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# Innovation and the Economics of Healthcare: The Case of Blood Cancer

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## 1. INTRODUCTION

FEW SECTORS TESTIFY to the benefits of innovation as much as healthcare. Today, people in developed economies live long and have a high quality of life. “Life is better now than at almost any time in history”, suggests Nobel laureate Angus Deaton.<sup>1</sup> In the 1960s and 1970s these societies had left the age of child mortality and infectious diseases. In the following decades, there has been great improvements to attack what he called “the monsters” of “chronic diseases that killed people in middle age: heart disease, stroke and cancer”.<sup>2</sup>

In the past 100 years, new medical innovation and access to healthcare have helped people survive what previously were deadly diseases. Rising global prosperity in the past decades

has converged billions of people in previously poor countries to the medieval frontier. And among rich countries, that frontier is yet again on the verge of a great expansion as the medical science is rapidly improving its capacity to treat malign conditions.

The question facing healthcare systems, however, is not just one of awe for the impressive achievements in pushing the medical frontier. There is also a far more pedestrian issue that they are wrestling with, and it is about the payment or financing of all these new opportunities to cure and treat people. For many healthcare administrators in Europe and elsewhere, the combination of increased longevity and medical innovation is not just a testimony of human ingenuity but also a potential blow to fiscal sustainability and efforts to maintain

<sup>1</sup> Deaton, 2015, p. 1.

<sup>2</sup> Deaton, 2015, p. 130.

## EXECUTIVE SUMMARY

While innovation is central for the quality of healthcare and improving health outcomes, it is also a source of increasing costs for governments. Confronted by fiscal pressures, governments have made efforts to restrict access to innovative treatments. While such policies are understandable, they are not necessarily supportive of the ambition to control the cost burden of a disease. This paper reviews economic analyses of the cost burden of cancer, and blood cancers

in particular, and the effects that innovative treatments have on other sources of costs in the healthcare system or the economy as a whole.

While there is a need for more research on the relations between costs in healthcare systems, and significant variations between countries, several studies have found that access to innovative treatments have reduced inpatient care costs because, among other

things, better treatments reduce the need for long hospital stay. Furthermore, research also shows that a significant part of the total cost burden of cancer and blood cancer is the productivity loss to the economy when patients are out of work. Reducing the productivity loss is central for improving the economic rationality of healthcare systems. This Policy Brief charts some areas for work – at national and the EU level.

healthcare budgets in good balance. Most countries in Europe already manage healthcare policies in a way that aim to contain costs and restrict access to healthcare. A long period of low or negative economic growth has given greater urgency to the need for governments to economize with resources. Faced with new medical innovation, governments increasingly fear that the supply of innovative drugs and medical technologies ultimately may "break the bank" unless they restrict access to them and avoid giving patients the expectation that governments can afford them. Consequently, patients in many European countries are today offered treatments that are increasingly distant from the medical frontier, and the gap between the frontier and current treatments is gradually getting larger. On current track, the policy of rationing access to innovative healthcare will only increase in strength and consequence.

This reaction by governments is understandable. However, it is not necessarily economically rational or the best way to use resources in a way that promotes efficiency and equity. In some areas, preventing access to better treatment will not just prolong or increase human suffering, it will also drive up government expenditures on healthcare and keep people away from the labour market, which in turn lower tax receipts and, in most countries, raise spending on social security. A general economic rule of thumb for healthcare is that the most expensive way to address illnesses is to not treat them, or to treat the symptoms rather than the source. While there is variety between diseases and areas of medical practice, this particularly holds true for diseases where it is difficult or outright impossible to shift the cost burden to the patient, or for the patient to manage his or her disease in a way that allows them to remain in work or education and not put other demands on the public purse.

Cancer treatment is one such area. It is expensive and the cost cannot be shifted to the patient. Delaying access to treatment has serious consequences for the ability to treat and cure patients. Non-treatment or non-efficient treatments are often associated with greater need for other healthcare or social assistance. Even the most cynical approach to cancer

treatment, therefore, would be associated with significant effects on public expenditure. In reality, the choice facing governments is not one of accepting or escaping the cost burden: it is rather the choice of how resources should be allocated between different parts of the healthcare system – or the welfare state generally.

In this Policy Brief, we will take a closer look at this allocation of resources and how different choices affect the economics of healthcare systems. We will particularly consider the case of blood cancer and what economic and medical research have concluded in terms of the best way of economizing with scarce resources for treating patients with blood cancer. Blood cancer is an interesting area of medical practice to study, because the growth in cancer incidence has increased and there has been a period of acceleration in healthcare innovation for various blood cancers over the past two decades.<sup>3</sup> It is not one of the most common forms of cancers, but blood cancer represents about 7 percent of all cancers today.

The basic question in this Policy Brief is: can governments improve on their expenditures by moving treatments closer to the medical frontier and allow a greater degree of innovation in medical devices and drugs? That is a difficult issue to respond to because there is an obvious lack of comparative data and research on the comparative costs of specific cancers and treatments in Europe. Nor is there necessarily a universal answer, applicable to all countries in Europe, to the question either as the design of healthcare systems vary considerably. Hence, there are clear limitations both in research and in the established knowledge about how healthcare systems work.

However, new research has put greater light on the economic effects of different choices in resource allocation, and this research is of great value for healthcare administrators making decisions about costs and access. This Policy Brief will present an overview of this research and discuss the findings in light of healthcare policy design in Europe. It will set out a new platform for policymakers and stakeholders with the interest and desire to improve on the current system.

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<sup>3</sup> Hostenkamp & Lichtenberg, 2015

## 2. REVIEWING THE HEALTHCARE ECONOMICS OF BLOOD CANCER TREATMENT

Blood cancer are a collection of 140 different diseases that are all heinous and require urgent medical attention once a patient has received a diagnosis. Treatment of blood cancer is also expensive and, just like other drugs to treat cancer, expenditures on blood cancer drugs have most likely increased significantly over the past decades in Europe. For governments working to find the right design for healthcare policy, the increase in expenditures for cancer drugs in general and for blood cancer drugs in particular have sparked concerns that the rise in expenditure has been too fast and that there may be little or no space to increase them farther.<sup>4</sup>

Such a cursory view of the evolution of expenditures is understandable: it is an immediate reality facing governments. Yet it is also misleading. There are several ways to map and measure the cost, effectiveness or the general economic impact of new treatments, and in order to get a complete picture there are several aspects and cost items that have to be considered. Some of them concern very basic facts about society and the consequences of increased prosperity and longevity. First, the incidence of cancer has gone up because of several factors, one of which is the increased longevity and a higher share of the population that are above 65 years old and have higher incidence risks.<sup>5</sup> Second, many countries that have experienced an acceleration in cancer drug expenditures generally are also countries that have witnessed an increase in population.

Other factors are more complicated. Treatment of blood cancer share with other rare diseases that pure cost effectiveness studies have not always supported their introduction to patients. Healthcare systems working predominantly with analyses of the comparative effectiveness of various treatment options often have difficulties accommodating the effects of treatments of rare diseases, and this field of in-

quiry has been somewhat blurred or lacked the clarity that can be found in cost-effectiveness studies of treatments in other areas of medical practice.<sup>6</sup> Obviously, a rare disease means it is rare, and such diseases generally require a greater sense of equity in order to support the introduction of better treatments.

Still, several cost effectiveness analyses of blood cancer treatments have concluded that the extra cost of innovation is motivated when the medical effectiveness of new treatments are considered. In a large study by a group of healthcare scholars, published studies of the cost effectiveness of nine treatment agents for four types of blood cancer (chronic myeloid leukemia, chronic lymphocytic leukemia, non-Hodgkin lymphoma, and multiple myeloma) were reviewed in order to evaluate the value of innovation.<sup>7</sup> The scholars concluded that innovative treatments for hematologic malignancies “provide reasonable value for money”. A clear majority of the 29 cost-utility analysis that were reviewed provided results that motivated inclusion when they were measured in terms of costs and health benefits for quality-adjusted life years (QALY).

However, analyses of the cost-effectiveness of innovation is a good servant but a bad master, also for policymakers that aim to improve resource efficiency in a healthcare budget. Gauging the comparative effectiveness of various treatments is necessary, but it does not take account of all consequences for healthcare expenditures as a consequence of innovation or non-innovation, partly because some of these effects are not known at the time of inclusion. To get a better view of what healthcare administrators need to include in an analysis that can help shape policy decisions, let us consider a couple of recent studies on the value of innovation.

### 2.1. THE DIRECT HEALTHCARE COST

In a broad analysis over cancer expenditure in Europe, a group of health economists concluded that the direct healthcare costs of cancer in Europe have broadly remained flat – at

<sup>4</sup> Chhatwal et al., 2015, consider these issues in the U.S. context.

<sup>5</sup> Existing research and data do not show if the incidence of blood cancers has increased as well. Sant et al., 2010, take stock of the incidence of selected blood cancer types in the period 2000-2002.

<sup>6</sup> Lopez-Bastida & Oliva Moreno, 2010.

<sup>7</sup> Saret et al., 2015

approximately 6 percent of total healthcare expenditures – over the past twenty years.<sup>8</sup> There is a degree of variation between countries and over time, and the exact figures on the relative cost of cancer have also been estimated by several other country-based studies which have arrived at other figures. The differences reflect the methodology in the research and, in particular, the exact definition of cost – in essence, what is included in the direct healthcare cost.

Studies done over expenditures in Sweden – a country where there has been plenty of research on the costs and economic impact of cancer and innovation – show this variation. The OECD has estimated, for instance, that the cost of cancer in 2006 represented 3.1 percent of total healthcare expenditures in the country.<sup>9</sup> An analysis by the National Board of Health and Welfare together with the Swedish Association of Local Authorities and Regions put the figure at 6.8 percent of total healthcare expenditures for the year of 2004.<sup>10</sup> According to a comparative study of cancer costs in Nordic countries, the relative cost of cancer in Sweden in 2013 is 4.4 percent.<sup>11</sup>

While the differences can be explained by methodological choices in the specific analyses, the research also reports a fairly stable share over time for total direct costs of cancer in total healthcare expenditures. The share of healthcare expenditures as part of Gross Domestic Product has not moved much either. An overview of cost estimates for other European countries and the United States suggest a similar conclusion.<sup>12</sup> In other words, despite the increase in cancer incidence and the costs of innovation, the relative cost of cancer appears to be stable over time. On the basis of existing data, it is difficult to find support for the proposition that the costs of cancer and innovation have “broken the bank” or put bigger pressure on public healthcare budgets than other sources of cost.

Yet, at the same time, expenditures on innovative cancer treatments – both costs on diagnos-

tic innovation and drugs – have risen fast. At a first glance, therefore, the equation does not seem to hold up: cancer drugs are a significant part of cancer treatment – and if expenditures on cancer drugs rise fast, it should affect the total direct healthcare cost for cancer.

However, an important part of the economic value of innovation is that it substitutes existing costs incurred by healthcare systems to treat cancer. All forms of cancer treatments are based on a combination of different costs. While they vary over time and between countries, research clearly suggests that there is a relation and, to use economics jargon, fungibility between the different sources of cost. In essence, the better that healthcare systems get at treating different diseases, the less need there is for patients to stay in hospitals and there is less demand for other forms of care, for example expensive ambulatory care.

There is plenty of research to support the view that innovation in treatment precision, efficacy and capability generally substitutes various forms of healthcare costs. For some diseases and countries, the direct cost of innovation does not get fully covered by “savings” made in other related expenditures to treat a disease. The substitutability of innovation depends on a variety of factors, and the innovation itself is just one of them. A greater determinant appears to be the way a healthcare system works and how expenditures on staff, buildings and machines respond or adapt to innovation and changes in the organization. In particular, healthcare organisations that do not adjust efficiently to new innovation tend to have problems to motivate new expenditures related to innovation. They also have a general development of expenditures that is unsatisfactory from the view point of allocating resources to promote efficiency and equity in healthcare.

Leading health economist Frank Lichtenberg, for instance, has in a series of studies of innovation and healthcare expenditures found that treatment innovation substitutes direct costs and, generally, can have a positive effect on healthcare expenditures. In a study of cancer care in Canada, Lichtenberg found that the number of cancer hospital days between 1995 and 2012 declined by 23 percent despite a 46 percent increase in the number of people di-

<sup>8</sup> Jönsson et al., 2016

<sup>9</sup> Swedish Cancer Society, 2006.

<sup>10</sup> National Board of Health and Welfare, 2014.

<sup>11</sup> Kalseth et al., 2011.

<sup>12</sup> Jönsson et al., 2016.

agnosed with cancer.<sup>13</sup> In areas of cancer that have witnessed faster innovation than others, the decline in hospital days were significantly larger. The result confirms many other studies focusing on different areas of medical practice.<sup>14</sup> Reducing the number of hospital days is central for an efficient use of resources. Furthermore, treatments that prevent patients from needing regular access to acute or ambulatory healthcare tend to have a significant impact on the direct healthcare costs of a disease.

General review studies suggest that innovative treatments of blood cancers show a high degree of cost substitution in that disease area.<sup>15</sup> Admittedly, there is not much research on the comparative economic impact of specific cancer diseases and their treatment. However, studies of countries like France, Germany, the Netherlands and the Nordics show that innovation that allows for better treatment, and greater precision in the treatment, of blood cancers have had a positive effect on other healthcare costs. The number of hospital days have declined. There is less need for contact with medical specialists. The use of ambulatory care goes down. Recoveries are faster. In these studies, the allocative efficiency of healthcare expenditures goes up with innovation. Apart from producing better healthcare outcomes, innovation has also shown to reduce sources of costs that is not directly a part of the treatment of blood cancers.

## 2.2. THE TOTAL HEALTHCARE COST

The direct healthcare costs are not the only relevant costs to estimate for governments with the desire to promote an economically rational use of healthcare expenditures. The direct healthcare costs are what confronts decision-makers in healthcare because it is these costs that are directly affecting the healthcare budget. Yet for the economy, and for government spending in its entirety, it is also crucial to get a good understanding of other related costs with a disease and a treatment. Healthcare economists call these costs “indirect costs”

and they are represented by disease or treatment-related expenditures by the patient and the time spent by family in nursing a patient out of hospital. Furthermore, a significant part of indirect healthcare costs are productivity losses in an economy due to the absence from work by patients in treatment.

Naturally, these indirect costs vary between diseases and treatments. Depending on a country’s general economic development, there is also a variation between the productivity losses. In economies with specialized and highly educated staff – which tend to be richer economies – the productivity loss of a patient being away from work is far greater than in economies with less educated staff.

Unfortunately, these type of costs are routinely ignored by governments making decisions about the inclusion or non-inclusion of new innovation. Admittedly, it is difficult at the time of the decision to know the effect of innovation on indirect costs. Some indirect costs are partially gauged, but governments generally stop short of obtaining this knowledge as they are more concerned about the direct effects on healthcare budgets. As a consequence, few governments, if any, have today a system of determining access to innovation that is based on the full economic impact of a new innovation.

There is also a dearth of research on the full economic impact of cancer in Europe. The best study is a *Lancet Oncology* study from 2013 that estimated the direct and indirect costs of cancer for the year 2009.<sup>16</sup> It arrived to the conclusion that the total costs of cancer in Europe was 126 billion euro. It pointed to the cancers that represented the highest share of the economic burden – breast, colorectal, lung and prostate cancers – but did not include the specifics of other cancers. The study found that the direct healthcare costs for cancer treatment that year was 51 billion euro, the equivalent of 102 euro per citizen. Productivity losses because of early deaths were estimated at 42.6 billion euro. Productivity losses because of lost working days stood at 9.43 billion euro. In total, productivity losses represented the biggest source of the cost burden of cancer. Informal

<sup>13</sup> Lichtenberg, 2016.

<sup>14</sup> See for instance Myron L. Weisfeldt and Susan J. Zie-man, 2007 and Earl S. Ford and Simon Capewel, 2011.

<sup>15</sup> Ministerie van Volksgezondheid Welzijn en Sport; Federal Health Monitoring System; Bonastre et al., 2012; Kalseth et al., 2011.

<sup>16</sup> Luengo-Fernandez et al., 2013.

care costs were 23.2 billion euro. Lung cancer was estimated to have the highest economic cost.

Like in other studies of less quality, the Lancet study showed a remarkable degree of variation between countries in Europe. While one part of the variation can easily be explained by the level of economic development – richer countries have greater abilities to offer better healthcare to patients – that particular factor cannot explain the full variation. Countries with similar level of economic development also show variations when they are compared. It rather seems as if the total economic costs are related to the organization of healthcare, what treatments that are offered, and how governments allocate the resources for treatment between various sources.

That conclusion also comes out of a recent study, also published in the Lancet, that replicated (and improved on) the methodology used in the above-mentioned study in order to estimate the economic costs of malignant blood disorders in Europe.<sup>17</sup> The group of scholars behind the study estimated that these diseases cost European Union countries (plus Iceland, Liechtenstein and Norway) 12 billion euros in 2012. Direct healthcare costs represented 62 percent of all total costs, and in category of costs, inpatient care was the main cost component (representing 54 percent of the healthcare costs). Pharmaceutical costs were the second biggest cost component, taking about 28 percent of the total direct healthcare costs. On average, these countries have costs at 141 euro per every ten citizens, but there is a big difference between countries. In Lithuania, for instance, that figure is 25 euro while it is 303 euro in Norway – a 12-times difference.

However, countries of similar economic development also show a high degree of variation, and the main explanation for it is the variation in costs for inpatient care. What particularly drives up the total costs for some countries direct healthcare costs are the costs for inpatient care. Generally, the countries that spend the highest share of their total healthcare budget on treating malignant blood disorders are countries where there is a disproportional rela-

tion between inpatient care costs and pharmaceutical costs. Countries like Croatia, Greece and Slovenia have a substantially higher share of total healthcare expenditures on these disorders (1.4, 1.7 and 1.2 percent, respectively). The same countries also spend a far higher proportion of direct healthcare costs on inpatient care. The ratio between the expenditures on inpatient care and the expenditures on pharmaceuticals in Greece is 2.3. In Belgium, where malignant blood disorders represent 0.3 percent of total healthcare expenditures, the same ratio is 1.27. In Greece, a patient under treatment with these diseases spend on average 48 days in hospital; in France and the Netherlands the average is 8 days. While most countries do not have such an extreme ratio as Greece, the reality is that countries that allocate a higher share of the budget on pharmaceuticals spend a smaller share of healthcare expenditures on malignant blood disorders.

The Lancet study also found the costs of productivity losses to be significant. This is partly surprising. Malignant blood disorders are generally seen as disorders where the incidence increase substantially with age, and people in retirement are no longer contributing to production. However, given the increasing population, that people are working longer, and, perhaps, an increasing incidence of blood cancers, the effects of productivity losses are substantial. The scholars estimated that approximately 90 000 working years were lost due to mortality-related productivity losses, and they valued these losses at 2 billion euro. In 2012, moreover, 12 million working days were lost and this morbidity-related productivity loss also represents about 2 billion euro per year. On average, Europe loses about 0.6 percent of GDP every year because of blood cancer.

### 3. FUTURE POLICY DEVELOPMENTS FOR GOVERNMENTS AND THE EU

This brief analysis of available research clearly suggests that there is an obvious need for governments and healthcare administrators to become better at understanding the full economic impact of diseases and treatments. While cursory analyses often prompt governments to hold back on new expenditures on innovation, the reality is that innovation often – but not always – have a positive impact

<sup>17</sup> Burns et al., 2016.



on not just health outcomes but also resource efficiency and the totality of resources spent on one particular treatment. Getting on top of these relations between costs is important in order to relieve people from suffering, but also to make sure that resources are spent on treatments that lower the total economic costs to an economy of a disease.

There are several areas where there is an obvious need for improvements, and governments could achieve much by cooperating more closely with each other in the EU, principally by sharing experiences and best practices. There is already important work done at the EU level on assessing the performance of healthcare systems, but there are still huge gaps and opportunities to import better practices from other healthcare systems.

#### **A. Cost Effectiveness of New Innovation**

There is a general need for governments to improve on the cost-effectiveness analyses of the inclusion or non-inclusion of innovative treatments. Many governments conduct high-quality analyses in some areas of medicine, but fail on others. Some governments do not produce high-quality analyses at all and generally take a very restrictive view of including new innovative treatments. While one country study cannot easily be applied to other countries, there is an obvious need to improve methodologies and access to data. There is also an obvious need of ex-post analyses of the full effectiveness. These are issues where governments should have an interest to intensify cooperation.

#### **B. Understanding the Substitutability Between Innovation and Other Costs**

New innovation often has a positive effect on total healthcare costs because they substitute existing costs. Governments, however, have an incomplete view on the substitutability of innovation and, as a rule of thumb, do not measure it adequately. The consequence is that governments have problems making informed decisions about the economic effects of innovation, with the risk of denying patients access to treatments that would both be better and cheaper. As part of a general effort to improve on the knowledge of how innovation relates

to other costs, governments also need to obtain a better understanding of how healthcare systems need to change to adapt to new innovation. This is another area where there is a role for the EU and other international bodies. Developing dispassionate analyses that can help countries to learn from others can have significant impacts on resource efficiency.

#### **C. The Relation Between Innovation and Productivity**

Obviously, it is costly for a society to have patients in hospital care rather than at work. It effects other expenditures of a government – e.g. sick-insurance pay – and the output of the economy. However, there is a dearth of research and knowledge that put greater light on the relation between innovation, expenditure and productivity, and governments making decision about access or non-access to new innovative treatments simply do not have knowledge about the full economic impact. Consequently, it should happen, perhaps frequently, that governments deny access to innovative treatments that, in their totality, would have a hugely beneficial effect on the economy and the total spending of a government.

If healthcare and public budgets are generally under pressure, there should be an even greater desire for governments to understand the full economic effects of the healthcare decisions they make. Given the constraint of limited resources, improving the efficiency in the allocation of resources between different treatment sources gets even more important. The reality, however, is that public healthcare bodies often make decisions on the basis of the effects they will have on their immediate budgets.

This situation is very unsatisfactory – and it needs attention. Developing better knowledge and methodologies for governments to make informed decisions is an area of work that fits international cooperation, like the EU. Countries should have an interest to learn from others, both when they make this right and when they make things wrong.

#### 4. CONCLUSIONS

Innovation is central for the quality of health-care and improving health outcomes. It is also central for smart allocation of scarce health-care resources. By reviewing existing research on especially healthcare costs of blood cancer treatment, this study has found that:

- There is a growing gap between the medical innovation frontier and what access to innovative treatments that are offered to patients in Europe.

- There is a high degree of variation between countries in Europe in access to innovative treatments and resource efficiency.

- There is a clear relation between access to innovation and the reduction of other treatment costs for blood cancers. Better access to innovation reduces the need for hospital and other healthcare.

- There is a clear relation between access to innovation and the full economic impact of a disease, including the economic costs related to productivity losses.

- Governments have a great challenge ahead of them in both understanding the relation between innovation and costs, and improving on the adaptability of healthcare systems.

- Governments should have a strong interest in collaborating more closely with other countries in the EU to develop knowledge about, and methodologies to investigate, the full economic impact of various diseases and their treatments. The EU has already started to develop this type of work, but it remains tentative and some member states governments guard very closely their privileged right to assess the performance and quality of their healthcare.



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