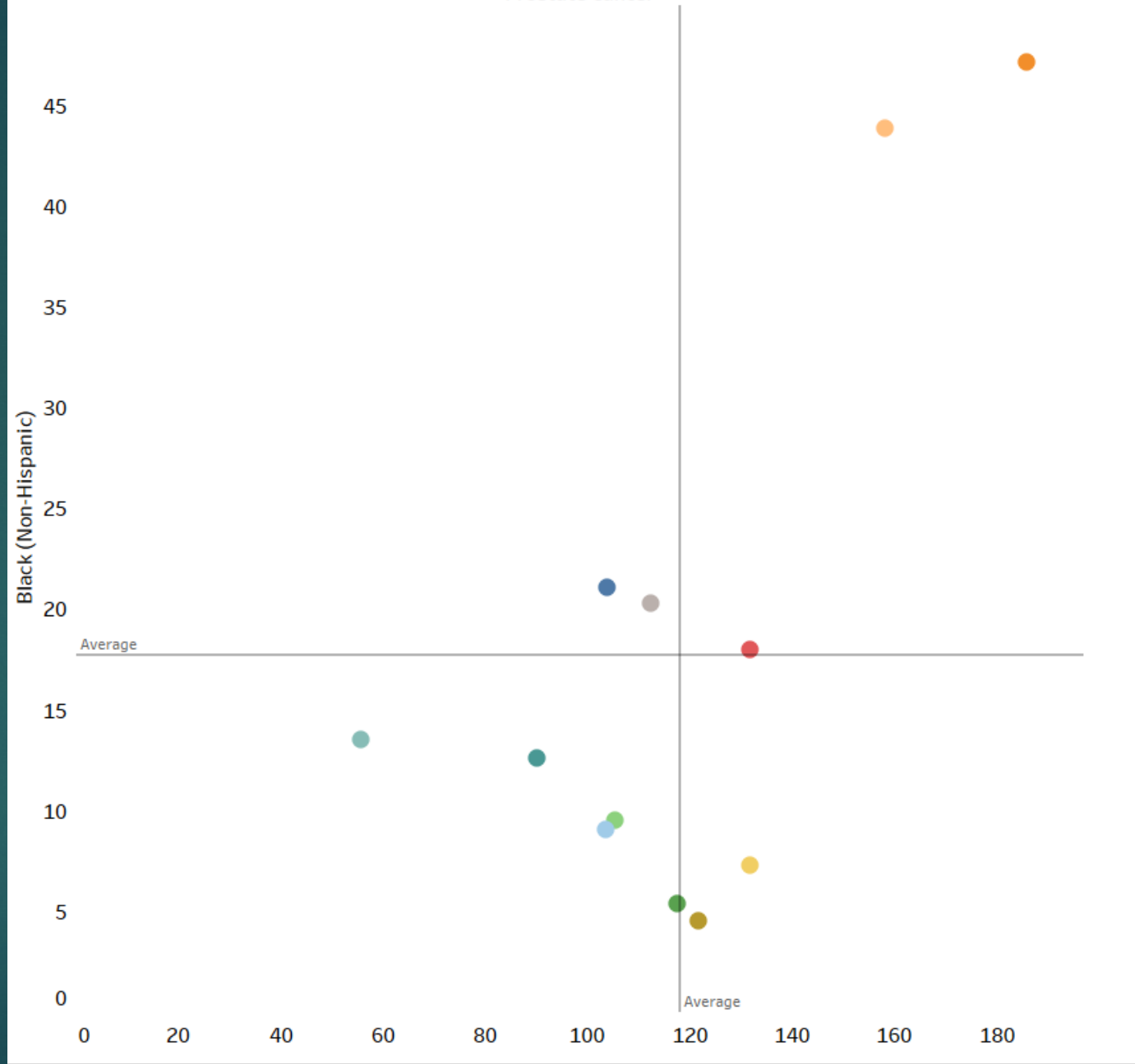
Age Adjusted Rate (per 100k)

Cancer mortality rates represent the number of cancer deaths per 100,000 people.

Data Source: State Cancer Profiles (SCP) (2016-2020)



Prostate Cancer



- County
- Alexandria City
  - Arlington County
  - Charles County
  - District of Columbia
  - Fairfax City
  - Fairfax County
  - Falls Church City
  - Loudoun County
  - Manassas City
  - Manassas Park City
  - Montgomery County
  - Prince William County