Cancer Progress and Priorities: Lung Cancer

Matthew B. Schabath[1,2,*], **Michele L. Cote**[3,4]

[1]Department of Cancer Epidemiology, H. Lee Moffitt Cancer Center and Research Institute, Tampa, Florida USA

[2]Department of Thoracic Oncology; H. Lee Moffitt Cancer Center and Research Institute, Tampa, Florida USA

[3]Wayne State University School of Medicine, Department of Oncology, Detroit, Michigan, USA

[4]Barbara Ann Karmanos Cancer Institute, Detroit, Michigan, USA.

Background

In the United States, lung cancer is the second most common diagnosed cancer and the leading cause of cancer-related death. Though tobacco smoking is the major risk factor accounting for 80 to 90% of all lung cancer diagnoses, there are numerous other risk factors that have been identified as casually associated with lung cancer etiology. However, there are few causally-linked risk factors for lung cancer diagnosed among never smokers which, if considered a unique reportable category, is the 11th most common cancer and the 7th leading cause of cancer-related death. Lung cancer survival has only marginally improved over the last several decades, but the availability of screening and early detection by low-dose computer tomography and advances in targeted treatments and immunotherapy will likely decrease mortality rates and improve patient survival outcomes in the near future.

Keywords

Lung cancer; epidemiology; statistics; disparities; risk factors; prevention early detection; lung cancer screening; epidemiology of lung cancer

Descriptive Epidemiology

Incidence

Globally, lung cancer has been the most common diagnosed cancer for the last several decades [1, 2]. In 2018, there was an estimated 2.1 million new lung cancer diagnoses accounting for 12% of the global cancer burden [1, 2]. Among men, lung cancer remains the most common cancer diagnosis with approximately 1.37 million diagnoses in 2018, with the highest incidence rates in Micronesia (54.1 per 100,000), Polynesia (52.0 per 100,000), Central and Eastern Europe (49.3 per 100,000) and Eastern Asia (47.2 per 100,000). Among

*Corresponding Author: Matthew B. Schabath, Ph.D., H. Lee Moffitt Cancer Center and Research Institute, 12902 Magnolia Drive MRC-CANCONT, Tampa, FL 33612, Fax: (813) 745-6525 | Matthew.Schabath@Moffitt.org.

women, incidence rates are generally lower than men with approximately over 725,000 new lung cancer diagnoses in 2018. Geographical variations in incidence rates differ for women compared to men (Figures 1a and 1b) which are attributed to historical differences in cigarette smoking. Among women, the highest incidence rates occur in North America (30.7 per 100,000), Northern Europe (26.9 per 100,000), and Western Europe (25.7 per 100,000).

In the United States, lung cancer is the second most common cancer in men after prostate cancer and the second most common cancer in women after breast cancer [3, 4]. In 2019 an estimated 228,150 new cases of lung cancer are expected. The incidence rate among men is 71.3 per 100,000 and for women it is 52.3 per 100,000. Although the incidence rate has been declining in men since the mid-1980s, incidence rates did not start declining for women until the mid-2000s because of historical sex-specific differences of smoking uptake and cessation. The decline in incidence has gained momentum in the past decade with rates decreasing from 2011 to 2015 by nearly 3% per year in men and 1.5% per year in women. Geographically, lung cancer incidence is higher the Midwest, East, and South with highest rates observed in the South for both men and women (Figures 2a and 2b).

Mortality

The global geographical patterns in lung cancer deaths closely follow those in incidence because of poor survival and the high fatality rate of this disease (Figure 3a and 3b). Worldwide, lung cancer is the leading cause of cancer death in men and the second-leading cause in women. In 2018, with an estimated 1.8 million deaths occurred (1.2 million in men and 576,100 in women), accounting for 1 in 5 cancer deaths worldwide [1, 2]. The geographical variations by country/region and between men and women are largely attributed to historical patterns in tobacco smoking and maturity of the tobacco epidemic [2].

In the United States, lung cancer is the leading cause of cancer-related death among both men and women [3, 4]. In 2019, an estimated 142,670 deaths are expected to occur, or about 23.5% of all cancer deaths. The mortality rate among men is 51.6 per 100,000 and 34.4 per 100,000 for women. Due to reductions in smoking, the lung cancer death rate has declined 48% since 1990 in men and by 23% since 2002 in women. From 2012 to 2016, the death rate dropped by about 4% per year in men and 3% per year in women. Geographically, lung cancer mortality follows a pattern similar to incidence including the highest rates observed in the South (Figures 4a and 4b).

Survival—Despite substantial improvements in survival in recent years for most other cancer types in the United States, there have only been small improvements in 5-year survival among patients diagnosed with lung cancer (Figure 5). This lack of improvement is primarily due to the majority of patients are diagnosed with last stage disease where the survival rates are dismal (Figure 6). The five-year relative survival rate for all lung cancers (non-small cell lung cancer [NSCLC] and small cell lung cancer combined) is 19% and the five-year survival is higher for non-small cell lung cancer (23%) than small cell lung cancer (6%) [3, 4].

Despite the high mortality rates and poor survival outcomes associated with a lung cancer diagnosis, the next-generation of targeted therapies and the emergence of immune