# Cost-components of lung cancer care within the first three years after initial diagnosis in context of different treatment regimens

Larissa Schwarzkopf [a],[*], Margarethe Wacker [a], Rolf Holle [a], Reiner Leidl [a], Christian Günster [b], Jürgen-Bernhard Adler [b], Rudolf Maria Huber [c]

[a] Helmholtz Zentrum München, Institute of Health Economics and Health Care Management, Comprehensive Pneumology Center Munich (CPC-M), Member of the German Center for Lung Research (DZL), Ingolstaedter Landstrasse 1, 85764 Neuherberg, Germany
[b] Wissenschaftliches Institut der AOK (WIdO), Forschungsbereich Integrierte Analysen, Rosenthaler Straße 31, 10178 Berlin, Germany
[c] Ludwig-Maximilians-Universität München, University Hositall, Division of Respiratory Medicine and Thoracic Oncology, Thoracic Oncology Centre Munich, Comprehensive Pneumology Center Munich (CPC-M), Member of the German Center for Lung Research (DZL), Ziemssenstr. 1, 80336 München, Germany

## ABSTRACT

Objectives: Although lung cancer is of high epidemiological relevance in Germany, evidence on its economic implications is scarce. Sound understanding of current care structures and associated expenditures is required to comprehensively judge the additional benefit of novel interventions in lung cancer care. Adopting a payer perspective, our study aims to analyze expenditures for individuals with incident lung cancer.

Material and methods: Patients with an initial diagnosis of lung cancer (ICD-10 code C34) in 2009 were searched in a large, nationwide base of health insurance claims data and grouped according to initial treatment (Surgery, Chemotherapy/Radiotherapy, No specific treatment). All-cause SHI and lung cancer-related spending was assessed for a patient-individual three-year time frame after initial diagnosis. Expenditures per case and expenditures per year survived were calculated via Generalized Linear Gamma Models adjusted for age, gender, living region, baseline metastases, multiple tumors and initial treatment regimen using time under observation as a weighting factor.

Results: 17,478 individuals were identified. Lung cancer-related expenditures peaked within the first six months after initial diagnosis. Following, they declined subsequently and so did their share in all-cause SHI spending. Lung cancer-related expenditures per case were estimated at €20,400 (53% of all-cause expenditures) with a huge variance according to initial treatment regimen [Surgery: €20,400, Chemotherapy/Radiotherapy: €26,300, No specific treatment: €4200]. Cost per year survived amounted to €15,500 (55% of all cause expenditures) [Surgery: €11,600, Chemotherapy/Radiotherapy: €20,200, No specific treatment: €7600].

Conclusion: Analyses of lung cancer-related expenditures need to take into account treatment strategies and survival. Our study is representative for a large share of the population and provides detailed, patient-level information on costs of care and their compilation. Results render estimates available for the cost of lung cancer e.g. for budget impact analyses, cost-effectiveness analyses of screening and prevention schemes, or prognostic models of life-time expenditures per lung cancer case.

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## 1. Introduction

According to 2012 GLOBCAN statistics, with 1.8 million incident cases lung cancer was the most frequently diagnosed cancer worldwide. It was the leading cause for cancer-related mortality in men and the second leading cause in women [1]. In Germany, about 52,000 individuals were initially diagnosed with lung cancer in 2010 and about 43,000 individuals died of it. Thus 25% of cancer-related deaths in men and 14% of cancer-related deaths in women were attributable to lung cancer [2].

* Corresponding author at: Helmholtz Zentrum München, German Research Center for Environmental Health (GmbH), Institute of Health Economics and Health Care Management, Ingolstaedter Landstrasse 1, 85764 Neuherberg, Germany. Fax: +48 89 3187 3375.

E-mail addresses: l.schwarzkopf@helmholtz-muenchen.de
(L. Schwarzkopf), margarethe.wacker@helmholtz-muenchen.de (M. Wacker), holle@helmholtz-muenchen.de (R. Holle), leidl@helmholtz-muenchen.de (R. Leidl), Christian.Guenster@wido.bv.aok.de (C. Günster), Juergen-Bernhard.Adler@wido.bv.aok.de (J.-B. Adler), Huber@med.uni-muenchen.de (R.M. Huber).
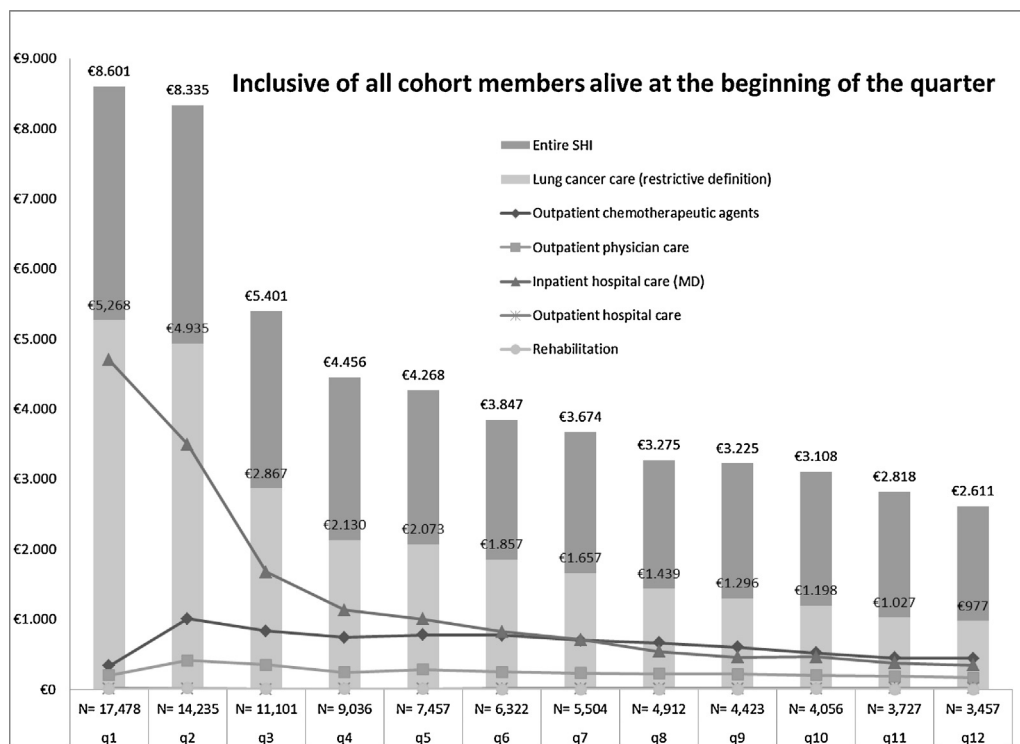
**Fig. 1.** Per capita SHI spending per quarter of observation.

Owing to the high disease-specific morbidity and mortality, lung cancer is of high public health relevance in Germany but there is still little evidence on current structures of lung cancer care [3]. During the recent decade, treatment options have fundamentally changed particularly in context of targeted medical interventions and clinical research on the development of (cost-) effective treatment strategies is ongoing [4,5].

Hence, a sound understanding of current care structures is required to estimate corresponding financing needs. Recently, there is growing international interest in quantifying the economic dimension of lung cancer care [6–9], but regarding Germany data on budget impact [10,11] or expenditures per case [12] are widely lacking.

Adopting a payer perspective, this paper aims to provide up-to-date patient-level information on various aspects of costs of lung cancer care. The main objectives are

a) to describe the development of lung cancer-related and all-cause statutory health insurance (SHI) expenditures during the three years after initial diagnosis by quarter
b) to compare expenditures per case and expenditures per year survived according to different treatment regimens
c) to assess the contribution of distinct SHI services to lung cancer-related expenditures.

## 2. Material and methods

### 2.1. Sample selection and observation period

The Ethics Committee of the Medical Faculty of the Ludwig-Maximilians-University of Munich consented to this retrospective analysis of completely anonymized individual data.

Our analyses refer to a dataset from the Local Health Care Funds provided by the AOK Research Institute containing patient-level information on inpatient and outpatient diagnoses from 2007 to 2012 and cost and service utilization information for the distinct SHI services from 2009 to 2012. AOK covers ca. 30% of the German resident population.

Sample selection started with a dataset containing all individuals with a diagnosis of lung cancer (ICD-10 code C34) in 2009. To best possibly exclude a false positive classification, we only included individuals with at least 1 inpatient principal diagnosis or at least 2 assured outpatient diagnoses within two distinct quarters of 2009 into the selection. Individuals not continuously enrolled within 2007 and 2008 and those with a history of lung cancer or lung metastases in one of these years were excluded to reach incident cases. Also excluded were individuals aged below 25 and those with lacking data on time of enrollment in 2009 or on survival status in 2012.
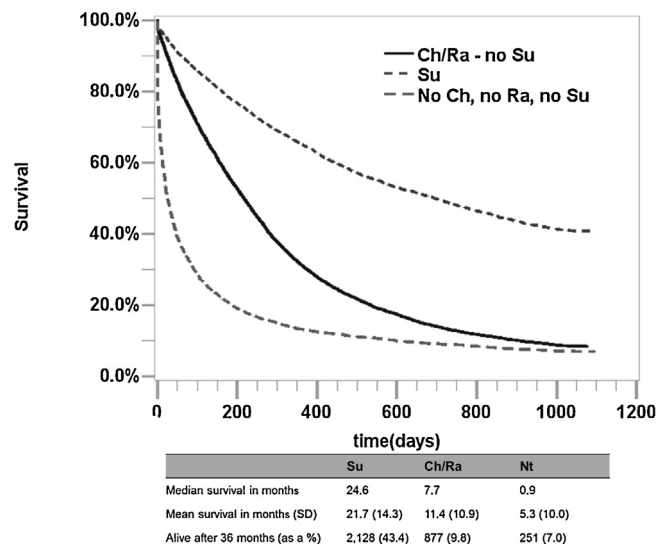


| | Su | Ch/Ra | Nt |
|---|---|---|---|
| Median survival in months | 24.6 | 7.7 | 0.9 |
| Mean survival in months (SD) | 21.7 (14.3) | 11.4 (10.9) | 5.3 (10.0) |
| Alive after 36 months (as a %) | 2,128 (43.4) | 877 (9.8) | 251 (7.0) |

**Fig. 2.** Survival according to initial treatment regimen.