

# Enhancing the Value Care of Lung Cancer Treatment for Medically Underserved Population in Kentucky

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## Abstract

**Background:** For many years Kentucky has had the nation's highest lung cancer incidence. Kentucky is one of the thirteen states in Appalachia in which the difference in wealth is a key determinant of health since residents of Appalachia do not have access to the same financial resources as the rest of the US population. In this study, the value of lung cancer treatment for a medically underserved population (Appalachia) would be evaluated based on health insurance type and treatment pattern. **Methodology:** Data for lung cancer cases diagnosed between 2000 and 2011 were obtained from the Kentucky Cancer Registry (KCR). The cohort included 49,512 patients who met the following inclusion criteria. Patients were classified into two distinct groups based on county location: Appalachian and Non-Appalachian. Chi-square, Cox survival regression analysis, and Kaplan Meier survival trend were performed to identify variables affecting treatment and survival. **Result:** The analysis evaluated 49,512 patients from KCR. For all population, sex ( $p < .0001$ ), age group ( $p < .0001$ ), Stage ( $p < .0001$ ), insurance type ( $p < .0001$ ) and county ( $p < .0001$ ) were significantly associated with the type of treatment. **Conclusions:** Even though the strongest predictors for survival in lung cancer are age and cancer Stage, health insurance does have a significant impact on improving the survival rate. Overall, early diagnosis and timely follow up are imperative for improving the value care in lung cancer treatment.

**Keywords:** value care, Lung cancer, medically underserved population.

## 1. Introduction

Lung cancer is the leading cause of cancer deaths in both men and women in the United States and causes more deaths than any other malignancy (Greenwald, Polissar, Borgatta, McCorkle & Goodman, 1998; Kathuria, Gesthalter, Spira, Brody & Steiling, 2014; Mulligan et al., 2006). In 2011, 14% of all cancer diagnosis and 27% of all cancer deaths were due to lung cancer (Center of Disease Control & Prevention, 2015). The cost of all cancer care in US for 2020 is estimated to be \$207 billion, as the result of 5% escalating cost in the initial phases of care during the follow up year (Mariotto, Yabroff, Shao, Feuer & Brown, 2011). Economic hardship occurred not only among those ineligible for government financial support, but also among those receiving subsidies that were insufficient to meet the cost of managing a long-term illness over and above necessary daily living expenses (Jeon, Essue, Jan, Wells & Whitworth, 2009).

It was stated in previous studies that patients with lung cancer mostly had Medicaid or were uninsured as their health insurance type (Halpern et al., 2008). Concern had been raised over the disproportionate cancer mortality rate among minority and low-income persons in that the lung cancer rate was 4.5 times higher among the Medicaid recipients (Bradley, Given &

Roberts, 2001). The availability and access to health care might indeed be more important in determining the clinical outcome than previously thought (Mulligan et al., 2006). Loss of insurance might, therefore, jeopardize completion of planned therapies and the management of symptoms related to cancer and its treatment as well as palliative care at the end of life (Ramsey et al., 2008).

Lung cancer disparities still exist in the US and can be attributed to variations in lung cancer care, since these disparities are multi-factorial (Nadpara et al., 2015). The disparities in lung cancer mortality within the Commonwealth of Kentucky were not completely clear, but some postulated that poor access to care or substandard care might contribute to the statistics (Lee, Kloecker, Pan, Rai & Dunlap, 2013). Kentucky is the state with the highest mortality rate of lung and bronchial cancer with a rate of 72:100,000 individuals for both sexes (SEER). Many attributes of Appalachia affect the health of its residents and specifically their cancer risk, screening, treatment and survival (Paskett et al., 2011).

The cost of lung cancer was substantial and Medicare paid a smaller proportion of the total cost over time (Cipriano et al., 2011). Hospitalization was the largest contributor to the total cost, followed by outpatient visits (Davis et al., 2015). It was possible that patients living in remote areas and those who were old and frail might not be offered treatment (Evans, Will, Berthelot & Wolfson, 1996), while the most cost-effective therapies tended to be those that were also the most effective (Boyer, 1996). In fact, chemotherapy remains underutilized while surgical utilization is increasing (Davis et al., 2015). There is no routine screening recommended for lung cancer, and as a result many tumors are discovered at the late Stage of the disease (Joyce, Schwartz & Huhmann, 2008). Nevertheless, treatment options are the most appropriate for every patient who is being judged based on their fitness for treatment, taking into account co-morbidities (Macbeth, Abratt, Cho, Stephens & Jeremic, 2007).

Patient-related reasons that might cause cancer to remain un-Staged after diagnosis include patient choice, financial constraints, or the lack of access to comprehensive care (Lengerich et al., 2005). In Kentucky, lung cancer patients utilizing all other types of insurance had a significantly higher risk of death within three years when compared to privately insured patients (McDavid, Tucker, Sloggett & Coleman, 2003). Patients have chosen less effective treatments with lower out of pocket costs (Cipriano et al., 2011). Access to health insurance is known to influence the amount and quality of health care received, and thus the insurance status of cancer patients may be important to their survival (McDavid et al., 2003).

When considering health care reform, giving value in health care refers to high quality care with low cost (Sprandio, 2015). Hence, enhancing quality means increasing reliability of delivery, a focus on processes of care delivery, including high reliability (Porter, 2010); while control of costs is reducing unnecessary utilization, failure of delivery, coordination, and overtreatment (Berwick & Hackbarth, 2012). Therefore, value is understood as the degree to which health services increase the likelihood of desired health outcomes, are consistent with professional knowledge, and are delivered with the proper allocation of resources (IOM, 2001).

## 2. Method

This study was a retrospective analysis approved by the Institutional Review Board at the University of Kentucky. The data for Non-Small Lung Cancer Cell (NSCLC) cases diagnosed between 2000 and 2011 were obtained from the Kentucky Cancer Registry (KCR). The cohort included 49,512 patients who met the following inclusion criteria: Lung cancer was their first diagnosed cancer Stage 0 through IV.

For purposes of this analysis, the patients were classified into two distinct groups based on county location: Appalachian and Non-Appalachian. All included patients were required to have treatment information in order to be sub-classified based on initial treatment modality: No treatment, Surgery Only, Radiation Only, Chemotherapy Only, Surgery + Chemotherapy, Surgery + Radiation therapy, Surgery + Radiation + Chemotherapy, Radiation + Chemotherapy. Chi-square, Cox survival regression analysis, and Kaplan Meier survival trend were performed.

### **3. Result**

This study demonstrated that most of the population suffering from lung cancer (NSCLC type) did not receive treatment and a large part of the population was found in the advanced Stages of the disease. Despite age and Stage as strong predictors of survival rate, disparities in the recommended treatment for early Stage disease occurred between health insurance types. The general demographic description for this cohort were females who were seventy or more years of age; while individuals who were of white race and tobacco users with Stage IV disease predominantly lived in Non-Appalachia counties. Most individuals undergoing treatment for lung cancer in Kentucky received a combination of radiation and chemotherapy, which was common for Stage III NSCLC. However, patients are frequently found in Stage IV but large numbers of them received treatment with Radiation + Chemotherapy instead of chemotherapy even though chemotherapy was the recommended treatment for Stage IV. The study showed that all insurance type groups had superior survival time when the patient received treatment with a combination therapy of Surgery + Radiation and Surgery + Radiation + Chemotherapy. All insurance types also had increased survival times when patients received a single therapy of Surgery Only and Chemotherapy Only. Over all, the combination and single therapy that yield higher mortality risk was the recommended treatment for advanced Stages of the disease, while single therapy of Surgery Only was the recommendation treatment for early Stages.

#### 4. Figures

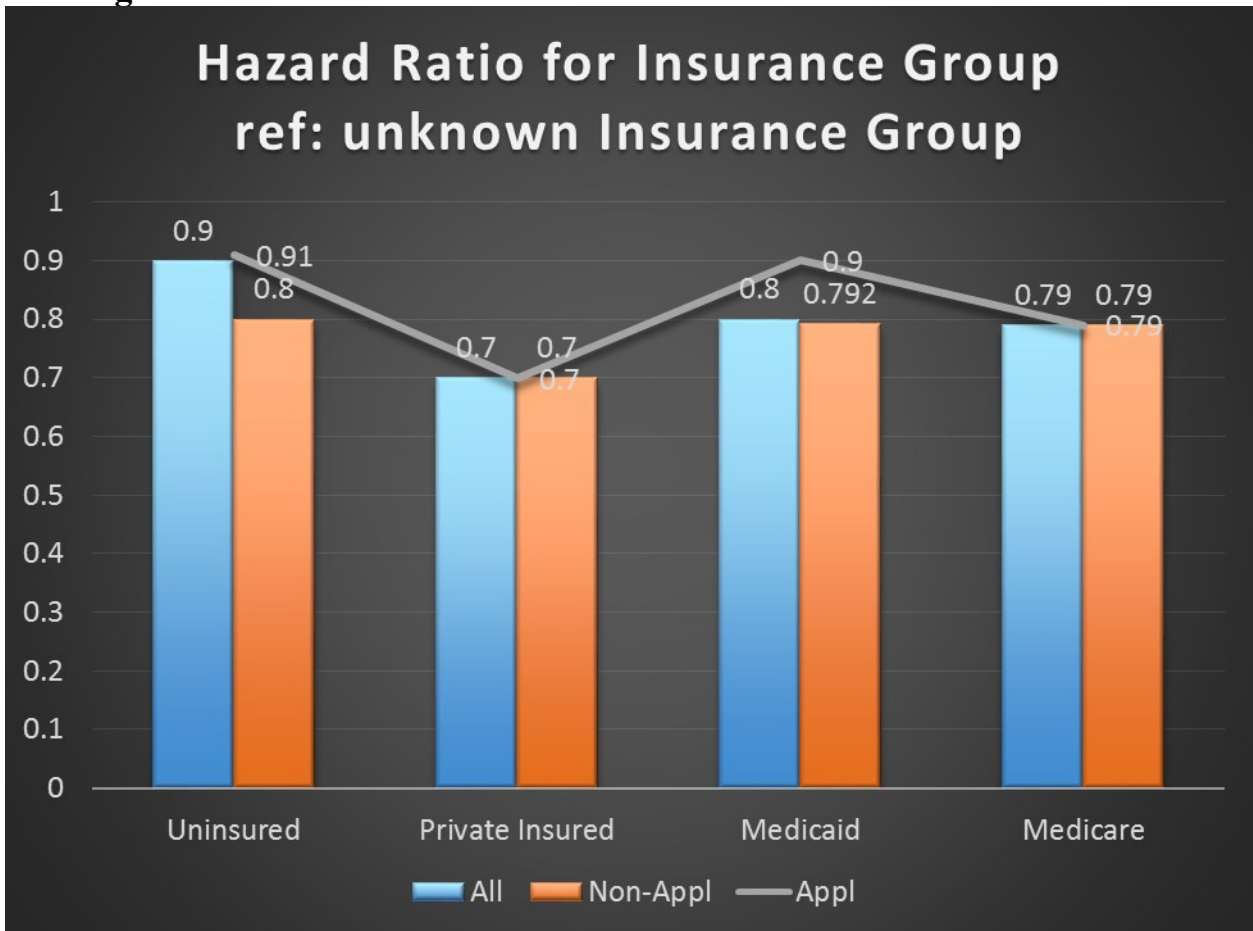


Figure 1. Hazard Ratio for Insurance Group.

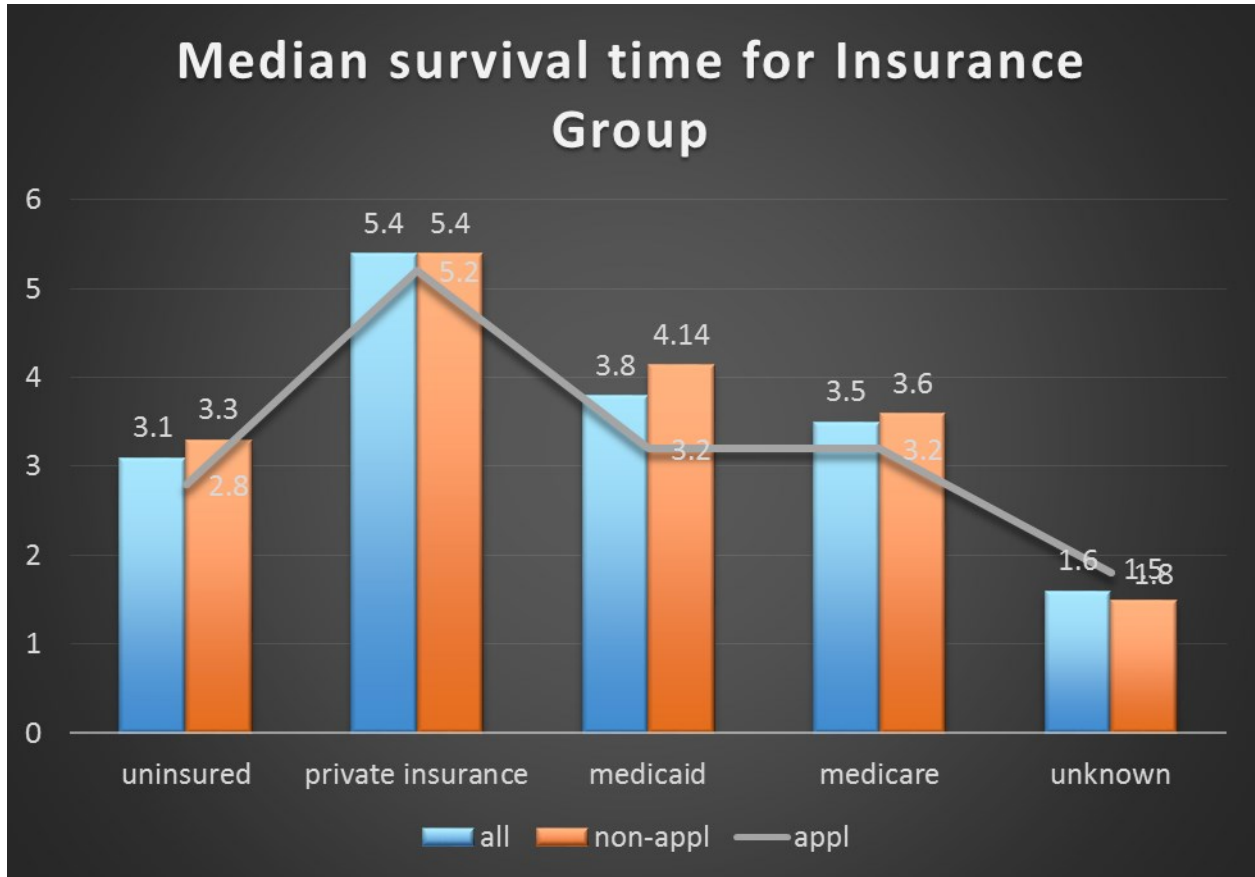


Figure 2. Median survival time for Insurance Group

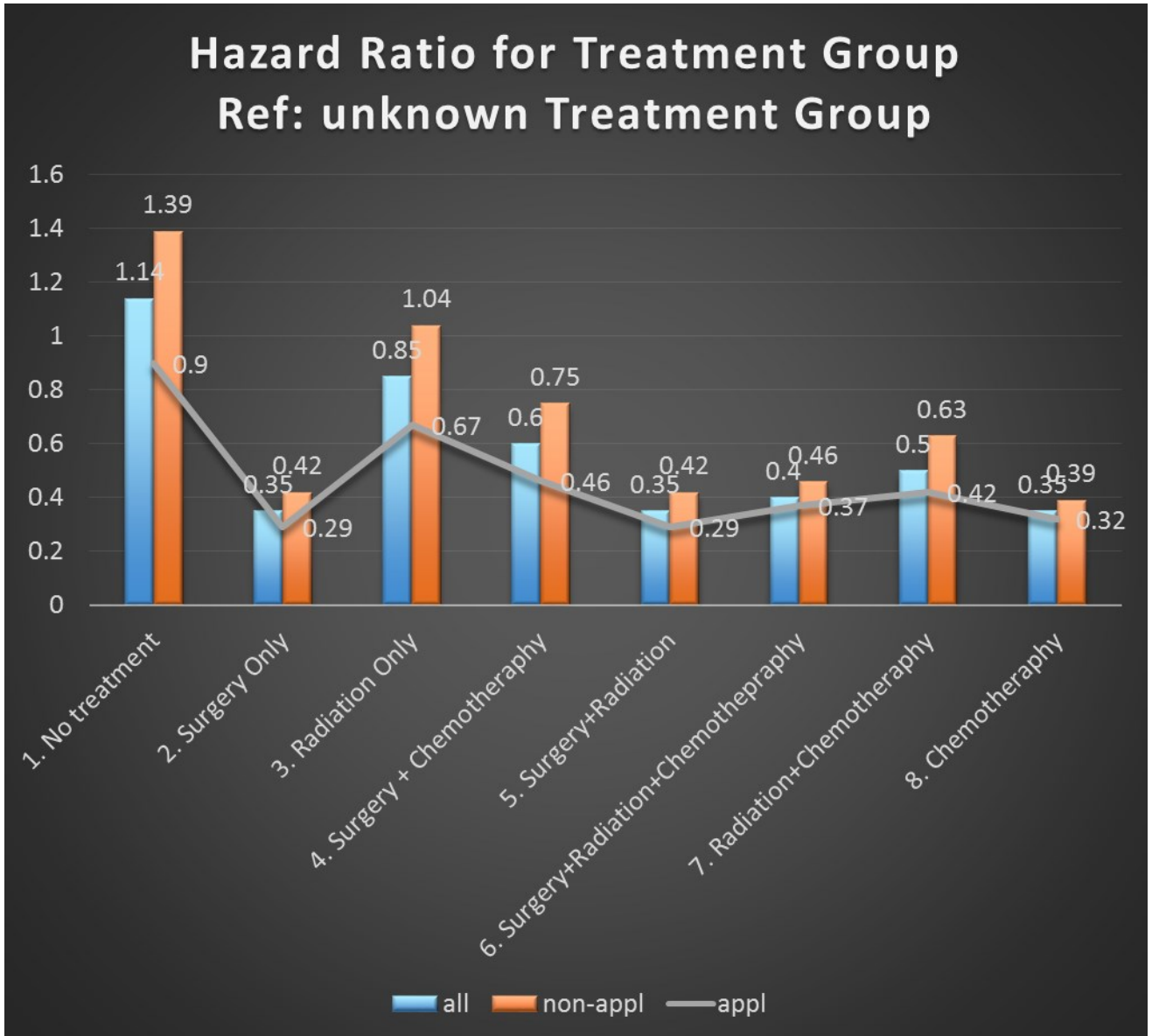


Figure 3. Hazard Ratio for Treatment Group

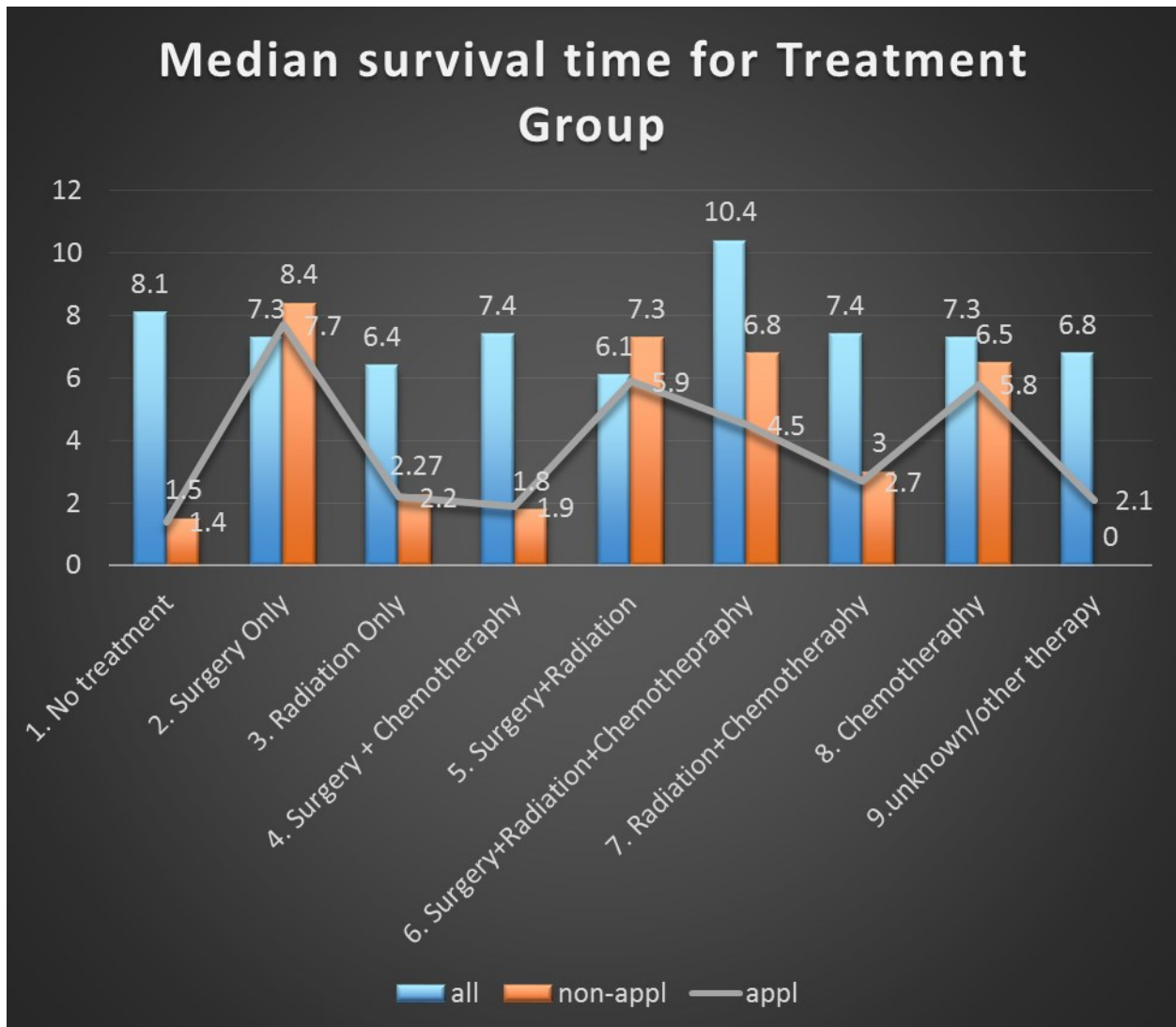


Figure 4. Median Survival Time for Treatment Group

### 5. Discussion

The study demonstrated that there was underutilization of lung cancer treatment occurred in Kentucky since 30 percent of the population did not receive treatment and most patients did not receive the recommended treatment (Ramsey, Howlader, Etzioni & Donato, 2004). Lung cancer treatment is varied and depends on the Stage of the disease. For patients with early Stage NSCLC, the best opportunity for cure remains surgical resection (Groth et al., 2013). Unfortunately, health care insurance status often dictates whether or not an operation is performed (Bradley, Given, Dahman, Luo & Virnig, 2007). The study found that most patients who were treated with surgery at an early Stage of the disease were patients with private insurance and Medicare residing in both Non-Appalachia and Appalachia.

Combined modality therapy conferred survival advantages on patients, but it was not always utilized in all patients (Lee et al., 2013). Effective treatment for advanced Stages of lung cancer was a combination of therapies, but a good prognosis depended on the early detection of the cancer (Forrest, Adams, White & Rubin, 2014; Hirsch, Fischer, Niklinski & Zöchbauer-Müller, 2002; Kanashiki et al., 2003). This might reflect the increased access of radiotherapy

and chemotherapy in rural areas and among referring physicians (Lee et al., 2013). There were many factors involved in the choice of treatment including its financial feasibility regardless the Stage of the cancer Stage (Gogineni, Shuman & Emanuel, 2013). Treatment often fell short of recommended care due to clinical reasons, including inoperable conditions, co-morbid conditions, the patient's refusal and advanced age (Bradley et al., 2007). Physicians might utilize surgery as palliative treatment for Stage IV ("www.lung-cancer.com,").

Financial feasibility is an issue depending on the method of payment such as out of pocket or a government insurance plan (Ramsey et al., 2008). The elder population was the largest group in both Non-Appalachia and Appalachia counties, making them eligible for Medicare. The strongest predictors for lung cancer survival are age and Stage of cancer. Even though patients with private insurance demonstrated better outcomes when compared to other health insurance types, this result did not affect the mortality risk and survival time when the cancer was already in the advanced Stage. However, having health insurance was better than not having assurance of obtaining the recommended treatments. Apparently, insurance at some point enhanced the patients' efforts of obtaining standard treatment regardless their cancer Stage.

On the other hand, the fact that there were large numbers of patients who did not get treatment and high percentage of censoring value indicated the poor initial condition of the patients. Medicaid enrollment policies that required individuals to meet disability requirements often placed patients close to the end of life (Bradley, Gardiner, Given & Roberts, 2005). Being Uninsured or having Medicaid insurance resulted in a substantially increase in the risk of being diagnosed with more advanced states of disease than having privately insurance (Halpern et al., 2008). Care for persons with advanced cancer was more intensive and costly than for early Stage and carried a higher risk for complications related to treatment (Ramsey et al., 2008). On the contrary, the goal of delivering value care was what matters for patients and united the interest of all actors in the system. If value improved, patients, payers, providers, and suppliers could also receive the benefits, while the economic sustainability of the health care system increased (Porter, 2010). The outcomes from Lung cancer treatment in Kentucky were suboptimal, making it worthwhile for the decision maker to review the state's health insurance coverage policies.

## 6. Conclusion

Over all, the efforts in enhancing value care for lung cancer treatment was found in reducing disparities. Many studies demonstrated that lung cancer treatment had not been effective for several patient groups, most especially for those who were medically underserved. Treatment, even if it was provided to patients, would not improve survival for advanced Stage lung cancer patients (Bradley et al., 2005). Changes in insurance coverage for the uninsured and underinsured were needed to consider the adequacy, availability and affordability of new programs. In order to achieve equity in healthcare, especially for individuals with cancer, these aspects were needed to be addressed in order to remove the barriers to disease screening and timely access to medical care providers (Halpern et al., 2008). The reasons behind the disparity in cancer care based on insurance status were likely included both the healthcare system and patient factors (Groth et al., 2013). Much had yet to be learned in order to narrow the gap in the treatment and survival from lung cancer. Finally, improving patient outcomes by ensuring a more equitable dissemination of recommended therapies to all segments of population was one means for enhancing the value care in lung cancer.



## References

- Berwick, D. M., & Hackbarth, A. D. (2012). Eliminating waste in US health care. *Jama*, 307(14), 1513-1516. doi:10.1001/jama.2012.362
- Boyer, M. (1996). The economics of lung cancer. *Lung Cancer*, 14(1), 13-17. doi:http://dx.doi.org/10.1016/0169-5002(95)00509-9
- Bradley, C. J., Gardiner, J., Given, C. W., & Roberts, C. (2005). Cancer, Medicaid enrollment, and survival disparities. *Cancer*, 103(8), 1712-1718. doi:10.1002/cncr.20954
- Bradley, C. J., Given, C. W., Dahman, B., Luo, Z., & Virnig, B. A. (2007). Diagnosis of advanced cancer among elderly Medicare and Medicaid patients. *Med Care*, 45(5), 410-419. doi:10.1097/01.mlr.0000256970.19359.2a
- Bradley, C. J., Given, C. W., & Roberts, C. (2001). Disparities in cancer diagnosis and survival. *Cancer*, 91(1), 178-188.
- Center of Disease Control & Prevention, a. N. C. I. (2015). *United States Cancer Statistic: 1999-2012, Incidence & Mortality web-based Report*. Retrieved from Atlanta, GA: [http://www.cdc.gov/cancer/lung/basic\\_info/index.htm](http://www.cdc.gov/cancer/lung/basic_info/index.htm)
- Cipriano, L. E., Romanus, D., Earle, C. C., Neville, B. A., Halpern, E. F., Gazelle, G. S., & McMahon, P. M. (2011). Lung cancer treatment costs, including patient responsibility, by disease stage and treatment modality, 1992 to 2003. *Value in Health*, 14(1), 41-52. doi:http://dx.doi.org/10.1016/j.jval.2010.10.006
- Davis, K. L., Goyal, R. K., Able, S. L., Brown, J., Li, L., & Kaye, J. A. (2015). Real-world treatment patterns and costs in a US Medicare population with metastatic squamous non-small cell lung cancer. *Lung Cancer*, 87(2), 176-185. doi:10.1016/j.lungcan.2014.11.002
- Evans, W. K., Will, B. P., Berthelot, J. M., & Wolfson, M. C. (1996). The economics of lung cancer management in Canada. *Lung Cancer*, 14(1), 19-29. doi:http://dx.doi.org/10.1016/0169-5002(95)00510-2
- Forrest, L. F., Adams, J., White, M., & Rubin, G. (2014). Factors associated with timeliness of post-primary care referral, diagnosis and treatment for lung cancer: population-based, data-linkage study. *Br J Cancer*, 111(9), 1843-1851. doi:10.1038/bjc.2014.472
- Gogineni, K., Shuman, K. L., & Emanuel, E. J. (2013). Survey of Oncologists about Shortages of Cancer Drugs. *New England Journal of Medicine*, 369(25), 2463-2464. doi:doi:10.1056/NEJMc1307379
- Greenwald, H. P., Polissar, N. L., Borgatta, E. F., McCorkle, R., & Goodman, G. (1998). Social factors, treatment, and survival in early-stage non-small cell lung cancer. *Am J Public Health*, 88(11), 1681-1684.
- Groth, S. S., Al-Refaie, W. B., Zhong, W., Vickers, S. M., Maddaus, M. A., D'Cunha, J., & Habermann, E. B. (2013). Effect of insurance status on the surgical treatment of early-stage non-small cell lung cancer. *Ann Thorac Surg*, 95(4), 1221-1226. doi:10.1016/j.athoracsur.2012.10.079

- Halpern, M. T., Ward, E. M., Pavluck, A. L., Schrag, N. M., Bian, J., & Chen, A. Y. (2008). Association of insurance status and ethnicity with cancer stage at diagnosis for 12 cancer sites: a retrospective analysis. *Lancet Oncol*, 9(3), 222-231. doi:10.1016/s1470-2045(08)70032-9
- Hirsch, F. R., Fischer, J. R., Niklinski, J., & Zöchbauer-Müller, S. (2002). Future developments in the treatment of lung cancer. *Lung Cancer*, 38, Supplement 3(0), 81-85. doi:http://dx.doi.org/10.1016/S0169-5002(02)00277-5
- IOM. (2001). Crossing the quality chasm: The IOM Health Care Quality Initiative. Retrieved from <http://www.iom.edu/Reports/2001/Crossing-the-Quality-Chasm-A-New-Health-System-for-the-21st-Century.aspx>
- Jeon, Y.-H., Essue, B., Jan, S., Wells, R., & Whitworth, J. A. (2009). Economic hardship associated with managing chronic illness: a qualitative inquiry. *BMC Health Services Research*, 9, 182-182. doi:10.1186/1472-6963-9-182
- Joyce, M., Schwartz, S., & Huhmann, M. (2008). Supportive Care in Lung Cancer. *Seminars in Oncology Nursing*, 24(1), 57-67. doi:http://dx.doi.org/10.1016/j.soncn.2007.11.013
- Kanashiki, M., Satoh, H., Ishikawa, H., Yamashita, Y. T., Ohtsuka, M., & Sekizawa, K. (2003). Time from finding abnormality on mass-screening to final diagnosis of lung cancer. *Oncol Rep*, 10(3), 649-652.
- Kathuria, H., Gesthalter, Y., Spira, A., Brody, J. S., & Steiling, K. (2014). Updates and controversies in the rapidly evolving field of lung cancer screening, early detection, and chemoprevention. *Cancers (Basel)*, 6(2), 1157-1179. doi:10.3390/cancers6021157
- Lee, K., Kloecker, G., Pan, J., Rai, S., & Dunlap, N. E. (2013). The Integration of Multimodality Care for the Treatment of Small Cell Lung Cancer in a Rural Population and Its Impact on Survival. *Am J Clin Oncol*. doi:10.1097/COC.0b013e3182a5346d
- Lengerich, E. J., Tucker, T. C., Powell, R. K., Colsher, P., Lehman, E., Ward, A. J., . . . Wyatt, S. W. (2005). Cancer incidence in Kentucky, Pennsylvania, and West Virginia: disparities in Appalachia. *J Rural Health*, 21(1), 39-47.
- Macbeth, F. R., Abratt, R. P., Cho, K. H., Stephens, R. J., & Jeremic, B. (2007). Lung cancer management in limited resource settings: Guidelines for appropriate good care. *Radiotherapy and Oncology*, 82(2), 123-131. doi:http://dx.doi.org/10.1016/j.radonc.2006.12.006
- Mariotto, A. B., Yabroff, K. R., Shao, Y., Feuer, E. J., & Brown, M. L. (2011). Projections of the cost of cancer care in the United States: 2010-2020. *J Natl Cancer Inst*, 103(2), 117-128. doi:10.1093/jnci/djq495
- McDavid, K., Tucker, T. C., Sloggett, A., & Coleman, M. P. (2003). Cancer survival in Kentucky and health insurance coverage. *Arch Intern Med*, 163(18), 2135-2144. doi:10.1001/archinte.163.18.2135
- Mulligan, C. R., Meram, A. D., Proctor, C. D., Wu, H., Zhu, K., & Marrogi, A. J. (2006). Unlimited access to care: effect on racial disparity and prognostic factors in lung cancer. *Cancer Epidemiol Biomarkers Prev*, 15(1), 25-31. doi:10.1158/1055-9965.epi-05-0537

- Nadpara, P. A., Madhavan, S. S., Tworek, C., Sambamoorthi, U., Hendryx, M., & Almubarak, M. (2015). Guideline-concordant lung cancer care and associated health outcomes among elderly patients in the United States. *J Geriatr Oncol*. doi:10.1016/j.jgo.2015.01.001
- Paskett, E. D., Fisher, J. L., Lengerich, E. J., Schoenberg, N. E., Kennedy, S. K., Conn, M. E., . . . Dignan, M. (2011). Disparities in underserved white populations: the case of cancer-related disparities in Appalachia. *Oncologist*, *16*(8), 1072-1081. doi:10.1634/theoncologist.2011-0145
- Porter, M. E. (2010). What Is Value in Health Care? *New England Journal of Medicine*, *363*(26), 2477-2481. doi:doi:10.1056/NEJMp1011024
- Ramsey, S. D., Howlader, N., Etzioni, R. D., & Donato, B. (2004). Chemotherapy use, outcomes, and costs for older persons with advanced non-small-cell lung cancer: evidence from surveillance, epidemiology and end results-Medicare. *J Clin Oncol*, *22*(24), 4971-4978. doi:10.1200/jco.2004.05.031
- Ramsey, S. D., Zeliadt, S. B., Richardson, L. C., Pollack, L., Linden, H., Blough, D. K., & Anderson, N. (2008). Disenrollment from Medicaid after recent cancer diagnosis. *Med Care*, *46*(1), 49-57. doi:10.1097/MLR.0b013e318158ec7f
- SEER. (7 February 2015). US Lung Cancer Mortality Rate. Retrieved from [http://seer.cancer.gov/csr/1975\\_2011/browse\\_csr.php?sectionSEL=15&pageSEL=sect\\_15\\_table.01.html](http://seer.cancer.gov/csr/1975_2011/browse_csr.php?sectionSEL=15&pageSEL=sect_15_table.01.html)
- Spradio, D. J. (Producer). (2015). The Oncology Medical Home: The Case of Change. Retrieved from [http://www.medscape.org/viewarticle/836396?src=wnl\\_cme\\_revw](http://www.medscape.org/viewarticle/836396?src=wnl_cme_revw)  
[www.lung-cancer.com](http://www.lung-cancer.com).