

## Trends in cancer mortality among Poland's oldest old (aged 85 years and older)

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**Introduction.** The population of Poland's oldest old has increased substantially in recent decades. We evaluate mortality rates for all major cancers and their trend changes between 1999–2018.

**Material and methods.** Cancer death data (1999–2018) were extracted from the World Health Organization (WHO) database. Age-standardized rates, and annual percent changes (APC) were determined.

**Results.** Overall, 1 out of every 8 cancers are diagnosed over age 85+. Women are more often diagnosed than men at a ratio of 2.6 to 1. With regards to the cancers with the highest mortality rates, APCs increased for lung (0.9; 95% confidence interval [CI]: 0.1–0.9) and breast (2.3; 95% CI: 1.7–2.9) cancer among women. Colon cancer also increased among men (2.7; 95% CI: 1.7–2.2).

**Conclusions.** Substantial progress in cancer prevention has been made due to access to diagnostic testing, treatment, and a reduction of smoking. However, there is a need for comprehensive cancer centers that are equipped to administer and coordinate complex and personalized cancer care for the growing elderly population.

**Key words:** cancer, mortality, elderly, Poland

### Introduction

The world's population is aging and has tripled in size from 1950 to 2022 [1]. In Poland, the median age increased from 28.8 years in 1950 to 41.7 in 2020 [2] and it is projected to further increase to 51 years by 2050 [3]. The population of Poland may increase more than projected, as the conflict in Ukraine has displaced an estimated 7.8 million refugees as of November 2022, with millions crossing into Poland [4]. In addition, the emigration of the young Polish population has also increased the proportion of the old [2]. These exogenous events, in addition to increasing life expectancy, have been recently reported to pose a major challenge for cancer care [5].

Like other European countries, the proportion of the oldest old in Poland – here defined as individuals over the age of 85

years – is increasing. When statistics were first published on this population in 2002, the number of people aged 85 and over was 329,525 (0.9% of the total population), while in 2020, the population doubled to 798,726 (2.2%) [6]. As the number of oldest old in Poland increases, so does the risk of acquiring common chronic diseases such as cancer. Cancer mortality has been shown to reach its peak between the ages of 80 to 89 in Poland [7], putting the healthcare system face to face with the burgeoning challenge of meeting the needs of an aging population.

To the best of our knowledge, there has been little research done to understand the epidemiology of cancer among the oldest old in Poland. In order to determine where to allocate healthcare resources in cancer care within this population, we

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evaluate mortality rates for all major cancers and their changes over two decades (1999–2018).

### Material and methods

Official death certification data from 1999 through 2018 were extracted from the World Health Organization (WHO) database for all cancers and 22 cancer sites by International Classification of Disease codes [8, 9]:

- lip, oral cavity and pharynx (C00–C14),
- oesophagus (C15),
- stomach (C16),
- colon (C18),
- rectum and anus (C19–C21),
- liver (C22),
- gallbladder and biliary tract (C23–C24),
- pancreas (C25),
- larynx (C32),
- lung (C33–C34),
- breast (C50),
- cervix uteri (C53),
- corpus uteri (C54),
- ovary (C56),
- prostate (C61),
- bladder (C67),
- kidney (C64–C65),
- brain and central nervous system (C70–C72),
- thyroid (C73),
- Hodgkin lymphoma (C81),
- non-Hodgkin lymphoma (C82–C88),
- multiple myeloma (C90),

- leukaemia (C91–C95),
- and all cancers excluding non-melanoma skin (C00–C96, excluding C44).

Age-specific mortality rates (2000–2014) were calculated for each 5-year age group from 61 and older compared to the standard population proposed by Doll et al. [10], as used in GLOBOCAN [11]. We computed the estimated age percent change (APC), defined as the percent change from one year to the next among individuals over 85+ years old over the two decades. Data on the population in Poland was abstracted from Statistics Poland [6].

### Results

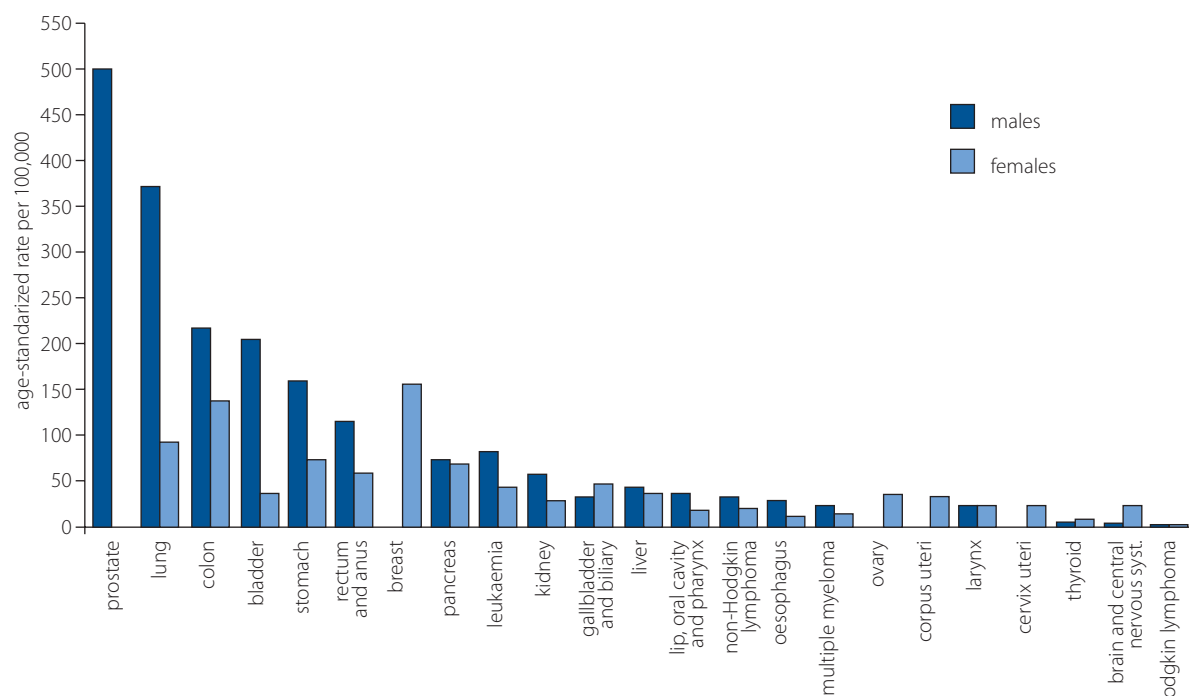
From 1999 to 2018, there were a total of 64,644 and 91,361 cancer mortalities reported among persons over 85 years among men and women, respectively, with a total of 156,005 cancers. Considering that there was a total of 1,850,553 malignancies diagnosed in Poland, this amounts to 1 out of every 8 cancers diagnosed at age 85+.

The cancer types with the highest age-standardized mortality rates (ASR) (fig. 1) and proportion of all cancers for men were:

- prostate (510.1; 21.2%),
- lung (377.1; 15.6%),
- colon (220.7; 9.2%),
- bladder (207.0; 8.6%)
- stomach (162.2; 6.8%).

For women:

- the highest ASRs were found for breast (159.4; 12.7%),
- colon (139.6; 11.1%),



**Figure 1.** Mortality rate of major cancers occurring in those 85-years and older in Poland (1999–2018). Age-standardized according to world population

- lung (93.9; 7.5%),
- stomach (72.7; 5.8%)
- pancreas (70.3; 5.6%).

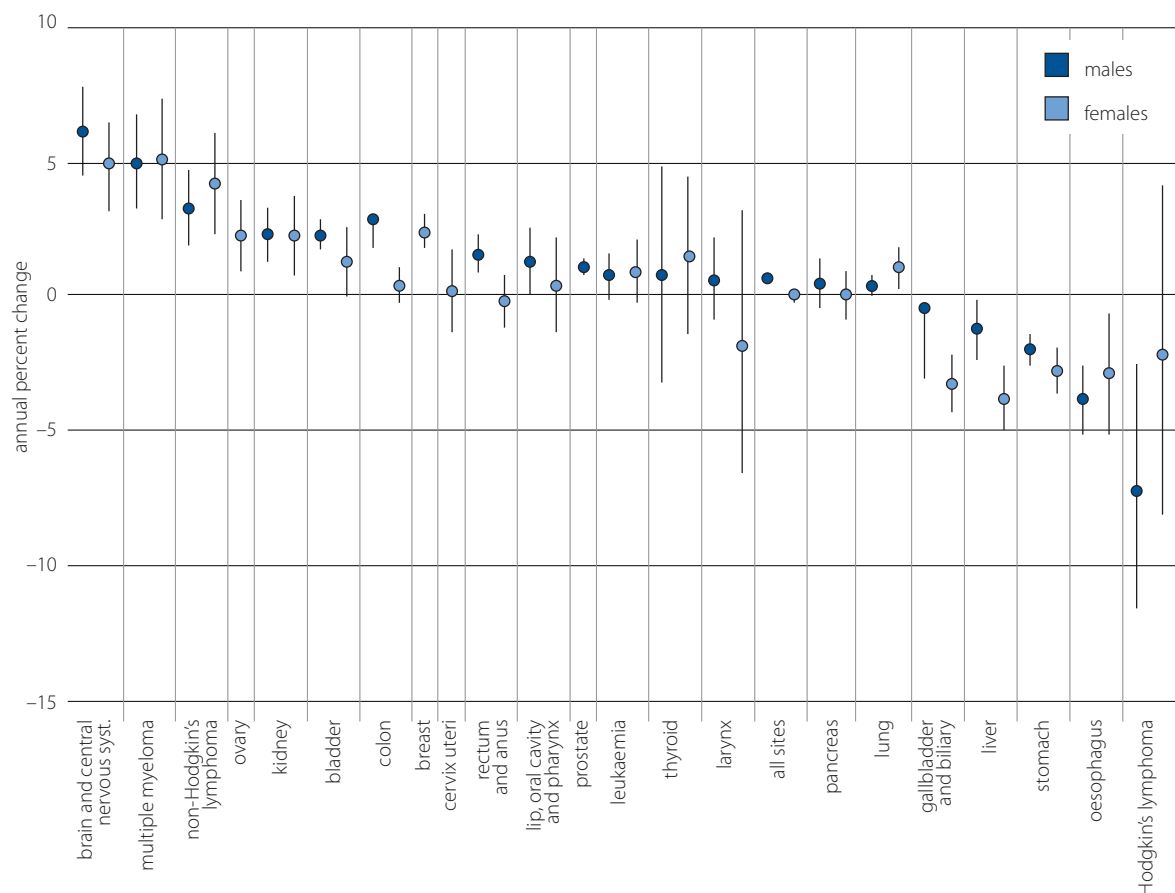
Among men, deaths due to prostate cancer are more frequent among those aged 85 years or older than for the general population (21.2% among the oldest old while 10.3% was reported among the general population) [12]. Breast cancers were similarly proportioned among both the general population and those 85 or older [12]. Conversely, for the general population, lung cancer accounted for the most deaths among both men and women [12].

According to the estimated APCs (fig. 2), mortality for all cancer sites remained stable for men (0.5; 95% CI: 0.4–0.7) and women (–0.1; 95% CI: –0.3–0.2). Mortality from cancers of the brain and central nervous system had the highest increase among the oldest old (6.0; 95% CI: 4.4–7.6 among men and 5.8; 95% CI: 3.0–6.6 among women). In addition, other cancers without established screening protocols – multiple myeloma, non-Hodgkin lymphoma, ovary, kidney, and bladder – showed the largest APC increases among those 85+ years old. While colon cancer mortality decreased among women, reaching 0.3 (95% CI: –0.3–1.0) APC, mortality rates have increased among men (2.7; 95% CI: 1.7–2.2).

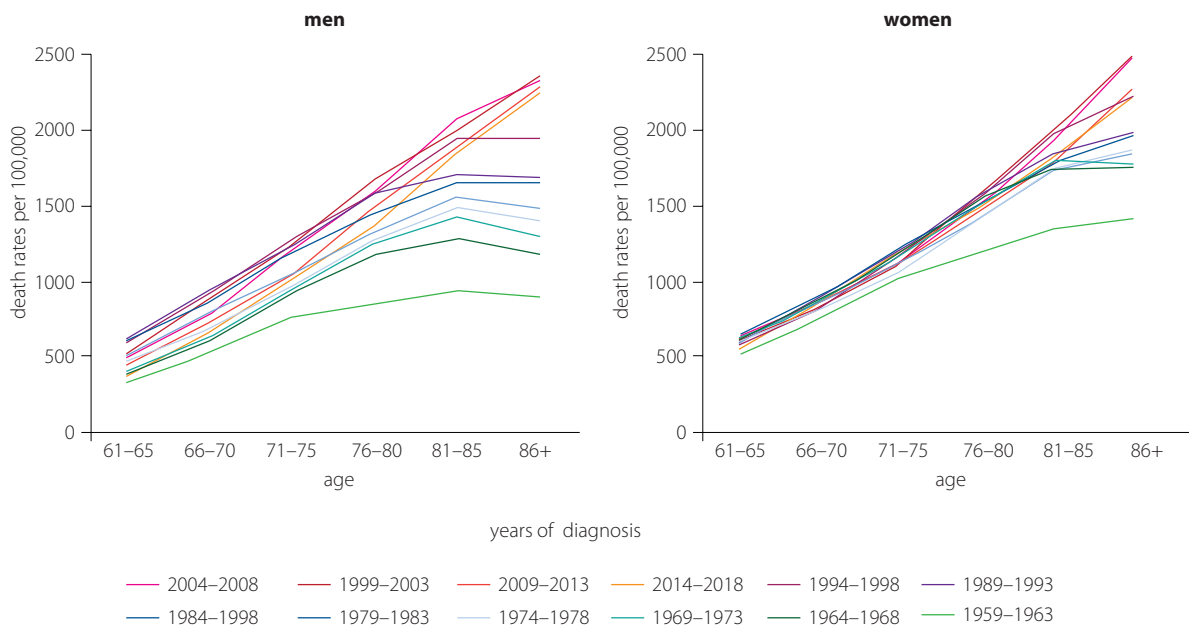
While the APC for lung cancer among men is towards the null (0.3; 95% CI: –0.1–0.7), the APC is larger among women (0.9; 95% CI: 0.1–0.9), and is similar to global findings that reflect the tobacco smoking habits women had started decades after men [13]. In addition, breast cancer (2.3; 95% CI: 1.7–2.9) showed an increase. Prostate cancer (1.0; 95% CI: 0.6–1.3) did not show any changes. Stomach cancer decreased among both men and women (–2.0; 95% CI: –2.6 to –1.5) for men and –2.8 (95% CI: –3.7 to –2.0 for women).

The direction of the changes in cancer mortality rates by five-year age group (fig. 3) vary depending on the years of diagnosis. Among men, diagnoses occurring at earlier periods (from the period 1959–1963 until 1994–1998) show a decline or stabilization in cancers once they age beyond 81–85 years old. The highest cancer mortality rate occurred during 1999–2003 and 2004–2008. This was followed by a progressive decrease in mortality rates for periods after 2009.

The cohorts follow a similar trend among women with the mortality rates reaching a slower decline into the oldest ages for most of the time periods apart from those diagnosed in 1959–1963. The major difference between trends among men and women is there are fewer changes in cancer mor-



**Figure 2.** Annual percent change in mortality rates of major cancers occurring in those 85-years and older in Poland (1999–2018). Age-standardized according to world population



**Figure 3.** Age-specific mortality rates by year of diagnosis in Poland

tality rates after 1963 compared to the time-period changes observed among men.

### Discussion

This brief report of cancer mortality trends among the oldest old in Poland (1999–2018) showed that 59% of cancers occurred in women, outnumbering men by 2.6 to 1. Among women, there was a 2% increase in the annual mortality rates of breast cancer as well as an increasing trend for lung cancers. For men aged 85 and older, colon cancer is also increasing nearly 3% annually. Although prostate cancer rates are high among men 85+ years old, there has been little change in the past two decades. The data reveals a concerning trend in cancer mortality among men and women over the age of 85, indicating an increase during the late 1990s and early 2000s compared to previous decades. This was followed by a gradual decline in overall mortality after the 2004–2008 period. The direction of these trends suggests that the change in cancer mortality following the late 1990s may be influenced by exogenous events, including the introduction of cancer screening programs and access to treatment following the fall of the Soviet Union, as well as lifestyle habits.

Public health education in western countries between the 80s and 90s were marked by the encouragement of tobacco smoking cessation, moderation in alcohol consumption, reduction in weight, and a higher consumption of fruits and vegetables – lifestyle habits that have now been included as part of the European Prevention [14]. Lifestyle habits were much slower to change in the east, as a result of western information deprivation, increasingly available tobacco products, and consumer subsidies that kept meat and dairy prices quite

low compared to western countries [15–17]. Prior to 1991, life expectancy was low; a 15-year-old boy in Poland had a life-expectancy of about 53.5 years [16]. It was not until the mid-1990s that life expectancy reached western standards, finally reaching 80.3 years in 2011 [18]. This has been partly attributed to reduced smoking, improved screening, and treatment advances, which led to a decline in mortality [19, 20].

Although a centralized cancer care management program is available at the Institute of Oncology, cancer care access and management in Poland has historically been and continues to be fragmented [21]. A 2016 study found that patients felt that their cancer care was not well-organized and lacked smooth and continuous care throughout diagnosis, treatment, and follow-up [22]. The national anticancer system in Poland, called the oncological package, attempted to transfer some of the cancer care onto general practitioners (GPs) [23]. However, not all institutions were found to be properly equipped. A 2015 study reported that only 28% of hospitals and 2% of specialist ambulatory providers participating were able to provide laboratory tests, CT and MRI scans, and endoscopy examinations; fewer than half of the audited providers could undertake the intraoperative pathology necessary to assess the margins of some tumor excisions [24].

The oldest old require particularly careful clinical evaluation due to multiple co-morbidities with multiple respective medication regimens, age-related physical and psychological changes, immunosuppression, and frailty [25, 26]. Cancer survival is lower among the oldest old compared to other age groups [27–29]. Comprehensive and interdisciplinary cancer care centers, where several specialists can collaborate, evaluate risks-versus-benefits, plan, and deliver cancer care treatments is therefore especially vital for this vulnerable patient population.

Unfortunately, the focus of cancer care has mainly been on hospital care treatment, despite concerns that many cancers are detected too late and before they can be successfully treated [21]. Preventive care, which includes cancer diagnostic testing, is therefore of the utmost importance, but has not been funded as part of the oncological package. As a result, GPs are apprehensive about paying “out-of-pocket” for patient diagnostic testing, which has led to patient symptoms being downplayed [22].

Our findings have shown that cancers of that brain and central nervous system, multiple myeloma, non-Hodgkin’s lymphoma, ovary, kidney, and bladder had the highest annual percent increases over the years. These are cancers for which there are no routine screening procedures, even during middle-age. In particular, brain, multiple myeloma and non-Hodgkin’s lymphoma, and ovarian cancer have limited treatments, even if the cancer is detected early. Lung cancer, which was one of the most common cancers diagnosed among the oldest old, can benefit from the implementation of primary prevention programs. Smoking cessation is possible at an older age and has been shown to lower mortality rates even if the patient is over 65 years old [30].

The increase in breast cancer among women is particularly concerning. The national screening programs for breast, cervical, and colorectal cancers, were introduced as part of the National Program for Cancer Disease Control in 2006 and extended through 2015 and was later renewed for 2016–24 [31]. However, a pilot from 2018 reported 16% for breast, 20% for cervical, and 40% for colorectal cancer screening [24]. While the oldest old fall outside the boundaries of breast cancer screening, diagnostic testing of breast cancer should not be delayed. Older women with breast cancer are more likely to have large tumors and positive metastatic axillary nodes than their younger counterparts [32].

## Conclusions

Life expectancy increases mean that the burden of cancers in the oldest old age group will grow. In 2021, Poland spent 6.6% of its GDP on health which is one of the lowest in the EU [33]. Given the increasing growth of the older population with chronic health issues, expenditures are expected to increase [34]. Cancer risks such as smoking and obesity should be addressed by preventive programs as these issues are still prevalent among the older population in Poland [34]. In addition, more research is needed on Poland’s oldest old in order to identify trends in time-to-diagnosis and survival, as well as pinpointing where the cancer healthcare system is most vulnerable. It is important to acknowledge that there is a wide variation of health status as individuals reach older ages, and comprehensive cancer centers that are equipped with diagnostic testing, resources, specialists will be best equipped to coordinate treatment for each patient. While substantial progress has been made, there is still a long way to go in terms of addressing and improving cancer care for the oldest old.

**Conflict of interest:** none declared

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