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Racial Disparities in Receipt of Lung Cancer Treatment in Southwest Georgia

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Racial Disparities in Receipt of Lung Cancer Treatment in Southwest Georgia

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2010

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An abstract of
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Abstract

Racial Disparities in Receipt of Lung Cancer Treatment in Southwest Georgia

By Xinwei Hua

Background: Previous studies have revealed existing racial disparities in the receipt of treatment among different groups of lung cancer patients in large urban settings. This study aims at evaluating lung cancer treatment patterns in a primarily rural region - Southwest Georgia (SWGA).

Methods: This population-based retrospective cohort study included 976 black and white lung cancer patients who resided in SWGA and were diagnosed from 2001 to 2003. Cases were identified through Georgia Cancer Registry (GCR). Patient-/disease-related characteristics, and treatment relevant data were obtained directly from medical records. We used logistic regression modeling to calculated crude and adjusted odds ratios (ORs) and the corresponding 95% confidence intervals (CIs) reflecting the association between various patient- and disease-related characteristics and receipt of treatment for lung cancer (surgery, radiation, chemotherapy). A separate analysis was conducted to evaluate determinants of receiving no treatment at all.

Results: No statistically significant associations were observed between race (Black versus White) and treatment receipt among SWGA lung cancer patients with OR of 0.64 (95% CI: 0.39-1.06) for surgery, OR=0.84 (95% CI: 0.62-1.14) for radiation, OR=0.64 (95% CI: 0.43-0.96) for chemotherapy. Older patients had a statistically significantly lower likelihood of receiving treatment in all analyses. Married individuals were more likely to receive any kind of treatment compared with those not married (single, separated, divorced, or widowed). Patients with earlier stage of lung cancer were also more likely to receive surgery but were less likely to receive radiation and chemotherapy or have no treatment at all.

Conclusion: Our findings confirmed previous reports indicating that marital status and age are important determinants of treatment receipt among lung cancer patients. No racial differences were observed in this largely rural region, which is consistent with our earlier observations in the SWGA population. Further investigations are needed in both SWGA and other rural areas of the country to extend the analysis beyond treatment receipt, and to evaluate predictors of treatment completion and survival among lung cancer patients.

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INTRODUCTION

Every year, around 1.5 million people in the world are diagnosed with lung cancer [1]. Approximately 85% of these newly diagnosed cases are found to have non-small cell lung cancer (NSCLC) [2]. In United States, annual death rate for men remains high although it decreases from 89.9 (per 100,000 person year) in 1991 to 64.03 in 2008, while the mortality among females is relatively lower with the average value of 35 per 100,000.[3] Five-year relative survival for lung cancer by year of diagnosis shows a steady improvement from 12.3% (1975-1977) to 16.3% (2001-2007).[3][4] It varies markedly with the stage at diagnosis, from 49 to 16 to 2% for local, regional, and distant stage disease, respectively [3][5].

Although surgery is proven to be an effective treatment especially for patients with early stage NSCLC [6-8] and stage I and II small cell lung cancer (SCLC), only 20% to 25% of lung cancers are suitable for curative resection [9]. There is also considerable evidence to support the use of chemotherapy for lung cancer [10-12]. Chemotherapy (often in combination with radiation) [13, 14] can be used pre-operatively [12], after surgery [10, 11] or as a palliative measure for patients with unresectable tumors and in more advanced stages of disease [15, 16]. The treatment for lung cancer is mainly decided based on the stage of disease as well as patient's health status as shown in Table 1 [17] and Table 2 [18].

Previous studies have revealed the existing disparities in the receipt of treatment among different groups of lung cancer patients. Black patients are less likely to receive

either surgical treatment or chemotherapy for both early stage and advanced lung cancer compared with whites [19, 20]. Another important factor that affects treatment receipt for cancer of any kind (including lung cancer) is age [21]. The proportion of untreated patients increases with age, and is particularly high in older patients with lung cancer [22]. In addition, disparities in guideline-concordant treatment and survival were found in one study comparing Medicare patients residing rural and urban areas [23]. However, the data on lung cancer treatment among patients in rural parts of the Unites States are generally lacking.

We seek to address the above knowledge gaps by evaluating lung cancer treatment patterns in Southwest Georgia (SWGA) - a primarily rural 31-county area with population of approximately 700,000 [24] that includes about 38% of African Americans [25]. About 82% of residents in this region live outside of Metropolitan Statistical Areas (MSA) and only 14% are college graduates compared with 24% nationally. People who live below the federal poverty line constitute 21% of SWGA population compared with the US average of 12.4% with median household income estimated at 72% of national average ($30,290 vs. $41,994). In this study, we examine the frequency and determinants of treatment receipt among lung cancer patients diagnosed and treated in SWGA between 2001 and 2003.

METHODS

Study design and study population

This is a population-based retrospective cohort study of cancer treatment receipt. It uses data pertaining to lung cancer patients who were residents of SWGA, were diagnosed between January 1, 2001 and December 31 2003, and received at least first twelve months of their post diagnosis treatment entirely within SWGA.

For the present analyses, we excluded individuals with unknown stages, unknown demographic information (marital status, age at diagnosis, comorbidity status and insurance status), and those with ethnicity group other than Non-Hispanic black or white.

Data collection

The methods of data collected have been described in detail elsewhere [25, 26]. Briefly, we selected eligible cases based on the data from Georgia Cancer Registry (GCR) and forwarded to the trained on-site abstractors to ascertain various patient- and disease-related characteristics, treatment plan, actual treatment received and treatment completion status. A customized electronic data collection instrument was developed to facilitate abstractors in identifying and coding information from medical records. For each type of cancer treatment (surgery, radiation, and chemotherapy), the electronic instrument guided abstractors through a sequence of study-relevant inquiries on treatments planned, delivered and discontinued. Data at each cancer center were

abstracted by local cancer registrars. In addition a separate group of abstractors was assigned to smaller hospitals and free-standing clinics.[1]

Information for all eligible cases, collected by on-site abstractors, was reviewed in detail by data managers, specifically on whether cancer treatment received matched treatment planned: Each affirmative response ("Yes") was validated by checking the dates and exact type of treatment planned and received, completion status, and the overall agreement between treatment planned and the one actually received. Each negative response ("No") was examined similarly with extra assessment of the reason(s) recorded for not matching the planned care.

Study Variables

Race/ethnicity was expressed as a dichotomous variable that categorized all participants as non-Hispanic whites (White) or non-Hispanic blacks (Black). All other racial/ethnic groups combined constituted only 0.5% of all the cases, and were excluded. Marital status was categorized into 2 levels: married and not married, with the latter category including patients who are single, separated, divorced, or widowed. Insurance status had 4 categories: uninsured (no insurance, self-pay, or charity); Medicaid (either enrolled in Medicaid or application for enrollment pending); Medicare only (enrolled in fee-for-service Medicare and without supplemental private insurance); and Private insurance/managed care (private insurance, health maintenance organization/independent practice association (HMO/IPA), Medicare advantage or fee-

[1]The Southwest Georgia Cancer Coalition based in Albany, assisted Emory University investigators in developing effective working relationships with the four cancer centers. The fifth study team was managed by the GCCR Regional Coordinator for Southwest Georgia.

for-service Medicare with supplemental private insurance, and CHAMPUS or VA coverage). The inclusion of military service-related options in the final category assumes that cancer care provided by the Department of Defense and the Department of Veterans Affairs is delivered in a ‘‘managed care’’ type of environment. The intent was to capture insurance status at time of diagnosis, to the extent possible. Comorbidity status, as coded at the time of diagnosis, was based on the following menu of options built into the project's electronic data reporting instrument: myocardial infarction, congestive heart failure, peripheral vascular disease, cerebrovascular disease, chronic pulmonary disease, connective tissue disease, ulcer disease, dementia, hemiplegia, AIDS, diabetes, diabetes with end organ damage, mild liver disease, moderate/severe liver disease, moderate/severe renal disease, any tumor, leukemia, lymphoma, metastatic solid tumor.

Statistical analysis

For each of the four study outcomes: receipt of surgery, radiation, chemotherapy, and no treatment at all, we conducted unadjusted analysis to assess their associations with race and each of the covariates, All comparisons were accompanied by χ^2 tests to measure the statistical significance with 2-sided p values (Table 3). We used multivariable logistic regression models to determine whether there were significant differences in the likelihood of receiving a particular therapy (ie, surgery, radiation, chemotherapy and no treatment) in whites and blacks after controlling for all other variables as potential confounders, based on a priori information regarding biologic plausibility, suspected causal pathways, and strength of association. We screened for multi-collinearity by

calculating correlation coefficients for each pair of independent variables. Interaction between race and each explanatory variable was assessed using likelihood ratio test. All models were examined for goodness-of-fit. The results of logistic regression were expressed as adjusted odds ratios, with corresponding 95% confidence intervals (CI). Analyses were conducted using SAS Version 9.3 (SAS Institute, Cary, NC).

RESULTS

As shown in Figure 1, among 1197 patients diagnosed with lung cancer between January 1, 2001 to December 31, 2003 in SWGA, 1184 were treated in SWGA. 976 patients were included in the final analysis after excluding those with unknown stage, unknown demographic information (marital status, age at diagnosis, etc.), and those with ethnicity groups other than non-Hispanic black or white.

Receipt of surgery

In all, 155 out of 976 (15.9%) lung cancer patients in SWGA received surgery. As shown in Table 3, the percentage of black patients who received surgery was somewhat higher than that of white patients (18.0 vs. 15.1%), however, the difference was not statistically significant (p=0.2721). Surgery receipt was positively and significantly associated with younger age at diagnosis, being married and having earlier stage of disease. Recipients of Medicaid or those with Medicaid pending had the highest percentage of patients receiving surgery.

In the multivariable logistic regression analyses there was no statistically significant association between race and receipt of surgery among SWGA lung cancer patients (OR=0.64; 95% CI: 0.39-1.06). Compared to the reference age group (< 59 years old), older patients had a lower likelihood of receiving surgery with OR of 0.38 (95% CI: 0.21-0.70) for people aged 59 to 66; 0.39 (95% CI: 0.21-0.73) for the age group 67-74, and 0.20 (95% CI: 0.10-0.41) for those aged 75 or above. Married individuals were more likely to receive surgery compared with those not married (single, separated, divorced,

or widowed) with OR=1.77 (95% CI: 1.11-2.84). Lung cancer patients with unknown tumor grade had the lowest probability of being treated surgically. Lower stage at diagnosis was positively and significantly associated with the receipt of surgery treatment: compared with Stage I, the ORs (95% CIs) for stage II-IV were 0.26 (0.14-0.50), 0.07 (0.04-0.13), and 0.02 (0.01-0.04), respectively. Insurance status and comorbidities were not associated with the receipt of surgery.

Receipt of radiation

A total of 501 out of 976 study participants (51.3%) received radiation therapy (Table 3). About 53% of black patients and 50.6% of white patients were treated with radiation, however this difference was not statistically significant (p=0.4673). Radiation therapy receipt was positively and significantly associated with younger age at diagnosis, being married and later stage when diagnosed. Patients with Medicaid or Medicaid pending were most likely to receive radiation therapy. The frequencies of comorbid conditions were similar in the radiation" and no-radiation groups.

The results of multivariable analyses are shown in Table 4. Race was not a significant predictor of radiation therapy (OR=0.84; 95% CI: 0.62-1.14). Age at diagnosis was associated with the receipt of radiation therapy however the association was statistically significant only for the age group of 75 years old or above with OR=0.51 (95% CI: 0.34-0.77) compared to the reference age group (< 59 years old). Married individuals had higher percentage of receiving radiation therapy as lung cancer treatment relative to single, separated, divorced, or widowed with OR=1.35 (95% CI: 1.03-1.78). Compared

with those covered by private insurance/managed care, Medicare advantage, Medicare with supplemental, and CHAMPUS/ VA coverage, patients with Medicaid/ Medicaid pending or Medicare only (no supplement) were more likely and uninsured individuals (none, self-pay, or by charity) were less likely to receive radiation therapy Higher stage at diagnosis was positively and significantly associated with receipt of radiation therapy. Using Stage I as the reference category, the ORs (95% CIs) were 1.96 (1.14-3.37) for Stage II, 4.41 (2.88-6.75) for Stage III, and 1.14 (0.76-1.69) for Stage IV. Comorbidities and grade were not significant predictors of radiation therapy.

Receipt of chemotherapy

Chemotherapy was given to 478 (49.0%) of participants. An unadjusted comparison of patients who did and did not receive chemotherapy revealed no significant black-white differences (51.3% vs. 48.2%, p=0.3819). Receipt of chemotherapy was positively and significantly associated with younger age at diagnosis, being married, and having fewer comorbidities, higher grade and later stage at diagnosis.

Multivariate logistic regression modeling results for chemotherapy receipt are shown in Table 4. Age at diagnosis was significantly associated with the receipt of chemotherapy for the patients aged 67-74 years old with OR=0.64 (95% CI: 0.43-0.96) and age group 75 years old or above (OR=0.51, 95% CI: 0.34-0.77) compared to the reference age group (< 59 years old). Married individuals had higher frequency of receiving chemotherapy relative to the non-married patients (OR=1.42; 95% CI: 1.07-1.89). Patients with Medicaid/ Medicaid pending or Medicare only (no supplemental) were less likely to

receive chemotherapy (OR=0.68, 95% CI: 0.49-0.95) compared with those covered by private insurance/managed care. Compared with Stage I each incremental increase in disease stage was associated with an increase in the likelihood of chemotherapy with the highest OR of 4.69 (95% CI: 2.93-7.51) observed for Stage IV. Grade and comorbid conditions were not associated with receipt of chemotherapy.

No treatment received

Of the 976 study subjects, 214 (21.9%) did not receive any treatment (surgery, radiation or chemotherapy) within one year of lung cancer diagnosis. Patients that received no treatment were particularly more likely to be older, not married and have unknown tumor grade or advanced disease stage (all p-values <0.001). Other factors demonstrating statistically significant associations with receiving no treatment in the unadjusted analyses included insurance status (p=0.0104) and greater number of comorbidities (p= 0.0085).

Race was not significantly related to failure to receive any lung cancer directed treatment in either unadjusted (Table 3) or multivariable (Table 4) analyses. After adjusting for all other covariates in the model, age at diagnosis remained an important predictor of no treatment with significantly increased ORs (relative to those <59 years of age) for aged groups 67-74 (OR=2.20, 95% CI: 1.27-3.81) and 75+ years (OR=5.75, 95% CI: 3.39-9.75). Married individuals have lower frequency of receiving no treatment at all compared with those not married with an OR of 0.59 (95% CI: 0.42-0.83). Patients with Medicaid/ Medicaid pending or Medicare only (no supplement) and those uninsured

were more likely to receive no treatment at all (OR=1.53, 95% CI: 1.04-2.24; and OR=2.21, 95% CI: 1.28-3.80, respectively) compared with those covered with private insurance/managed care. The statistically significant associations with unknown grade and advanced stage that were observed the unadjusted analyses remained strong and statistically significant after controlling for confounders.

DISCUSSION

We examined patterns of treatment among lung cancer patients in SWGA and did not find statistically significant racial differences in receipt of any specific lung cancer treatment (surgery, radiation and chemotherapy) or in getting no treatment at all. Younger age at diagnosis and being married were positively and significantly associated with lung cancer treatment in all analyses. Patients with earlier stage of lung cancer were more likely to receive surgery and less like to receive radiation and chemotherapy or have no treatment at all.

Previous research has shown that racial disparities do exist in receipt of surgery among lung cancer patients [19, 20, 23, 27-30], especially among early-stage non-small cell lung cancer patients for whom surgery is the optimal care [19, 27, 29, 30]. Bach et al [19] and Hardy et al [20] reported that black early stage NSCLC patients were significantly less likely to undergo surgical resection compared with their white counterparts based on data from the Surveillance, Epidemiology, and End Results (SEER) cancer registries. Steele et al [23] performed analyses of lung cancer cases using Alabama Statewide Cancer Registry data linked Medicare claims and found statistically significant racial disparities in receipt of surgery for both rural and urban areas.

Racial disparities have also been reported in some (but not all) studies evaluating receipt of radiation and chemotherapy among lung cancer patients. The previously cited study by Hardy et al [20] observed that black Medicare beneficiaries were less likely to receive chemotherapy compared to whites, but there were no statistically significant racial

differences with respect to the receipt of radiation. In another study Bradley et al [31] reported that black Medicare beneficiaries with NSCLC were less likely to receive radiation and chemotherapy than white beneficiaries. In another previously cited study, Steele et al [23] found that racial disparities in the receipt of radiation existed in urban but not rural counties.

Some researchers have explored the multifactorial reasons for racial disparities [27-29]. Lathan et al found that black patients with early stage lung cancer were less likely to receive recommendation for surgical treatment and were more likely to refuse offered surgery. McCann et al suggested that the lower surgical rate among black patients with early stage lung cancer is mainly due to low rates of acceptance of surgical treatment. Cykert et al indicated that although both white and black patients were affected by poor communication and low diagnostic certainty, limited regular source of care and inadequate documentation of comorbidities were exclusively associated with lower surgical rates among black patients [29].

Marital status and age at diagnosis were identified as strong predictors for receipt of lung cancer treatment in our study, which is in agreement with previous findings. Ou et al [32] found that unmarried NSCLC patients were less likely to be offered surgery, to undergo surgery, and to accept surgery. Similarly, Goodwin et al [33] and Greenberg et al [34] also reported that unmarried patients were less likely to undergo treatment. Consistently with our findings, Kapadia et al also reported that younger patients were

more likely to receive palliative radiotherapy [35], which concurred with previously reported American and Canadian data [36, 37].

Strengths and limitations

The strength of our study is that we collected treatment information directly from medical records rather from claims data [19, 20, 23, 38]. Our data collection method is superior because it avoids the miscoding of procedures and is not affected by the underestimation of comorbidities associated with the Medicare claims [39, 40]. Moreover, by including eligible lung cancer patients of all ages, we accounted for the variability in the care provided to the oldest and the youngest individuals, which presents an advantage compared with Medicare-based studies that only included patients aged 65 years or older [19, 23].

Our findings of no apparent racial disparities in receipt of lung cancer treatment seem inconsistent with previous studies. It is important to keep in mind, however, that SWGA is an area that has not been sufficiently represented in the previous research. Social factors such socioeconomic status (SES), and rural/urban residence shown to be associated with receipt of lung cancer treatment [19, 23, 38, 41] may have different distributions in different parts of the country. For this reason it is possible that previous research findings are not applicable to regions such as SWGA which are characterized by low levels of income, considerable distance from major metropolitan areas and large proportions of rural residents that include both whites and African Americans. Similar

studies of SWGA patients diagnosed with cancers of breast [26] and colon (manuscript in preparation) also found no racial disparities in treatment receipt.

Few studies focused on receipt of lung cancer treatment in rural areas, which are traditionally underrepresented in health care research. Our study was made possible by the active and established cancer research partnership involving eight institutions: Emory University in Atlanta, the Centers for Disease Control and Prevention (CDC), the Georgia Comprehensive Center Registry, the Southwest Georgia Cancer Coalition, and the four community cancer centers located within the SWGA region. The Coalition, as the link between Atlanta research institutes and local community cancer centers, is the key organizational force for cancer prevention, education, care and research to raise community awareness in SWGA.

The presence of an active patient support and advocacy organization such as the SWGA Cancer Coalition undoubtedly facilitates research efforts. However, it is also possible that the Coalition's success makes it difficult to generalize the findings in SWGA to other rural parts of Georgia and the rest of the country. Another limitation of this study is that the data were collected for patients diagnosed from 2001 to 2003, which may render our results out of date. Our analyses may also be limited by the lack of data on additional factors thought to be related to the receipt of lung cancer treatment, most notably socioeconomic status and histological subtypes (NSCLC and SCLC).

Conclusion

Our findings confirmed previous reports indicating that marital status and age are important determinants of treatment receipt among lung cancer patients. We also found no evidence of racial disparities, a result which goes contrary to previous findings reported in other parts of the country, but is consistent with our earlier observations in the SWGA population. Future studies should collect more information on patients' preferences to identify the full set of socio-psycho factors influencing treatment receipt. Further investigations are also needed in both SWGA and other rural areas of the country to extend the analysis beyond treatment receipt, and to evaluate predictors of treatment completion and survival among lung cancer patients.

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TABLES

Table 1 Non-Small Cell Lung Cancer (NSCLC), Treatment Options by Stage

Stage I	○ Surgery (wedge resection, segmental resection, sleeve resection, or lobectomy). ○ External radiation therapy (for patients who cannot have surgery or choose not to have surgery).	
Stage II	○ Surgery (wedge resection, segmental resection, sleeve resection, lobectomy, or pneumonectomy). ○ Chemotherapy followed by surgery or surgery followed by chemotherapy ○ External radiation therapy (for patients who cannot have surgery or choose not to have surgery). ○ A clinical trial of radiation therapy following surgery.	
Stage III A	NSCLC can be removed with surgery	○ Surgery (wedge resection, segmental resection, sleeve resection, lobectomy, or pneumonectomy). ○ Chemotherapy followed by surgery or surgery followed by chemotherapy ○ External radiation therapy (for patients who cannot have surgery or choose not to have surgery). ○ Radiation therapy following surgery.
	NSCLC can NOT be removed with surgery	○ Chemotherapy combined with radiation therapy. ○ External radiation therapy alone (for patients who cannot be treated with combined therapy, as palliative treatment). ○ Internal radiation therapy or laser surgery using an endoscope, as palliative treatment.
Stage III B	○ Chemotherapy followed by or combined with external radiation therapy. ○ Chemotherapy followed by surgery. ○ External or internal radiation therapy as palliative therapy.	
Stage IV	○ Combination chemotherapy. ○ Combination chemotherapy and targeted therapy with a monoclonal antibody. ○ Targeted therapy with a tyrosine kinase inhibitor. ○ Maintenance therapy with an anticancer drug to help keep cancer from progressing, after combination chemotherapy. ○ External radiation therapy as palliative therapy. ○ Laser therapy and/or internal radiation therapy using an endoscope.	

Table 2 Small Cell Lung Cancer (SCLC), Treatment Options by Stage

Limited-Stage SCLC	○ Combination chemotherapy and radiation therapy to the chest. Radiation therapy to the brain may later be given to patients with complete responses. ○ Combination chemotherapy for patients with lung problems or who are very ill. Radiation therapy to the brain may later be given to patients with complete responses. ○ Surgery followed by chemotherapy or chemotherapy plus radiation therapy to the chest. Radiation therapy to the brain may later be given to patients with complete responses. ○ Clinical trials of new chemotherapy, surgery, and radiation treatments.
Extensive-Stage SCLC	○ Combination chemotherapy. Radiation therapy to the brain may later be given to patients with complete responses. ○ Radiation therapy to the brain, spine, bone, or other parts of the body where the cancer has spread, as palliative therapy to relieve symptoms and improve quality of life. ○ Clinical trials of new chemotherapy treatments.

Table 3 Characteristics of participants diagnosed with lung cancer in SWGA, 2001-2003.

Characteristic	# Patients (N=976)	% of Sample	Treated surgically (N=155)		Treated with radiation (N=501)		Treated with chemotherapy (N=487)		Not treated (N=476)	
			N (%)	P-value	N (%)	P-value	N (%)	P-value	N (%)	P-value
Age at diagnosis (years)										
< 59	241	24.7	56 (23.2)	0.0004	145 (60.2)	0.0017	153 (63.5)	<.0001	28 (11.6)	<.0001
59-66	239	24.5	39 (16.3)		122 (51.1)		129 (54.2)		37 (15.5)	
67-74	262	26.8	39 (14.9)		135 (51.5)		134 (51.2)		55 (21.0)	
75+	234	24.0	21 (9.0)		99 (42.3)		62 (26.5)		94 (40.2)	
Race [1]										
White	715	73.3	108 (15.1)	0.2721	362 (50.6)	0.4673	344 (48.2)	0.3819	163 (22.8)	0.2764
Black	261	26.7	47 (18.0)		139 (53.3)		134 (51.3)		51 (19.5)	
Marital Status [2]										
Married	524	53.7	102 (19.5)	0.001	288 (55.0)	0.0146	276 (52.8)	0.0118	89 (17.0)	<.0001
Not Married	452	46.3	53 (11.7)		213 (47.1)		202 (44.7)		125 (27.7)	
Insurance Status [3]										
Private (FFS,HMO) + Medicare w/supplemental + VA/CHAMPUS	610	62.5	103 (16.9)		309 (50.7)		304 (49.9)		121 (19.8)	
Medicare Only (no supplement)	174	17.8	24 (13.8)	0.5431	88 (50.6)	0.5887	66 (37.9)	0.0019	52 (29.9)	0.0104
Medicaid/Medicaid Pending	80	8.2	14 (17.5)		47 (58.8)		50 (62.5)		12 (15.0)	
Uninsured (none/self-pay/ charity)	112	11.5	14 (12.5)		57 (50.9)		58 (51.8)		29 (25.9)	
Comorbid conditions [4]										
None	247	25.3	39 (15.8)	0.7281	130 (52.6)	0.1697	131 (53.3)	0.0008	51 (20.7)	0.0085
One	270	27.7	43 (15.9)		149 (55.2)		153 (56.7)		46 (17.0)	
Two	236	24.2	42 (17.8)		121 (51.3)		103 (43.6)		51 (21.6)	
Three or more	223	22.9	31 (13.9)		101 (45.3)		91 (40.8)		66 (29.6)	

Grade									
I	30	3.1	6 (20.0)		17 (56.7)		12 (40.0)	5 (16.7)	
II	176	18.0	52 (29.6)		95 (54.0)		79 (44.9)	26 (14.8)	
III	288	29.5	75 (26.0)	<.0001	151 (52.4)	0.5961	134 (46.5)	0.0222	47 (16.3)	<.0001
IV	67	6.9	6 (9.0)		37 (55.2)		44 (66.7)	7 (10.5)	
Unknown	415	42.5	16 (3.9)		201 (48.4)		209 (50.4)	129 (31.1)	
AJCC Stage at diagnosis									
Stage I	155	15.9	86 (55.5)		60 (38.7)		30 (19.4)	18 (11.6)	
Stage II	89	9.1	29 (32.6)	<.0001	50 (56.2)	<.0001	38 (43.2)	<.0001	14 (15.7)	<.0001
Stage III	304	31.2	30 (9.9)		219 (72.0)		197 (64.8)	51 (16.8)	
Stage IV	428	43.9	10 (2.3)		172 (40.2)		213 (49.8)	131 (30.6)	

1 Racial/ethnic groups are categorized into 2-level variable that includes non-Hispanic whites (White) and non-Hispanic blacks (Black), since all other racial/ethnic groups combined (including Filipino, Asian Indian, New Guinean and Other Asian) constituted only 0.5% of the incident lung cancer cases in SWGA in 2001–2003;

2 Not married include patients who are single, separated, divorced, or widowed;

3 This 4-level variable was constructed from the coverage options in a drop-down box in the electronic data collection instrument as follows: Uninsured (no insurance, self-pay, or charity); Medicaid (either enrolled in Medicaid or application for enrollment pending); Medicare only (enrolled in fee-for-service Medicare and without supplemental private insurance); and Private insurance/managed care (private insurance, health maintenance organization/independent practice association (HMO/IPA), Medicare advantage or fee-for-service Medicare with supplemental private insurance, and CHAMPUS or VA coverage). The inclusion of military service-related options in the final category assumes that cancer care provided by the Department of Defense and the Department of Veterans Affairs is delivered in a ‘‘managed care’’ type of environment. Consistently, the intent was to capture insurance status at time of diagnosis, to the extent possible;

4 As coded at the time of diagnosis, based on the following menu of options built into the project’s electronic data reporting instrument: myocardial infarction, congestive heart failure, peripheral vascular disease, cerebrovascular disease, chronic pulmonary disease, connective tissue disease, ulcer disease, dementia, hemiplegia, AIDS, diabetes, diabetes with end organ damage, mild liver disease, moderate/severe liver disease, moderate/severe renal disease, any tumor, leukemia, lymphoma, metastatic solid tumor (Note also that any patient with a recorded previous cancer was excluded from these analyses).

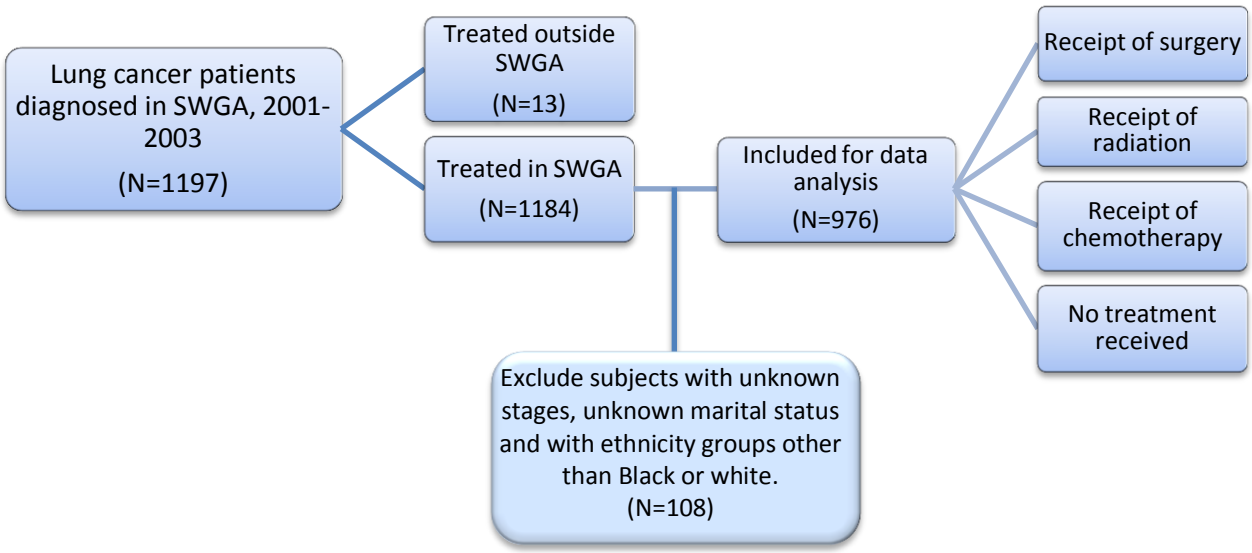
Table 4 Multivariable Logistic Regression Analysis of the Association between Treatment Modality and Characteristics of Study Participants

Characteristic	Treated surgically			Treated with radiation			Treated with chemotherapy			Not treated		
	OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI	
Race												
Black	1.00			1.00			1.00			1.00		
White	0.64	0.39	1.06	0.84	0.62	1.14	0.81	0.59	1.12	1.41	0.95	2.09
Age at diagnosis (years)												
< 59	1.00			1.00			1.00			1.00		
59-66	0.38	0.21	0.70	0.75	0.51	1.12	0.74	0.49	1.11	1.54	0.87	2.71
67-74	0.39	0.21	0.73	0.77	0.52	1.14	0.64	0.43	0.96	2.20	1.27	3.81
75+	0.20	0.10	0.41	0.51	0.34	0.77	0.19	0.12	0.30	5.75	3.39	9.75
Marital Status												
Not Married	1.00			1.00			1.00			1.00		
Married	1.77	1.11	2.84	1.35	1.03	1.78	1.42	1.07	1.89	0.59	0.42	0.83
Insurance Status												
Private (FFS,HMO) + Medicare w/supplemental + VA/CHAMPUS	1.00			1.00			1.00			1.00		
Medicaid or Medicare Only	1.07	0.63	1.82	1.02	0.74	1.40	0.68	0.49	0.95	1.53	1.04	2.24
Uninsured (none/self-pay/charity)	0.50	0.23	1.08	0.88	0.56	1.37	0.77	0.49	1.23	2.21	1.28	3.80
Comorbid conditions												
None	1.00			1.00			1.00			1.00		
One	0.79	0.43	1.46	1.00	0.68	1.46	1.28	0.86	1.90	0.87	0.53	1.41
Two	0.82	0.43	1.57	1.02	0.69	1.51	0.91	0.61	1.37	0.94	0.58	1.53
Three or more	0.80	0.40	1.59	0.75	0.50	1.12	0.76	0.50	1.16	1.35	0.83	2.18
Grade												
I, II	1.00			1.00			1.00			1.00		
III, IV	1.17	0.71	1.93	0.92	0.64	1.34	1.03	0.69	1.52	0.92	0.55	1.53
Unknown	0.19	0.10	0.36	0.81	0.56	1.17	1.08	0.73	1.59	1.87	1.17	3.00

AJCC Stage at diagnosis												
Stage I	1.00			1.00			1.00			1.00		
Stage II	0.26	0.14	0.50	1.96	1.14	3.37	3.19	1.74	5.85	1.55	0.70	3.46
Stage III	0.07	0.04	0.13	4.41	2.88	6.75	9.31	5.69	15.25	1.30	0.71	2.40
Stage IV	0.02	0.01	0.04	1.14	0.76	1.69	4.69	2.93	7.51	3.07	1.73	5.45

FIGURES

Figure 1 Lung cancer patients diagnosed and treated in SWGA, 2001-2003: Receipt of different kinds of treatments in our study population.



EMORY UNIVERSITY
Institutional Review Board

October 4, 2011

RE: Determination: No IRB Review Required
Title: Rural/urban residency and racial disparities among lung cancer patients
PI: Xinwei Hua

Dear Principal Investigator:

Thank you for requesting a determination from our office about the above-referenced project. Based on our review of the materials you provided, we have determined that it does not require IRB review because it does not meet the definition(s) of "research" involving "human subjects" or the definition of "clinical investigation" as set forth in Emory policies and procedures and federal rules, if applicable. Specifically, in this project, you will be conducting data analysis with de-identified datasets.

This determination could be affected by substantive changes in the study design, subject populations, or identifiability of data. If the project changes in any substantive way, please contact our office for clarification.

Thank you for consulting the IRB.

Sincerely,

Andrea Goosen, MPH
Research Protocol Analyst
This letter has been digitally signed