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Lung Cancer Incidence, 2019–2020, United States: The Potential Impact of the COVID-19 Pandemic

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Abstract

Purpose: Cancer incidence declined during the COVID-19 pandemic in part due to health care delivery challenges. We examined the impact of the COVID-19 pandemic on changes in lung cancer incidence.

Methods: We used 2019–2020 US Cancer Statistics data from 49 cancer registries covering 97% of the US population. We calculated the number of new lung cancer diagnoses in 2019 and 2020, age-adjusted lung cancer incidence rates per 100,000 persons, and 2019-to-2020 percentage changes in incidence rates. We also calculated number and percentage of new lung cancer diagnoses by month and stage at diagnosis.

Results: The age-adjusted lung cancer incidence rate per 100,000 persons was 47.9 in 2019 vs. 41.4 in 2020—a 13.6% decrease. Differences in the percentage change in incidence rates were observed by age, race and ethnicity, US census region, histology, and stage at diagnosis. A higher percentage of people were diagnosed at distant stage in 2020 than 2019.

Conclusions: This report provides new insight into subgroups that experienced the greatest decline in observed lung cancer incidence during the first year of the COVID-19 pandemic. The

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CRediT Authorship Contribution Statement

Christine M. Kava: Conceptualization; Data Curation; Formal Analysis; Investigation; Methodology; Project Administration; Software; Writing – Original Draft; Writing – Review & Editing; Visualization. **David A. Siegel:** Conceptualization; Methodology; Supervision; Writing – Review & Editing. **Susan A. Sabatino:** Methodology; Supervision; Writing – Review & Editing. **Jin Qin:** Methodology; Supervision; Writing – Review & Editing. **Thomas B. Richards:** Methodology; Writing – Review & Editing. **S. Jane Henley:** Conceptualization; Methodology; Writing – Review & Editing.

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The authors did not use AI in any capacity.

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The authors have no competing interests to declare.

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findings can be used to inform intervention efforts to improve lung cancer screening, diagnosis, and treatment.

Keywords

COVID-19; epidemiology; incidence; lung neoplasms

Introduction

Survival from lung cancer is highest when diagnosed early. Five-year relative survival ranges from 58% at localized stage to 8% at distant stage [1], underscoring the importance of timely screening for those eligible, diagnosis, and treatment. A report based on US Cancer Statistics (USCS) data showed decreases in age-adjusted lung cancer incidence rates from 2019 to 2020 and concluded that multiple factors, including delays in medical care due to the COVID-19 pandemic, might have contributed to observed decreases in cancer incidence [2].

Similar conclusions have been made elsewhere [3–6]. In the 2023 Annual Report to the Nation on the Status of Cancer: Part 2 [4], decreases were found in lung cancer diagnoses in 2020 relative to expected numbers, with corresponding decreases in pathology report volume. A lower-than-expected number of new lung cancer cases were observed across multiple subgroups, including people who were Asian or Pacific Islander, aged ≥65 years, and diagnosed at localized stage [4].

The purpose of this study was to describe and compare age-adjusted lung cancer incidence rates between 2019 and 2020 to better understand the potential impact of the COVID-19 pandemic on incidence changes. We examined incidence by additional subgroups where differences in lung cancer outcomes have been observed, including rural-urban status [7], histology [8], and socioeconomic status [9]. Our study used USCS data from 49 cancer registries covering 97% of the US population, allowing for a more comprehensive and generalizable understanding of changes in lung cancer incidence compared to some previous studies. Our study also expands upon previous reports by providing more detailed information on changes in lung cancer incidence among subgroups that have not been examined to date.

Materials and Methods

Population

We calculated lung cancer incidence using USCS data from the 2022 submission [10]. USCS combines data from CDC's National Program of Cancer Registries and the National Cancer Institute's Surveillance, Epidemiology, and End Results (SEER) Program [11]. Our primary analysis included people diagnosed in 2019 or 2020 with lung and bronchus [lung] cancer, defined by C340-C349 codes in the *International Classification of Diseases for Oncology, 3rd edition* (ICD-O-3) [12]. People missing information on age of diagnosis were excluded. Only malignant, microscopically confirmed cases were included. To ensure high data completeness and low data missingness for our analysis, we included 49 registries that met USCS publication criteria based on national data quality standards [13, 14] (Indiana and Nevada were excluded).

Measures

We examined the following sociodemographic characteristics: sex (female or male); age at diagnosis (<45, 45–54, 55–64, 65–74, 75–84, or ≥85 years); race and ethnicity (non-Hispanic American Indian or Alaska Native; non-Hispanic Asian or Pacific Islander; non-Hispanic Black; non-Hispanic White; Hispanic or Latino, all races); US census region (Northeast, Midwest, South, or West); county classification (metropolitan or non-metropolitan); and county economic status (bottom 25%, middle 50%, or top 25%). County classification was defined based on US Department of Agriculture Economic Research Service 2013 Rural-Urban Continuum Codes [22]. County economic status was defined for 2020 by the Appalachian Regional Commission [14] and considers three-year average unemployment rate, per capita market income, and poverty rate.

We also measured histology, stage at diagnosis (localized, regional, distant, or unknown), and receipt of surgery during first course of treatment (yes or no). Histology was defined based on ICD-O-3 [12] site codes: small-cell carcinoma (8041–8045); adenocarcinoma (8140–8239, 8250–8384, 8440–8490, 8550–8551, 8570–8574, 8576); squamous cell carcinoma (8050–8084); and other histology (8000–8040, 8046–8049, 8085–8139, 8240–8249, 8385–8439, 8491–8549, 8552–8569, 8575, 8577–9992). Site codes for adenocarcinoma, squamous cell carcinoma, and other histology were combined into one category to calculate incidence for non-small cell carcinoma.

Statistical Analysis

We used SEER*Stat version 8.4.2 [15] to calculate the reported number of new lung cancer cases and age-adjusted lung cancer incidence rates per 100,000 persons in 2019 and 2020. We calculated the 2019-to-2020 percentage change in incidence and produced corresponding 95% confidence intervals. Like previous studies [3], we produced percentage change estimates from rate ratios (formula: ([2020 incidence rate/2019 incidence rate-1]*100)). We examined percentage changes in incidence rates overall and by the characteristics described above. We also calculated the number and percentage of new diagnoses by stage at diagnosis and surgery and month. To understand the magnitude of change in incidence rates from 2019 to 2020 compared to previous years, as a secondary analysis we examined one-year changes in age-adjusted lung cancer incidence during 2016 to 2019.

Results

We analyzed data from 370,051 lung cancer diagnoses (Table 1). We observed a decrease in age-adjusted lung cancer incidence rates from 2019 to 2020 overall and across all subgroups. In 2019, the age-adjusted lung cancer incidence rate was 47.9 per 100,000 persons (95% CI: 47.7, 48.1) compared to 41.4 per 100,000 persons (95% CI: 41.2, 41.6) in 2020. This change in incidence rates amounted to a 13.6% (95% CI: −13.1, −14.2) decrease from 2019 to 2020. The decrease observed was larger than in previous years: −1.2% (95% CI: −0.6, −1.9) from

2016 to 2017; −3.0% (95% CI: −2.4, −3.6) from 2017 to 2018; and −1.1% (95% CI: −0.4, −1.7) from 2018 to 2019 (data not shown on table).

Decreases in incidence rates from 2019 to 2020 were similar for females (−13.8; 95% CI: −13.0, −14.7) and males (−13.4; 95% CI: −12.6, −14.2). By age at diagnosis, the largest decrease was observed among adults aged ≥85 years (−17.8; 95% CI: −15.6, −19.9) and smallest among adults aged 55–64 years (−11.0; 95% CI: −9.8, −12.1). By race and ethnicity, decreases were largest for people who were non-Hispanic Asian or Pacific Islander (−17.6; 95% CI: −14.5, −20.6) and smallest for non-Hispanic American Indian or Alaska Native (−12.5; 95% CI: −4.6, −19.8). However, CIs overlapped among all groups except for non-Hispanic White (−12.9; 95% CI: −12.2, −13.5).

People in the West US census region had the largest decrease in incidence rate (−15.0; 95% CI: −13.6, −16.4), while those in the Midwest region had the smallest decrease (−11.3; 95% CI: −10.0, −12.5). Decreases were similar among metropolitan counties (−13.78; 95% CI: −13.1, −14.4) and non-metropolitan counties (−13.0; 95% CI: −11.7, −14.3). Decreases were also similar by county economic status, ranging from −12.9% to −14.1%; all three economic categories (bottom 25%, middle 50%, top 25%) had overlapping confidence intervals.

The incidence rate decrease was larger for people diagnosed with non-small cell lung cancer (−14.0; 95% CI: −13.4, −14.6) vs. small-cell lung cancer (−11.2; 95% CI: −9.6, −12.8). By stage at diagnosis, the smallest decrease was observed among people diagnosed at distant stage (−10.0; 95% CI: −9.1, −10.8). The percentage of people who received surgery during first course of treatment was slightly lower in 2019 (23.8%) vs. 2020 (22.7%). The decrease in receipt of surgery for 2020 seemed to be driven by people diagnosed at regional, distant, or unknown stage (Table A.1.).

For all months except February 2020, the total number of new lung cancer diagnoses were larger in 2019 than for 2020 (Figure 1, Table A.2, and Table A.3). The largest differences were in April (6,731 fewer diagnoses in 2020), May (4,969 fewer diagnoses in 2020), and March (2,449 fewer diagnosis in 2020). The percentage of cases diagnosed at distant stage increased in 2020, and increases were largest for May (7.6%), April (6.9%), and June (4.4%). In May 2019, 44.4% of people were diagnosed at a distant stage, compared to 52.0% in May 2020. Conversely, the percentage of people diagnosed at the localized stage decreased from 28.0% in May 2019 to 23.5% in May 2020.

Discussion

We observed decreases in age-adjusted lung cancer incidence rates per 100,000 persons from 2019 to 2020; this decrease was larger than in previous years. The largest decrease in number of new lung cancer diagnoses were in April and May of 2020, when stay-at-home orders, business shutdowns, and reduced access to routine health care were implemented to prevent the spread of COVID-19 [2]. A recent report using electronic health record data observed larger than expected decreases in lung cancer diagnoses for years 2020, 2021, and 2022 [6], suggesting that the COVID-19 pandemic impacted incidence beyond its first year.

The COVID-19 pandemic also led to delays in reporting for some cancer registries due to disruptions in operations [2]. Changes in lung cancer incidence might be explained by reporting delays rather than reduced access to care due to the pandemic. However, similar declines in pathology report volume during 2020 [4, 16] suggest that reporting delays are not wholly responsible for declines in cancer incidence. As previous reports have noted [5], the percentage of cases estimated to be accounted for by delays in reporting tend to be smaller for lung cancer (i.e., less than 5%) [17] than for other cancer sites like melanoma, which is diagnosed and treated in non-hospital settings that have greater reporting delays [18].

Consistent with previous reports [4, 5], we observed larger decreases in lung cancer incidence from 2019 to 2020 among people who were ≥85 years, Asian or Pacific Islander, and diagnosed at the regional stage. Adding to previous reports, we observed similar decreases in incidence by county classification and county economic status, and larger decreases in incidence among people diagnosed with non-small cell lung cancer. Small cell carcinomas are aggressive and spread rapidly, and most people are symptomatic at presentation [19]. This could explain our findings by histology, as people with this type of cancer may have been more likely to seek care due to their symptoms and subsequently diagnosed.

By stage at diagnosis, we observed larger decreases in lung cancer incidence among people diagnosed at the localized or regional vs. distant stage. Further, a higher percentage of people were diagnosed at distant stage in 2020, and this increase was not the result of an increase in the number of new diagnoses or incidence rate for distant stage. These findings may suggest that fewer cases were diagnosed by screening, especially during the first few months of the COVID-19 pandemic. Indeed, some reports have observed similar declines in lung cancer screening during the pandemic [21, 22]. While we found that receipt of surgery for lung cancer remained similar in 2019 (23.8%) and 2020 (22.7%), one study observed treatment changes (e.g., treatment delays, dosing and schedule changes) in more than half of people diagnosed with lung cancer between March and May of 2020 [20].

The findings highlighted above indicate the importance of addressing potential changes in lung cancer screening and treatment [20] to mitigate future consequences like increased lung cancer mortality. However, additional research is needed to better understand the long-term impact of the COVID-19 pandemic on lung cancer outcomes. Studies employing a longitudinal design and that include multiple years of post-pandemic data could provide further insight into the clinical implications of our findings.

While outside of the scope of this descriptive analysis, modeling changes in lung incidence to adjust for factors like health insurance coverage and smoking status—variables not included in the USCS database—could offer further insight into how the COVID-19 pandemic may have affected lung cancer outcomes. For example, Poghosyan et al. [23] used Behavioral Risk Factor Surveillance System data to model adjusted odds of lung cancer screening utilization. The study found that, while screening rates remained relatively stable between 2019–2022, select groups had lower odds of screening in 2020.

Limitations

Our findings should be considered within the context of some limitations. It can take multiple years after a cancer diagnosis for cancer registry data to be made publicly available. The most recent year of data available at the time of our analysis was 2020, limiting our ability to understand how lung cancer incidence was impacted in subsequent years of the pandemic. Our study, in addition to similar studies [4, 5, 24], used summary stage to examine stage at diagnosis. Reporting TNM stage could have been advantageous as it is the most widely used staging system, including in National Comprehensive Cancer Network algorithms for non-small cell lung cancer and small cell lung cancer. Regardless of these limitations, our study adds to the growing body of literature on how the COVID-19 pandemic might have impacted cancer health outcomes and speaks to the importance of improving medical care for lung cancer, particularly among subgroups with a larger number of missed diagnoses.

Conclusions

Lung cancer incidence decreased from 2019 to 2020. This one-year decrease in observed incidence was larger in 2020 than for previous years and likely due to health care access challenges (e.g., limited capacity for cancer care [5]) and changes in health-seeking behavior during the COVID-19 pandemic. Differences in incident decreases by characteristics like stage at diagnosis suggest that certain groups were disproportionately impacted by the effects of the COVID-19 pandemic. For these reasons, caution should be exercised when comparing lung cancer incidence rates in 2020 between groups and to previous years. Continued monitoring of trends in health care delivery and lung cancer incidence could help inform intervention efforts to improve lung cancer screening, diagnosis, and treatment.

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Appendix

Table A.1.

Receipt of surgery and stage at diagnosis among people diagnosed with lung cancer, 2019–2020 US Cancer Statistics, 49 cancer registries

	2019		2020	
Variable	**No.**	**%**	**No.**	**%**
First-course surgery[a]				
Received surgery	46,782	23.8%	39,485	22.7%
Did not receive surgery	147,284	75.0%	132,286	76.2%
Unknown surgery status	2,300	1.2%	1,912	1.1%
Stage at diagnosis x first-course surgery				
Localized				
Received surgery	26,659	49.5%	23,209	49.3%

Variable	2019 No.	2019 %	2020 No.	2020 %
Did not receive surgery	26,764	49.7%	23,454	49.9%
Unknown surgery status	439	0.8%	370	0.8%
Regional				
Received surgery	16,702	35.7%	13,626	34.3%
Did not receive surgery	29,826	63.8%	25,945	65.3%
Unknown surgery status	198	0.4%	183	0.5%
Distant				
Received surgery	3,016	3.4%	2,419	3.0%
Did not receive surgery	84,476	95.9%	78,159	96.4%
Unknown surgery status	587	0.7%	482	0.6%
Unknown				
Received surgery	405	5.3%	231	4.0%
Did not receive surgery	6,218	80.8%	4,728	81.0%
Unknown surgery status	1,076	14.0%	877	15.0%

[a]Recorded in the treatment plan and given before the person's cancer progresses or recurs. Surgery for lung cancer was coded by cancer registries according to surgery codes in the 2018 Surveillance, Epidemiology, and End Results Program Coding and Staging Manual [25], which applies to cases diagnosed between January 1, 2018 to December 31, 2020. The following codes were used to categorize surgery status: 12–13, 15, 19–25, 30, 33, 45–48, 55–56, 65–66, 70, 80, 90 (received surgery); 00 (did not receive surgery); 99 (unknown surgery status).

Table A.2.

Number and percentage of lung cancer diagnoses by month and stage at diagnosis, 2019–2020 US Cancer Statistics, 49 cancer registries[a]

		Stage at Diagnosis							
		Localized Stage		Regional Stage		Distant Stage		Unknown Stage	
Date	Total No.	No.	%	No.	%	No.	%	No.	%
2019	**196,139**	**53,830**	**27.4%**	**46,704**	**23.8%**	**88,011**	**44.9%**	**7,594**	**3.9%**
Jan	17,427	4,674	26.8%	4,028	23.1%	7,893	45.3%	832	4.8%
Feb	15,640	4,202	26.9%	3,879	24.8%	6,962	44.5%	597	3.8%
Mar	16,751	4,463	26.6%	4,047	24.2%	7,577	45.2%	664	4.0%
Apr	17,158	4,759	27.7%	4,048	23.6%	7,760	45.2%	591	3.4%
May	17,297	4,851	28.0%	4,167	24.1%	7,682	44.4%	597	3.5%
Jun	15,703	4,300	27.4%	3,713	23.6%	6,955	44.3%	735	4.7%
Jul	16,812	4,625	27.5%	3,983	23.7%	7,601	45.2%	603	3.6%
Aug	16,542	4,611	27.9%	3,974	24.0%	7,342	44.4%	615	3.7%
Sep	15,532	4,230	27.2%	3,635	23.4%	7,101	45.7%	566	3.6%
Oct	17,237	4,933	28.6%	4,061	23.6%	7,605	44.1%	638	3.7%
Nov	14,817	4,080	27.5%	3,539	23.9%	6,637	44.8%	561	3.8%
Dec	15,223	4,102	26.9%	3,630	23.8%	6,896	45.3%	595	3.9%
2020	**173,536**	**47,016**	**27.1%**	**39,741**	**22.9%**	**81,001**	**46.7%**	**5,778**	**3.3%**
Jan	17,387	4,752	27.3%	4,116	23.7%	7,860	45.2%	659	3.8%

Date	Total No.	Stage at Diagnosis							
		Localized Stage		Regional Stage		Distant Stage		Unknown Stage	
		No.	%	No.	%	No.	%	No.	%
Feb	15,668	4,527	28.9%	3,771	24.1%	6,848	43.7%	522	3.3%
Mar	14,302	3,987	27.9%	3,460	24.2%	6,343	44.4%	512	3.6%
Apr	10,427	2,361	22.6%	2,283	21.9%	5,434	52.1%	349	3.3%
May	12,328	2,895	23.5%	2,623	21.3%	6,409	52.0%	401	3.3%
Jun	15,255	3,915	25.7%	3,404	22.3%	7,424	48.7%	512	3.4%
Jul	15,153	4,121	27.2%	3,422	22.6%	7,142	47.1%	468	3.1%
Aug	15,107	4,162	27.6%	3,421	22.6%	7,082	46.9%	442	2.9%
Sep	15,292	4,317	28.2%	3,507	22.9%	6,976	45.6%	492	3.2%
Oct	15,396	4,307	28.0%	3,464	22.5%	7,078	46.0%	547	3.6%
Nov	13,340	3,812	28.6%	3,132	23.5%	5,986	44.9%	410	3.1%
Dec	13,881	3,860	27.8%	3,138	22.6%	6,419	46.2%	464	3.3%

[a]Percentages based on the monthly number of diagnoses (e.g., in January 2019 at the localized stage, there were 4,674 out of 196,139 (26.8%) diagnoses. The total number of diagnoses for 2019 (n=196,139) and 2020 (n=173,536) differ from the totals reported in Table 1 due to missing data.

Table A.3.

Difference in the number and percentage of lung cancer diagnosis by month and stage at diagnosis from 2019 to 2020, US Cancer Statistics, 49 cancer registries[a]

Month	Total No.	Stage at Diagnosis							
		Localized stage		Regional stage		Distant stage		Unknown stage	
		No.	%	No.	%	No.	%	No.	%
All months	**−22,603**	**−6,814**	**−0.4%**	**−6,963**	**−0.9%**	**−7,010**	**1.8%**	**−1,816**	**−0.5%**
Jan	−40	78	0.5%	88	0.6%	−33	−0.1%	−173	−1.0%
Feb	28	325	2.0%	−108	−0.7%	−114	−0.8%	−75	−0.5%
Mar	−2,449	−476	1.2%	−587	0.0%	−1,234	−0.9%	−152	−0.4%
Apr	−6,731	−2,398	−5.1%	−1,765	−1.7%	−2,326	6.9%	−242	−0.1%
May	−4,969	−1,956	−4.6%	−1,544	−2.8%	−1,273	7.6%	−196	−0.2%
Jun	−448	−385	−1.7%	−309	−1.3%	469	4.4%	−223	−1.3%
Jul	−1,659	−504	−0.3%	−561	−1.1%	−459	1.9%	−135	−0.5%
Aug	−1,435	−449	−0.3%	−553	−1.4%	−260	2.5%	−173	−0.8%
Sep	−240	87	1.0%	−128	−0.5%	−125	−0.1%	−74	−0.4%
Oct	−1,841	−626	−0.6%	−597	−1.1%	−527	1.9%	−91	−0.1%
Nov	−1,477	−268	1.0%	−407	−0.4%	−651	0.1%	−151	−0.7%
Dec	−1,342	−242	0.9%	−492	−1.2%	−477	0.9%	−131	−0.6%

Numbers and percentages were calculated by subtracting the number of diagnoses and percentage of cases by month (see eTable 1) in 2020 from 2019. Negative values indicate fewer cases diagnosed, or a smaller percentage of cases diagnosed for that month, in 2020 vs. 2019.

Abbreviations

ICD-O-3	International Classification of Diseases for Oncology, 3rd edition
SEER	Surveillance, Epidemiology, and End Results
USCS	United States Cancer Statistics

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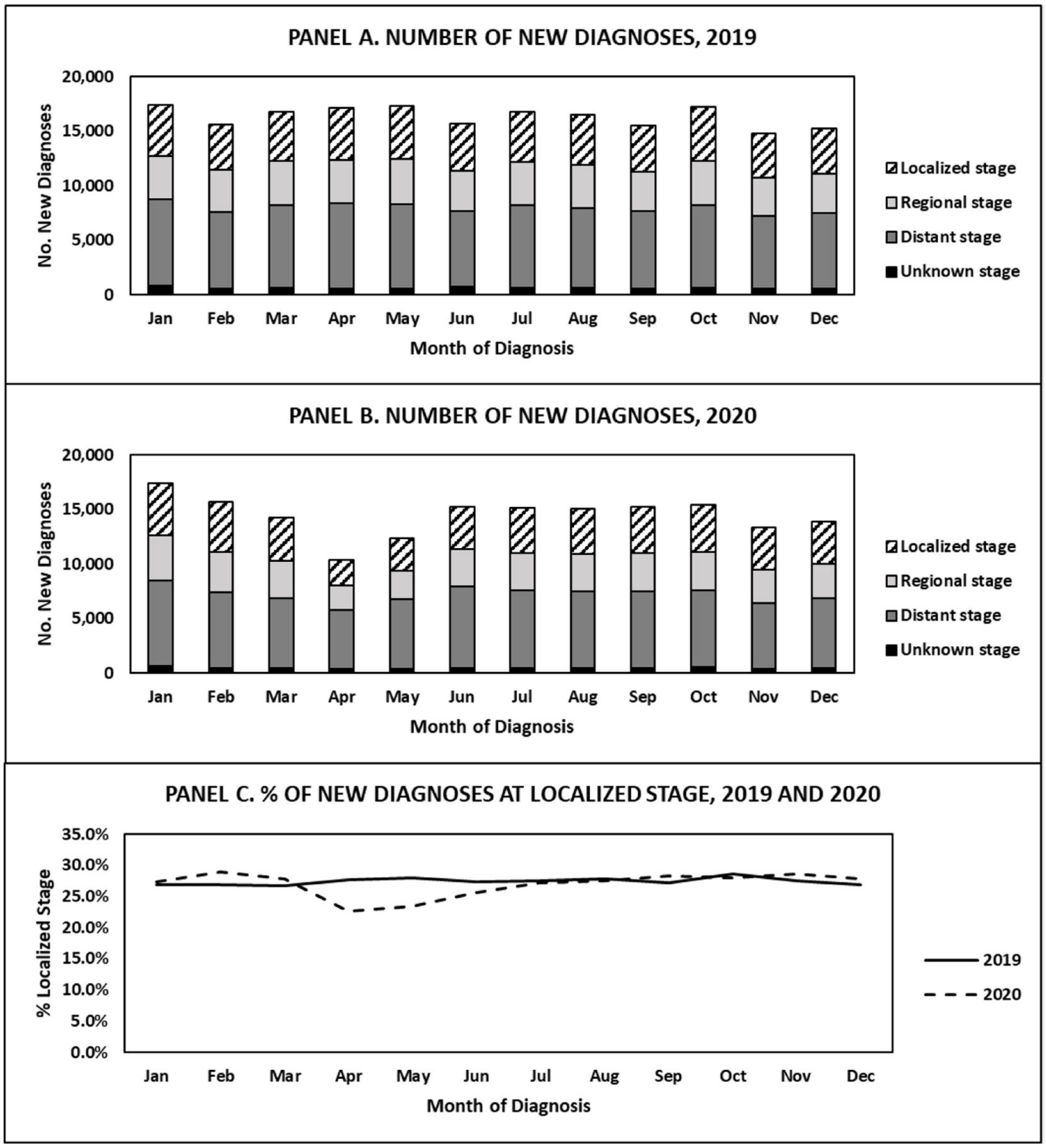

Figure 1.

Number of lung cancer diagnoses by month and stage at diagnosis, 2019–2020 US Cancer Statistics, 49 cancer registries

Table 1.

Number of new diagnoses, age-adjusted incidence rate per 100,000 persons, and percentage change in incidence rate for lung cancer, 2019–2020 US Cancer Statistics, 49 cancer registries

	2019		2020		
Variable	**No.[a]**	**Rate (95% CI)[b]**	**No.[a]**	**Rate (95% CI)[b]**	**% Change (95% CI)[c]**
Total	196,366	47.9 (47.7, 48.1)	173,685	41.4 (41.2, 41.6)	−13.6 (−13.1, −14.2)
Sex					
Female	97,289	43.9 (43.6, 44.2)	85,824	37.8 (37.6, 38.1)	−13.8 (−13.0, −14.7)
Male	99,077	53.1 (52.7, 53.4)	87,861	45.9 (45.6, 46.3)	−13.4 (−12.6, −14.2)
Age at diagnosis, years					
<45	2,245	1.3 (1.3, 1.4)	1,996	1.2 (1.1, 1.2)	−12.2 (−6.7, −17.4)
45–54	10,230	25.0 (24.5, 25.5)	8,843	21.9 (21.4, 22.3)	−12.7 (−10.1, −15.1)
55–64	46,925	111.7 (110.7, 112.7)	41,950	99.4 (98.5, 100.4)	−11.0 (−9.8, −12.1)
65–74	72,764	241.0 (239.2, 242.7)	64,897	207.1 (205.5, 208.7)	−14.0 (−13.1, −15.0)
75–84	51,804	334.2 (331.3, 337.1)	45,715	286.2 (283.5, 288.8)	−14.4 (−13.3, −15.4)
≥85	12,398	193.0 (189.6, 196.4)	10,284	158.7 (155.6, 161.8)	−17.8 (−15.6, −19.9)
Race and ethnicity[d]					
American Indian or Alaska Native, non-Hispanic	1,180	43.5 (41.0, 46.2)	1,055	38.1 (35.7, 40.5)	−12.5 (−4.6, −19.8)
Asian or Pacific Islander, non-Hispanic	6,423	31.2 (30.4, 32.0)	5,552	25.7 (25.0, 26.4)	−17.6 (−14.5, −20.6)
Black, non-Hispanic	21,063	49.8 (49.1, 50.5)	18,288	41.8 (41.2, 42.4)	−16.1 (−14.3, −17.8)
White, non-Hispanic	152,777	51.8 (51.5, 52.1)	135,372	45.1 (44.9, 45.4)	−12.9 (−12.2, −13.5)
Hispanic or Latino, all races	9,625	24.7 (24.2, 25.2)	8,471	20.5 (20.1, 21.0)	−16.8 (−14.3, −19.3)
US census region					
Northeast	38,827	50.8 (50.3, 51.3)	33,667	43.4 (42.9, 43.8)	−14.7 (−13.4, −16.0)
Midwest	44,070	54.0 (53.4, 54.5)	39,840	47.9 (47.4, 48.4)	−11.3 (−10.0, −12.5)
South	81,818	50.7 (50.4, 51.1)	72,504	43.8 (43.4, 44.1)	−13.8 (−12.9, −14.6)
West	31,651	35.0 (34.6, 35.4)	27,674	29.8 (29.4, 30.1)	−15.0 (−13.6, −16.4)
County classification[e]					
Metropolitan	154,814	46.4 (46.2, 46.7)	136,957	40.1 (39.8, 40.3)	−13.8 (−13.1, −14.4)
Non-metropolitan	36,547	56.1 (55.5, 56.7)	32,209	48.8 (48.2, 49.3)	−13.0 (−11.7, −14.3)
County economic status[f]					

Variable	2019 No.[a]	2019 Rate (95% CI)[b]	2020 No.[a]	2020 Rate (95% CI)[b]	% Change (95% CI)[c]
Bottom 25%	20,688	55.2 (54.4, 56.0)	18,162	47.7 (47.0, 48.4)	−13.6 (−11.8, −15.3)
Middle 50%	109,737	49.7 (49.4, 50.0)	96,492	42.7 (42.4, 43.0)	−14.1 (−13.4, −14.9)
Top 25%	55,072	42.8 (42.5, 43.2)	49,205	37.3 (37.0, 37.7)	−12.9 (−11.8, −14.0)
Histology[g]					
Small cell carcinoma	26,010	6.2 (6.2, 6.3)	23,645	5.5 (5.5, 5.6)	−11.2 (−9.6, −12.8)
Non-small cell carcinoma	170,356	41.6 (41.4, 41.8)	150,040	35.8 (35.6, 36.0)	−14.0 (−13.4, −14.6)
Adenocarcinoma	97,834	23.9 (23.8, 24.1)	86,264	20.6 (20.5, 20.8)	−13.8 (−13.0, −14.6)
Squamous cell carcinoma	46,541	11.3 (11.2, 11.4)	40,199	9.5 (9.4, 9.6)	−15.9 (−14.8, −17.1)
Other histology	25,981	6.4 (6.3, 6.5)	23,577	5.7 (5.6, 5.8)	−11.2 (−9.5, −12.7)

[a] Number of new diagnoses by subgroups may not add to total number of diagnoses due to missing data.

[b] Rates represent the number of cases per 100,000 persons and are age-adjusted to the 2000 U.S. standard population.

[c] Calculated based on rate ratios, where percentage change = (rate ratio – 1) x 100.

[d] Due to a coding issue, race and ethnicity data are suppressed for North Dakota and Wisconsin.

[e] Defined based on U.S. Department of Agriculture Economic Research Service 2013 Rural-Urban Continuum Codes.

[f] County economic status was defined for 2020 by the Appalachian Regional Commission and considers three-year average unemployment rate, per capita market income, and poverty rate. Minnesota and Kansas excluded from this analysis due to incomplete county data.

[g] Defined based on *International Classification of Diseases for Oncology, Third Edition* (ICD-O-3) site codes: small-cell carcinoma (8041–8045), adenocarcinoma (8140–8239; 8250–8384; 8440–8490; 8550–8551; 8570–8574; 8576), squamous cell carcinoma (8050–8084), and other histology (8000–8040; 8046–8049; 8085–8139; 8240–8249; 8385–8439; 8491–8549; 8552–8569; 8575; 8577–9992). The site codes for adenocarcinoma, squamous cell carcinoma, and other histology were combined into one category to calculate incidence for non-small cell carcinoma.