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ORIGINAL PAPER

ASSESSING THE ECONOMIC BURDEN OF CERVICAL CANCER IN POLAND: THE CRITICAL ROLE OF PRODUCTIVITY LOSS

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Highlights

- Losses due to sick leave resulting from cervical cancer (CC) in Poland are increasing.
- Productivity losses are nearly 5 times higher than direct public expenditures on CC.
- The need for prioritizing preventive programs is growing.

Abstract

Background: Absenteeism due to cervical cancer (CC) poses a considerable challenge for both employers and employees, with implications for productivity. The aim of the article is to assess the costs of lost productivity associated with CC in Poland 2018–2022. **Material and Methods:** The analysis is based on the human capital method and a societal perspective, focusing on 2 main aspects of productivity losses: absence and premature mortality. **Results:** The average number of sick leave days for CC patients ranged 23–25 days annually, and productivity losses from this cause increased from EUR 10.3 million in 2018 to over EUR 14 million in 2022. During the analyzed period, 1742 deaths of women of working age due to CC were recorded. Expenditures by the National Health Fund on CC treatment for women of working age 2018–2022 averaged EUR 11 million per year, while the Social Insurance Institution covered benefits such as pensions and sickness allowances ranging from EUR 5.3 million to EUR 6.4 million annually. **Conclusions:** Productivity losses due to CC were nearly 5 times higher than direct public expenditures. The findings highlight the need to prioritize prevention programs and to consider indirect costs in the assessment of disease burden and health policy decisions. Med Pr Work Health Saf. 2025;76(5)

Key words: health economics, absenteeism, health expenditures, indirect costs, economic burden, uterine cervical neoplasms

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INTRODUCTION

Worldwide, cervical cancer (CC) ranks as the fourth most common cancer among women, with approx. 660 000 new diagnoses in 2022. That same year, roughly 350 000 women died from that disease [1].

Variations in the burden of CC between regions and countries are linked to disparities in access to human papillomavirus (HPV) vaccination, screening, and treatment services. Cervical cancer is the ninth most commonly diagnosed neoplastic disease among European women and the second most common tumor in women aged 15–44 years [2]. It is the 11 leading cause of cancer death in Europe and the second – among younger women [2], which is particularly important in terms of productivity loss. However, there are significant differences in CC incidence and mortality between European countries. In 2020, the incidence rate (age-standardized rate) was 14.5 per 100 000 women in Eastern Europe and 7.03 per 100 000 women in Western Europe, while the mortality rate was 6.06 per 100 000 women in Eastern Europe and 2.05 per 100 000 in Western Europe.

Cervical cancer carries significant economic implications for public payers, patients, and the wider economy, including its impact on the workforce. Absenteeism due to CC poses a considerable challenge for both employers and employees, with implications for productivity. Unfortunately, in public discourse in Poland, as well as in official documents scrutinized by decision-makers, the significance of indirect costs is often neglected.

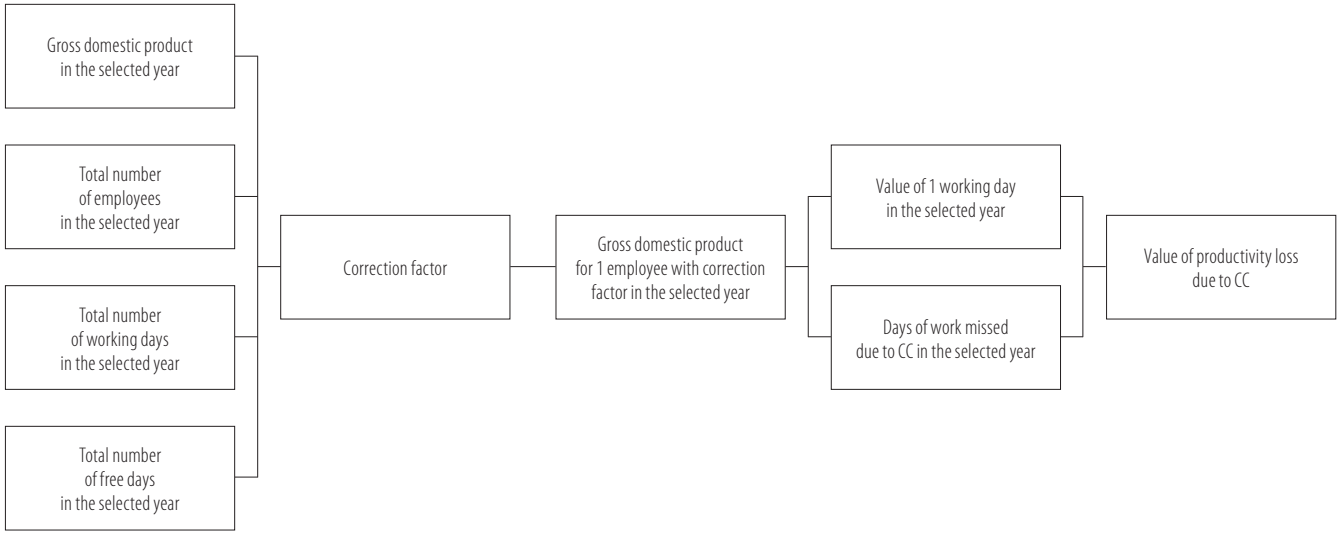


Figure 1. Model for estimating productivity loss due to cervical cancer (CC)

Therefore, understanding the scale of absenteeism and premature mortality associated with the examined cervical neoplasm is crucial for formulating effective strategies for financing oncological care and prioritizing the treatment of this disease.

In Poland, productivity losses associated with short-term absences due to all malignancies have been increasing, reaching EUR 349.4 million in 2012 and EUR 575.3 million in 2022, with a substantial share attributed to CC [3]. A previous study [4] on production losses due to CC in Poland emphasized the importance of this issue. Aims of the analysis include not only presenting the current situation, but also highlighting the problem by showing the proportion of productivity loss costs within the overall economic burden of the disease. This article reviews the productivity loss associated with CC morbidity and mortality in Poland, exploring their prevalence, contributing factors, economic impact, and potential interventions. The primary objective of the analysis is to illustrate how the magnitude of these indirect costs compares with the expenditure on CC borne by public payers in Poland.

By highlighting the multifaceted burden of CC, the analysis seeks to promote dialogue among stakeholders and contribute to discussions on the need to strengthen prevention efforts. The goal is to enhance the scientific discourse in Poland on the need to prioritize cytology screening, colposcopy, and HPV immunization programs [5,6]. It is important to raise awareness that work absenteeism and premature mortality constitute a significant societal burden and should always be considered by decision-makers.

MATERIAL AND METHODS

To estimate the productivity loss (indirect costs) of CC in Poland over the period 2018–2022, the human capital method (HCM) was applied within a societal perspective. This method assesses an individual's economic contribution by applying productivity measures, considering not worked as an hour lost. Efficiency in HCM is most commonly approximated by average salary, gross domestic product (GDP) per capita, but also by a number of other parameters, including the amount of sickness benefit [7].

The analysis considered production loss attributed to the following factors:

- absenteeism of the sick,
- premature mortality caused by the disease.

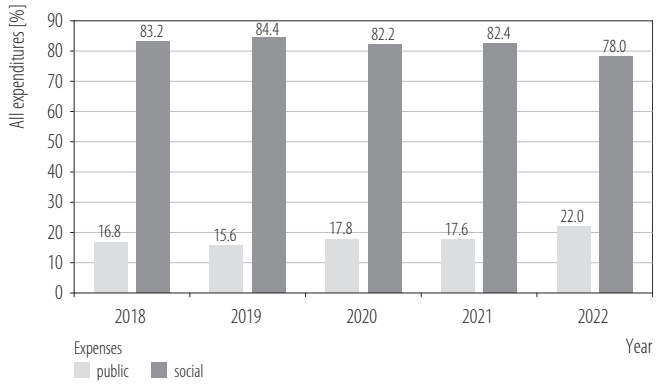
Several data sources were used, the most important of which were data from the Social Insurance Institution (SII), and from the joint report of the National Health Fund (NHF) and the National Cancer Registry [8]. Data on GDP per capita was obtained from the Central Statistical Office [9].

As the data on premature mortality due to CC included age groups of patients who died during their working life, the years of life lost were calculated by taking the difference between the retirement age for women in Poland (60 years) and the median age of the age group for which death was reported. To calculate the value of lost productivity due to the cancer discussed in this study, a model was developed to estimate it based on Poland's GDP (Figure 1).

The GDP per employee has been adjusted by a correction factor (CF) allowing for a more realistic estimate of productivity losses resulting from job loss, eliminating the influence of capital and other factors not directly related to employment. The CF value of 0.65 was adopted, as it corresponds to the level applied in various economic analyses by the European Commission [10]. As economic growth is influenced mainly by labor and capital, reducing only the labor factor affects GDP in proportion to its contribution. By applying a CF, GDP per employee is adjusted to reflect only the labor-related share, specifically the impact of lost working hours due to CC morbidity and mortality. This aligns with the generally accepted labor share of total income [11]. These figures were then compared with the total costs incurred by the Polish third-party payer (NHF) and the Polish SII, encompassing both treatment-related expenses and other services provided to these patients (Figure 2).

To convert the value of lost production due to sickness absence into euros, an exchange rate of EUR 1 equal PLN 4.32 was used. This rate corresponds to the average National Bank of Poland exchange rate in the 6 months preceding this analysis (December 15, 2023 – June 14, 2024).

The analysis included all data from patients diagnosed with codes C53 and D06 of the International Classification of Diseases, 10th Revision, which are standard codes for this disease.



Based on data from Social Insurance Institution [12], Central Statistical Office [9], and National Health Fund [8].

Figure 2. Comparison of social expenditures and public payer costs (National Health Fund and Social Insurance Institution) for cervical cancer in Poland 2018–2022

RESULTS

Absenteeism

Based on data collected from the SII, the average length of sickness absence due to cervical cancer in Poland was calculated [12] (Table 1).

In total for Poland, the annual number of sick leave days for CC patients was just <116 000, ranging from 111 500 in 2020 to 120 500 in 2018 and the average length of that sick leave ranged 23–25 days. It should be noted that the average sick leave due to cancer (in any location) in Poland has been shorter in recent years: from 22 days in 2019–2021 to just <20 days in 2022 [9,12].

Table 1. Sickness absence due to cervical cancer in Poland 2018–2022

Variable	Sick leave days [n]	Issued sick leave certificates [n]	Duration of sick leave [days] (M)
ICD10: C53			
2018	114 071	4 558	25
2019	107 326	4 489	24
2020	103 274	4 213	25
2021	106 808	4 438	24
2022	107 996	4 719	23
ICD10: D06			
2018	6 436	431	15
2019	8 488	530	16
2020	8 208	502	16
2021	8 466	548	15
2022	8 844	580	15

C53 – malignant neoplasm of cervix uteri, D06 – carcinoma in situ of cervix uteri, ICD-10 – The International Classification of Diseases, 10th Revision.
Based on data from the Social Insurance Institution [12].

Table 2. Productivity loss due to absenteeism among cervical cancer patients in Poland 2018–2022

Year	GDP per employee [EUR]	Working days [n/year]	Daily work value [EUR]	Production lost [EUR]
2018	29 914	227	132	10 322 101
2019	32 159	228	141	10 618 120
2020	32 533	230	141	10 249 661
2021	36 198	229	158	11 843 737
2022	42 276	228	185	14 081 999

GDP – gross domestic product.
Based on data from Social Insurance Institution [12] and Central Statistical Office [9].

Table 3. Number of cervical cancer (CC) deaths among women of working age in Poland 2018–2022

Year	CC deaths [n]								
	18–24 years	25–29 years	30–34 years	35–39 years	40–44 years	45–49 years	50–54 years	55–59 years	total
2018	1	2	18	39	55	85	93	164	457
2019	1	6	20	31	61	80	101	142	442
2020	1	4	22	23	36	57	89	99	331
2021	0	3	13	38	39	64	75	74	306
2022	3	4	11	17	24	32	45	70	206
Total	6	19	84	148	215	318	403	549	1742

Based on data from National Health Fund [8].

Table 4. Productivity loss due to premature mortality among cervical cancer patients (age groups) in Poland 2018–2022

Year	Production lost [EUR]									
	18–24 years	25–29 years	30–34 years	35–39 years	40–44 years	45–49 years	50–54 years	55–59 years	total	total with CF
2018	1 171 769	1 982 993	15 142 858	26 950 682	29 744 899	33 200 115	22 353 743	14 782 314	145 329 372	94 464 092
2019	1 254 217	6 367 563	18 009 269	22 929 658	35 311 031	33 445 785	25 984 802	13 699 908	157 002 233	102 051 451
2020	1 257 740	4 256 966	19 865 842	17 060 114	20 897 833	23 897 059	22 961 817	9 578 174	11 977 5545	77 854 104
2021	0	3 567 912	13 118 382	31 498 532	25 299 736	29 984 873	21 623 706	8 000 771	13 309 3913	86 511 043
2022	4 946 296	5 580 437	13 021 019	16 529 930	18 263 247	17 586 831	15 219 373	8 877 967	100 025 099	65 016 315

CF – correction factor.
Based on data from Social Insurance Institution [12], Central Statistical Office [9], and National Health Fund [8].

The value of lost productivity due to sick leave of CC patients ranged between EUR 10.32 million in 2018 and EUR 14.08 million in 2022. The main contributor to this increase in value was the increase in GDP per capita, which led to a corresponding increase in the value of a single working day (Table 2).

Analysis of CC mortality data in Poland shows that it remains a significant cause of premature death, even among very young women. Between 2018 and 2022, although the trend is decreasing, as many as 257 women <40 years died from CC. Additionally, 533 patients died between the ages of 40–49 years, while 952 deaths were recorded among those aged 50–59 years (Table 3).

The high number of deaths among women of working age results in significant losses due to the lost productivity of these individuals (Table 4).

Despite the rapid increase in GDP per capita, these costs (accounting for the CF) tend to fall as a result of the gradual decline in mortality rates.

Table 5. National Health Fund (NHF) expenditures on the treatment of cervical cancer in women of working age (18–59 years) in Poland 2018–2022

Year	NHF expenditures [EUR]		
	ambulatory care	hospital care	total
2018	602 135	10 170 443	11 631 944
2019	629 681	10 351 857	11 793 981
2020	536 208	9 268 780	10 432 870
2021	528 241	10 096 156	11 187 500
2022	403 591	10 054 624	10 983 796

Based on data from National Health Fund [8].

Table 6. Social Insurance Institution (SII) expenditure on cervical cancer women of working age (18–59 years) in Poland 2018–2022

Year	SII expenditure [EUR]				
	disability pensions	social pensions	sick leave benefits	cost of rehabilitation	total
2018	3 288 796	156 528	1 677 639	872 199	5 995 162
2019	3 012 315	148 426	1 765 787	868 773	5 795 301
2020	2 476 991	92 569	1 840 116	875 208	5 284 884
2021	2 767 917	159 769	2 174 097	989 838	6 091 620
2022	2 825 370	166 111	2 388 588	1 015 486	6 395 556

Based on data from Social Insurance Institution [12].

Public expenditure

Public expenditure on CC in Poland consists mainly of costs incurred by the public payer for health services, namely the NHF.

They are included in the costs of outpatient and hospital care. The second public payer is the SII which covers costs such as:

- disability pensions,
- social pensions,
- sick leave benefits,
- costs of rehabilitation services.

As shown in Table 5, the majority of NHF's expenses 2018–2022 were allocated to hospital care, with only a small proportion allocated to outpatient care. Total expenditure also encompasses categories beyond hospital and outpatient care, such as medications, rehabilitation or palliative care services.

Of the expenditure incurred by the SII, >80% was for disability pensions and sick leave benefits (Table 6).

Social costs as a proportion of public payer expenditures

As illustrated in Figure 2, public expenditures by both payers in Poland (NHF and SII) account for an average of only 18% of total expenditures, ranging 15.6–22% in individual years. Conversely, productivity losses caused by CC in Poland represent an average of 82%, with a range of 78–84.4%.

DISCUSSION

For many years, research has investigated the economic impact of productivity losses resulting from sickness absence and premature mortality caused by cancer. Similarly, in Poland [3], increasing attention has been paid to the influence of current epidemiological and demographic trends on the societal burden of cancer.

Cervical cancer, which predominantly affects women of working age, has also been the focus of research on indirect costs. Studies conducted in the USA [13], consistent with the findings of this analysis, confirm that the estimated annual productivity losses due to CC are several times higher than recent estimates of direct medical costs associated with this disease. Likewise, research from Europe [14], including analyses of CC, shows that direct healthcare costs account for only a small proportion of the total societal burden of cancer.

This study provides a comprehensive assessment of the economic burden of CC in Poland 2018–2022. The findings indicate that productivity losses (particularly those resulting from premature mortality) constitute the most significant component of the total economic impact of this disease. Given that CC primarily affects women of working age and often leads to death at a relatively young age, the resulting productivity losses place a substantial burden on the national economy. These findings are in line with international evidence, further supporting the robustness of the estimates.

Available and effective preventive programs contribute primarily to improved epidemiological outcomes, while also reducing productivity losses. It should be emphasized that, even today in Poland, women continue to die from a disease that could be at least partially prevented if detected at an early stage. Observational studies have demonstrated that well-organized CC screening programs based on cytological testing can reduce both the incidence and mortality of this invasive cancer by up to 80% [15]. By enabling early detection and preventing advanced-stage diagnoses and premature deaths, such programs significantly reduce both direct healthcare expenditures and indirect costs related to productivity loss and early mortality. These improvements in epidemiological outcomes inevitably translate into a reduced economic burden, which remains considerable in many countries. A study conducted in Central and Eastern Europe [16] confirmed that the high prevalence of HPV-related cancers in this region results in substantial economic losses, primarily driven by lost productivity.

The limitation of the study is that, in estimating the cost of lost productivity, the focus was placed solely on costs related to sickness absence and premature mortality in CC patients. The analysis did not account for 2 important aspects: sickness absence of family members or caregivers (i.e., informal care costs) and reduced productivity (presenteeism). This limitation stems from the lack of reliable data on sick leave costs for informal caregivers (as the SII does not keep such statistics) and the lack of studies measuring the extent of presenteeism in this patient group. It is acknowledged that the approach used in this analysis is conservative, and as a result, the presented productivity loss is likely to be underestimated. However, a deliberate decision was made to avoid the common simplification seen in similar analyses – namely, assuming that the sickness absence of informal caregivers is equivalent to that of patients. Such an assumption is considered to lead to an overestimate, which is viewed as a less desirable outcome than the conservative approach adopted here.

CONCLUSIONS

The results of this study demonstrate that work absences and premature mortality represent a significant societal burden of CC in Poland and should be a major focus of public debate. It was established that the cost of lost productivity is almost 5 times higher than the direct cost to public payers in Poland.

It is particularly important to recognize that the cost of lost productivity, which is often overlooked in cost analyses, represents a substantial burden, especially for diseases such as CC, and should be properly measured and accounted for in such evaluations.

The results of this study are consistent with epidemiological evidence [17] confirming that Poland, a middle-income country with CC rates significantly higher than the European average, exemplifies the financial disparities between European countries and their impact on health outcomes. The results of the analysis clearly indicate that significant efforts are still needed to mitigate the economic and social impact of CC in Poland. Addressing this challenge requires bridging existing gaps and enhancing public health practices. In particular, prevention programs must evolve and expand to reach a wider audience, emphasizing both primary and secondary prevention. In this context, the proposed systemic changes in Poland should be supported, as they seek to broaden the scope of occupational medicine examinations and integrate cancer prevention measures, such as cytology.

AUTHOR CONTRIBUTIONS

Research concept: Michał Seweryn, Tomasz Banaś
Research methodology: Agnieszka Leszczyńska, Joanna Streb
Collecting material: Tomasz Banaś, Joanna Augustyńska, Agnieszka Leszczyńska
Statistical analysis: Michał Seweryn, Joanna Augustyńska
Interpretation of results: Michał Seweryn, Tomasz Banaś, Joanna Streb
References: Agnieszka Leszczyńska, Joanna Augustyńska

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