JABSOM Mini Medical School Lung Cancer

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Disclosures

- I have no disclosures

Objectives

01
List 3 risk factors for lung cancer

02
Recognize who is eligible for lung cancer screening

03
Name 2 different types of treatments for early stage lung cancer

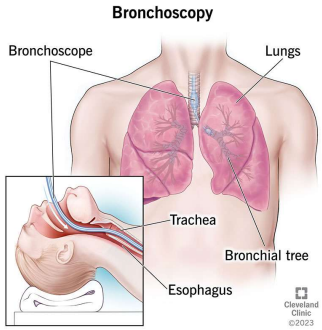
04
Name 3 types of medicines that can be used to treat lung cancer

Patient Case

- Mr. R is a 67 year old male with a history of high blood pressure and cholesterol who was referred to medical oncology for newly diagnosed lung cancer.
- He has a history of tobacco use but quit 5 years ago. He notes previously smoking 1 pack per day for the past 20 years.
- His primary care physician ordered a low dose CT chest for lung cancer screening which demonstrated a new lung mass.

Patient case continued…

- He was referred to pulmonology who recommended a bronchoscopy for tissue biopsy.
- This confirmed a diagnosis of lung adenocarcinoma (cancer).
- He was referred to medical oncology, thoracic surgery, and radiation oncology for evaluation.



Estimated New Cases

Male			Female		
Prostate	313,780	30%	Breast	316,950	32%
Lung & bronchus	110,680	11%	Lung & bronchus	115,970	12%
Colon & rectum	82,460	8%	Colon & rectum	71,810	7%
Urinary bladder	65,080	6%	Uterine corpus	69,120	7%
Melanoma of the skin	60,550	6%	Melanoma of the skin	44,410	4%
Kidney & renal pelvis	52,410	5%	Non-Hodgkin lymphoma	35,210	4%
Non-Hodgkin lymphoma	45,140	4%	Pancreas	32,490	3%
Oral cavity & pharynx	42,500	4%	Thyroid	31,350	3%
Leukemia	38,720	4%	Kidney & renal pelvis	28,570	3%
Pancreas	34,950	3%	Leukemia	28,170	3%
All sites	**1,053,250**		**All sites**	**988,660**	

Estimated Deaths

Male			Female		
Lung & bronchus	64,190	20%	Lung & bronchus	60,540	21%
Prostate	35,770	11%	Breast	42,170	14%
Colon & rectum	28,900	9%	Pancreas	24,930	8%
Pancreas	27,050	8%	Colon & rectum	24,000	8%
Liver & intrahepatic bile duct	19,250	6%	Uterine corpus	13,860	5%
Leukemia	13,500	4%	Ovary	12,730	4%
Esophagus	12,940	4%	Liver & intrahepatic bile duct	10,840	4%
Urinary bladder	12,640	4%	Leukemia	10,040	3%
Non-Hodgkin lymphoma	11,060	3%	Non-Hodgkin lymphoma	8,330	3%
Brain & other nervous system	10,170	3%	Brain & other nervous system	8,160	3%
All sites	**323,900**		**All sites**	**294,220**	

FIGURE 1 Leading sites of estimated new cancer cases and deaths by sex, United States, 2025. Estimates exclude US territories and are rounded to the nearest 10, and cases exclude basal cell and squamous cell skin cancers and in situ carcinoma except urinary bladder. Ranking is based on modeled projections and may differ from the most recent observed data.

- Lung cancer is estimated to account for **11% of new cancer diagnoses in 2025**.
- It remains the **leading cause of cancer deaths** in the United States.
- **In 2025, Hawaii** is estimated to have **880 new lung cancer diagnoses** and **470 lung cancer deaths.**

CA Cancer J Clin. 2025 Jan-Feb;75(1): 10-45

Declining incidence of lung cancer

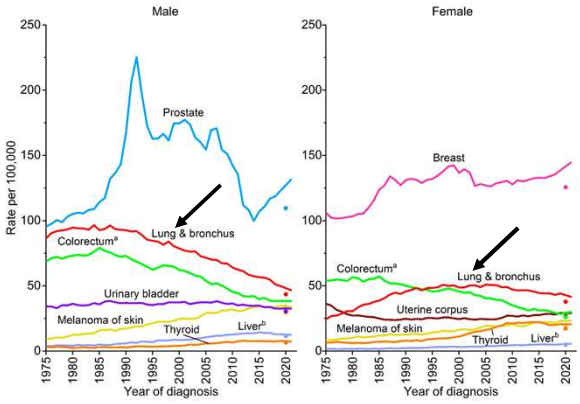


FIGURE 4 Trends in incidence rates for selected cancers by sex, United States, 1975 to 2021. Rates are age adjusted to the 2000 US standard population and adjusted for delays in reporting. Data for 2020 are shown separate from trend lines. [a]Excludes appendix. [b]Includes intrahepatic bile duct.

- **From 2012-2021, there was a 2.2% per year decrease in lung cancer incidence.**

CA Cancer J Clin. 2025 Jan-Feb;75(1): 10-45

Declining mortality rates

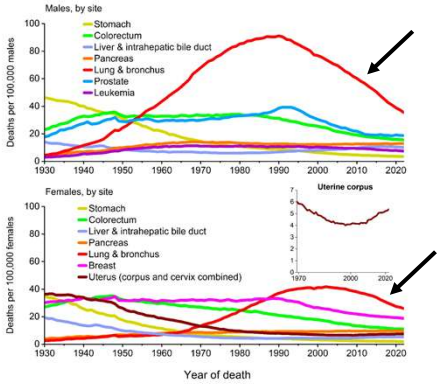


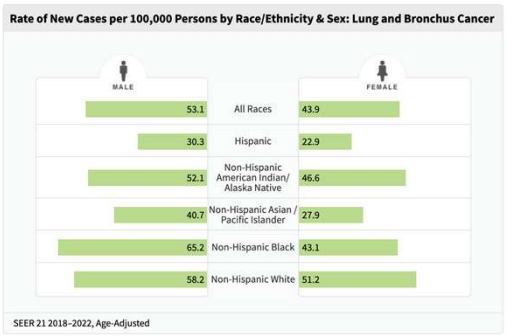
FIGURE 7 Trends in cancer mortality rates by sex overall and for selected cancers by sex, United States, 1930 to 2022. Rates are age adjusted to the 2000 US standard population. Numerator data for cancers of the lung and bronchus, colon and rectum, liver, and uterus differ from the contemporary time period because of improvements in International Classification of Diseases coding over time. For example, rates for lung and bronchus include pleura, trachea, mediastinum, and other respiratory organs.

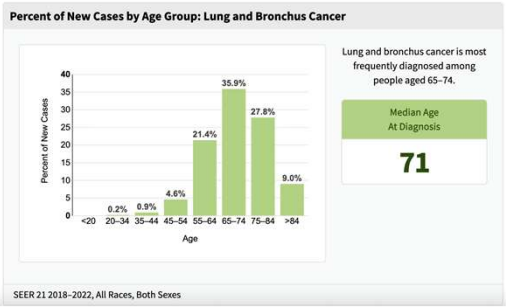
- **From 2013-2022, there was a 4.3% per year decrease in lung cancer deaths.**

CA Cancer J Clin. 2025 Jan-Feb;75(1): 10-45

Who is at risk?

- Males > Females
- Non-Hispanic black men with highest rate of new cases
- Median age at diagnosis is 71 years old
- Most patients are diagnosed between 65-74 years old

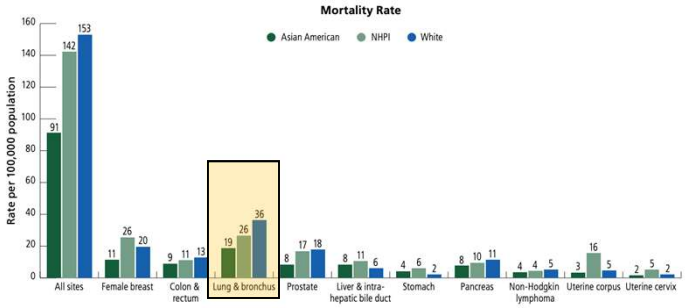




SEER Database

Asian American, Native Hawaiian and Other Pacific Islander (NHPI)

- In Hawaii, nearly 60% of the state's population are Asian Americans and 26% are NHPIs.
- Lung cancer incidence ranks first among Chinese, Vietnamese, Laotian, and Chamorro/Guamanian men.



American Cancer Society Cancer Facts & Figures for Asian American, Native Hawaii, & Other Pacific Island People 2024-2026

Lung cancer survival disparities in Hawaii

- Retrospective study at the Queen's Medical Center of all patients diagnosed with non small cell lung cancer (NSCLC) between January 1, 2000 and December 31, 2022.
- >4000 NSCLC patients were included.
- NHPI had the highest proportion of diagnosis <60 years old and more frequently covered by Medicaid or uninsured.
- NHPI had the lowest proportion receiving surgery compared to other races.

Wannaphut et al., Cancer Epidemiology 99 (2025) 102904

Lung cancer survival disparities in Hawaii

- **Asian patients had lower risk of death,** however **NHPI patients had a higher risk of death** compared to White patients.
  - When adjusting for treatment, survival disadvantages for NHPI were no longer significant.
- Risk factors for worse outcomes:
  - Older age (>/= 80)
  - Male
  - Medicaid/uninsured
  - Squamous cell carcinoma, other NSCLC
  - Advanced stage at diagnosis

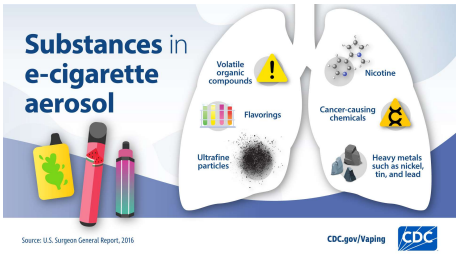
Wannaphut et al., Cancer Epidemiology 99 (2025) 102904

Tobacco Use

- Tobacco use is responsible for 85% of lung cancer deaths in 2025.
- Cigarette smoking remains the leading cause of preventable death in the US despite declines in cigarette smoking prevalence.

E-cigarettes and vaping

- E-cigarettes are battery operated devices that heat a liquid and produce an aerosol which is inhaled in the lungs.
- They commonly contain nicotine and potentially harmful substances.
- Not an FDA approved product to quit smoking
- Advertising to youth



https://www.cdc.gov/tobacco/e-cigarettes

E-cigarettes and vaping

- Recent systematic review found **potential increased risk of lung cancer,** especially among dual uses of conventional cigarettes(CC) and e-cigarettes (EC).
- Patients who **switched from CC to EC had higher lung cancer incidence and mortality** compared to non-EC users.
- Increased **risk of respiratory outcomes** with EC.

ESMO Open. 2025 Dec;10(12):105910.

Other risk factors

- Radon
- Occupational carcinogens (ie asbestos)
- Radiation
- Secondhand smoke
- Other combustible tobacco products (cigar or pipe smoking)
- Lung disease
- Air pollution
- Household use of solid fuels, high temperature frying

CA Cancer J Clin. 2025 Jan-Feb;75(1): 10-45
Nat Rev Clin Oncol. 2024 February ; 21(2): 121–146.

Genetic Testing?

- **Currently, no recommended routine genetic testing for lung cancer.**
- Increase risk in patients with a family history of lung cancer.
  - 3.2 fold increase in risk among smokers with a 1st degree relative with lung cancer.
- Hereditary lung cancer with rare epidermal growth factor receptor (EGFR) mutation.
- Pathogenic germline variants (PGV) may predispose patients to lung cancer.

Am Soc Clin Oncol Educ Book. 2023 May:43:e389956.

Lung cancer screening

Lung cancer screening

U.S. Preventive Services TASK FORCE

- **Low dose computed tomography (LDCT)** recommended for:
  - **At least 20 pack-year smoking history and**
  - **Currently smoke or have quit within the past 15 years and**
  - **Between 50 to 80 years old**

Example: 1 pack per day for 10 years = 10 pack years

- Shared decision making

Lung cancer screening

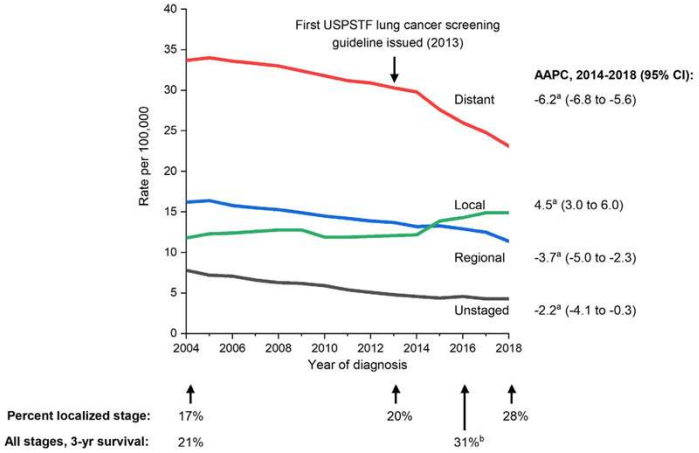
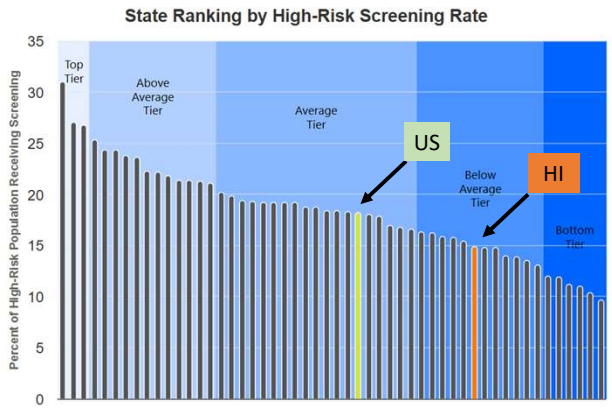


FIGURE 6. Trends in Lung Cancer Incidence Rates by Stage at Diagnosis, United States, 2004 to 2018. AAPC indicates average annual percent change; USPSTF, US Preventive Services Task Force. Incidence rates are age adjusted to the 2000 US standard population. Three-year relative survival is presented for patients followed through 2018. [a]The AAPC is significantly different from zero ($P < .05$). [b]Patients were diagnosed from 2015 to 2017.

CA CANCER J CLIN 2022;72:7–33

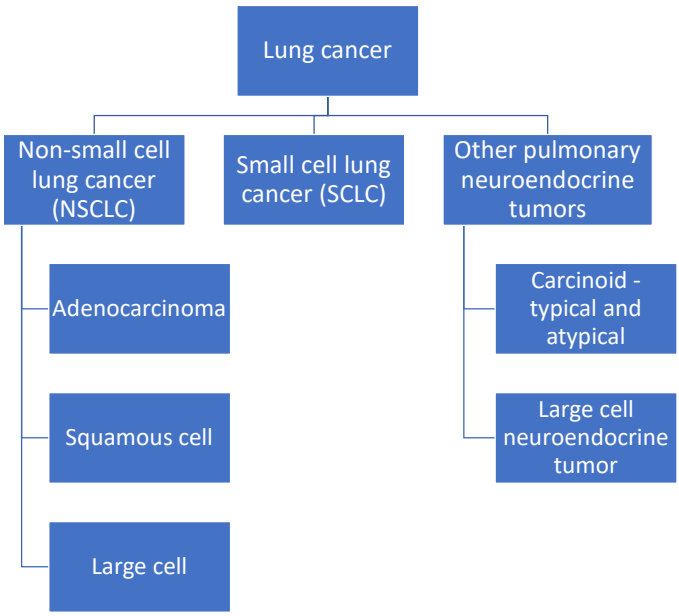
American Lung Association. | State of Lung Cancer 2025 Hawaii

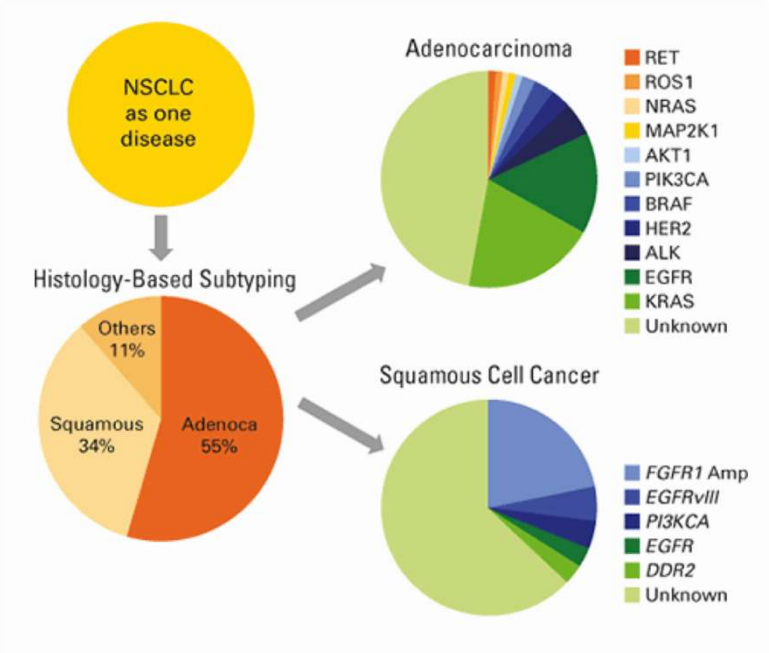


Screening for High Risk:

- In Hawaii, **14.9%** of those at high risk were screened, which was not significantly different than the national rate of 18.2%.
- It ranks **39th** among all states, placing it in the **below average tier**.
- Screening rates in this year's report have been updated to correct an error in the data source and should not be compared to previous reports.

https://www.lung.org/research/state-of-lung cancer/states/hawaii





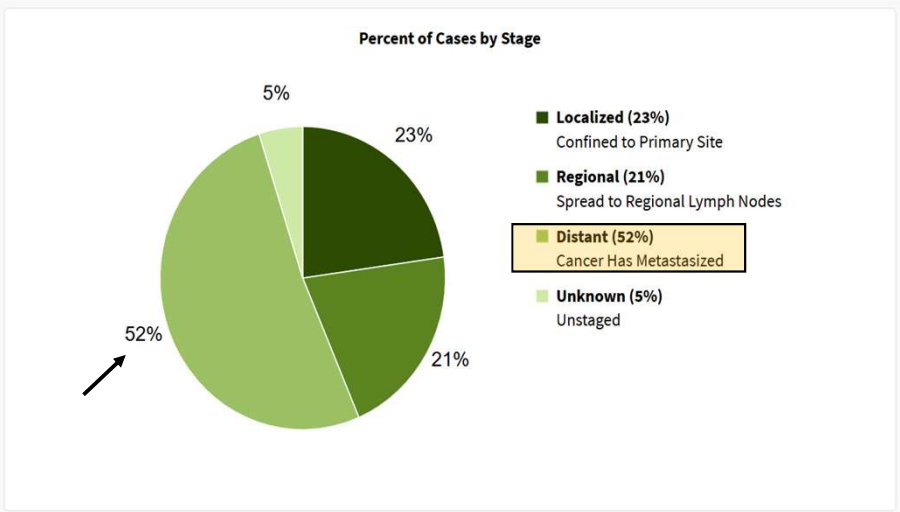
ASCO-SEP 6th Ed

Clinical presentation

- Common symptoms:
  - Cough (sometimes with blood)
  - Shortness of breath
  - Weight loss
  - Chest pain
  - Voice hoarseness
- Symptoms may be related to the spread of cancer to areas outside the lung (i.e., bone pain)

UpToDate

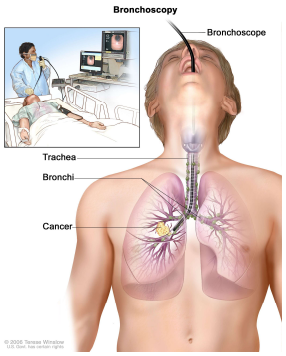
Most patients will present with advanced disease

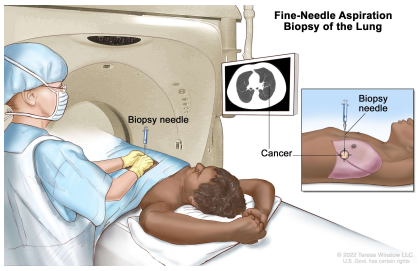


Obtaining a diagnosis

- Bronchoscopy with transbronchial biopsy
- Percutaneous needle biopsy

- Imaging:
  - CT scan
  - PET scan
  - MRI brain



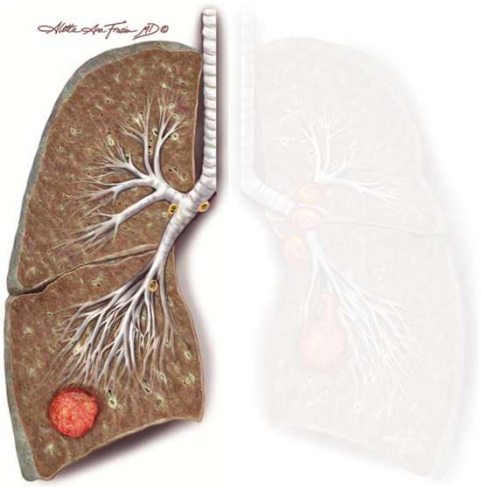


NCCN guidelines, National Cancer Institute, ASCO-SEP 6th ed

How do we stage lung cancer?

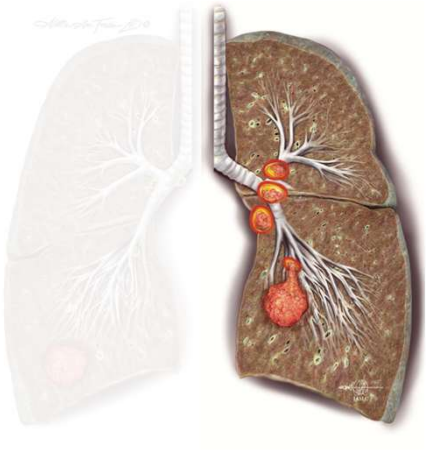
- In lung cancer, we determine a patient's stage using the TNM classification which evaluates 3 factors:
  - T = [Primary] Tumor
  - N = [Regional Lymph] Node
  - M = Metastasis
- There are 4 lung cancer stages.
- There are different levels within the TNM classification based on the size and extent of tumor invasion, extent of lymph node spread, and areas of spread outside the lung. The stage is impacted by the degree of these factors.

Primary Tumor



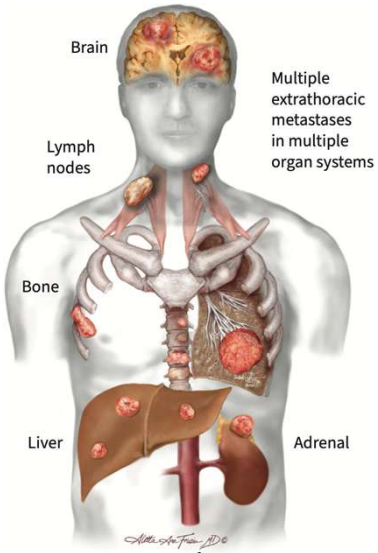
Pictures from IASLC Staging Manual in Thoracic Oncology, 3rd Ed.

Regional Lymph Node



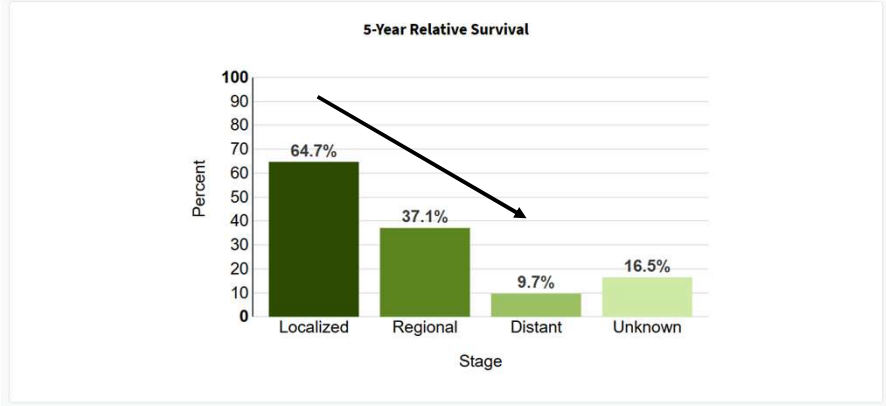
Pictures from IASLC Staging Manual in Thoracic Oncology, 3rd Ed.

Distant Metastasis (Stage IV)



Pictures from IASLC Staging Manual in Thoracic Oncology, 3rd Ed.

Prognosis



SEER 21 (Excluding IL) 2015–2021, All Races, Both Sexes by SEER Combined Summary Stage

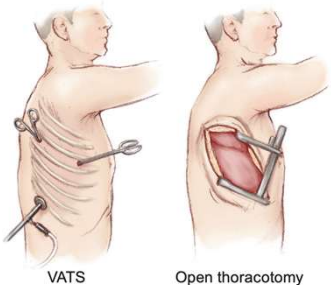
SEER Database

Early-stage NSCLC

- The goal of treatment is **curative**

- **Surgery**
  - Lobectomy is preferred
  - Pre-surgery lung and heart evaluation
  - Lymph node evaluation for cancer spread

- **Radiation**
  - Alternative option to surgery



Annals of Cardiothoracic Surgery
J Thorac Oncology 2015; Mar(10):412-9

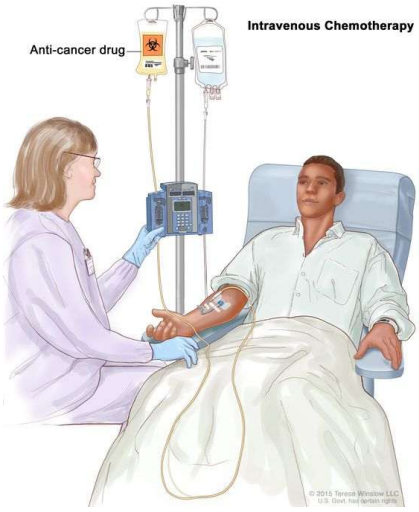
Treatment before or after surgery

- For some patients, we can offer cancer treatments either before and/or after surgery.
- Studies have shown reduction in recurrence and improvement in survival for some treatments.
- These treatments can include:
  - Chemotherapy
  - Immunotherapy
  - Targeted therapy
- If surgery is not recommended, additional therapies can be incorporated with radiation treatments.

Patient case continued…

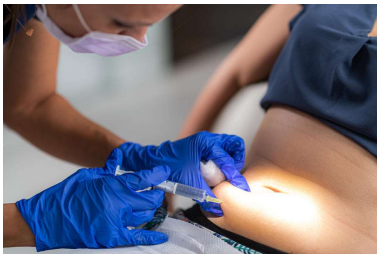
- Mr. R met with his oncology team and decided to proceed with surgical resection of his lung cancer.
- The surgery was a success! The pathology report demonstrated no cancer cells along the surgical margins and no spread to lymph nodes.
- He was felt to have a stage I lung adenocarcinoma. No additional treatment was recommended but advised to undergo CT chest imaging for continued monitoring.

Cancer directed treatments



National Cancer Institute

Fox Chase Cancer Center



National Cancer Institute

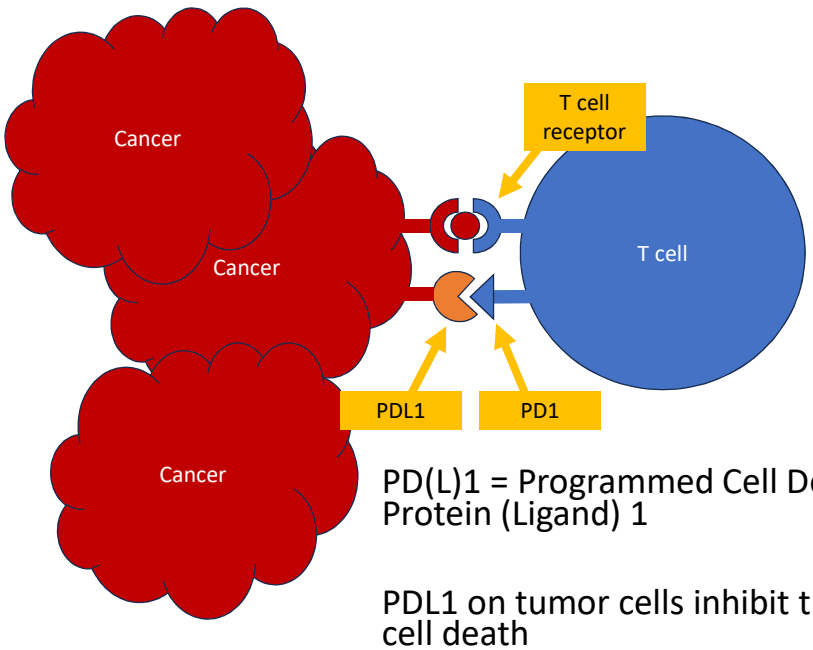
Chemotherapy

- Chemotherapy are medicines that work by killing or stopping the growth of cancer.
- They can be one or multiple medications depending on the treatment regimen.
- Treatments are given on a set schedule or “cycle”.

National Cancer Institute

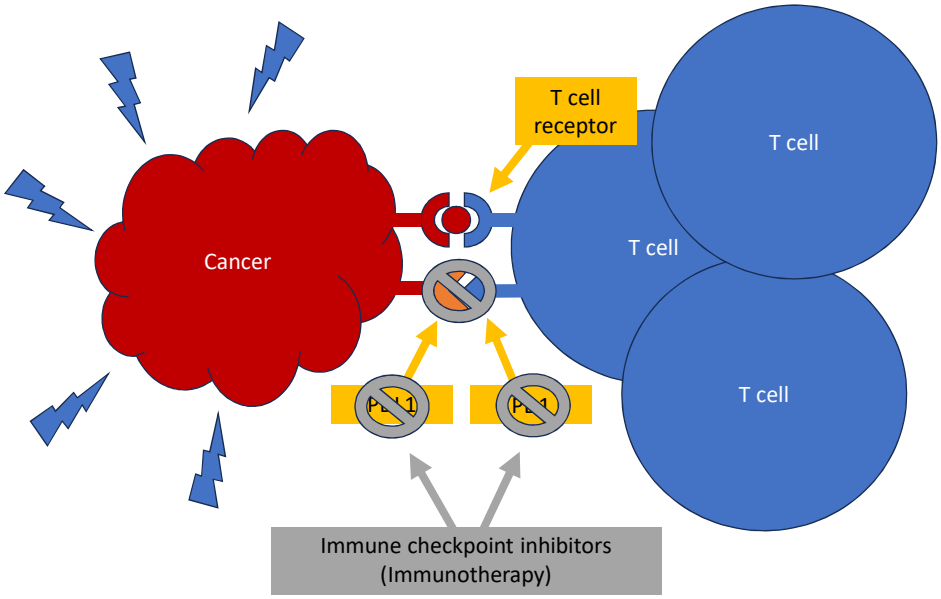
Immunotherapy

- Therapies that use the immune system to treat cancer.
- Current treatments target the “immune checkpoints” which the cancer cells exploit to evade cancer cell death.
- They are now approved as both intravenous and subcutaneous (under the skin) injections.



PD(L)1 = Programmed Cell Death Protein (Ligand) 1

PDL1 on tumor cells inhibit tumor cell death



Targeted therapies

- Non small cell lung cancers (particularly lung adenocarcinomas) may harbor “driver mutations” which are associated with tumor cell growth.
- Select mutations have oral targeted treatments to those mutations which can be used to effectively treat their lung cancer.
- In stage IV cancers, these medications can often be used as the first cancer directed treatment.

Molecular testing for oncogenic driver mutations

- Next generation sequencing (NGS)

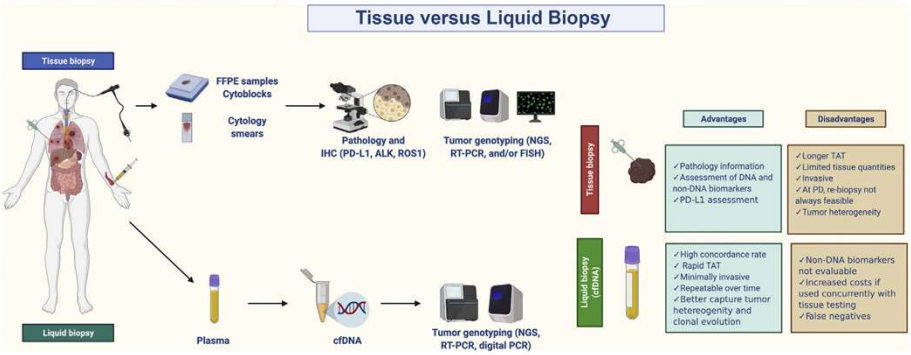


Figure 1. Advantages and disadvantages of tissue and liquid biopsy for tumor genotyping in advanced or metastatic NSCLC. Credit: created with BioRender.com. cfDNA, cell-free DNA; FFPE, formalin-fixed, paraffin-embedded; FISH, fluorescence in situ hybridization; IHC, immunohistochemistry; NGS, next-generation sequencing; PD, progressive disease; PD-L1, programmed death-ligand 1; RT-PCR, real-time polymerase chain reaction; TAT, turnaround time.

J Thorac Oncol. 2021 Oct;16(10):1647-1662.

Evolution of targeted therapies for NSCLC

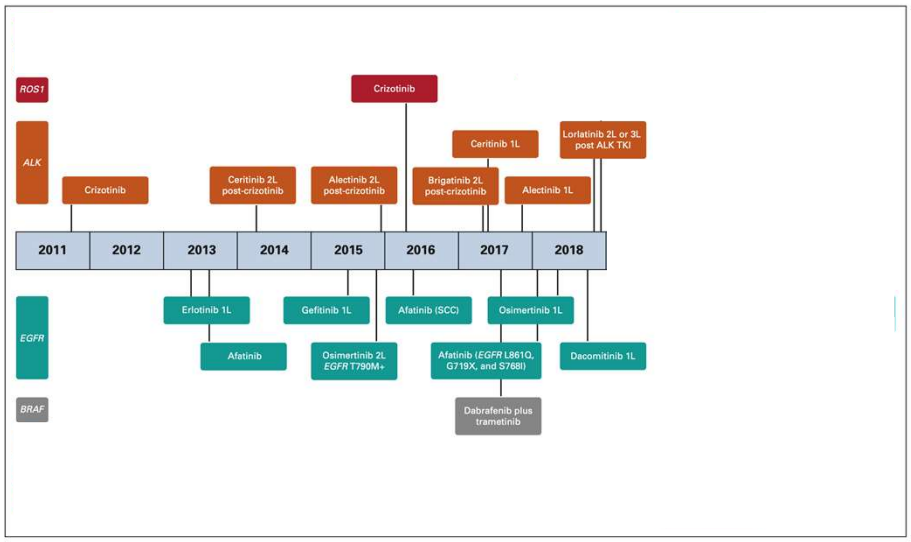
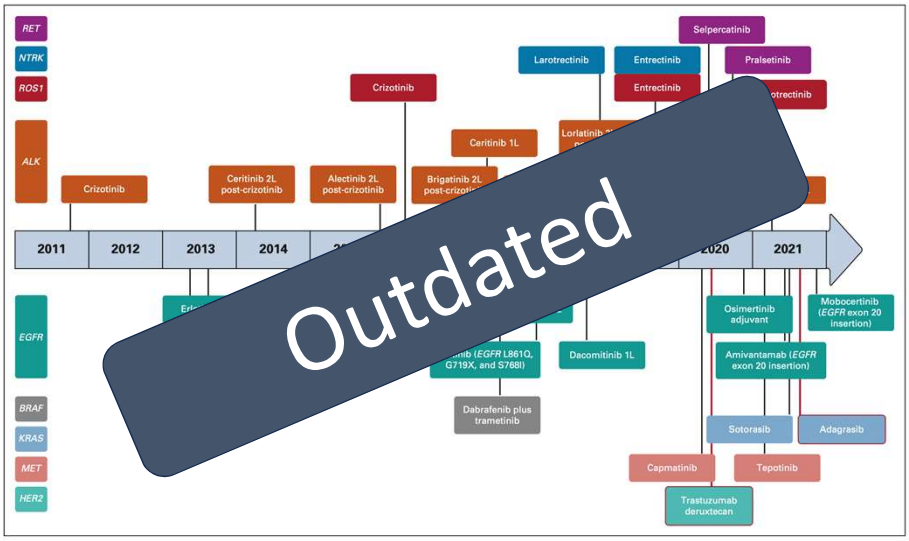


FIG 2. Timeline of FDA-approved targeted therapies for oncogene-driven NSCLC. The red lines indicate breakthrough therapy designation. 1L, first-line; 2L, second-line; FDA, US Food and Drug Administration; NSCLC, non–small-cell lung cancer; TKI, tyrosine kinase inhibitor.

J Clin Oncol 2022; 40:611-625

Evolution of targeted therapies for NSCLC



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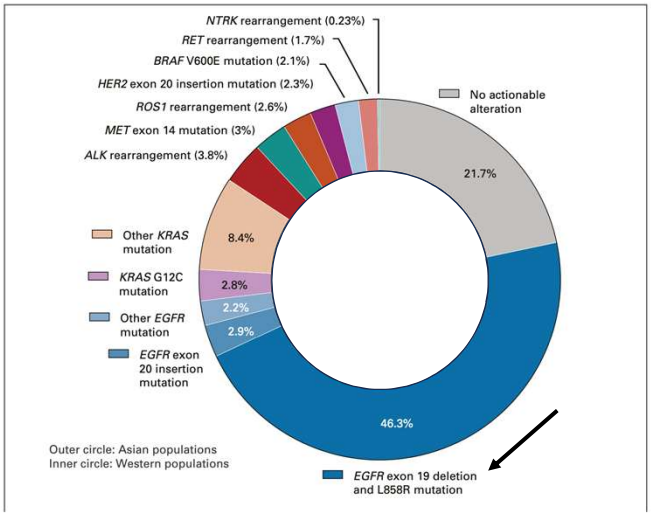
J Clin Oncol 2022; 40:611-625

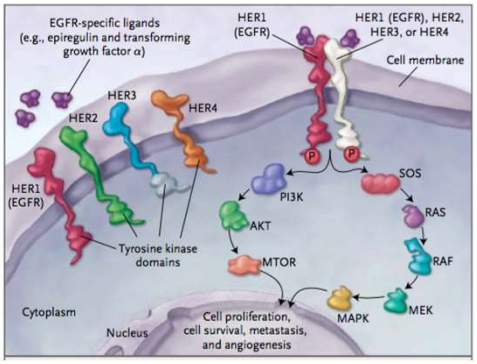
How common are driver mutations?



J Clin Oncol 2022; 40:611-625

Epidermal growth factor receptor (EGFR) mutation

- Most common oncogenic driver mutation in non-small cell lung cancer
- More common in women, East-Asian descent, never-smokers and adenocarcinoma histology



Cataldo et al. N Engl J Med 2011

Small Cell Lung Cancer (SCLC)

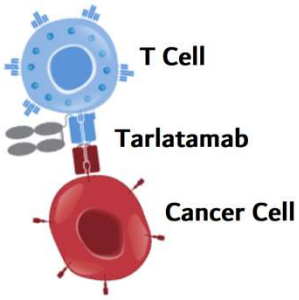
- Accounts for ~15% of lung cancers; associated with tobacco use.
- Compared to NSCLC, SCLC tend to present with more aggressive, advanced disease and with a limited survival.
- Pre-treatment evaluation like NSCLC.
- Staging is divided into:
  - Limited stage
  - Extensive stage

Treatment

- Infrequently, surgical resection for small tumors without spread to lymph nodes.
- Most patients receive combination of chemotherapy and radiation if the cancer has not metastasized.
- For metastatic disease, chemotherapy and immunotherapy is typically given as combination treatment.
- SCLC are highly sensitive to radiation and chemotherapy, however responses are short-lived.

Promising novel immunotherapy

- A new type of immunotherapy called a bispecific T cell engager that directs the patients T cells to the small cell lung cancer cells.
- This activates the T cells to kill the small cell lung cancer cells.
- Use of this treatment as the second cancer treatment has significantly prolonged survival over the standard care of chemotherapy.



N Engl J Med 2025;393:349-361, National Cancer Institute

Future directions

UNIVERSITY OF HAWAI'I CANCER CENTER

- The field of lung cancer is rapidly evolving.
- Improvements in cancer detection, diagnosis, treatment, and monitoring have improved cancer outcomes for many patients.
- With the UH Cancer Center, we have ongoing clinical trials for lung cancer.

Tobacco Cessation Resources

- https://www.cdc.gov/tobacco/campaign/tips/quit-smoking/index.html
- https://smokefree.gov/
- https://www.hawaiiquitline.org/
- https://www.lung.org/quit-smoking

Thank you!