ALABAMA PUBLIC HEALTH

EPA National Radon Program Services
sosradon.org

St. Elizabeth HEALTHCARE

THE INTERSECTION OF RADON AND LUNG CANCER SCREENING

Michael Gieske, MD
Director Lung Cancer Screening
Physician Advisor Advocacy

April 1, 2025

St. Elizabeth PHYSICIANS

DISCLOSURES

Association Cancer Care Centers (ACCC)

Consultant - RALCSI, Rural Appalachian Lung Cancer Screening Initiative

Lungevity

Consultant – ELCC, Early Lung Cancer Center

Astra Zeneca

Consultant – THIS, The Health Innovation Summit for Lungs

Lung Ambition Alliance

Research

Delfi

Nucleix

World Health Organization (WHO); International Agency for Research on Cancer (IARC)

St. Elizabeth Healthcare

The St. Elizabeth Healthcare Thoracic Oncology Team

$140 Million Center
244,000 Square Feet
Largest Cancer Center
Within a 250-mile Radius

Yung Cancer Center
Opened to patients October 2020

$44 Million Center

Dearborn Cancer Center
Opened to patients April 2024

ST. ELIZABETH PHYSICIANS

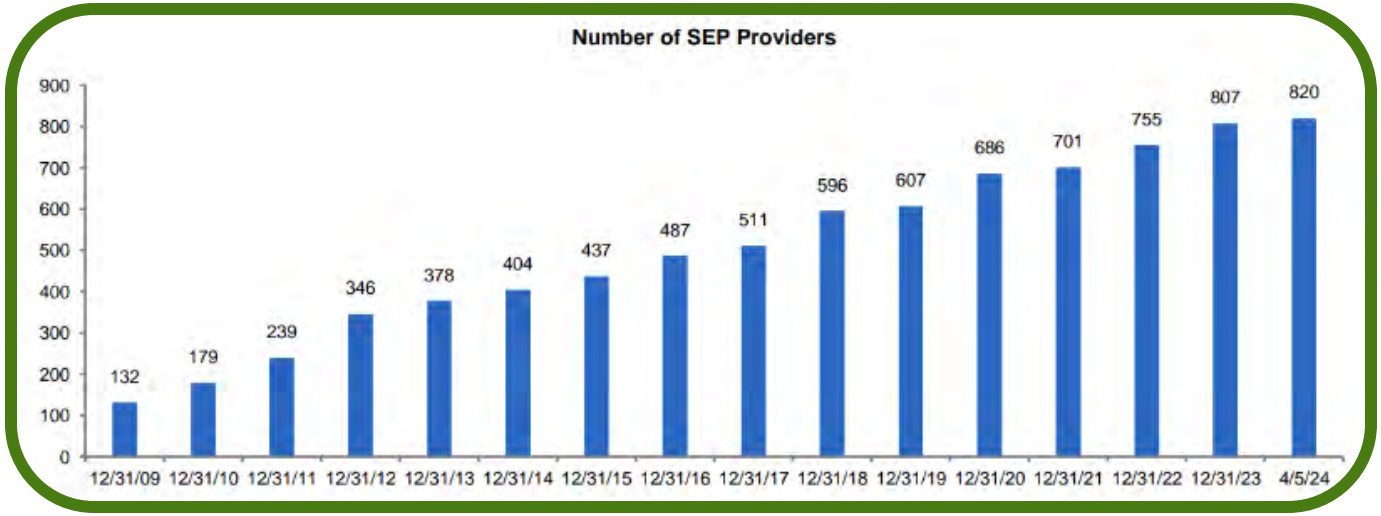
- Serving over **401,000 patients**
- **820 Providers**
  - 506 Physicians
  - 314 Advanced Practice Providers
- **2,500 Associates** (including providers)
- 44 Specialties & Services
- 90 Practices / 64 Locations
- 2 States / 11 Counties
- One in two patients participating in value-based care programs
- CBO 4 time recipient of HFMA MAP award
- 88% patients active users of patient portal
- 2020 recipient of AMGA Acclaim award

In 2023

- **Nearly 2.1 million visits, 6% virtual visits**
- Nearly $540 million in gross revenue
- Net growth of 11% physicians and providers
- 6.42% of Primary Care visits performed virtually

44 SPECIALTIES & SERVICES

- Addiction Medicine
- Bariatric Surgery
- Behavioral Health
- Breast Surgery
- Cardiology
- Colon & Rectal Surgery
- Critical Care
- Dermatology
- Electrophysiology
- Emergency General Surgery
- Endocrinology
- Family Medicine
- Gastroenterology
- General Surgery
- Geriatrics
- Hospital Medicine
- Infectious Disease
- Internal Medicine
- Internal Medicine/Pediatrics
- Medical Oncology
- Medical Weight Management
- MOHS Surgery
- Neurology
- Obstetrics & Gynecology
- Occupational Medicine/Business Health
- Ophthalmology
- Osteopathic Manipulation Medicine
- Pain Management/Spine
- Palliative Care
- Pediatrics
- Physiatry
- Plastic Surgery
- Podiatry
- Pulmonology
- Radiation Oncology
- Rheumatology
- Sleep Medicine
- Sports Medicine
- Surgical Oncology
- Urgent Care
- Urogynecology
- Urology
- Vascular Surgery
- Wound Care



Leading Cause of Death in United States

1900

1. Pneumonia/Infuenza
2. Tuberculosis
3. Diarrhea
4. Heart Disease
5. Stroke
6. Kidney Disease
7. Accidents
8. **Cancer**
9. Senility
10. Diphtheria

By 1940, Cancer moved from 8th to 2nd position

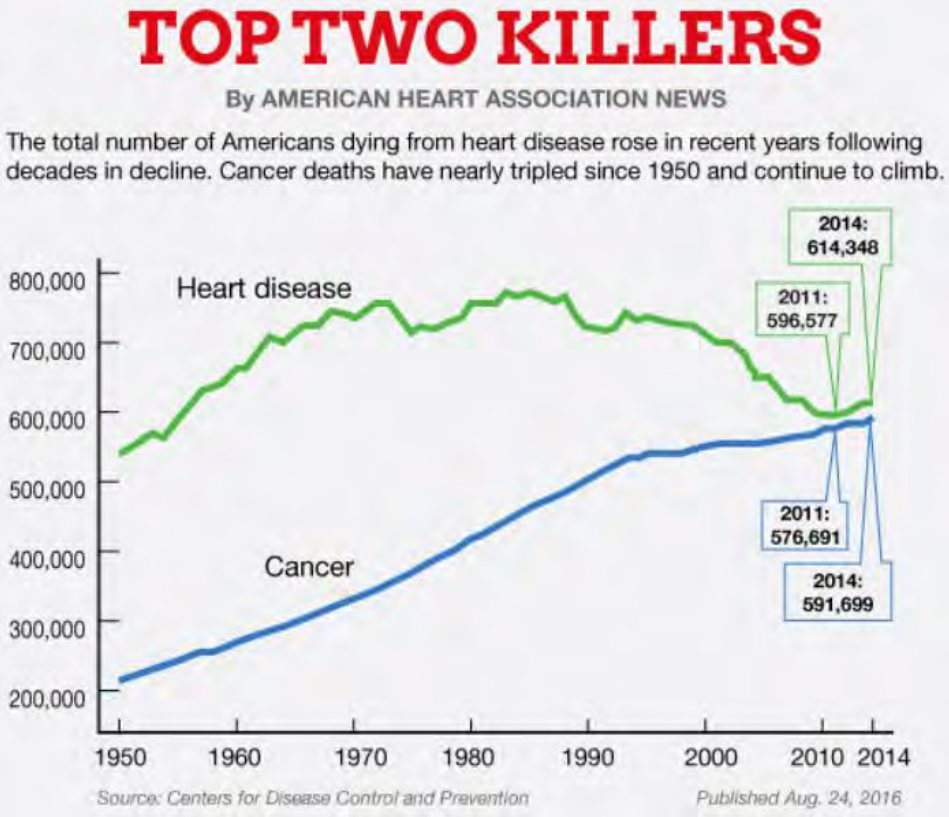
2020

1. Heart Disease
2. **Cancer**
3. Covid-19
4. Accidents
5. Stroke
6. Chronic Lower Respiratory Diseases
7. Alzheimer Disease
8. Diabetes
9. Pneumonia/Influenza
10. Kidney Disease

https://nchstats.com/2007/07/06/historical-leading-causes-of-death/#:~:text=The%20earliest%20data%2C%20that%20from,the%20leading%20causes%20of%20death.

NCHS Data Brief, Number 427, December 2021 (cdc.gov)

CANCER TAKING OVER HEART DISEASE AS #1 KILLER



2014

Cancer surpasses heart disease as leading cause of death in many US counties

By Susan Scutti, CNN
Updated 5:03 PM ET, Mon November 12, 2018

Cancer: The facts 01:00

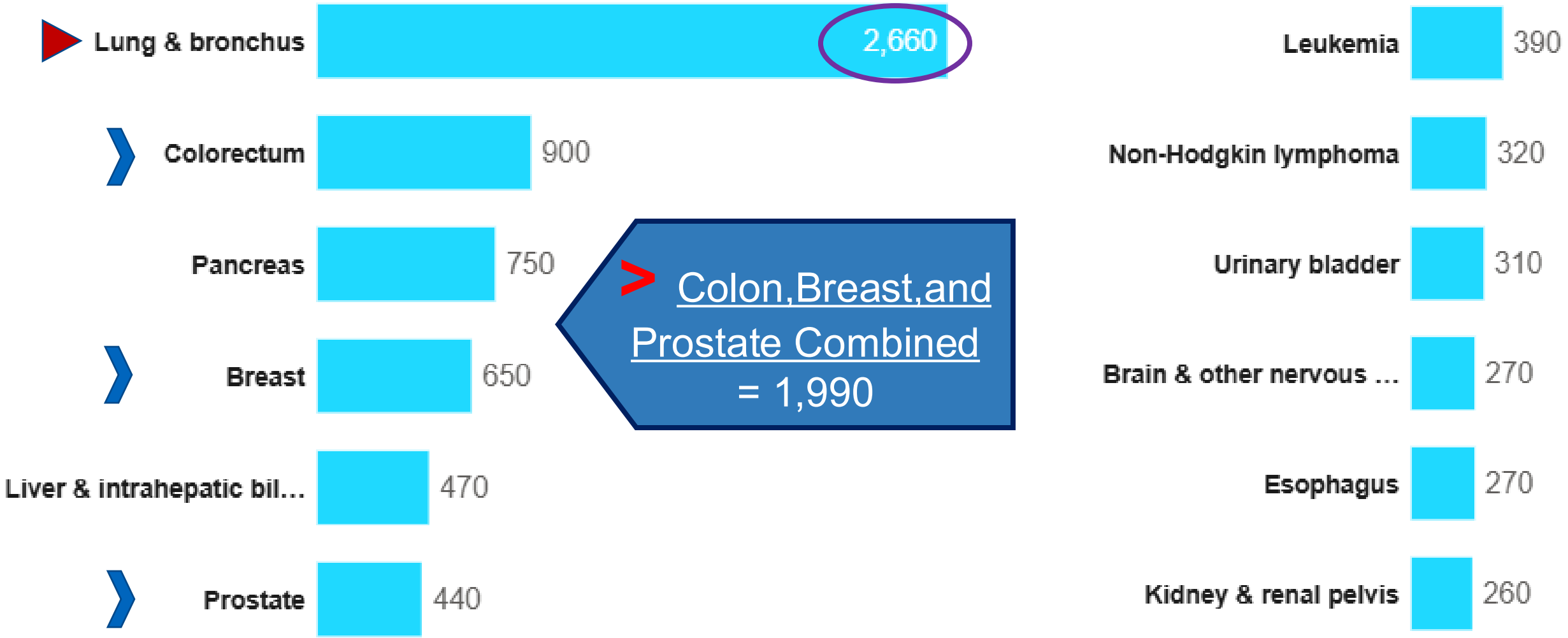
(CNN) — An important transition is happening across the United States: Cancer was the leading cause of death in more counties in 2015 than 13 years earlier, a new study finds. However, the opposite was true for heart disease during that period; fewer counties reported it as the top killer.

LUNG CANCER

CANCER DEATH ESTIMATES AMERICAN CANCER SOCIETY

Kentucky Death Estimates, 2025

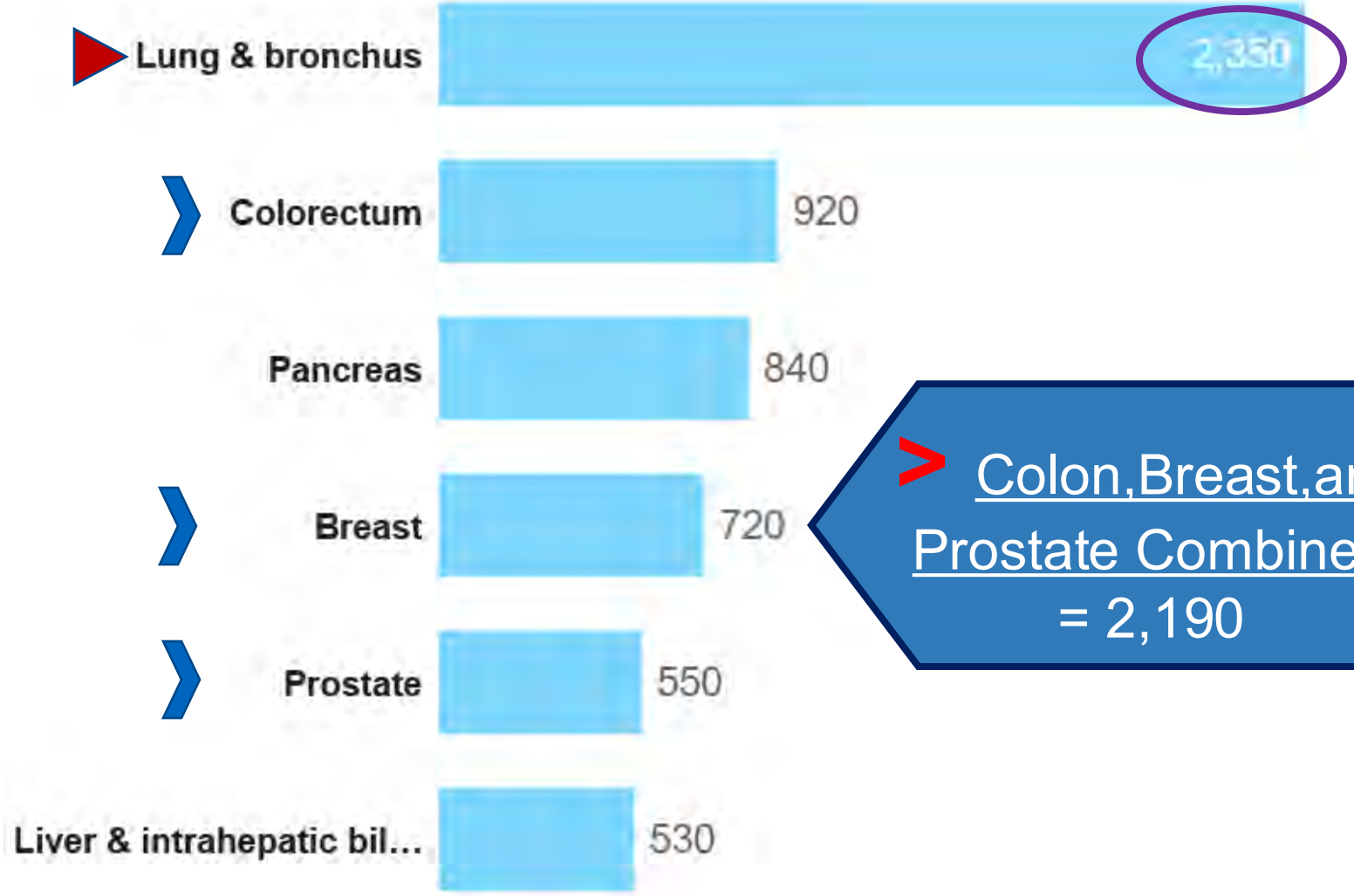
#1 Cancer Killer in the USA and the World



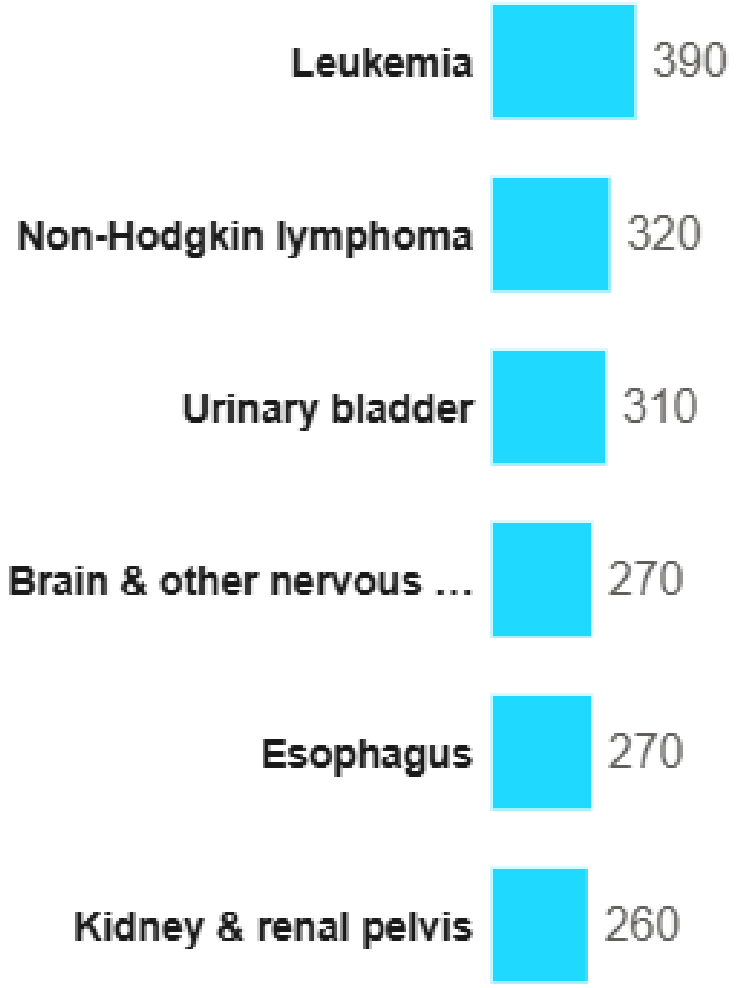
CANCER DEATH ESTIMATES AMERICAN CANCER SOCIETY

Alabama Death Estimates, 2025

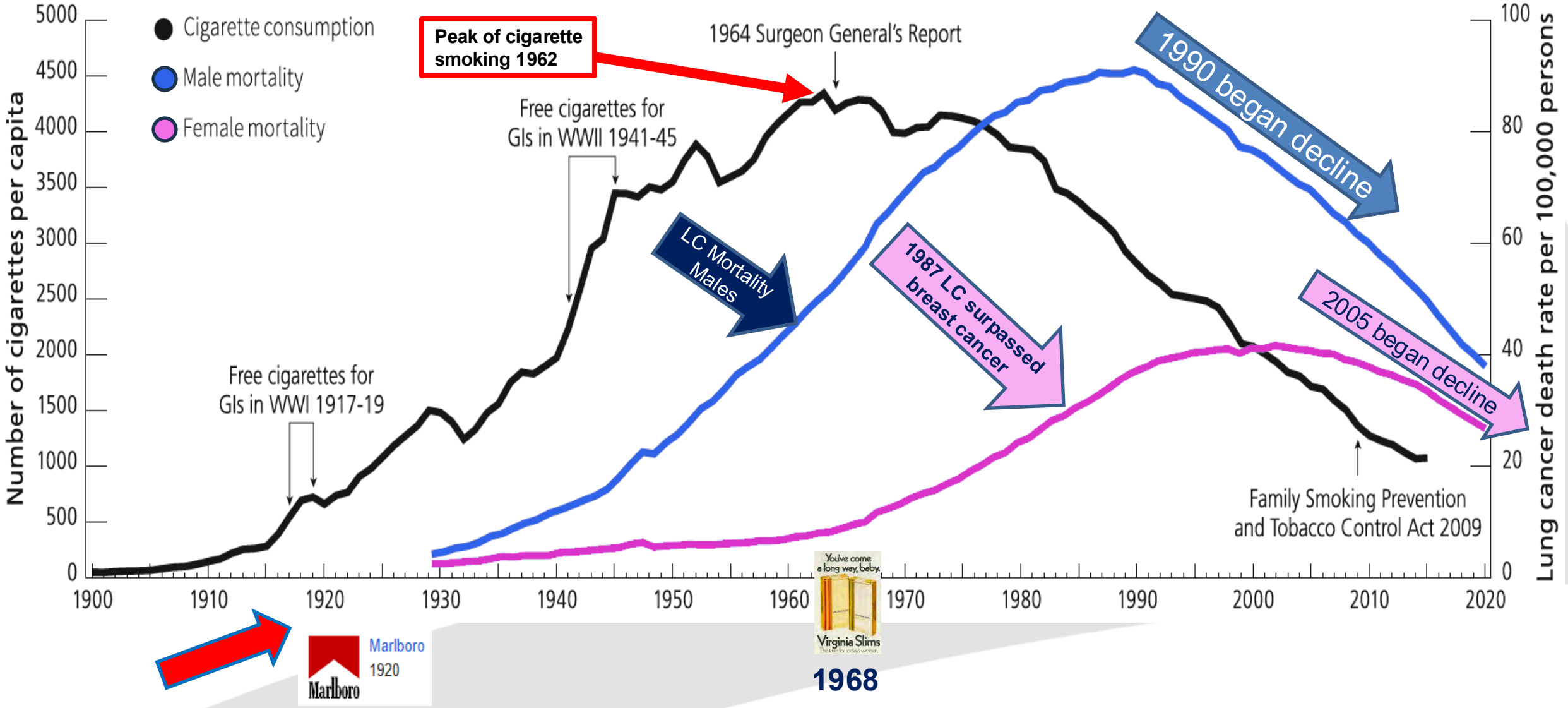
#1 Cancer Killer in the USA and the World



> Colon,Breast,and Prostate Combined = 2,190



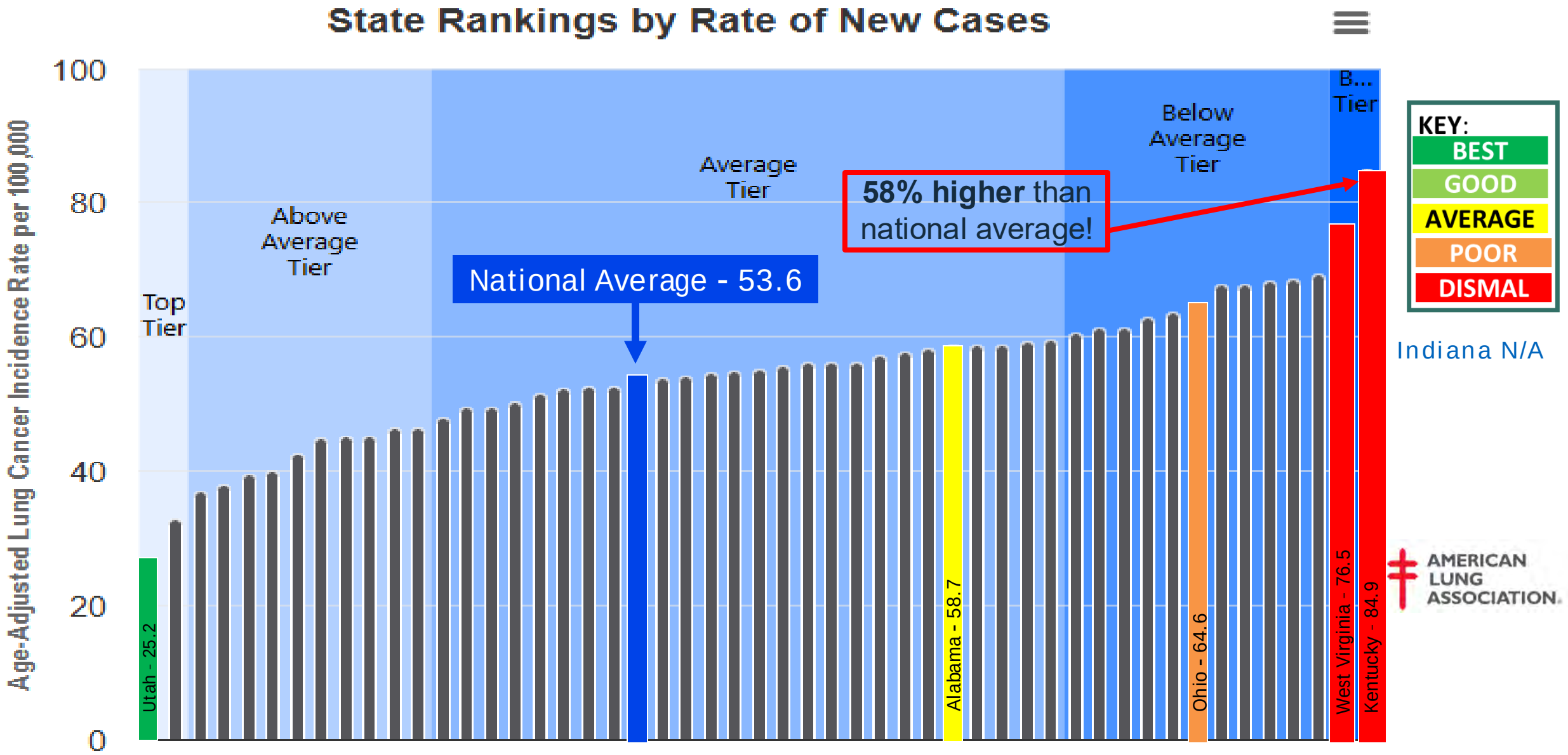
LUNG CANCER – TRENDLINES – 120 YEARS – MALES VS FEMALES



Trends in tobacco consumption and lung cancer mortality rates by sex, 1900–2020. Reproduced from American Cancer Society Cancer Facts & Figures 2023. Age is adjusted to the 2000 US standard population. Rates exclude deaths in Puerto Rico and other US territories. Because of changes in International Classification of Diseases coding, numerator information for mortality rates has changed over time. Sources: Death rates: US Mortality Data, 1960–2020 and US Mortality Volumes, 1930–1959, National Center for Health Statistics. Cigarette consumption: 1900–1999: US Department of Agriculture; 2000–2015: reference 19–22

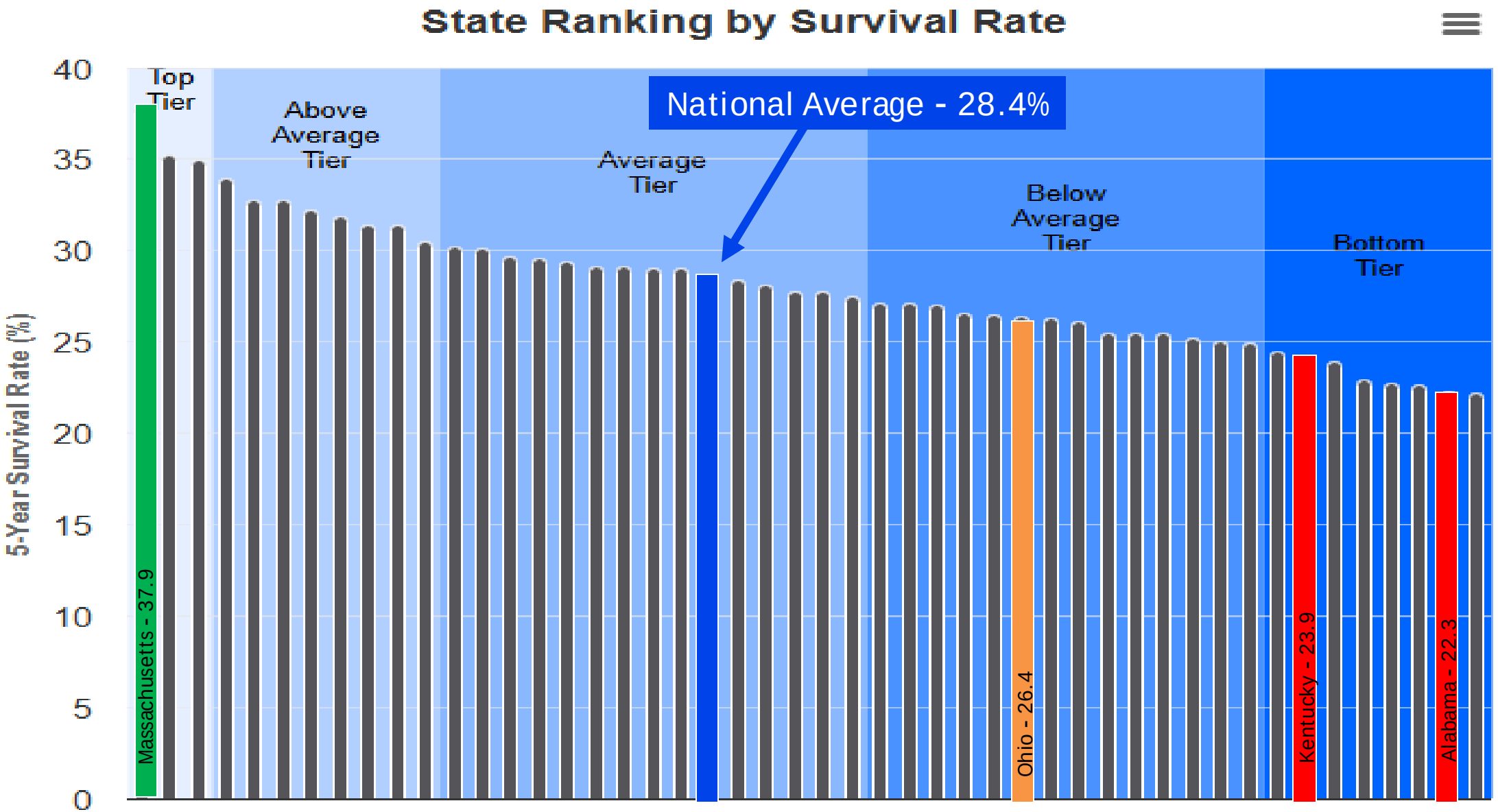
NATIONAL LUNG CANCER INCIDENCE

Nov. 19, 2024 Amer. Lung Assoc. State of Lung Cancer Report



NATIONAL LUNG CANCER 5-YEAR SURVIVAL

Nov. 19, 2024 Amer. Lung Assoc. State of Lung Cancer Report



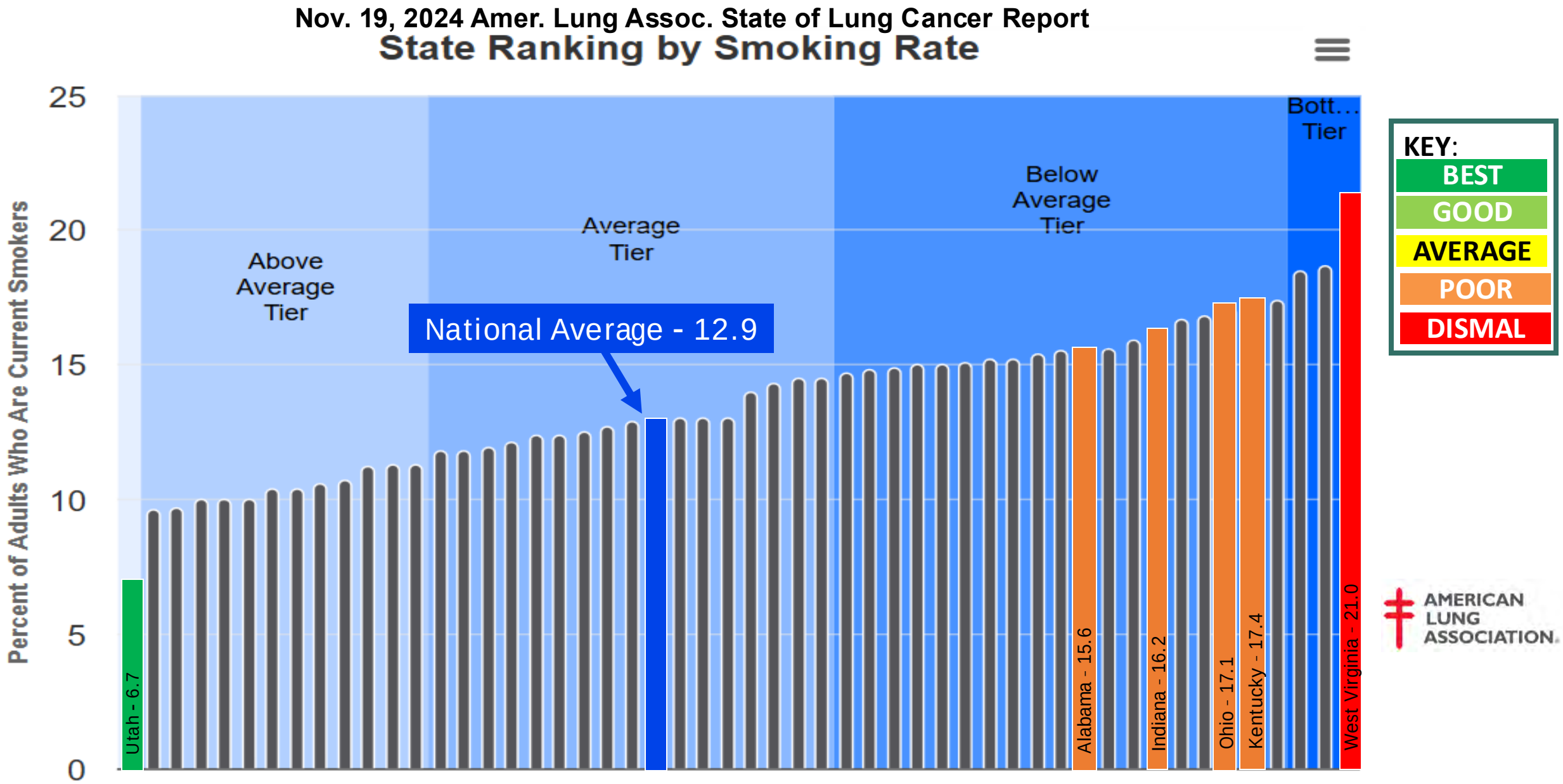
KEY:

- BEST
- GOOD
- AVERAGE
- POOR
- DISMAL

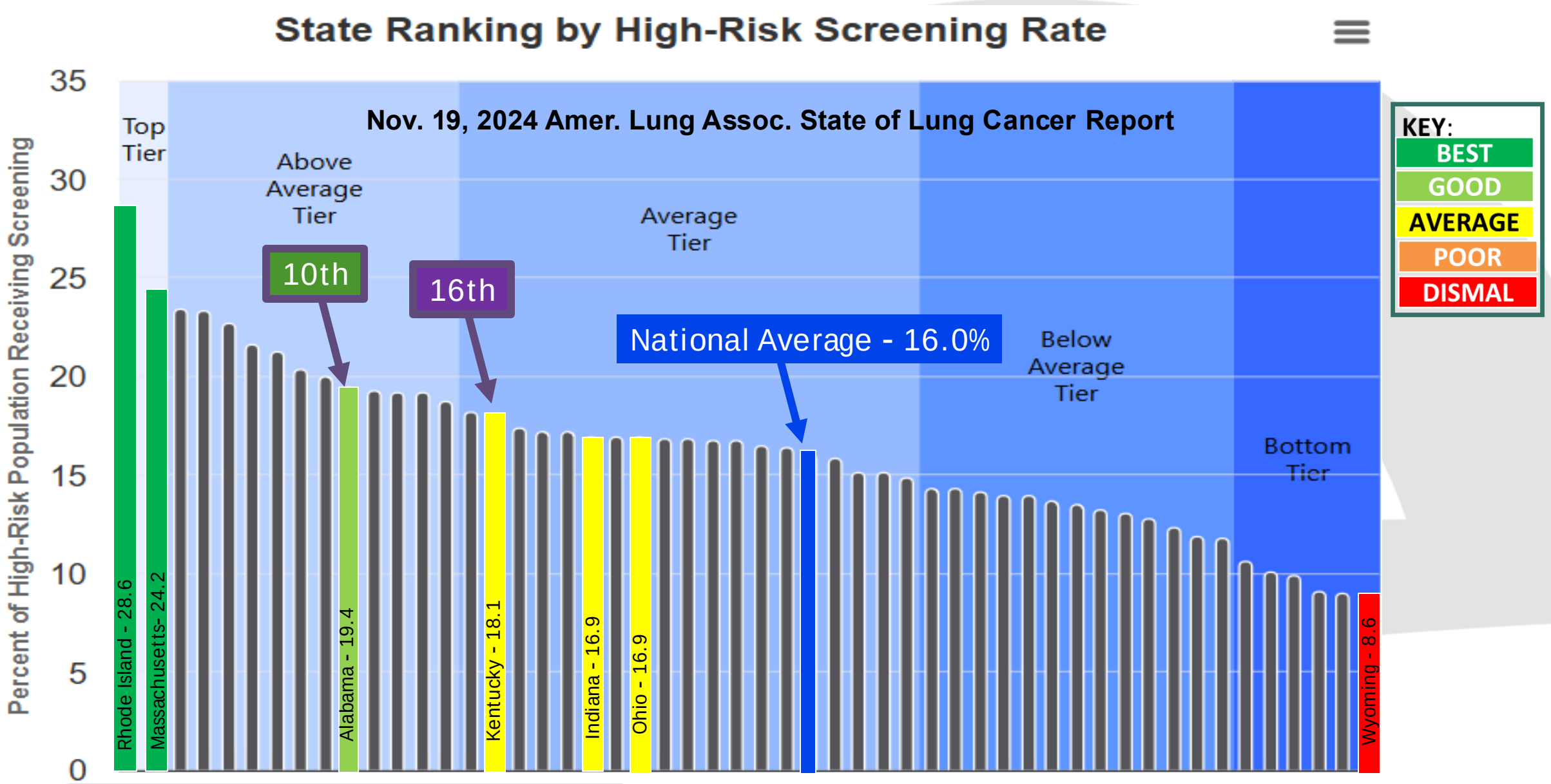
Indiana N/A

AMERICAN LUNG ASSOCIATION.

NATIONAL SMOKING PREVALENCE



NATIONAL SCREENING RATE



When it comes to survival, stage matters

5-Year Survival Rates from 2018 American Cancer Society

5 Year Survival Rate Non Small Cell Lung Cancer (NSCLC)		
Stage	IA1	92%
	IA2	83%
	IA3	77%
	IB	68%
	IIA	60%
	IIB	53%
	IIIA	36%
	IIIB	26%
	IIIC	13%
	IVA	10%
	IVB	< 1%

The numbers below come from thousands of people from all over the world who were diagnosed with NSCLC between 1999 and 2010. Although the numbers are based on people diagnosed several years ago, they are the most recent rates published for the current AJCC (Am Joint Comm. Ca) staging system. Chest, January 2017,Vol. 151, Issue 1, Pages 193-203

5 Year Survival Rate Small Cell Lung Cancer (SCLC)		
Stage	I	31%
	II	19%
	III	8%
	IV	2%

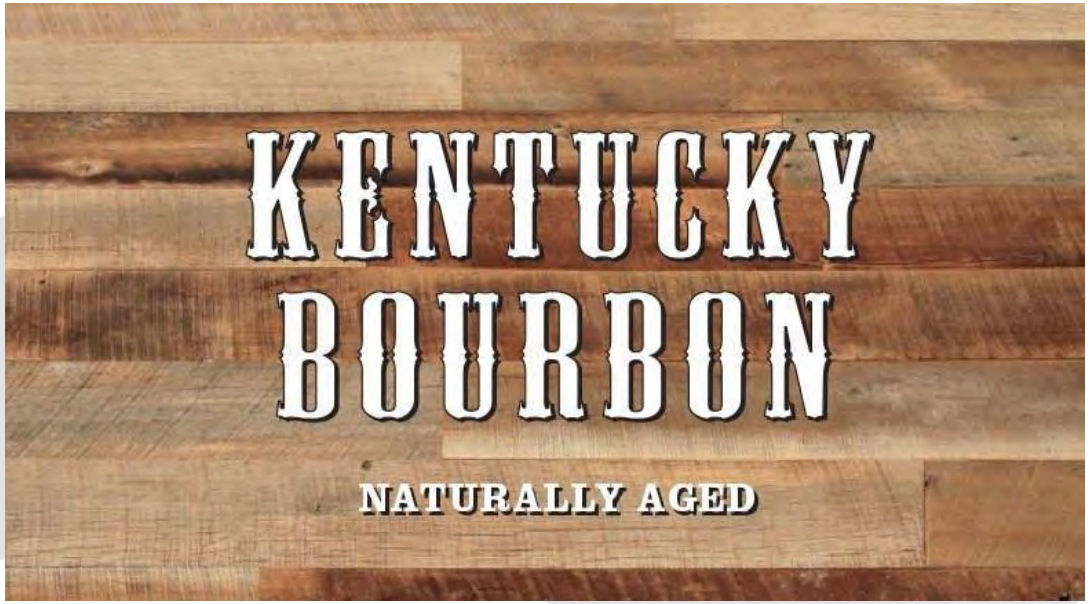
The numbers below are relative survival rates calculated from the National Cancer Institute's SEER database, based on people who were diagnosed with SCLC between 1988 and 2001

These survival rates are based on the TNM staging system in use at the time, which has since been modified slightly for the latest version. Because of this, the survival numbers may be slightly different for the latest staging system.

Stage Matters!

KENTUCKY DERBY

KENTUCKY Bourbon TRAIL®



Kentucky
UNBRIDLED SPIRIT™

LDCT – THE PATIENT EXPERIENCE

Overall, the entire process takes about 15 minutes or so; the scan itself takes less than 3 minutes

LDCT uses X-rays to scan the entire chest in about 5 to 10 seconds during a single breath-hold. Less than background dose of radiation for 1 yr, 1.3 mSv

The process is performed without needles or contrast/dye

USPSTF RECOMMENDATION – MARCH 9, 2021

U.S. Preventive Services TASK FORCE

St. Elizabeth implemented March 1, 2022

Recommendation Summary

Population	Recommendation	Grade
Adults aged 50 to 80 years who have a 20 pack-year smoking history and currently smoke or have quit within the past 15 years	The USPSTF recommends annual screening for lung cancer with low-dose computed tomography (LDCT) in adults aged 50 to 80 years who have a 20 pack-year smoking history and currently smoke or have quit within the past 15 years. Screening should be discontinued once a person has not smoked for 15 years or develops a health problem that substantially limits life expectancy or the ability or willingness to have curative lung surgery.	B

Commercial Insurance payers have 1 year after the USPSTF guidelines are finalized to cover A and B recommendations under the PPACA; year begins after date of insurance contract renewal.

CMS COVERAGE DETERMINATION – FEBRUARY 10, 2022

2022 CMS criteria

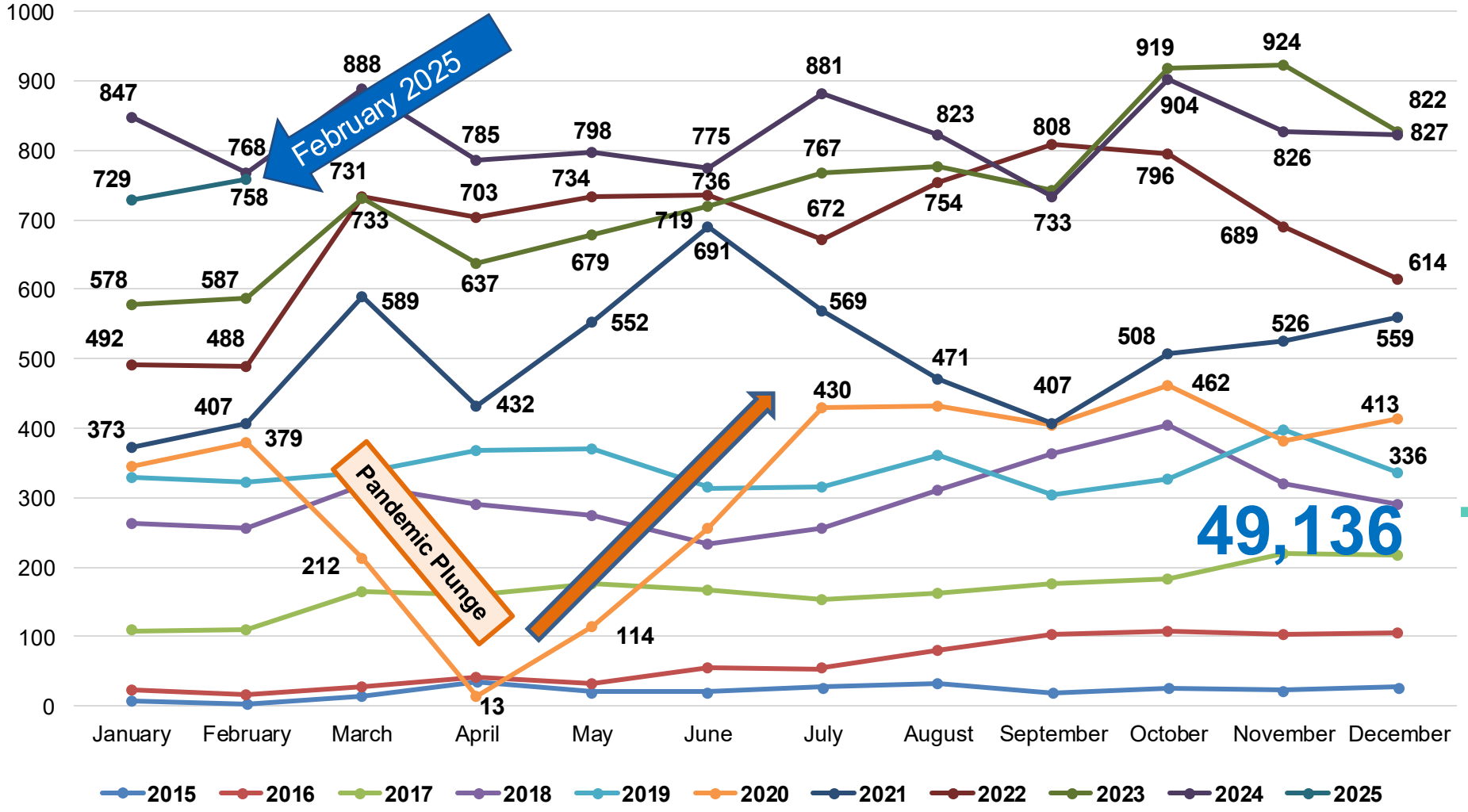
- 50 – 77 yo
- ≥ 20 Pack-Year
- Smoked in last 15 years
- Asymptomatic
- SDM mandated for baseline screen

Reasoning

We find that the human clinical evidence is not sufficient to conclude that lung cancer screening with low dose CT is reasonable and necessary for Medicare beneficiaries with the specific eligibility criterion for stopping low dose CT screening at age 80 years. The Medicare beneficiary eligibility criterion for stopping age will not be changed and will remain at 77 years-old.

TRACKING OUR PROGRESS – THE PATH TO SUCCESS

St. Elizabeth LDCT Screening Volumes (2015 – 2025 YTD)



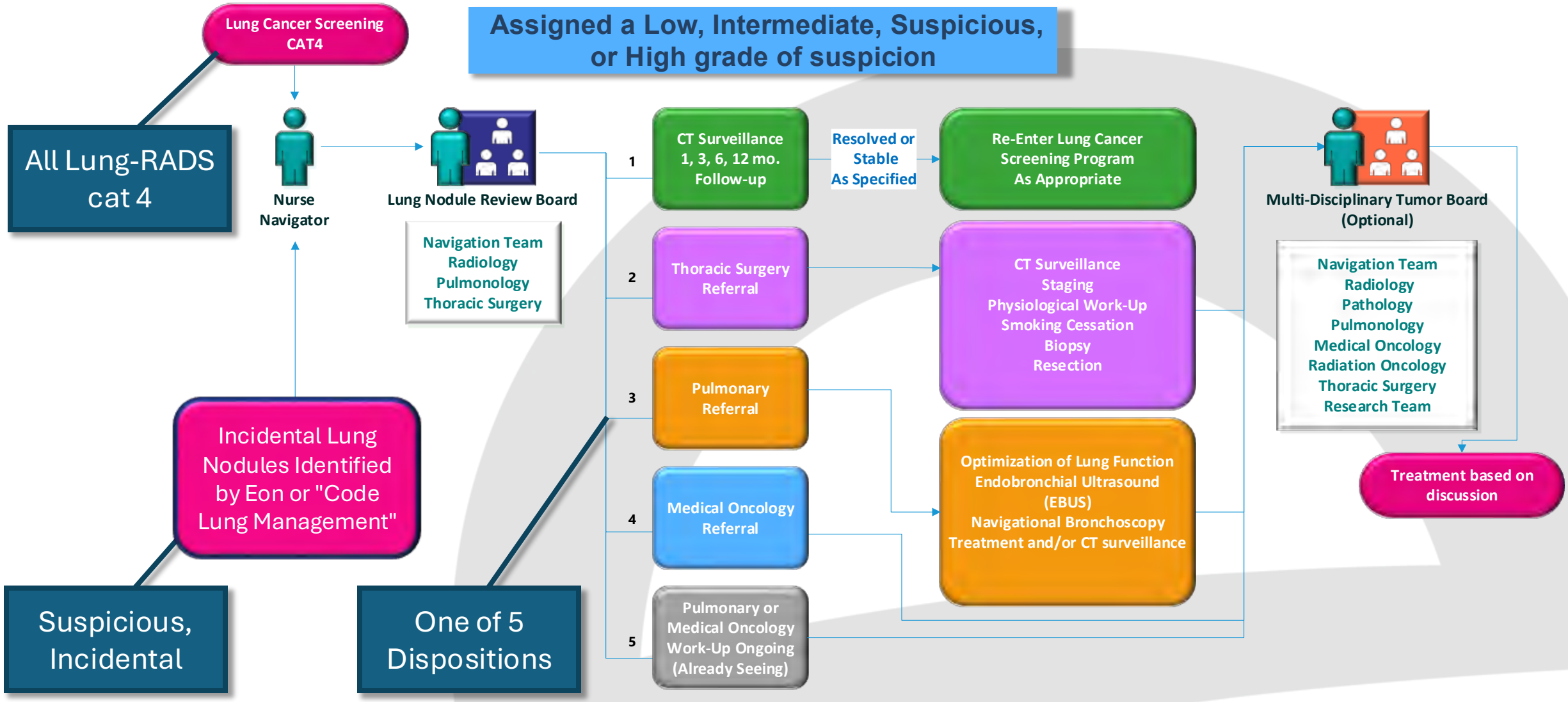
Year	Total LDCT Screening
2013	7
2014	121
2015	252
2016	753
2017	1,965
2018	3,585
2019	4,082
2020*	3,843
2021	6,084
2022**	8,219
2023	8,888
2024	9,850
2025	1,487

**Methodology to include incident and interval screens starting 2022

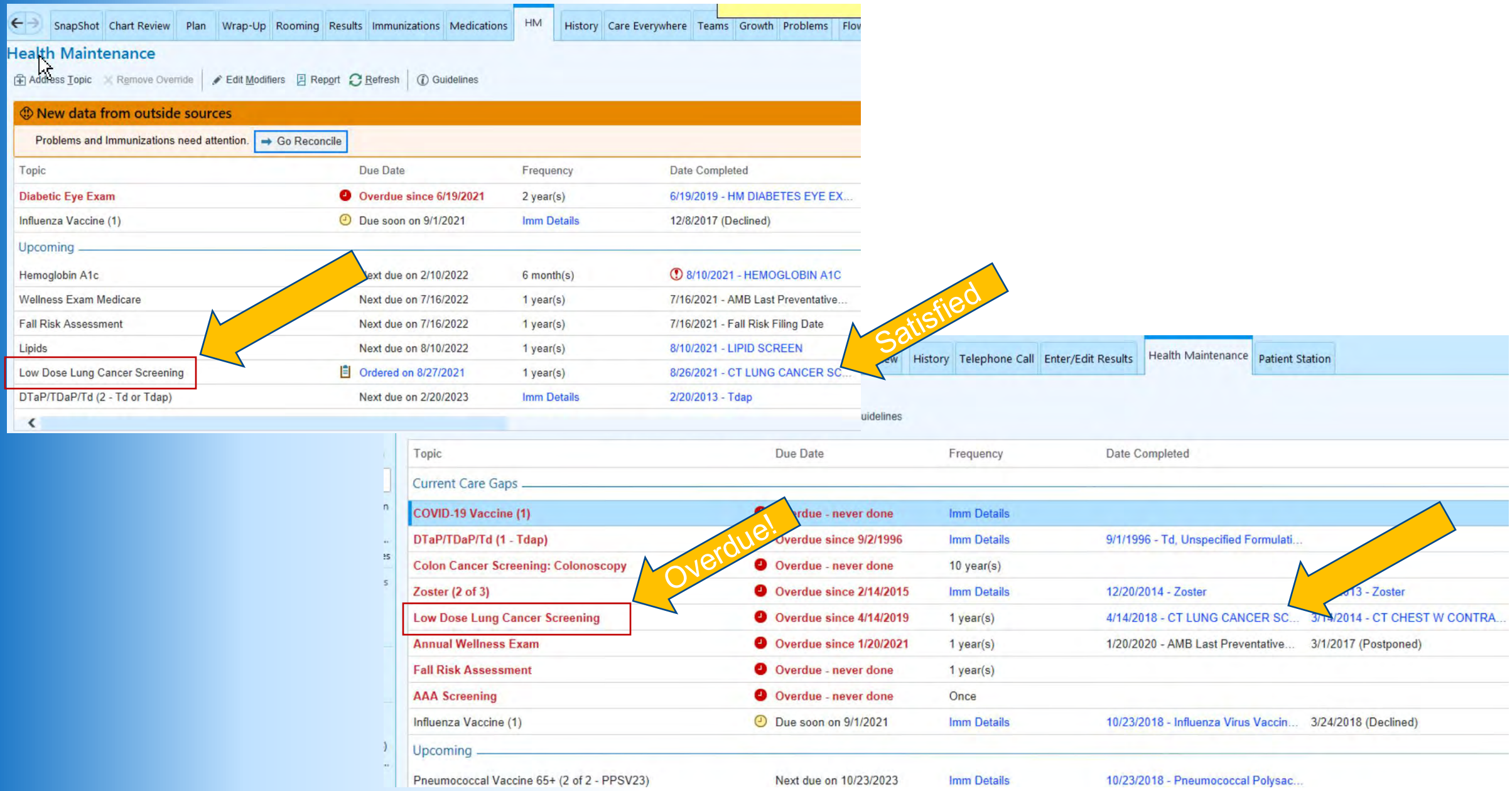
*5.81% pandemic reduction 2020 vs. 2019

50,000 LCS completed as of 3/17/25!

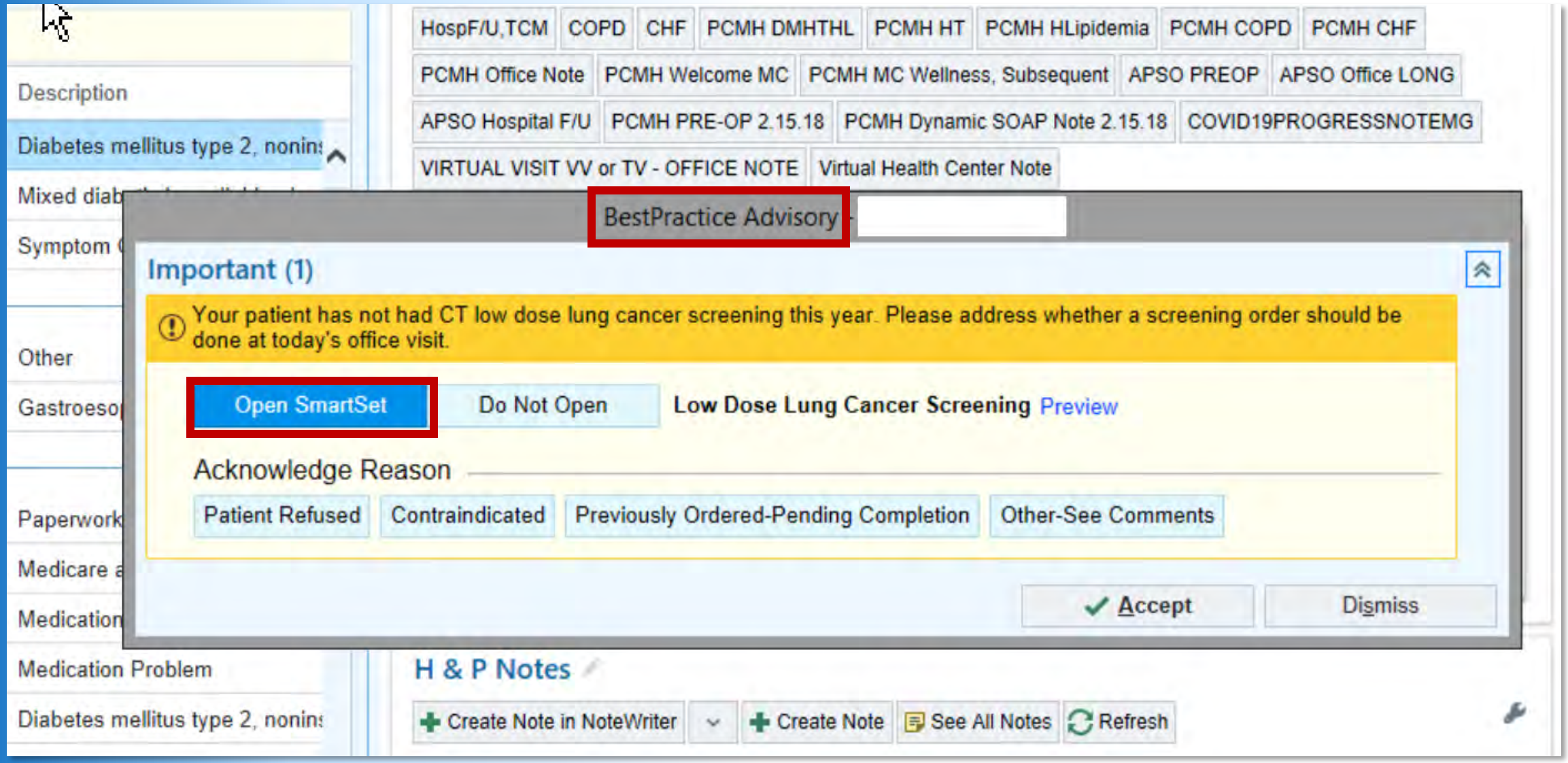
Nodule Review Board



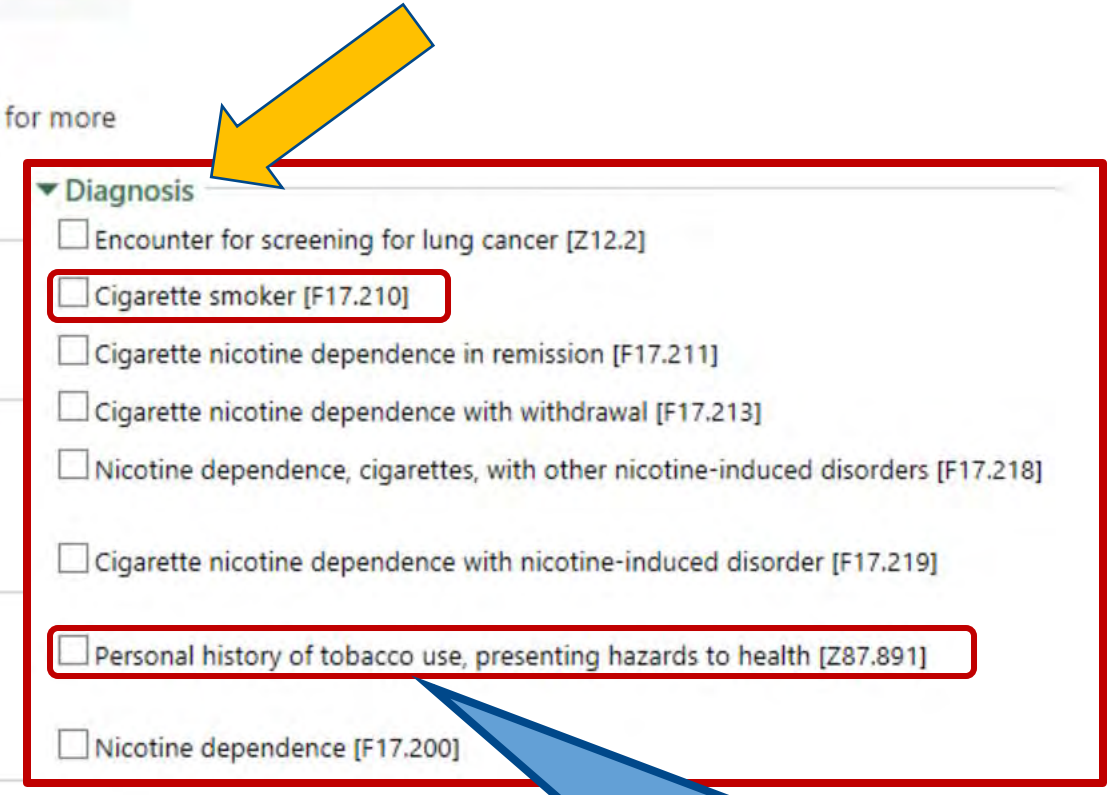
EMR – HEALTH MAINTENANCE PROMPT



LDCT LCS BPA – BEST PRACTICE ALERT/ADVISORY

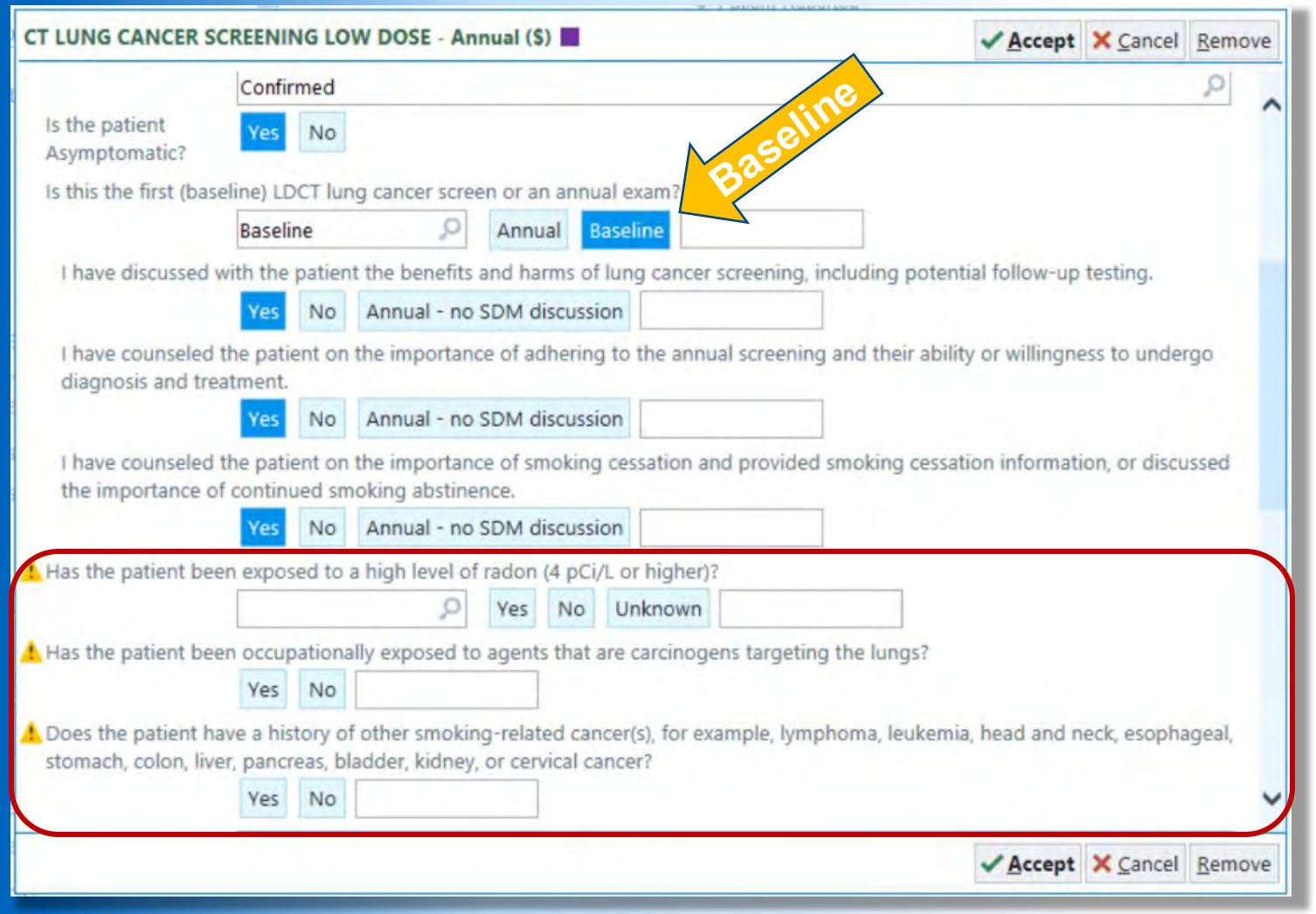


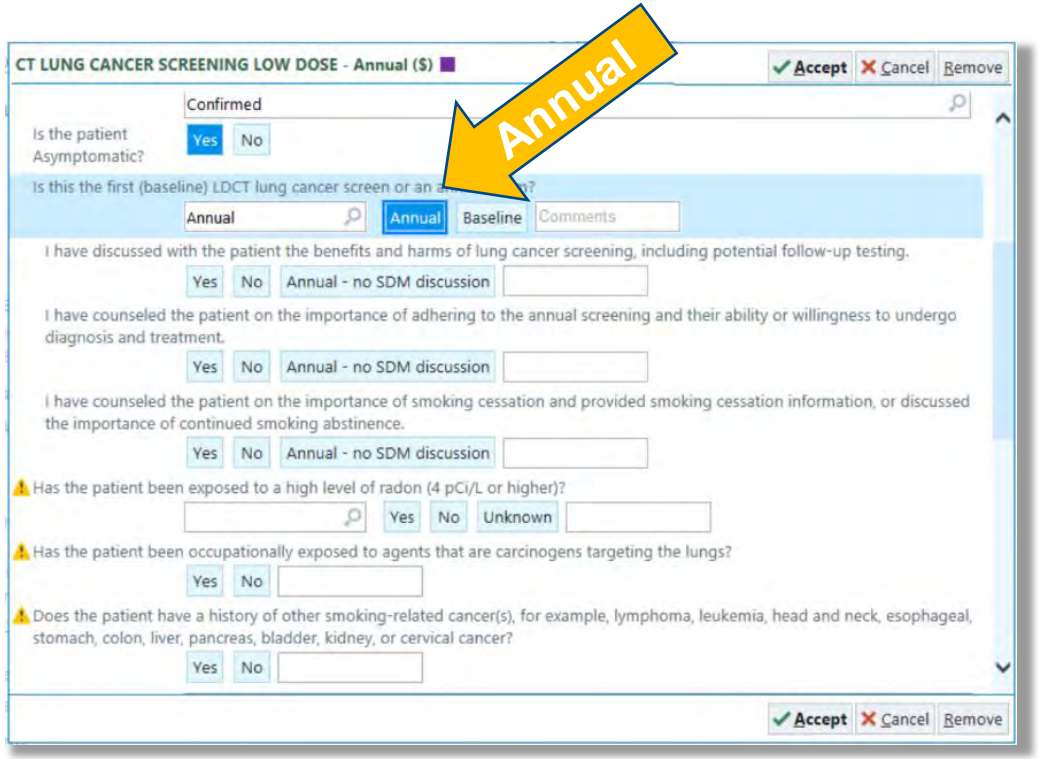
OUR LCS EMR SMARTSET



Best collectively covered codes for MC/MC, commercial; F17.210 and Z87.891

OUR LCS EMR SMARTSET, BASELINE OR ANNUAL





EPIC PROGRESS NOTE ENTRY
PROBLEM FOCUSED CHARTING, LDCT SDM COMPONENT

Diagnoses and all orders for this visit:

Needs flu shot
- QUADRIVALENT FLUZONE HIGH DOSE

Chronic anxiety (Chronic)
Overview:
Stable, continue meds, and r

Orders:
- clonazePAM (KLONOPIN) 1 mg Oral Tab
Dispense: 90 Tablet; Refill: 2

Benzodiazepine dependence, continuous (
Overview:
Stable, continue meds, and r

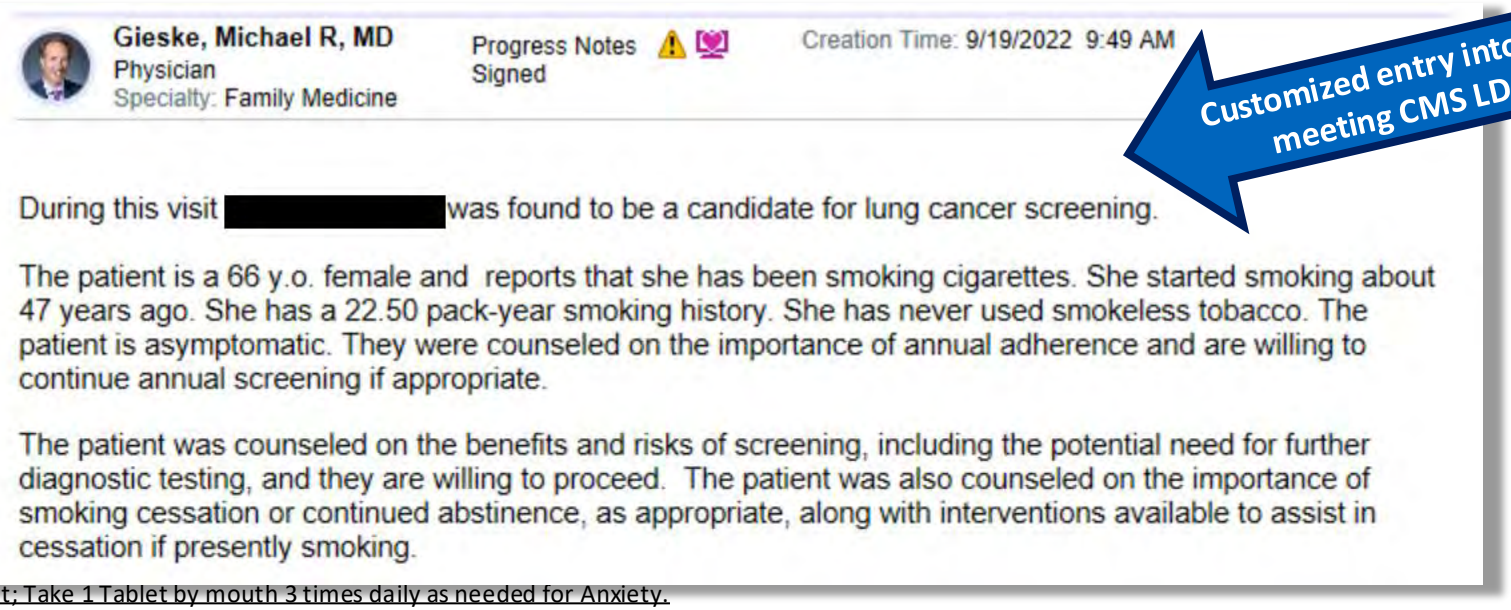
Orders:
- clonazePAM (KLONOPIN) 1 mg Oral Tablet; Take 1 Tablet by mouth 3 times daily as needed for Anxiety.
Dispense: 90 Tablet; Refill: 2

Need for pneumococcal vaccination
- PNEUMOCOCCAL CONJUGATE VACCINE 20 VALENT IM

Screening for osteoporosis
- DX BONE DENSITY AXIAL SKELETON; Future

Postmenopausal
- DX BONE DENSITY AXIAL SKELETON; Future

Nicotine dependence, cigarettes, with other nicotine-induced disorders
- CT LUNG CANCER SCREENING LOW DOSE; Future
- PR VISIT TO DERTERMINE LDCT ELIG



Gieske, Michael R, MD
Physician
Specialty: Family Medicine

Progress Notes
Signed

Creation Time: 9/19/2022 9:49 AM

During this visit [redacted] was found to be a candidate for lung cancer screening.

The patient is a 66 y.o. female and reports that she has been smoking cigarettes. She started smoking about 47 years ago. She has a 22.50 pack-year smoking history. She has never used smokeless tobacco. The patient is asymptomatic. They were counseled on the importance of annual adherence and are willing to continue annual screening if appropriate.

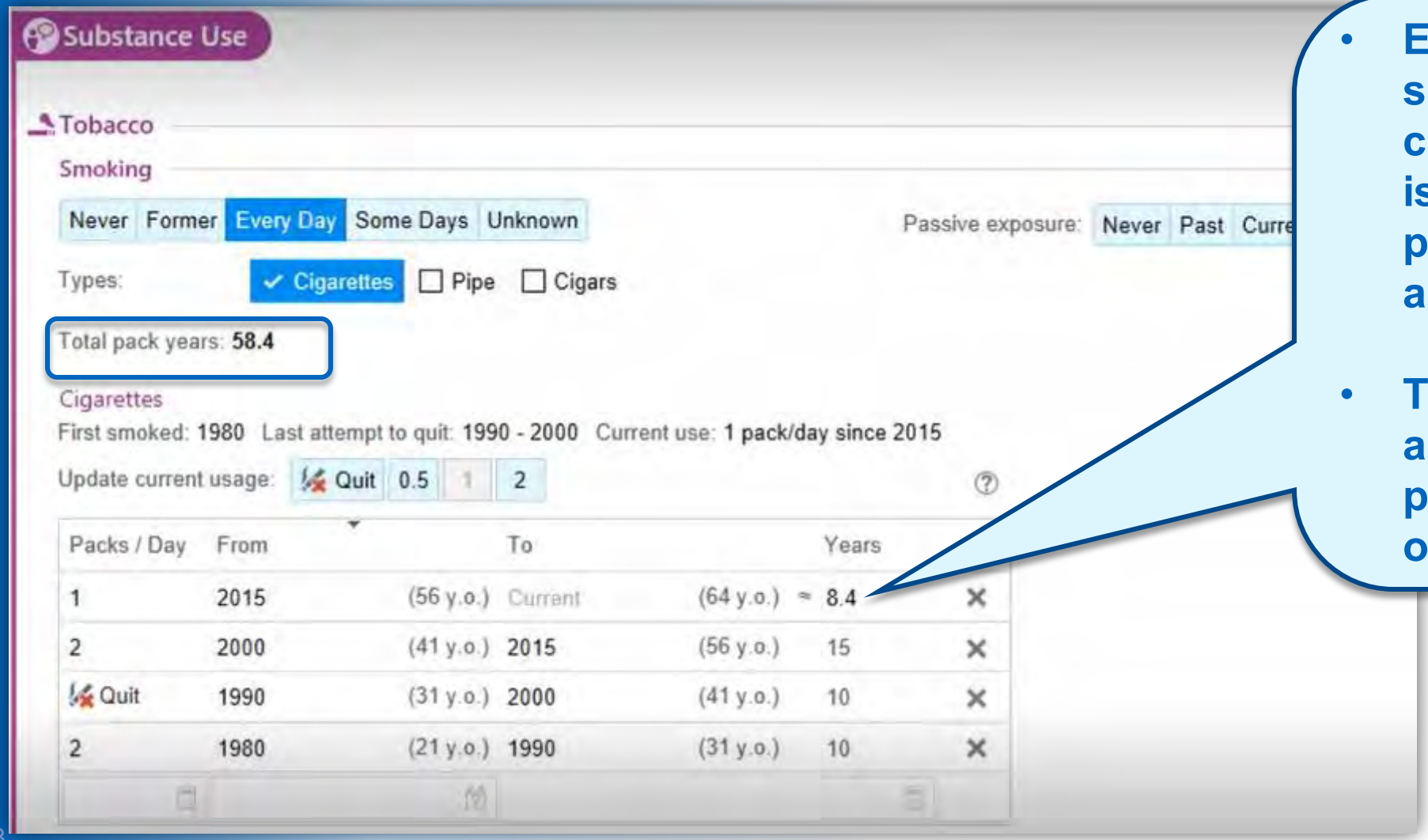
The patient was counseled on the benefits and risks of screening, including the potential need for further diagnostic testing, and they are willing to proceed. The patient was also counseled on the importance of smoking cessation or continued abstinence, as appropriate, along with interventions available to assist in cessation if presently smoking.

Customized entry into progress note, meeting CMS LDCT Criterion

Qualifying diagnosis is added to the Assessment and Plan

NEW! – 7/11/23 - LONGITUDINAL SMOKING HISTORY

- **The new way to document Smoking History for our patients in the EMR**



- **Each time the patient's smoking history changes, a new line-item is entered, and the total pack years automatically adjusts.**
- **This continues to update automatically until the patient's smoking status or current use changes**

REGISTRY SUMMARY – 2015 – 2025 YTD

Analysis of Positive Scans - St. Elizabeth Healthcare --- 1/1/2015 - 2025 YTD															
Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	TOTAL	% Scans	False Positive	False Discovery
Total LDCT LC Scr. SCANS	252	753	1965	3585	4082	3854	6084	7729	8339	9050	1357	47050	*	**	***
Tot. # Unique Patients Scanned	237	716	1649	2751	2267	1332	1964	2770	2651	2157	259	18753			
Annual					1815	2511	4120	4959	5688	6898	1102	27093			
Baseline					2267	1332	1964	2770	2651	2157	259	13400			
Annual LCS - % of total					44.5%	65.3%	67.7%	64.2%	68.2%	76.2%	81.0%	49.5%			
Follow-Up/Interval Screens	9	32	100	168	293	286	430	490	549	800	130	2357			
Annual, Baseline, Interval	261	785	2065	3753	4375	4140	6514	8219	8888	9850	1487	49407			
Cat 1	127	457	1164	2194	2312	2289	3630	4399	4752	4974	760	27058	57.51%		
Cat 2	76	201	506	887	1250	1121	1760	2357	2342	2718	398	13616	28.94%		
Cat 3 (Indeterminate)	22	47	143	240	250	258	401	533	643	848	112	3497	7.43%		
Cat 4 (Suspicious) - Total	27	48	152	264	270	190	303	423	586	500	86	2849	6.06%	4.43%	73.15%
Cat 4A	16	33	108	186	188	138	238	343	502	454	76	2282	4.85%		
Cat 4B	11	15	44	78	82	45	60	74	76	41	8	534	1.13%		
Cat 4X						8	5	6	8	5	2	34	0.07%		
Cat 3 + Cat 4 - Combined	49	95	295	504	520	448	704	956	1229	1348	198	6346	13.49%	11.86%	87.95%
Lung Cancer	5	16	37	82	81	51	66	120	144	151	12	765	1.63%	#Lung Cancer Screens to find 1 LC=	61.5
													4.08%	#Unique Patients Screened to find 1 LC=	24.5

SEP ATTRIBUTED PATIENTS – RANKED BY SITE – 2024 YEAREND

The "Hawthorne Effect"

Finished 2023 at 46.8% uptake

Finished 2022 at 44.1% uptake

National Average 16.0% of 14.2 million eligible population

Nov. 19, 2024 Amer. Lung Assoc. State of Lung Cancer Report

Distribution of Lung Cancer Screening per USPSTF 2021 Criteria - Eligible & Attributed Patients - By Practice
2024 Q4 - Listed by Percentage of Eligible Patients Captured YTD

Rank	Department	Metric	Measure Date	Benchmark	Numerator	Denominator	%	Gap/Site
	SEP Site Overall	USPSTF 2021	12/31/2024	> 45.00%	10,690	20,680	51.7%	33.8
1	SEP CONCIERGE MEDICINE	Screening: Lung Cancer	12/31/2024	> 45.00%	6	7		
2	SEP CVH IM/PEDS	Screening: Lung Cancer	12/31/2024	> 45.00%	316	503	62.82%	
3	SEP EDGEWOOD IM/PEDS	Screening: Lung Cancer	12/31/2024	> 45.00%	27	43	62.79%	
4	SEP LBG WILSON CRK PC	Screening: Lung Cancer	12/31/2024	> 45.00%	131	214	61.21%	
5	SEP BURLINGTON PC	Screening: Lung Cancer	12/31/2024	> 45.00%	249	411	60.58%	64
6	SEP NEWPORT OVATION PC	Screening: Lung Cancer	12/31/2024	> 45.00%	124	207	59.90%	31
7	SEP AURORA PC	Screening: Lung Cancer	12/31/2024	> 45.00%	134	228	58.77%	31
8	SEP CRESTVIEW HILLS IM	Screening: Lung Cancer	12/31/2024	> 45.00%	386	662	58.31%	88
9	SEP GREENDALE PC	Screening: Lung Cancer	12/31/2024	> 45.00%	211	362	58.29%	48
10	SEP FORT MITCHELL PC	Screening: Lung Cancer	12/31/2024	> 45.00%	517	897	57.64%	113
11	SEP HIGHLAND HTS PC	Screening: Lung Cancer	12/31/2024	> 45.00%	567	989	57.33%	122
12	SEP AURORA 107 PC	Screening: Lung Cancer	12/31/2024	> 45.00%	100	176	56.82%	21
13	SEP UNION BRISTOW PC	Screening: Lung Cancer	12/31/2024	> 45.00%	298	550	54.18%	51
14	SEP COVINGTON PC	Screening: Lung Cancer	12/31/2024	> 45.00%	499	923	54.06%	84
15	SEP CRITTENDEN PC	Screening: Lung Cancer	12/31/2024	> 45.00%	675	1,258	53.66%	109
16	SEP UNION US 42 PC	Screening: Lung Cancer	12/31/2024	> 45.00%	492	922	53.36%	77
17	SEP FLO TURFWAY PC	Screening: Lung Cancer	12/31/2024	> 45.00%	560	1,055	53.08%	85
18	SEP FLORENCE EWING PC	Screening: Lung Cancer	12/31/2024	> 45.00%	358	676	52.96%	54
19	SEP SOUTHGATE IM	Screening: Lung Cancer	12/31/2024	> 45.00%	197	377	52.25%	27
20	SEP NPTFTT PC	Screening: Lung Cancer	12/31/2024	> 45.00%	268	515	52.04%	36
21	SEP HEBRON CONNER PC	Screening: Lung Cancer	12/31/2024	> 45.00%	319	621	51.37%	40
22	SEP BELLEVUE PC	Screening: Lung Cancer	12/31/2024	> 45.00%	293	572	51.22%	36
23	SEP HEBRON LITTON PC	Screening: Lung Cancer	12/31/2024	> 45.00%	304	594	51.18%	37
24	SEP INDEPENDENCE PC	Screening: Lung Cancer	12/31/2024	> 45.00%	393	785	50.06%	40
25	SEP LBG STATELINE PC	Screening: Lung Cancer	12/31/2024	> 45.00%	155	316	49.05%	13
26	SEP LBG ELM STREET PC	Screening: Lung Cancer	12/31/2024	> 45.00%	343	707	48.51%	25
27	SEP WALTON PC	Screening: Lung Cancer	12/31/2024	> 45.00%	239	494	48.38%	17
28	SEP BRIGHT PC	Screening: Lung Cancer	12/31/2024	> 45.00%	145	301	48.17%	10
29	SEP COVINGTON IM	Screening: Lung Cancer	12/31/2024	> 45.00%	123	258	47.67%	7
30	SEP BUTLER PC	Screening: Lung Cancer	12/31/2024	> 45.00%	370	791	46.78%	14
31	SEP EDGEWOOD PC	Screening: Lung Cancer	12/31/2024	> 45.00%	106	232	45.69%	2
32	SEP WILLIAMSTOWN PC	Screening: Lung Cancer	12/31/2024	> 45.00%	245	537	45.62%	3
33	SEP TAYLOR MILL PC	Screening: Lung Cancer	12/31/2024	> 45.00%	333	731	45.55%	4
34	SEP RISING SUN PC	Screening: Lung Cancer	12/31/2024	> 45.00%	156	343	45.48%	2
35	SEP ALEXANDRIA PC	Screening: Lung Cancer	12/31/2024	> 45.00%	398	888	44.82%	-2
36	SEP DRY RIDGE PC	Screening: Lung Cancer	12/31/2024	> 45.00%	427	966	44.20%	-8
37	SEP MILAN PC	Screening: Lung Cancer	12/31/2024	> 45.00%	57	133	42.86%	-3
38	SEP AT MUBEA	Screening: Lung Cancer	12/31/2024	> 45.00%	15	36	41.67%	-1
39	SEP VEVAY PC	Screening: Lung Cancer	12/31/2024	> 45.00%	87	211	41.23%	-8
40	SEP DILLSBORO NS IM	Screening: Lung Cancer	12/31/2024	> 45.00%	62	174	35.63%	-16
41	SEP AT AURORA CASKET	Screening: Lung Cancer	12/31/2024	> 45.00%	5	15	33.33%	-2
42								
43								
44								
					10,690	20,680	51.7%	33.8

51.7%

USPSTF 2021 Uptake Ranked by PC Site (41)

Presented Quarterly to PCPs, Oncology Team, Management

PERFORMANCE OF SEHC LCSP, HISTOLOGY, PY, SEX DISTRIBUTION – 2024

Overall Lung Cancer Discovery		
Stage - all yrs	N	%
Stage I	493	64.03%
Stage II	78	10.13%
Stage III	126	16.36%
Stage IV	73	9.48%
Unknown	0	0.00%
Total	770	100.00%
Stage I & II	74.16%	

Lung Cancer Type		
Type	N	%
adenocarc.	349	45.3%
squamous	230	29.9%
small cell	80	10.4%
limited 50		
extensive 30		
large cell	12	1.6%
carcinoid	16	2.1%
other	16	2.1%
unknown	67	8.7%
	770	100%

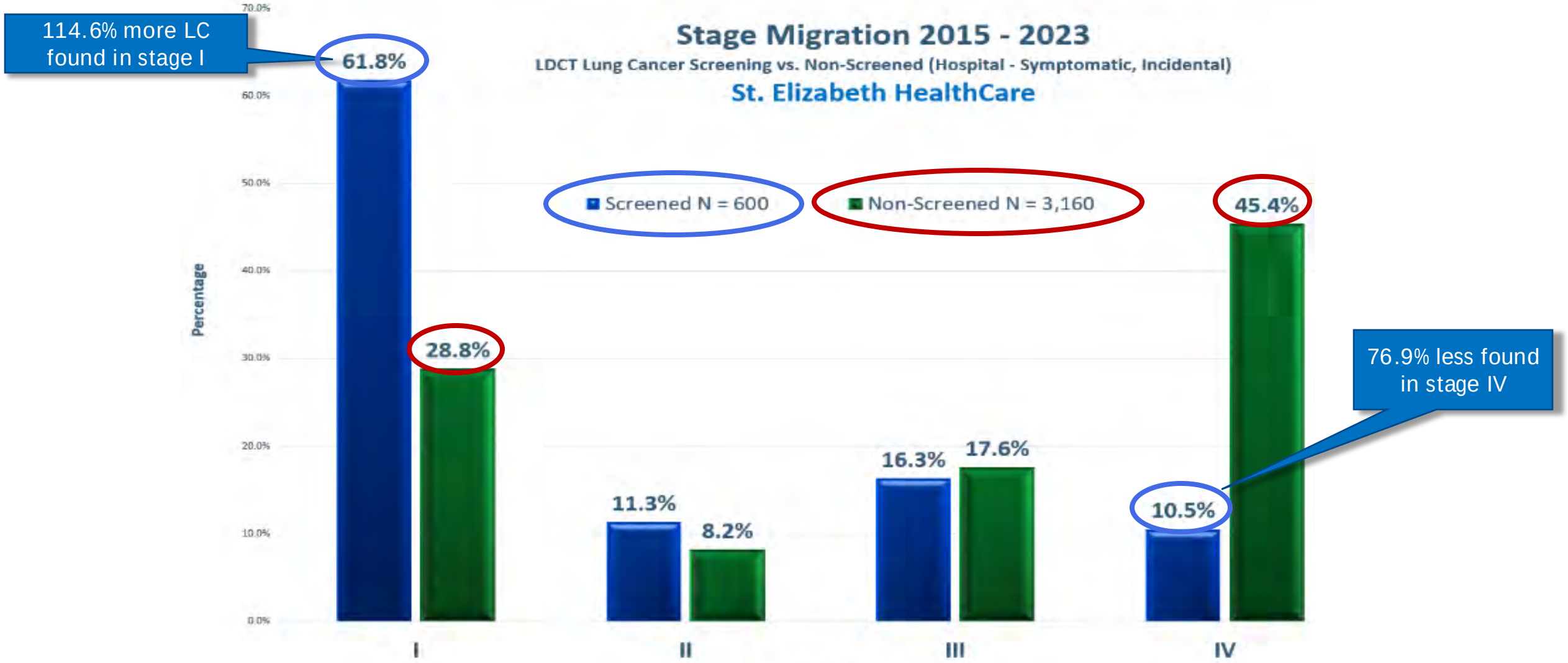
74.2% found in early stages

Male	368	47.8%
Female	402	52.2%
	770	100%

Average (Mean) PY =	61.0
Median PY =	52.0

2024 151 lung cancers discovered;
109 in stage I = 72.2% stage I, 76.8% in early stage I & II

STAGE MIGRATION 2015 – 2023
LUNG CANCERS DISCOVERED – 3,760 OVER 9 YEARS

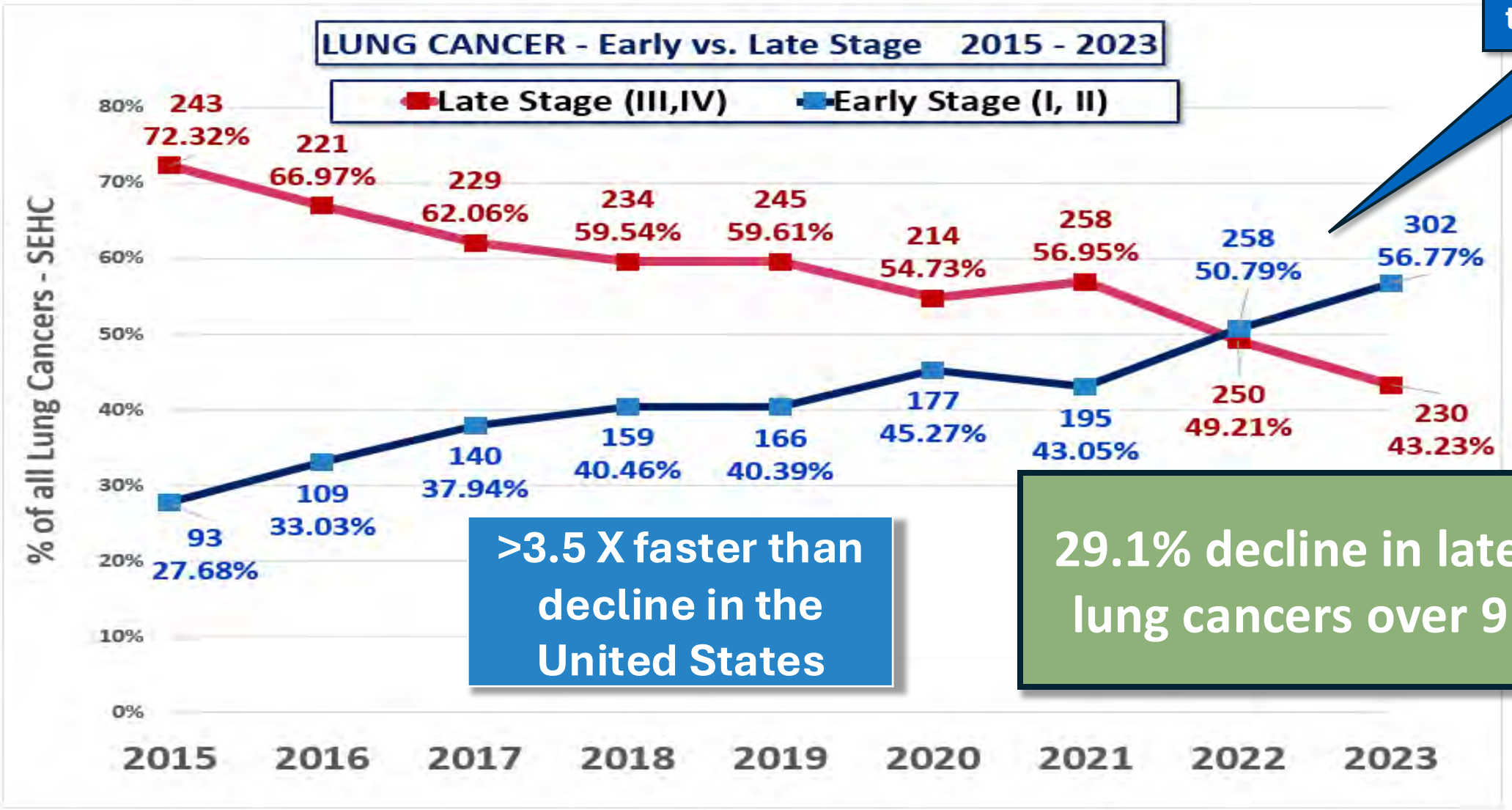


73.1% Found in Early Stages (I and II) Screened

63.0% Found in Late Stages (III and IV) Non-Screened

Decline in Late-Stage Lung Cancer – 3,723 lung cancers SEHC

Lung Cancer – Early vs. Late Stage - 2015 – 2023 – A Decade of Evolution



2022 – more early than late-stage LC!

1,599
2,124

>3.5 X faster than decline in the United States

29.1% decline in late-stage lung cancers over 9 years

THE FUTURE IS NOW!

Applying Innovation and Evolving Technology

BIOMARKERS

Cancer Predilection - Prediction, Risk Modeling

Genetic Markers
Proteins/Genes – genetic predeterminants

Cancer Detection – Determine Presence of Disease

Cf DNA and RNA
Proteins shed into blood
MCED – Multi-Cancer Early Detection, SCED – Single-Cancer Early Detection

Cancer Direction - Treatment

Liquid Biopsies

- MRD – molecular residual disease
- Precision medicine – targeted treatments

Tissue biopsies

- To determine treatments – Driver Mutations - Precision Medicine - targeted therapies
- Tracking therapy – cancers change and evolve – keeping ahead – determine aggressiveness
- Monitoring success of treatment – predict how the patient will respond

Development and validation of a protein biomarker panel in the Lung Cancer Cohort Consortium

Hilary A. Robbins, PhD MHS MSPH
International Agency for Research on Cancer | RobbinsH@iarc.fr | @hilaryarobbins

World Health Organization (WHO)

Mattias Johansson

Hilary Robbins

Paul Brennan

Florence Guida

Karl Smith Byrne

Hana Zahed

Andreea Spanu

Karine Alcala

PREDICTION – PROTEIN MARKERS - PROTEOMICS

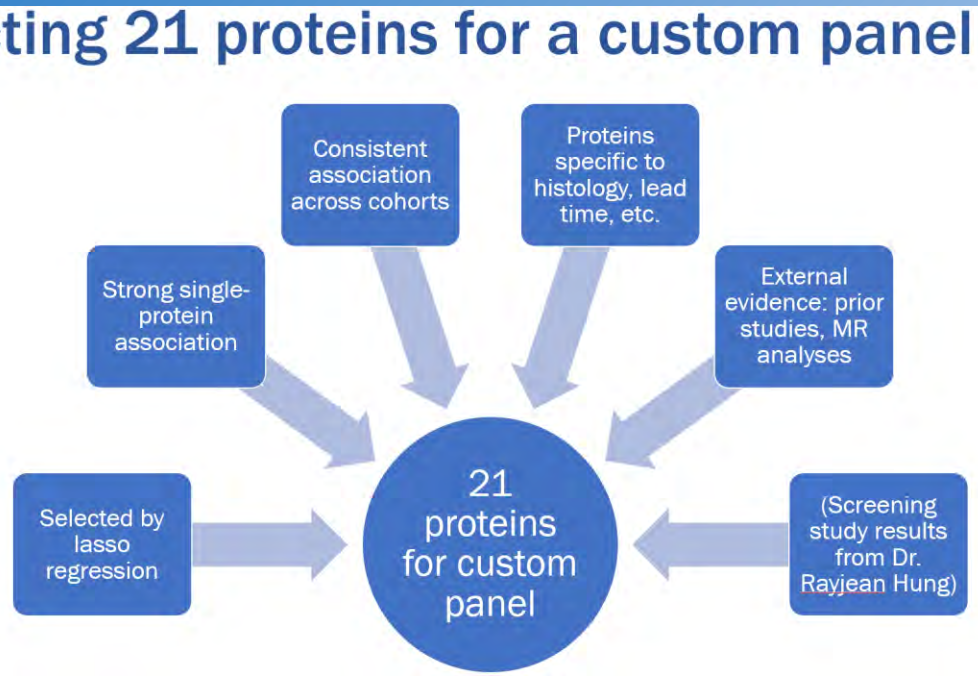
Initial studies indicated that protein markers can improve lung cancer risk models

Robust answers to a few questions:

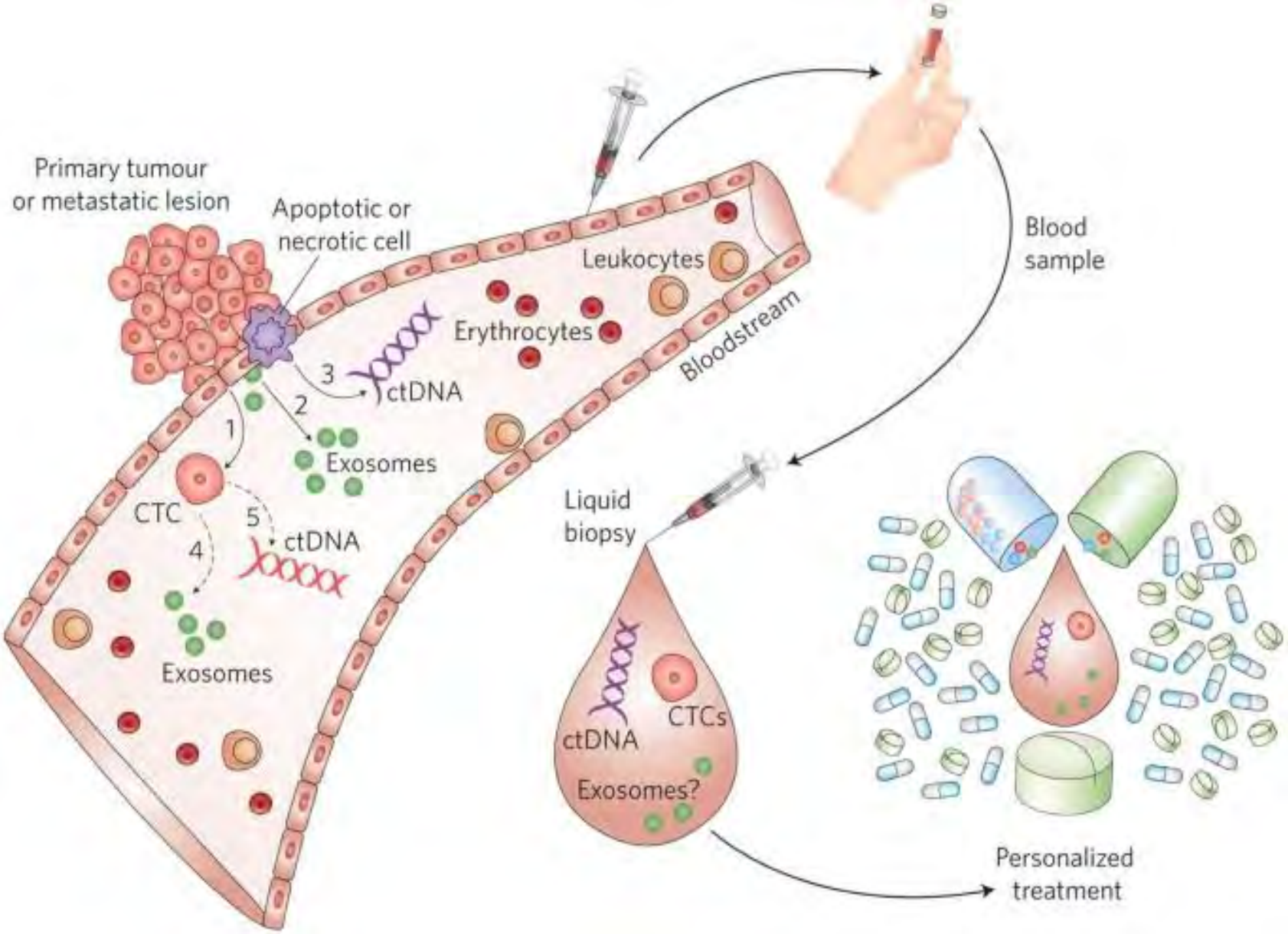
Can circulating proteins **improve** the discrimination of **standard** lung cancer **risk prediction models**? By how much?

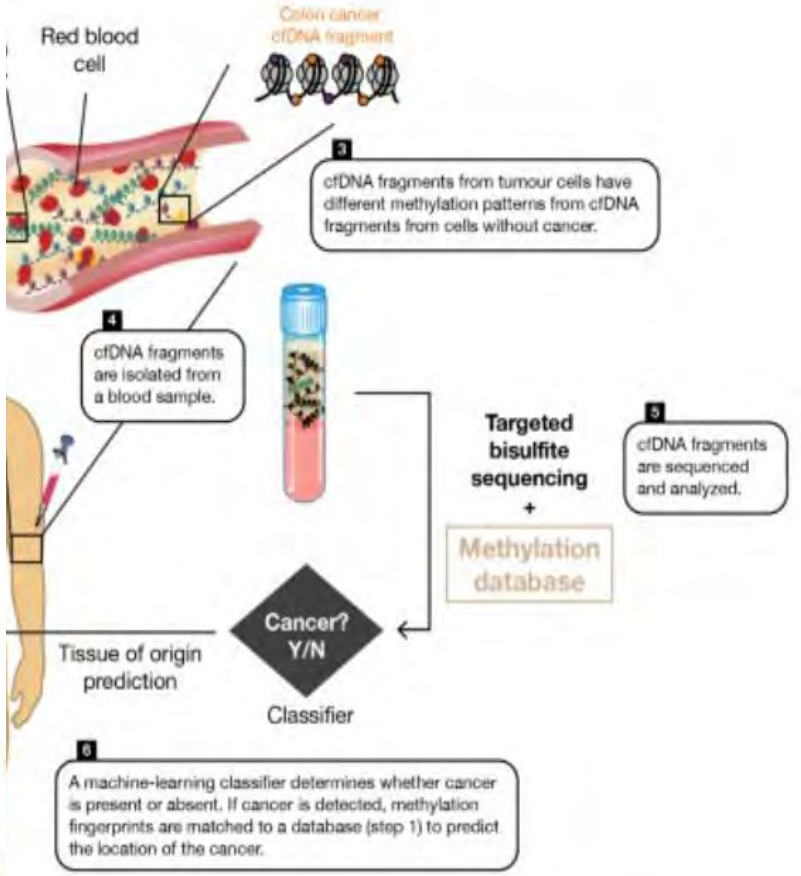
How does this affect who is classified as screening-eligible?

How does the performance of lung cancer risk models vary across **geography and ethnicity**?



DETECTION - MCED – MULTI-CANCER EARLY DETECTION





ylation patterns in blood. A targeted methylation-
e differences in DNA methylation patterns in cell-free
tterns are characteristic of different cell types and
cancer and map its location in the body.

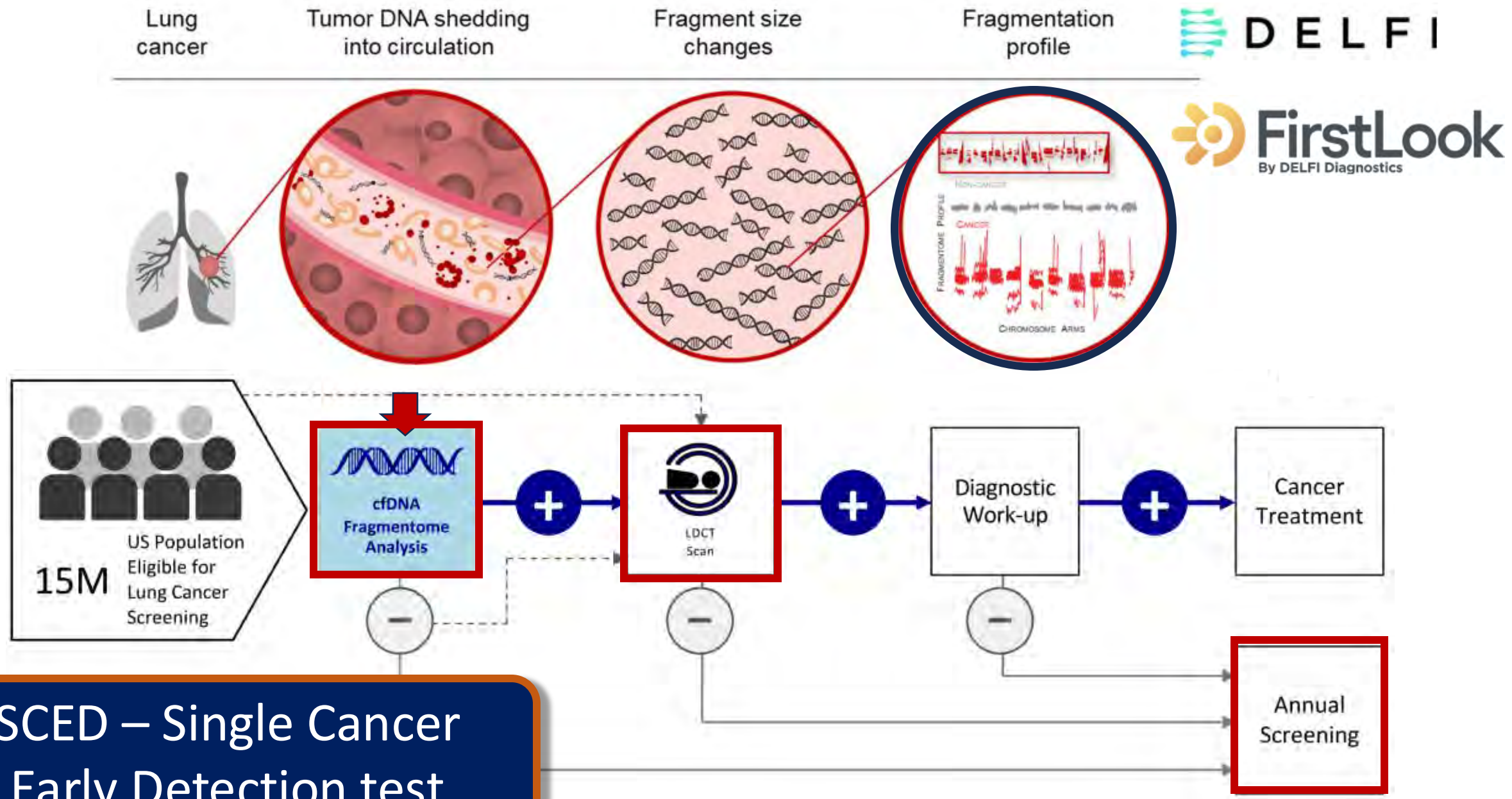
DETECTION - MCED – MULTI-CANCER EARLY DETECTION

- We've proven that early detection reduces mortality for 6 cancers: cervix, lung, breast, colon, rectal, prostate (25% of all cancer deaths)
- Only 14% of diagnosed cancers are detected by current screening tests (NORC, University of Chicago, December 14, 2022)
- Some MCEDs can detect over 50 cancers
    - Expensive
    - Not included in present screening guidelines
    - Not covered by insurance
    - Low sensitivity for early-stage cancers (<40%), though very high specificity, or low false positive (~98%); <25% sensitivity stage I lung cancer

DETECTION - MCED – MULTI-CANCER EARLY DETECTION

- Circulating DNA can detect and indicate deadly cancers in asymptomatic people
- Can increase screening rates even for cancers for which we already have screening tests
- Will this expanded testing reduce mortality for the other cancers detected?
- Will they contribute to existing healthcare disparity and inequities?
- The Public will embrace the concept of a blood test that can find cancer(s)
- These tests are coming; they are here!

Clinical validation of a cell-free DNA fragmentome assay for augmentation of lung cancer early detection



SCED – Single Cancer Early Detection test

/aacrjournals.org/cancerdiscovery/article-pdf/doi/10.1158/2159-8290.CD-24-0519/3459487/cd-24-0519.

DETECTION – SCED - HIGH SENSITIVITY DETECTION METHYLATED CFDNA

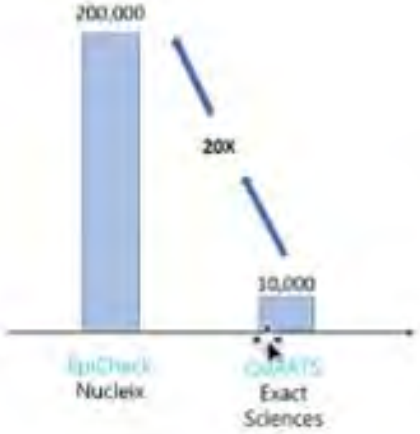
CANCER SCREENING REQUIRES FOUR KEY ELEMENTS

Nucleix is differentiated on all key elements required for early cancer detection

85 – 90% Sensitivity picking up stage I lung cancer, 70% specificity

Best Performance

EpiCheck® has 20X analytical sensitivity



Patient-Friendly

EpiCheck® is a convenient blood or urine test, ideal for broad adoption

Simple, Flexible

EpiCheck® can leverage local labs for speed and ease of use, by running on standard lab equipment (qPCR)

Affordable

EpiCheck® CoGS <$30, allows for reasonable pricing — crucial for early screening & monitoring

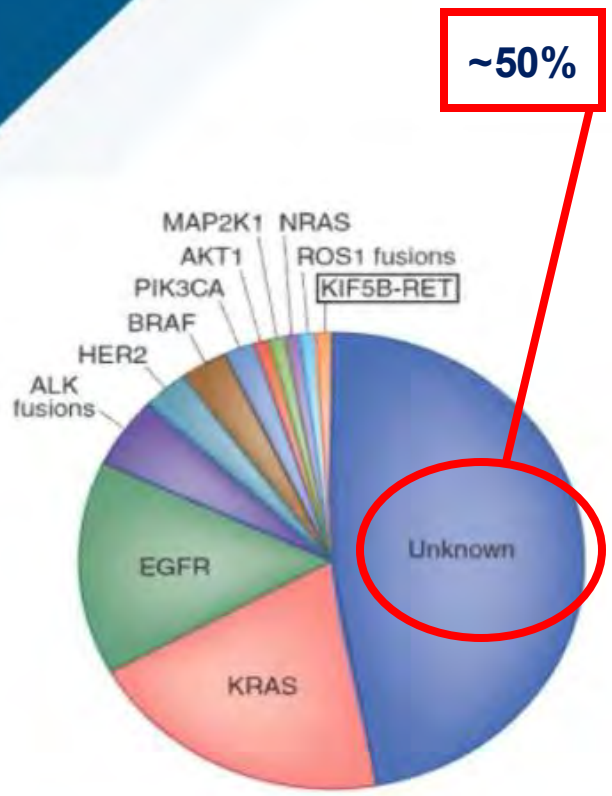
Currently there are no liquid biopsy early detection tests for lung cancer. Large market opportunity for early detection of lung cancer patients

SEHC recruited 407 of 5,914 internationally

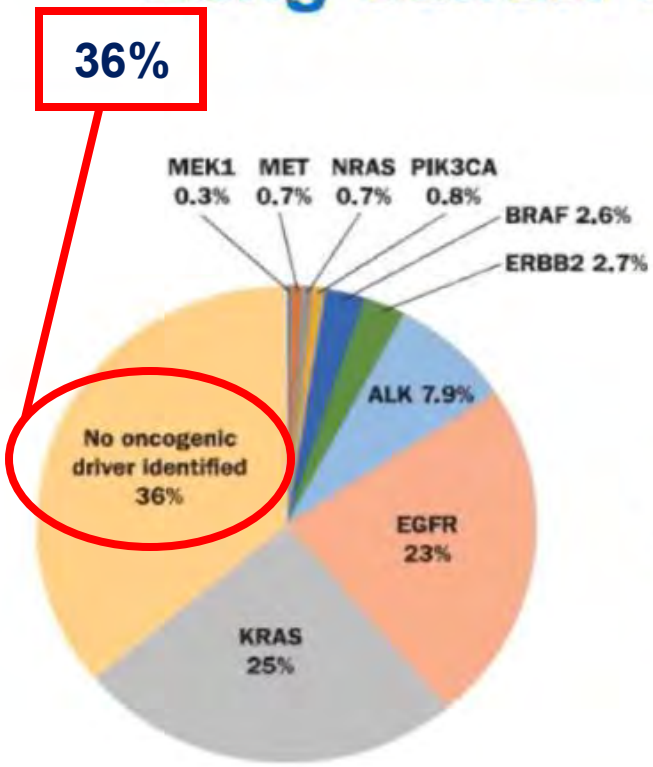
A SIMPLE BLOOD TEST COULD BE USED AS AN ADJUNCT TO LOW DOSE CT

DIRECTION – CONFRONTING NIHILISM – THE NEW FRONTIER

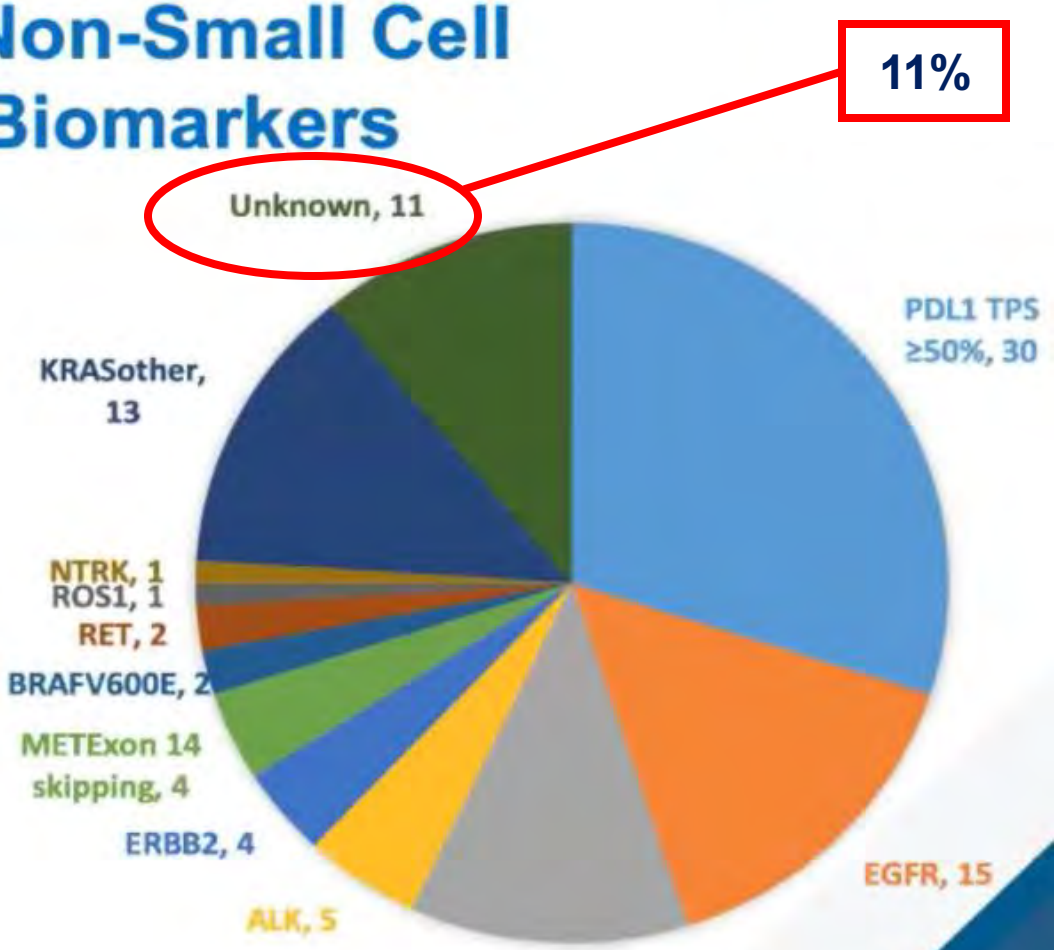
Non-Squamous Non-Small Cell Lung Cancer Biomarkers



Pao and Hutchinson 'Chipping away at the lung cancer genome'
Nature Medicine. **March 2012**



Scholl et al. Lung Cancer Mutation Consortium
J Thorac Oncol. **May 2015**



2020: biomarkers with drug targets

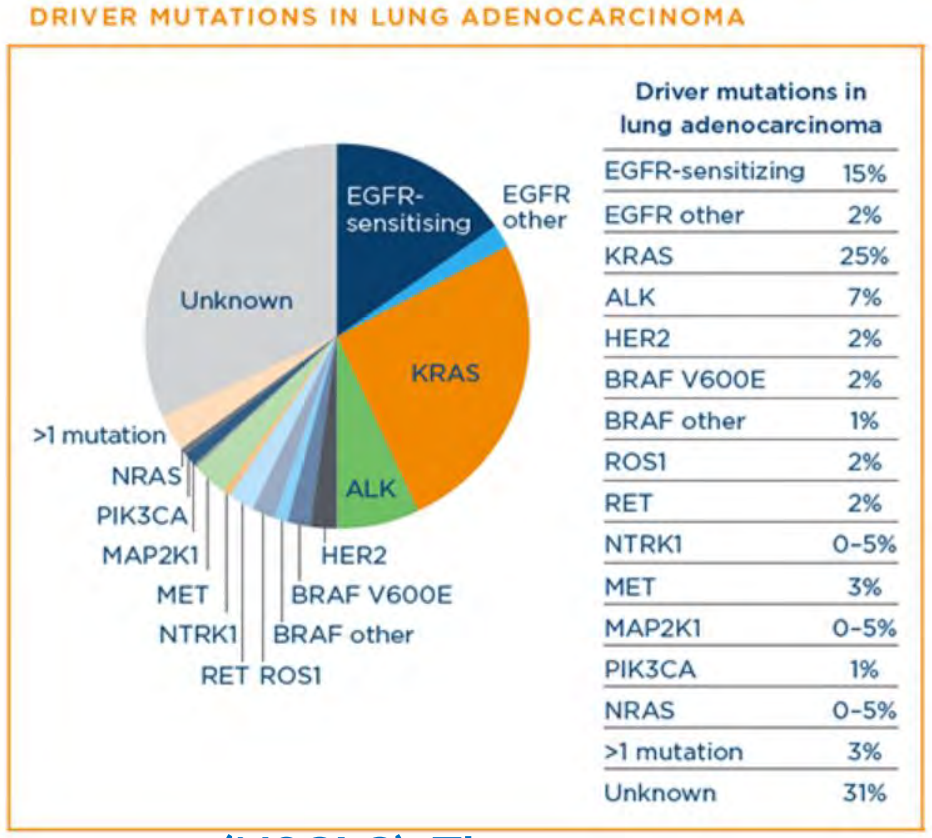
There is a targeted therapy revolution, being led by lung cancer

BIOMARKERS – CANCER TREATMENT

Targeted Therapies- for mutations; genetic abnormalities(variants) in cancer cells

>Nine (9) Genes with driver mutations for which there are FDA-approved targeted therapies (TKIs) for the treatment of lung cancer:

- **ALK** – Xalkori/crizotinib, Alecensa/alectinib, Alunbri/brigatinib, Zykadia/certinib, Lobrena/loratinib
- **BRAF V600E** - combined Tafinlar/dabrafenib and Mekinist/tremetinib
- **EGFR** – Tarceva/erlotinib, Gilotnif/afatinib, Iressa/gefitinib, Tagrisso/osimirtinib (AZ, 2015), Rybrevant/amivantamab, Portrazza/necitumab, Excivity/mobocertinib (9/15/21)
- **KRAS G12C** – Lumakras/sotorasib
- **MET exon 14 skipping** – Xalkori/crizotinib, Cometriq/cabozantinib
- **NTRK**– Vitrakvi/larotrecinib, Rozlytrek/entrectinib
- **RET**– Gavreto/pralsetinib, Cometriz/carbozantinib
- **ROS1**– Xalkori/crizotinib, Rozlytrek/entrectinib, Lobrena/lorlatinib
- **HER2 /not amplifications**– Herceptin/trastuzumab, TDM-1 ado-trastuzumab ematansine



All current FDA-approved targeted therapies treat non-small cell lung cancer (NSCLC). There are as yet no approved targeted therapies for small cell lung cancer

IMMUNOTHERAPY – THE OTHER FRONTIER

Immunotherapy drugs are treatments that work by essentially boosting the ability of the immune system to fight cancer.

One category of immunotherapy drugs is checkpoint inhibitors, of which five drugs are currently available for treating non-small cell lung cancer (with different indications):

American Cancer Society, Immunotherapy for non-small cell lung cancer. Updated April 18, 2019.

- **Opdivo (nivolumab)**
- **Keytruda (pembrolizumab)**
- **Tecentriq (atezolizumab)**
- **Imfinzi (durvalumab)**
- **Yervoy (Ipilimumab)**

Not everyone responds to immunotherapy, but in some cases, the results can be very dramatic with long-term control of the disease.

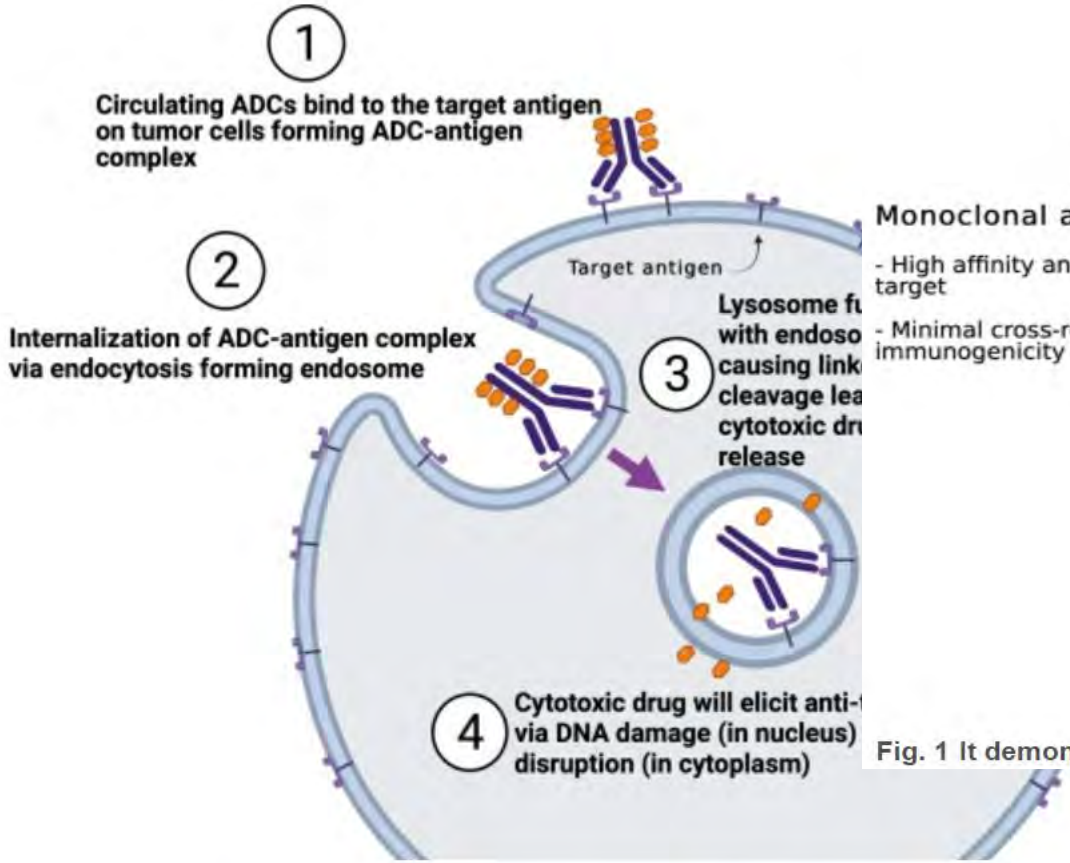
ONGOING RESEARCH, THERAPEUTIC TRIALS

- Unfortunately, even when cancers respond favorably and succumb to treatment, they eventually outsmart the treatments and **develop resistance** to the targeted therapies.
- **Previously,** we did not know this to be the case as lung cancer patients **did not outlive their first lines of treatment.**
- Now we are discovering that we need to be nimble and correct course as cancers outsmart the targeted therapies. We need new **replacement therapies or combined therapies** that are less likely to succumb to resistance.

ADC – ANTIBODY DRUG CONJUGATES

A comprehensive review on antibody-drug conjugates (ADCs) in the treatment landscape of non-small cell lung cancer (NSCLC)

Ziad Abuhelwa [a], Abdurahman Alloghbi [b,c,d], Misako Nagasaka [e,f,*] April 2022



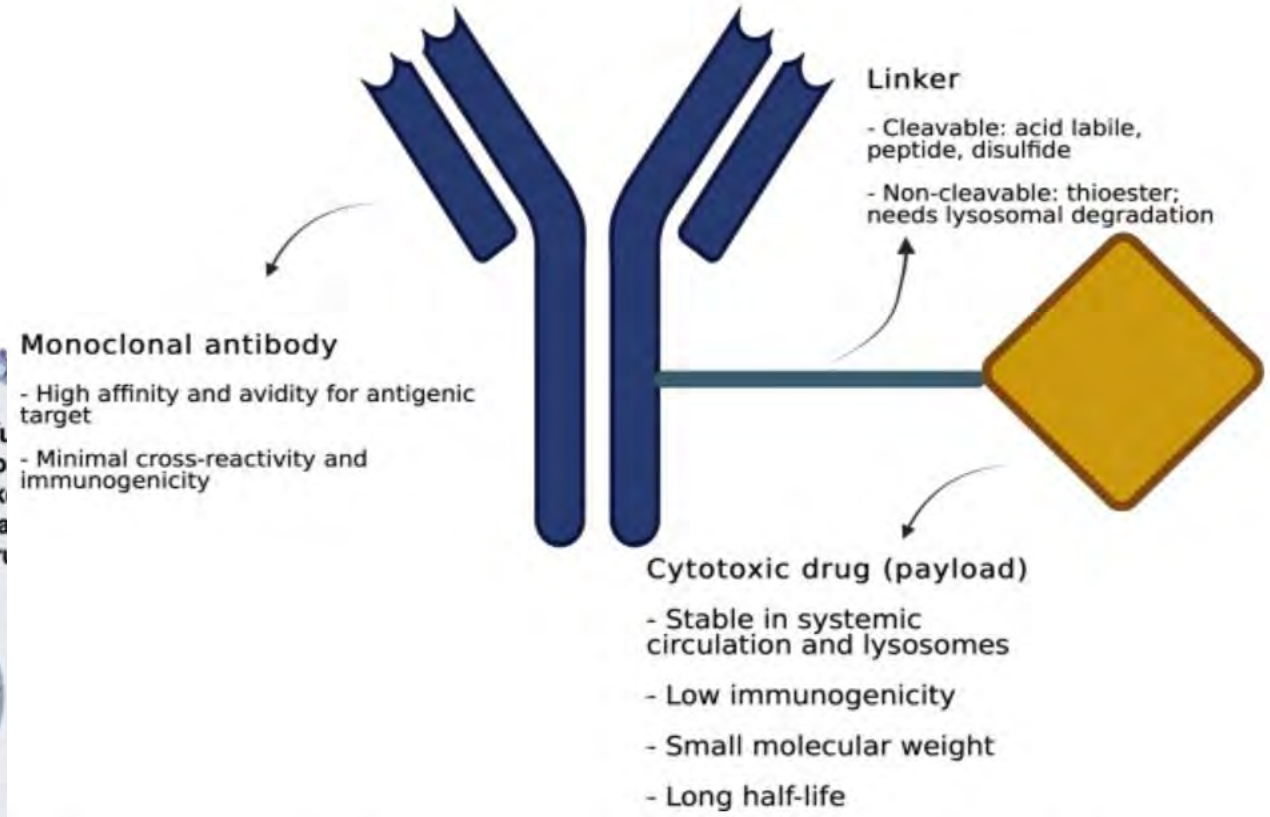
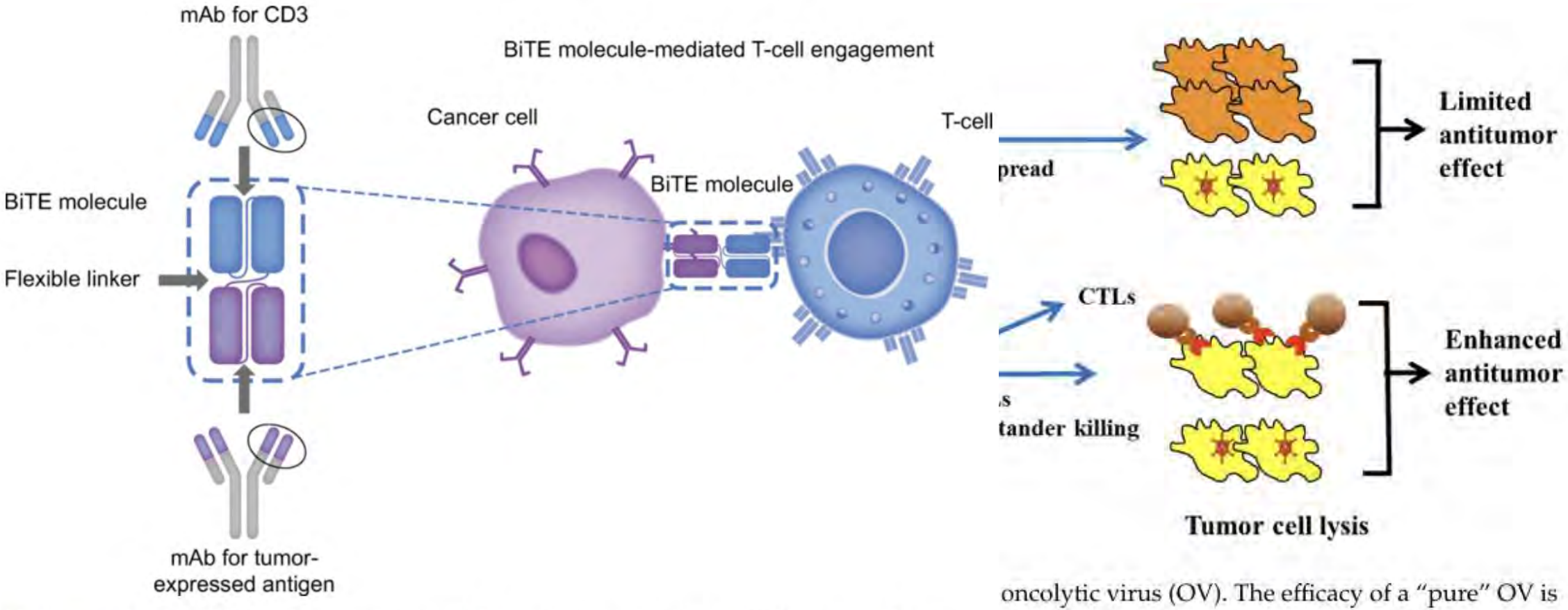


Fig. 1 It demonstrates the three components of ADCs; the monocolonal antibody, cytotoxic drug (payload) and the linker.

Fig. 2 It shows the step by step mechanisom of action of ADCs. Circulating ADCs bind to the target antigen forming an ADC-antigen complex (1).

Then, the complex is internalized via endocytosis (2). Linker cleavage leads to cytotoxic drug release (3) and elicit anti-tumor effects (4).

BITES – BISPECIFIC T-CELL ENGAGERS – ONCOLYTIC VIROTHERAPY



Mechanism of action of BiTE technology. BiTE bispecific T cell engager, CD3 cluster of differentiation 3, mAb monoclonal antibody

Viardot, Andreas & Locatelli, Franco & Stieglmaier, Julia & Zaman, Faraz. (2020). Concepts in immuno-oncology: tackling B cell malignancies with CD19-directed bispecific T cell engager therapies Annals of Hematology. 99. 10.1007/s00277-020-04221-0.

oncolytic virus (OV). The efficacy of a "pure" OV is
roughout the tumor tissue and induction of tumor
ercome these limitations as the armed OV produces
and secrete these BiTEs that diffuse within the tumor tissue, activating and directing endogenous T cells to recognize and kill the tumor cells or/and stromal cells effectively (even if not directly infected by the OV), resulting in improved antitumor efficacy. This is a modified version of a figure originally published by Song XT, Discovery Med, 2013 [71].

Guo, Zong Sheng & Lotze, Michael & Zhu, Zhi & Storkus, Walter & Song, Xiao-Tong. (2020). Bi- and Tri-Specific T Cell Engager-Armed Oncolytic Viruses: Next-Generation Cancer Immunotherapy. Biomedicines. 8. 204. 10.3390/biomedicines8070204.

LCS CRITERIA STILL MISSING MANY PATIENTS

Review of our first 30,000+ LCSs

Overcoming barriers to lung cancer screening using a systemwide approach with additional focus on the non-screened , ASPIRED

Michael R Gieske, Jessica Kerns, [...], and Royce F Calhoun (+8) View all authors and affiliations

OnlineFirst https://doi.org/10.1177/09691413231208160

Distribution of non-screened cohort respective of patients who could have qualified for screening, either with existing EMR data, or upon audit of substance use substance use history

	CMS 2015		USPSTF 2021	
Non-screened lung cancers	*N*	%	*N*	%
Met criteria—existing EMR	720	31.96%	1020	45.27%
Met criteria—on audit	294	13.05%	272	12.07%
Subtotal	**1014**	**45.01%**	**1292**	**57.35%**
Eligibility could not be determined	87	3.86%	120	5.3%
Did not meet screening criteria	1152	51.13%	841	37.3%
Total	**2253**	**100.00%**		**100.00%**

EMR: electronic medical record; CMS: Centers for Medicare & Medicaid Services; USPSTF: Uni… …entive Services Task Force.

42.6% of lung cancer patients, even after an audit, did not qualify for any insurance recognized LCS criteria

WE NEED A BETTER RISK PREDICTION MODEL/ALGORITHM

- 20% Lung Cancers in the United States occur in individuals without a history of smoking
- SEHC – 42.7% lung cancers not within USPSTF 2021criteria after audit

Gieske MR, Kerns J, Schmitt GM, et al. Overcoming barriers to lung cancer screening using a systemwide approach with additional focus on the non-screened. *Journal of Medical Screening.* 2024;31(2):99-106. doi:10.1177/09691413231208160

- Radon is considered to be a major risk factor for non-smoking related Lung Cancers
- In Asia and Africa, cooking oils and open wood burning without ventilation is a major risk factor
- Family history is a substantial risk factor and increases with the number of relatives affected. Biomarkers will become increasingly part of the equation
- Air pollution is a major risk factor in many areas of the world
- In Taiwan, 53% of Lung Cancer occurs in individuals with no smoking history; 60% found in stage IV. Globally, more than 60% of LC occurs in females who have never smoked (USA – 15%)

Lo YL Hsiao CF, Chang GC, et al. Risk factors for primary lung cancer among never smokers by gender in a matched case-control study. *Cancer Causes Control.* 2013; 24: 567-576

RISK PREDICTION MODELS

PLCOm2012

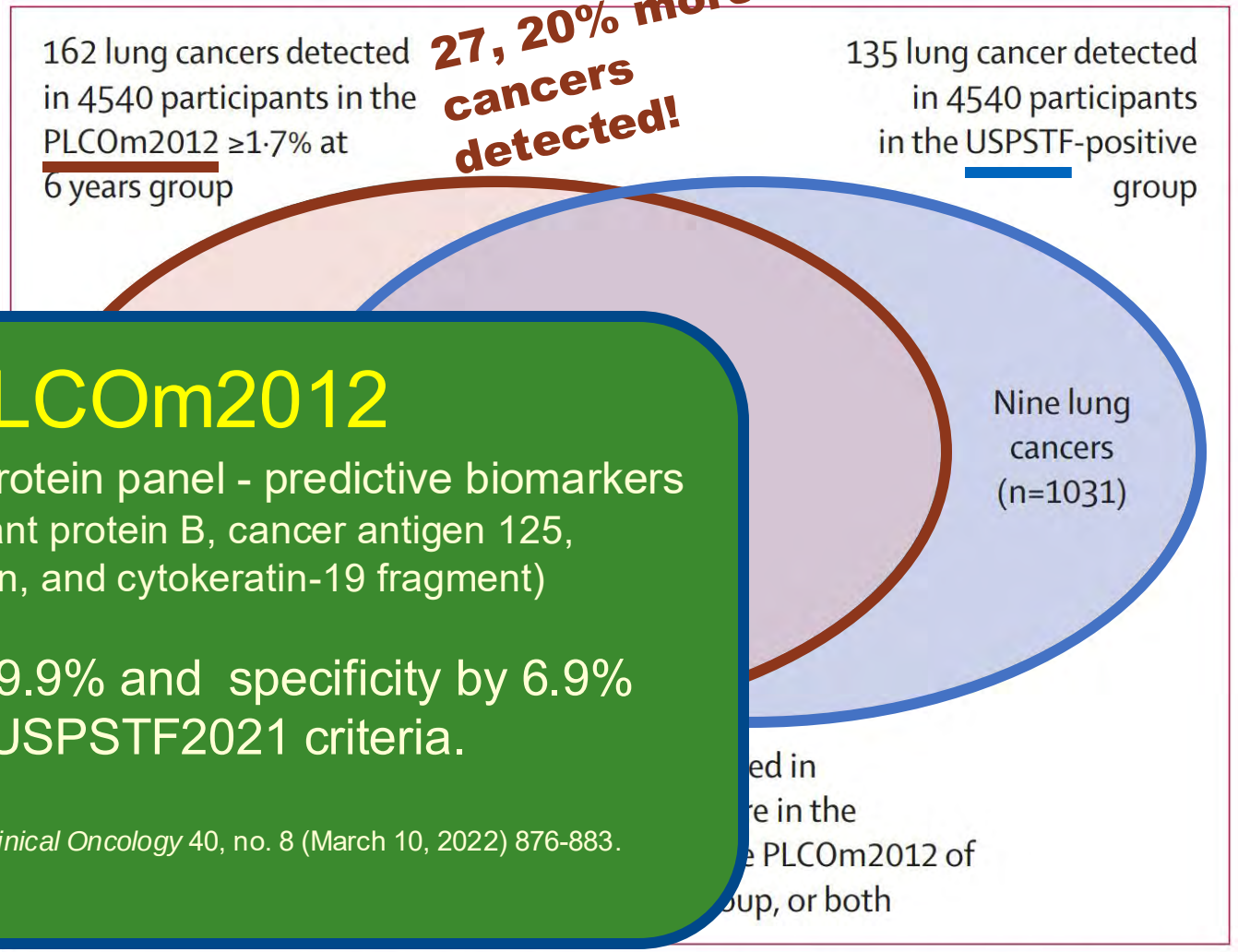
We have implemented and utilized the PLCOm2012 risk prediction model to calculate risk; use ≥1.3% chance of lung cancer in 6 years. Incorporates 11 predictors: (1) age; (2) smoking status (fo… average number … (4) duration smok… smoking. (6) highest level … mass index (BMI) … pulmonary diseas… of cancer; (10) fa… (11) race and eth…

4MP+PLCOm2012

Incorporates a 4 marker protein panel - predictive biomarkers (precursor form of surfactant protein B, cancer antigen 125, carcinoembryonic antigen, and cytokeratin-19 fragment)

Improved sensitivity by 9.9% and specificity by 6.9% compared with USPSTF2021 criteria.

DOI: 10.1200/JCO.21.01460 *Journal of Clinical Oncology* 40, no. 8 (March 10, 2022) 876-883.



USPSTF2013 versus PLC… eligibility criteria (International Lung Screening Trial): interim analysis of a prospective cohort study

Martin C Tammemägi, Mamta Ruparel, Alain Tremblay, Renelle Myers, John Mayo, John Yee, Sukhinder Atkar-Khattra, Ren Yuan, Sonya Cressman, John English, Eric Bedard, Paul MacEachern, Paul Burrowes, Samantha L Quaife, Henry Marshall, Ian Yang, Rayleen Bowman, Linda Passmore, Annette McWilliams, Fraser Brims, Kuan Pin Lim, Lin Mo, Stephen Melsom, Bann Saffar, Mark Teh, Ramon Sheehan, Yijin Kuok, Renee Manser, Louis Irving, Daniel Steinfort, Mark McCusker, Diane Pascoe, Paul Fogarty, Emily Stone. David C L Lam. Mina-Yen Na. Varut Vardhanabhuti, Christine D Berg†, Rayjean J Hung, Samuel M Janes, Kwun Fong, Stephen Lam* **Lancet Oncol 2022; 23: 138-48***

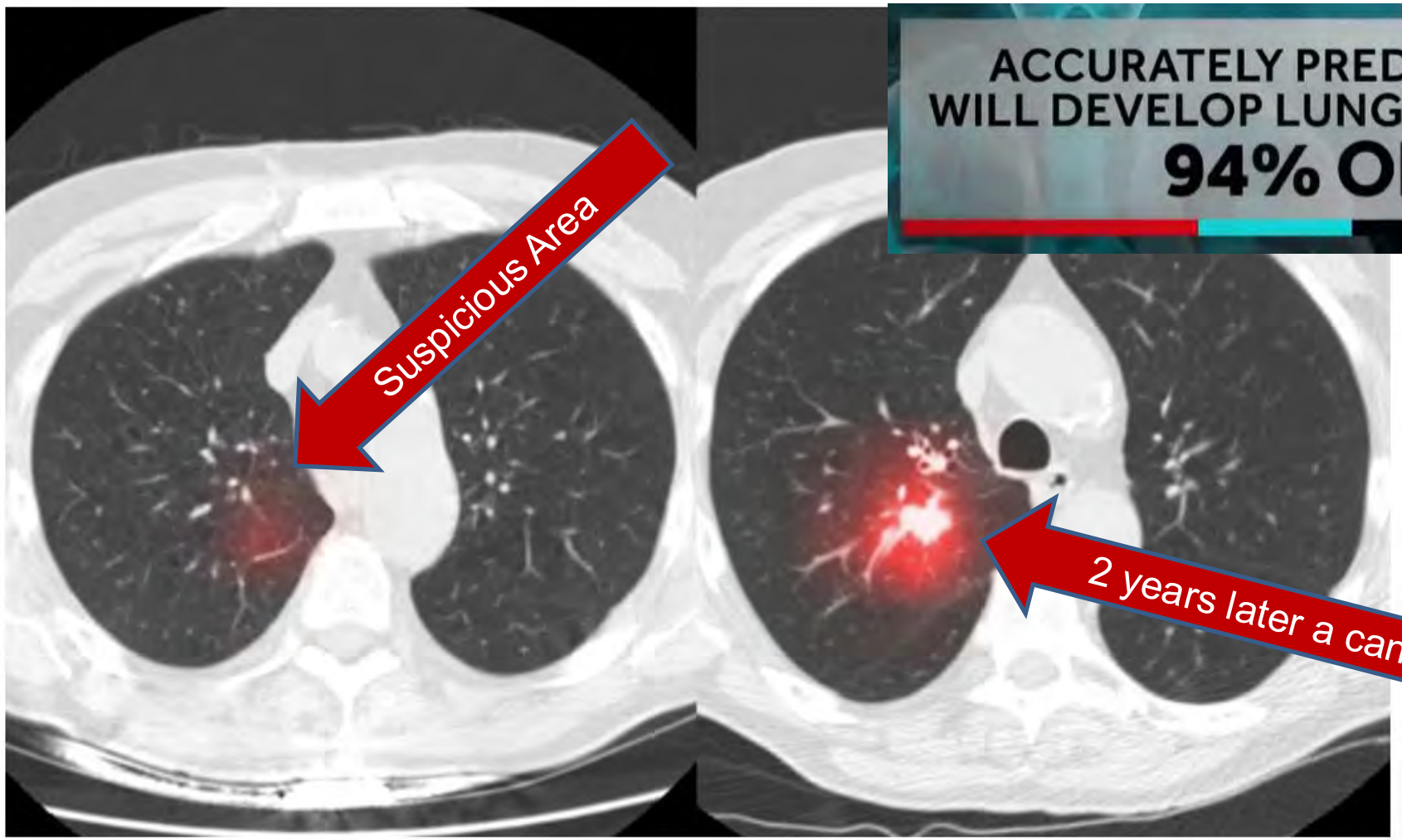
Figure: **Venn diagram describing the distribution of individuals and lung cancer cases by criteria (USPSTF2013 positivity and PLCOm2012 ≥1·7% at 6 years status)**

Sybil AI Tool for Prediction of Lung Cancer

Promising new AI can detect early signs of lung cancer that doctors can't see

The tool, Sybil, looks for signs of where cancer is likely to turn up so doctors can spot it as early as possible.

Sybil AI Tool for Prediction of Lung Cancer



ACCURATELY PREDICT WHETHER A PERSON WILL DEVELOP LUNG CANCER IN THE NEXT YEAR
94% OF THE TIME

Sybil is able to detect early signs of lung cancer. These CT scans, from the same patient, were taken two years apart. In the scan on the left, the area highlighted in red is what Sybil detected. The scan on the right shows what the radiologists saw two years later.

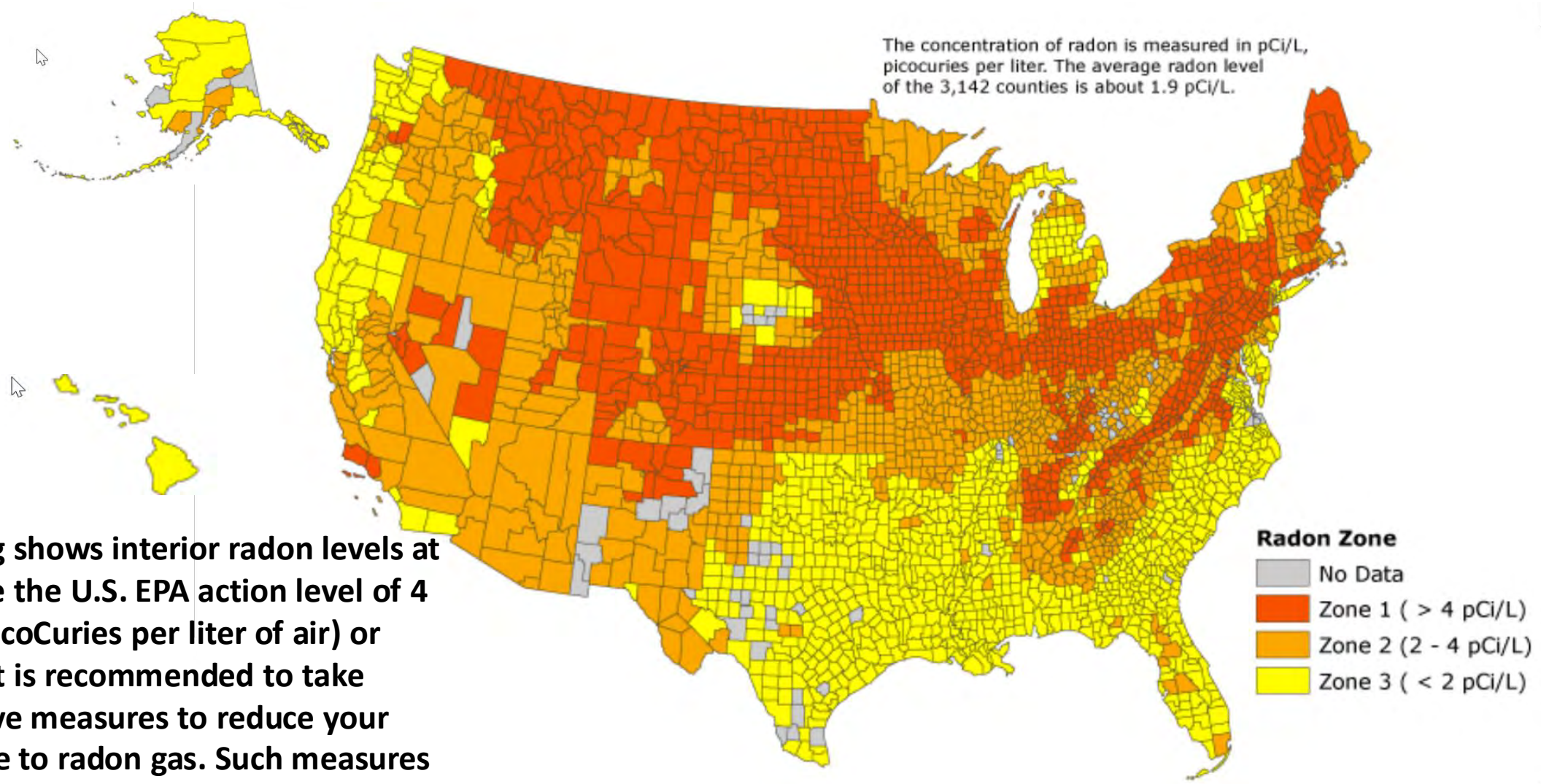
MIT and Mass General

AS WE MAKE PROGRESS,

- Cancer Care is entering an **extraordinary era**
- Lung Cancer has been increasingly at the **forefront of many emerging technologies** and treatments
- **We can not tolerate progress for some but not for others**
- Achieving **equitable cancer care and outcomes** is going to become increasingly difficult

RADON

RADON



If testing shows interior radon levels at or above the U.S. EPA action level of 4 pCi/L (picoCuries per liter of air) or higher, it is recommended to take corrective measures to reduce your exposure to radon gas. Such measures should also be considered at levels at or above 2 pCi/L.

RADON

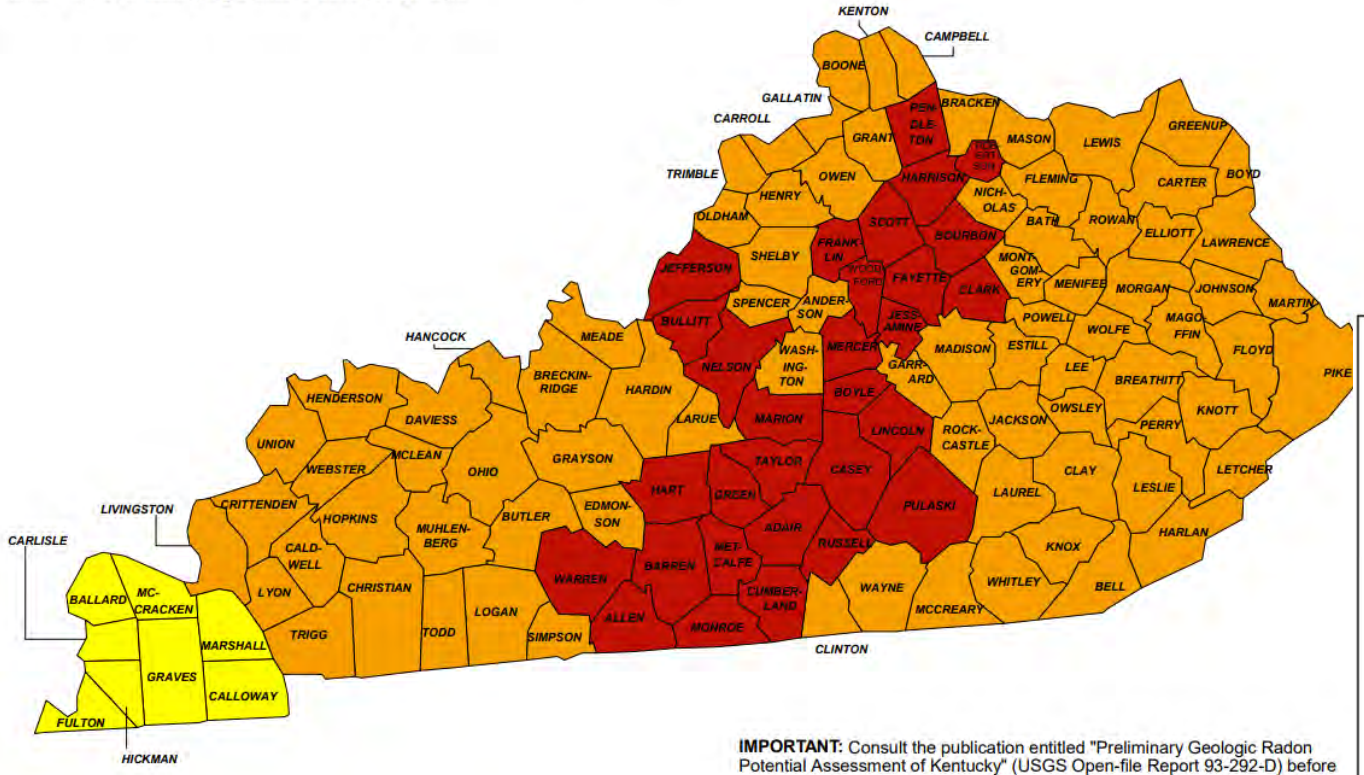
KENTUCKY - EPA Map of Radon Zones

http://www.epa.gov/radon/zonemap.html

The purpose of this map is to assist National, State and local organizations to target their resources and to implement radon-resistant building codes.

This map is not intended to determine if a home in a given zone should be tested for radon. Homes with elevated levels of radon have been found in all three zones.

All homes should be tested, regardless of zone designation.



IMPORTANT: Consult the publication entitled "Preliminary Geologic Radon Potential Assessment of Kentucky" (USGS Open-file Report 93-292-D) before using this map. http://energy.cr.usgs.gov/radon/grpinfo.html This document contains information on radon potential variations within counties. EPA also recommends that this map be supplemented with any available local data in order to further understand and predict the radon potential of a specific area.

Zone 1 Zone 2 Zone 3

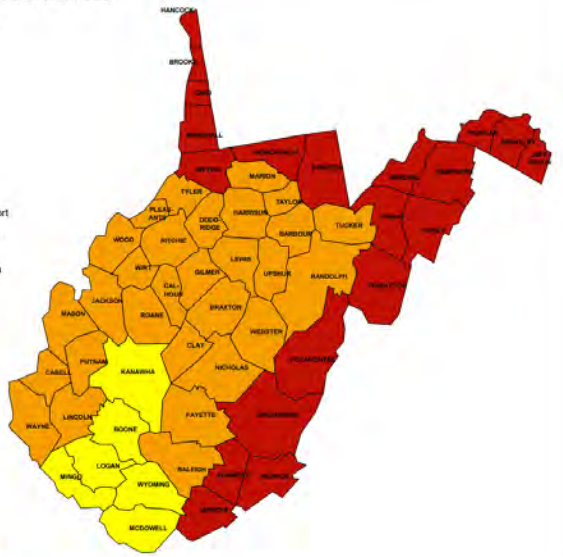
WEST VIRGINIA - EPA Map of Radon Zones

http://www.epa.gov/radon/zonemap.html

The purpose of this map is to assist National, State and local organizations to target their resources and to implement radon-resistant building codes.

This map is not intended to determine if a home in a given zone should be tested for radon.

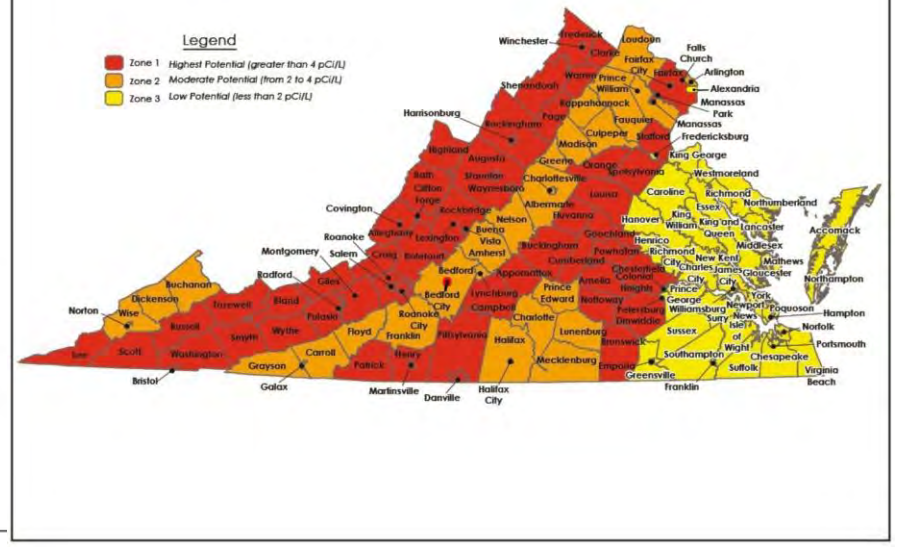
All homes should be tested, regardless of zone designation.



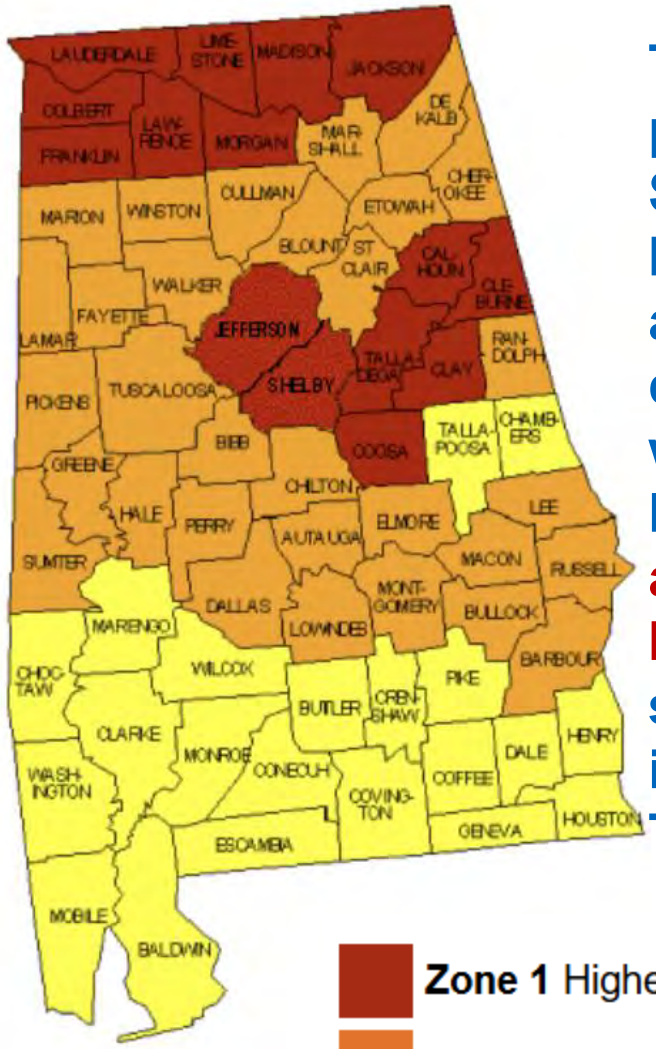
IMPORTANT: Consult the publication entitled "Preliminary Geologic Radon Potential Assessment of West Virginia" (USGS Open-file Report 93-292-C) before using this map. http://energy.cr.usgs.gov/radon/grpinfo.html This document contains information on radon potential variations within counties. EPA also recommends that this map be supplemented with any available local data in order to further understand and predict the radon potential of a specific area.

Zone 1 Zone 2 Zone 3

Virginia - Radon Zones



RADON



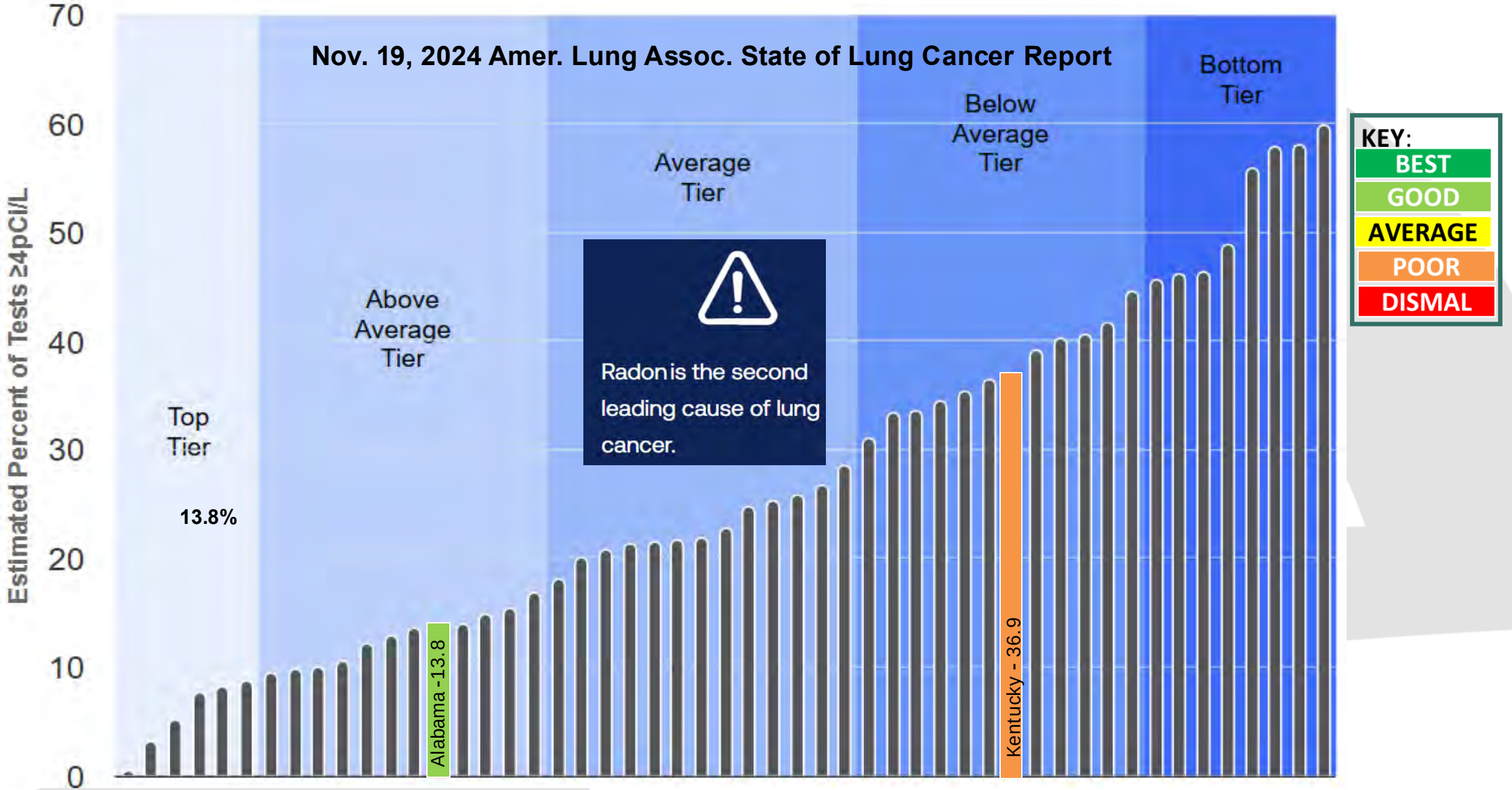
The U.S. EPA and the U.S. Geological Survey have evaluated the radon potential in the U.S. and have developed this map is to assist National, State, and local organizations to target their resources and to assist building code officials in deciding whether radon-resistant features are applicable in new construction. This map is not intended to be used to determine if a home in a given zone should be tested for radon. Homes with elevated levels of radon have been found in all three zones. All homes should be tested regardless of geographic location. **The map assigns each of the 3,141 counties in the U.S. to one of three zones based on radon potential.** Each zone designation reflects the average short-term radon measurement that can be expected to be measured in a building without the implementation of radon control methods. The radon zone designation of the highest priority is Zone 1.

Zone 1 Highest Potential (greater than 4 pCi/L)

Zone 2 Moderate Potential (from 2 to 4 pCi/L)

Zone 3 Low Potential (less than 2 pCi/L)

% OF RADON TESTS AT OR ABOVE EPA ACTION LEVEL



RADON 86 Rn RADON KENTUCKY – COUNTY SPECIFIC - PIKE

Radon is a naturally occuring, radioactive gas.

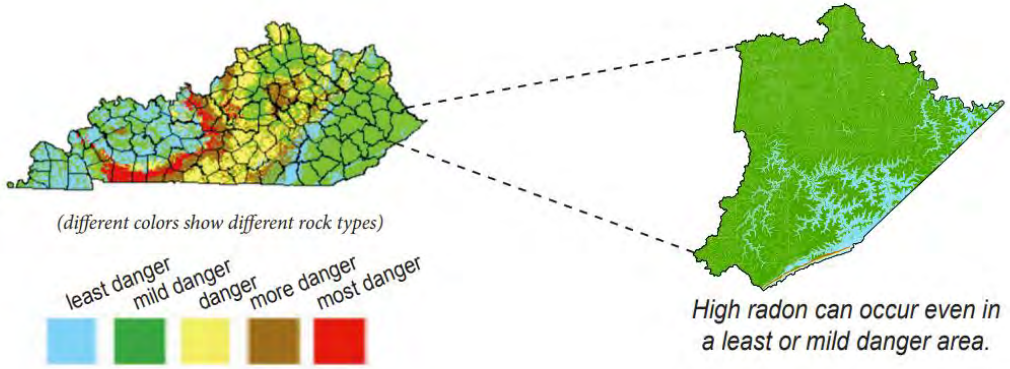
- It cannot be seen, smelled or tasted.
- It may seep into your home from the rocks below.
- It is the second leading cause of lung cancer.

TEST YOUR HOME • KNOW YOUR LEVEL

For a radon test kit, contact the Kentucky Radon Program at (502) 564-4856.

Certain types of rock have higher levels of radon:

Radon is a problem in many areas in Kentucky, including Pike County.

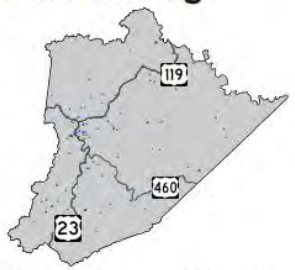


High radon can occur even in a least or mild danger area.

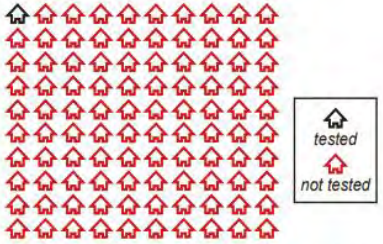
Smoking and radon:

Breathing radon is dangerous, but it is even *more* harmful when you also breathe tobacco smoke.

Radon Testing:



• Blue dots show homes already tested for radon.



More homes in Pike County need to be tested.

TEST YOUR HOME • KNOW YOUR LEVEL

For a radon test kit, contact the Kentucky Radon Program at (502) 564-4856.
For more information about the maps, contact BREATHE at (859) 257-7028.

BREATHE
Bridging Research Efforts and Advocacy Toward Healthy Environments

Radon Policy Research Program

College of Nursing

Funding provided by the Kentucky State Radon Program © University of Kentucky BREATHE

Radon

86 Rn RADON

Radon is in the ground naturally.
But sometimes it gets into homes through cracks in the floors or walls.

Radon and Smoking: A Dangerous Combination

1 OUT OF 15

HOMES IN THE U.S. HAVE HIGH RADON LEVELS *

Radon is a gas that you **can't see, smell,** or **taste** – but it can be dangerous. It's the **second leading cause of lung cancer in the U.S.**

Action is required if your home has a radon level of 4 picocuries per liter (pCi/L) or higher

RADON AND SECONDHAND SMOKE

SECONDHAND SMOKE

86 Rn RADON

RADON

WHAT IS IT?

Radon is a naturally occurring radioactive gas that cannot be seen, smelled, or tasted.

WHY IS IT DANGEROUS?

Radon is the **2nd leading cause of lung cancer.**

Radon **attaches to dust or tobacco smoke** and gets carried into the lungs.

MOST EXPOSURE OCCURS IN HOMES

NO SAFE LEVEL OF RADON

WHAT CAN YOU DO ABOUT IT?

TEST YOUR HOME
KNOW YOUR LEVEL

Ask a certified radon professional to fix high radon levels

The state radon program and some local health departments provide free radon test kits.

Kentucky State Radon Program
(502) 564-4856

RADON & SECONDHAND SMOKE

Breathing radon is dangerous, but it is ***more harmful*** when you also breathe tobacco smoke.

FOR MORE INFORMATION:

Breathe - University of Kentucky College of Nursing
(859) 323-4587
Breathe.uky.edu

NO SAFE LEVEL OF RADON

stelizabeth.com

St. Elizabeth PHYSICIANS | St. Elizabeth HEALTHCARE

SECONDHAND SMOKE (SHS)

WHAT IS IT?

SHS is a mixture of smoke exhaled by the smoker and smoke from the burning end of tobacco products.

CIGARETTE SMOKE CONTAINS:

MORE THAN **7,000** CHEMICALS AND **69** CAUSE CANCER

SHS is EVERYWHERE

Businesses | Restaurants | Homes

when smoking is allowed.

IN CHILDREN, SHS CAUSES:

- Ear infections
- More frequent & severe asthma attacks
- Lung infections
- Sudden infant death syndrome (SIDS)

BREATHING SHS CAUSES:

HEART DISEASE | **LUNG CANCER** | **STROKE**

WHAT CAN YOU DO ABOUT IT?

- Make your car and home **100%** tobacco-free.
- **QUIT SMOKING & STAY AWAY** from tobacco smoke.
- Only visit **smoke-free** restaurants & businesses
- Contact local policymakers to advocate for smoke-free air

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St. Elizabeth PHYSICIANS | St. Elizabeth HEALTHCARE

RADON TEST KITS, DEVICES

Airthings Corentium Home Radon Detector 223 Portable, Lightweight, Easy-to-Use, (3) AAA Battery Operated, USA Version, pCi/L

Visit the Airthings Store

4.5 ★★★★½ 8,654 ratings | 277 answered questions

-24% $136.25

List Price: $179.99

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FREE Returns

Get a **$125 Amazon.com Gift Card** upon approval for the Amazon Business Prime American Express Card. Terms apply.

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1 option from $34.06/2 weeks at 0% APR

One-time payment
$136.25

AprilAire Radon Test Kit Single Pack, Short Term, Shipping & Lab Fees Included, Easy to use, EPA Approved Method

Visit the Aprilaire Store

3.5 ★★★½☆ 45 ratings

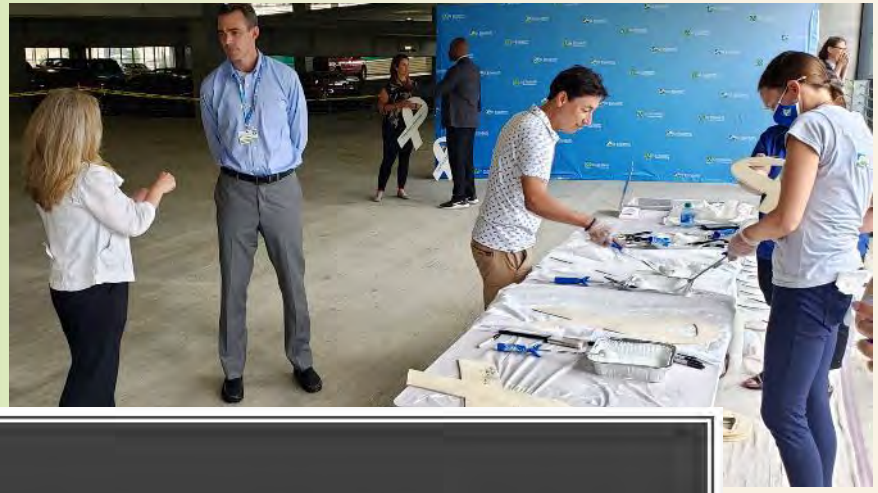
$19.94

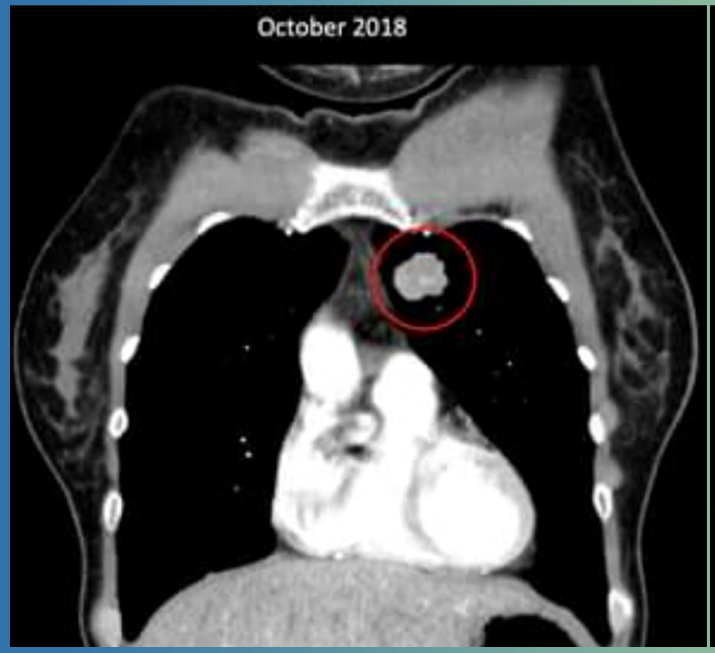
prime One-Day

FREE Returns

- KEEP YOUR HOME SAFE from radon- it is a naturally occurring odorless and colorless gas and is the number one cause of lung cancer among non-smokers
- EASY TO USE test kit with simple instructions that are easy to follow and perfect for any homeowner- it only takes 3-7 days to complete
- FREE SHIPPING and paid postage of your test kit back to the lab, simply seal up your test kit and send it in
- FULL ANALYSIS of your test kit by an NRPP certified lab, recognized in all 50 states and every US territory. All lab and processing fees are included with the purchase of your kit, simply set up your test and send it in for results
- QUICK, EASY, AND ACCURATE- our tests provide you with the answers you need to protect your family from the dangers of radon

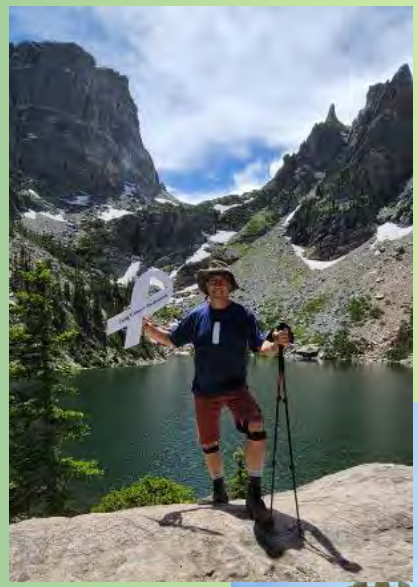
The White Ribbon Project





The White Ribbon Project

Promoting action through engagement



HOPE...

Thank You!

...From the Mountaintops