



## THE UNIVERSITY OF ILLINOIS HOSPITAL & HEALTH SCIENCES SYSTEM:

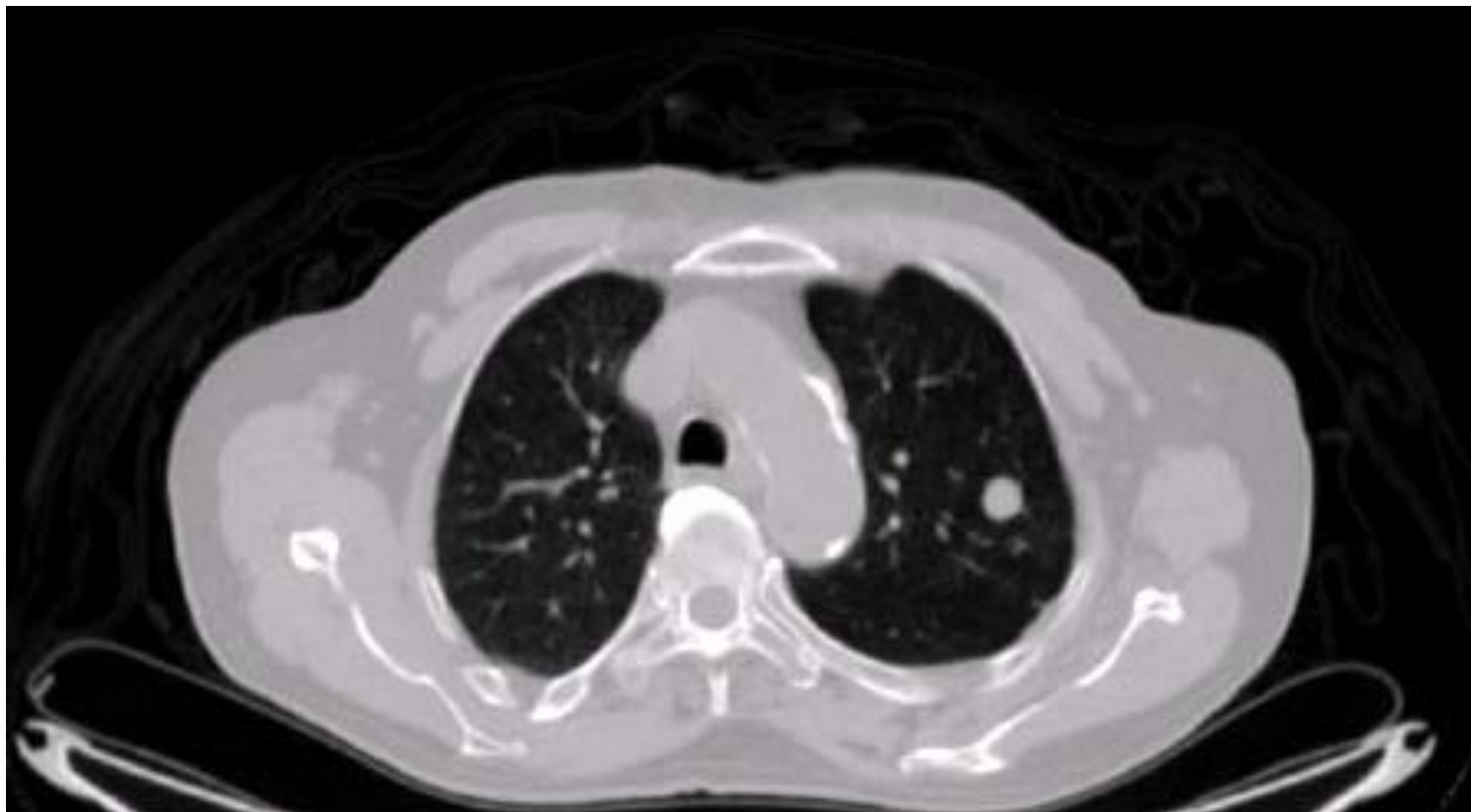
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# Making The Case for Lung Cancer Screening

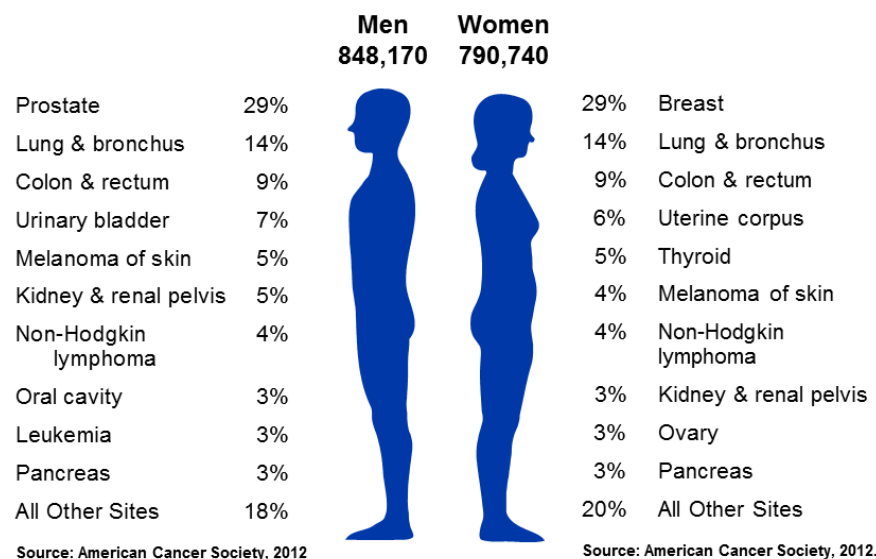
# Lung Cancer



# Lung Nodule



## 2012 Estimated US Cancer Cases\*

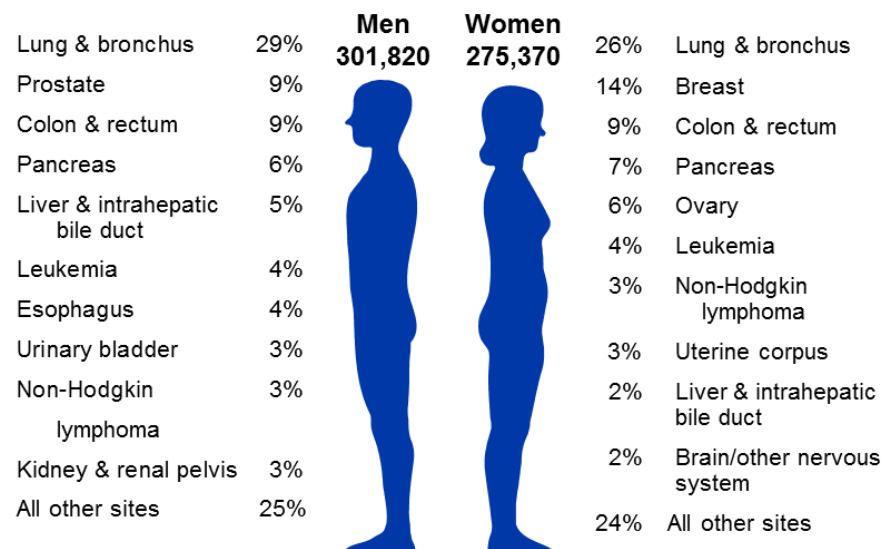


Lung Cancer is the 2<sup>nd</sup> most common cause of cancer in the U.S.

Lung Cancer is the leading cause of cancer deaths in the U.S.

\*Excludes basal and squamous cell skin cancers and in situ carcinomas except urinary bladder.

## 2012 Estimated US Cancer Deaths



# Lung Cancer Survival

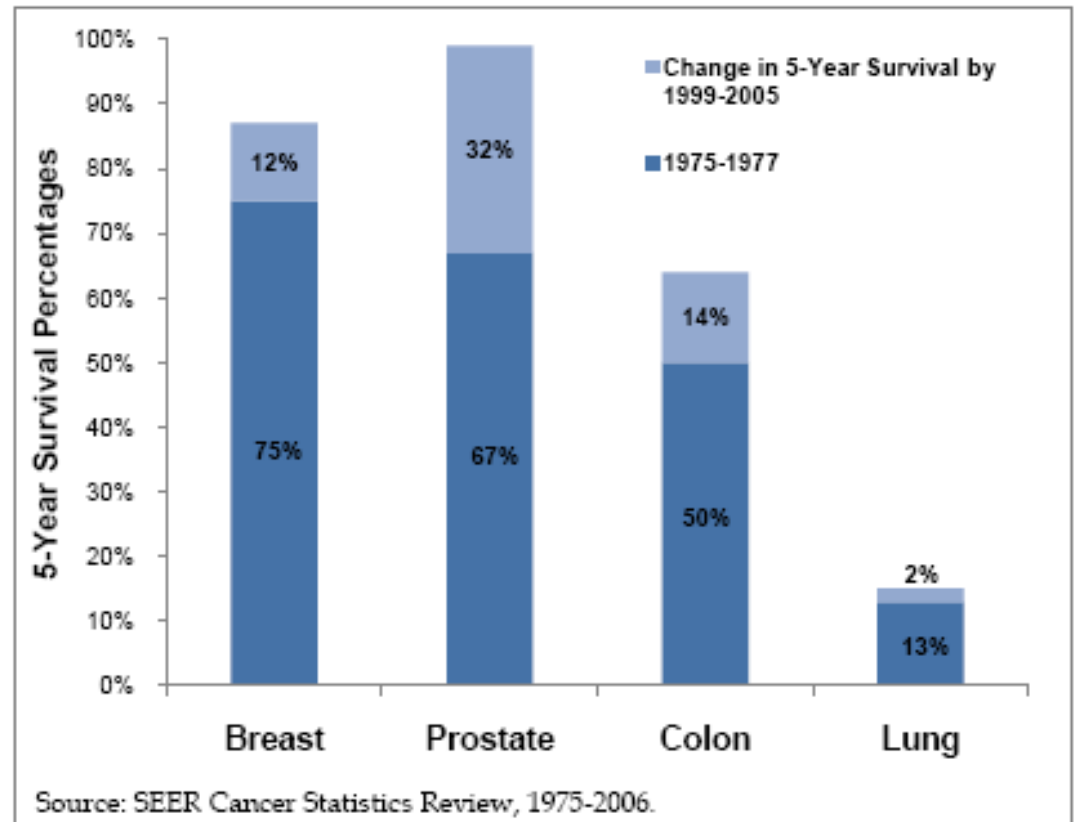
## Five-year survival

- 1964 - 5%
- 1977 - 13%
- 1996 - 14%
- 2001 - 14%
- 2008 - 16%

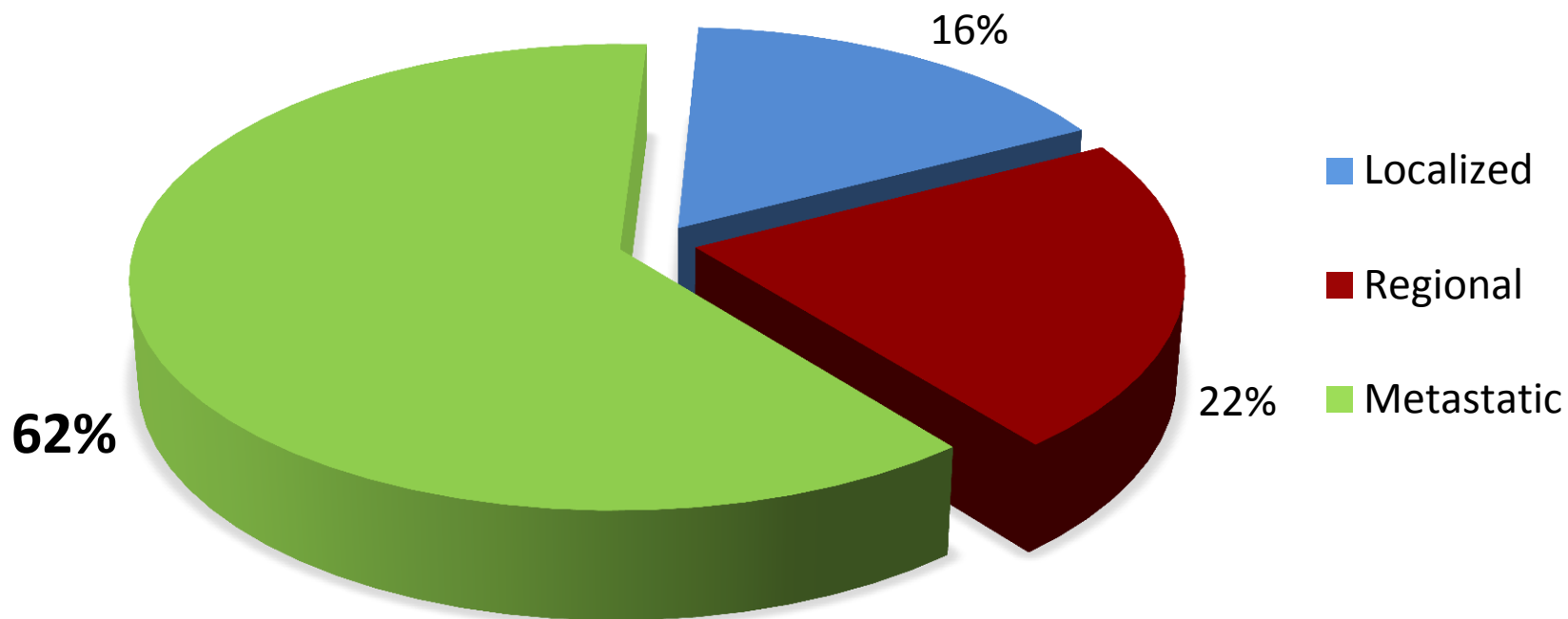
## Improvements due to:

- Staging
- Pre-op/Post-op care
- Combination therapy
- Targeted treatment

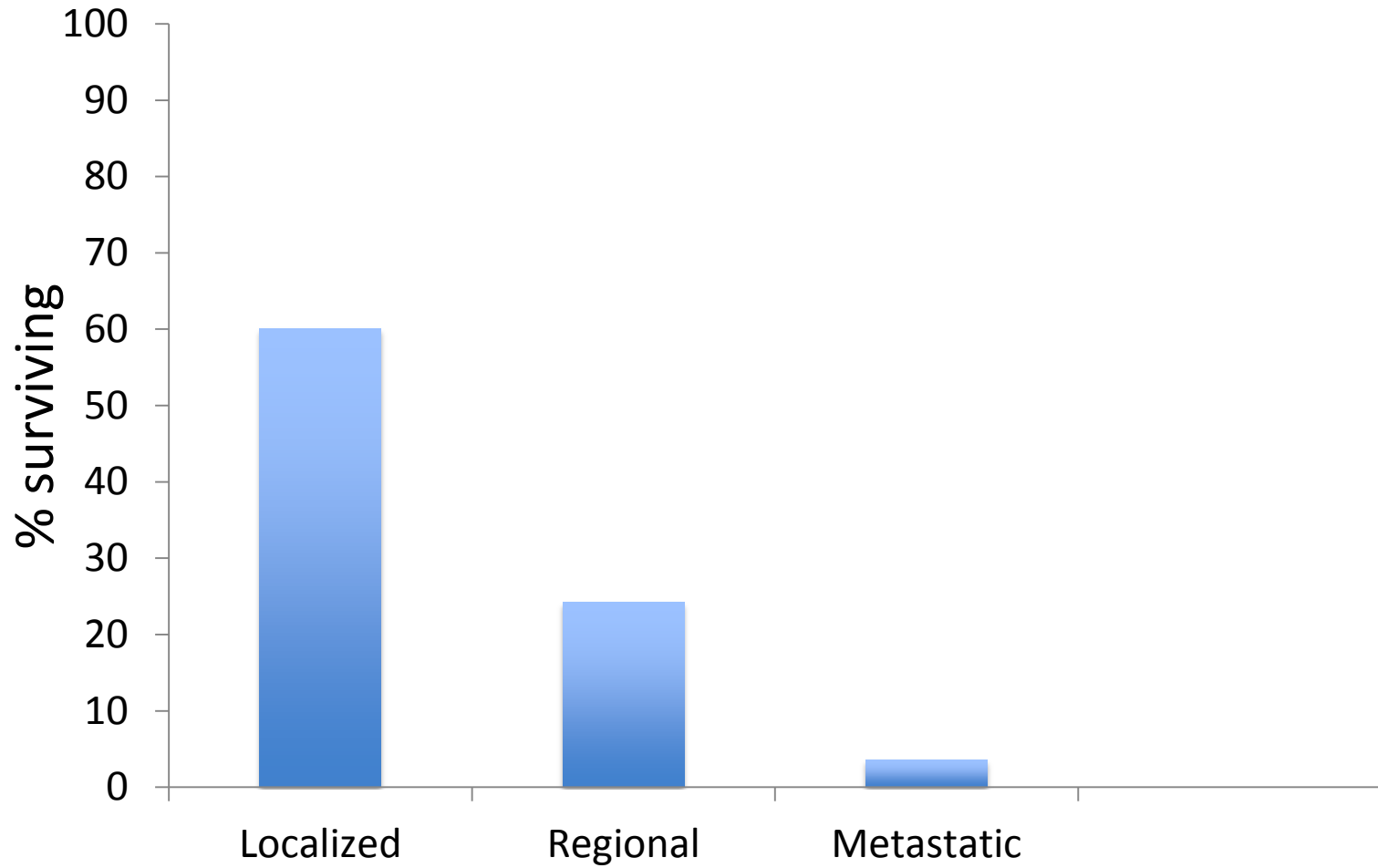
Table 3: Cancer Survival in 1975-1977 & Change by 1999-2005



# Stage at Diagnosis



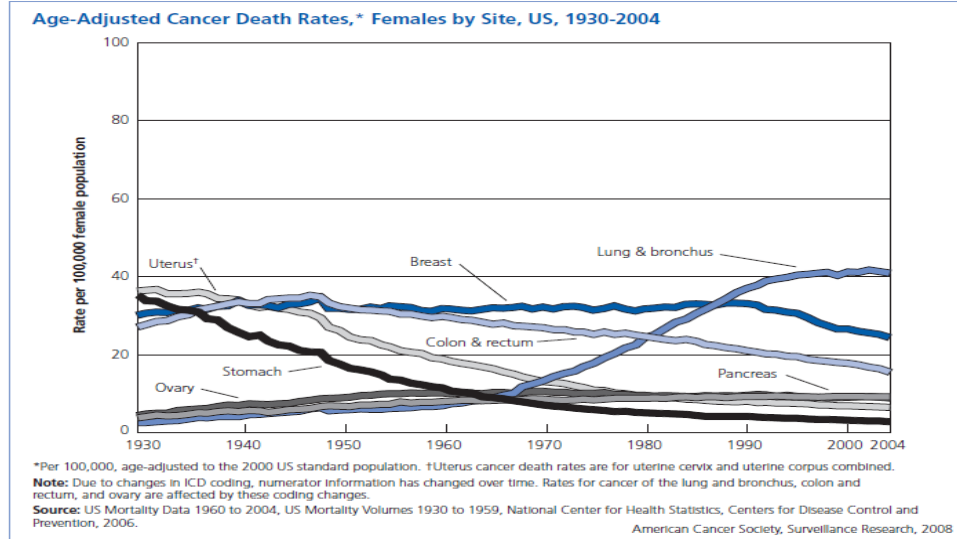
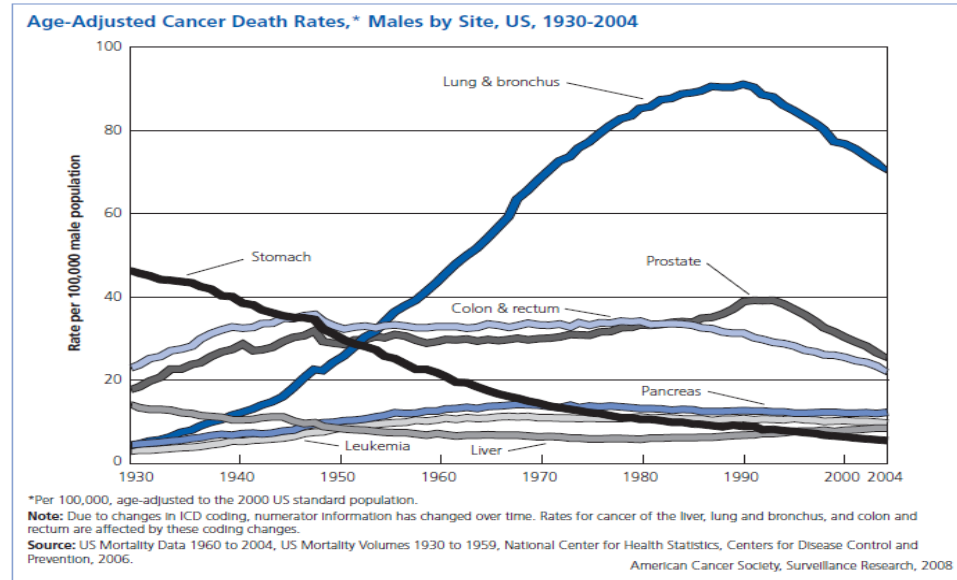
# Lung Cancer 5-Year Survival



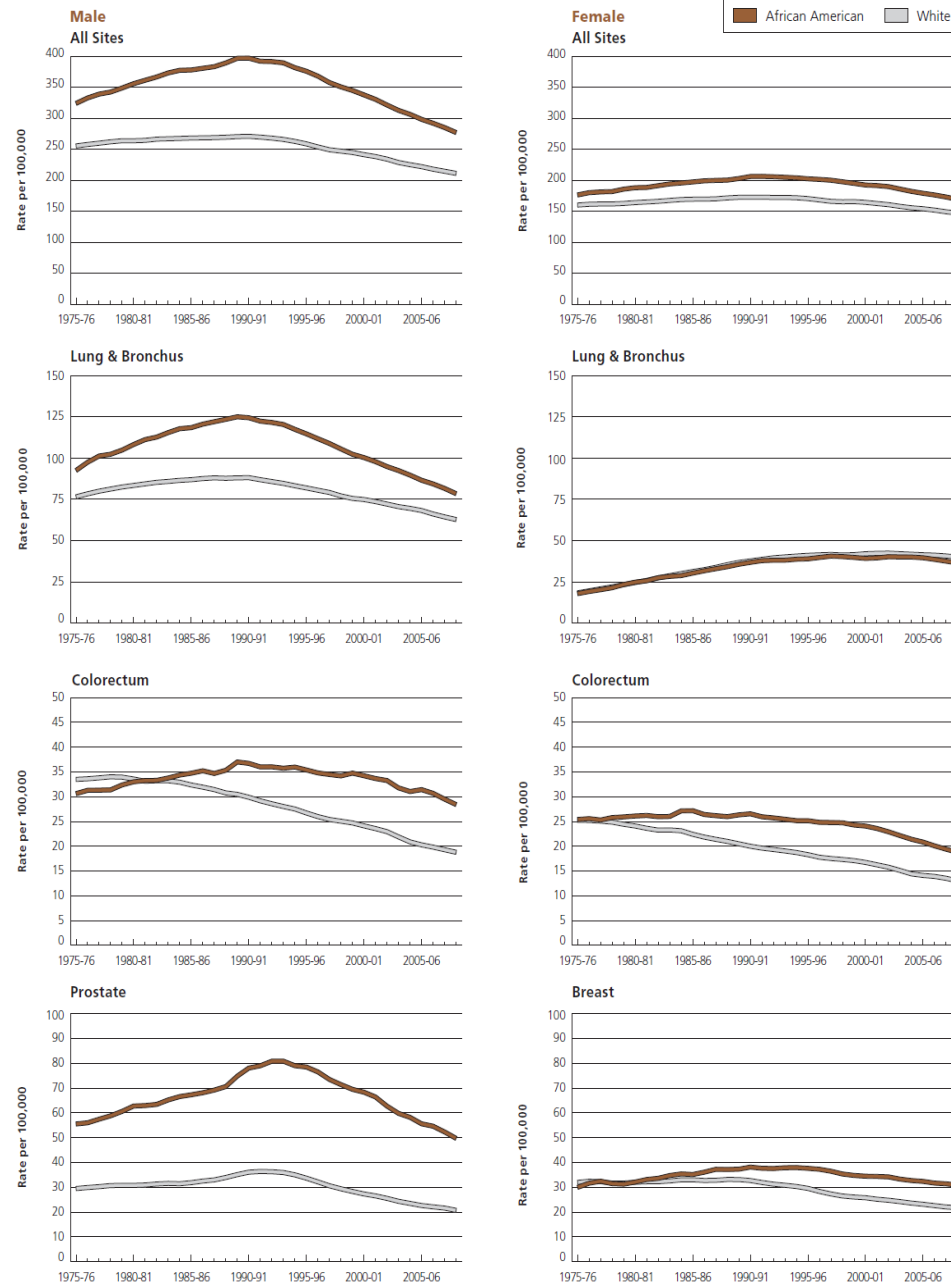


# Lung Cancer Trends

- Lung cancer death rates continuing to rise among women
- Rate of cancer among never-smokers appears to be rising
  - Accounts for 20% of NSCLC
  - 7<sup>th</sup> leading cause of cancer death globally



**Figure 3. Trends in Death Rates\* for Selected Cancer Sites among African Americans and Whites, US, 1975 to 2009**



\*Rates are per 100,000 and age adjusted to the 2000 US standard population and are 2-year moving averages.

Source: National Center for Health Statistics, Centers for Disease Control and Prevention as provided by the SEER\*Stat database.<sup>4</sup>

## **ThE FACTS About Lung CANCER in African americans**

1. Lung Cancer Kills more African Am than any other type of cancer
2. African Am have higher rates of lung cancer than Whites (23% higher than Whites)
3. African Am have a lower 5 year survival than Whites
4. African Am with early stage disease are less likely to receive surgery
5. Because of reduced smoking African Am have declining rates of lung cancer

# Clinical Manifestations of Lung Cancer Caused by Local Tumor Growth and Intrathoracic Spread at Presentation

Clinical manifestation	Frequency (%)	
	SCLC	NSCLC
Cough	50–76	40
Dyspnea	34–40	30–40
Chest pain	35–36	25–40
Hemoptysis	15–23	15–35
Pneumonitis	21–25	13–24
Vocal cord paralysis	15	Uncommon
SVC syndrome	12	<10
Pleural effusion	10–15	15
Pancoast's syndrome	Rare	3
Pericardial effusion	Uncommon	Rare

NSCLC—Non-small-cell lung cancer; SCLC—small cell lung cancer; SVC—superior vena cava.

Cancer Medicine 1998







# Clinical Manifestation Caused by Systemic Effect at Presentation

	Frequency (%)	
	SCLC	NSCLC
Anorexia	30	30
Weight loss ( <sup>3</sup> 10 lb)	35–52	45–52
Fatigue	23–42	35
Fever	11–15	7–16
Anemia	11–15	16–20

NSCLC—Non-small-cell lung cancer; SCLC—small cell lung cancer.

# **Lung Cancer Screening**

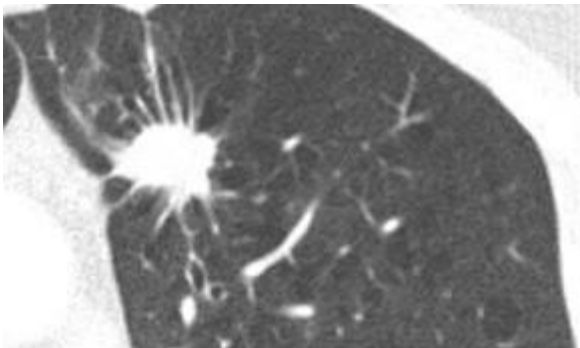
# SCREENING-PRINCIPLES

- High morbidity and mortality 
- Prevalent 
- Identifiable risk factors 
- ASYMPTOMATIC 
- Effective therapy should be available 
- Early disease more treatable 
- Early detection leads to IMPROVED DISEASE SPECIFIC MORTALITY, NOT SIMPLY IMPROVED SURVIVAL

# Solitary Pulmonary Nodule

- 30-40% of solitary pulmonary nodules are malignant.
- **Clinical factors associated with high probability of malignancy:**  
age > 30 years, history of previous malignancy, smoking history.
- **Radiographic characteristics associated with high probability of malignancy:** noncalcified nodule, size over 3 cm, spicular (type 4) nodule edge, cavity wall thickness > 16 mm.

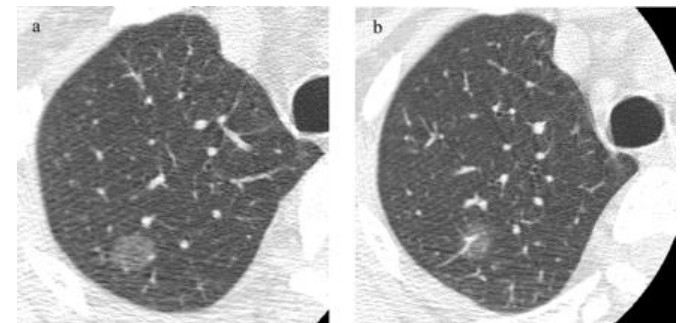
Spiculated



Rounded nodule



Groundglass nodule





## Reduced Lung-Cancer Mortality with Low-Dose Computed Tomographic Screening

The National Lung Screening Trial Research Team\*

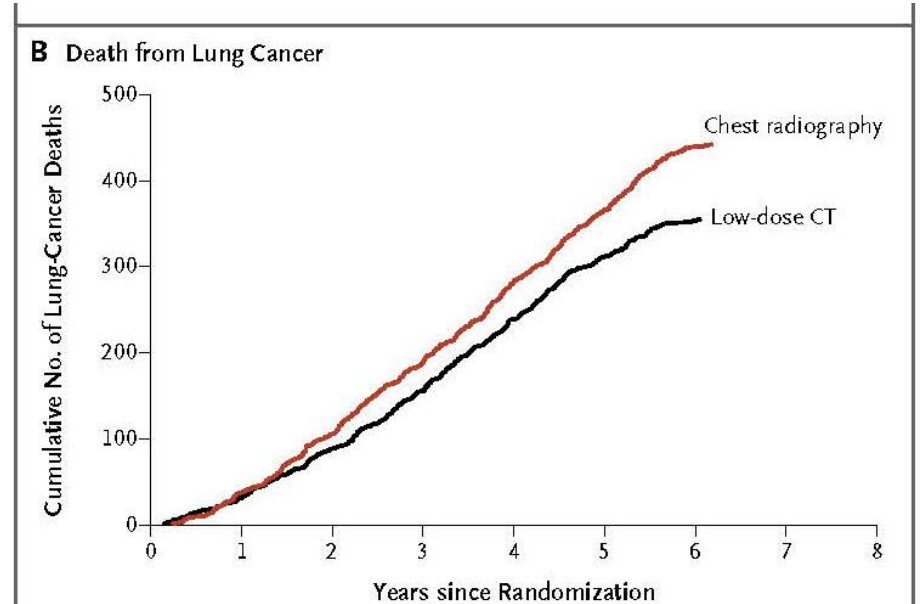
- Low-dose CT scan yearly for 3 years vs. yearly CXR in pts with heavy smoking history
- Randomized 53,456 pts in 33 sites in U.S.A.
- Pts enrolled between 2002 and 2004, screened from 2002 to 2007, and followed until Dec. 31, 2009
- Eligibility criteria:
  - 55-74 years old
  - 30 pk/yr smokers, if former smokers, quit no more than 15 years prior
  - Exclusion: if previous dx of lung cancer, hemoptysis, or recent unexplained wt. loss

# NLST Trial

- Screening was performed yearly for 3 years
- Any non-calcified nodule  $>4\text{mm}$  was considered “positive”
- Guidelines were provided for intervention, but no mandates were given

# Results

- 20% relative reduction in lung cancer-specific mortality
- Stage I cancers:
  - 50% LDCT vs 31% CXR
- Stage IV cancers:
  - 21.7% LDCT vs 36% CXR
- Need to screen 320 to prevent 1 lung cancer death
- Can pick up curable lung cancer using LDCT!



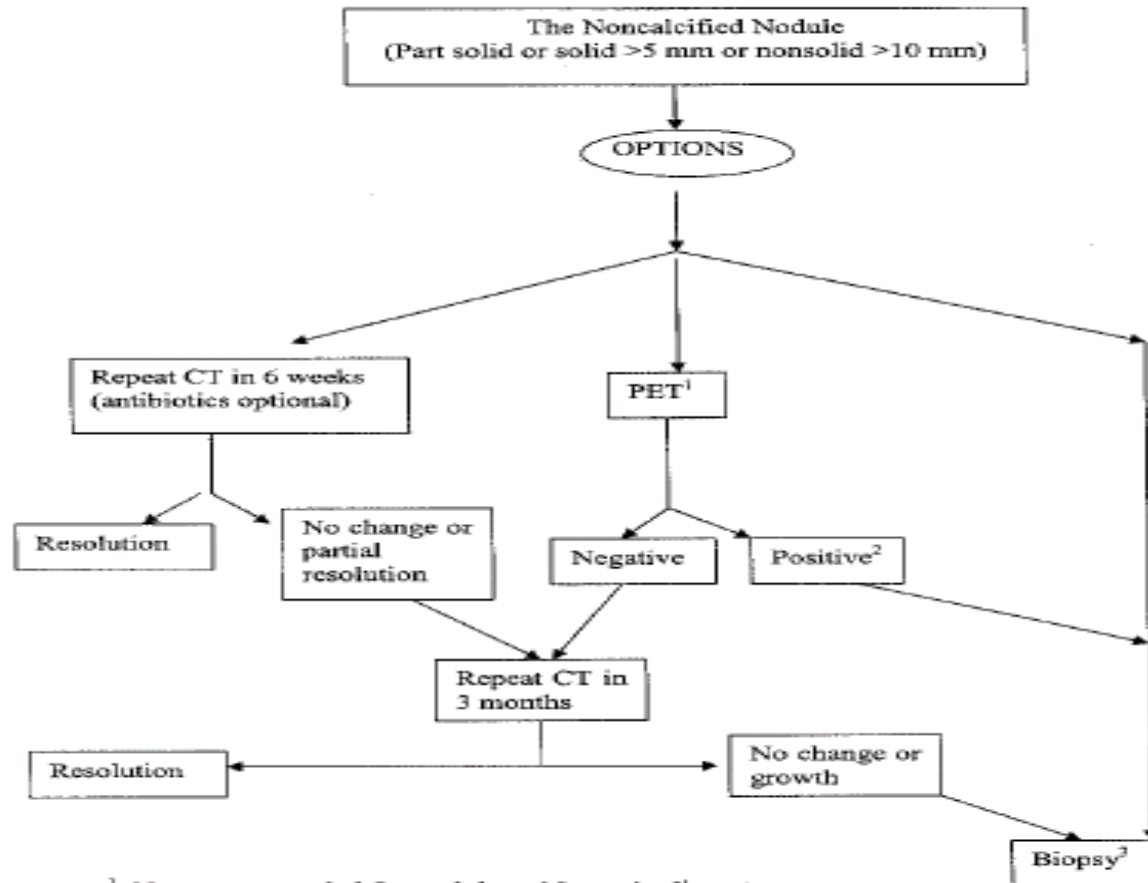
# Problems with Low Dose CT Screening (LDCT)

- Significant variability among radiologists detection rates
- A high number of False Positive in certain populations
- Increased radiation exposure
- Increased cost over traditional Cxr
- USPSTF found poor evidence that screening decreased mortality
- Invasive nature and risk of Diagnostic testing (e.g. bronchoscopy, IRT, VATS etc)
- Potential for harm due to lung cancer screening

# Screening in Underserved Populations

- Most vulnerable
- Higher rates of cancer Dx and Mortality
- Like other cancer e.g. prostate, colon, it's possible that African Am may need screening at an earlier time point
- Lack of data guiding the screening of URM

# Workup of SPN



<sup>1</sup> Not recommended for nodules <10 mm in diameter

<sup>2</sup> Some high-risk patients may be sent directly to surgery after a positive PET scan and forego biopsy.

<sup>3</sup> Continued observation (rather than biopsy) may be warranted for nodules that are stable at 3 months and PET-negative.



# Solitary Pulmonary Nodule–Emerging Role of FDG-PET

- Prospective PET data analysis of 89 patients with indeterminate pulmonary abnormalities. 60 SPNs were malignant and 29 were benign. Overall sensitivity for malignancy was 92% and specificity of 90%.  
(Lowe, J Clin Oncol 1998; 16(3):1075-84).
- SPN in 61 patients were evaluated by PET scans and later biopsied. Sensitivity of PET was 93%, specificity 88% and positive predictive value of 92%. A negative PET was associated with 4.7% risk of malignancy.  
(Gupta, J Nucl Med 1996; 37(6):948-949).
- Prospective study of 50 patients with SPN. Sensitivity was 100%, specificity 88%. Positive predictive value 94% and negative predictive value of 100%. Conclusion: Highly accurate technique in differentiating malignant from benign SPN. (Bury et al, Eur Respir J 1996; 9(3):410-4).
- **Most insurance won't cover without a diagnosis of carcinoma**



# Differential Diagnosis for Solitary Pulmonary Nodules

Type of cause	Disease entity
Neoplastic: Malignant	Primary pulmonary carcinoma Primary pulmonary lymphoma Primary pulmonary carcinoid tumor Solitary metastases
Neoplastic: Benign	Hamartoma Chondroma
Inflammatory: Infectious	Granuloma (tuberculous, fungal) Nocardia infection, Round pneumonia, Abscess
Inflammatory: Noninfectious	Rheumatoid arthritis Wegener granulomatosis
Vascular	Arteriovenous malformation Infarct Hematoma
Congenital	Bronchial atresia Sequestration
Other	External object (nipple, mole) Pseudotumor (fluid in fissure) Pleural plaque or mass

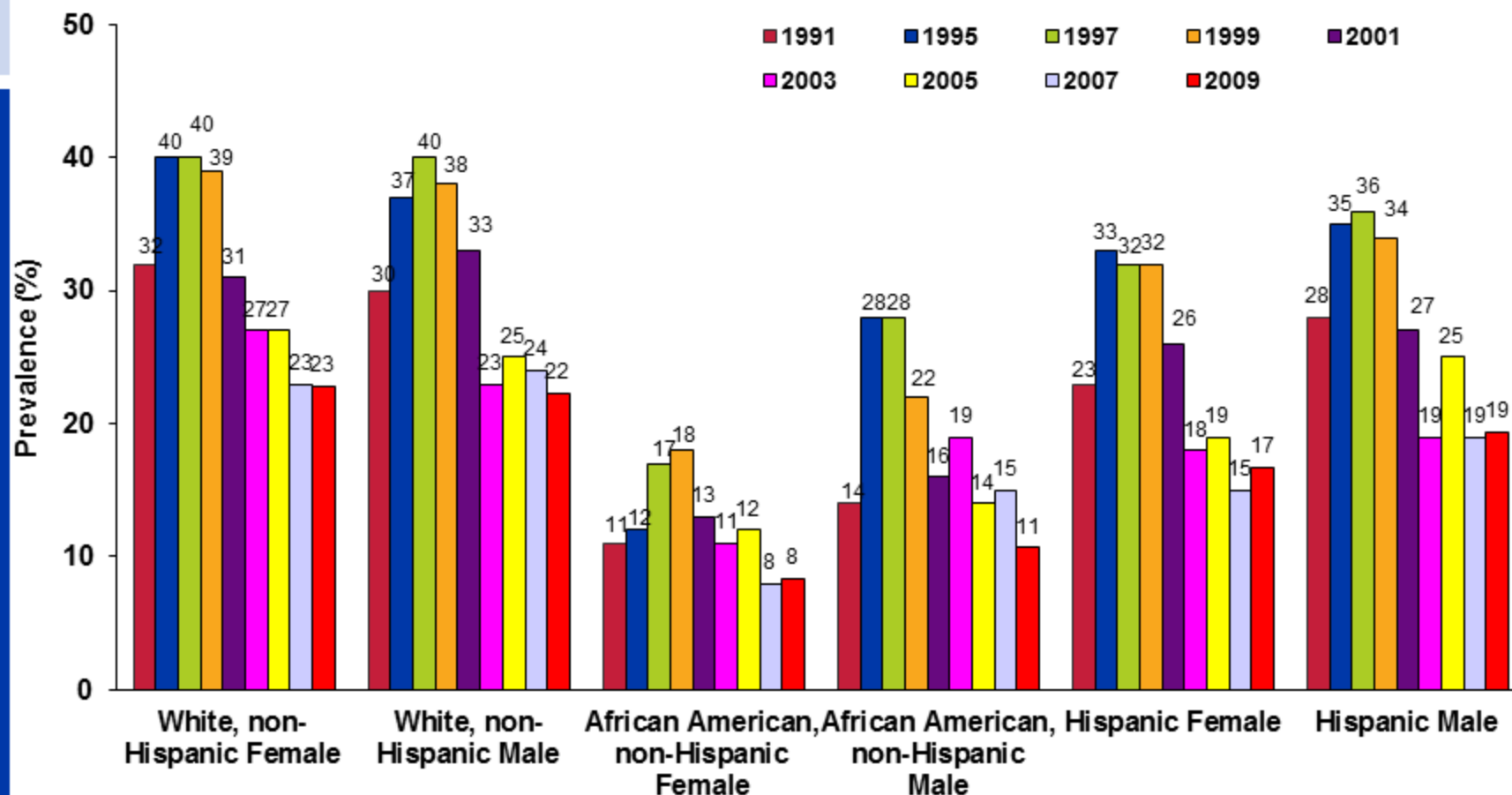
# Downside...

- >95% of the “positives” were false positives
- LDCT gives you 3X more positive tests
- Many more extra procedures, costs, and potential side effects of interventions
  - Physical and mental

## CONCLUSION:

- Lung cancer screening can and will be done
- Interpret results with caution!
- Smoking cessation remains important

# Current\* Cigarette Smoking Prevalence (%) Among High School Students by Sex and Race/Ethnicity, US, 1991-2009



\*Smoked cigarettes on one or more of the 30 days preceding the survey.

Source: Youth Risk Behavior Surveillance System, 1991-2009 National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, 2010.

# Documented Occupational Lung Carcinogens

<b>Substance</b>	<b>Occupational exposures</b>
Arsenic	Smelters, pesticide manufacturers
Asbestos	Miners, millers, insulators, railroad and shipyard workers
Beryllium	Workers in electronic industries, aerospace and nuclear-reactor parts manufacturers
Chloromethyl ethers	Ion-exchange resin manufacturers
Chromium	Chromate and pigment manufacturers
Hydrocarbons	Coal-gas workers, roofers
Mustard gas	Poison-gas manufacturers
Nickel	Refiners
Radiation	Miners of uranium and other ores

Frank AL. Epidemiology of lung cancer. In Thoracic Oncology.

Edited by JA Roth, J Ruchdeschel, T Weisenburger. Philadelphia: Saunders, 1989, p 8.