



Walter Reed
National Military
Medical Center

Murtha Cancer Center

“The DoD Cancer Center of Excellence”



Screening for Lung Cancer in our Veterans: The risk of lung cancer from military service

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Disclosure



- *“The views expressed in this lecture are those of the author and do not necessarily reflect the official policy or position of the Department of the Navy, Department of Defense, nor the U.S. Government”*





Lung Cancer



- Estimated 224,210 in U.S. 2014¹
 - 130,270 male
 - 113,910 female

Most common cancer overall

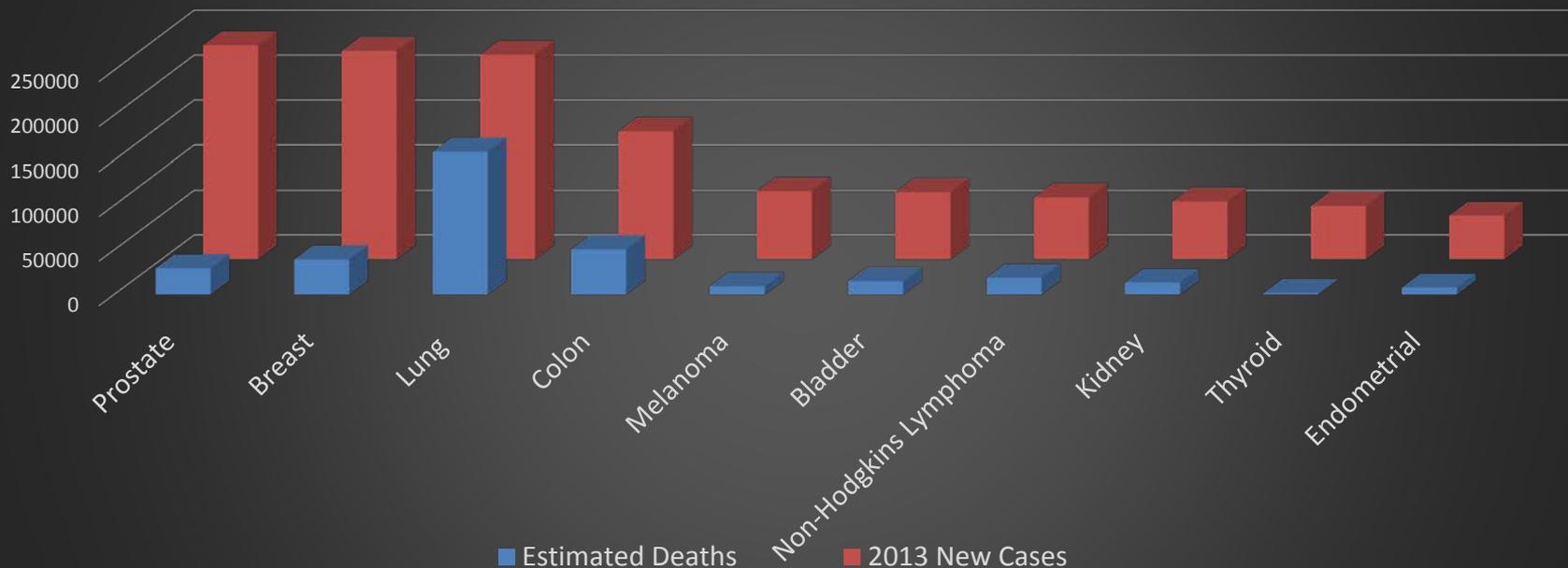
- 2nd most common cancer in men and women
- Leading cause of cancer related death
 - More than (Breast, Prostate, Colon, and Pancreas combined)
 - 29% of cancer related deaths
- 159,260 deaths
 - Median age diagnosis **71 yrs**



Lung Cancer Statistics



2013 Cancer Statistics



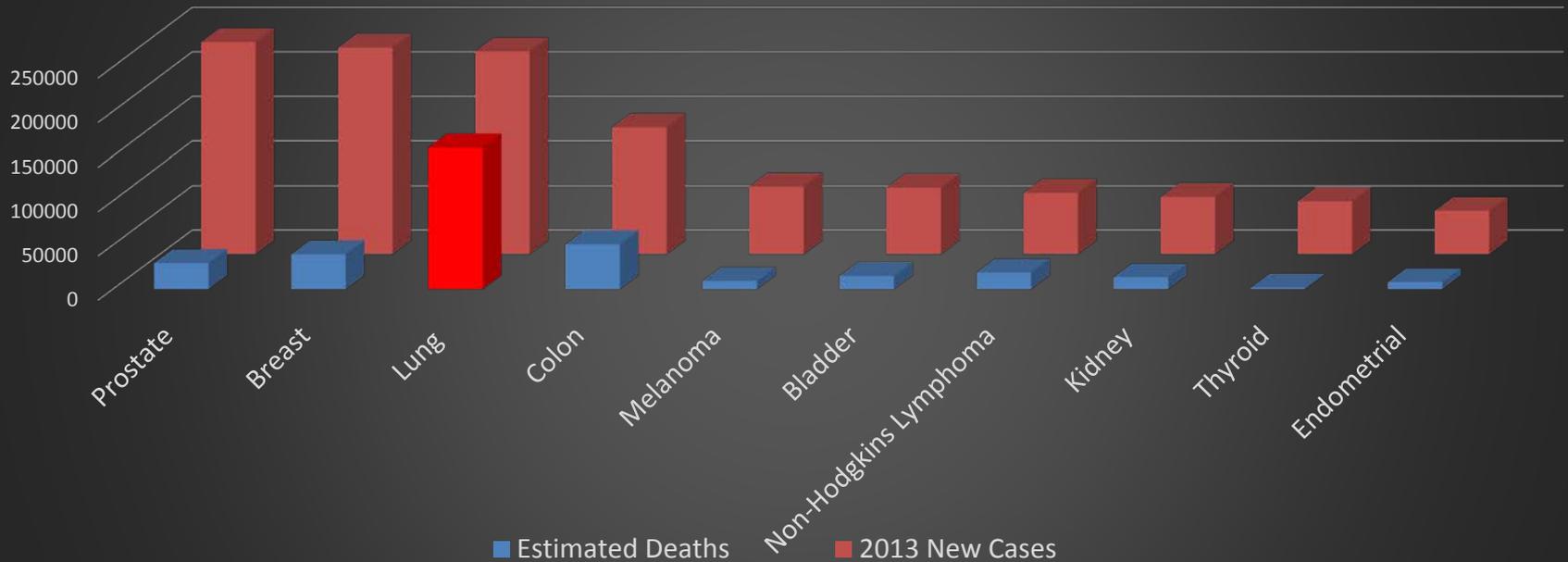
Adapted from SEER (Surveillance, Epidemiology, and End Results Program located at <http://seer.cancer.gov/statfacts/html/all.html>)



Lung Cancer Statistics



2013 Cancer Statistics



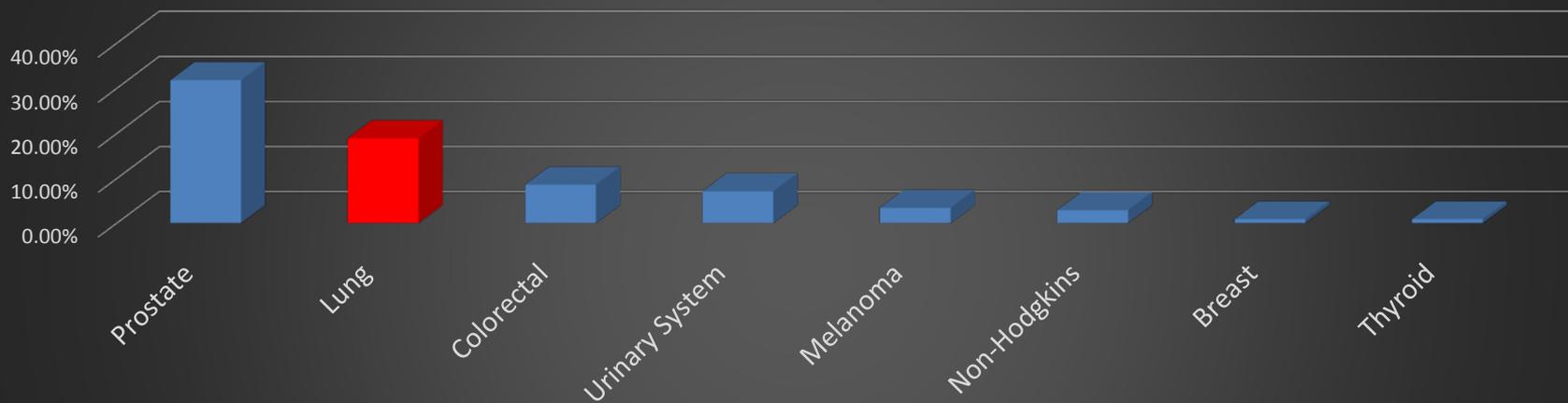
Adapted from SEER (Surveillance, Epidemiology, and End Results Program located at <http://seer.cancer.gov/statfacts/html/all.html>)



Lung Cancer Statistics



VA Cancer Statistics



Adapted from Zullig LL, Jackson GL, Dorn RA, Provenzale DT, McNeil R, Thomas CM, Kelley MJ. Cancer incidence among patients of the U.S. Veterans Affairs Health Care System. *Mil Med.* 2012 Jun;177(6):693-701.

Lung Cancer Funding

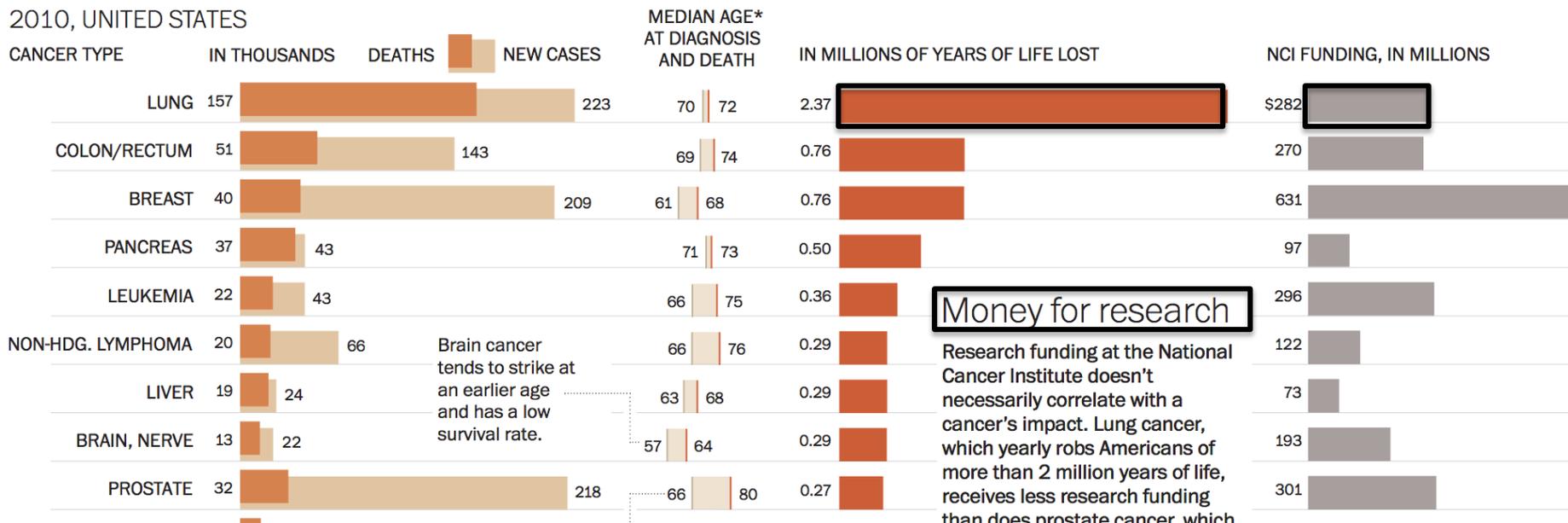


The years lost to cancer

By Patterson Clark, Published: Feb. 17, 2014

While some cancers may claim fewer lives than others, they might cause a greater loss of potential years of life. Less common but more potent cancers that tend to be diagnosed earlier in life may have a greater impact on the population than would a more common but less virulent cancer occurring later in life. Related: New therapies targeting cancer could change everything

2010, UNITED STATES



Washington Post FEB 17, 2014



Lung cancer and smoking



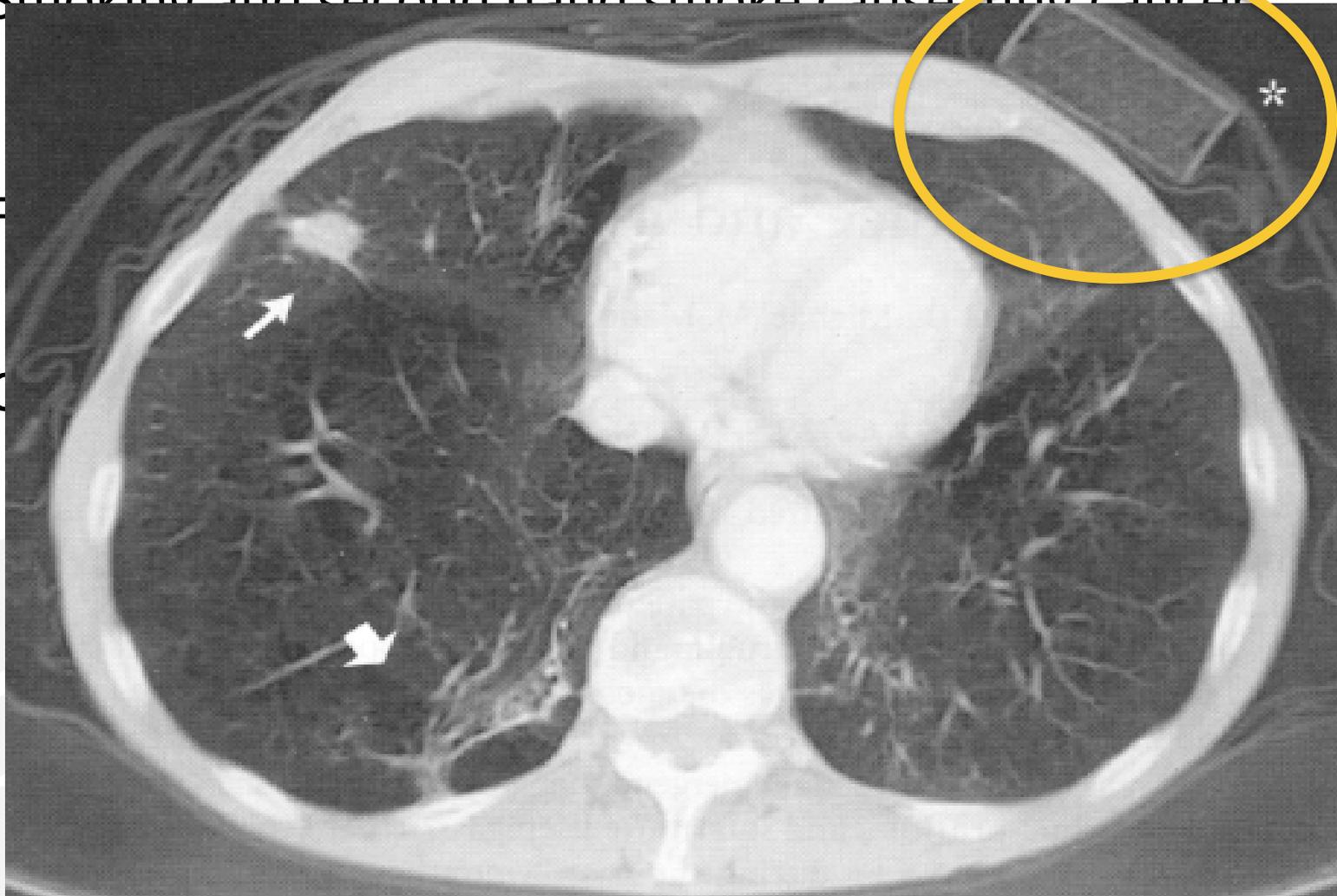
- 87 % of time lung cancer occurs in either former or current smokers
- **13%** occurs in never smokers
 - (~**36,500** cases of lung cancer)



Risks for Lung Cancer



- Smoking and second hand smoke cause lung cancer



- F
- C



Prognostic factors



- Early stage
- Good performance status (0, 1)
- Female
- Race: Asian > White > Black
- Histology
 - Adenocarcinoma > Large Cell > Squamous Cell
- Presence of EGFR mutation
- Presence of ALK translocation (when treated with targeted tx)
- ABSENCE of multiple mutations
 - (i.e. **K-ras** and **p53** mutations)
 - (increased pack years = increased number of mutations)



NSCLC Facts



- Most people are diagnosed Stage III and IV.
 - 25% stage I
 - 7% stage II
 - 32% stage III
 - 36% stage IV
- Overall 5 year survival for all stages is 15%



Military Service



- Army, Air Force, Coast Guard, Marines and Navy
- Wide range of exposures
 - Some unique to service, location, length
 - Some universal



AFP/GETTY IMAGES



Lung Cancer Risk of Veterans



- **Smoking –**
 - **Military members have increased rates of smoking.**
 - 25 to 30 %
 - Second hand smoking risk
 - **Deployments worsen smoking rates**
 - ~50%
 - **Veterans have increased rates of smoking.**
- **Occupational Risks –**
 - **Environmental tobacco smoke**
 - **Asbestos**
 - **Diesel fuels**



<http://www.history.army.mil/photos/Korea/kor1952/SC409999.jpg>

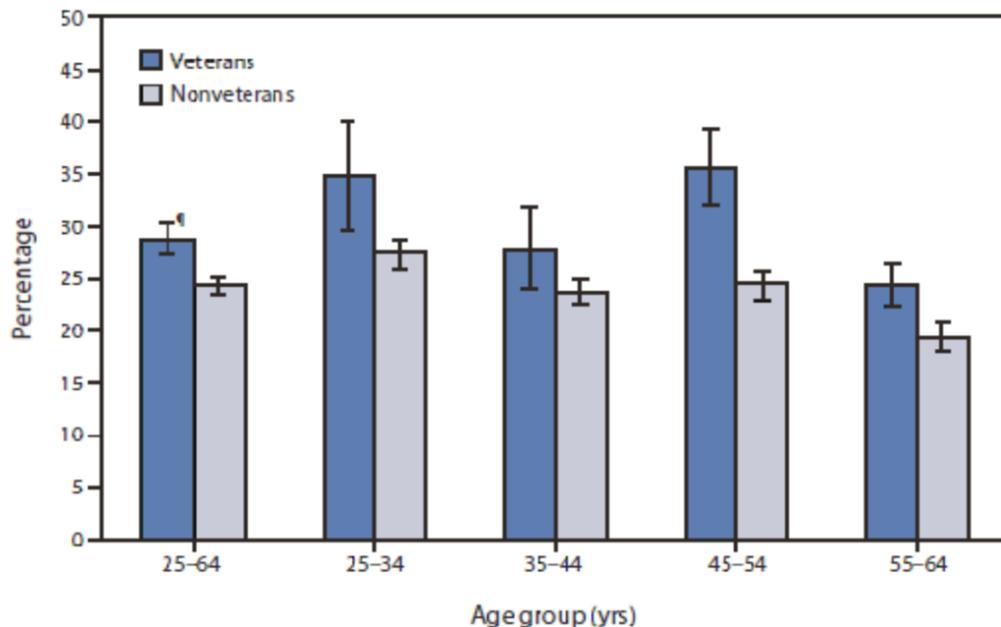
Brown DW. Smoking prevalence among US veterans. *J Gen Intern Med.* 2010;25(2):147–149.
Klevens RM, Giovino GA, Peddicord JP, Nelson DE, Mowery P, Grummer-Strawn L. The association between veteran status and cigarette-smoking behaviors. *Am J Prev Med.* 1995;11(4):245–250.
Hamlett-Berry K, et al; Evidence-based national initiatives to address tobacco use as a public health priority in the Veterans Health Administration. *Mil Med.* 2009;174(1):29–34.
Smith B, et al; Cigarette smoking and military deployment: a prospective evaluation. *Am J Prev Med.* 2008;35(6):539–546.

Veteran Smoking

QuickStats: Current Smoking* Among Men Aged 25-64 Years, by Age Group and Veteran Status† – National Health Interview Survey (NHIS), United States, 2007-2010§

Weekly

November 16, 2012 / 61(45);929



* Defined as having smoked at least 100 cigarettes in their lifetime and now smoke everyday or some days.



Veteran's smoking: historical perspective



Increased smoking rates associated with war

- WWII and Korean War
 - **35% excess lung cancer** mortality over the general population¹
- Vietnam Veterans
 - Estimated 47% current smokers²
 - Ever smokers 70%²
- Gulf War Veterans
 - Estimated 47% current smokers³

1. Bedard K et al. American Econ R, 2006:96;1-

2. Watanabe et al. J Occup and Envir Med, 1997:38;272-278

3. Bray et al. 2005 Department of defense survey, 2005, Report RTI/7841/106-FR



DOD and Tobacco



- **1975** Military stopped issuing cigarettes as part of K-rations¹
- **1996** Military stops subsidizing tobacco²
 - DOD spent **30 million dollars** subsidizing tobacco in 1996

The New York Times

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Tobacco Lobby Fights for Military Subsidy

By ERIC SCHMITT
Published: October 20, 1996

The tobacco industry is campaigning on Capitol Hill to block a Pentagon plan to raise the price of discounted cigarettes sold in scores of military grocery stores around the world, lawmakers and their top aides say.

The military sells \$458 million of cigarettes and chewing tobacco a year in Government-subsidized supermarkets, called commissaries, at prices 30 to 60 percent less than prices in commercial grocery stores. Commissaries sell 58 million cartons of cigarettes a year.

Government budget analysts estimate that the new policy could cut tobacco sales at commissaries in half and cost tobacco companies as much as \$200 million a year in sales.

Under the Pentagon's plan, which is scheduled to take effect on Nov. 1, the Government would end its subsidy of commissary tobacco products in an effort to discourage tobacco consumption among troops. The price of a carton of brand-name cigarettes would rise to about \$15.50 from \$11.50, compared with \$17.50 for stores off the bases. The subsidy now amounts to at least \$30 million a year, a Pentagon official who works with the commissaries said.

1. Feigelman W. Preventive Medicine 1994;23:235-241
2. Smith et al. Tobacco Control 2007;16:38-46



DOD and Tobacco



- 1975 Military stopped issuing cigarettes as part of K-rations¹
- 1996 Military stops subsidizing tobacco²
 - DOD spent **30 million dollars** subsidizing tobacco in 1996
- **2001 DOD 1330.9**
 - cigarettes must be within 5% local price²
- **2012 DOD 1330.9**
 - Cigarettes must be equal to local price

1. Feigelman W. Preventive Medicine 1994;23:235-241
2. Smith et al. Tobacco Control 2007;16:38-46



Navy considering tobacco sales ban on bases, ships

By [Steven Beardsley](#) and [Jon Harper](#)

Stars and Stripes

Published: March 25, 2014



NAPLES, Italy — The Navy is considering a ban on all tobacco sales on ships and bases due to health concerns over the high rate of tobacco use among sailors, officials say.

The idea is “one option on the table” as Navy Secretary Ray Mabus explores ways to further curb tobacco use among sailors, said a Navy official who spoke on condition of anonymity because he was not authorized to speak on the subject.





- Smoking –
 - Military members have increased rates of smoking.
 - Deployments worsen smoking rates.
 - Veterans have increased rates of smoking.
- **Occupational Risks –**
 - **Environmental tobacco smoke**
 - **Asbestos**
 - **Diesel fuels**



011202-N-6520M-005 Camp Rhino, Afghanistan (Dec. 2, 2001)U.S. Navy Photo by Photographers Mate 1st Class Greg Messier. (RELEASED)

Stayner L, et al; Lung cancer risk and workplace exposure to environmental tobacco smoke. Am J Public Health. 2007 Mar;97(3):545-51.

Gallus S, et al;European studies on long-term exposure to ambient particulate matter and lung cancer. Eur J Cancer Prev. 2008 Jun;17(3):191-4.

Raaschou-Nielsen, et al; Air pollution and lung cancer incidence in 17 European cohorts: prospective analyses from the European Study of Cohorts for Air Pollution Effects (ESCAPE). Lancet Oncol. 2013 Aug;14(9):813-22.

Field RW, Withers BL. Occupational and environmental causes of lung cancer. Clin Chest Med. 2012 Dec;33(4):681-703.

Silverman DT, et al; The Diesel Exhaust in Miners study: a nested case-control study of lung cancer and diesel exhaust. J Natl Cancer Inst. 2012 Jun 6;104(11):855-68.



Chemicals



Unique Chemicals in the military related to lung cancer and other cancers:

- polycyclic aromatic hydrocarbons (PAH)
 - Diesel Fuel
- Asbestos - (3% to 4% of lung cancers)
- Agent Orange exposure (arsenic containing) pesticides
- Depleted uranium ammunition?



Pollution



Pollution has been difficult to document as a contributor to cancer.

- However, long-term exposure to high levels of air pollution may increase lung cancer risk by as much as 25%

Raaschou-Nielsen, et al; Air pollution and lung cancer incidence in 17 European cohorts: prospective analyses from the European Study of Cohorts for Air Pollution Effects (ESCAPE). *Lancet Oncol.* 2013 Aug;14(9):813-22.

Military “pollution”

- Oil fires in the Iraq War
- Burn pit exposures
- Diesel exhaust



VA Registry: Burn Pits and Airborne Hazards



Public Health

Public Health

More Health Care

QUICK LINKS

Hospital Locator

Zip Code

Go

Health Programs

VA's Action Plan: Burn Pits and Airborne Hazards

Registry for Veterans who may have been exposed

VA's Airborne Hazards and Open Burn Pit Registry will allow eligible Veterans exposed to burn pit smoke and other airborne hazards to document their exposures and report health concerns. Veterans will enter information through a web-based questionnaire and have the opportunity to obtain an evaluation. Eligible Veterans include those who served in:

- Operation Enduring Freedom/Operation Iraqi Freedom/Operation New Dawn
- Djibouti, Africa after September 11, 2001





Cost of Lung Cancer in the DOD/VA



- TRICARE in 2006
 - Smoking related disabilities cost **\$2.1 billion** in excess medical care annually¹ (compared to \$584 million in 1997)²
 - Lung Cancer ~**\$564 million**
 - Comparatively Prostate Cancer ~\$42 million

- Department of Veterans Affairs
 - Smoking related disabilities cost **5 billion** in 1997³
 - Expected to grow to 9.6 billion over next decade

1. Dall TM et al. Am J Health Promot. 2007;22: 120-139

2. Helyer AJ et al. Mil Med. 1998;163: 217-221

3. Harris J. 1997 Commissioned report Department of Veterans Affairs



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Veteran's incidence of lung cancer



Lung Cancer Rates

- At least 25%-43% higher^{1,3}
- One study (Harris) reported a 76% higher rate than the national average compared to age matched SEER data²



1. Center for tobacco Cessation, 2004, Vol.2 :17
2. Harris et al. Cancer 1989;64;1160-1168
3. Campling et al. Cancer 2005;104;833-840



Screening



- PLCO (CXR)
 - 77,464 age 55-74 former smokers;
 - Detection of early lung cancer; no reduction in mortality
- I-ELCAP (CT scan) (not a randomized trial)
 - 31,567 age 40-86 former or high risk; 85% detection of early lung cancer
- NELSON Trial (CT scan vs. no screening)
 - 7,557 age 55-75 current or former < 10 years; 64% detection of early stage lung cancer
 - Results: 2016
- NLST (CT scan vs. CXR)
 - 56,456 (CT vs. CXR) (current or former) (30 pack-years)
 - Stopped Early 11/4/10 (20% reduction in lung cancer mortality)
 - Favor of CT scan: reduction in lung cancer and all cause mortality

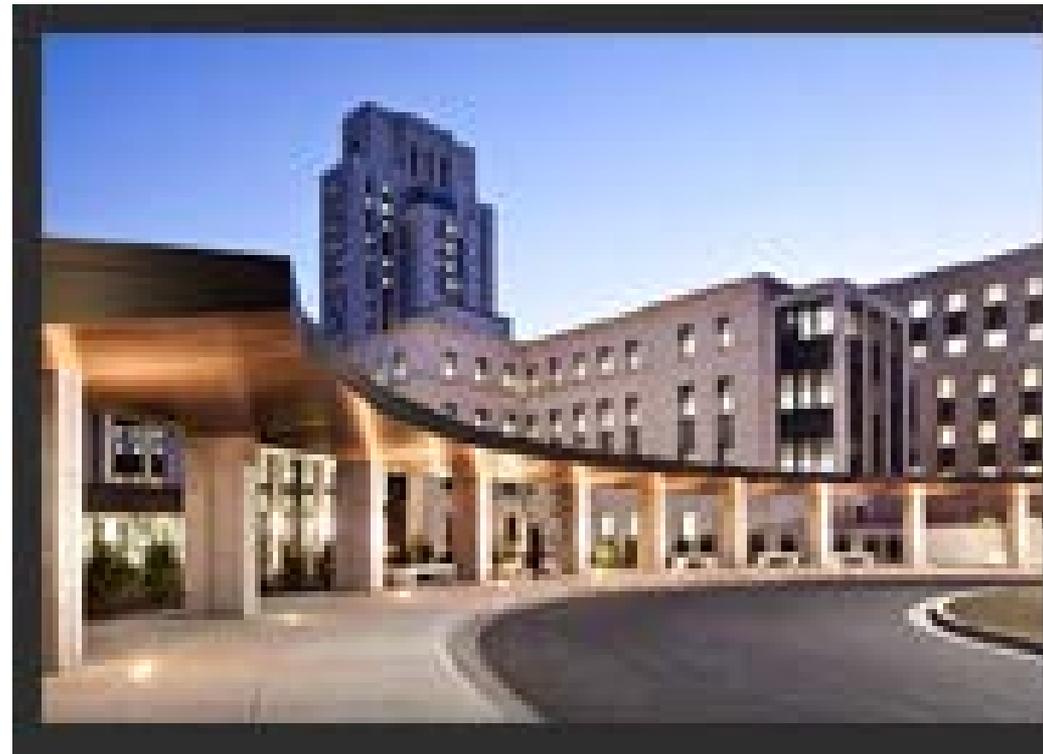


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- World's largest military medical center
- Provides care to over a million beneficiaries a year
- Inclusive healthcare of eligible beneficiaries
- Excellent system to integrate cancer screening
- Robust disease management department



<http://www.wrnmmc.capmed.mil>



Developing a Lung Cancer Screening Program



- Planning 2011 – 2012
- Screening began in November 2012
- 2013 WRB and VA joint pilot for screening in 8 VA hospitals as well as 4 major military medical centers

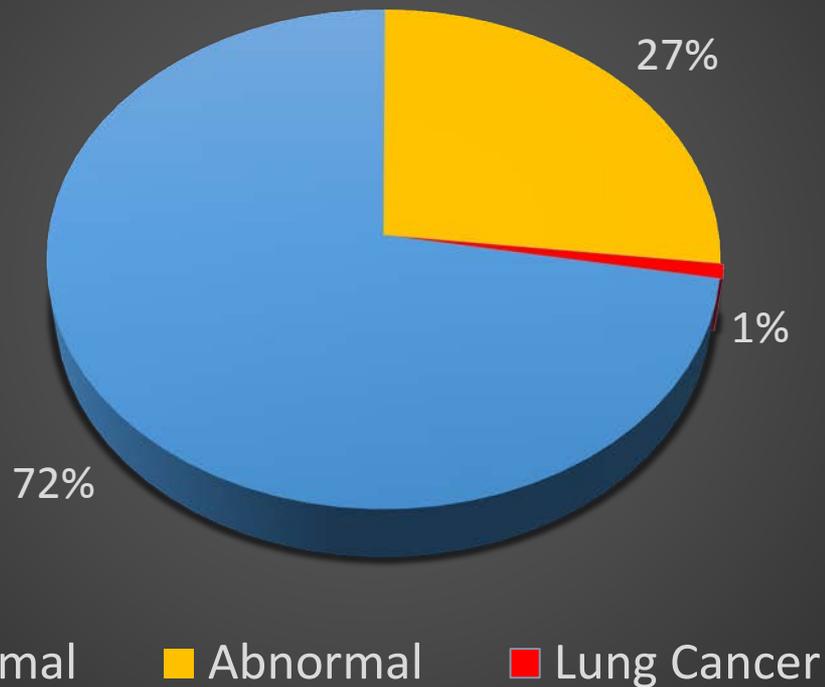




Expected Outcomes



Outcomes of Screening

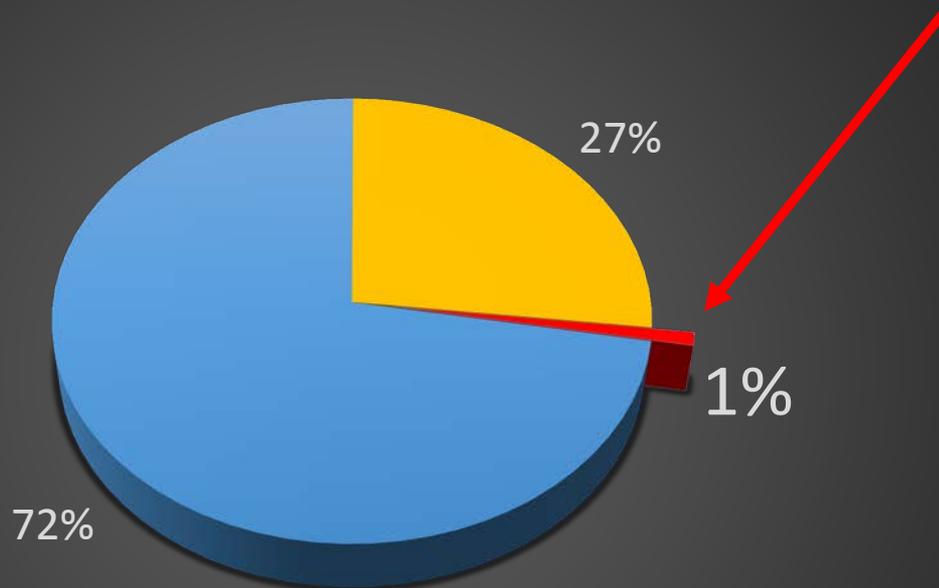




Expected Outcomes



Outcomes of Screening



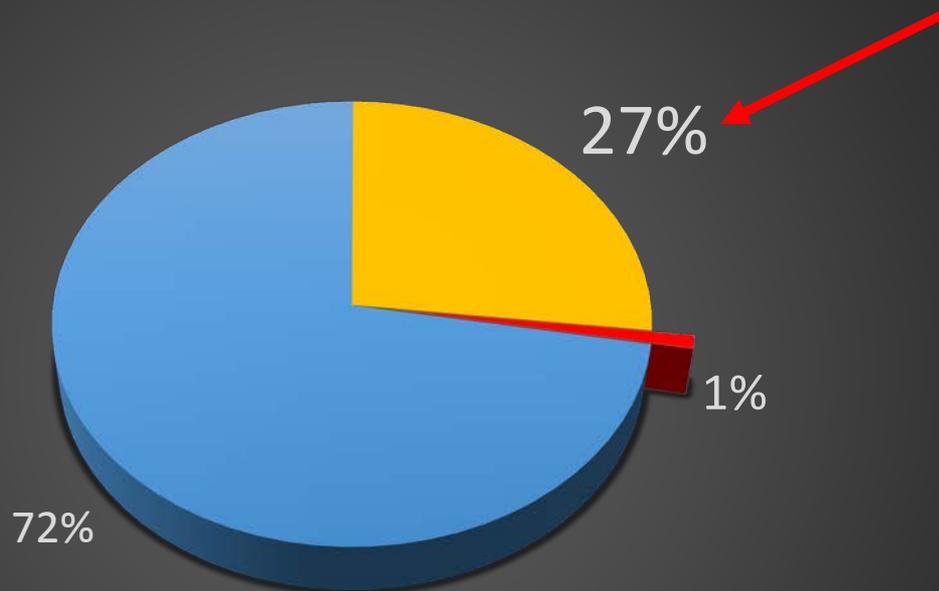
■ Normal ■ Abnormal ■ Lung Cancer



Expected Outcomes



Outcomes of Screening



■ Normal ■ Abnormal ■ Lung Cancer



Organized Approach Team Members



Roles

- Inclusion criteria for screening –
 - Radiology/Pulmonology/Oncology/
Primary Care
- Radiologic Studies –
 - Radiology (LDCT)
- Guidelines for addressing abnormal screening –
 - Pulmonology/Radiology/Oncology/Primary
Care
- Smoking Cessation
 - Primary Care/Smoking Cessation
- Enrollment into database for continued screening -
 - Pulmonology/Disease Management
- Database management during screening –
 - Pulmonology/Disease Management
- Clinical and radiologic assessment during screening –
 - Pulmonology/Radiology





Developing Lung Cancer Screening Program



New Patient Request for Lung Cancer Screening

If all items below are checked for either Criteria 1 or Criteria 2 and patient wishes to be screened, please order Low Dose Chest CT, complete information below and click submit.

Does the patient wish to be screened?

Criteria 1

- Age 50 - 80?
- Used Tobacco at least 30 pack years? [More Info](#)
- Has not quit or quit less than 15 years ago?

-OR-

Criteria 2

- Age 50 or greater?
- Used Tobacco at least 20 pack years? [More Info](#)
- One other risk factor (not second hand smoke exposure)

Risk Factors:

- Occupational Exposure: Radon, Asbestos, Agent Orange, Silicon
- Patient Cancer History: Lung, HEENT, Lymphoma, CA related to smoking
- Patient Chronic Lung Disease: COPD, Pulmonary Fibrosis
- Family History: 1st Degree Relative with Lung Cancer

List other risk factor:





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Developing Lung Cancer Screening Program



Allergies	Tobacco Use	Military Service	Duty Stations	Exposure	History
		Start Year	End Year	OR Number of y	





Early Outcomes of Lung Cancer Screening at WR-B



Author	Year	Screened	Nodules	Lung Cancer Detected	Comments
Henschke	1999	1000	23.3 % 9.7% (>5mm)	2.7%	
Sone	2001	5483	5.1%	0.4%	
Diederich	2002	817	50.1% 18.8% (>5mm)	1.35%	
Nawa	2002	7956	26.4% 6.8% (>8mm)	0.45%	
Sobue	2002	1611	11.5%	0.81%	
Swensen	2002	1520	51.4% 31.3%	1.38%	
Titola	2002	602	18.4% 8.0% (>5mm)	0.83%	
NLST Research Team	2011	53454 (26,722 LDCT)	27.3% (first round) 39.1% (during 3 rounds)	1.0% (first round) 3.9% (during 3 rounds)	20% reduction in lung cancer deaths.
WR-B	2013-2014	150	>55%	4 %	Offered now as standard of care



Smoking Cessation



- Increased referrals to smoking cessation
 - (added 50 new patients)
- Smoking Cessation for screening program:
 - 50% of patients
- Smoking Reduction Rates:
 - 25 % (reduced number of cigarettes)
 - Follow-up smoking cessation >50%



Beyond lung cancer screening...



- Which nodules are malignant?
- How can we improve screening?
- Are the lung cancers we are seeing in the military different?



- 2011 Congressionally Directed Medical Research Programs (CDMRP) grant (13M)
- The Detection of Early Lung Cancer Among Military Personnel

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NAVY
UNITED STATES PUBLIC HEALTH SERVICE

WELCOME ABOUT DECAMP LOCATIONS NEWS RESOURCES DECAMP DICTIONARY

DECAMP
BIOMARKER RESEARCH
Detection of Early Lung Cancer among Military Personnel

Welcome to the DECAMP Web site – a resource for the clinical trial participants and their family and friends. DECAMP is designed to develop and confirm molecular biomarkers that can lead to the earlier detection of lung cancer among active military personnel, their dependents, and veterans.

The earlier cancer is detected the more likely it can be cured. We thank you for your interest in this important project that is working toward that goal.

Sincerely,
The DECAMP Research Team

The DECAMP research project is funded by the United States Department of Defense.
2012 DECAMP Research

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RADIOLOGY
INTEGRATED NETWORK



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DECAMP Consortium



- CO-PI Avrum Spira, MD, MSc Boston Univ,
- Co-PI Mitchell Schnall, MD, PhD ACRIN
- 4 designated Military Treatment Facilities (MTF)
- 7 Veterans Administration Hospitals (VAH),
- One academic hospital
- several molecular biomarker laboratories, along with Biostatistics, Bioinformatics, Pathology and Biorepository cores
- Pathology Core: MD Anderson (Ignacio Wistuba MD)



Murtha Cancer Center Bio-Bank



- Banked Lung cancer specimens:
 - Approx. 300 samples
 - frozen tissue and paraffin blocks (FFPE)
 - blood and serum, urine
 - Linked to radiographic images
 - clinical data, and deployment exposures, etc



Research Direction



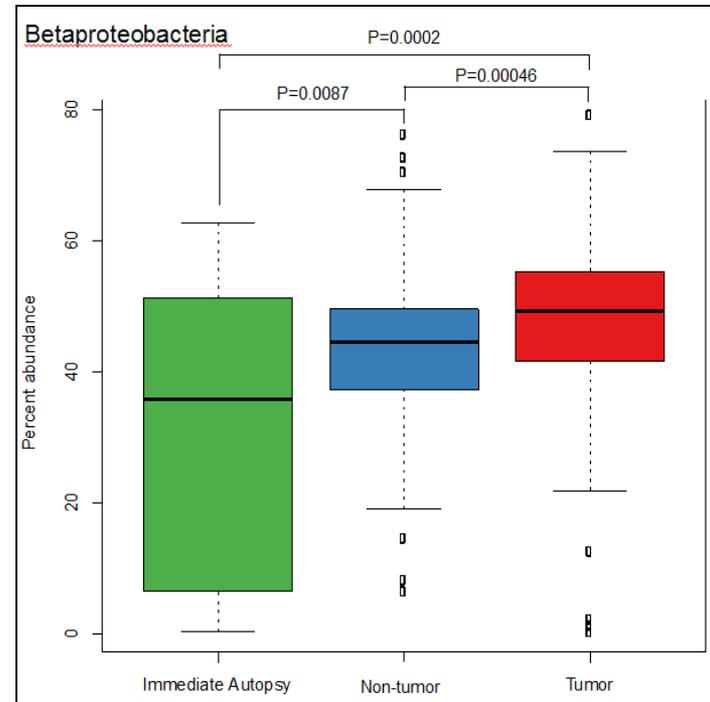
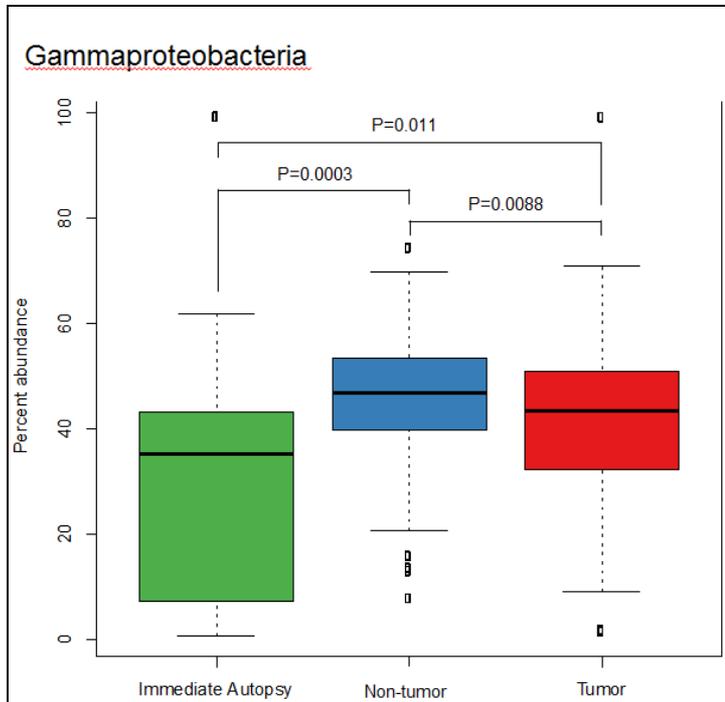
- 1) How Many Lives Can we Save in the National Capital Area
 - (enhanced Multi-Service Market) for the Defense Health Agency
 - Statistical Analysis focusing on COST for the military

- 2) Natural History Study for Lung Cancer Screening the Military
 - Includes optional BIOBANKING
 - Blood, Urine, and Nasal tissue

- 3) **Understanding the Immunosuppressive microenvironment of tumorigenesis** (focusing on KRAS mutated lung cancer)

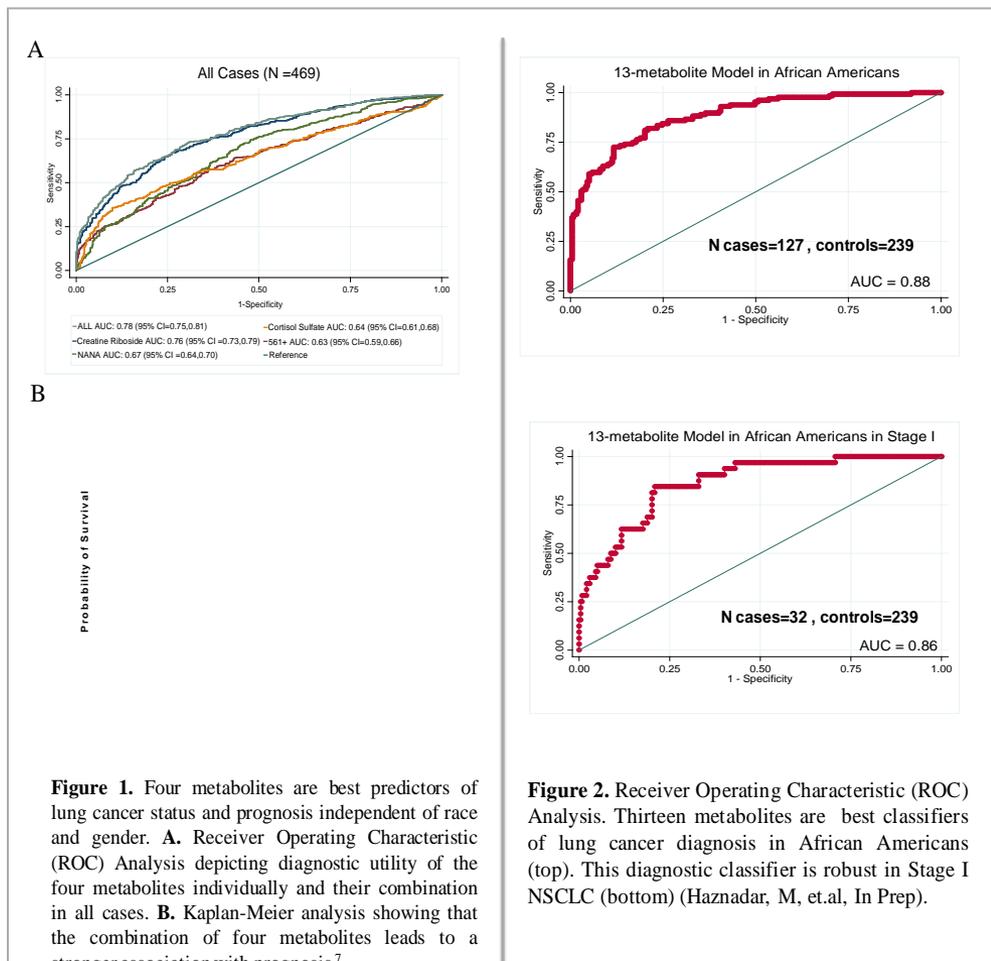
Future Direction

- Integrative analysis of the Microbiome and their metabolites



Future Directions

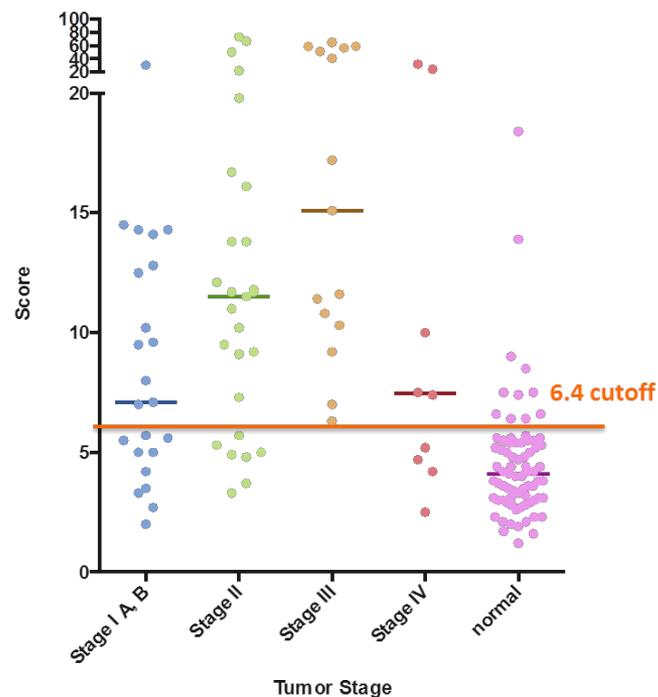
- Understanding and validating unique **Urinary Metabolic Profiling**





Future Directions

- Addition of a BIOMARKER to the Low Dose CT scan
 - **PAULA's test:**
 - 20/20 Gene Assay: 3 tumor proteins and one autoantibody
Sens.: (0.83) Spec.: (0.80)
 - Addition of additional autoantibody-based biomarkers identified through collaboration with the Rush Thoracic-Oncology research program
 - Increase Sensitivity to 0.90 and Specificity to 0.90



Summary



- Military service appears to increase risk for lung cancer
 - Unique exposures and deployments
 - Increased smoking
- Military medicine is invested in the early detection of lung cancer and prevention
- As screening experience grows, patient inclusion criteria will need to be modified for pertinent risk factors. Military service may be a unique factor.
- Screening, coupled with aggressive smoking cessation, likely provides the best method to reduce the mortality impact of lung cancer
 - Couple cessation with continued measures to limit access to tobacco and smoking in the military

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Thank you

F. Edward Hébert School of Medicine - "America's Medical School"

