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A Comprehensive Analysis of the Impact of the COVID-19 Pandemic on Lung Cancer in Delaware

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Abstract

Background: COVID-19 has greatly impacted the U.S. health system. What is not as well-understood is how this has altered specific aspects of lung cancer care. While cancer incidence and screening have been affected, it is not known whether pre-existing racial and socioeconomic disparities worsened or if treatment standards changed. The purpose of this study is to provide a comprehensive analysis of the impact of COVID-19 on lung cancer in the state of Delaware. **Methods**: Health care claims were analyzed from the Delaware Healthcare Claims Database for the years 2019-2020. Patients with a new lung cancer diagnosis and those who had undergone lung cancer screening were identified. Demographic and socioeconomic variables including gender, age, race, and insurance were studied. Patients were analyzed for type of treatment by CPT code. The intervention of interest in this study was the institution of restrictions at the end of March 2020. An interrupted time series analysis (ITSA) was utilized to evaluate baseline levels and overall trend changes. **Results**: The incidence of lung cancer diagnoses and lung cancer screenings decreased in the nine-month time period after the initiation of COVID-19 lockdowns. Demographic and socioeconomic variables including gender, race, income, and education level were not affected; however, statistical differences were seen in the most elderly subgroup. Treatment modalities including number of surgeries, chemotherapy, and radiation therapy did not change significantly. **Conclusions**: COVID-19 has had a significant impact on lung cancer care within the state of Delaware. Lung cancer incidence, screenings, and elderly patients were affected the most.

Introduction

The first cluster of cases of a severe acute respiratory syndrome coronavirus2 (SARS-CoV-2) was reported in Wuhan, China in December of 2019.[1] The U.S. Centers for Disease Control and Prevention detected the first laboratory-confirmed case in the U.S. on January 20, 2020.[2] In

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Delaware, a State of Emergency was issued on March 12, and stay-at-home restrictions were instituted on March 23, 2020. Since then, COVID-19 has been responsible for the deaths of around 3000 Delawareans,[3] and more than one million Americans.[4]

COVID-19 has had a tremendous impact on health care in the US and health systems needed to adapt to this new reality. Restrictions limited the spread of infection; however, access to care was impaired. Providing timely cancer care was an ongoing challenge as health systems and physicians adopted new practice models to deal with the influx of acutely sick patients. Treatment standards, along with patient perceptions towards care, may have been altered. Pre-existing disparities may have worsened as well. The impact on cancer care delivery is not yet fully understood, and a comprehensive examination of the effects of the pandemic on lung cancer has not been performed to date. The objective of this study is to evaluate impact of COVID-19 on lung cancer care in Delaware.

Material and Methods

Data Source and Study Population

Health care claims from the Delaware Health Information Network Database were collected for the years 2019-2020. Two populations were identified using ICD-10 and CPT codes: patients with a new lung cancer diagnosis (ICD- 10 code C34.9) and those who have undergone lung cancer screening (CPT code 71271). These two study populations were analyzed separately. The study population for lung cancer screening was selected according to the United States Preventive Services Task Force (USPSTF) guidelines, which recommends annual screening for adults aged 50 to 80 years who have a 20 pack-year smoking history and are current smokers or have quit within the past 15 years.[5]

From these claims, we obtained demographic information (gender, age at diagnosis or screening, race), type of cancer treatment – i.e., surgery (CPT codes: 32440, 32482, 32484, 32504, 32505, 32663, 32668, 32669, 32670, 32671), chemotherapy (CPT codes: 96401, 96402, 96409, 96411, 96413, 96415, 96416) and radiation (CPT codes: 32701, 77412, 77470) – as well as census tract information. We further linked the census tract data to the American Community Survey to obtain socio-economic information such as median income.[6]

Statistical Analysis

An interrupted time series analysis (ITSA) was used to evaluate the level and trend changes in lung cancer incidence and screenings from January 1, 2019 to December 31, 2020.[7–10] Primary outcomes were defined as the weekly number of new lung cancer cases, the weekly number of screenings and the monthly number of different treatment modalities. A breakpoint in significant level changes and trends was identified corresponding to the institution of COVID restrictions at the end of March 2020.

Patient-level demographics are summarized as descriptive statistics. Median income was defined as $90,000/year based on the Pew Research Center definition for 2020.[6] Continuous variables are presented as means and medians, and categorical variables are presented as frequencies. Group differences were evaluated by chi-squared and Fisher-Exact tests for categorical variables and T-test for continuous variables. All tests were 2-sided and statistical significance was set at $p \leq 0.05$.

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Segmented regression analysis used statistical models to estimate levels and trends of outcomes before the pandemic and after the institution of restrictions. The fitted model was selected using stepwise selection and AIC (Akaike information criterion). Sensitivity analyses were performed. The trend before the pandemic was added to the final model as a control variable. Segmented regression with an ordinary least-squares method was used in this analysis. Autocorrelation was assessed by examining the plot of ACF (Autocorrelation Function) and PACF (Partial Autocorrelation Function) residuals and conducting Durbin-Watson and Breusch-Godfrey tests. After detecting autocorrelations, these were adjusted for standard errors. Subgroups analyses were conducted to examine whether changes in new lung cancer and lung cancer screening varied according to age group and insurance. Segmented regression was used to measure parameter estimates and 95% confidence interval (CI) for immediate (level) changes in the outcome as well as changes in the trend (slope). The Mann-Whitney U test was performed to compare median of monthly counts of lung cancer treatments between the two time-periods. Statistical analyses were performed using R 4.2 and SAS 9.4.

Results

A total of 2,031 patients with a new diagnosis of lung cancer and a total of 4,285 patients who underwent lung cancer screening were identified during a two-year period from January 1, 2019, to December 31, 2020.

Lung Cancer Counts

The monthly counts of newly diagnosed lung cancer cases along with the number of new COVID cases in Delaware are shown in Figure 1. Several demographic and socioeconomic groups were examined for worsening of pre-existing disparities (Table 1). No significant differences were seen between the two time-periods in mean age, gender, race, insurance, geographic county, or income level. However, a significant change was seen in the most elderly population, ages 81-90 ($p=0.038$) for whom the frequency of new cases of lung cancer was much lower during the COVID time-period.

Figure 1. Monthly Lung Cancer Incidence and COVID Cases in Delaware Before and During the Pandemic

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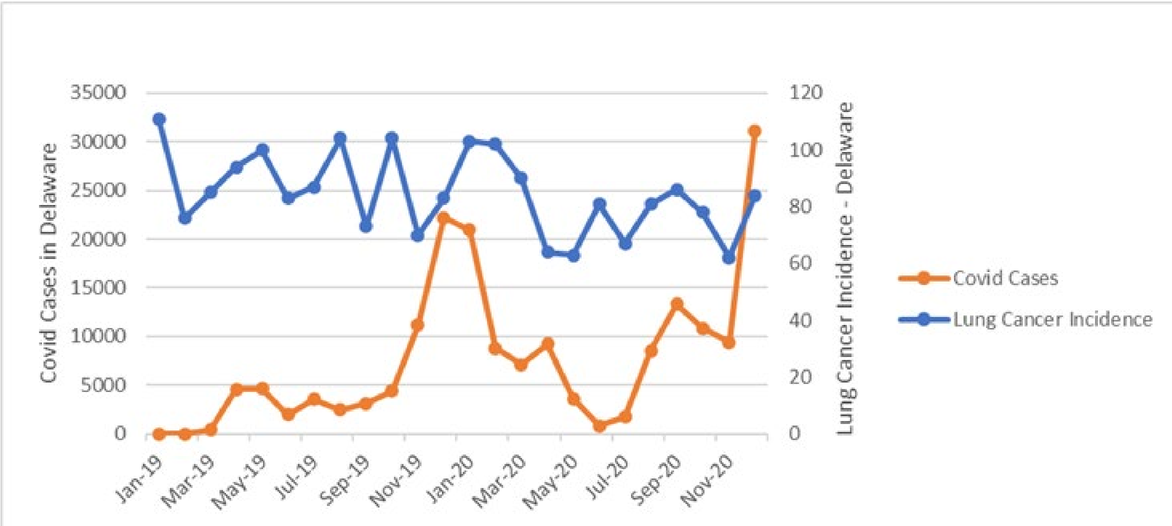

Table 1. Demographics of New Lung Cancer Patients Before and After April 1, 2020

	Jan 1, 2019 - Mar 31, 2020 (n=1365)	**Apr 1, 2020 - Dec 31. 2020 (n=666)**	**P-value**
Age, mean (SD)	71.17 (9.69)	70.51 (9.17)	0.138
Age Groups			
20 - 69	553 (40.51%)	282 (42.34%)	0.038
70 - 79	537 (39.34%)	281 (42.19%)	
80 - 90	275 (20.15%)	103 (15.47%)	
Gender			
Female	685 (50.18%)	336 (50.45%)	0.910
Male	680 (49.82%)	330 (49.55%)	
Race			
AA	138 (10.11%)	66 (9.91%)	0.999
White	994 (72.82%)	474 (71.17%)	
Other	75 (5.49%)	36 (5.41%)	
# of missing	158 (11.58%)	90 (13.51%)	
Insurance			
Commercial	150 (10.99%)	69 (10.36%)	0.869
Medicaid	132 (9.67%)	62 (9.31%)	
Medicare	1083 (79.34%)	535 (80.33%)	
County			
Kent	252 (18.46%)	122 (18.32%)	0.137
New Castle	594 (43.52%)	262 (39.34%)	
Sussex	519 (38.02%)	282 (42.34%)	
Income			
< 90,000	502 (36.78%)	266 (39.94%)	0.161
>90,000	83 (6.08%)	30 (4.50%)	
# of missing	774 (56.70%)	365 (54.80%)	

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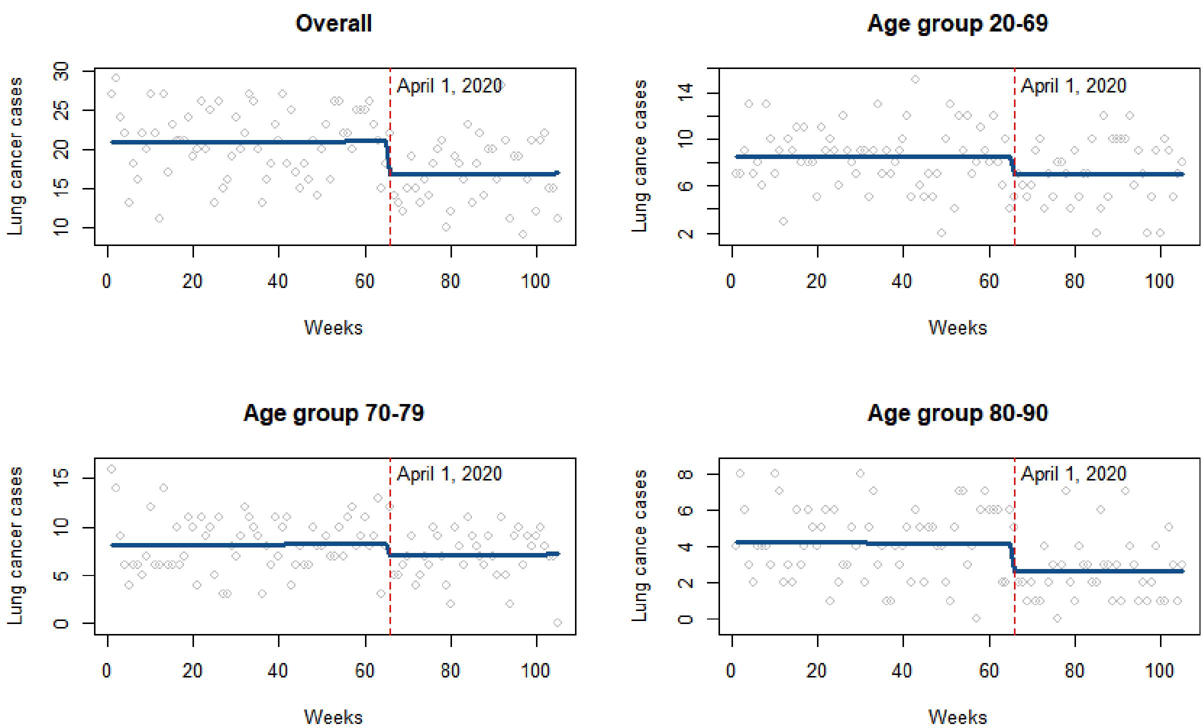
Segmented regression results are provided in Table 2. Autoregressive error models were used to quantify changes over time and compare patterns before and after April 1, 2020. The Durbin-Watson statistic for the regression model of lung cancer incidence was 2.0901 (p-value for hypothesis of negative autocorrelation =0.3023, p-value for hypothesis of positive autocorrelation = 0.6977), indicating no autocorrelation. The baseline level before the COVID-19 pandemic was 20.8063 (95% CI: 18.8257 to 22.7869). The trend before the pandemic was flat (0.0026; 95% CI: -0.0481 to 0.0533). The level change (p-value=0.005) in incidence of new lung cancers decreased by 4.204 (95% CI: -7.3717 to -1.0364) or 20% immediately after the institution of restrictions after April 1, 2020. There was no evidence of significant recovery or upward trend change, even though restrictions were lifted on June 1, 2020 (Figure 2).

Figure 2. Weekly Numbers of Lung Cancer Diagnoses in Delaware from January 1, 2019 to December 31, 2020



The grey circle represents the observed weekly lung cancer screening cases. The solid blue line corresponds to the fitted regression line for each of the two study intervals. The vertical dashed red line indicates the institution of restrictions on April 1, 2020.

Results of age group sub-analyses are presented in Table 2 and Figure 2. The institution of restrictions had an immediate effect on new lung cancer diagnoses for individuals of the ages 80-90 (-1.5424, 95% CI: -2.9151 to -0.1697). This represents a 37% decrease in incidence within this cohort. Changes in age groups 20-69 and 70-79 were small and not statistically significant.

Table 2. Interrupted Time Series Regression Analysis of Lung Cancer Incidence Overall and Per Age Group

	Level Before Pandemic (95% CI)	**Trend Before Pandemic**	**Absolute Changes in Levels After the**

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		(95% CI)	Institution of Restrictions April 1, 2020 (95% CI)
Overall	20.8063 (18.8257,22.7869)*	0.0026 (-0.0481,0.0533)	-4.204 (-7.3717,-1.0364)*
Age 20-69	8.4961 (7.4703,9.522)*	0.0001 (-0.0262,0.0264)	-1.4427 (-3.0878,0.2022)
Age 70-79	8.0906 (6.7995,9.3816) *	0.0033 (-0.0297,0.0363)	-1.249 (-3.3138,0.8158)
Age 80-90	4.2204 (3.3621,5.0787) *	-0.0006 (-0.0226,0.0213)	-1.5424 (-2.9151,-0.1697) *

All models are unadjusted. 95% Confidence Interval (CI) in brackets, Estimates from best-fitting segmented regression. *Statistically significant with p-value ≤ 0.05.

Lung Cancer Screening

Several demographic and socioeconomic groups were again examined for worsening of pre-existing disparities (Table 3). No significant differences were seen in screening frequency according to age groups, mean age, gender, race, or income level.

Table 3. Demographics of Patients Undergoing Lung Cancer Screening Before and After April 1, 2020

	Jan 1, 2019 - Mar 31, 2020 (n=3023)	**Apr 1, 2020 - Dec 31. 2020 (n=1262)**	**P-value**
Age, mean (SD)	66.133 (5.732)	65.824 (5.857)	0.1106
Age			
50-59	491 (16.24%)	229 (18.15%)	0.2805
60-69	1618 (53.52%)	669 (53.01%)	
70-79	914 (30.23%)	364 (28.84%)	
Gender			
Female	1514 (50.08%)	645 (51.11%)	0.5401
Male	1509 (49.92%)	617 (48.89%)	
Race			
AA	213 (7.05%)	106 (8.40%)	0.0597
White	1956 (64.70%)	759 (60.14%)	
Other	182 (6.02%)	87 (6.89%)	
# of missing	672 (22.23%)	310 (24.57%)	
Insurance			
Commercial	631 (20.87%)	223 (17.67%)	0.0002
Medicaid	280 (9.26%)	164 (13%)	
Medicare	2112 (69.86%)	875 (69.33%)	
County			
Kent	646 (21.37%)	257 (20.36%)	<.0001
New Castle	725 (23.98%)	391 (30.98%)	
Sussex	1652 (54.65%)	614 (48.65%)	

Income			
< 90,000	1114 (85%)	468 (37.08%)	0.8444
>90,000	119 (3.94%)	48 (3.80%)	
# of missing	1777 (58.78%)	739 (58.56%)	

Compared to patients who were screened before the pandemic, those screened after April 1, 2020 were more likely to have Medicaid and less likely to have commercial insurance (p=0.0002). Differences between the two time-periods were also seen in the proportions of patients screened per county (p<0.0001).

As shown in Table 4 and Figure 3, the weekly overall count of patients undergoing lung cancer screening was constant prior to the pandemic at approximately 46 per week, with a non-significant decrease of 0.0073 per week. However, the restriction in services due to COVID-19 led to a sharp decrease of 29 screenings per week (95% CI: -42.6616 to -15.4949) immediately after March 31 followed by a gradual and significant increase of 0.7625 (95% CI: 0.2184 to 1.3066) lung cancer screenings per week. The estimated trend for the post-COVID pandemic was 0.7552 [95% CI: 0.2851 to 1.2251], (0.7552= trend pre (-0.0073) + changes in trend after pandemic (0.7625)).

Table 4. Interrupted Time Series Regression Analysis of Lung Cancer Screening Overall and Per Insurance Category

	Level Before Pandemic (95% CI)	**Trend Before April 1, 2020 (95% CI)**	**Immediate Change in Level (95% CI)**	**Change in Trends After April 1, 2020 (95% CI)**
Overall	45.9419 (36.8882,54.9956)*	-0.0073 (-0.2429,0.2283)	-29.0783 (-42.6616,-15.4949)*	0.7625 (0.2184,1.3066)*
Commercial	10.6625 (8.8195,12.5054)*	-0.0289 (-0.0774,0.0196)	-6.3933 (-9.3671,-3.4196)*	0.1843 (0.0726,0.296)*
Medicaid	4.6811 (3.5419,5.8204)*	-0.0114 (-0.0414,0.0185)	-2.9467 (-4.7828,-1.1106)*	0.163 (0.0939,0.232)*
Medicare	30.55 (24.4714,36.6286)*	0.049 (-0.1094,0.2074)	-23.413 (-32.911,-13.9149)*	0.522 (0.1557,0.8883)*

All models are unadjusted. 95% Confidence Interval (CI) in brackets, Estimates from best-fitting segmented regression. *Statistically significant with p-value≤0.05.

The best-fitting model estimates for each of the insurance categories are given in Table 4. The immediate decreases in the counts of patients undergoing screening in the first week just after April 2020 were significant for the three types of insurance: -6.3933 (72.83%) for commercial insurance, -2.9467 (62.95%) for Medicaid, and -23.413 (69.40%) for Medicare.

As illustrated in Figure 3, the pandemic effect diminished over time with the number of lung cancer screenings increasing. The absolute difference and relative difference between the hypothetical number of cases on the counterfactual line and the observed number of cases was smaller six months (10.766 and -0.239) after March 31, 2020 compared to three months (19.922 and -0.439). At three months after the pandemic, the absolute difference for the number of lung cancer screening per week was 4.18 for commercial insurance, 0.99 for Medicaid, 17.153 for Medicare compared with what the number of cases would have been if the trend observed prior

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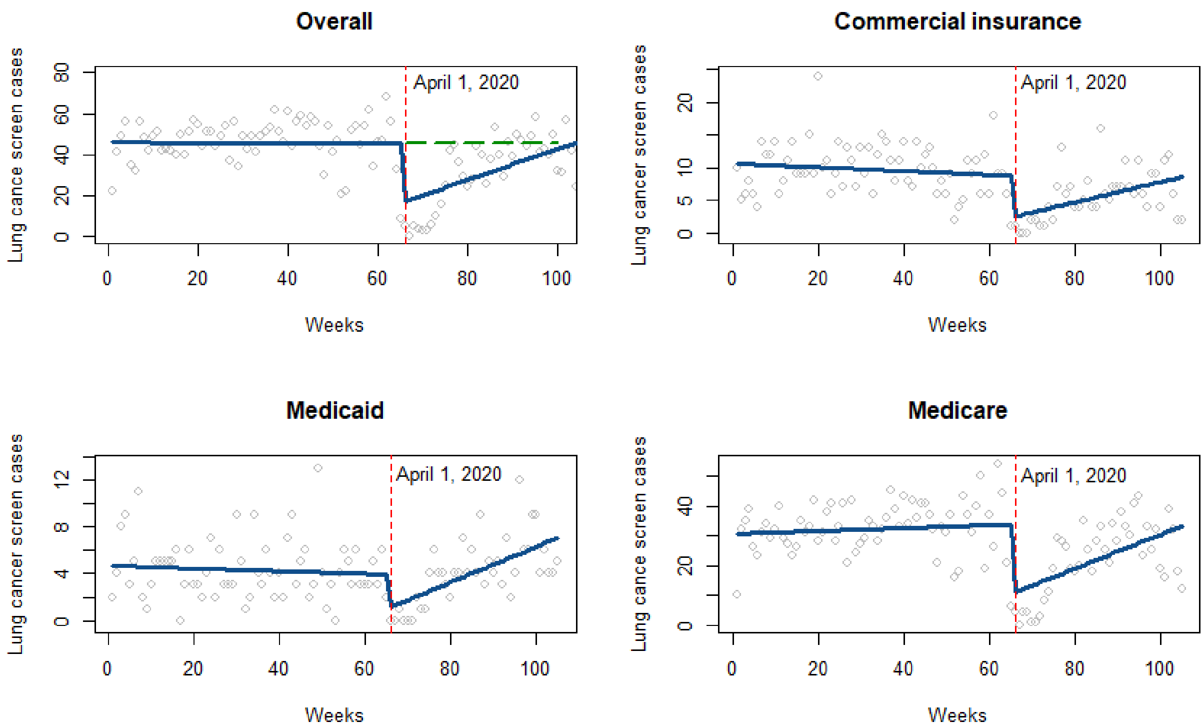
to the pandemic had not been interrupted, indicating that lung cancer screening recovered faster for patients on Medicaid than for patients on commercial insurance and Medicare.

Figure 3. Weekly Numbers of Lung Cancer Screening in Delaware from January 1, 2019 to December 31, 2020



The grey circle represents the observed weekly lung cancer screening cases. The solid blue line corresponds to the fitted regression line for each of the two study intervals. The vertical dashed red line indicates the institution of restrictions on April 1, 2020. The dashed green line represents the counterfactual. If the institution of restrictions had not happened, the blue line would have continued as shown by the green line.

Impact of COVID on the Management of Lung Cancer

The impact of the pandemic on the treatment practice of lung cancer was also examined. The median of the monthly numbers of patients receiving surgical resection decreased from 14 to 9 after the institution of restrictions and from 21 to 17 for those receiving radiation therapy, but the differences were not significant (p=0.0848, p=0.3848) (Table 5). An increase was observed for those receiving chemotherapy (median:12 vs 15, p-value = 0.1023); however, this was also not statistically significant.

Table 5. Comparison of Treatment Methods Before and After April 1, 2020

	Jan 1, 2019 - Mar 31, 2020 Median Monthly (range)	**Apr 1, 2020 - Dec 31, 2020 Median Monthly (range)**	**P-value**
Surgery (n=283)	14 (10-15)	9 (8-11)	0.0848

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	n=191	n=92	
Radiation (n=482)	21 (17-23) n=317	17 (15-22) n=165	0.3848
Chemotherapy (n=340)	12 (11-17) n=196	15 (13-21) n=144	0.1023

Median (the first quartile, the third quartile), n=new lung cancer patients.

Impact on Health Care Utilization

Virtual visits in the form of phone visits were a new phenomenon in the care of lung cancer patients. The usage of this modality peaked in April of 2020 and then decreased for the remainder of the year (Figure 4). The average of the monthly number of submitted health claims (Figure 5) decreased by 27% during the months of April and May of 2020 (300,137 claims/month before April 1, 2020 to 218,220)) but returned close to pre-pandemic levels for the remainder of 2020 (292,604 claims/month).

Figure 4. Monthly Phone Visits Before and After the Pandemic

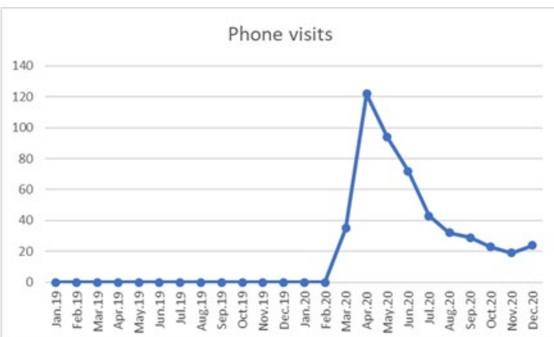
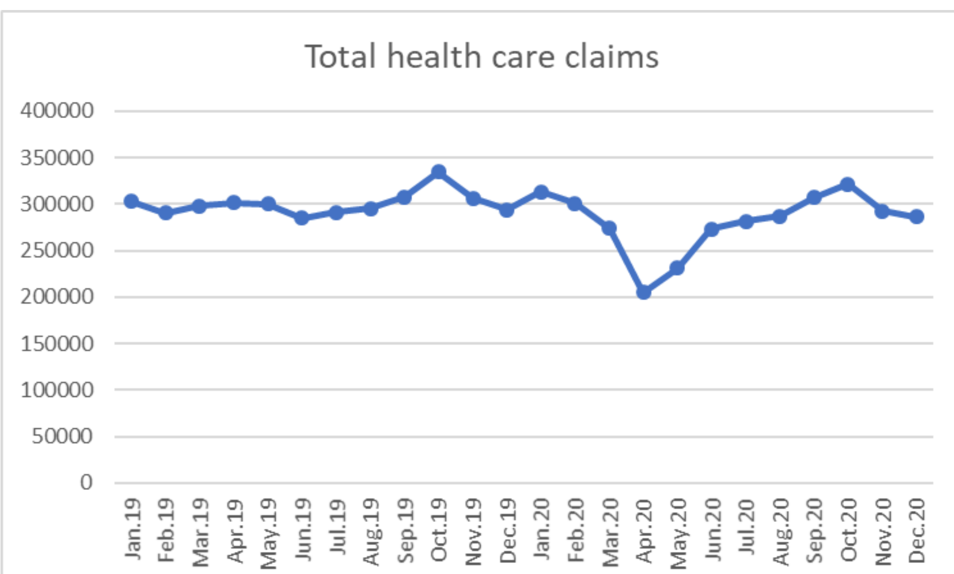


Figure 5. Monthly Number of Healthcare Claims Before and After the Pandemic



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Discussion

These results illustrate the impact of the pandemic on health systems and lung cancer care. Significant decreases in lung cancer incidence and screening were observed in this analysis are in line with findings from previous studies.[11,13]

Interestingly, these decreases did not correlate with the course of the virus, or the number of Americans infected; but, rather, with the institution of lockdowns. Lockdowns mitigated the spread of the virus and saved lives; however, restricting access adversely affected cancer care.[12] These findings suggest that alternative mitigation plans should be considered in the future.

Screening recovered to pre-pandemic levels by the end of 2020; however, lung cancer incidence did not. These effects may have led to delayed diagnoses and an upshifting of all stages although this could not be analyzed within the scope of this study. Fortunately, a worsening of pre-existing disparities in several demographic and racial/socioeconomic groups was not observed. However, one group that was significantly impacted was the most elderly population (ages 80-90). These patients were the most vulnerable to COVID-related mortality and should be kept at the forefront when developing future healthcare policies.

In the lung screening group, a decrease was observed in those with commercial insurance while those needing Medicaid insurance increased. Likely, this was secondary to employment patterns during the pandemic with patients losing employment and necessitating Medicaid for health coverage. The differences in screening at the county level were likely due to individual health systems resuming their screening programs at different rates.

Treatment paradigms for lung cancer were possibly altered during the pandemic. Fewer patients underwent surgical resection and more underwent less invasive treatment options such as chemotherapy, although these differences were not statistically significant. Other studies have examined these trends as well[14] and are important to keep in mind, so that patients continue to receive the standard of care amidst a future health crisis.

The pandemic adversely impacted total health care claims and health care revenue for the 2020 year. Federal relief funds blunted some of these deficits; however, the need for innovation led to the development of novel alternative forms of care including virtual visits. Virtual medicine persisted even as the pandemic waned and will likely become a permanent option for accessing and delivering health care.

Conclusions

COVID-19 had a significant impact on lung cancer care within the state of Delaware. Lung cancer incidence, screenings, and the most elderly patients were affected. These findings can be utilized to help shape health policies in the event of a future pandemic.

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References

1. World Health Organization. (2020). Pneumonia of unknown cause — China. https://www.who.int/csr/don/05-january-2020-pneumonia-of-unkown-cause-china/en/
2. Holshue, M. L., DeBolt, C., Lindquist, S., Lofy, K. H., Wiesman, J., Bruce, H., ... Pillai, S. K., & the Washington State 2019-nCoV Case Investigation Team. (2020, March 5). First case of 2019 novel coronavirus in the United States. *The New England Journal of Medicine, 382*(10), 929–936. https://doi.org/10.1056/NEJMoa2001191 PubMed
3. Delaware Health and Social Services. (2023, Feb 24). Myhealthycommunity coronavirus COVID-19 data dashboard. https://myhealthycommunity.dhss.delaware.gov/locations/state/deaths
4. Centers for Disease Control and Prevention. (2023, Feb 24). COVID data tracker. https://covid.cdc.gov/covid-data-tracker/#datatracker-home
5. Krist, A. H., Davidson, K. W., Mangione, C. M., Barry, M. J., Cabana, M., Caughey, A. B., ... Wong, J. B., & the US Preventive Services Task Force. (2021, March 9). Screening for Lung Cancer: US Preventive Services Task Force Recommendation Statement. *JAMA, 325*(10), 962–970. https://doi.org/10.1001/jama.2021.1117 PubMed
6. Kochhar, R., & Sechopoulos, S. (2022, April 20). How the American middle class has changed in the past five decades. *Pew Research Center*. https://www.pewresearch.org/fact-tank/2022/04/20/how-the-american-middle-class-has-changed-in-the-past-five-decades/
7. Bernal, J. L., Cummins, S., & Gasparrini, A. (2017, February 1). Interrupted time series regression for the evaluation of public health interventions: A tutorial. *International Journal of Epidemiology*, *46*(1), 348–355. https://doi.org/10.1093/ije/dyw098 PubMed
8. Bernal, J. L., Cummins, S., & Gasparrini, A. (2021). Corrigendum to: Interrupted time series regression for the evaluation of public health interventions: a tutorial. *International Journal of Epidemiology*, *50*(3), 1045. https://doi.org/10.1093/ije/dyaa118 PubMed
9. Xiao, H., Augusto, O., & Wagenaar, B. H. (2021, July 9). Reflection on modern methods: A common error in the segmented regression parameterization of interrupted time-series analyses. *International Journal of Epidemiology*, *50*(3), 1011–1015. https://doi.org/10.1093/ije/dyaa148 PubMed
10. Turner, S. L., Karahalios, A., Forbes, A. B., Taljaard, M., Grimshaw, J. M., & McKenzie, J. E. (2021, June 26). Comparison of six statistical methods for interrupted time series studies: Empirical evaluation of 190 published series. *BMC Medical Research Methodology*, *21*(1), 134. https://doi.org/10.1186/s12874-021-01306-w PubMed
11. Fedewa, S. A., Bandi, P., Smith, R. A., Silvestri, G. A., & Jemal, A. (2022, February). Lung cancer screening rates during the COVID-19 pandemic. *Chest*, *161*(2), 586–589. https://doi.org/10.1016/j.chest.2021.07.030 PubMed
12. Van Haren, R. M., Delman, A. M., Turner, K. M., Waits, B., Hemingway, M., Shah, S. A., & Starnes, S. L. (2021, April). Impact of the COVID-19 pandemic on lung cancer screening program and subsequent lung cancer. *Journal of the American College of Surgeons*, *232*(4), 600–605. https://doi.org/10.1016/j.jamcollsurg.2020.12.002 PubMed

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13. Mariotto, A. B., Feuer, E. J., Howlader, N., Chen, H., Negoita, S., & Cronin, K. A. (2023, September). Interpreting cancer incidence trends: Challenges due to the COVID-19 pandemic. *Journal of the National Cancer Institute*, *115*(9), 1109–1111. https://doi.org/10.1093/jnci/djad086

14. Piñeiro, F. M., & Aguado, J. F. (2021, February). Management of lung cancer in the COVID-19 pandemic: A review. *Journal of Cancer Metastasis and Treatment*, *7*, 10. 10.20517/2394-4722.2020.115