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**Cost Considerations and Economic Impact
of Cancer on Labour Markets**

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Abstract

The challenges faced by newer member states in the reform and management of their healthcare sector are well-known, yet often under-assessed. This paper adds to this literature by analysing the indirect costs of cancer in the context of a Central and Eastern European member state. We consider the case study of Romania because it is among the European countries with the lowest health-care expenditures for cancer per person – 20 euros, and overall Romania has the lowest health expenditure per capita in the EU with only 584 euro (Hofmarcher et al., 2020). Romania has very low capabilities in terms of public healthcare expenditures, preventive care expenditures, and treatable mortality. Patients with cancer experience various administrative and social obstacles: lack of national screening programs, translated into late diagnosis, low access to and poor education around screening, long waiting list for mandatory tests, etc. In addition to this, our data shows that, it takes up to 6 months from diagnostic to the start of treatment for pulmonary cancer in Romania, or that patients are sometimes traveling up to 12 hours to reach a cancer treatment centre. The poorer conditions for people with cancer in Romania are reflected in a higher burden of cancer. We look specifically at the impact of cancer on the Romanian labour market as indirect costs of the disease.

Keywords: labour market, disease burden, healthcare costs.

JEL Classification: I15, I18, J08.

1. Introduction

The burden of cancer is an increasing concern for all countries, as the number of cancer patients is expecting to grow worldwide. According to the WHO, the number of cancer cases will grow from 18.1 million persons/year in 2018 to 29.4 millions of persons/year in 2024. Globally, 1 in 6 deaths are caused by cancer,

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and the number of deaths is projected to increase by 45% between 2008 and 2030, mainly due to the fact that people are living longer and the exposure to risk factors is growing (WHO 2020). Cancer is one of the top causes of death in Europe. More than one in every four deaths (26%) in Europe is due to cancer, which makes cancer the second leading cause of death. The spread of the disease requires a prompt answer from policy makers, both in prevention and treatment decisions for which the dimension and the category of costs involved by cancer are determinant.

Consequences of cancer may be considered in terms of economic costs (both direct and indirect), emotional distress of patients and relatives, and social and psychological side effects. Indirect costs are composed of productivity loss due to foregone labour market earnings of cancer patients based on three different reasons: mortality (the productivity loss between effective age and legal retirement age), temporary absence from work due to treatment or disease (absenteeism, payed leaves, diminished work capacity) and permanent discontinuation of work (loss of work capacity, early retirements). Additionally, patient incur indirect costs in the way of informal care, out-of-pocket money necessary for different activities associated to the illness (such as transportation, housing, etc.).

2. Research Hypotheses and Literature Review

Cancer patients are on average three times less likely to participate in the labour market at normal employment (i.e., full-time) (Bates et al., 2018). Even when a cancer patient returns to work after or in between treatments, their productivity will be significantly affected by the level of side-effects associated with the treatment option. Loss of productivity of the active persons can be associated with the hours of absenteeism and days of medical leave (Volintiru, 2020). Therefore, from a societal perspective, the economic burden of cancer is composed of direct costs, informal care costs, and indirect costs (Hofmacher et al., 2020).

Romania ranges among the European countries with the lowest healthcare costs of cancer per person: 20 euros per person comparing to Luxembourg, with 184 euro per person (Luengo-Fernandez et al., 2013). As in other countries, the indirect cost associated to cancer are higher than the direct costs. However, cancer patients in Romania face a lot of problems, making it hard to estimate the total costs associated with the illness. Despite a national health insurance that covers cancer diagnosis, treatment, and follow-up, patients with cancer still experience various administrative and social obstacles: lack of national screening programs, translated into late diagnosis, low access to and poor education around screening, long waiting list for mandatory tests – sometimes for weeks or months (as CT or MRI scan), lack of support therapy facilities, which means that patients are sometimes traveling up to 12 hours to reach a cancer centre (Udrea, 2020). The poorer conditions for people with cancer in Romania are reflected into a higher burden of cancer. Despite the fact that the percentage of people diagnosed with cancer in Romania is 1.63%, less than

in France, for example (where the prevalence is 2.9%), DALY⁵ is significantly higher for Romania (3732) than for France (3018) or for Germany (3026).

Therefore, for the purpose of this paper, the following hypotheses are considered:

H1: The indirect costs of cancer in Romania are higher than the medical costs and can increase the burden of cancer.

In Romania, according to CNAS data, the average cost per patient treated per year for oncological conditions is 12,000 RON. Given that the average salary / year is 62,000, we can see how the indirect costs associated with cancer can be 6 times higher than the direct ones. Per-capita health spending on cancer in Romania is the lowest in the EU: below 100 euros, in 2018. Expenditures on cancer drugs, in per capita terms, for Romania, was 20 euros in 2018, comparing to other countries, like Austria, were they were 90 euros. Furthermore, because the level of adverse effects differs greatly between existing therapies, estimating the impact of treatment on active individuals is much more complex.

H2: The course of treatment can impact significantly the quality of life and productivity of cancer patients in Romania.

Cancer patients are on average three times less likely to participate in the labour market at normal employment (i.e., full-time) (Luengo-Fernandez et al., 2012). Even when a cancer patient returns to work after or in between treatments, their productivity will be significantly affected by the level of side-effects associated with the treatment option. Loss of productivity of the active persons can be associated with the hours of absenteeism and days of medical leave. It can also be associated with the overall gross-value added lost in the economy. It can also be associated with the overall gross-value added lost in the economy. For different types of cancer, the hours of work lost due to illness per week range between 1h -1h30m for progression-free patients for the rest of their life, and in between 2.8h per week (Tangka et al., 2013) and up to full-week lost due to illness for patients with progressing disease. There is a wide category of cancer patients who continue to go to work - either on their own or due to the completion of the medical leave allowed by law. For this category of "patients active on the labour market" very few data exist regarding the low efficiency in the workplace (Tangka et al., 2013).

According to a study conducted among European countries, Romania loses 598 million euro as productivity loss from premature mortality and 160 million euro as productivity loss from morbidity (Hofmarcher et al., 2018). However, much of the indirect costs due to morbidity differ from country to country, and the differences emerged from different policies for granting permanent or temporary disability (Bates et al 2018). While for Romania available data on absenteeism is limited, we do know that productivity levels are low, and policy measures should account for the impact of the disease on this socio-economic level as well.

⁵ Disability-Adjusted Life Years (DALYs) per 100,000 individuals from all cancer types. DALYs measure the total burden of disease – both from years of life lost due to premature death and years lived with a disability. One DALY equals one lost year of healthy life (Roser and Ritchie, 2019).

3. Measuring the Indirect Cost of Cancer

The direct health cost of cancer (DHCC) has increased six-fold in the period 2005-2014 in the European Union (Wilking et al., 2016). New treatment options can significantly decrease this overall cost that is compiled from both the direct costs of treatment, as well as the indirect costs of productivity loss and lower quality of life associated with the disease.

In the context in which the Single market is consolidating on the dimension of the Social Compact, and further integration of social and health services is intended, it is very important to have a complete overview of direct and indirect costs associated with this disease. A proper estimate of the economic impact on the labour force (for both patients and caretakers) can inform better health policies in member states.

In Europe, the estimated cost of productivity loss was 42% of total cost of cancer, while direct medical assistance accounted for only 41% of total costs on average, and informal care for 18% (Luengo-Ferandez et al., 2013). Except for the USA, in the existent cohort of studies on indirect costs of cancer, developed economies have a much higher share of indirect costs of cancer such as productivity loss than those associated with the treatment itself (see table below). The share of indirect costs in the total cost of cancer leave room for improvement on this level via new therapies that present significantly lower side effects (e.g. immuno-oncology). In Table 1 we use data from existent studies to showcase in a comparative manner the extent to which the share of formal or informal costs related to cancer is distributed.

Table 1. Comparative Burden of Cancer Related Medical Costs in the World

	Direct medical costs (% total cancer costs)	Indirect medical costs (i.e., productivity loss) (% total cancer costs)
EU	41%	42%
USA	61%	22%
South Korea	28%	55%
Australia	29%	54%

Source: Based on existent studies (Bates et al., 2018, Carter, 2016, Luengo-Fernandez et al., 2013, Wilking et al. 2016, Tangka et al., 2013, Venkatesan, 2018).

Prevalence of informal care leaves the burden of the disease on the shoulders of the patient and the family hub. As such, social costs are incurred not only by the patient, but also by their caregivers and family members. Extended human capital costs are therefore registered at the level of a society that does not efficiently mediate the negative impact of cancer. According to a recent study, in the United Kingdom, up to 1 in 3 caretakers see their own personal incomes diminished by taking care of a cancer patient in the family (Cancer Support, 2017). The academic literature covers

the extent to which caretakers of cancer patients generally suffer a psychological, social and financial burden (Desheids et al. 2012). In a context of poor formal care, such as Romania, where the extent of facilities for non-medical care (e.g., transportation, accommodation) related to cancer is very scarce, the burden of informal care by family members is even higher. In Table 2, we show a comparative overview of the average productivity impact (i.e., hours of work lost due to own or family member illness) for both patients and caretakers or family members. We distinguish, based on existent studies and data, between different types of disease and different stages. In the absence of a patients' registry in Romania, such impact assessments are not possible, unfortunately.

Breast cancer survivors reported a mean reduction in productivity of 3.1% below the healthy worker norm, which amounts to a loss of 2.48 hours of work over two weeks of full-time employment (Lavigne et al., 2008). But, most of this loss is associated with the side-effects of the treatment, not disease itself (i.e., fatigue and hot-flashes), as stage progression itself accounts for only half of the productivity loss recorded in this study.

Table 2. Hours of work lost due to illness

	Hours of work lost due to illness (per week)		
	Progression free*	Progress ingdisease	Caretaker (progressed or terminal phase)**
Melanoma	0.92	2.8 – 40 (full-work week)	34
Lung cancer	0.92	2.8 – 40 (full-work week)	34
Brest cancer	0.92 - 1.24***	2.8 – 40 (full-work week)	34
Urothelial carcinoma	0.92	2.8 – 40 (full-work week)	34
Head and neck cancer	0.92	2.8 – 40 (full-work week)	34
Renal cell carcinoma	0.92	2.8 – 40 (full-work week)	34
Gastric cancer	0.92	2.8 – 40 (full-work week)	34
Hepatocellular carcinoma (HCC)	0.92	2.8 – 40 (full-work week)	34

Source: Created by authors.

* calculated based on absenteeism levels in Romania and the rate of workdays missed for people with cancer (Tangaka et al, 2013)

** calculated based on the average of 6.8 hours per day (Yabroff and Kim, 2009)

*** value specifically calculated for Stage 1 and 2 by Lavigne et al. (2008)

For different types of cancer, the hours of work lost due to illness per week range between 1h -1h30m for progression free patients for the rest of their life, and in between 2.8h per week (Tangaka et al., 2013) and up to full-week lost due to illness for patients with progressing disease. There is a wide category of cancer patients who continue to go to work - either on their own or due to the completion of the medical leave allowed by law. For this category of "patients active on the labour market" very few data exist regarding the low efficiency in the workplace.

The administration costs in Romania are taken to be the same for the standard care and immuno-oncology treatments according to CNAS data. The treatment day is considered to be 280 RON for each patient disregarding the number of hours

needed to administer the treatment itself. Furthermore, because the level of adverse effects differs greatly between existing therapies, estimating the impact of treatment on active individuals is much more complex.

Administration cost	
Daily administration cost for chemo infusion	280 RON/ day (blanket value)

Source: National Health Insurance House Romania (CNAS).

There is no data to estimate the terminal cost of a patient in Romania or the broader region. However, we can refer to reasonable estimates of 1-1.2 day (172-207 RON) per week loss in productivity for care-takers of terminal stage patients. The terminal cost also portrays costs related to the death of the cancer patients. In Australia, for example, a recent analysis shows that about 88,000 hours were lost to premature cancer deaths in a single year (the equivalent of about \$ 4.2 billion in revenue) - 30% of these costs being associated with lung and colorectal cancer.

Terminal cost	<p>Terminal cost The expected cost incurred due to a patient transitioning to the "dead" state. This will be used to capture all the costs involved in the end of the life of a patient. This can be given as a single value for all indications.</p>	<p>1.2-4.25 days * / 207 – 732 RON** per week productivity loss of care-taker</p>
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* Minimum interval based on Kouli et al. (2013) estimates, and maximum interval based on Lavigne et al. (2008).

** Calculated based on the average salary in Romania of 5163 RON.

In Romania, according to CNAS data, the average cost per patient treated per year for oncological conditions is 12,000 RON. Given that the average salary / year is 62,000, we can see how the indirect costs associated with cancer can be 6 times higher than the direct ones.

4. Conclusions

This paper has a twofold goal. It aims to develop a conceptual overview of existent methodological approaches to studying and measuring the burden of cancer on patients, caretakers or budgetary allocations. This paper showed that there are indirect economic effects of a cancer diagnostic, on the patient, but also on the broader economic ecosystem in which cancer patients normally live and work. There are also psychological effects, and also the financial stress that extends to the family and support people (relatives, caregivers) are important, especially in the context where there is limited or no access to care services or when they are very expensive. Family members are generally unpaid for this additional activity and therefore a

reduction in employment, financial problems, and a poor physical / mental state can occur with profound negative effects on their ability to be productive members of society.

The second goal of the paper was to define some potential measurements for the burden of cancer in Romania. There are significant limitations in the availability of primary data, comprehensive patient registries and other information that can help towards the quantification of the burden of cancer in this country. In this context, several conclusions emerge with regards to the broader socio-economic implications of fighting cancer in Romania and elsewhere.

Efforts to reduce the economic effects of cancer must come from all those involved: governments (public health and investment policies), individuals (improving lifestyles and using health system services), professional associations (coordination and self-regulation), industry (access to medicines, innovation, partnerships, and strategic investments). Thus, by cooperation of all stakeholders, investment and efforts to reduce the effects of cancer can bring the expected benefits, especially in terms of reducing suffering, saving the lives of those affected, promoting social equity, and maintaining adequate productivity. The forms of intervention take several forms, from primary prevention to hospital care services in the terminal phase of the disease (WHO, 2020) and significant improvements can be achieved in each if these stages.

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