Lung Cancer Screening

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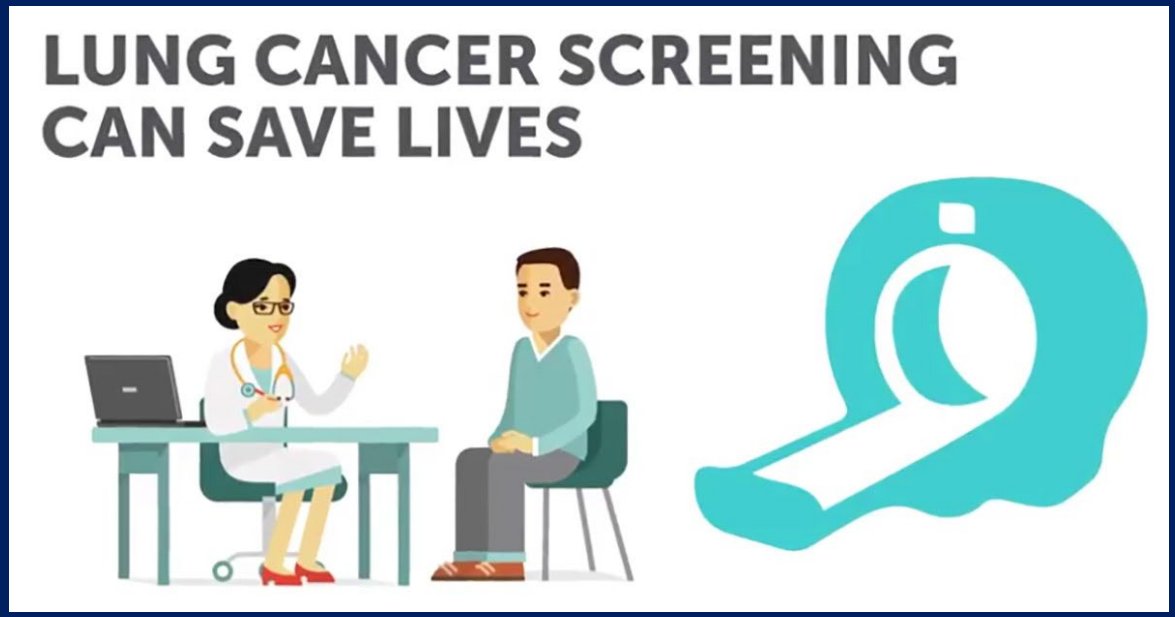
MARYLAND TCRC Tobacco Control Resource Center

Disclosures

- None



https://www.lung.org/lung-health-diseases/lung-disease-lookup/lung-cancer/screening-resources

Objectives

- Reason for Lung Cancer screening (LCS)
- Components of LCS
- How to interpret LDCT results
- Barriers to LCS

“You ask me what we need to win this war. I answer, tobacco as much as bullets.”
So cabled the commander of the American Expeditionary Force, Gen. John Pershing, to the War Department in 1917

Reportable condition 100 years back, with only 374 cases worldwide in 1912

At a Glance

Estimated New Cases in 2024	234,580
% of All New Cancer Cases	11.7%

Estimated Deaths in 2024	125,070
% of All Cancer Deaths	20.4%

5-Year Relative Survival
26.7%
2014–2020

	Common Types of Cancer	Estimated New Cases 2024	Estimated Deaths 2024
1.	Breast Cancer (Female)	310,720	42,250
2.	Prostate Cancer	299,010	35,250
3.	**Lung and Bronchus Cancer**	**234,580**	**125,070**
4.	Colorectal Cancer	152,810	53,010
5.	Melanoma of the Skin	100,640	8,290
6.	Bladder Cancer	83,190	16,840
7.	Kidney and Renal Pelvis Cancer	81,610	14,390
8.	Non-Hodgkin Lymphoma	80,620	20,140
9.	Uterine Cancer	67,880	13,250
10.	Pancreatic Cancer	66,440	51,750

Lung and bronchus cancer represents 11.7% of all new cancer cases in the U.S.

11.7%

JAMA | US Preventive Services Task Force | RECOMMENDATION STATEMENT

Screening for Lung Cancer

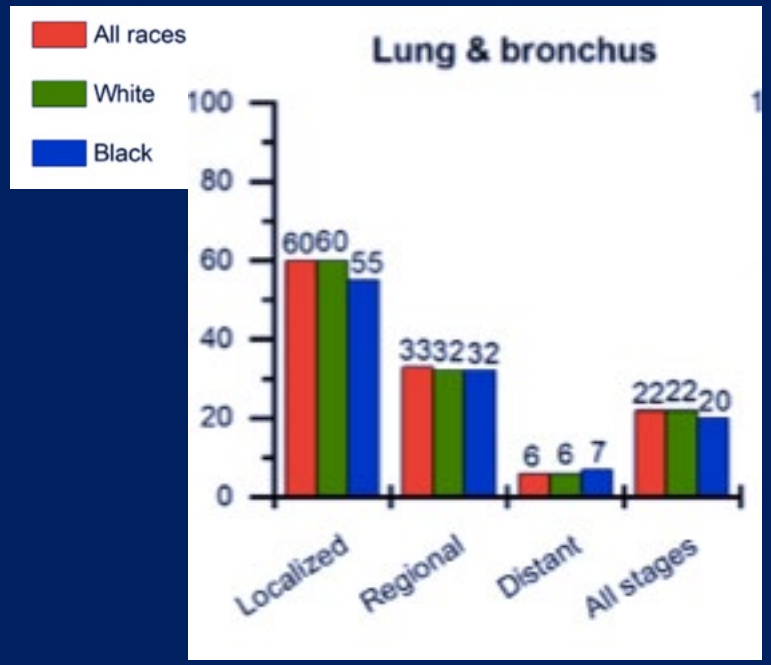
US Preventive Services Task Force Recommendation Statement

US Preventive Services Task Force

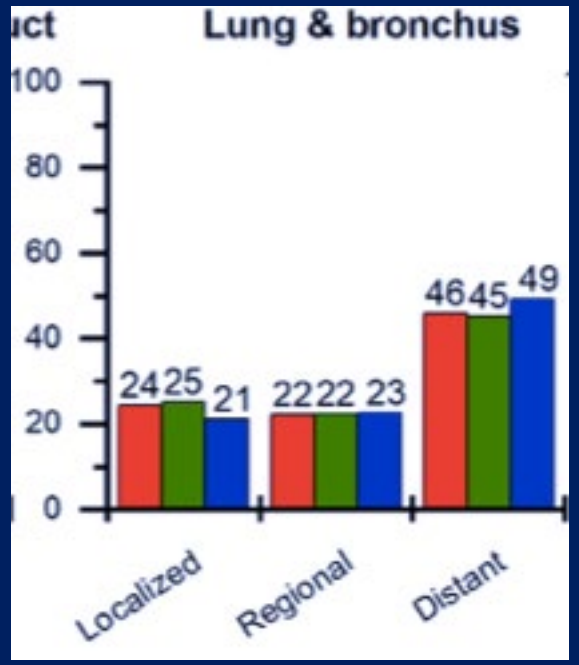
Adults aged 50 to 80 years who have a 20 pack-year smoking history and currently smoke or have quit within the past 15 years	The USPSTF recommends annual screening for lung cancer with low-dose computed tomography (LDCT) in adults aged 50 to 80 years who have a 20 pack-year smoking history and currently 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

JAMA. 2021;325(10):962-970. doi:10.1001/jama.2021.1117

Epidemiology

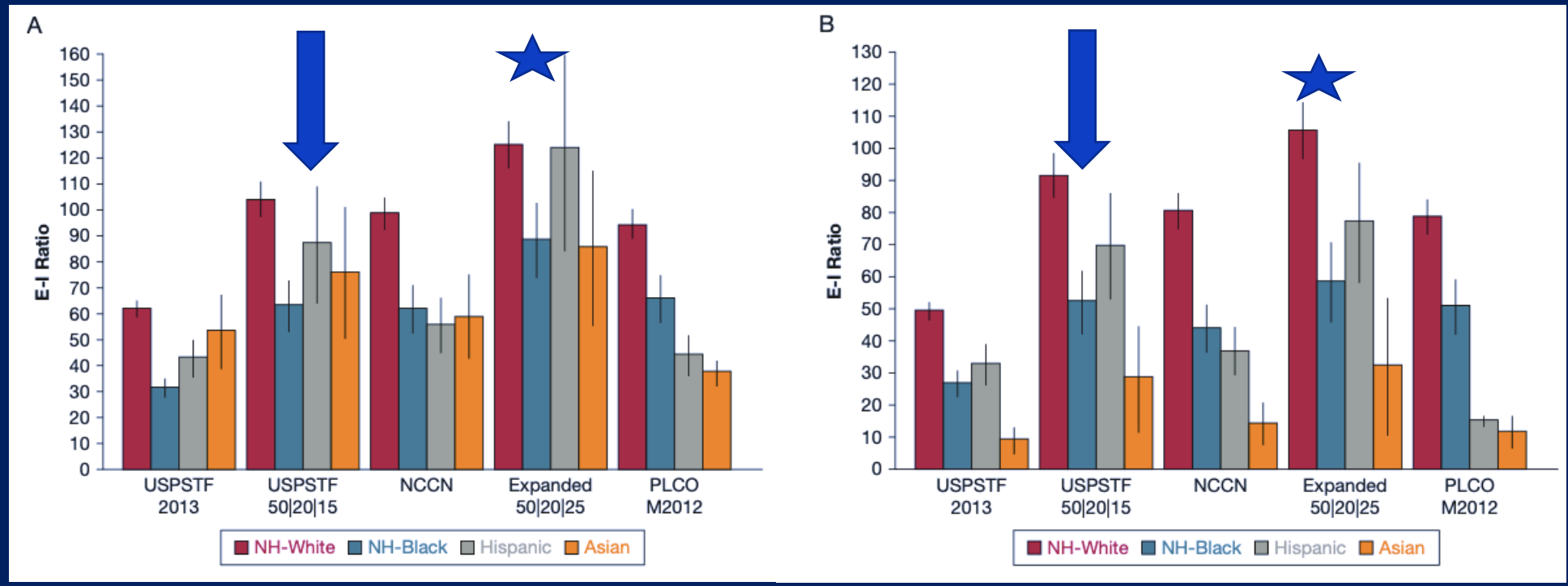


Five-Year Relative Survival for Selected Cancers by Race and Stage at Diagnosis, United States, 2011 to 2017



Stage Distribution for Selected Cancers by Race, United States, 2014 to 2018

Eligibility to Incidence Rate of Lung cancer Men(A) and women (B)



Pinsky PF, Lau YK, Doubeni CA. Potential Disparities by Sex and Race or Ethnicity in Lung Cancer Screening Eligibility Rates. Chest. 2021 Jul;160(1):341-350. doi: 10.1016/j.chest.2021.01.070. Epub 2021 Feb 3. PMID: 33545164; PMCID: PMC8411441.

Socioeconomic Differences In Lung Cancer

- Cigarette smoking causes about 80% to 90% of lung cancer deaths in the United States
- Current tobacco product use prevalence is higher among adults who were uninsured (27.3%), enrolled in Medicaid (28.6%), or had some other public insurance (21.3%) compared to adults with private insurance (16.4%) or Medicare only (12.5%)
- People with annual family incomes of less than $12,500 have higher lung cancer incidence than those with family incomes of $50,000 or more

Cornelius ME, Loretan CG, Wang TW, Jamal A, Homa DM. Tobacco Product Use Among Adults — United States, 2020. MMWR Morb Mortal Wkly Rep. 2022; 71:397–405
Siahpush M, Singh GH, Jones PR, Timsina LR. Racial/Ethnic and Socioeconomic Variations in Duration of Smoking: Results from 2003, 2006 and 2007 Tobacco Use Supplement of the Current Population Survey. Journal of Public Health. 2009;32(2):210-8

Reason For Screening

- High prevalence in a high-risk population
- 5-year survival rate for all stages combined is approximately 26.7 % however survival for stage Ia is 58-77%
- Only 15 % of lung cancers are diagnosed at an early stage

National Lung Cancer Screening Trial (NLST)

55 to 74 years volunteers with 30 pack-years of smoking currently or former smokers who quit within the last 15 years

26,309 participants (98.5%) LDCT and 26,035 (97.4%) CXR, respectively, underwent screening and followed up annually for 3 years

LDCT showed positive results **three times as frequently** as did chest radiography (***27% vs. 9%)*** and detected more than twice as many stage I cancers (***158 vs. 70).***

247 vs 309 deaths from lung cancer per 100,000 person-years

Relative reduction in mortality from lung cancer with LDCT screening of 20.0% (95% CI, 6.8 to 26.7; P=0.004)

N Engl J Med 2013;368:1980-91.

NELSON Trial

15,822 subjects randomized in two arms: Low Dose CT (N=7.915) and clinical surveillance (N=7.907)

Objective: to reduce lung cancer mortality by at least 25% in CT arm after 10-year follow-up

Participants: 50–75-year-old tobacco users (15 cigarettes or +/day during 25 y or 10 cigarettes or +/day during 30 y and who currently smoke or quit = 20 pack years

LDCT scans performed at baseline, after 1y, 3y and 5y and a half

Evaluation of pulmonary nodules based on nodule volume and volume doubling time

With 26% reduction in lung cancer mortality the Nelson trial results surpassed those of the NLST (20%)

Lung-Cancer Mortality with Volume CT Screening in a Randomized Trial. N Engl J Med. 2020 Feb 6;382(6):503-513. doi: 10.1056/NEJMoa1911793. Epub 2020 Jan 29. PMID: 31995683

Components Of Lung Cancer Screening

- LCS Eligibility
- Shared Decision Making
- LDCT what does it entail
- Structured Reporting ACR LUNG RADS
- Tobacco Health
- Data Collection-LCS database
- Multidisciplinary Governance
- False Positive Rates

Shared Decision Making

- https://shouldiscreen.com/English/home

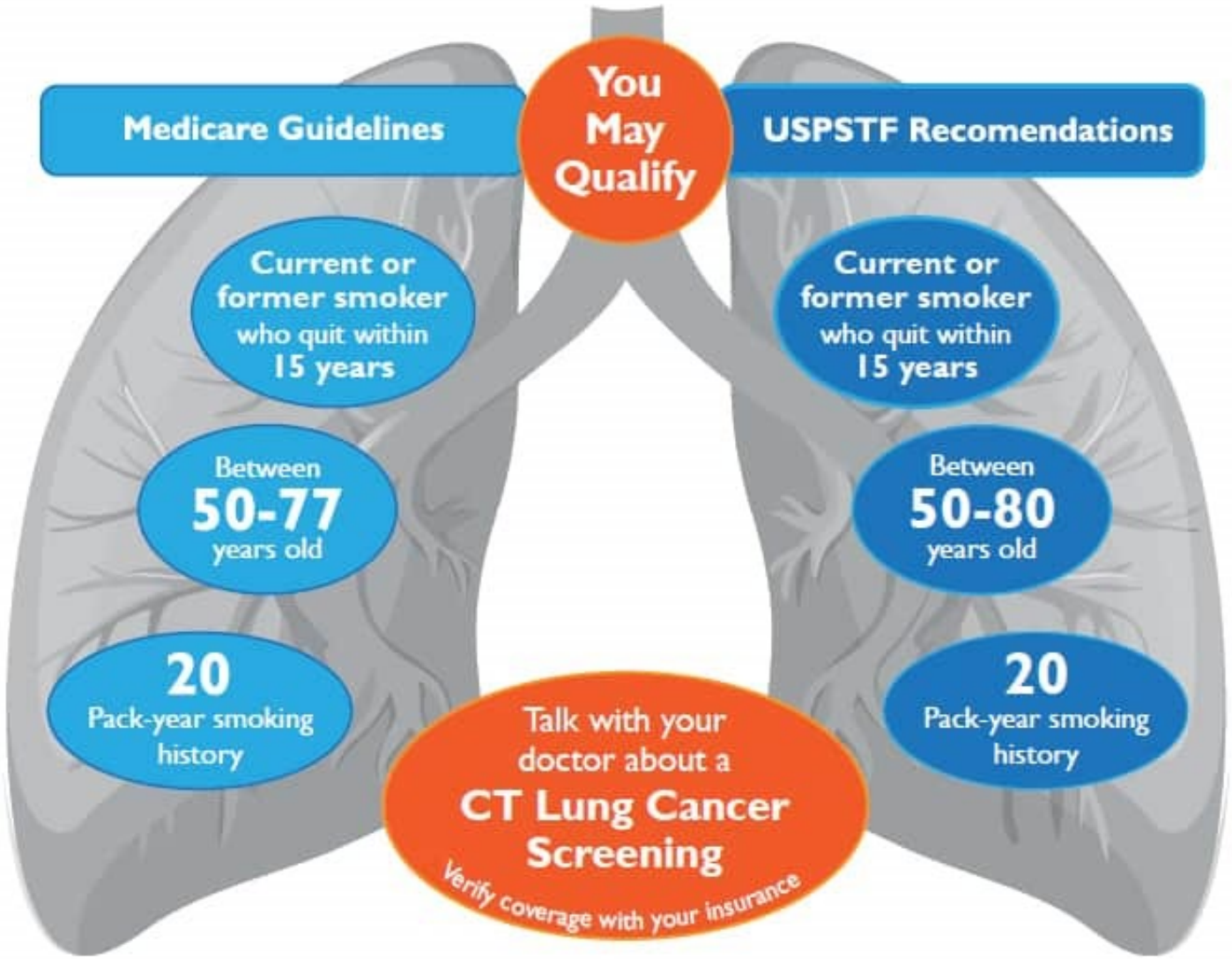
- “Collaborative process that allows patients and their health care providers to make health care decisions together, taking into account the best scientific evidence available, as well as the patient’s values and preferences”

BMC Med Informatics Decision Making. 2013;13(Suppl 2):S1,

When To Stop Screening

- Turns 81 years old,
- Has not smoked in 15 or more years, or
- Develops a health problem that makes him or her unwilling or unable to have surgery if lung cancer is found.

CT Lung Cancer Screening



Insurance and Medicare coverage

- Most insurance plans and Medicare help pay for recommended lung cancer screening tests.
- If the screening test finds something abnormal, you may need more tests. These follow-up tests may have a cost such as a co-pay or deductible.
- Check with your insurance plan to find out what benefits are covered for lung cancer screening.
- For more information about Medicare coverage, visit www.medicare.gov or call 1-800-MEDICARE (1-800-633-4227). TTY users should call 1 (877) 486-2048.

Effect of Stopping Smoking on Overall Health and Lung Cancer Risk Among Smokers

- 5-year survival rate for patients aged 65 years with early stage non small cell lung cancer who quit smoking is 70% compared with 33% among those who continue smoking

- Combination of smoking abstinence (15 years) and LDCT screening, resulted in a 38% reduction in lung cancer–specific mortality (HR, 0.62; 95% confidence interval, 0.51–0.76) m

- (BMJ. 2010; 340:b5569. [PubMed: 20093278])
- J Respir Crit Care Med. 2016 Mar 1;193(5):534-41. doi: 10.1164/rccm.201507-1420OC. PMID: 26502000)

Effect of Lung Cancer Screening on Smoking Behavior

- 77% of NLST participants continued to smoke after three rounds of screening
- In the Danish Lung Cancer Trial (N = 4104), there was no effect of lung cancer screening on smoking
- NSLT participants --current smokers at the time of enrollment had over a 2-fold increased lung cancer mortality during follow up compared to former smokers, regardless of their screening arm
- Former smokers in the chest radiography screening arm who remained abstinent for 7 years had a 20% mortality reduction compared to current smokers--the same magnitude of benefit achieved with LDCT screening.
- **Patients who received more intensive smoking-cessation interventions In the NLST trial year 1 from their primary care provider had higher smoking quit rates than patients who received less intensive interventions (i.e., asked about smoking, advised to quit)**

Two-Year Follow-Up of a Randomized Controlled Study of Integrated Smoking Cessation in a Lung Cancer Screening Program. JTO Clin Res Rep. 2020 Sep 15;2(2):100097. PMID: 34589978; PMCID: PMC8474430.

Thorax. 2010; 65:600–605. [PubMed: 20627916]

Thorax. 2014; 69:574–579. [PubMed: 24443174]

American Journal of Respiratory and Critical Care Medicine Volume 193 Number 5 | March 1 2016

JAMA Intern Med. 2015 Sep;175(9

False Positive Rates

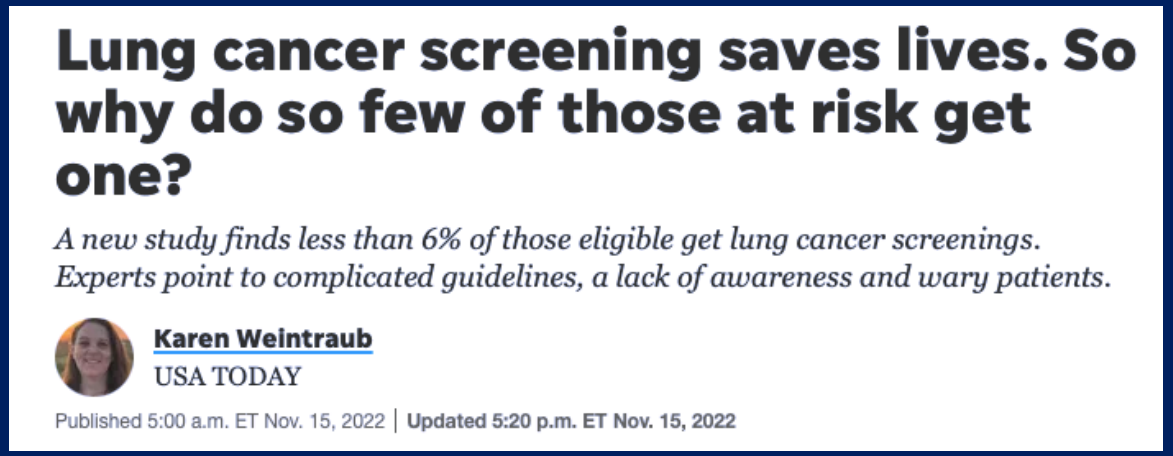
- In the NLST, the false-positive rate was 24% at baseline, and 27% and 16% for the two subsequent screening rounds
- In a systematic review of 20 studies (including the NLST), the median false-positive rate was 20.5% (range, 1%–49%) on baseline screens and 9.5% (range, 1%–42%) on postbaseline screens.
- The Lung-RADs criteria which are in wide use in the United States, decreases false positive rates to about 6-13%
- Factors influencing it-radiologist experience, age, COPD, site of scan, gender

Hammer MM, Byrne SC, Kong CY. Factors Influencing the False Positive Rate in CT Lung Cancer Screening. Acad Radiol. 2022 Feb;29 Suppl 2(Suppl 2):S18-S22. doi: 10.1016/j.acra.2020.07.040. Epub 2020 Sep 3. PMID: 32893112; PMCID: PMC9219003.

Aberle DR, Adams AM, Berg CD, et al.: Reduced lung-cancer mortality with low-dose computed tomographic screening. N Engl J Med 365 (5): 395-409, 2011. [PUBMED Abstract]
Bach PB, Mirkin JN, Oliver TK, et al.: Benefits and harms of CT screening for lung cancer: a systematic review. JAMA 307 (22): 2418-29, 2012. [PUBMED Abstract]
Pinsky PF, Gierada DS, Black W, et al.: Performance of Lung-RADS in the National Lung Screening Trial: a retrospective assessment. Ann Intern Med 162 (7): 485-91, 2015.

Cancer Screening Rates

- Adherence to repeat lung cancer screening reported from other academic centers for LDCT with Lung-RADS 1 or 2 is 28% to 38%
- Adherence to guideline-recommended screening for breast and colorectal cancer screening is 76% to 81% and 59% to 65%,



Lung cancer screening saves lives. So why do so few of those at risk get one?

A new study finds less than 6% of those eligible get lung cancer screenings. Experts point to complicated guidelines, a lack of awareness and wary patients.

Karen Weintraub
USA TODAY

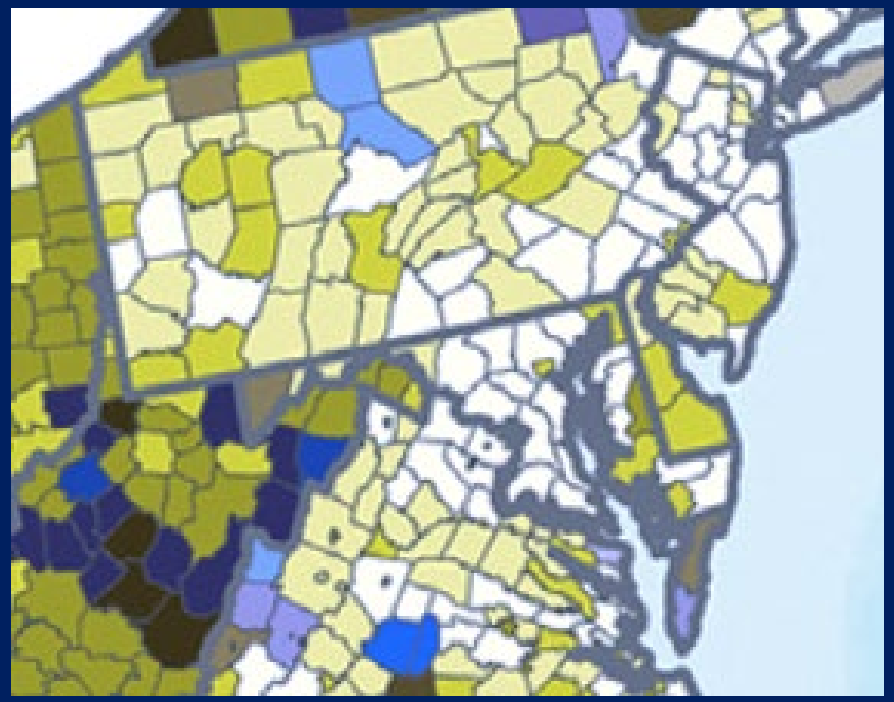
Published 5:00 a.m. ET Nov. 15, 2022 | **Updated 5:20 p.m. ET Nov. 15, 2022**

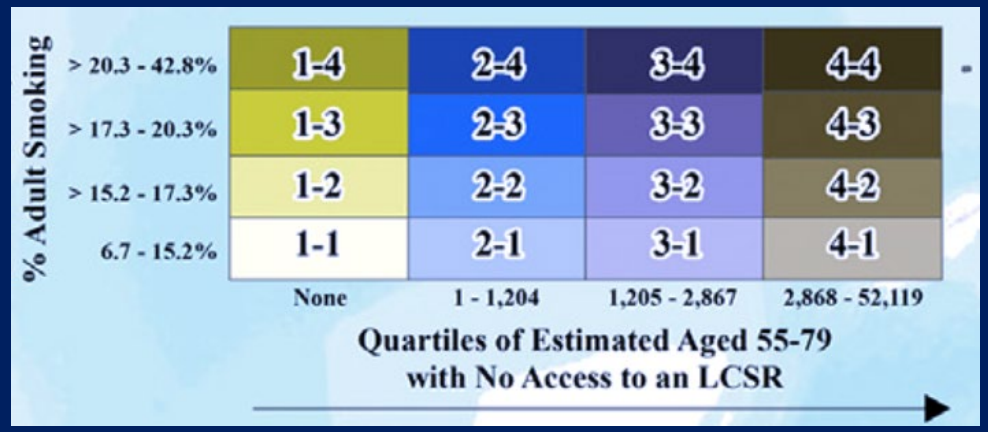
Henderson LM, Sites SK, Tailor TD, et al. International Cancer Screening Network; 2019.
Mortani Barbosa EJ, Jr., Yang R, Hershman M.. AJR Am J Roentgenol 2021 Apr;216: 919–26. DOI: https://doi.org/10.2214/AJR.20.23637
TripletteM,ThayerJH,KrossEK,etal.Theimpactofsmokingandscreeningresultson adherence to follow-up in an academic multisite lung cancer screening program. Ann Am Thorac Soc 2021 Mar;18:545–7. DOI: https://doi.org/10.1164/ajrccm-conference.2020. 201.1_meetingabstracts.a6465

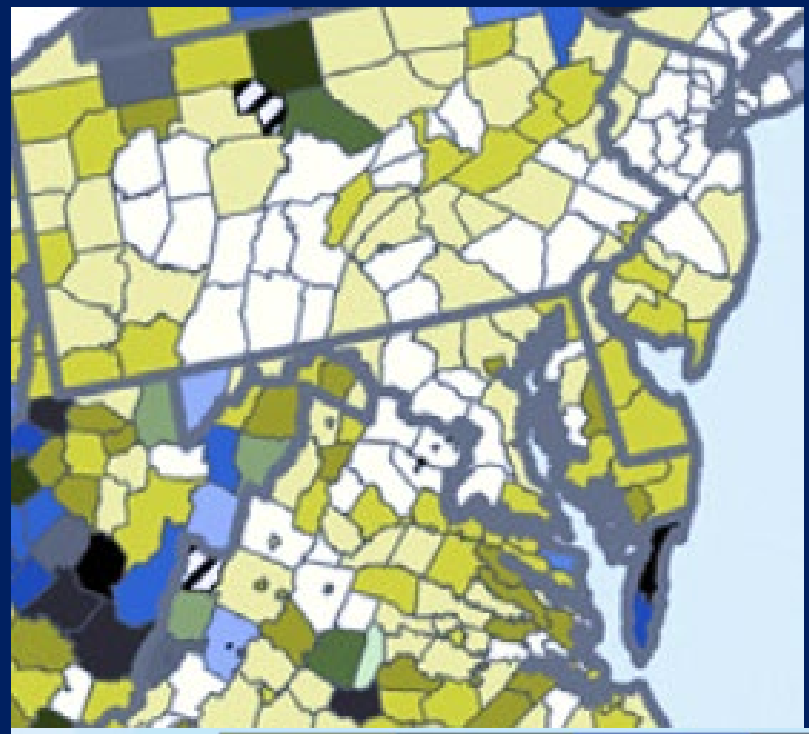
Barriers To LCS

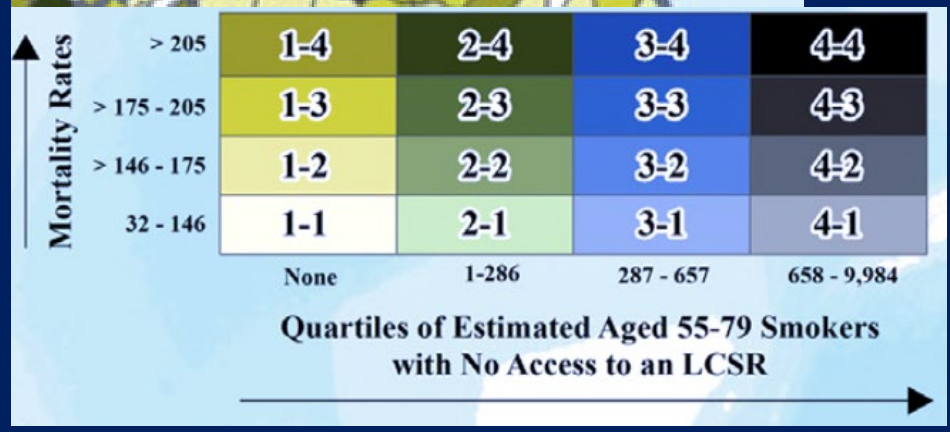
- Access to LCS
- Follow Up
- Patient perspectives
- Provider barriers
- System barriers

Access to LCS









Sahar L, Douangchai Wills VL, Liu KK, Kazerooni EA, Dyer DS, Smith RA. Using Geospatial Analysis to Evaluate Access to Lung Cancer Screening in the United States. Chest. 2021 Feb;159(2):833-844. doi: 10.1016/j.chest.2020.08.2081. Epub 2020 Sep 1. PMID: 32888933.

Follow Up

- Appropriate follow-up is essential to achieve LCS mortality benefits
- More than one-half of all screen-detected cancers in both the National Lung Screening Trial (NLST) and the Dutch-Belgian Lung Cancer Screening Trial (NELSON) were detected on subsequent rounds of screening

1.de Koning HJ, van der Aalst CM, de Jong PA, et al. Reduced lung-cancer mortality with volume CT screening in a randomized trial. N Engl J Med. 2020;382(6):503-513.
2.National Lung Screening Trial Research Team, Aberle DR, Adams AM, et al. Reduced lung-cancer mortality with low- dose computed tomographic screening. N Engl J Med. 2011;365(5):395-409.
3.Krist AH, Davidson KW, Mangione CM, et al. Screening for lung cancer: US Preventive Services Task Force Recommendation Statement. JAMA. 2021;325(10):962-970

Patient Perspectives

- Patients Who Have Undergone Screening Report Positive and Easy Experiences With Screening and Positive Attitudes Toward Screening

- "I think it's pretty easy right now if you want to do it"
- "It was not a hardship, it was an easy thing to do"
- "Everything was orderly when I arrived, it was quick to get in, the screening was comfortable"
- "It's not invasive, and it's not embarrass-ing, it's not…people are not demanding, so it's a good experience"

- "If you [are] high risk I think it's very important"
- "I'm going to have them as long as the doctor wants me to have them, so I'm game you know what I mean"
- "I think based on my history more screening would be advantageous in providing me with the knowledge of any problems just like I go in for a colonoscopy"

CHEST 2022; 162(1):230-241

- Although patients understand lung cancer risk factors, many are influenced by personal factors and symptoms rather than understanding the importance of asymptomatic screening

- "My family was in the body and fender business and…I breathed a whole lot of stuff, so my whole life I've been breathing a whole lot of stuff that I shouldn't have been breathing, and then to top it off, I smoke cigarettes"
- "I think that the older I get, the higher the risk of cancer"

- "If I had lung cancer I'd have a symptom, ok, of some sort and so I guess that's where my head has been at"
- "For a smoking person like me I think it's less important given that the results should be obvious and recognizable, the screening for things like colon cancer and breast cancer and mammography seem to not be so evident and obvious, the kind of hidden and creeping issues that could benefit from a screening"
- "If I had maybe a cough or something that might indicate that there was a problem"

CHEST 2022; 162(1):230-241

- Concerns over cost, insurance coverage, screening accessibility, and other medical conditions are often cited as barriers to longitudinal screening

• "The primary thing was first of all I needed to know that it was going to be covered by the insurance because if it wasn't I couldn't have afforded it"
• "After getting them for two to three years, my insurance said I didn't need them any longer and they would not pay for them"
• "Other than the travel logistics it was easy, traveling there and then returning home was a logistics problem because of not having a car and a local city construction work" • "My problem is transportation, getting to [facility], no no no I'm dead serious about this, I've had appointments and I can't get there, I don't drive, I have no support system" • "To have them done locally would be amazing" • "Have more places that you can have it done"

CHEST 2022; 162(1):230-241

- Other health concerns can make screening less of a priority

- "I was going to schedule the follow up and then came the virus… so I don't, I'm not, I'm just staying away from all medical care places"
- "I actually wanted to get this last screening about a month ago, it was, I had an appointment, and like I said I didn't keep it because of the coronavirus going around"
- "Yes I would have been due for one I believe this last summer, however just as I was going to be due for that I was diagnosed with breast cancer, it's ok, but you know that diagnosis took over everything, so I put off the lung cancer screening, it's still in my mind that I would like to have a follow up"

CHEST 2022; 162(1):230-241

Barriers To LCS Providers Perspective

Barriers to screening	Attending Physicians		Resident Physicians		p-value[a]
	N	%	N	%	
Any barrier	37	88.1	28	93.3	0.460
Cost to patient	31	72.8	25	83.3	0.338
Too many false positives	28	66.7	22	73.3	0.545
Potential for emotional harm	23	54.8	19	63.3	0.467
Potential for complications	22	52.4	21	70.0	0.133
Cost to healthcare system	19	45.2	20	66.7	0.072
Lack of efficacy/evidence	16	38.1	12	40.0	0.870
Low patient acceptance	14	33.3	13	43.3	0.388
False negatives/missed cancers	2	4.8	4	13.3	0.227

Attitude statement	Attending Physician N=42		Resident Physician N=30		p-value[a]
	N	%[a]	N	%[a]	
I am convinced that screening for lung cancer is beneficial for patients					
Strongly agree	3	7.5	1	3.5	0.709
Agree	13	32.5	9	31.0	
Undecided	17	42.5	16	55.2	
Disagree	7	17.5	3	10.3	
Strongly disagree	0	0	0	0	
Missing	2	–	1	–	
Inconsistent recommendations about lung cancer screening make it difficult to decide whether or not to screen					
Strongly agree	5	12.2	3	10.3	0.620
Agree	18	43.9	16	55.2	
Undecided	3	7.3	4	13.8	
Disagree	13	31.7	5	17.2	
Strongly disagree	2	4.9	1	3.5	
Missing	1	–	1	–	
Screening for lung cancer is cost-effective					
Strongly agree	1	2.4	0	0	0.687
Agree	7	17.1	2	6.9	
Undecided	22	53.7	19	65.5	
Disagree	6	14.6	5	17.2	
Strongly disagree	5	12.3	3	10.3	
Missing	1	–	1	–	
I rely on the recommendations of local specialists regarding lung cancer screening in my practice					
Strongly agree	0	0	0	0	0.173
Agree	9	22.5	7	24.1	
Undecided	6	15.0	6	20.7	
Disagree	19	47.5	16	55.2	
Strongly disagree	6	15.0	0	0	
Missing	2	–	1	–	

Attitude statement	Attending Physician N=42		Resident Physician N=30		p-value[a]
	N	%[a]	N	%[a]	
I have enough knowledge to explain the pros and cons of lung cancer screening to my patients					
Strongly agree	8	20.0	1	3.5	0.156
Agree	16	40.0	17	58.6	
Undecided	8	20.0	4	13.8	
Disagree	7	17.5	7	24.1	
Strongly disagree	1	2.5	0	0	
Missing	2	–	1	–	
Time restrictions during a patient's clinical visit mean other presenting problems have higher priority than screening for lung cancer					
Strongly agree	6	15.4	4	13.8	0.323
Agree	18	46.2	18	62.1	
Undecided	4	10.3	4	13.8	
Disagree	11	28.2	3	10.3	
Strongly disagree	0	0	0	0	
Missing	3	–	1	–	

Henderson LM, Jones LM, Marsh MW, Brenner AT, Goldstein AO, Benefield TS, Greenwood-Hickman MA, Molina PL, Rivera MP, Reuland DS. Opinions, practice patterns, and perceived barriers to lung cancer screening among attending and resident primary care physicians. Risk Manag Healthc Policy. 2018 Jan 22;10:189-195. doi: 10.2147/RMHP.S143152. PMID: 29403320; PMCID: PMC5784747

Systems Barriers

Themes from key informant interviews with organizational and clinical leaders

Theme	Description
1. Clarifying roles and responsibilities regarding LDCT	There is uncertainty about the boundary of responsibility for primary care provider vs others (radiologists, pulmonologists, etc). The lack of a clear boundary of roles and responsibilities creates an opportunity for patients to "fall through the cracks."
2. Enhancing care coordination across primary care, specialty care, and ancillary services	Preventive care should be unified in mission and values across primary and specialty care. Adherence to lung cancer screening needs to be a shared responsibility, with clear handoffs and leveraging of the strengths of all health-care systems partners.
3. Improving training of clinicians and care teams in lung cancer screening	Clinicians have limited opportunities to learn about lung cancer screening and normalize the process in routine care. Ongoing training needs to include all team members, including medical assistants.
4. Automating EHR tools to ease clinician burden and simplify processes	Current EHR tools are inadequate to meet clinicians needs to remind them when patients are due for screening and to facilitate ordering of next LDCT. Clinicians lack a health maintenance reminder.
5. Creating data metrics to support benchmarking	Metrics from clinical leadership are based on the provider's panel (eg, how many Pap smears the provider needs to do from their panel), and lung cancer screening is not included in these panels.
	This is something that is missing from the message about delivering high-quality care.

Wernli KJ, Tuzzio L, Brush S, Ehrlich K, Gao H, Anderson ML, Palazzo L. Understanding Patient and Clinical Stakeholder Perspectives to Improve Adherence to Lung Cancer Screening. Perm J. 2021 Jun 2;25:20.295. doi: 10.7812/TPP/20.295. PMID: 35348073; PMCID: PMC8817936.

Summary

- LDCT -50-80 years 20 pack years ;quit within the past 15 years
- Shared decision making is crucial
- False positive
- Barriers exist to LCS

Questions

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