



Virginia Radiological Society  
ANNUAL MEETING

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RESORT  
AUGUST 13-14, 2022



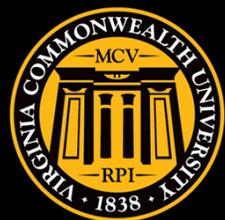
# Disparities in Lung Cancer Screening

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**Department of Radiology**



## Disparities in Lung Cancer Screening Disclosures

Leila Rezai Gharai, MD: Co-authorship Thoracic Imaging  
Textbook

### *Lung Cancer Screening*

Mark S Parker, Robert C. Groves, Joanna E Kusmirek, Leila  
Rezai Gharai, and Samira Shojaee; Thieme, New York; 2017

## Disparities in Lung Cancer Screening Overview

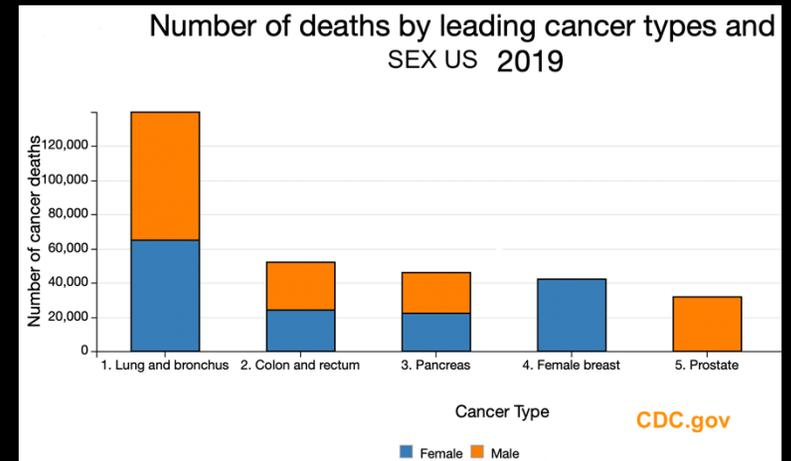
### Lung cancer in the US:

The second most common cancer  
The leading cause of cancer death in both men and women

### Most important risk factor for lung cancer is smoking

Smoking is estimated to account for about 80% of all lung cancer deaths

Relative risk of lung cancer is about 20 times higher in smokers than in non-smokers



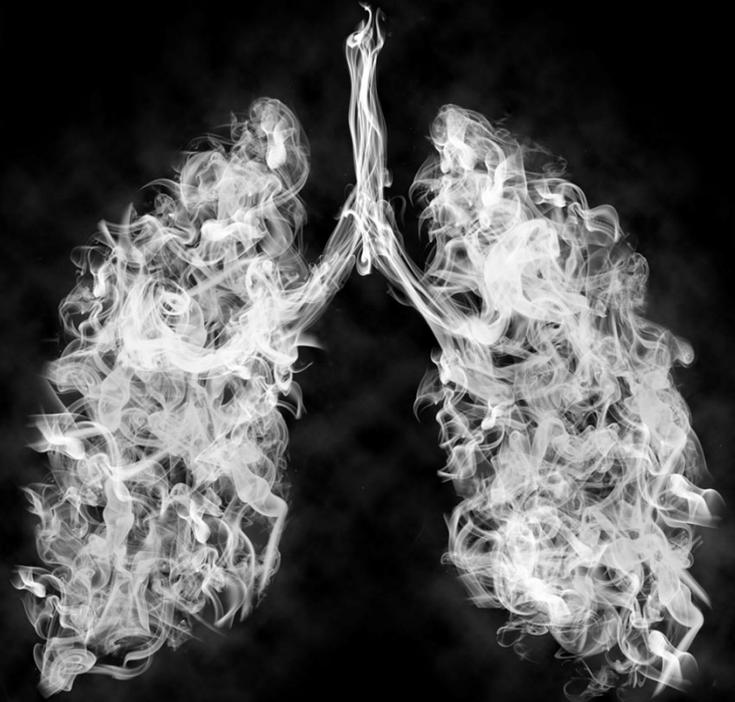
1. Screening for Lung Cancer: US Preventive Services Task Force Recommendation Statement. *JAMA*. 2021;325(10):962-970. doi:10.1001/jama.2021.1117
2. Alberg AJ, Brock MV, Ford JG, Samet JM, Spivack SD. Epidemiology of lung cancer: Diagnosis and management of lung cancer, 3rd ed: *American College of Chest Physicians evidence-based clinical practice guidelines*. *Chest*. 2013;143(5 Suppl):e1S-e29S. doi:10.1378/chest.12-2345
3. Samet JM. Health benefits of smoking cessation. *Clin Chest Med*. 1991;12(4):669-679.

## Disparities in Lung Cancer Screening Overview

The American Cancer Society's estimates for lung cancer in the United States for 2022 are:

About 236,740 new cases of lung cancer  
(117,910 in men and 118,830 in women)

About 130,180 deaths from lung cancer  
(68,820 in men and 61,360 in women)



4. <https://www.cancer.org/cancer/lung-cancer/about/key-statistics.html>

## Disparities in Lung Cancer Screening Overview

Annual low-dose computed tomography (LDCT) lung cancer screening has been utilized for early detection of cancer and timely intervention in an at-risk population.

If a lung cancer cannot be resected when it's first discovered, most patients will **die** within the **next 9-months**

Despite **surgical** and **chemo-radiation therapy** advances, in the absence of “**early detection**” the **5-year survival** for lung cancer is a dismal **20.5%**



National Lung Screening Trial Research Team, Aberle DR, Adams AM, Berg CD, Black WC, et al. Reduced Lung Cancer Mortality Rate with Low-Dose Computed Tomography. *N Engl J Med* 2011; 365(5): 395-409.

Ellis PM, Vandermeer R. Delays in diagnosis of lung cancer. *J Thorac Dis*. 2011;3:183–188.

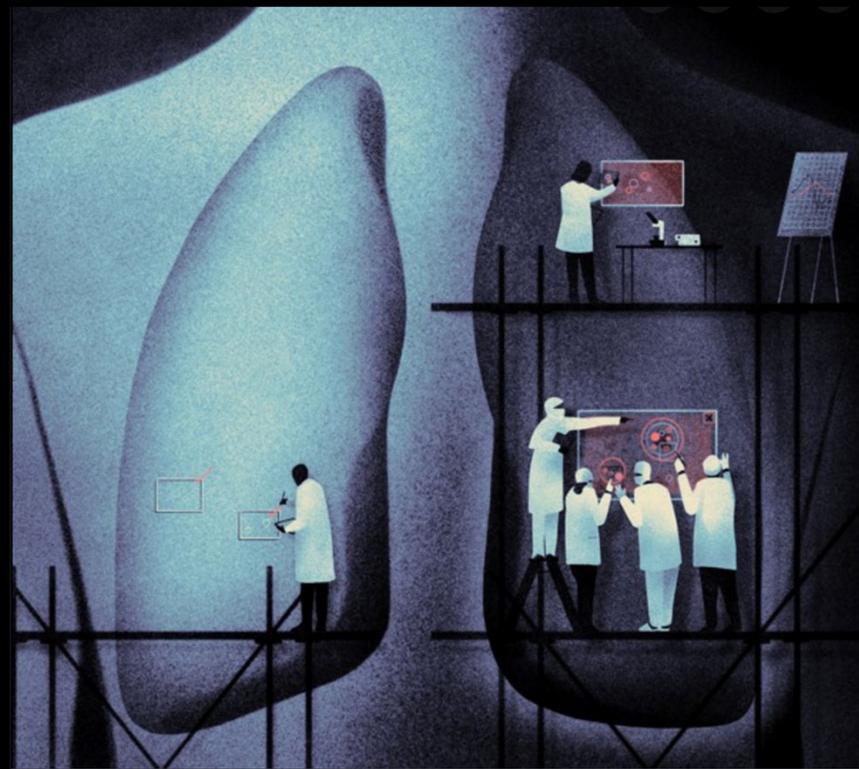
Henschke CI, Yankelevitz DF, Libby DM. **Survival of patients with stage I lung cancer detected on CT screening.** *N Engl J Med* 2006; 17: 1763-1771

Alberg AJ, Brock MV, Ford JG, Samet JM, Spivack SD. Epidemiology of lung cancer: Diagnosis and management of lung cancer, 3rd ed: *American College of Chest Physicians evidence-based clinical practice guidelines*. *Chest*. 2013;143(5 Suppl):e1S–e29S. doi:10.1378/chest.12-2345

## Disparities in Lung Cancer Screening Overview

Paramount importance to diagnose lung cancer **EARLY** while it is **small, confined** to the lung, **treatable** and potentially **curable**

Annual low-dose computed tomography (LDCT) lung cancer screening has been utilized for **early detection** of cancer and **timely intervention** in **at-risk populations**



8. Alberg AJ, Brock MV, Ford JG, Samet JM, Spivack SD. Epidemiology of lung cancer: Diagnosis and management of lung cancer, 3rd ed: *American College of Chest Physicians evidence-based clinical practice guidelines*. *Chest*. 2013;143(5 Suppl):e1S-e29S. doi:10.1378/chest.12-2345

## Disparities in Lung Cancer Screening

Background: NLST

### National Lung Screening Trial

Patient recruited 2002-2004  
Over 53400 participated  
Underwent LDCT scan or CXR  
Three annual screening

20% fewer lung cancer deaths in those screened with LDCT compared with x-ray

All cause mortality in NLST was 7% lower in LDCT group

1 in 100 high risk patients have lung cancer

Cancer death prevented 1 case is 320 (compare to mammography 1 per 1905 and flex sigmoidoscopy 1 per 871)

Opportunity to save 30,000 lives/yr

N Engl J Med 2011; 365:395-409

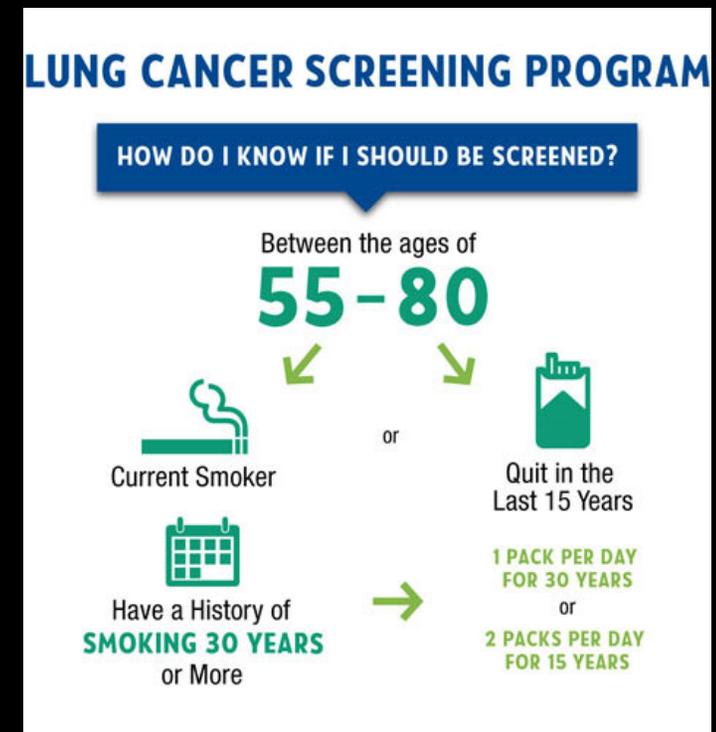
## Disparities in Lung Cancer Screening

### Background: USPSTF

On December 31, 2013, the USPSTF issued its **final recommendation statement** and released a **fact sheet** to aid in the implementation of lung cancer–screening programs for high-risk individuals.

The task force gave LDCT a “B” grade (the equivalent grade for screening mammography).

“B” grade → there is **high certainty** the net benefit is **moderate** or there is **moderate certainty** the net benefit is **moderate to substantial** and that this particular service should be provided.



## Disparities in Lung Cancer Screening

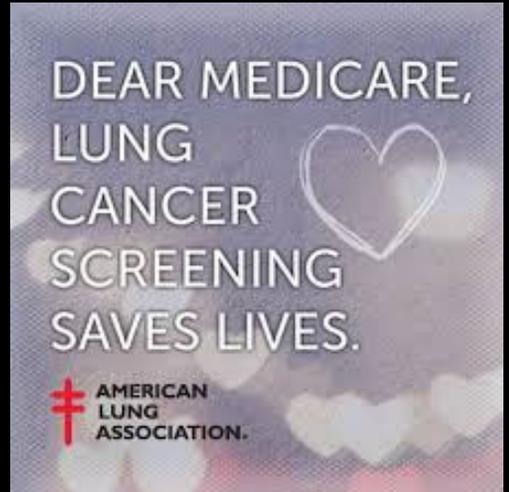
Background: Centers for Medicare and Medicaid Services (CMS)

In **2015**, CMS approved **reimbursement** LDCT lung screening for Medicare beneficiaries.

Persons eligible for LCS under CMS guidelines identical to those recommended by the USPSTF.

However, CMS **restricted** the age of eligible persons with Medicare to **55-77**-years as opposed to the 80-years.

CMS mandated that the primary health care provider must both **counsel and document** mutual participation in a **shared decision-making visit** prior to written order for LCS.



Benefits and potential harms of LCS,  
Need to adhere to annual screening and appropriate follow-up,  
Reinforcing **abstinence** for former smokers and **cessation** counseling or provision of resources for interested current smokers.

## Disparities in Lung Cancer Screening Racial Disparity

2014 lung cancer screening eligibility guidelines using the 30-pack-year criterion exclude a large percentage of high-risk, light-smoker **black** individuals.

Secondary analyses of the Framingham Heart Study found **60%** of lung cancer cases met eligibility criteria for USPSTF lung cancer screening guidelines

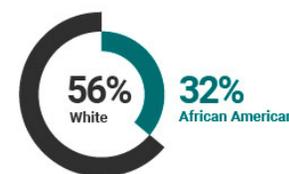
J Natl Cancer Inst 2018; 110:1201–1207.

### Racial Disparities in Lung Cancer Screening

Previous federal guidelines recommended CT screening for smokers age 55 to 80 with a 30 pack-year history and who still smoke, or have quit only within the past 15 years. Researchers observed several disparities in these guidelines that put African American smokers at risk.

#### Screening Eligibility

Among smokers diagnosed with lung cancer, **56% of Whites** and **32% of African Americans** met the guidelines' eligibility.



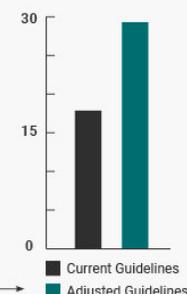
#### Smoking Pack-Year Requirements

**~50% of African American smokers**

did not meet the minimum 30 pack-year requirement for a screening.

Adjusting the requirement from **30 to 20 pack-years**

for African Americans increases chances of curative treatment and the number of African American smokers for screening from **17.4% to 28.5%**.



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## Disparities in Lung Cancer Screening

### Racial Disparity

#### AFRICAN-AMERICAN MEN AND LUNG CANCER

PROTECT YOUR FAMILY AND YOURSELF!

AFRICAN-AMERICAN  
MEN have the HIGHEST  
RATES OF LUNG CANCER  
in the U.S.

LUNG CANCERS  
are mostly  
caused  
by SMOKING.

When you  
smoke around  
your family,  
EVERYONE  
SMOKES!

The smoke from your  
cigarettes, called secondhand  
smoke, can cause lung cancer  
and other health problems in  
PEOPLE WHO HAVE NEVER  
SMOKED, EVEN KIDS.

There's  
NO SAFE WAY  
to smoke.

Menthol cigarettes are  
JUST AS DANGEROUS  
as non-menthol cigarettes.

IT'S NEVER TOO LATE TO QUIT.

YOUR RISK FOR LUNG CANCER GOES DOWN WHEN YOU QUIT,  
no matter how old you are or how long you have smoked.

Quitting can be hard, and you may need help.  
For free help quitting, visit [SMOKEFREE.GOV](http://SMOKEFREE.GOV),  
call 1-(800)-QUIT-NOW, or text the word QUIT  
to 47848 from your mobile phone.



U.S. Department of  
Health and Human Services  
Centers for Disease  
Control and Prevention

Black individuals who smoke compared to non-Hispanic White individuals:

Higher risk of lung cancer **incidence**

**Earlier presentation**

**Higher mortality**

**Despite less smoking intensity**

Among NLST participants, Black individuals compared to non-Hispanic white individuals:

**More likely less educated,**

**More comorbidities,**

**More likely to be “current” smokers**

J Thorac Oncol. 2020;15(11):1738-1747

Cancer Causes Control. 2006;17(8):1017-1024

Am J Respir Crit Care Med. 2015;192(2):200-208

## Disparities in Lung Cancer Screening

### Racial Disparity

Black males and American Indian/Alaskan Natives have the **highest** prevalence of smoking.

Black individuals diagnosed with lung cancer are more likely to be intermittent or light smokers than their white counterparts with fewer accumulated pack-years .

Black individuals are more likely to start smoking later in life and smoke fewer cigarettes per day than white smokers.

Centers for Disease Control and Prevention; 2014.  
MMWR Morb Mortal Wkly Rep 2018;67:53–59.  
N Engl J Med 2006;354:333–342.  
Nicotine Tob Res 2016;18:S16–S29.



## Disparities in Lung Cancer Screening Racial Factors

Black current smokers are **four** times more likely to **die** from lung cancer than black former smokers in the NLST.

Black individuals have decreased smoking cessation rates compared with white individuals.

Possibly **high prevalence** of **menthol** cigarette use in black smokers compared with white smokers. Menthol higher levels of **dependence** and addiction, making quitting more difficult.

Am J Respir Crit Care Med 2015;192:200–208.  
N Engl J Med 2006;354:333–342.  
Nicotine Tob Res 2016;18:S16–S29.

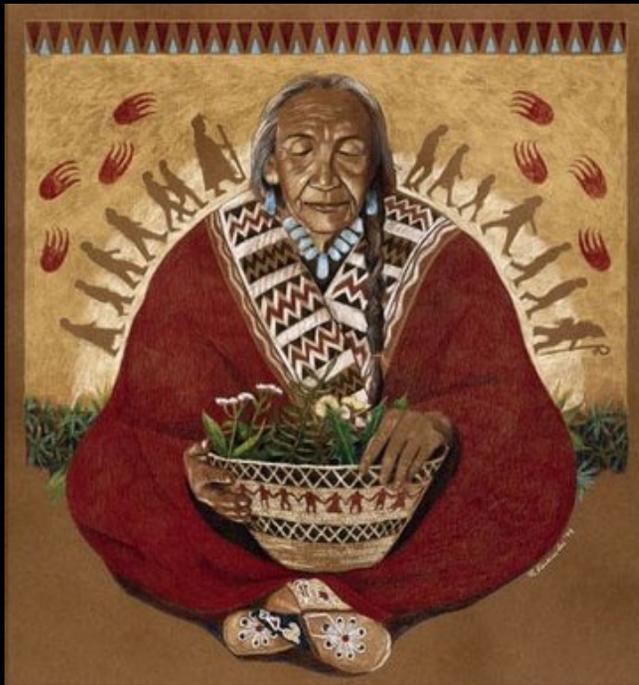


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## Disparities in Lung Cancer Screening

### Racial Factors

American Indian and Alaskan Native populations have nearly **three times** higher rates of lung and colorectal cancer incidence compared with other ethnic/racial groups.



The highest overall prevalence of cigarette smoking yet have lower incidence and mortality rates than white and black individuals

Pena et al. ARRS 2022  
[https://seer.cancer.gov/csr/1975\\_2016/](https://seer.cancer.gov/csr/1975_2016/)



Patterns are strongly influenced by:

- Income
- Rurality
- Education
- Transportation

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## Disparities in Lung Cancer Screening

### Faces of Disparity

Life expectancy three years shorter and heart disease, cancer, and stroke death rates significantly higher in rural areas (23% of the U.S. population) vs. metropolitan areas.

Black males have the highest rates of age-adjusted lung cancer incidence among all U.S. racial/ethnic groups, specifically 73.5 per 100,000, versus 63.5 per 100,000 for white males.

HIV-positive patients, are also at high risk and experience lung cancer incidence three times higher than the general population.

**Largest** socioeconomic disparity reported in lung cancer.

ACR Bulletin, Aug 2022, Vol. 77, No. 8

CA Cancer J Clin 2011;61:212–236.

Ann Am Thorac Soc Vol 17, No 4, pp 399–405, Apr 2020



## Disparities in Lung Cancer Screening

### Disparity in Cessation

LCS has maximum benefit when combined with **smoking cessation**. Screening with LDCT in the NLST together with smoking cessation at 15 years demonstrated a 38% decrease in lung cancer–specific mortality.

**Underrepresented racial/ethnic groups** less likely to be offered smoking cessation by a healthcare provider than white smokers.



Am J Respir Crit Care Med 2016;193:534–541

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## Disparities in Lung Cancer Screening Disparity in Cessation

These lower rates of tobacco cessation counseling by a provider as well as decreased use of pharmaceutical aids among Hispanic and black smokers persist even after adjusting for socioeconomic status.

The uninsured are also significantly less likely to be offered smoking cessation by a provider than those with insurance.

Low health literacy is associated with decreased use of preventive services such as smoking cessation programs.



MMWR Morb Mortal Wkly Rep 2017;65:1457–1464.  
Am J Prev Med 2008;34: 404–412.  
Ann Intern Med 2011;155:97–107.

## Disparities in Lung Cancer Screening

### Contributing Factors: Race and Ethnicity

Black smokers have lower rates of lung cancer screening than white smokers.

Black participants in the LDCT arm of the NSLT study had greater reduction in both lung cancer and all-cause mortality than white participants, despite low participation (4.4% black vs. 90.9% white).

In a more diverse screening population with a higher percentage of black individuals (69.6%), lung cancer screening detected a larger percentage of cancers than the NSLT study 2.6% vs. 1.1%, with the majority being early-stage lung cancer.



Prev Med Rep 2018;10:49–54.  
Am J Respir Crit Care Med 2015;192:200–208.  
JAMA Oncol 2018;4: 1291–1293.

Despite having greater lung cancer incidence, black smokers are less likely to be eligible for screening (40, 41), as the current lung cancer screening guidelines with the 30 pack-year inclusion criteria exclude a higher proportion of high-risk black smokers because of their lower average cigarette per day consumption compared with white smokers.

Black smokers are also at greater risk of developing lung cancer at an earlier age, with the highest difference in age- adjusted incidence between black and white smokers noted in the 50- to 54-year-old age range, earlier than the currently recommended minimum screening age of 55 years (10).

*J Racial Ethn Health Disparities* 2019;6:22–26.  
*BMJ Open Respir Res* 2016;3:e000166.  
*JAMA Oncol.* 2019;5(9):1318-1324

## Disparities in Lung Cancer Screening

### Contributing Factors: Rurality

Disparities in lung cancer incidence between white and black men and women worsen in rural geographic regions versus urban areas.

The prevalence of cigarette smoking is higher in rural counties  
Adolescents in rural communities start smoking earlier.

Lung cancer incidence for individuals living in rural areas is estimated to be **20% higher** than those living in urban areas.



J Thorac Oncol 2018;13:497–509.  
J Cancer Epidemiol 2011;2011:107497.  
Ann Am Thorac Soc Vol 17, No 4, pp 399–405, Apr 2020

## Disparities in Lung Cancer Screening

### Contributing Factors: Rurality

Rural residents, including those in regions with high lung cancer burden, are less likely to have a comprehensive accredited screening facility within 30 miles of their residence.

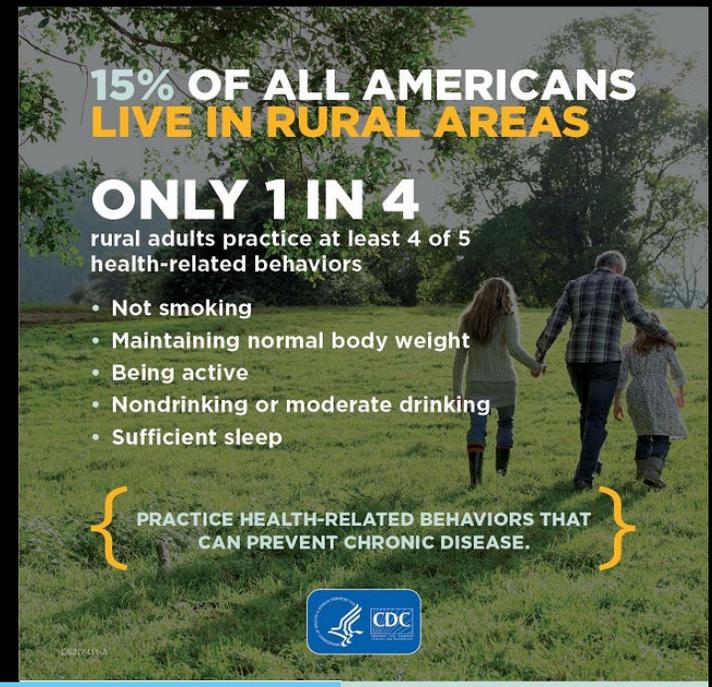
### Strategies:

Increase access to screening should focus on these areas where geographic access to both lung cancer screening centers and high-quality treatment is limited.

J Thorac Oncol 2018;13:497–509.

J Cancer Epidemiol 2011;2011:107497.

Ann Am Thorac Soc Vol 17, No 4, pp 399–405, Apr 2020



## Disparities in Lung Cancer Screening

### Contributing Factors: Environmental and Occupational Exposures

Often more common in underrepresented minority populations and those with lower socioeconomic status.

Radon is present in soil, concentrated in enclosed spaces such as mines and homes, and has been identified as the second leading cause of lung cancer after cigarette smoking.

Asbestos, chromium, arsenic, and air pollution

Targeted occupational screening questions could be considered for high-risk individuals with subsequent referral for screening.



smoking



Lung disease  
(like COPD)



chemical exposure



radon exposure



secondhand  
smoke



air pollution

J Thorac Dis 2013;5:S440–S445.  
Clin Chest Med 2012;33:681–703.

## HIV Infection

Lung cancer is the leading cause of non-AIDS-defining cancer deaths, and lung cancer incidence in HIV-positive patients is significantly higher than the general population (5).

Age of lung cancer onset in HIV-positive patients is 25 to 30 years earlier than the general population (5).

HIV-infected patients have an estimated 52% excess lung cancer risk when compared with noninfected individuals (60).

median survival is between 3.5 and 6.3 months

smoking prevalence ranging from 25% to 80%, two to three times higher than the general population

Current lung cancer screening guidelines perform poorly in individuals living with HIV (62).

A modified Lung Cancer Policy Model that mirrors the distinctive aspects of lung cancer screening in HIV-infected individuals appears to provide similar mortality reduction in HIV-infected persons with a CD4<sub>+</sub> cell count of >500 cells/ml, as in the general population (63).

Policy to be determined

J Natl Cancer Inst 2015;107:dju503.  
AIDS 2018;32: 1333–1342.  
Chest 2013;143:305–314.

## Disparities in Lung Cancer Screening Contributing Factors: Access to Care

CMS approved coverage for adults aged 55 to 77 years, mandating an accompanied shared decision-making visit

This expanded coverage of lung cancer screening for Medicare beneficiaries but not for eligible Medicaid beneficiaries

Medicaid eligibility is determined at the state level

Employer-based and private health insurance plans, states that have adopted the Medicaid expansion package, are required to cover this Grade B USPSTF recommendation.

Lack of coverage in states that did not adopt Medicaid expansion lead to socioeconomic disparities in access to LCS



Improving access to healthcare systems, both financial with insurance coverage and geographic

<https://www.cms.gov/medicare-coverage-database/details/nca-decision-memo.aspx?NCAId=274>.

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However, states that have not adopted Medicaid expansion leave high-risk patients without insurance coverage for lung cancer screening.

As low-income individuals who often depend on Medicaid coverage have the highest rates of tobacco use (27),

More than half of those who qualify for lung cancer screening on the basis of USPSTF recommendations are estimated to have Medicaid or be uninsured (70).

, is important in addressing the burden of lung cancer in vulnerable populations.

JAMA Oncol 2017;3: 1278–1281.  
MMWR Morb Mortal Wkly Rep 2018;67:53–59.

## Disparities in Lung Cancer Screening

### Contributing Factors: Patient Level Barriers

Black and Hispanic populations report higher levels of **physician mistrust** than white populations, with large variability among individuals with disparate socioeconomic status, geographic location, and insurance



**Underrepresented racial/ethnic populations and individuals with low socioeconomic status demonstrate greater beliefs of fatalism, nihilism, and the futility of medical intervention, frustrates attempts at cancer prevention, such as smoking cessation and LCS**

Address community beliefs regarding the importance of smoking cessation and risk of lung cancer, low socioeconomic status.

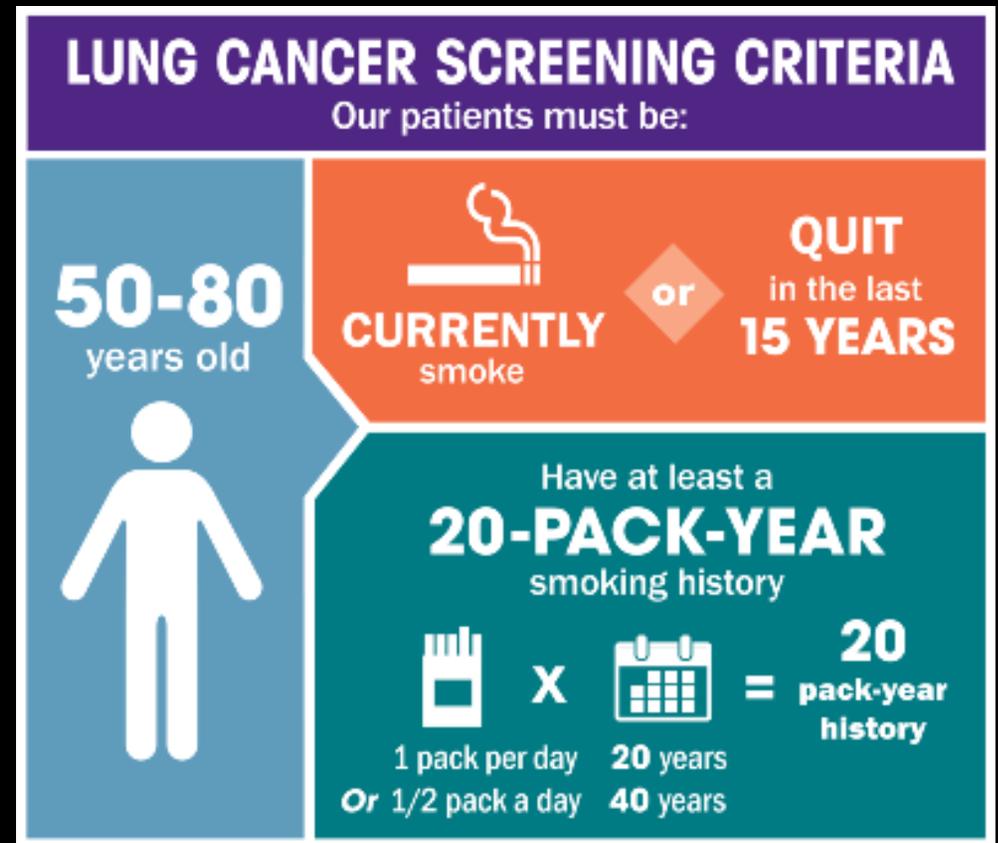
J Clin Oncol 2013;31:1002–1008.  
Ann Intern Med 2003;139: 558–563.  
Cancer Epidemiol Biomarkers Prev 2007; 16:998–1003.

## Disparities in Lung Cancer Screening

### Background: USPSTF

LDCT has high sensitivity and reasonable specificity for lung cancer detection

**2021:** The United States Preventive Services Task Force (USPSTF) “updated” its recommendations on the use of low-dose CT (LDCT) for the early detection of lung cancer and expanded the definition of high-risk persons that should be screened



<https://www.cancer.org/cancer/lung-cancer/about/key-statistics.html>

<https://www.umchealthsystem.com/medical-services/cancer-care/services-programs/lung-cancer-screening>

## Disparities in Lung Cancer Screening New Guidelines

### Eligibility for CT lung cancer screening by race and sex, by year of USPSTF recommendation

Factor	2013	2021
Non-Hispanic white	87.0%	83.7%
Non-Hispanic Black	6.9%	7.7%
Hispanic	3.5%	4.1%
Non-Hispanic Asian	2%	3.7%
Males	57.5%	55.4%
Females	42.5%	44.6%

The number of eligible individuals grew from 7.9 million under the 2013 guidelines to 14.2 million under the 2021 recommendation, a relative increase of 81.4%

Madden Yee et al. Cancer Medicine. 2022

## Disparities in Lung Cancer Screening New Guidelines

New guidelines issued by USPSTF in 2021 to expand lung cancer screening (LCS) eligibility and mitigate disparities

Nearly doubled the number of population eligible for LCS

Update's impact on drivers of disparities is less clear

Black individuals disproportionately share late-stage lung cancer diagnoses, despite being lighter smokers

Same group negatively affected by demographic factors like lacking access to transportation and appointment wait times

Ongoing socioeconomic disparities that need to be addressed to ensure equitable access



**50-80**   
Age range recommended for lung cancer screening for those at high risk under USPSTF guidelines

Madden Yee et al. Cancer Medicine. 2022

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## Disparities in Lung Cancer Screening Lack of Adherence

When comparing National Health Interview Survey data from 2010 and 2015  
No change nationally in the prevalence of LCS (3.3% vs. 3.9%) before or after implementation of the 2013 USPSTF screening recommendation

Reasons for this lack of screening uptake:

- Limited **access** to screening
- Limited patient **acceptance**
- Lack of physician knowledge about screening guidelines

J Natl Cancer Inst 2017;109:1–22.  
J Natl Compr Canc Netw 2019;17:339–346.  
Lung Cancer 2017; 104:38–44.

### How does facility location affect access to lung cancer screening?

A 2018 JACR study explored the average **driving distance** for **people who smoke** to the nearest **ACR-accredited CT facility**.



**81.8%**  
of people who smoke live within  
**15 miles** of a CT facility



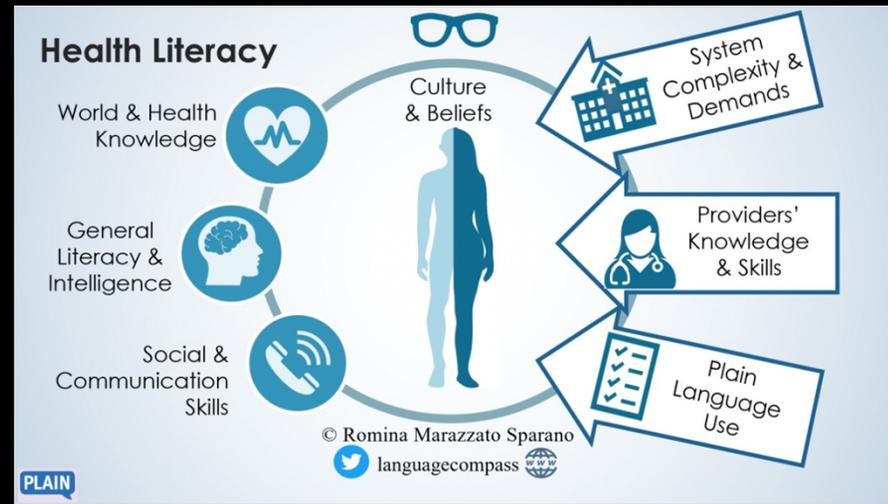
Lower population density = longer  
average distance



Certain smoking populations, particularly those in **rural areas**, may lack **access** to nearby **CT facilities** for **lung cancer screening**. This may lead to **lower rates of lung cancer screening** in some **screen-eligible** populations.

JACR VISUAL ABSTRACT

## Disparities in Lung Cancer Screening Lack of Adherence



Reduce barriers to screening and improving lung cancer outcomes among minority populations,

At the patient level:

Integrating patient navigators

Interventions to address health literacy

Efforts to reduce medical mistrust



Madden Yee et al. Cancer Medicine. 2022

Screening in Underserved Communities, ACR, July 2022

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## Disparities in Lung Cancer Screening

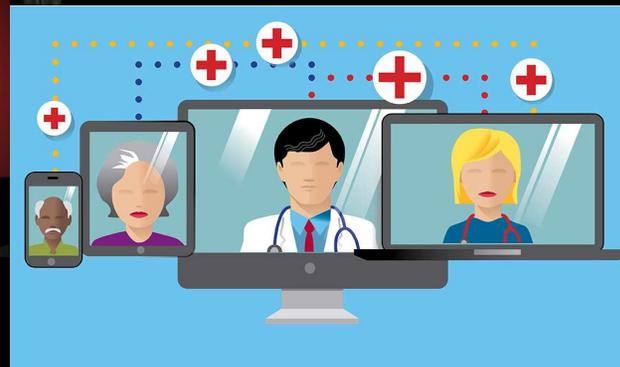
How can these disparities be mitigated?

Increasing accessibility through:

Mobile clinics,

Telehealth

Other innovations in care delivery may help to reduce some barriers to screening



Madden Yee et al. Cancer Medicine. 2022  
Screening in Underserved Communities, ACR, July 2022

## Disparities in Lung Cancer Screening

### What we do at VCUHS

VCUHS LCS program started in 2012,  
We offered free LCS in Nov 2013 and  
2014

VCU Medical Center is the first facility in the state of Virginia to be designated by the American College of Radiology as a Lung Cancer Screening Center. As an ACR-designated Lung Cancer Screening facility, we are dedicated to providing high quality screening care and patient safety.



In 2015, a dedicated LCS program coordinator was recruited; in 2021 second  
So far we have done over 5400 LDCT  
Amongst numerous category S comorbidities found on our scans: Thymoma,  
thyroid CA, renal CA, cardiac disease, ILD

## Disparities in Lung Cancer Screening

### What we do at VCUHS

Through collaborative efforts of the Departments of Radiology/Thoracic Imaging and Pulmonology:

**VCUH LCS Clinic** at the VCU Medical Center at Stony Point in 2017

*Mission: "To save lives"*

**"one-stop-shop" for lung cancer screening**

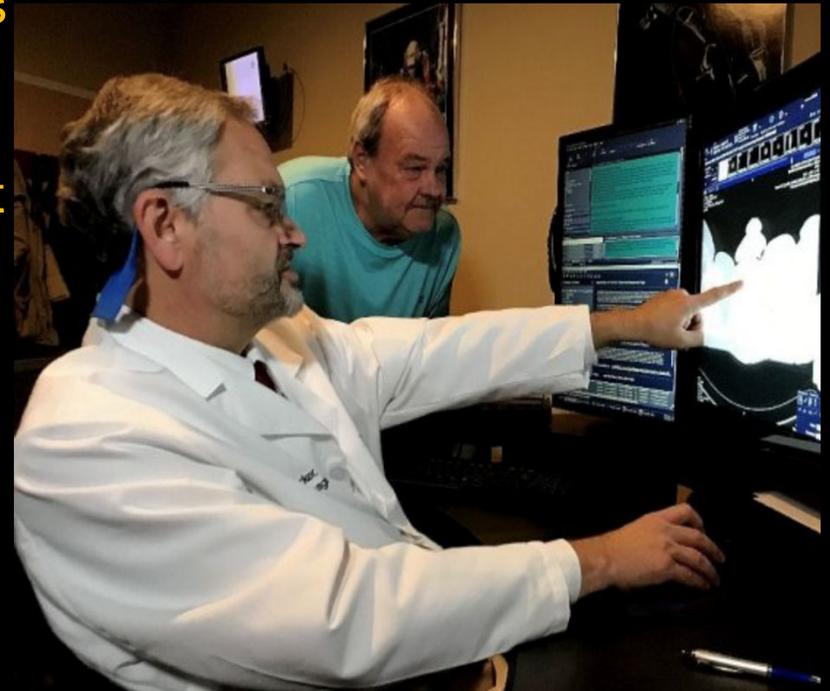
- Shared decision making

- LDCT

- Pulmonology clinic

- Smoking cessation counseling

**Partnership with Massey Cancer Center**





## Disparities in Lung Cancer Screening

### What we do at VCUHS

Reached out to the community:  
Invested in educational videos, pamphlets,  
billboards etc.

Radio and local TV interviews

Two lung cancer screening navigator

Liaison between outside providers and VCU

Network with providers both within and outside  
the VCU system in monthly meetings.



## Disparities in Lung Cancer Screening

### What we do at VCUHS

Network with outreach liaisons between outside providers and referral services (biweekly)

Educational material provided to various NPs, PAs and other navigators in their primary care specialty clinics (minority patients)

Collaborate with Tappahannock Riverside Hospital, took over program

Grand Rounds to Tappahannock providers

Our navigator go out into the community and meet with individual practices to educate them

Significant positive result and impact in our demographic data



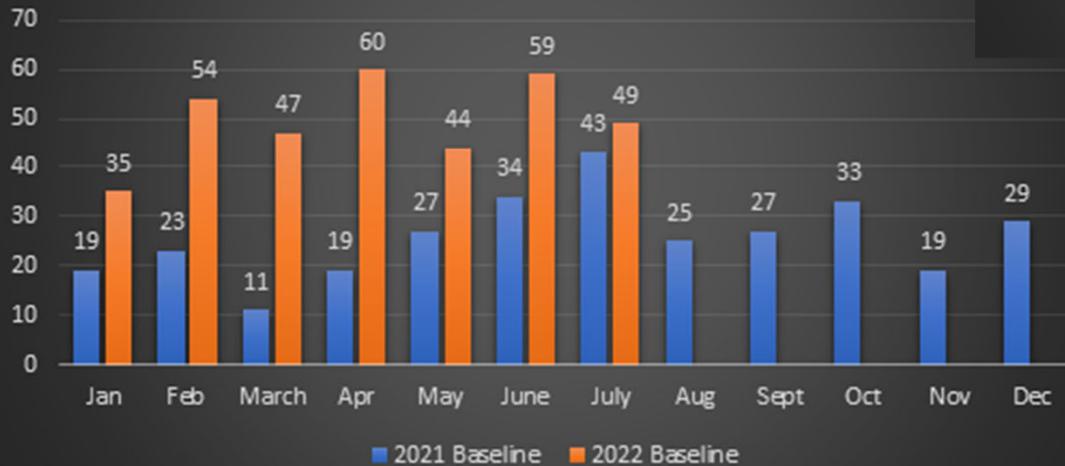
Where  
there's  
smoke,  
there could  
be cancer.



# Disparities in Lung Cancer Screening

## What we do at VCUHS

2021 v 2022: VCUHS/Tapp  
Baseline Scans by Month

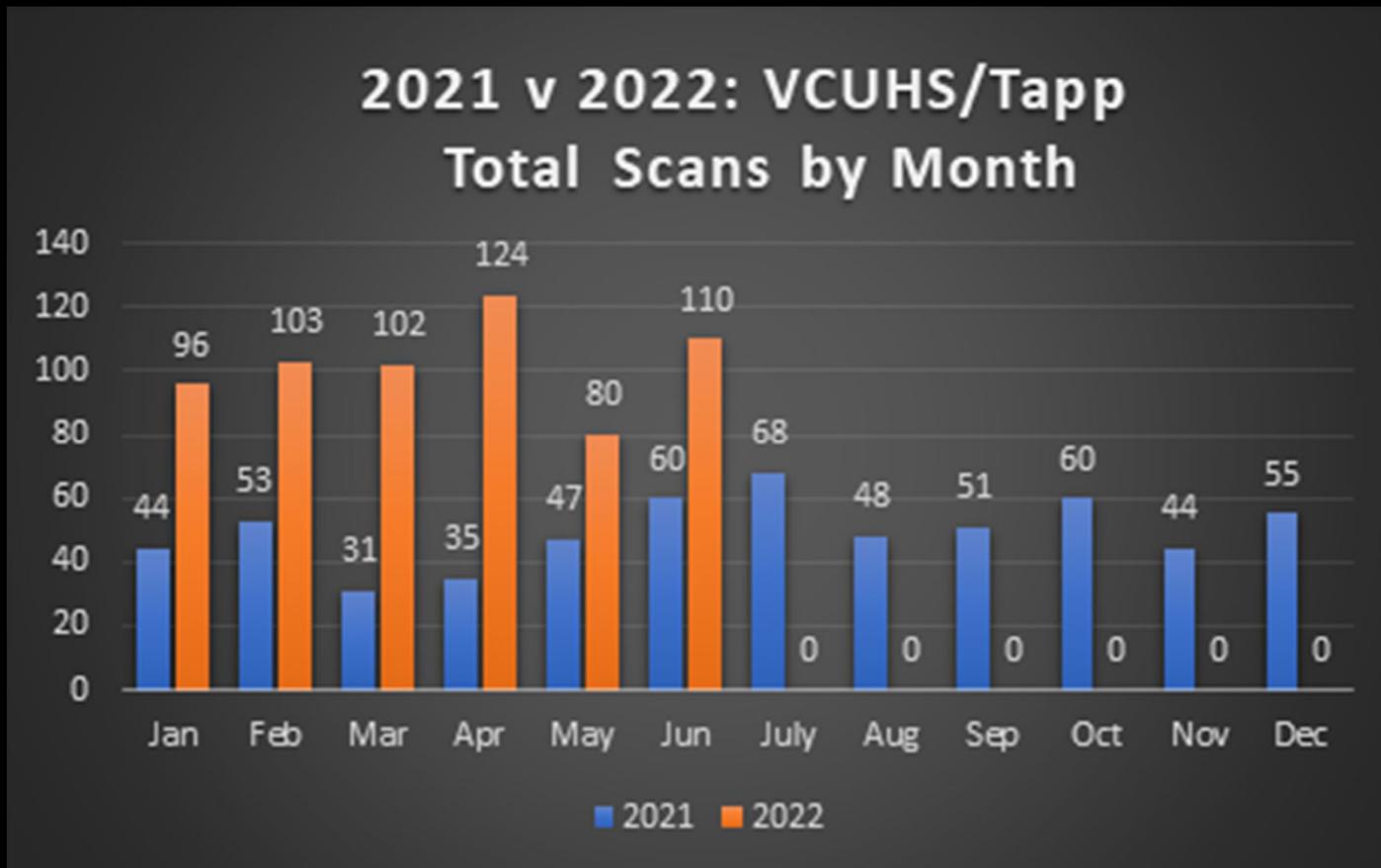


2021 v 2022: VCUHS/Tapp  
Annual Scans by Month



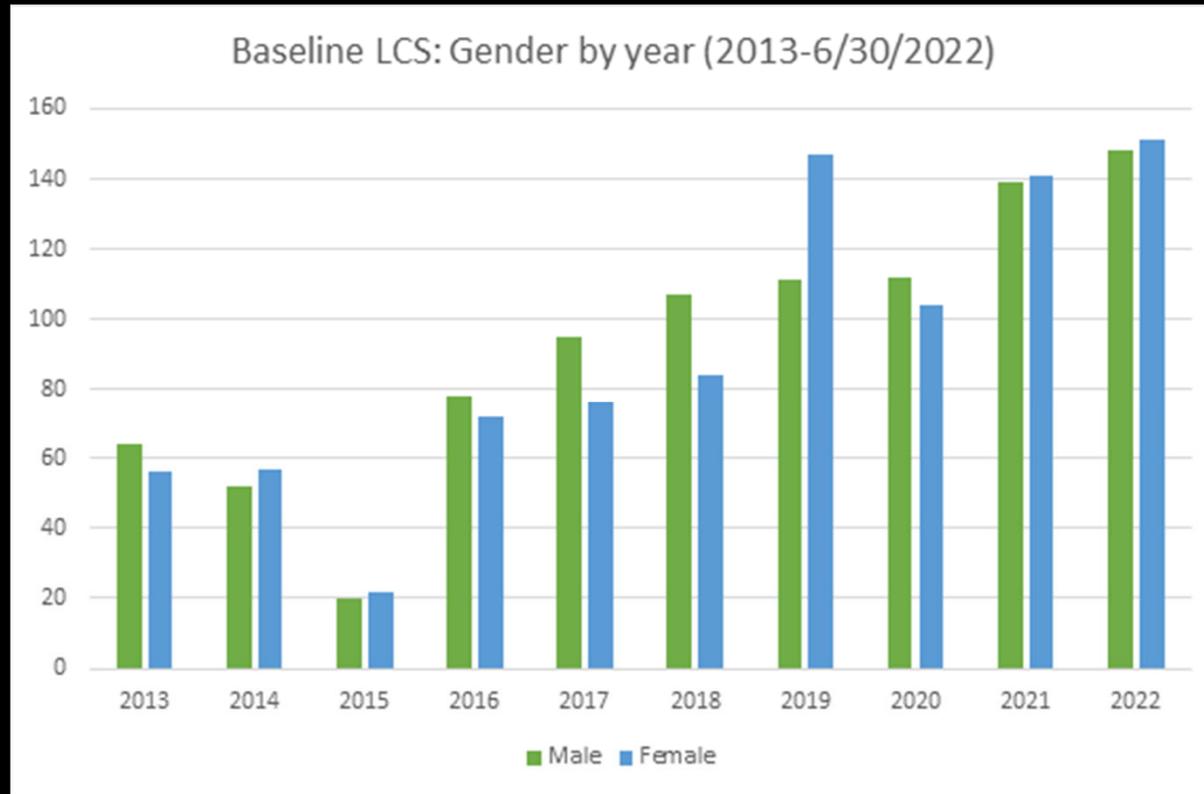
## Disparities in Lung Cancer Screening

What we do at VCUHS



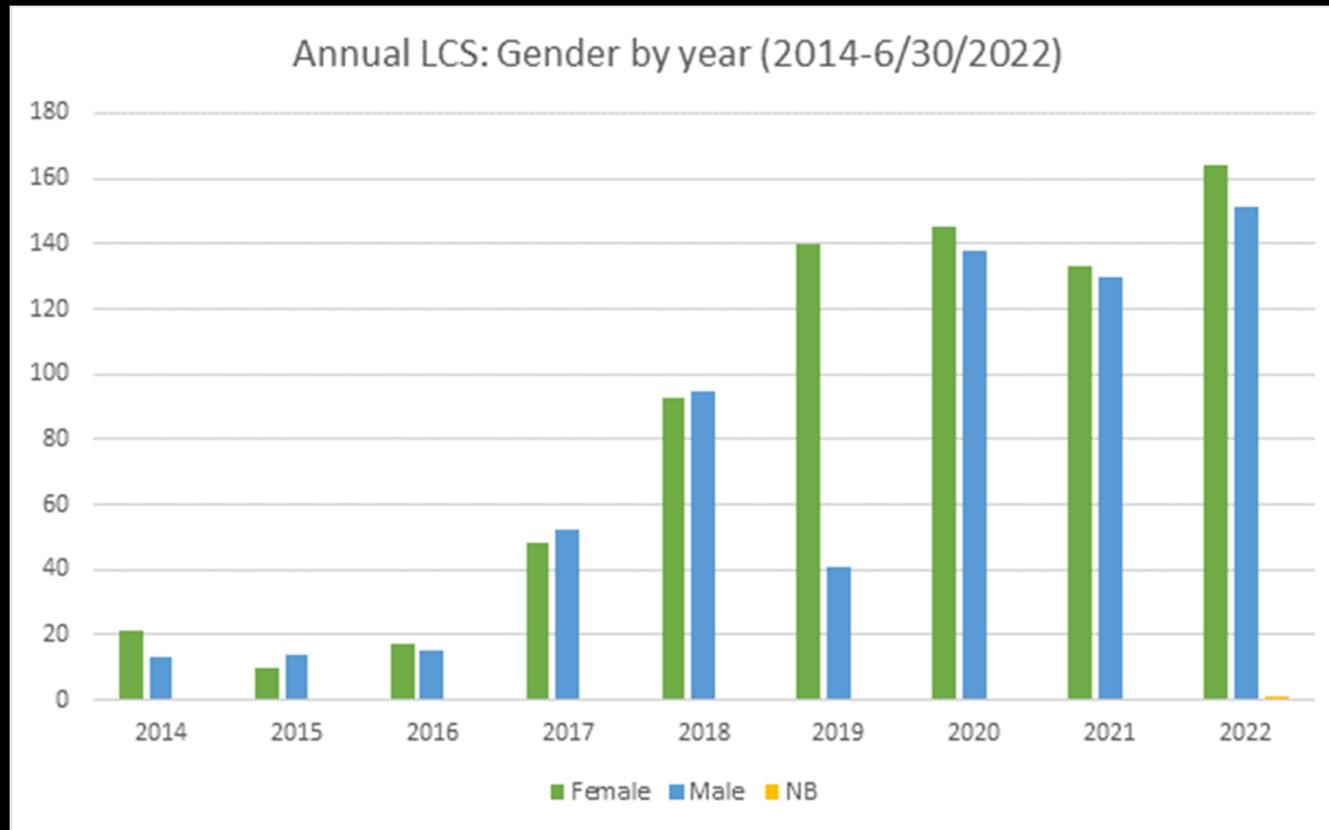
## Disparities in Lung Cancer Screening

### What we do at VCUHS



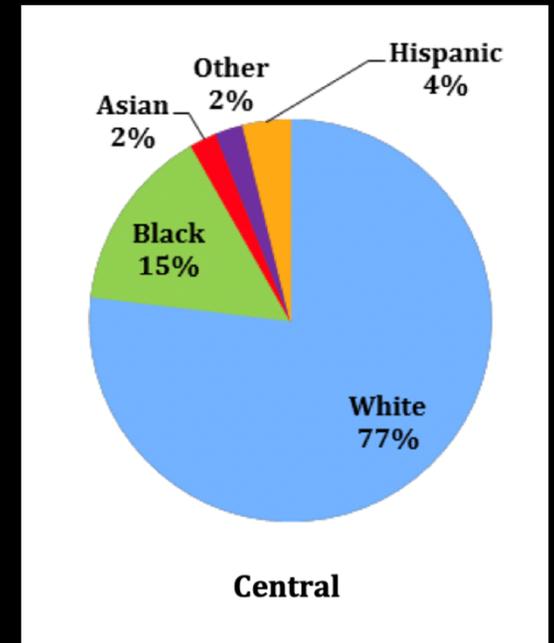
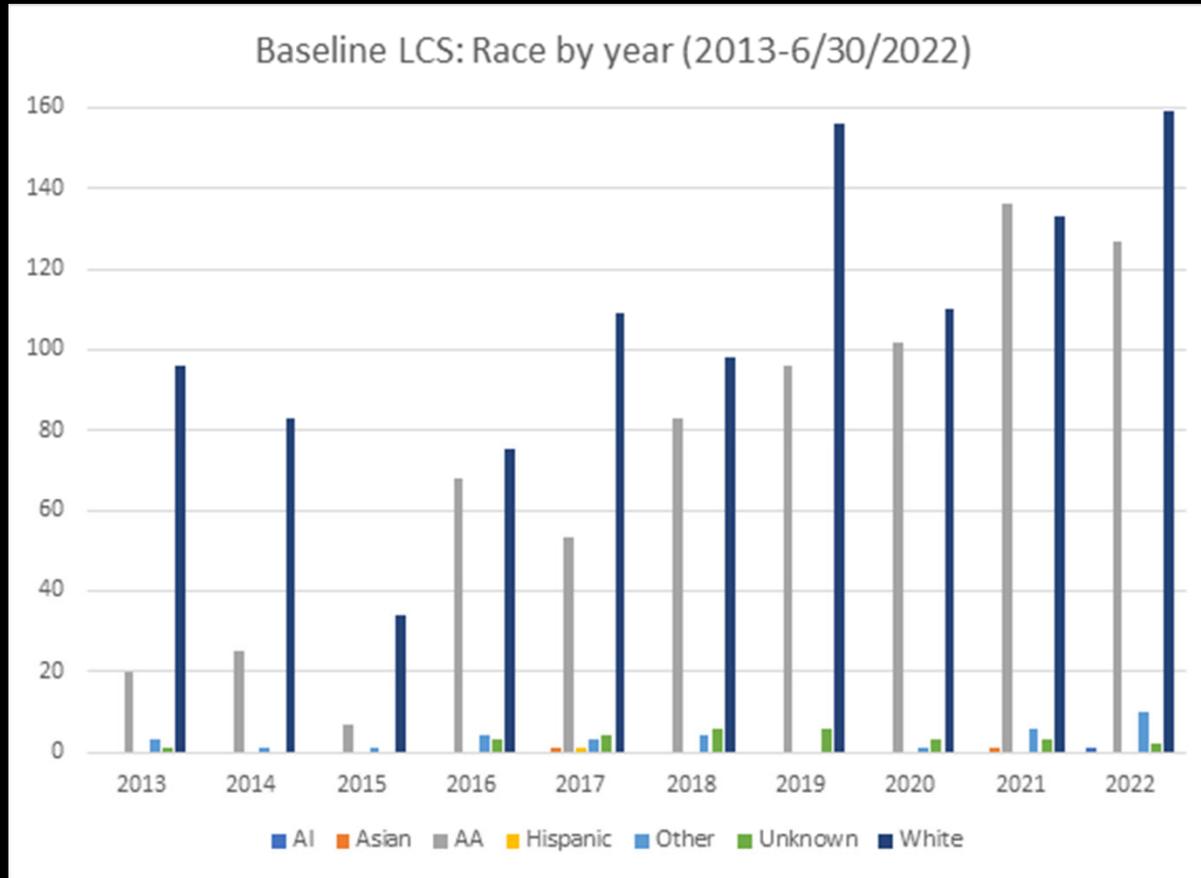
## Disparities in Lung Cancer Screening

### What we do at VCUHS



# Disparities in Lung Cancer Screening

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## Disparities in Lung Cancer Screening Acknowledgement

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For providing VCUHS data.



# Disparities in Lung Cancer Screening

Thanks for your attention.

**Address  
Disparities  
in Lung  
Cancer  
Screening**

