Annals of Medicine and Surgery 60 (2020) 680–685

Contents lists available at ScienceDirect

Annals of Medicine and Surgery

journal homepage: www.elsevier.com/locate/amsu

Gender disparities in lung cancer survival from an enriched Florida population-based cancer registry☆

Adel Elkbuli [a,b,*], Margaret M. Byrne [a,e], Wei Zhao [e], Mason Sutherland [b], Mark McKenney [b,d], Yeissen Godinez [c], Devina J. Dave [a], Layla Bouzoubaa [a,e], Tulay Koru-Sengul [a,e]

[a] Department of Public Health Sciences, University of Miami Miller School of Medicine, 1120, NW 14thStreet, Don Soffer Clinical Research Center, Miami, FL, 33136, USA
[b] Department of Surgery, Kendall Regional Medical Center, 11750 SW 40th St, Miami, FL, 33175, USA
[c] Department of Internal Medicine, Kendall Regional Medical Center, 11750 SW 40th St, Miami, FL, 33175, USA
[d] Department of Surgery, University of South Florida, Tampa, FL, USA
[e] Sylvester Comprehensive Cancer Center, University of Miami Miller School of Medicine, 1475 NW 12th Ave, Miami, FL, 33136, USA

ARTICLE INFO

Keywords:
Lung cancer survival
Health inequalities
Gender disparity
Socioeconomic status
Healthcare access

ABSTRACT

Background: Previous studies have revealed gender disparities in lung cancer survivorship, but comprehensive inclusion of clinical/individual variables which affect outcomes is underreported. We utilized the Florida Data Cancer System (FCDS) to examine associations between gender and lung cancer survivorship while controlling for prognostic variables on a large population-based scale.

Methods: A retrospective cohort analysis utilizing the FCDS, linked to Florida Agency for Health Care Administration and US Census Bureau tracts for patients diagnosed with primary lung cancer (n = 165,465) from 1996 to 2007. Primary outcome measures included median survival time and mortality. Multivariable Cox regression models, independent sample T-tests, and descriptive statistics were utilized with significance defined as $p < 0.05$.

Results: 165,465 cases were analyzed revealing 44.3% females and 55.7% males. The majority of patients were white/Caucasian, males, middle-high socioeconomic status, lived in urban areas, and geriatric age. Females had longer median survival compared to males (9.6 vs 7.1 months). Multivariable analyses showed that women had better survival after controlling for sociodemographic, clinical, and comorbidity covariates. Males had higher risk of mortality than females (aHR = 1.17, 95%CI 1.14–1.19, $p < 0.01$).

Conclusions: Individuals of higher socioeconomic status experienced greater survivorship compared to those of lower socioeconomic status. Women experienced significantly better survival for lung cancer at multiple time frames after controlling for covariates compared to men. Interventions aimed at public education and access to high-quality healthcare are needed to ameliorate socioeconomic and gender-based disparities in lung cancer survivorship. Future studies should investigate gender differences in lung cancer while incorporating individual socioeconomic status and treatment received.

1. Introduction

Cancers of the lung are among the most prevalent malignancies in the United States (US) with adenocarcinoma representing the most common type of lung carcinoma [1–3]. The American Cancer Society estimates that 234,030 new cases of lung cancer occurred in the US in 2018 and 228,150 cases in 2019, leading to 154,050 deaths and 142,670 deaths, respectively [1,2,4]. An interesting disparity reported in previous literature regarding lung cancer is the better survivorship of female patients compared to males [5–11]. According to the National Cancer Institute's Surveillance, Epidemiology, and End Results (NCI-SEER) program, there are 63.5 deaths per 100,000 men compared to 39.2 deaths per 100,000 women of all race/ethnicity groups for cancer of the lung and bronchus, with women diagnosed with small cell lung cancer (SCLC) experiencing a particularly prominent survival advantage [5]. Previous studies utilizing NCI-SEER data from 1975 to 1999 have indicated that although women have a greater incidence of lung cancer compared to men, they also experience higher stage-specific survival

☆ The abstract leading to this manuscript was presented at the 142ndAmerican Public Health Association (APHA) Annual Meeting in New Orleans, LA, USA.

* Corresponding author. Department of Surgery Kendall Regional Medical Center, 11750 bird road, Miami, FL, 33175, USA.
E-mail address: adel.elkbuli@hcahealthcare.com (A. Elkbuli).

https://doi.org/10.1016/j.amsu.2020.11.081
Received 8 November 2020; Received in revised form 26 November 2020; Accepted 28 November 2020
Available online 1 December 2020

rates than male counterparts [6–8]. Univariate and multivariable analyses have demonstrated that female gender is associated with improved lung cancer survivorship, with females diagnosed with non-small cell lung cancer (NSCLC) experiencing greater survivorship compared to males in a phase III Eastern Cooperative Oncology Group (ECOG) trial [8–10].

However, there are numerous influences besides gender which may play a role in the increased survivorship of female patients compared to males including age and smoking history, among other variables [11]. In particular, greater exploration of the impact of relevant socioeconomic and individual factors such as patient race/ethnicity and insurance status has the potential to further explain why female lung cancer patients may experience greater survivorship compared to male counterparts. Therefore, this review aims to utilize the 1996–2017 Florida Cancer Data System (FCDS) registry data enhanced with Florida Agency for Health Care Administration (FL-AHCA) information to assess for potential economic inequalities in survivorship for female lung cancer patients by accounting for patient race/ethnicity, comorbidities, smoking status, insurance status, marital status, hospital characteristics, treatment type, and carcinoma grade with the hypothesis that female lung cancer survivorship is associated with a higher overall socioeconomic status.

2. Material and methods

A retrospective cohort analysis was performed utilizing data from the US Census Bureau, FCDS and FL-AHCA regarding lung cancer incidence and inpatient outpatient procedures to treat lung carcinoma from 1996 to 2007. This report was conducted in line with the STROCSS criteria [12]. The FCDS is a statewide cancer registry funded by the Florida Department of Health (FL-DOH) and the Centers for Disease Control and Prevention's National Program of Cancer Registries (CDC-NPCR) which receives annual information from 252 hospitals, 127 radiation therapy centers, 453 surgery centers, and 3360 physician offices in the state of Florida [13]. We report data in accordance with research agreements with FCDS and utilized one cohort of patients according to FCDS patient inclusion criteria: adult patients who were at least 18 years of age, diagnosed with primary lung cancer, and resided in the state of Florida when diagnosed [13]. Matches between the FCDS and FL-AHCA data were confirmed with the patient's date of birth and gender. Patients were not involved in study design of this analysis.

Survival time was defined as the elapsed time from lung cancer diagnosis to death or last follow-up for alive patients. Patient residency and the year 2000 US Census Bureau information was utilized to approximate the patient's neighborhood socioeconomic status (NSES), defined as the percentage of households living below the federal poverty line: lowest (≥20%), middle-low (≥10% and <20%), middle-high (≥5% and <10%), and highest (<5%). NSES was utilized as previous studies have indicated that this measure yielded similar results to more complex composite scores, with poverty as an ideal indicator because this metric produces similar results to multivariable indices incorporating multiple contributing factors to socioeconomic status such as education and total asset possession [14,15]. Additionally, NSES was utilized over individual socioeconomic status information on the basis that individual SES data was not available in our dataset as well as to account for geographical area-based socioeconomic differences which may have implicit influences on patient health [16].

Multivariable Cox regression models were fitted by including variables of patient race/ethnicity, smoking status, insurance, marital status, hospital characteristics, treatment, cancer stage, cancer grade, and comorbidities in order to examine overall survivorship as the primary clinical outcome. Adjusted hazard ratios (aHRs), corresponding 95% confidence intervals (95% CI), and independent sample T-tests were calculated with significance defined as $p < 0.05$. Data management and statistical analyses were performed using SAS v9.4 statistical software for Windows (SAS Institute Inc., Cary, NC, USA). This study was conducted in compliance with ethical principles, was reviewed and approved by the FL-DOH and University of Miami institutional review boards. The Research Registry UIN of this study is: researchregistry6293. [17].

3. Results

3.1. Patient characteristics

Our sample initially included information on 179,630 adults ≥18 years of age in the state of Florida diagnosed with SCLC or NSCLC carcinoma-in-situ or higher staging from 1996 to 2007. Of this total, 14,165 patients were excluded on the basis of missing information regarding gender, race/ethnicity, NSES, SEER stage, or survival time, yielding 165,465 patients included in the final dataset. As seen in Table 1, the dataset was comprised of 73,276 (44.3%) female and 92,189 male (55.7%) patients. The majority of patients were white (n = 152,880; 92.4%), non-Hispanic (n = 155,402; 93.9%), most commonly middle-high NSES (n = 61,840; 37.4%), possessed Medicare insurance (55.6%), and were married (53.2%). Most patients lived in urban areas (93.0%), and were treated at low-volume hospitals (64.4%) and non-teaching hospital hospitals (92.6%). The majority of patients had a current or past history of smoking (73.3%). Females comprised a larger proportion of the never-smoker group (n = 8677; 11.8%) compared to males (n = 5666; 6.1%). Both male and female patient populations were comprised of primarily geriatric individuals (age ≥ 65) [Table 1]. There was no significant difference in mean age at time of cancer diagnosis between males and females (70.1 years vs. 69.5 years, $p > 0.05$). In addition, the median age at diagnosis was similar for both genders at 71.0 years (male interquartile range [IQR] = 15 years, female IQR = 14 years).

3.2. Clinical and pathological characteristics

Lung carcinomas were most commonly graded as poorly differentiated (23.0%), with more males (24.0%) than females (21.7%) being diagnosed with this grade [Table 2]. The predominant histological type of the tumors was adenocarcinoma (27.7%), comprising 25.0% of lung malignancies in males and 31.0% of lung malignancies in females. More male patients (20.6%) were diagnosed with squamous cell cancer (SCC)/combine complex than females (14.2%). The most common treatment received by patients was radiotherapy (39.3%), followed by chemotherapy (31.6%), and surgery (21.6%).

3.3. Association between survival and gender

Median survival time (MST) increased accordingly by NSES level [Table 3]. A longer MST was observed for female patients than male patients (9.6 months vs. 7.1 months) ($p < 0.001$). Survival rates were also higher in females compared to male patients at 1, 3, and 5 years after diagnosis as demonstrated in Fig. 1 ($p < 0.001$). Multivariable analyses demonstrated that women had better survival than men after controlling for race/ethnicity, NSES, and other sociodemographic/clinical/comorbidity covariates [Table 4 & Fig. 1]. In our fully adjusted model, males had higher risk of mortality than females (aHR = 1.17, 95% CI: 1.14–1.19, $p < 0.01$). No significant interactions between gender, race/ethnicity, and NSES were detected in fully adjusted models.

4. Discussion

It was found that the majority of adult patients who were diagnosed with primary lung carcinoma in the state of Florida from 1996 to 2007 where white/Caucasian, males, middle-high NSES, lived in urban areas, and were of a geriatric age. Poorly differentiated adenocarcinoma was the most common type of lung malignancy diagnosed, with the most frequently received treatments being radiotherapy, followed by

Table 1
Demographic characteristics of lung cancer by gender.

Variable	All patients		Female		Male	
	N	%	N	%	N	%
All patients	165,465	100.0	73,276	100.0	92,189	100.0
Race						
White	152,880	92.4	68,562	93.6	84,318	91.5
Black	11,462	6.9	4165	5.7	7297	7.9
NA	57	0.0	16	0.0	41	0.0
Asian	526	0.3	275	0.4	251	0.3
PI	45	0.0	23	0.0	22	0.0
AIP	115	0.1	51	0.1	64	0.1
Other	380	0.2	184	0.3	196	0.2
Hispanic Origin						
Non-Hispanic	155,402	93.9	69,770	95.2	85,632	92.9
Hispanic	10,063	6.1	3506	4.8	6557	7.1
NSES						
Lowest	21,406	12.9	8423	11.5	12,983	14.1
Middle-Low	53,742	32.5	22,866	31.2	30,876	33.5
Middle-High	61,840	37.4	28,625	39.1	33,215	36.0
Highest	28,477	17.2	13,362	18.2	15,115	16.4
Vital status (not in model)	22,437	13.6	12,248	16.7	10,189	11.1
Alive						
Dead	143,028	86.4	61,028	83.3	82,000	88.9
Age at diagnosis (years)						
Mean (SD)	69.7 (11.2)		69.5 (10.9)		70.1 (11.5)	
Median (Q1, Q3)	71.0 (63.0,78.0)		71.0 (63.0,77.0)		71.0 (63.0,78.0)	
Min, Max	18.0, 110.0		18.0, 105.0		18.0, 110.0	
Tobacco Use						
Never	14,343	8.7	8677	11.8	5666	6.1
History	65,651	39.7	27,161	37.1	38,490	41.8
Current	55,678	33.6	24,543	33.5	31,135	33.8
Unknown	29,793	18.0	12,895	17.6	16,898	18.3
Marital Status						
Never Married	20,528	12.4	7233	9.9	13,295	14.4
Divorced/Separated/ Widowed	52,655	31.8	33,492	45.7	19,163	20.8
Married	88,045	53.2	30,661	41.8	57,384	62.2
Unknown	4237	2.6	1890	2.6	2347	2.5
Insurance Status						
Uninsured	5663	3.4	2188	3.0	3475	3.8
Private Insurance	31,018	18.7	14,251	19.4	16,767	18.2
Medicaid	5938	3.6	2423	3.3	3515	3.8
Medicare	92,011	55.6	41,667	56.9	50,344	54.6
Defense/Military/ Veteran	2482	1.5	679	0.9	1803	2.0
Indian/Public	225	0.1	105	0.1	120	0.1
Insurance, NOS	10,803	6.5	4940	6.7	5863	6.4
Unknown	17,325	10.5	7023	9.6	10,302	11.2
Urban Rural by zip code						
Urban	153,829	93.0	68,802	93.9	85,027	92.2
Rural	11,636	7.0	4474	6.1	7162	7.8
AAMC 2005 Teaching Hospital						
Non-teaching hospital	153,145	92.6	67,958	92.7	85,187	92.4
Teaching hospital	12,320	7.4	5318	7.3	7002	7.6
Hospital Volume						
Low	106,496	64.4	47,056	64.2	59,440	64.5
High	58,969	35.6	26,220	35.8	32,749	35.5

Race abbreviations are as follows: NA=Native American, PI=Pacific Islander, AIP = Asian Indian or Pakistani; NSES: percentage of households living below the federal poverty line: lowest (≥20%), middle-low (≥10% and <20%), middle-high (≥5% and <10%), and highest (<5%); SD: standard deviation.

Table 2
Pathological and clinical characteristics.

Variable	All patients		Female		Male	
	N	%	N	%	N	%
All	165,465	100.0	73,276	100.0	92,189	100.0
Co-morbidity						
None	13,699	8.3	5337	7.3	8362	9.1
1–2	5910	3.6	2662	3.6	3248	3.5
3–4	12,702	7.7	6015	8.2	6687	7.3
>4	133,154	80.5	59,262	80.9	73,892	80.2
SEER Stage						
Localized	27,347	16.5	13,621	18.6	13,726	14.9
Regional, direct extension ± lymph nodes	19,960	12.1	8699	11.9	11,261	12.2
Regional, lymph nodes only	14,142	8.5	6365	8.7	7777	8.4
Distant	66,028	39.9	28,354	38.7	37,674	40.9
Unknown/Unstaged	37,988	23.0	16,237	22.2	21,751	23.6
Types of lung cancer						
SCLC	20,593	12.4	9874	13.5	10,719	11.6
NSCLC	98,541	59.6	43,338	59.1	55,203	59.9
Other	46,331	28.0	20,064	27.4	26,267	28.5
Grade						
Undifferentiated	12,125	7.3	5457	7.4	6668	7.2
Poorly-differentiated	38,048	23.0	15,884	21.7	22,164	24.0
Moderately-differentiated	18,916	11.4	8570	11.7	10,346	11.2
Well-differentiated	5794	3.5	3053	4.2	2741	3.0
Unknown/not stated	90,582	54.7	40,312	55.0	50,270	54.5
Regional Nodes Positive						
No	20,141	12.2	9810	13.4	10,331	11.2
Yes	11,890	7.2	5367	7.3	6523	7.1
Unknown	133,434	80.6	58,099	79.3	75,335	81.7
Histologic Type						
Adenocarcinoma	45,808	27.7	22,750	31.0	23,058	25.0
Squamous/combine complex	29,336	17.7	10,382	14.2	18,954	20.6
Neuroendocrine	2580	1.6	1523	2.1	1057	1.1
Large cell	7936	4.8	3284	4.5	4652	5.0
Other	15,424	9.3	6690	9.1	8734	9.5
Unknown	64,381	38.9	28,647	39.1	35,734	38.8
Chemotherapy						
No	95,994	58.0	43,368	59.2	52,626	57.1
Yes	52,305	31.6	22,954	31.3	29,351	31.8
Unknown	17,166	10.4	6954	9.5	10,212	11.1
Radiation Therapy						
No	87,238	52.7	40,605	55.4	46,633	50.6
Yes	65,028	39.3	27,424	37.4	37,604	40.8
Unknown	13,199	8.0	5247	7.2	7952	8.6
Surgery						
No	117,283	70.9	51,254	69.9	66,029	71.6
Yes	35,725	21.6	17,087	23.3	18,638	20.2
Unknown	12,457	7.5	4935	6.7	7522	8.2

SCLC = small cell lung cancer, NSCLC = non-small cell lung cancer.

chemotherapy and surgery. Women experienced significantly greater 1-, 3-, and 5-year survivorship compared to men after controlling for race, ethnicity, NSES, sociodemographic, clinical, and comorbidity covariates.

Our study indicates that when controlling for known prognostic factors such as patient medical comorbidities and smoking status, NSES exerted a significant impact on lung cancer survivorship, with both male and female patients of a higher NSES experiencing greater survivorship compared to more socioeconomically disadvantaged counterparts. These findings are supported by previous literature and may be due to the influence of multiple factors including a greater ability of higher NSES patients to access and receive high quality care and ancillary services throughout the duration of their treatment, as well as a greater amount of health literacy and knowledge regarding lung cancer diagnoses and treatment [18–20]. Critical to the discussion of socioeconomic status on the survivorship of lung cancer patients is the type of insurance possessed by patients. Previous studies have shown that higher quality insurance is associated with greater detection and treatment of early-stage lung carcinomas [21]. Given the mixed conclusions regarding the impact of insurance type on treatment complications, hospital duration of stay, and mortality of lung carcinoma patients, the benefit of possessing comprehensive insurance by higher-NSES individuals may stem from early disease detection and management more

Table 3
Median and survival rates, n = 165,465.

	Median survival (months)	Survival rates (%) at time (years) after diagnosis		
		1 year	3 years	5 years
Overall	8.1	39.9	18.2	12.0
Gender				
Female	9.6	44.4[a]	21.9[a]	15.0[a]
Male	7.1	36.4[a]	15.3[a]	9.7[a]
Race[b]				
White	8.1	40.2	18.5	12.3
Black	7.0	36.2	14.4	8.8
NA	4.8	36.5	9.8	4.9
Asian	10.8	45.8	20.9	12.3
PI	12.9	51.3	21.6	10.3
AIP	11.0	48.0	21.5	12.4
Other	8.9	44.6	18.4	13.0
Hispanic Origin				
No	8.0	39.9	18.2	12.0
Yes	8.4	40.5	17.9	12.0
NSES				
Lowest	6.5	34.8	13.7	8.6
Middle-low	7.6	38.4	16.8	11.0
Middle-high	8.5	41.2	19.4	12.8
Highest	9.6	44.0	21.7	15.0

[a] Females possessed significantly higher survival rates than males at the 1, 3, and 5 year time points after diagnosis ($p < 0.001$).

[b] Race abbreviations are as follows: NA=Native American, PI=Pacific Islander, AIP = Asian Indian or Pakistani; NSES: Neighborhood Socioeconomic Status; Lowest (≥20%); Middle-Low (≥10% and <20%); Middle-High (≥5% and <10%); Highest (<5%).

than the modality or duration of treatment received [21,22]. The implications of these findings are that socioeconomically disadvantaged cancer patients may benefit from greater implementation of interventions aimed at improving their access to high quality healthcare, as well as additional efforts aimed at improving education regarding the importance of screening and early symptoms to ameliorate any disparity conferred by unfavorable insurance coverage [23,24].

However, our findings also indicate that after controlling for relevant covariates, women of higher NSES have a significantly higher lung cancer survival rate compared to male counterparts at multiple time frames post-diagnosis and further substantiates previous literature which have implicated a gender disparity in lung cancer survivorship between women and men [25,26]. The evaluation of both intrinsic and extrinsic confounders is necessary in order to further delineate these gender disparities. Our findings that women comprised the majority of patients who have never used tobacco products and developed adenocarcinoma is supported by previous literature and highlights a possible predilection for this gender to develop adenocarcinoma in comparison to males, possibly due to the greater influence of endogenous and exogenous estrogens and progestins, as well as a greater frequency of mutations in the tumor suppressor gene p53 and proto-oncogene K-RAS [27–29]. This greater risk for women to develop lung carcinoma is compounded when the influence of tobacco is introduced [29]. However, the higher survivorship observed for female patients of higher-NSES in our study may indicate that although the incidence of lung cancer is higher among women, an increased willingness to seek medical attention and utilize necessary services aimed at improving morbidity and mortality may be a considerable influence in these individuals experiencing greater survivorship [30].

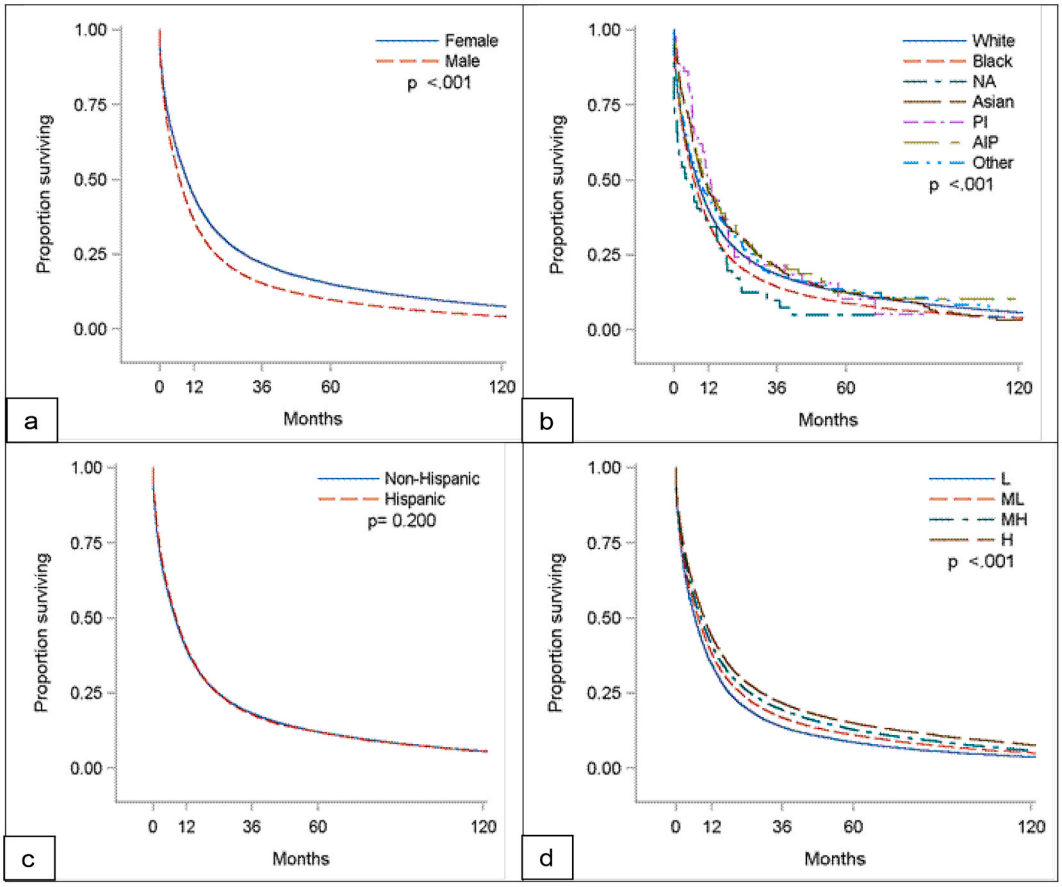

Fig. 1. Survival Plots (a) Gender (b) Race (c) Hispanic or non-Hispanic (d) NSES: L = Lowest (≥20%), ML = Middle-Low (≥10% and <20%), MH = Middle-High (≥5% and <10%), and H = highest (<5%) NSES.

Table 4
Cox Regression Models for Overall Survival Clustered Hospital, n = 165,465.

Prognostic factors	Category	Model 1		Model 2	
		HR (95%CI)	P value	aHR (95% CI)	P value
Gender	Female	1.00		1.00	
	Male	1.23 (1.22,1.25)	<0.001	1.17 (1.14,1.19)	<0.001
Race	White	1.00		1.00	
	Black	1.12 (1.10,1.15)	<0.001	0.98 (0.95,1.02)	0.314
	NA	1.39 (1.04,1.85)	0.024	1.17 (0.92,1.50)	0.196
	Asian	0.88 (0.80,0.97)	0.012	0.87 (0.79,0.97)	0.010
	PI	0.83 (0.59,1.16)	0.268	0.75 (0.50,1.12)	0.162
	AIP	0.86 (0.70,1.06)	0.168	0.97 (0.80,1.17)	0.727
	Other	0.95 (0.84,1.07)	0.386	0.94 (0.83,1.07)	0.342
Hispanic	No	1.00		1.00	
	Yes	0.99 (0.96,1.01)	0.205	0.94 (0.89,0.99)	0.015
NSES	Lowest	1.00		1.00	
	Middle-Low	0.90 (0.89,0.92)	<0.001	0.96 (0.93,0.98)	0.001
	Middle-High	0.84 (0.82,0.85)	<0.001	0.92 (0.89,0.94)	<0.001
	Highest	0.77 (0.76,0.79)	<0.001	0.88 (0.84,0.91)	<0.001

Model 1: Univariate.
Model 2: Multivariate - gender + Race/Ethnicity/SES + demographics + clinical + comorbidities (use individual variables).
aHR = Adjusted Hazard Ratio; 95%CI = 95% Confidence Interval.
None of the models included interaction terms. There are no significant interactions between gender and race, ethnicity, and NSES respectively in model 5.
Race abbreviations are as follows: NA=Native American, PI=Pacific Islander, AIP = Asian Indian or Pakistani; NSES: Neighborhood Socioeconomic Status (living below poverty line); Lowest (≥20%); Middle-Low (≥10% and <20%); Middle-High (≥5% and <10%); Highest (<5%).

Our study design offers several advantages compared to prior studies. While several previous investigations have described gender-related differences in lung cancer survivorship, ours confers an advantage over other studies by adjusting for relevant covariables in our Cox regression model such as insurance status, race/ethnicity, and age, among others [31]. Therefore, the results of our study allow for a greater degree of generalizability as the racial/ethnic, and geographic distribution of patients in the FCDS, FL-AHCA, and US Census Bureau from 1996 to 2007 do not significantly deviate from the national population of lung cancer patients and incorporate data from hundreds of medical centers rather than single center studies [31]. However, there are several limitations to our study. First, our investigation was subject to inherent limitations of retrospective analyses including selection bias and retention of subjects to follow-up which may have affected certain variables in our analysis, such as median survival time. Relatedly, analysis of retrospective data was reliant on accurate data entry and could be subject to human error. As such, approximately 10% of patients who satisfied our inclusion criteria were excluded on the basis of missing or insufficient data. Secondly, NSES was used as a proxy for individual level socioeconomic status and therefore may over- or underestimate trends for patients of an individual socioeconomic status which significantly differs from their NSES. Thirdly, our regression models do not account for the duration or type of treatment (radiation, chemotherapy, surgery, or combination therapy) which can serve as potential co-founders on overall survival.

We hypothesized that female lung cancer survivorship is associated with a higher socioeconomic status. Our findings that after controlling for relevant confounders, individuals of higher NSES experienced higher cancer survivorship compared to individuals of lower NSES, as well as women of higher NSES experiencing greater survivorship compared to males of higher NSES, support our hypothesis and validate previous literature which detail gender-related differences in long-term survival [18]. However, given the multifactorial contributions of individual, institutional, and systematic influences on lung cancer survivorship, we recommend for future studies to investigate the impact different of gender on lung cancer survivorship while incorporating individual socioeconomic status and type/duration of treatment received in order to further investigate potential gender-related differences and develop targeted interventions. Relatedly, we recommend for future studies to include information regarding patient medications and follow-up setting, duration, and frequency alongside outcomes in order to examine the impact of these aspects of clinical care on lung cancer survivorship. Specific efforts which may serve to benefit socioeconomically disadvantaged cancer patients may be greater access to affordable public insurance policies and more robust educational interventions aimed at explaining the importance of lung cancer screening, early detection, and treatment compliance. Greater elaboration of the variables which may be contributing the socioeconomic and gender-based differences observed in this analysis can serve to improve lung cancer patient outcomes for all affected members of the US population.

5. Conclusion

Individuals of higher NSES diagnosed with primary lung cancer in the state of Florida from 1996 to 2007 had a significantly higher survivorship at multiple time points compared to socioeconomically disadvantaged populations, highlighting socioeconomic disparities in survivorship. Additionally, women diagnosed with primary lung cancer experienced significantly higher survivorship compared to men, highlighting a potential gender disparity. This data accentuates the importance of focusing future preventative efforts on public education and the access to prompt healthcare in hopes of narrowing survival disparities in lung cancer.

Sources of funding

Funding and Disclosures: This work was funded by James and Esther King Florida Biomedical Research Program (#10KG-06). The authors confirm that the funder had no influence over the study design, content of the article, or selection of this journal. The authors have no conflicts to report. All authors have no disclosures or conflicts to report.

Ethical approval

This study was conducted in compliance with ethical principles, was reviewed and approved by the FL-Department of Health and University of Miami institutional review boards.

Trial registry number

Researchregistry6293.

If you are submitting an RCT, please state the trial registry number – ISRCTN: Not applicable.

Author contribution

Study design and conception: MB, AE, TS.

Data acquisition, collection, analysis and interpretation: TS, MB, WZ, MS, AE.

Manuscript preparation: AE, MB, WZ, MS, MM, YG, DD, LB, TS.

Critical revision of manuscript: AE, MB, WZ, MS, MM, YG, DD, LB, TS.

Guarantor

Adel Elkbuli.
Tulay Koru-Sengul.

Provenance and peer review

Not commissioned, externally peer-reviewed.

Declaration of competing interest

None.

Abbreviations

Florida Cancer Data System FCDS
Adjusted hazard ratios aHRs
95% Confidence Intervals 95% CI
United States US
National Cancer Institute's Surveillance, Epidemiology, and End Results NCI-SEER
Small Cell Lung Cancer SCLC
Non Small Cell Lung Cancer NSCLC
Eastern Cooperative Oncology Group ECOG
Florida Agency for Health Care Administration FL-AHCA
Socioeconomic Status SES
Neighborhood Level Socioeconomic Status NSES
Florida Department of Health FL-DOH
Centers for Disease Control and Prevention's National Program of Cancer Registries CDC-NPCR
SD Standard Deviation
Squamous Cell Cancer SCC
Median Survival Time MST
HR Hazard Ratio
Vitamins and Lifestyle Study VITAL study
Society of Thoracic Surgeons STS

Appendix B. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.amsu.2020.11.081.

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