The Mass General Cancer Early Detection & Diagnostics Clinic :
A Collaboration with Home Base

Lecia V. Sequist, MD, MPH

The Landry Family Professor of Medicine, Harvard Medical School

Program Director, Cancer Early Detection & Diagnostics, Mass General Cancer Center

Mass General Brigham
Mass General Cancer Center

DISCLOSURES

Cancer in Military Personnel

Study finds higher cancer rates among U.S. military airmen and ground crews

Mar 25, 2023 5:40 PM EDT

Alarming breast cancer rates among troops reported

Jon R. Anderson, Military Times
Published 12:10 p.m. ET Oct. 2, 2012 | Updated 12:26 p.m. ET Oct. 2, 2012

June 27, 2023 | 3 min read   SAVE

Agent Orange exposure linked to increased risk for bladder cancer among Vietnam veterans

Exposure	Associated Cancers
Agent Orange	Prostate Cancer, Bladder Cancer, Lung Cancer
Radiation	Breast Cancer, Colon Cancer, Lung Cancer, Bladder Cancer, Liver Cancer
Asbestos	Mesothelioma, Lung Cancer
Burn Pits	Lung Cancer, Melanoma, Kidney Cancer, Brain Cancer

1 IN 5 VETERANS WILL GET PROSTATE CANCER DURING THEIR LIFETIME.

25% Compared to the general population, military servicemembers are 25 percent more likely to receive a lung cancer diagnosis. In addition to carrying a higher risk, the survival rate among veterans has been historically lower than the general population.
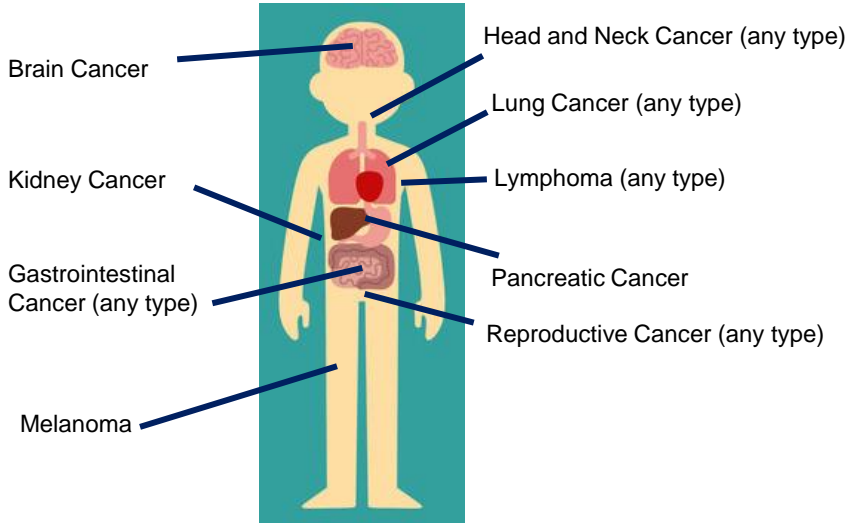
Research shows increased skin cancer risk among U.S. military members

HAZARD LINE: ARE TOXIC MILITARY BURN PITS CAUSING HIGHER RATES OF BRAIN CANCER IN VETERANS?

ASAVARI GOWDA   APRIL 15, 2022   WORLD NEWS

Is Cancer a Hidden Wound of War?

Brain Cancer

Kidney Cancer

Gastrointestinal Cancer (any type)

Melanoma

Head and Neck Cancer (any type)

Lung Cancer (any type)

Lymphoma (any type)

Pancreatic Cancer

Reproductive Cancer (any type)

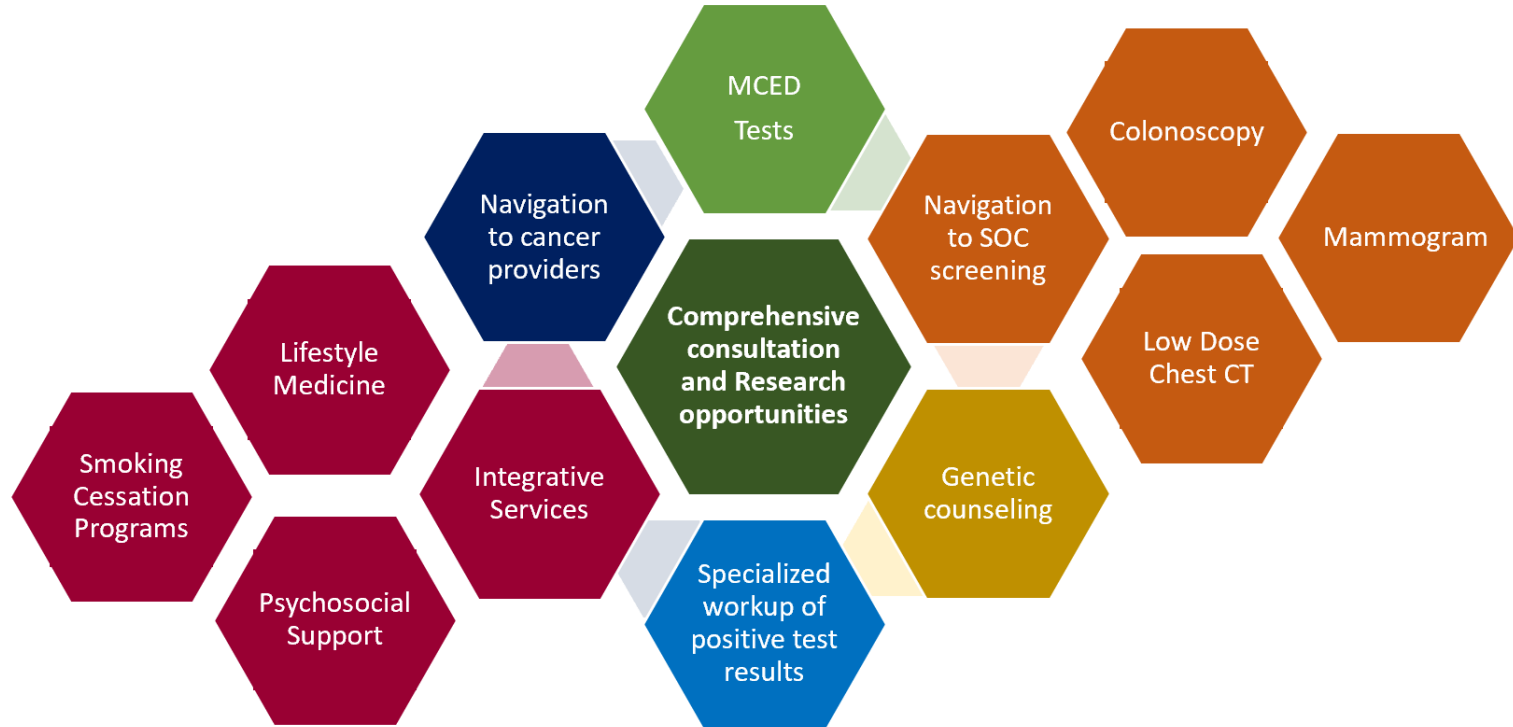# Early Detection & Diagnostic Clinic

Cancer Risk Assessment

Personalized cancer risk assessment to direct cancer screening recommendations:

Family and medical history, occupational exposures, research

Cancer Suspicion

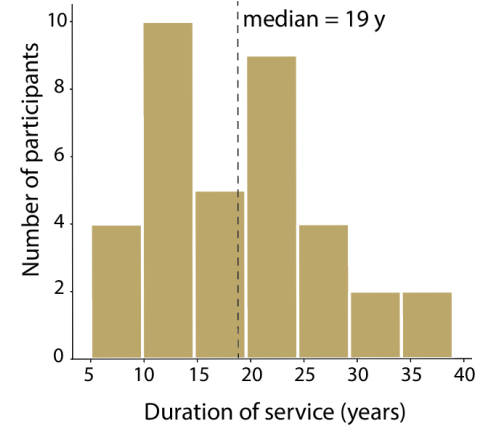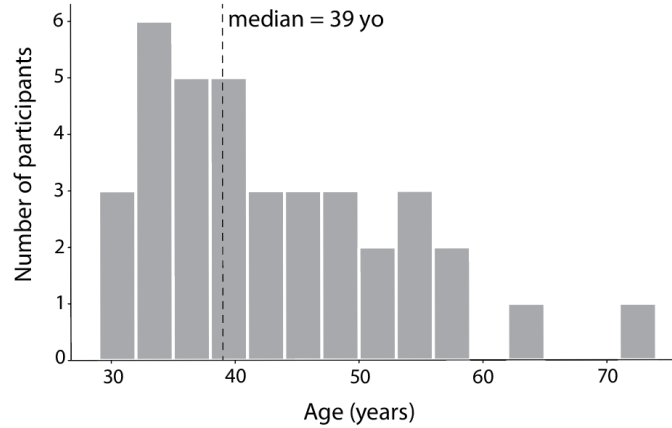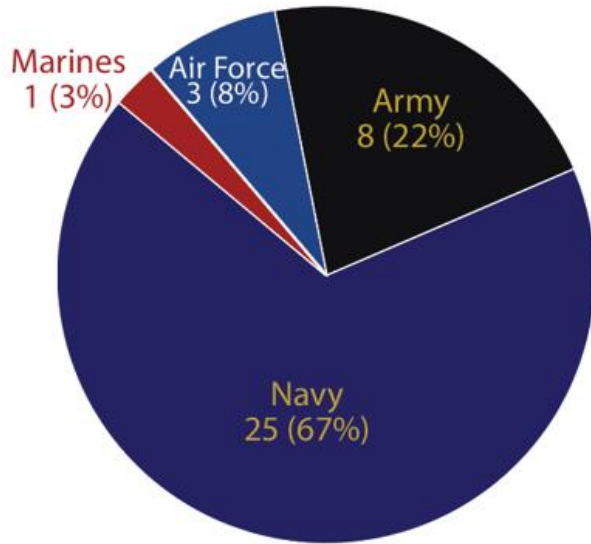Diagnostic Work up of radiographic or lab abnormality, or symptoms that suggest cancer

What services are offered at EDDx?

EDDx + Home Base: 37 pts July + Aug 2024

Distribution of military branches

Marines 1 (3%)
Air Force 3 (8%)
Army 8 (22%)
Navy 25 (67%)

median = 39 yo

median = 19 y

20 (54%) Active Duty
17 (46%) Veterans

EDDx + Home Base

Top 3 exposure concerns:

Inhaled substances (air quality, burn pits)

Toxins (lead, blast materials, solvents)

Radiofrequency signals

Classic Cancer Risk Factors:

Substances:

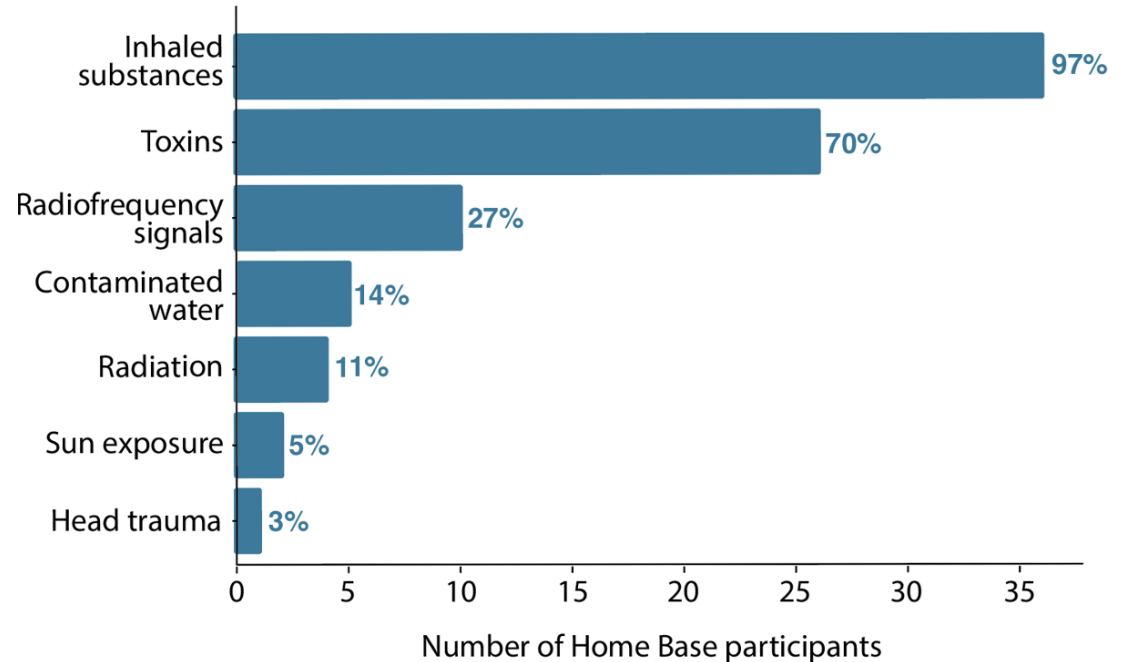5 (14%) have smoked cigarettes.

   9 (24%) have used smokeless tobacco

5 (19%) consume 7+ alcoholic drinks/week

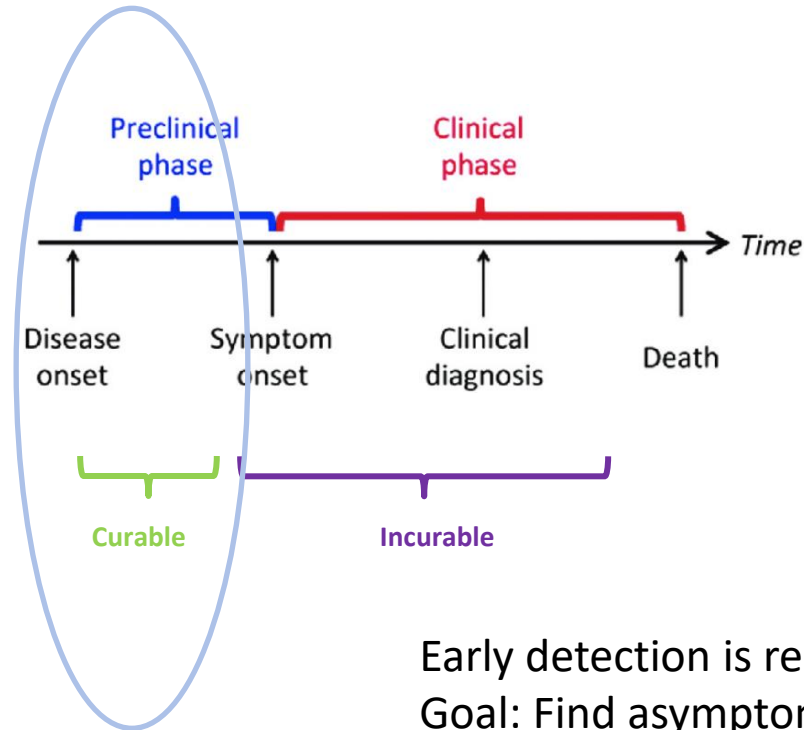*Family history of cancer:*

14 (38%) have ≥1 first-degree relative

16 (43%) have ≥2 second-degree relative

Exposure themes

Exposure theme	Number of Home Base participants
Inhaled substances	97%
Toxins	70%
Radiofrequency signals	27%
Contaminated water	14%
Radiation	11%
Sun exposure	5%
Head trauma	3%

Number of Home Base participants

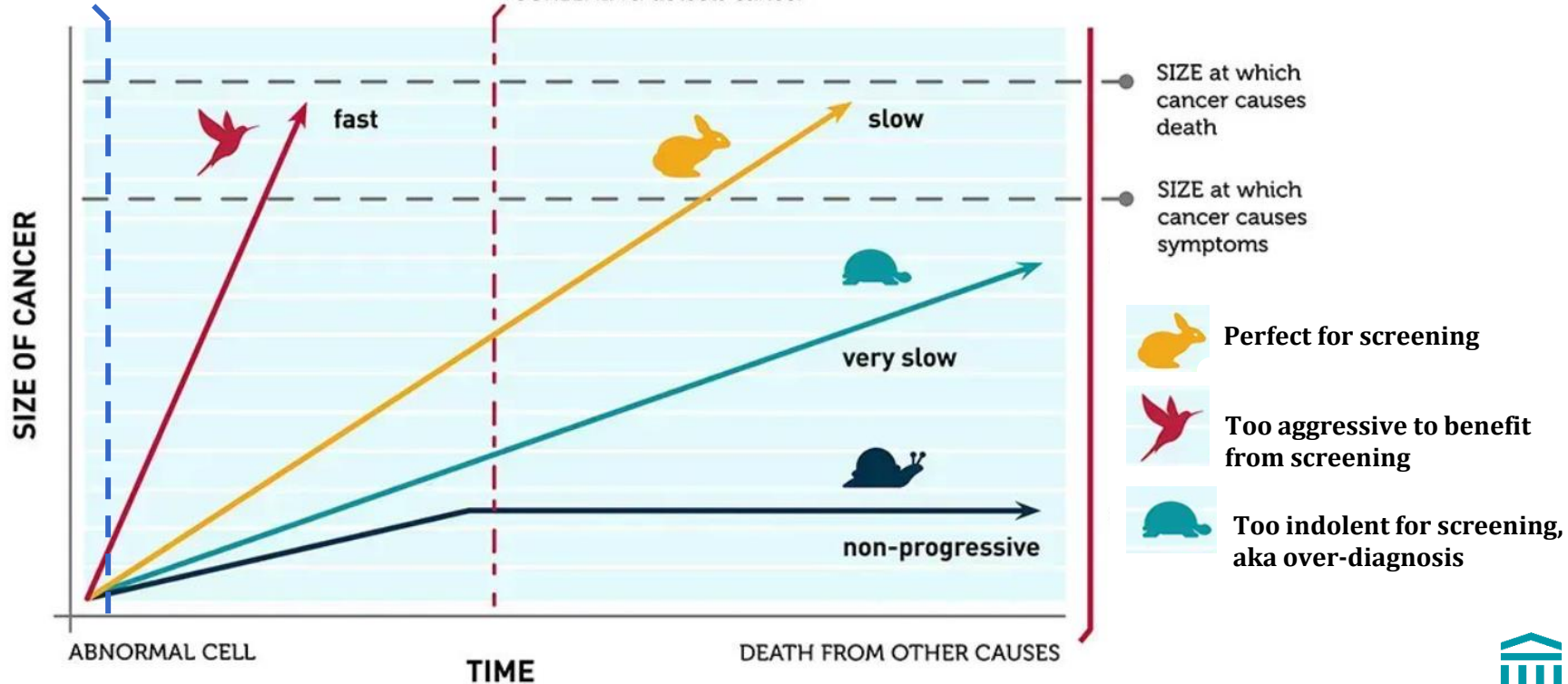# What do we mean by early detection?

Early detection is really early **STAGE** detection.
Goal: Find asymptomatic cancers
when may be cured by treatment

Screen Interval and Growth Rate

SCREENING unable to detect cancer here

SCREENING detects cancer

fast

slow

SIZE at which cancer causes death

SIZE at which cancer causes symptoms

very slow

SIZE OF CANCER

non-progressive

ABNORMAL CELL

TIME

DEATH FROM OTHER CAUSES

Perfect for screening

Too aggressive to benefit from screening

Too indolent for screening, aka over-diagnosis

Risk of the Screened Population

Novel test to detect cancer:
    95 % Sensitivity
    95 % Specificity

But the clinical utility of this great test depends on the rate (prevalence) of the disease in the tested population…..

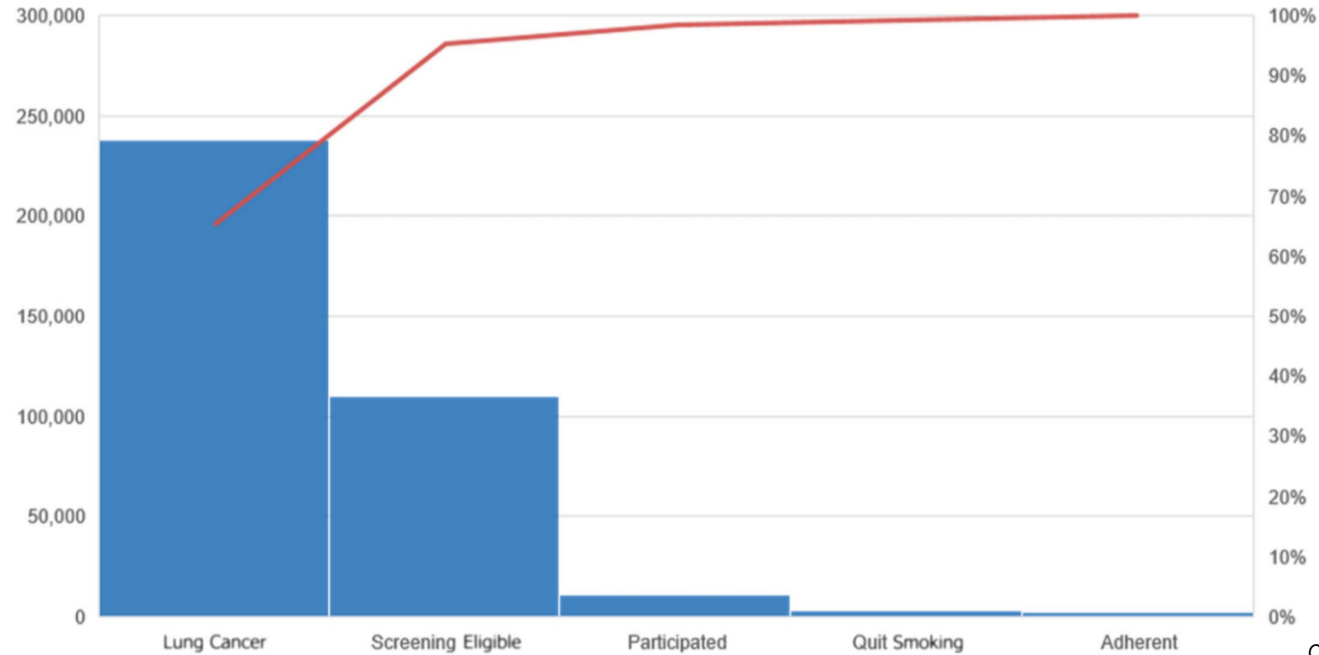| Prevalence	20 %	5 %	1 %	0.1 %
Test positive predictive value	83 %	50 %	16 %	2 %

Our primary research question: RISK

Our Goals for Collaboration:

- Develop a SOF cohort to understand the unique cancer risks in this population

- Provide education, reassurance and guidance for joint HB + EDDx patients

- Develop and test novel tools to predict risk and thereby personalize screening recommendations

Very high

High

Moderate

Low
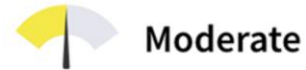
The problem of the grasp and reach of LCS

Osarogiagbon et al, ASCO Ed Book 2023

Lecia V. Sequist, MD, MPH – Cancer Early Detection & Diagnostics, Mass General Cancer Center

The problem of the grasp and reach of LCS

Need to improve our assessment of individual RISK

Need to get at risk individuals to screening

Osarogiagbon et al, ASCO Ed Book 2023

Lecia V. Sequist, MD, MPH – Cancer Early Detection & Diagnostics, Mass General Cancer Center

Sybil: Individualized Future Cancer Risk

> 44K LDCT exams from
15K subjects in NLST trial
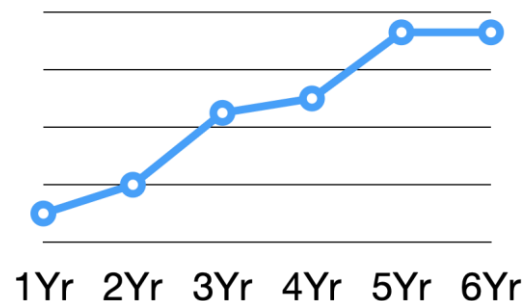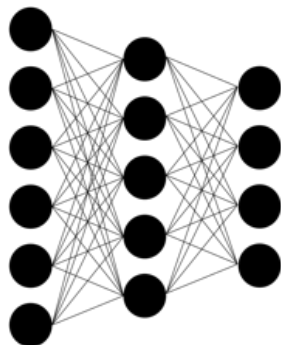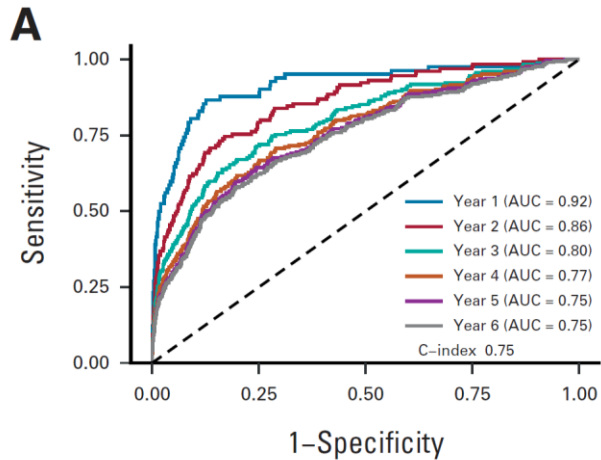

Key Advantages
- No image annotation
- No clinical data needed
- Instant readouts
- Multi-year <u>future</u> risk stratification from single CT
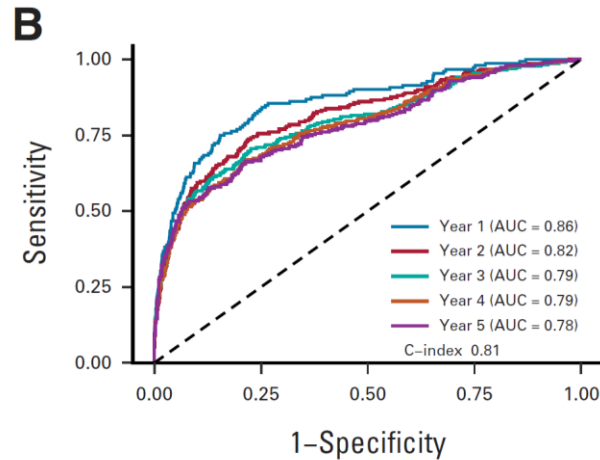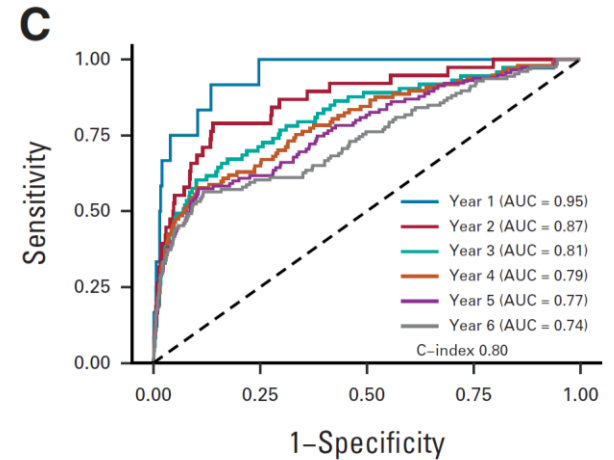- Code is open source

Mikhael, *J Clin Oncol* 2023

Sybil Performance

A — NLST, n=6,282

Year 1 (AUC = 0.92)
Year 2 (AUC = 0.86)
Year 3 (AUC = 0.80)
Year 4 (AUC = 0.77)
Year 5 (AUC = 0.75)
Year 6 (AUC = 0.75)
C-index 0.75

B — MGH, n=8,862

Year 1 (AUC = 0.86)
Year 2 (AUC = 0.82)
Year 3 (AUC = 0.79)
Year 4 (AUC = 0.79)
Year 5 (AUC = 0.78)
C-index 0.81

C — CGMH, n= 12,280

Year 1 (AUC = 0.95)
Year 2 (AUC = 0.87)
Year 3 (AUC = 0.81)
Year 4 (AUC = 0.79)
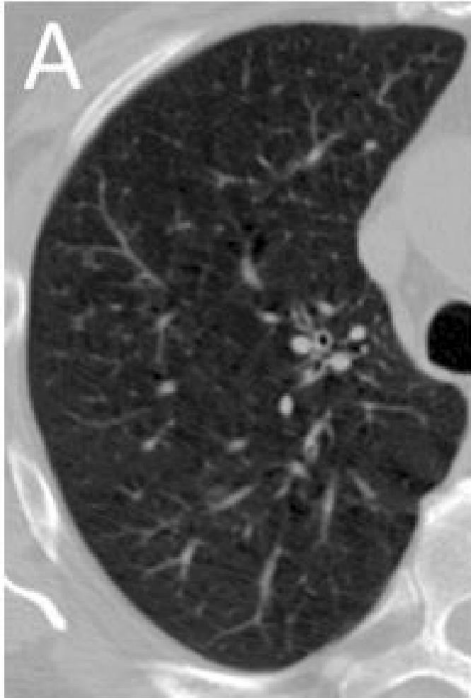Year 5 (AUC = 0.77)
Year 6 (AUC = 0.74)
C-index 0.80

Most Common Question:

What is Sybil "seeing"?
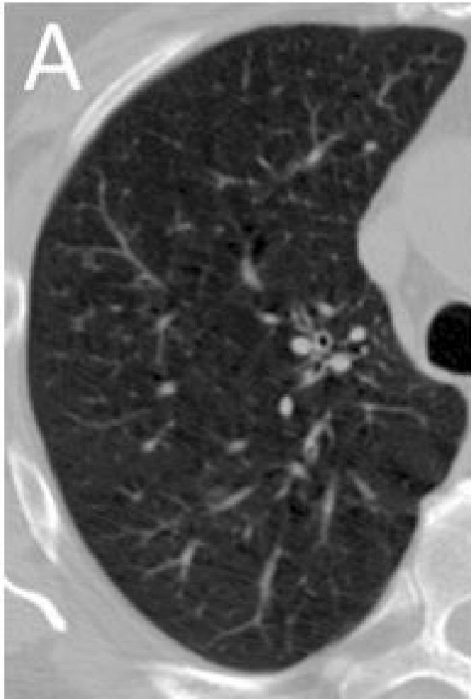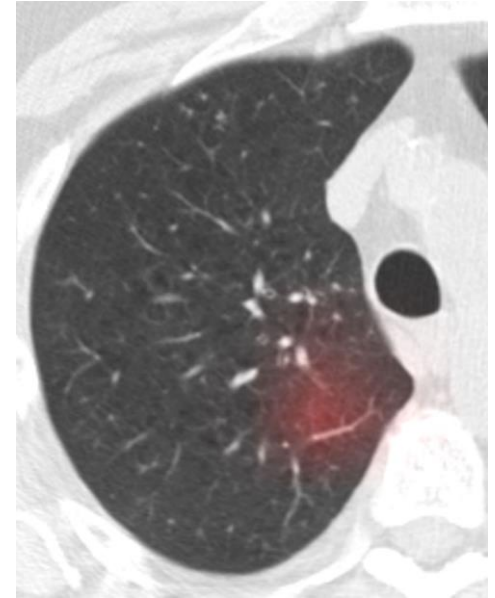
What is Sybil Seeing?

69-year-old male with
99 pack-year smoking hx

Baseline scan read by
radiologist as "negative
screen, minor abnormalities
not suspicious for lung
cancer"

Sybil placed scan in 75%
risk percentile (6-year risk)

Mikhael, *J Clin Oncol* 2023

What is Sybil Seeing?
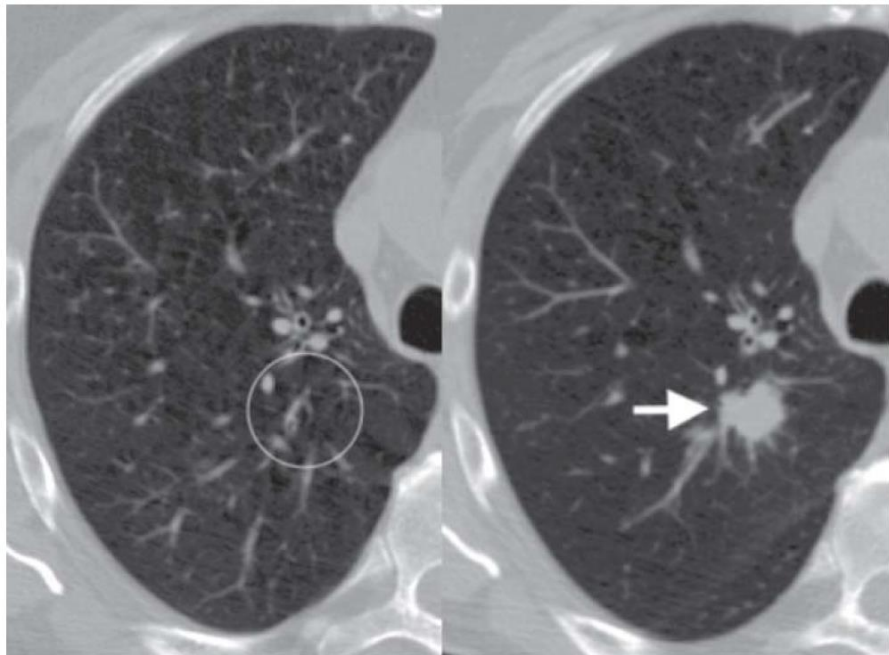

69-year-old male with
99 pack-year smoking hx

Baseline scan read by
radiologist as "negative
screen, minor abnormalities
not suspicious for lung
cancer"

Sybil placed scan in 75%
risk percentile (6-year risk)

Mikhael, *J Clin Oncol* 2023

Sybil "attention map"
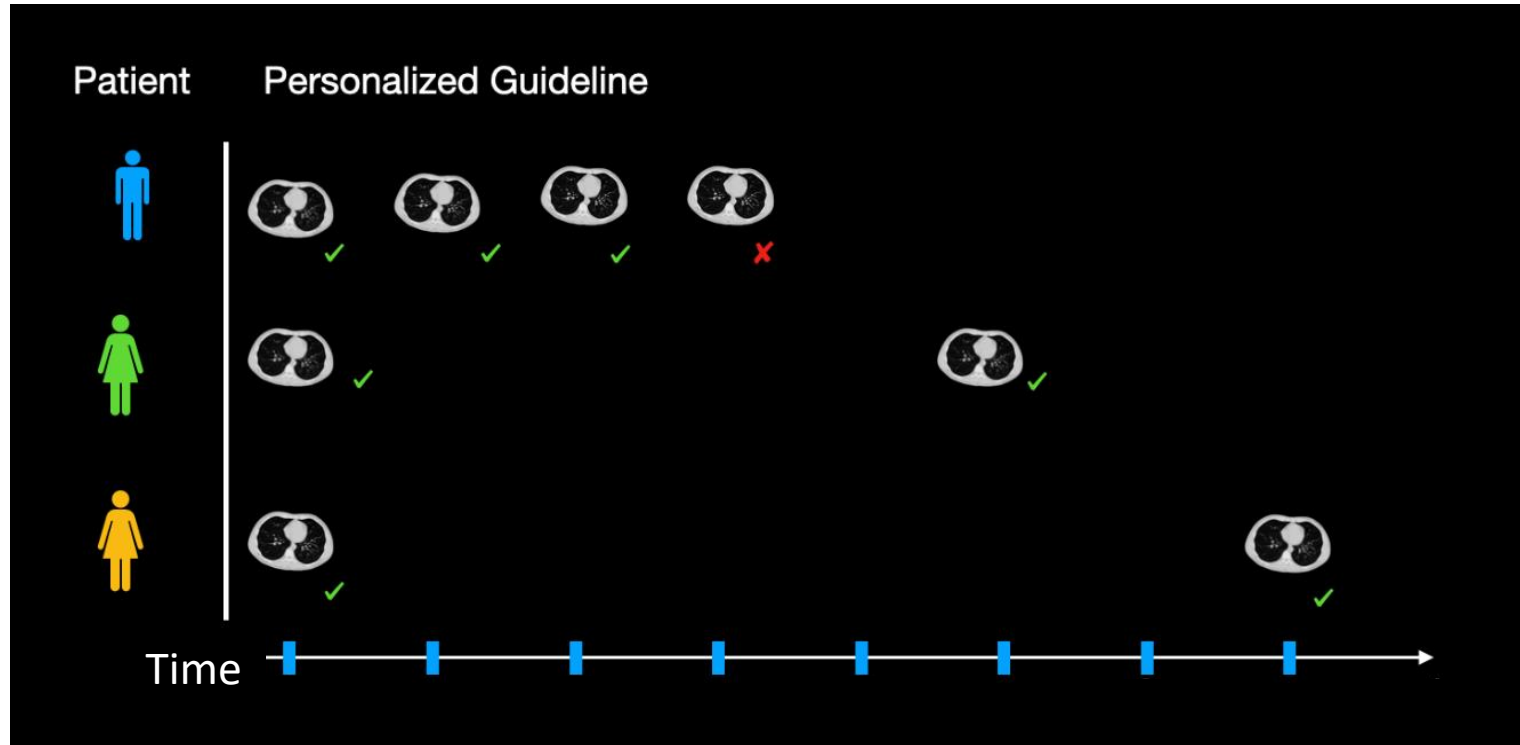(note this is *not* a PET scan)

What is Sybil Seeing?

- The following year, a worrisome nodule appeared in the location Sybil was focused on for risk assessment.
- Pt had surgery for a 2.2 cm poorly-differentiated squamous cell lung cancer (pT1cN0)
- A "win" for lung cancer screening in a trial w/ high adherence, but in the real world, adherence is only 25%

Mikhael, *J Clin Oncol* 2023

Personalized Screening Strategies

Thank you