# Patterns of neoplasm mortality and incidence rates in the Central European countries: guide for better targeting of the prevention and screening

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## Motive for the study

Most of the European countries experienced significant mortality decrease from the cardiovascular diseases. The reasons could be found in changes in the lifestyle of the population (better food, more physical activities) as well as more efficient methods of health care (better prevention, treatment, efficient cardio-surgery, availability of cardiovascular health care, etc.). Such a positive development could be observed during the second half of the 20th century in Western and Northern European countries, from the last decades of the 20th century also in the Central European countries. This is expressed also by the term "cardiovascular revolution" (Meslé, Vallin, 2000).

On the other side, mortality from neoplasms is not decreasing with the same pace. In some European countries (e.g. France) the proportion of deaths caused by neoplasms is currently significantly higher than the proportion caused by cardiovascular diseases. That means, that mortality from neoplasms deserves the attention, the possible effect of effectively aimed prevention and screening should be considered so as the mortality from this group of causes could be limited.

## Goals of the study

The main goal of the study is to present the effect of preventive screening on incidence and mortality rates of selected causes of death. Increase of the incidence rates could be taken as a positive effect of preventive screening if the incidence rates increase for lower (treatable) clinical stages of the disease. On the other side, increase of mortality as well as of incidence rates of higher (less treatable) clinical stages could signalize a potential target for better prevention and screening.

The presented study has two particular main goals:

(1) To present the most important trends of mortality according to selected causes of neoplasms in European countries, with a specific attention to the Central European countries, where the development of mortality from neoplasms has not a unified pattern (according to countries, sex or various causes).

(2) Observed mortality patterns are tied to trends in cause- and age-specific incidence rates. Those are studied according to clinical stages of the disease. The effect of prevention and preventive screening is illustrated using both types of data: incidence rates and mortality rates. For the most detailed study the national data for the Czech Republic was selected (case study).

## Data used in the study

The data used in the presented study are acquired from the WHO Mortality Database[2] using the VBA program for data extraction from the WHO Mortality Database (Andreev, 2010). Incidence data are published within the CI5 database (Ferlay et al., 2014) and GLOBCAN database (Ferlay et al., 2013). More detailed (according to clinical stages and age of the patients) incidence data for the case study (Czech Rep.) are acquired from the SVOD Web Portal (Dušek et al., 2015).

## Selected most important results of the analysis

The more detailed part of the analysis is focused above all on the Central European countries, specifically the Czech and Slovak Republic. Although the history of these two countries is

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[2] http://www.who.int/healthinfo/statistics/mortality_rawdata/en/

significantly connected, the mortality development during the last two decades differs above all for neoplasm mortality. This is especially significant in the case of females. In case of the Czech Rep. the mortality development is rather positive, in the Slovak Rep. some causes could be traced, where the mortality development contributed negatively to the life expectancy change – malignant neoplasms of the breast or lungs, etc. In the Czech Rep. the lung cancer is almost the only cause of the group of neoplasms, where the mortality increased during the last two decades (see Figure 1).

*Figure 1: Decomposition of the life expectancy increase between 1994 and 2013, females, Slovak Rep. (left), Czech Rep. (right), selected causes of death*
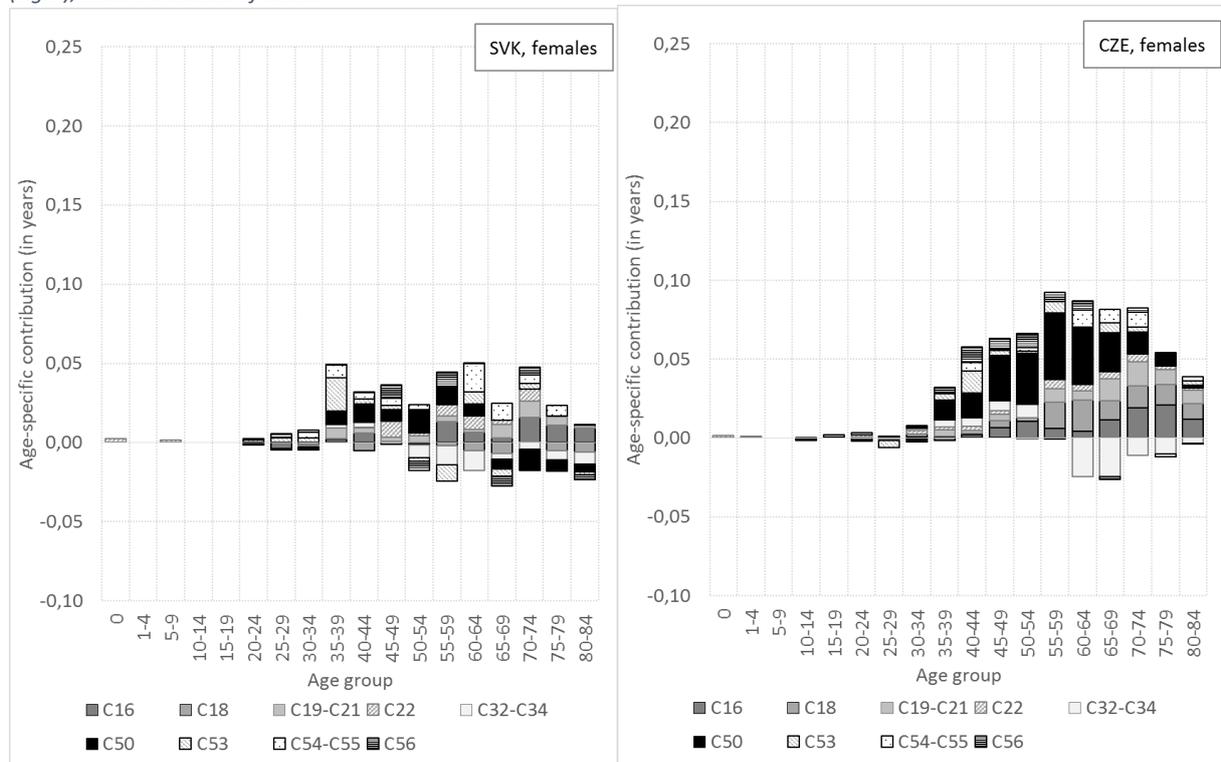


Note: *C16: Malignant neoplasm of stomach; C18-C21: Malignant neoplasm of colon, rectum and anus; C22: Malignant neoplasm of liver and intrahepatic bile ducts; C32: Malignant neoplasm of larynx; C33-C34: Malignant neoplasm of trachea, bronchus and lung; C50: Malignant neoplasm of breast; C53: Malignant neoplasm of cervix uteri; C54-C55: Malignant neoplasm of other and unspecified parts of uterus; C56: Malignant neoplasm of ovary*

For the Czech Republic, it is clear that the mortality increase for the lung cancer occurred above all at higher age groups (60 and more years). It could be supposed, that the negative development is tied to the increasing prevalence of smoking of females during the second half of the 20th century. On the other side, mortality from the breast cancer decreased significantly. The decrease is visible above all at ages covered by the preventive screening, i.e. from age 45 (see Figure 2).

According to the age-specific incidence rates, the incidence rate in the Czech Republic increased for the breast cancer above all in the 1st clinical stage. The increase was especially significant after the official support of the addressed preventive screening in 2002 (see Figure 3 – only data for females in the Czech Rep. are shown). The preventive screening is not the only preventive method related to the breast cancer in the Czech Republic – many preventive programs, events or information campaigns took place during the last years.

On the other hand, the incidence rates of the lung cancer increased for females in the Czech Republic above all in clinical stage 4, which is the least treatable one (see Figure 4 – only data for females in the Czech Rep. are shown). This unfavorable development of the incidence rates in advanced stages of the disease negatively influenced also the mortality development (described above).

*Figure 2: Age specific mortality rates (per mile), selected causes, Czech Republic, females, 1994, 2012*
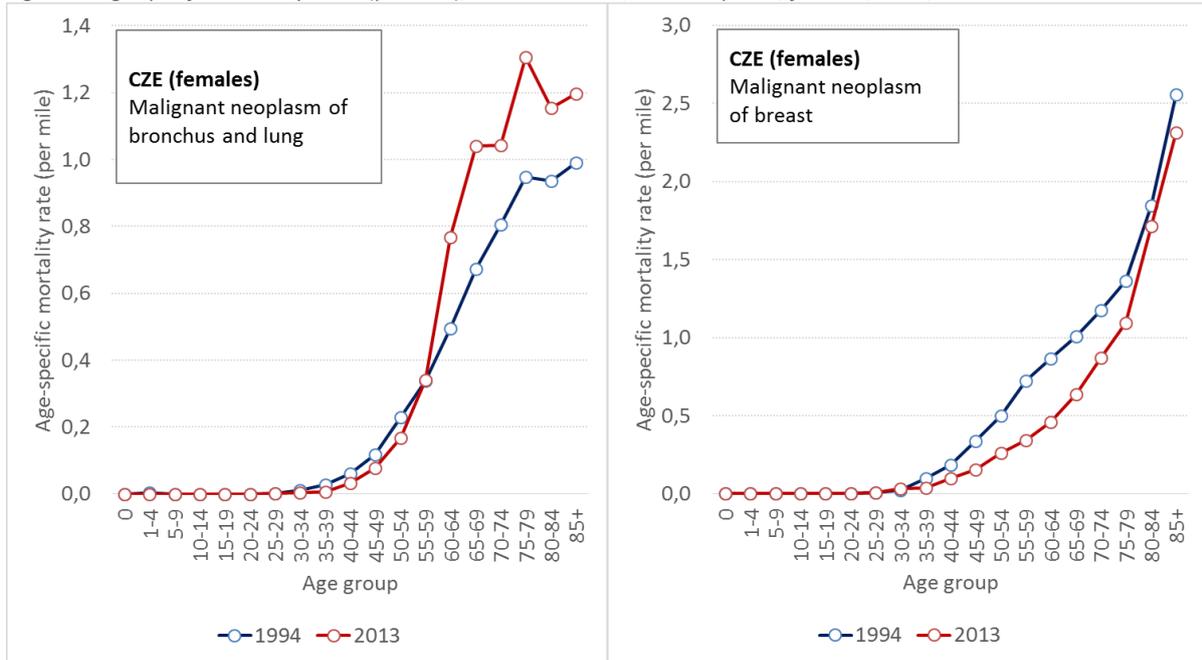


*Source of the data: Czech Statistical Office*

*Figure 3: Age specific incidence rates, lung cancer (left), breast cancer (right), females, Czech Republic, selected years, clinical stage 1 (the most treatable)*
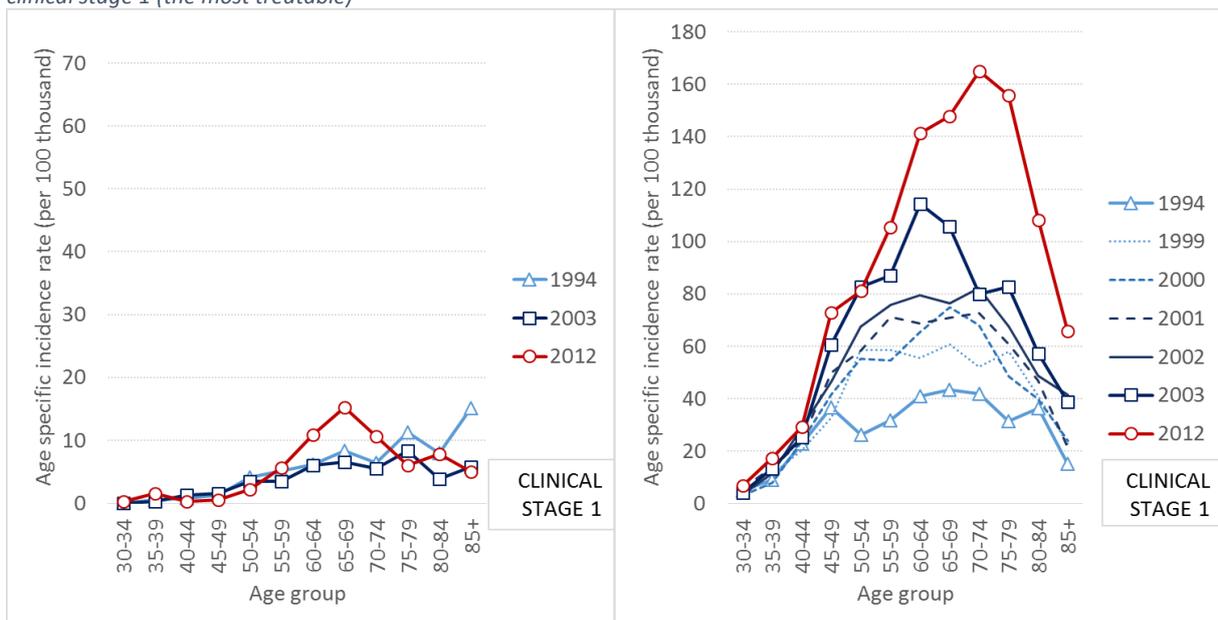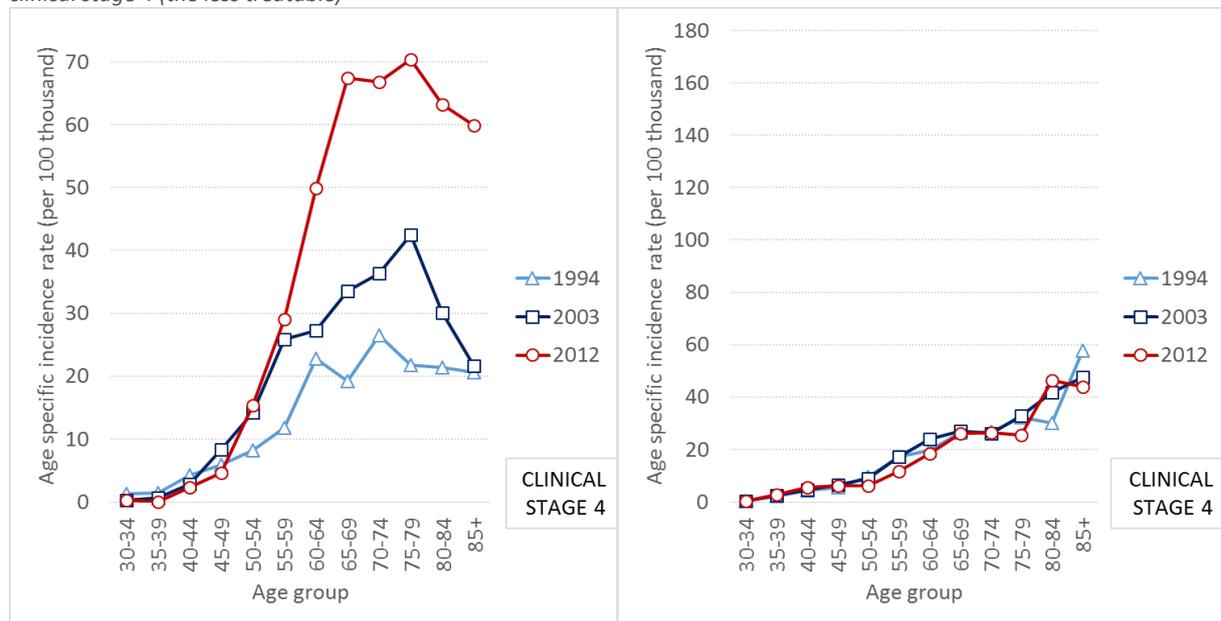


*Source of the data: the SVOD Web Portal (Dušek et al., 2015)*

In contrast to the breast cancer, there are no preventive programs in the Czech Republic focused on the lung cancer. However, based on the results presented above, it could be concluded, that an effective screening (e.g. targeted on a relevant sex or age groups) could be taken as an important tool of mortality reduction. In case of the Czech Republic (and similarly also in other countries with similar development of a lifestyle and smoking habits) the optimal target group for lung cancer prevention and screening are females aged 50 and more years – above all active smokers or females with a proved genetic predisposition to cancer diseases. This corresponds for example to the Lung Cancer Screening

Guidelines and Recommendations for the USA (revealed by the Centers for Disease Control and Prevention[3]).

*Figure 4: Age specific incidence rates, lung cancer (left), breast cancer (right), females, Czech Republic, selected years, clinical stage 4 (the less treatable)*



*Source of the data: the SVOD Web Portal (Dušek et al., 2015)*

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[3] http://www.cdc.gov/cancer/lung/pdf/guidelines.pdf