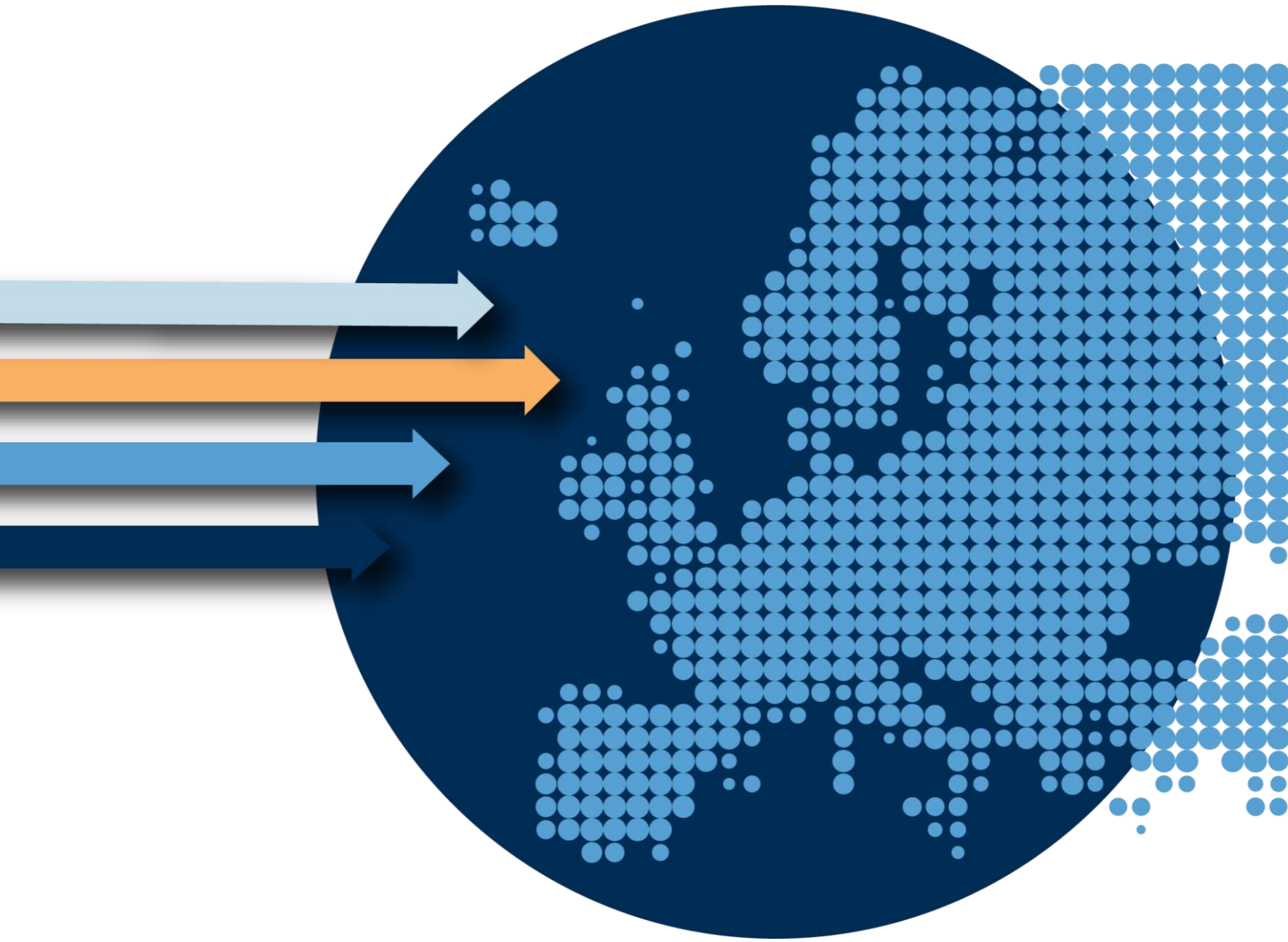
THE COST OF CANCERS OF THE DIGESTIVE SYSTEM IN EUROPE



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IHE - The Swedish Institute for Health Economics

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Foreword

The work and costs of oncologists, nurses, hospital beds, radiotherapy machines, cancer drugs, etc. are the backbone of the cancer care process. The economic burden that cancer imposes on society is broader than health care costs though. Relatives and friends provide many hours of unpaid care for patients, which represents a cost. It is also costly to society when otherwise working patients are forced to be on sick leave to receive treatment and recover from their disease, when they are forced to retire early due permanent incapacity and disability, and when they die.

IHE has in a previous study estimated the cost of cancer in 31 countries in Europe. In this report, IHE breaks down the costs by cancers of the digestive system. Information on the full scale of the economic burden of these cancer types is an important element for providing a broader perspective in future decision-making on the allocation of health care resources.

Nils Wilking provided excellent research support for this report. We would like to thank Stefan Gijssels at Digestive Cancers Europe for discussions and comments on the report. We also thank Digestive Cancers Europe for funding the project through a grant to IHE. The responsibility for the analysis and conclusions in this report lies solely with the authors.

Lund, Sweden, September 2020

Peter Lindgren
Managing Director, IHE

Executive summary

The total cost of cancer – comprised of direct costs, informal care costs, and indirect costs – is an under-researched area. Pan-European studies on the cost of cancer are rare. This is even more true for pan-European studies on the costs of specific cancer types. The cost of different cancer types naturally varies, as some cancer types are more common than others and more patients entail higher costs. Whether there is a big modern drug arsenal available for a specific cancer type influences direct costs. The survival rate and the typical age at which patients of a specific cancer type are diagnosed influences indirect costs and informal care costs. It is thus important to study the size and composition of the total cost of specific cancer types.

In this report, a prevalence-based cost-of-illness study was conducted to estimate the costs of the six major cancer types of the digestive system – esophageal cancer, stomach cancer, colon cancer, rectal cancer, liver cancer, and pancreatic cancer. The analysis was carried out for 31 European countries, the EU-27 member states, Iceland, Norway, Switzerland, and the UK for the year 2018. The types of costs included were direct costs (including cancer drugs), informal care costs, and indirect costs. Direct costs were calculated in a top-down manner by combining total health expenditure with national estimates of the share of total health expenditure spent on cancer care overall and on cancers of the digestive system. Data on cancer drug sales were obtained from IQVIA. Informal care costs were based on results from a previous study. Indirect costs related to premature mortality were calculated based on data from Eurostat and indirect costs related to morbidity were based on results from a previous study.

The total cost of the six cancer types of the digestive system jointly amounted to almost €39 billion in Europe in 2018. This represented around 19% of the total cost of cancer of €199 billion. Colon cancer caused the highest cost amounting to €12.2 billion, followed by pancreatic cancer with €7.0 billion, rectal cancer with €6.8 billion, and stomach cancer with €5.0 billion. Liver cancer with €4.0 billion and esophageal cancer with €3.6 billion caused the lowest cost.

The report shows that non-health care costs form a major part of the total costs in all countries. In all six cancer types, the sum of informal care costs and indirect costs was either equally large as the direct costs (colon cancer and rectal cancer) or larger than the direct costs (esophageal cancer, stomach cancer, liver cancer, pancreatic cancer). Health policy makers should not neglect informal care costs and indirect costs in their decision making. Every new intervention made in the health care system (e.g. use of a new drug, use of an improved surgical procedure, implementation of a screening program) will also affect these other types of costs.

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1. Background

Decision makers in health care are faced with constrained budgets. Decisions have to be made on what kind of goods and services money should be spent on, how much should be spent on them, and when and where investments have to be made. While costs and benefits of a specific resource allocation *within* the health care system are taken into account in the decision-making process (at least in the assessment of new drugs), costs and benefits *outside* of the health care system are typically not considered. This silo-budgeting mentality has been subject to much debate, but it is still the pervasive method of decision making. As a consequence, discussions on the costs of different diseases are often limited to health care costs. The real costs that diseases impose on society are broader though. This is also true for cancer.

The cost of cancer refers to the economic burden that cancer imposes on society. It consists of three types of costs. First, direct costs of cancer consist of expenditures for cancer care that are predominantly but not exclusively made within the health care system (such as expenditures for oncologists, nurses, hospital beds, drugs, etc.). Second, costs of informal care arise from the time forgone by relatives and friends to provide unpaid care. Third, indirect costs of cancer consist of productivity loss from the inability to work due to sickness and incapacity/disability as well as premature death. Health policy makers often disregard informal care costs and indirect costs because of a strict focus on the health care budget and partly paucity of data. However, every new intervention made in the health care system (e.g. use of a new drug) will also affect these other cost types. A holistic view is therefore important whenever decisions are made on improving the status quo.

A recent study estimated the cost of cancer in 31 countries in Europe (1). It found that the total cost of cancer amounted to €199 billion in Europe in 2018. These costs consisted of €103 billion of direct costs (including €32 billion for drugs), €26 billion of informal care costs, and €70 billion of indirect costs. Thus, expenditure on cancer care made within the health-care system were of a similar magnitude as the sum of costs arising outside the health care system. The major magnitude of non-health care costs highlights the importance to consider these costs in decision-making in cancer care.

An under-researched area is the cost of different cancer types. Cancer is the collective name of a group of over 100 different types that are all characterized by uncontrolled growth and division of cells. The cost of different cancer types naturally varies, as some cancer types are more common than others and more patients entail higher costs. In addition, the treatability of each cancer type influences costs, as, e.g., a lack of a big drug arsenal entails lower direct costs. The typical age at which patients of a specific cancer type are diagnosed influences also costs, as already retired people cannot incur a productivity loss.

1.1 Objective

The objective of this report was to estimate the costs of six cancer types of the digestive system (gastrointestinal cancers), esophageal cancer, stomach cancer, colon cancer, rectal cancer, liver cancer, and pancreatic cancer. The estimation was done for the year 2018 and for 31 European countries, the EU-27 member states, Iceland, Norway, Switzerland, and the UK. The types of costs included were direct costs, informal care costs, and indirect costs. The analysis built on a previous study that estimated the cost of cancer in the same countries for all cancer types jointly in 2018 (1).

1.2 Cancers of the digestive system

The estimated total number of newly diagnosed cancer cases (incidence) was 3.08 million in Europe in 2018 (2). Almost a quarter of all cases (23%) concerned cancers of the digestive system; see Figure 1. The estimated total number of deaths from cancer (mortality) was 1.44 million in Europe in 2018. Cancers of the digestive system stood for almost one third of all cases (31%); see Figure 1. The fact that cancers of the digestive system are overrepresented in mortality statistics compared to incidence statistics relates to a lower chance of survival in this group of cancers compared to other groups such as cancers of the male genial organs (mainly prostate cancer) and breast cancer.

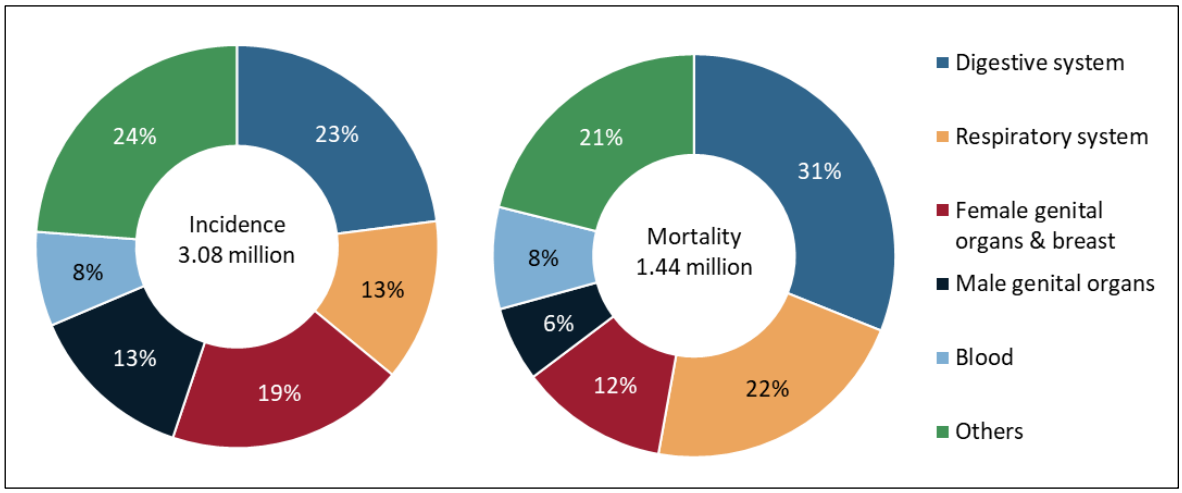

Figure 1: Cancer incidence and cancer mortality in Europe, 2018

Notes: Europe includes the EU-27, IS, NO, CH, and UK. Cancer refers to all cancer sites but non-melanoma skin cancer (ICD-10 C00-C97/C44). Source: (2).

The incidence and mortality of the different cancer types of the digestive system is shown in Figure 2. The estimated number of newly diagnosed cases was around 708,000 and the number of deaths around 449,000 in Europe in 2018. Colon cancer was the most frequently newly diagnosed type followed by rectal cancer and pancreatic cancer. Colon cancer also caused the highest number of deaths followed by pancreatic cancer and liver cancer. Figure 2 also shows that gallbladder cancer

and anal cancer were comparatively uncommon. Given their small size, detailed statistics on these two cancer types are often not reported. This makes it difficult to analyze their costs, which is why they were not considered in this report.

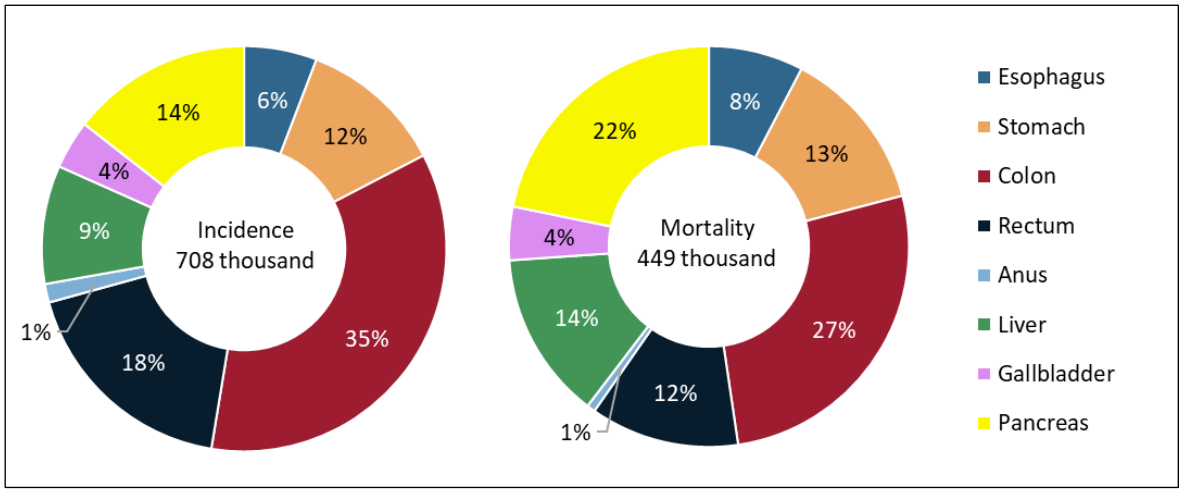

Figure 2: Incidence and mortality of cancers of the digestive system in Europe, 2018

Notes: Europe includes the EU-27, IS, NO, CH, and UK. Source: (2).

The six cancers of the digestive system analyzed in this report also have very different survival rates; see Figure 3. The average 5-year survival rate of people diagnosed in 2010–2014 in Europe ranged from 9% for pancreatic cancer to 60% or more for colon cancer and rectal cancer.

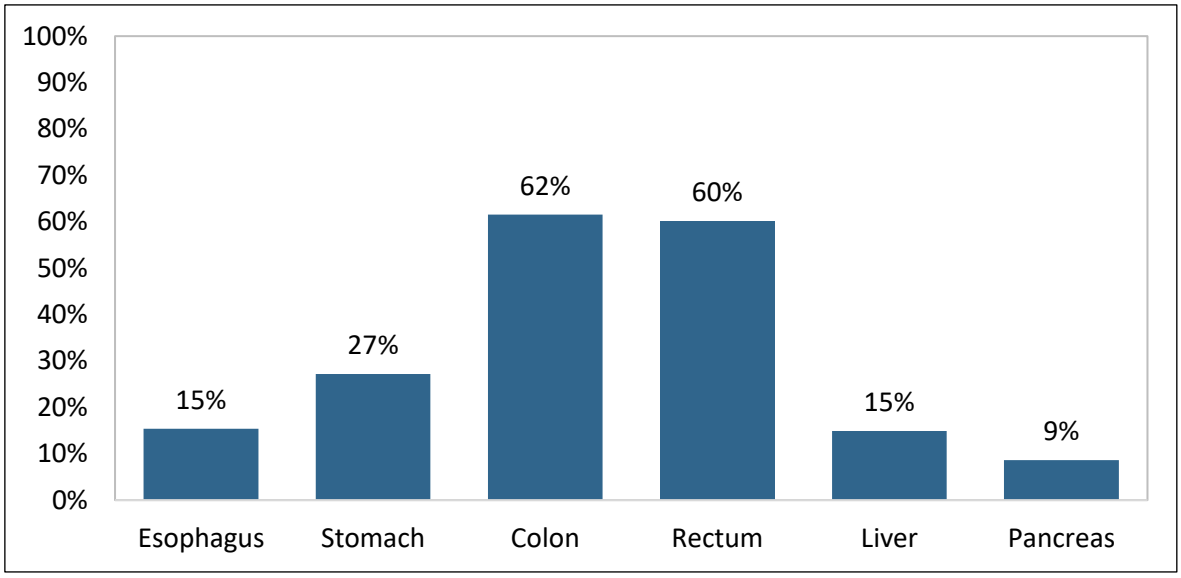

Figure 3: 5-year age-standardized net survival rates for cancers of the digestive system in Europe, 2010–2014

Notes: Europe includes the EU-27 (except EL, HU, LU), IS, NO, CH, and UK. Survival rates are based on the population-weighted average of the country-specific survival rates. Source: (3, 4).

2. Method and data

A prevalence-based cost-of-illness (COI) study was conducted to estimate the costs of cancers of the digestive system in European countries (5). This method entails the estimation of costs incurred during a given year. In this report, the reference year is 2018. A societal perspective was adopted to estimate the total cost of cancers of the digestive system and key cost components (direct costs including cancer drugs, informal care costs, indirect costs).[1]

The study population along with definitions, data sources, and calculations for every cost component are explained below. All costs were expressed in euros (€) in 2018 exchange rates and prices and were inflated where necessary according to country-specific inflation rates based on data from Eurostat (7, 8). Costs were not adjusted for price differentials between countries (purchasing power parities, PPP) (7), unless otherwise noted.

2.1 Study population

The focus in this report is on six cancer types of the digestive system. According to the 10th revision of the International Statistical Classification of Diseases (ICD-10), cancers of the digestive system were defined in the following way:

- Esophageal cancer (C15)
- Stomach cancer (C16)
- Colon cancer (C18)
- Rectal cancer (C19-20)
- Liver cancer (C22)
- Pancreatic cancer (C25)

Colon cancer and rectal cancer are frequently grouped together as colorectal cancer (C18-20) in the medical literature and sometimes this group also includes anal cancer (C18-21). Rectal cancer is sometimes only defined as C20 and excludes cancers of the rectosigmoid junction (C19). Whenever underlying data used in the cost calculations specified a deviating definition to the one specified above, this was taken into account. For instance, when data were only available for a group of cancers of the digestive system (e.g. colorectal cancer), the costs were split according to the proportions of

[1] Another cost component that is sometimes included in COI studies is intangible costs. These costs refer to a valuation of reduced quality of life due to a disease. Unlike direct, informal, and indirect costs, these costs have no direct connection to the use of or lack of production of resources. COI studies often exclude intangible costs, as they are difficult to measure and cannot be valued with existing (market) prices. Omitting intangible costs is nonetheless unsatisfactory, as the implicit assumption would be that the economic value of quality of life is zero (6).

incidence cases (i.e. colon cancer, rectal cancer, anal cancer) observed in country-specific epidemiological data from the Global Cancer Observatory in 2018 (2).

For the purpose of this report, the total costs of all cancer types jointly were also re-calculated, due availability of newer data in some instances. Cancer was here defined as neoplasms (ICD-10 C00-D48). When data were only available for malignant neoplasms (ICD-10 C00-97), costs were adjusted whenever feasible.

2.2 Direct costs

2.2.1 Definition and valuation

The direct costs of cancer refer in this report to expenditures for cancer care that are made within the health care system. The care process of cancer patients requires many different resources. To locate the cancer, medical equipment, such as CT, MRI, and PET-CT scanners, is used. Pathologists and diagnostic radiologists examine the nature of the cancer. Surgeons, radiologists, and medical oncologists assisted by nurses perform surgery on the tumors and initiate radiation therapy and/or systemic therapy (chemotherapy, molecularly targeted therapy, immunotherapy). Modern cancer care includes psychosocial care and rehabilitation. Screening programs are also an important cornerstone of cancer care.

The direct costs constitute the sum of the consumption of all resources mentioned above (9). It should be noted that they also include some resources outside of the health care system (e.g. social care services). Both publicly paid resources (financed by tax money and/or social security contributions spent on the health care system) and privately paid resources (out-of-pocket payments for health care visits and medication, but also private health insurance) are part of the direct costs. The valuation of the resources used within the health care system was based on prevailing (market) prices.

2.2.2 Data and calculations

Direct costs were calculated in a top-down manner, in line with a recent study and an underlying report of the cost of cancer in Europe (1, 10). Estimates of total health expenditure for 2018 (or latest available year) were obtained from the Organisation for Economic Co-operation and Development (OECD) and the World Health Organization (WHO) (11, 12). These data were combined with national estimates of the share of total health expenditure spent on cancer care overall and on cancers of the digestive system. However, most countries lack disease-specific health accounts that would provide such information. To cover up the data gaps for these countries, country-specific data on

health expenditure on cancer care overall and on cancers of the digestive system were gathered from reports and studies from national ministries of health, national statistical offices, research institutes, national cancer societies, peer-reviewed journals, the OECD, and the WHO.

A full description of the sources used and the assumptions made to fill data gaps is provided in Appendix A1. For cancer care overall, national estimates for 20 countries could be obtained. For the 11 remaining countries, data were imputed based on geographical proximity and similarity in gross domestic product (GDP) per capita. For the six cancers of the digestive system, between 2 and 9 national estimates could be obtained. For all remaining countries, data were imputed based on average values observed in countries with actual data.

2.3 Cancer drug costs

2.3.1 Definition and valuation

Cancer drugs were defined as belonging to Anatomical Therapeutic Chemical (ATC) group L, which encompasses antineoplastic and immunomodulating agents. Drugs in this group are used for chemotherapy, hormonal therapy, molecularly targeted therapy, and immunotherapy. The valuation of cancer drugs was based on list prices (i.e. not including confidential rebates). Supportive medications such as antiemetic drugs were not included due to lack of data. This is also true for other drugs used in supportive care to treat symptoms related to the underlying disease, such as gastrointestinal obstruction, nausea, anorexia, and fatigue, and those caused by the treatments, such as oral mucositis, neuropathy, and chemotherapy-induced diarrhea. There are also other toxicities caused by various treatments such as hand-foot syndrome with oral capecitabine and continuous infusion fluorouracil and biliary sclerosis with intrahepatic arterial floxuridine. Administered targeted therapies also present different toxicities, such as cardiovascular events, arterial thrombotic events, bowel perforation, hypertension, and wound-healing complications with bevacizumab and rash and hypomagnesemia with cetuximab as well as peripheral neuropathy.

2.3.2 Data and calculations

For the calculation of the costs, a list of all drugs potentially used in 2018 for the treatment of each of the six cancers of the digestive system was assembled based on information from the American Cancer Society[2] (for chemotherapy drugs) and the European Medicines Agency[3] (for molecularly

[2] https://www.cancer.org/ (accessed May 8, 2020)
[3] https://www.ema.europa.eu/en/medicines/download-medicine-data (accessed May 16, 2019)

targeted drugs); see first column in Table A2 in Appendix A2. The latter source was used for these newer types of drugs to ensure that they were approved for use in the European market in 2018. Note that no immunotherapy drugs had been approved for these cancer types until the end of 2018.

Data on the use of cancer drugs were obtained from national sales data from the MIDAS database maintained by IQVIA. These data are based on list prices, which often do not represent actual final sales prices, as patent-protected drugs are granted confidential rebates in most European health systems. This leads to an overestimation of the costs of cancer drugs in this report.

The data on drug sales from IQVIA do not include information on use in a specific cancer type. This is not a problem for cancer drugs that only have a marketing authorization for a single cancer type. Virtually all cancer drugs used in the treatment of the different cancers of the digestive system are however used for multiple cancer types. Therefore, sales data of these drugs had to be split into their use in different cancer types. Assumptions on the proportions of use of a specific drug in different cancer types were made by a medical advisor[4] as well as based on the distribution of incidence cases observed in different cancer types. The estimated proportions are summarized in Table A2 in Appendix A2. For simplicity, the same proportions were used in all countries.

2.4 Informal care costs

2.4.1 Definition and valuation

Informal care refers to the services provided by relatives and friends. These services are important complements but also substitutes to other formal services. They include accompanying and transporting the patient to the hospital to receive treatment and providing support and care for the patient at home. If these services had not been provided informally, formal services would have been needed to replace them. This means that the work and time spent by informal caregivers entail an opportunity cost, which should be assigned a value. Both forgone leisure time and forgone working time present an opportunity cost.[5] The valuation of the time forgone by relatives and friends is not obvious though. Two possibilities are to use minimum wages or mean salary of social care workers.

[4] Nils Wilking, MD PhD, former chief oncologist at Skåne University Hospital, the largest oncology clinic in Sweden and co-author of several reports on access to cancer drugs in Europe.

[5] For informal care providers who have to leave work to take care of the patient, an indirect cost might arise in addition to the informal care cost. This would happen if the value of their time produced at the workplace exceeds the value of the same time spent on informal care. In reality, informal care is provided by relatives who in many cases have reached retirement age.

2.4.2 Data and calculations

The costs of informal care of all cancers were based on results for 2012 from a previous study for European countries (13). This study assumed that only patients aged 50 or older who were severely limited in daily activities or who were terminally ill would receive informal care. These assumptions probably underestimate the true extent of informal care. The study valued the time spent on informal care with the mean hourly wage in a country for employed care providers, whereas the time spent by retired care providers was valued with the hourly minimum wage (or mean wage in worst paid economic sector). For this report, estimated costs were adjusted to 2018 values and scaled up from malignant neoplasms to neoplasms with the same factor as for morbidity-caused productivity loss (see section 2.5.2). Missing data for three countries were imputed based on geographical proximity and similarity in GDP per capita.[6]

Based on the costs of informal care of all cancers, the costs of each cancer type were estimated using the respective share of newly diagnosed cases (incidence) in each country; see Table A3 in Appendix A3. The use of incidence as a basis of allocation was chosen in order to reflect the need of additional support, as every patient typically needs support during the initial months after diagnosis.[7] That said, the symptom burden also plays a role for the actual patient need. The symptom burden is typically higher in patients with pancreatic cancer and esophageal cancer than with colorectal cancer, but this was not taken into account in the cost estimations.

2.5 Indirect costs

2.5.1 Definition and valuation

From an economic perspective, it is costly when patients of working age are forced to be on sick leave to receive treatment and recover from the disease, when they are forced to retire early due permanent incapacity/disability, and also when they die. Foregone labor market earnings represent a productivity loss caused by morbidity (i.e. sick leave and early retirement) and premature mortality. These types of productivity loss form the indirect costs of a disease (9). Costs refer here to the value

[6] For Iceland and Norway, per-capita costs from Sweden adjusted for differences in mean annual earnings in 2010 were used, and for Switzerland data from Austria were used in the same manner.

[7] Instead of incidence, two other conceivable measures are mortality and prevalence. The use of mortality works less well for informal care, as cancers with very high survival would be assumed to get very little informal care and those with very low survival would get a lot of informal care even though it only lasts for a few months for them in reality. The use of prevalence (such as 1-year or 5-year) also works less well for informal care, as cancers with very high survival would be assumed to get almost all informal care and those with very low survival almost none.

of resources that are not being created due to sick leave, early retirement, and premature death of working-age people. Similar to informal care costs, the fact that individuals' time is a limited resource for which there is an alternative cost is widely accepted in economic theory (14). One hour of lost production thus corresponds to the value of the work that would have been carried out. Transfer payments within the social security system (sickness benefits, disability benefits, widower's/widow's pensions etc.) should not be included to avoid double counting of costs.

Even though there is broad agreement on the importance of indirect costs, there is less agreement on the exact methodology to value and calculate them. Two different methodologies are commonly used: the human-capital method (HCM) and the friction-cost method (FCM). The HCM takes the patient's perspective and counts any hour not worked as an hour lost. By contrast, the FCM takes the employer's perspective and counts only those hours not worked as lost until another employee takes over the patient's work (15). The FCM method rests on the dubious assumption that there are unemployed persons that can quickly replace cancer patients who temporarily or permanently leave the labor market. The choice of the method matters for the size of the indirect costs. Costs estimated via the FCM are typically smaller than costs estimated via the HCM (16). In line with previous studies on the cost of cancer (1, 10), the HCM is used in this report.

2.5.2 Data and calculations

The productivity loss from premature mortality was calculated as the present value of the future earnings that a working-age person who dies would have been expected to produce throughout her/his working life.[8] In a first step, potential years of working life lost (PYWLL) were calculated for each country and cancer type, based on age-specific and sex-specific data on deaths for 2018 (or latest available year) from Eurostat (17).[9] As death data are grouped into five-year age intervals, all deaths in an age interval were assumed to occur in the middle of that interval[10], and working age was defined to range from age 15 to 64 inclusive. In a second step, PYWLL were combined with country-specific data from Eurostat on sex-specific mean annual earnings from employment (referring to year 2014 but adjusted to 2018 prices and exchange rates) and sex-specific employment rates in the age group 15–64 years (implicitly assuming a uniform employment rate) (18, 19). Future lost earnings

[8] Unpaid work of homemakers or volunteering is thus not included.
[9] Data from Eurostat were only available for colorectal cancer (ICD-10 C18-C21). These data were split according the age-specific proportions seen for colon cancer (C18) and rectal cancer (C19-20) in Global Cancer Observatory data on estimated mortality in 2018 (2).
[10] For instance, a death in the age interval 55–59 years was assumed to occur at age 57.5 and result in 7.5 PYWLL (= retirement age of 65 years minus age at death of 57.5 years). One additional step that is sometimes taken is to correct the PYWLL in each age interval for the general risk of death in that age group to take into account the likelihood of reaching retirement age. In line with the previous studies, we did not correct for this.

were discounted with a 3.5% annual discount rate and a zero real growth rate in future earnings was assumed.

The productivity loss from morbidity was calculated based on results for 2009 from a previous study for European countries (20), which included sickness absence and permanent incapacity and disability.[11] Country-specific estimates for all cancers were multiplied with a factor of 1.7 to convert the results, which were calculated based on the FCM, to the HCM, based on the previous study's own result. Missing data for four countries were imputed based on geographical proximity and similarity in GDP per capita.[12] For this report, estimated costs were adjusted to 2018 values and scaled up from malignant neoplasms to neoplasms with a country-specific factor (around 1.02), based on the observed difference in productivity loss from premature mortality between these two definitions of cancer in 2010. Based on the morbidity-caused productivity loss of all cancers, the costs of each cancer type were estimated using the respective share of newly diagnosed cases (incidence) in the age group 15–64 years in each country; see Table A4 in Appendix A4. The use of incidence as a basis of allocation was chosen in order to capture the time period when working life is most impaired, as every patient is typically on sick leave during the initial months after diagnosis. That said, the use of incidence is less satisfactory to capture permanent incapacity and disability, as it overestimates/underestimates the size of cancers with low/high survival.[13] It also does not take into account the symptom burden that is typically lower in colorectal cancer than in the four other cancer types.

[11] To base estimates for 2018 on data from 2009 is not ideal, as advances in cancer care during this period affect sickness absence and early retirement. However, a study for Finland looked into the development of the productivity loss from morbidity between 2004 and 2014 and found no major overall trends (21). It found that expenditures for disability pensions decreased from €80 to €76 million (in current prices) during this period, whereas expenditures for sickness benefits increased from €46 to €58 million. In sum, there was a slight increase in the productivity loss from morbidity from €126 to €134 million, but once adjusted for inflation (8), this turns into a 13% decrease from €154 to €134 million (measured in 2014 prices).

[12] For Iceland and Norway, per-capita costs from Sweden adjusted for differences in mean annual earnings in 2010 were used, and for Switzerland data from Austria were used in the same manner. For Croatia, an estimate for the year 2012 from another study was used (13).

[13] Another conceivable measure that might capture this better is (3-year or 5-year) prevalence. Yet prevalence works less well for the initial period of sickness absence.

3. Results

3.1 Results for Europe by cancer type

From a societal perspective, the economic burden of cancer is composed of direct costs, informal care costs, and indirect costs. The total cost of cancer amounted to €199 billion (€377 per capita) in the 31 countries in Europe included in this report in 2018.[14] Figure 4 shows that the six cancers of the digestive system included in this report jointly represented around 19% of the total cost of cancer, corresponding to almost €39 billion.[15]

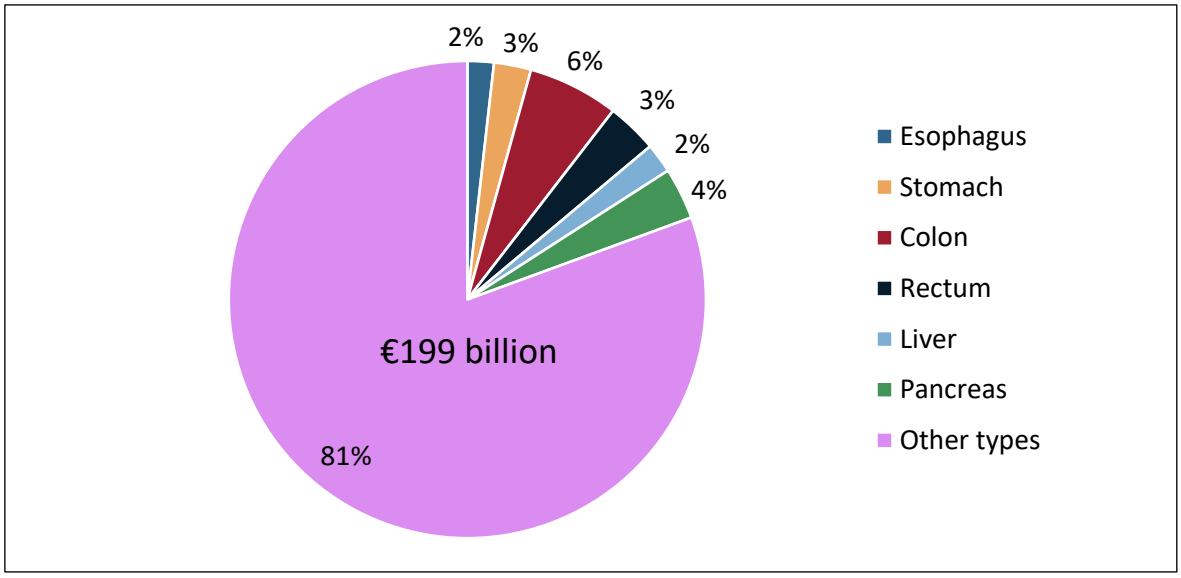

Figure 4: Total cost of cancer in Europe, 2018

The total cost of each of the six cancers of the digestive system varies; see Figure 5. Colon cancer caused the highest cost amounting to €12.2 billion, followed by pancreatic cancer with €7.0 billion, rectal cancer with €6.8 billion, and stomach cancer with €5.0 billion. Liver cancer with €4.0 billion and esophageal cancer with €3.6 billion caused the lowest cost. Indirect costs exceeded direct costs in all cancer types except colon cancer and rectal cancer. This result is a reflection of differences in survival rates that translate into differences in mortality-caused indirect costs. Notably, Figure 5 shows that the indirect costs of pancreatic cancer (€3.3 billion), which has the lowest survival rate of all six cancer types, were almost as high as those of colon cancer (€3.7 billion), which has the highest

[14] Note that these costs have been re-calculated for the purpose of this report in line with the methodology in the previous study (1), because of availability of newer data. This has resulted in minor deviations from the original results for some countries and cost categories.
[15] This is roughly in line with the share of these six cancer types on the total number of newly diagnosed cancer cases (22% in 2018, ICD-10 C00-C97/C44). Costs refer to ICD-10 C00-D48 though.

survival rate. For colon cancer and rectal cancer, the sum of indirect costs and informal care costs was essentially as large as direct costs. This shows that non-health care costs form a major part of the total costs in all six cancers of the digestive system.

The size of the total costs of each cancer type is related to many factors. First and foremost, it is related to the number of cancer patients (see Figure 2 for a comparison). For instance, there are many more patients with colon cancer than with esophageal cancer, and this is reflected in the total costs in Figure 5.

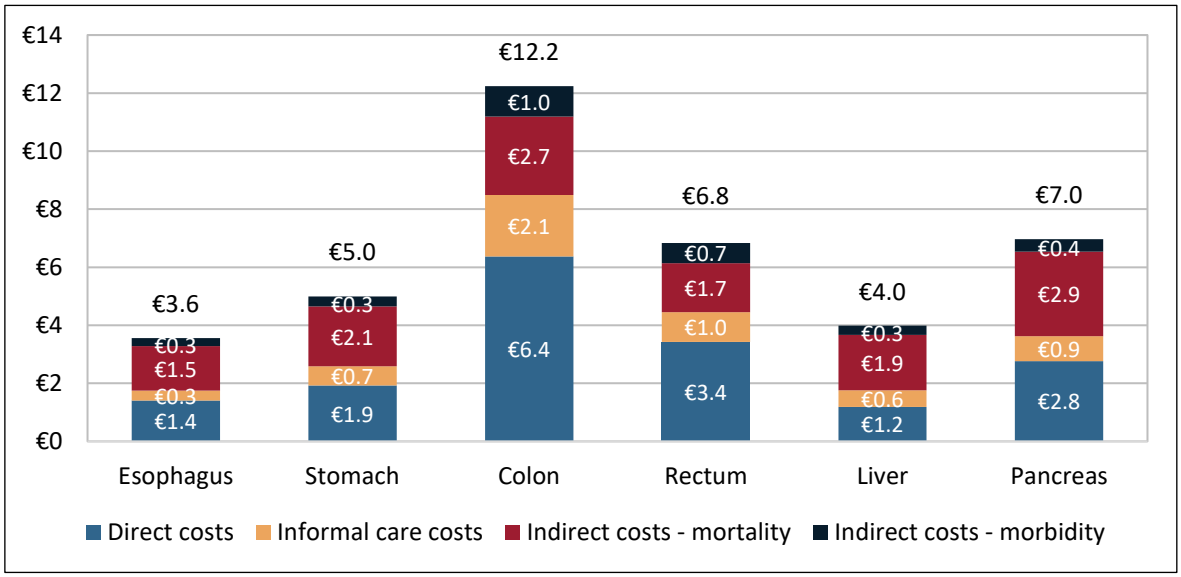

Figure 5: Costs of cancers of the digestive system (in billion €) in Europe, 2018

The availability of modern (patent-protected and hence expensive) cancer drugs for targeted therapy is also a factor that influences the size of the total costs of each cancer type (see Table A2 in Appendix A2). More specifically, cancer drugs influence the size of the direct costs shown in Figure 5. The fact that there are many different cancer drugs available and used in the treatment of colon cancer and rectal cancer is reflected in Figure 6. Almost one quarter of all direct costs are made up of cancer drugs for these two cancer types. By contrast, for all other cancer types this proportion equals 10% or less.

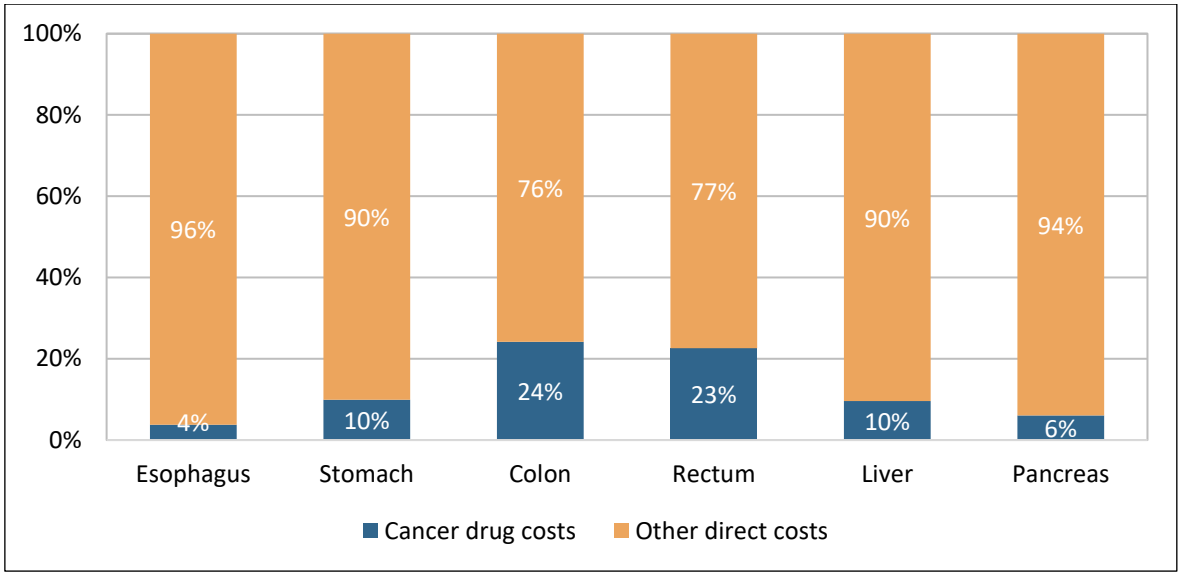

Figure 6: Composition of direct costs in Europe, 2018

Another factor that influences the size of the total costs of each cancer type is the survival rate (see Figure 3 for a comparison). Patients who live longer can receive more courses of treatment, which increases direct costs. More importantly however, higher survival rates mean that a lower proportion of patients die. Fewer deaths entail lower mortality-caused productivity loss but potentially also higher morbidity-caused productivity loss. This is reflected in the composition of indirect costs in Figure 7. Colon cancer and rectal cancer with comparatively high survival rates have a lower share of mortality-caused productivity loss.

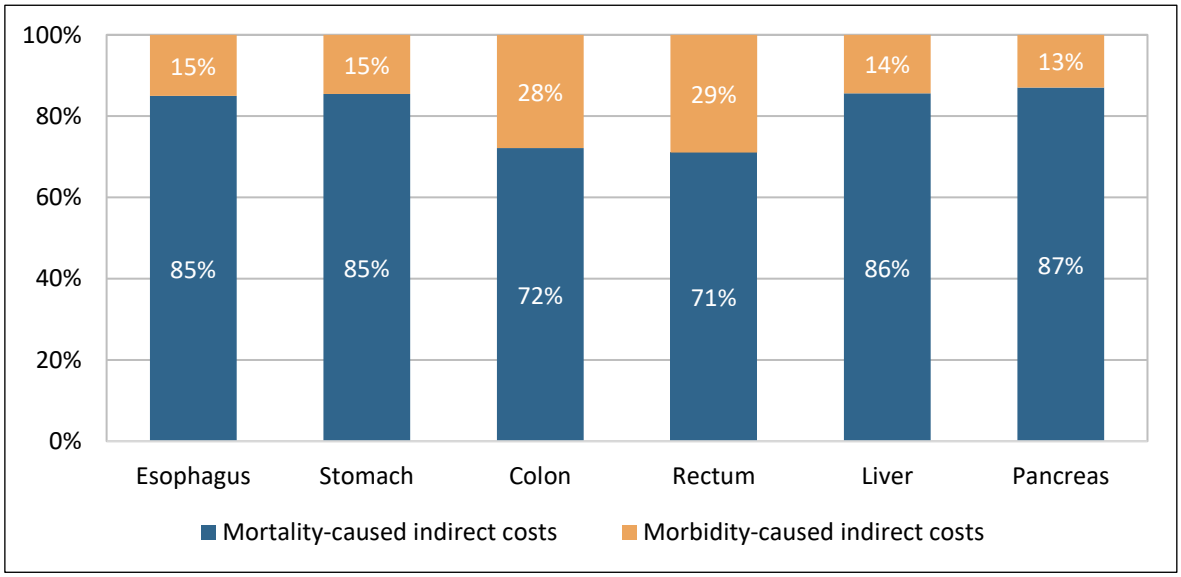

Figure 7: Composition of indirect costs in Europe, 2018

3.2 Results by country and cancer type

The total costs per capita for every cancer type in every country are shown graphically in Figures 8 to 13. More detailed numerical results are provided in Tables A5 to A18 in Appendix A5. In Figures 8 to 13, there is a clear tendency that total costs are higher in wealthier countries (such as Switzerland, Denmark, Luxembourg) than in poorer countries (such as Bulgaria, Romania, Poland) in every cancer type. This is true for all three main components of the total costs. This pattern is not a result of a much higher number of cancer patients in wealthier countries though.

One explanatory factor for country differences in direct costs in Figures 8 to 13 are great country differences in relative prices of cancer care services (e.g. hourly salaries of physicians and nurses). These price differences increase country differences in direct costs artificially. The calculation of PPP-adjusted costs would mitigate this effect. Another explanatory factor is that total health care spending – both in absolute terms and as a share of GDP – was lower in poorer countries than in wealthier countries in 2018. By contrast, all countries spent between 4 to 7% of their total health expenditure on cancer care, and there was no systematic difference in relation to how wealthy or poor countries were. Thus, differences in total health care spending translate into differences in health care spending on cancer.

Country differences in informal care costs and indirect costs are mostly a reflection of differences in earnings levels. That is, the hourly salary forgone by an informal caregiver and the annual loss of earnings of an otherwise working cancer patient are higher in wealthier countries. In fact, wealthier countries in Europe tend to record a lower number of potential years of working life lost by cancer patients due to higher survival rates in these countries (10).

Figure 14 presents the results on the total costs of each cancer type in relative terms. Similar to Figure 4 above, the total costs of the six cancers of the digestive system are put in relation to the total cost of cancer in each country. In most countries, the sum of the six cancer types is close to the European average of 20%. Portugal (driven by comparatively high costs of stomach cancer) and Hungary (driven by comparatively high costs of colon cancer) lie well above 20% though. By contrast, Belgium, France, Sweden, and the UK lie the furthest below the European average.

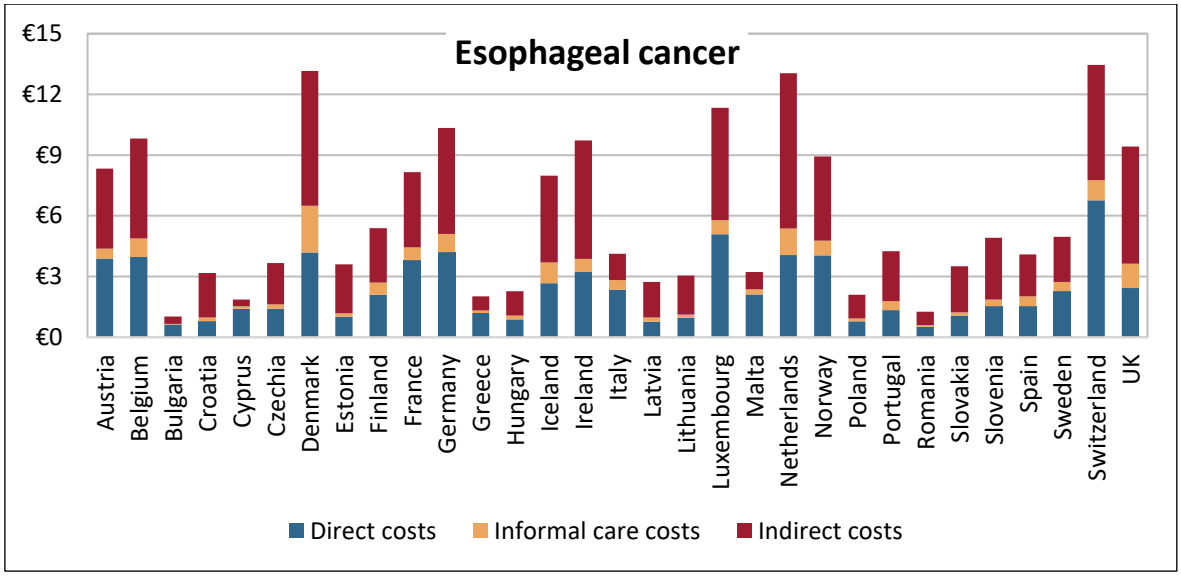

Figure 8: Costs of esophageal cancer per capita, 2018

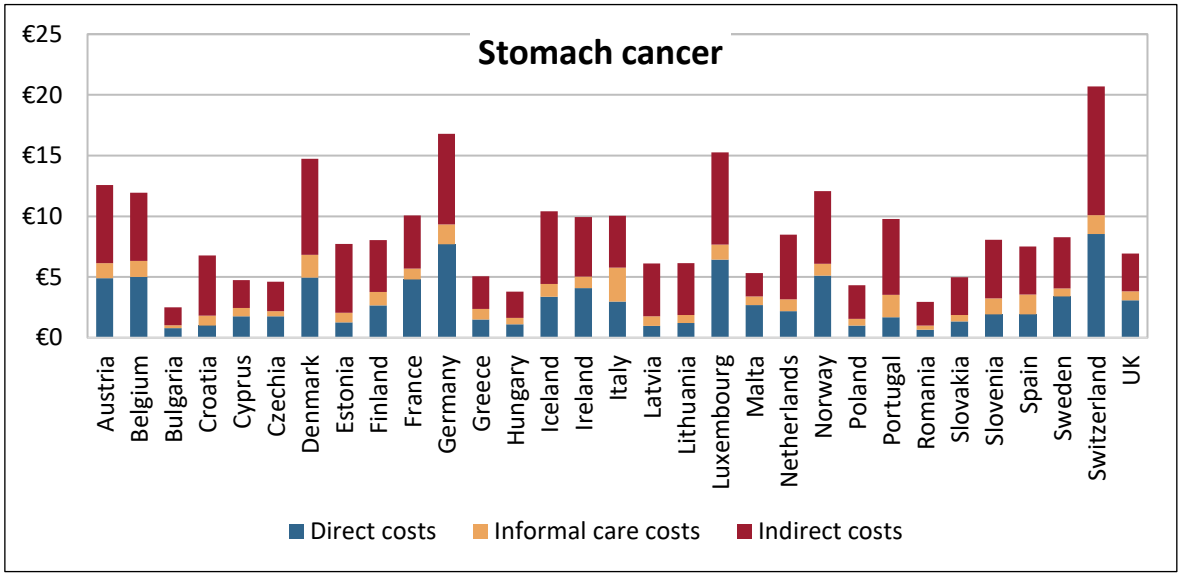

Figure 9: Costs of stomach cancer per capita, 2018

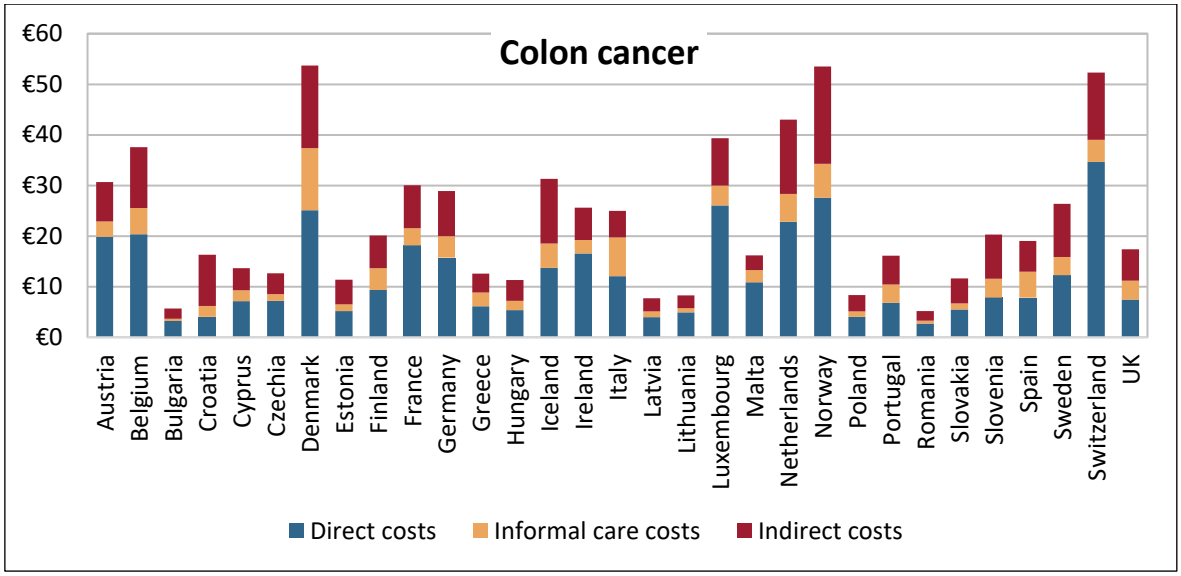

Figure 10: Costs of colon cancer per capita, 2018

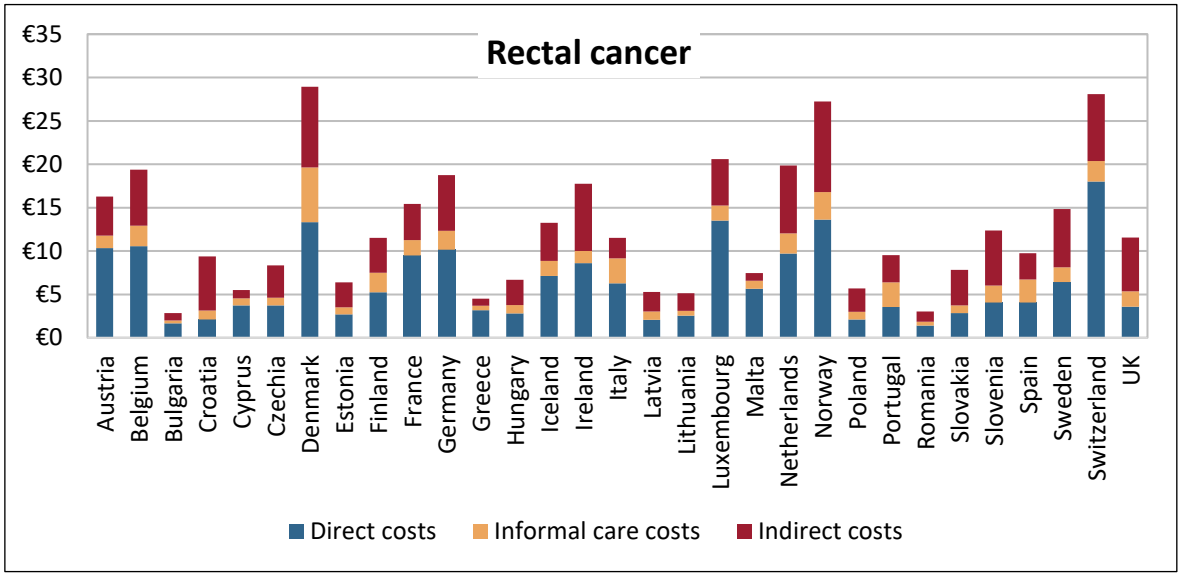

Figure 11: Costs of rectal cancer per capita, 2018

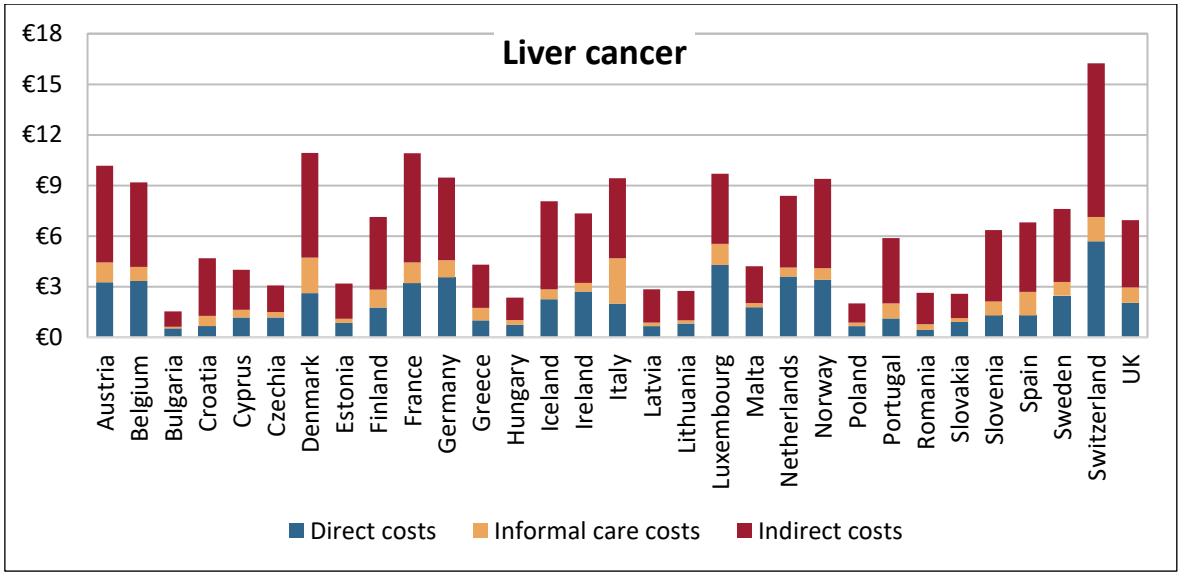

Figure 12: Costs of liver cancer per capita, 2018

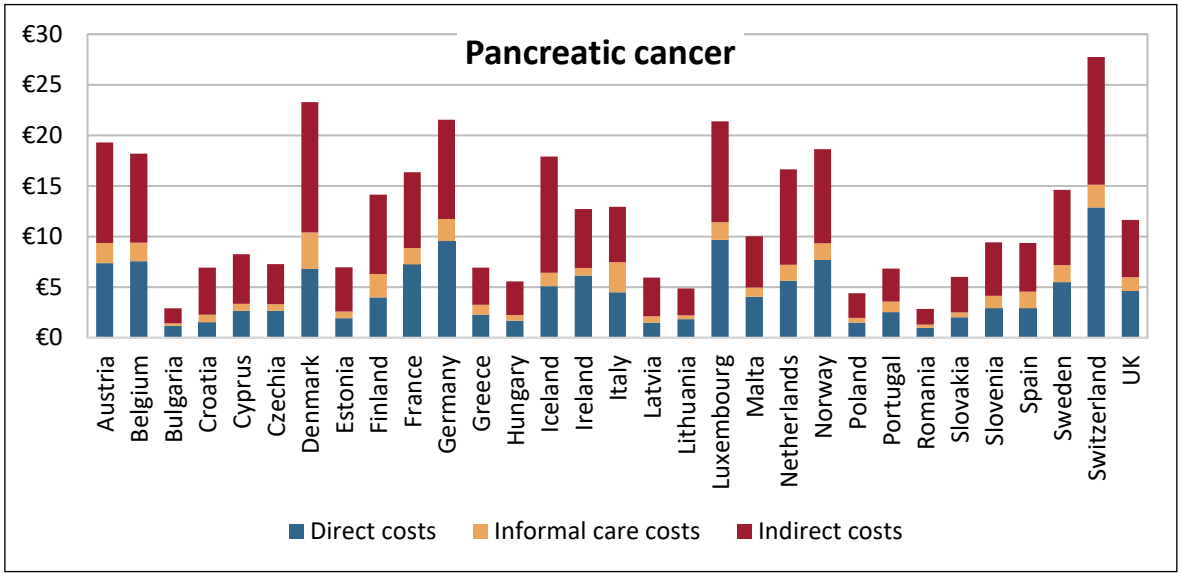

Figure 13: Costs of pancreatic cancer per capita, 2018

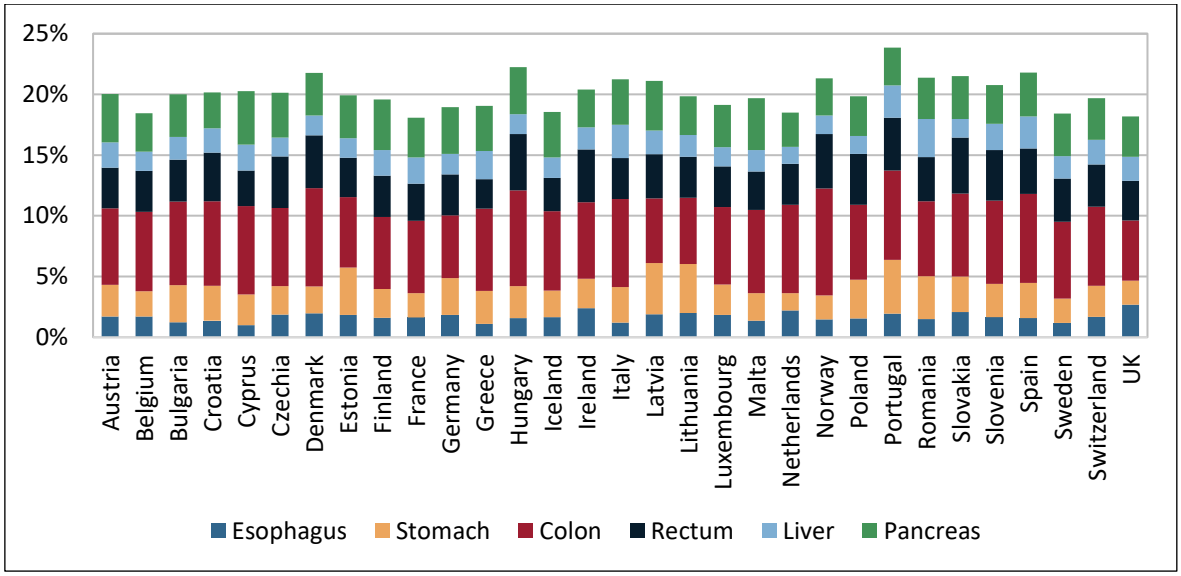

Figure 14: Total costs of each cancer as a share of total cancer costs, 2018

4. Discussion

Pan-European studies on the cost of cancer and specific cancer types are rare and only provided at irregular intervals. Studies published during the last decade have provided estimates for the total cost of cancer for the years 2009 and 2018 (1, 20). There are also studies on the total cost of breast cancer, colorectal cancer, lung cancer, and prostate cancer for the year 2009 (20), for bladder cancer and malignant blood disorders for the year 2012 (13, 22), and on mortality-caused productivity loss for ten major cancer types for the year 2008 (23). As the treatment options have been changing quickly in many cancer types over the last decade, up-to-date evidence on the economic burden of cancer is important for future decision making.

The estimates in this report show that expenditure on cancer care made within the health care system were of a similar magnitude as the sum of costs arising outside the health care system (i.e. informal care costs plus indirect costs) for colon cancer and rectal cancer in 2018. For esophageal cancer, stomach cancer, liver cancer, and pancreatic cancer – all of which are characterized by much lower survival rates compared to colorectal cancer – the sum of costs arising outside the health care system markedly exceeded the direct costs. The major magnitude of non-health care costs of cancer in general has also been emphasized by previous studies (24, 25).

It is important to acknowledge the full cost of cancer. A lack of applying a societal perspective can lead to suboptimal policy decisions in the design of measures to prevent, detect, and treat cancer. For instance, population-based screening programs for colorectal cancer aim to reduce deaths by detecting and removing polyps and/or early-stage cancers. Within the health care system such a screening program necessitates additional investment in medical equipment and staff to carry out the screening, while it might reduce treatment costs by preventing polyps from becoming malignant. The improvements in health together with the additional costs and savings arising within the health care system might already be enough to motivate an introduction of colorectal cancer screening programs (26). However, the assessment of the wider impact of these programs on morbidity-caused and mortality-caused productivity loss and informal care costs should not be neglected. This type of information should feed into any decision on cost-effective spending of health care resources.

The results in this report refer to a single year (2018) and it is difficult to predict future changes in the size and composition of the costs of each cancer type. The incidence of esophageal cancer, colorectal cancer, liver cancer, and pancreatic cancer has been increasing between 1995 and 2018 in Europe, whereas it decreased in stomach cancer (27, 28). If this development continues, it will decrease the total costs of stomach cancer but increase the total costs of the other cancer types. Primary and secondary prevention measures (tobacco control, alcohol control, obesity control,

vaccination against hepatitis B, effective treatments for hepatitis C, screening for colorectal cancer) can influence this development (29). Moreover, the recent introduction of several new targeted drug therapies for metastatic liver cancer will likely increase the direct costs. The same might be true if new or existing immunotherapy drugs will be started to be used in the six cancer types considered. At the same time, all incremental improvements in the treatment of these cancer types (improved surgical procedures, radiation therapy, drug therapy including diagnostics) achieved in the past lead to increased survival and potentially also quality of life. These improvements can reduce informal care costs and morbidity-caused and mortality-caused productivity loss.

4.1 Limitations

The cost estimations in this report build on several assumptions that are important to note. The direct costs rely on a large number of country-level studies, but for some countries no studies exist and thus results had to be extrapolated from other countries. The results for some cancer types (colon cancer and rectal cancer) are also more reliable than others (esophageal cancer and liver cancer) due to different numbers of underlying studies. To better understand the size of the direct costs, a provision of detailed disease-specific health expenditure data by public authorities (such as in Germany and the Netherlands) within a common methodological framework would be needed.

The estimates of cancer drug costs are overestimated, as they are based on sales data which often do not represent actual final sales prices due to confidential and often sizeable rebates. The size of these rebates might vary between countries. The exact use of cancer drugs in different cancer types is also rather crude, as one common split for all countries was used. Local practices are thus not necessarily taken into account. A provision of sales data based on claims data that are linked to the exact diagnosis that is being treated would be needed. This type of data is unfortunately not routinely collected in an accessible way. On the other hand, the estimates of cancer drug costs do not include costs of supportive drugs, which instead are part of the overall estimates of direct costs.

The estimates of informal care costs should be interpreted with caution. The underlying study for the estimates might have missed most patients below the age of 50, yet the six considered cancer types are rare in younger cohorts. It also had to impute data for half of the countries, which means that these estimates are rather crude. The estimates in this report are also crude, as incidence data was used to split overall costs by cancer type in each country. Such a split rests on the implicit assumption that patient need for informal care is equal in all cancer types, whereas the symptom burden differs between cancer types in reality. With increasing survival and a growing incidence of most cancer types, a detailed assessment of informal care costs is becoming increasingly important.

The major part of indirect costs – mortality-caused productivity loss – could be estimated comparatively accurately in this report for all cancer types due to good data availability. By contrast, the estimation of morbidity-caused productivity loss is rather crude, as the underlying study only calculated costs for all cancers overall and had to impute data for some countries. These estimates were then split by cancer type in each country based on incidence data in this report. Such a split rests on the implicit assumption that all cancer types are equally severe in terms of morbidity, whereas the symptom burden differs between cancer types in reality. A detailed calculation of morbidity-caused productivity loss in every country is hindered by a lack of diagnosis-specific data provision on sick leaves and early retirements on both the country level and the European level.

5. Conclusion

This report presents up-to-date evidence on the economic burden of cancers of the digestive system in Europe. Among the six cancer types considered, colon cancer caused the highest total cost amounting to €12.2 billion in 31 countries in Europe in 2018. It was followed by pancreatic cancer (€7.0 billion), rectal cancer (€6.8 billion), stomach cancer (€5.0 billion), liver cancer (€4.0 billion), and esophageal cancer (€3.6 billion). Taken together, these six cancer types represented around 19% of the total cost of cancer (€199 billion) in 2018.

The economic burden of cancer goes beyond the cost of resources consumed within the health care system. Informal care costs and indirect costs are also important, as they represent the value of resources that could have been created and would have benefited society at large. In all six cancer types considered, the sum of informal care costs and indirect costs was either equally large as direct costs (colon cancer and rectal cancer) or larger than direct costs (esophageal cancer, stomach cancer, liver cancer, pancreatic cancer). Non-health care costs thus form a major part of the total costs in all six cancers of the digestive system.

References

1. Hofmarcher T, Lindgren P, Wilking N, Jonsson B. *The cost of cancer in Europe 2018*. Eur J Cancer. 2020;129:41-9.

2. Ferlay J, Ervik M, Lam F, Colombet M, Mery L, Piñeros M, et al. Global Cancer Observatory: Cancer Today. Available from: https://gco.iarc.fr/today [accessed May 6, 2020].

3. Allemani C, Matsuda T, Di Carlo V, Harewood R, Matz M, Niksic M, et al. *Global surveillance of trends in cancer survival 2000-14 (CONCORD-3): analysis of individual records for 37 513 025 patients diagnosed with one of 18 cancers from 322 population-based registries in 71 countries*. Lancet. 2018;391(10125):1023-75.

4. Eurostat. Population change - Demographic balance and crude rates at national level [demo_gind]. Available from: https://ec.europa.eu/eurostat/data/database [accessed May 6, 2020].

5. Byford S, Torgerson DJ, Raftery J. *Economic note: cost of illness studies*. BMJ. 2000;320(7245):1335.

6. Rice DP. *Estimating the cost of illness*. Am J Public Health Nations Health. 1967;57(3):424-40.

7. Eurostat. Purchasing power parities (PPPs), price level indices and real expenditures for ESA 2010 aggregates [prc_ppp_ind]. Available from: https://ec.europa.eu/eurostat/data/database [accessed May 13, 2020].

8. Eurostat. HICP (2015 = 100) - annual data (average index and rate of change) [prc_hicp_aind]. Available from: https://ec.europa.eu/eurostat/data/database [accessed May 13, 2020].

9. Guinness L. *Counting the costs*. In: Guinness L, Wiseman V, editors. Introduction to Health Economics. Maidenhead, UK: Open University Press. 2011. p. 201-16.

10. Hofmarcher T, Brådvik G, Svedman C, Lindgren P, Jönsson B, Wilking N. *Comparator Report on Cancer in Europe 2019 – Disease Burden, Costs and Access to Medicines*. IHE Report 2019:7. Lund: IHE. 2019.

11. OECD. OECD Statistics - Health expenditure and financing. Available from: https://stats.oecd.org/ [accessed May 13, 2020].

12. World Health Organization. Global Health Expenditure Database. Available from: https://apps.who.int/nha/database [accessed May 13, 2020].

13. Leal J, Luengo-Fernandez R, Sullivan R, Witjes JA. *Economic Burden of Bladder Cancer Across the European Union*. Eur Urol. 2016;69(3):438-47.

14. Sculpher MJ. *The role and estimation of productivity costs in economic evaluation*. In: Drummond MF, A. M, editors. Economic evaluation in health care: Merging theory with practice. Oxford, UK: Oxford University Press. 2001.

15. van den Hout WB. *The value of productivity: human-capital versus friction-cost method*. Ann Rheum Dis. 2010;69 Suppl 1:i89-91.

16. Pike J, Grosse SD. *Friction Cost Estimates of Productivity Costs in Cost-of-Illness Studies in Comparison with Human Capital Estimates: A Review*. Appl Health Econ Health Policy. 2018;16(6):765-78.

17. Eurostat. Causes of death - deaths by country of residence and occurrence [hlth_cd_aro]. Available from: https://ec.europa.eu/eurostat/data/database [accessed June 3, 2020].

18. Eurostat. Structure of earnings survey: annual earnings [earn_ses_annual]. Available from: https://ec.europa.eu/eurostat/data/database [accessed May 13, 2020].

19. Eurostat. Employment rates by sex, age and citizenship (%) [lfsa_ergan]. Available from: https://ec.europa.eu/eurostat/data/database [accessed May 13, 2020].

20. Luengo-Fernandez R, Leal J, Gray A, Sullivan R. *Economic burden of cancer across the European Union: a population-based cost analysis*. Lancet Oncol. 2013;14(12):1165-74.

21. Torkki P, Leskela RL, Linna M, Maklin S, Mecklin JP, Bono P, et al. *Cancer costs and outcomes in the Finnish population 2004-2014*. Acta Oncol. 2018;57(2):297-303.

22. Burns R, Leal J, Sullivan R, Luengo-Fernandez R. *Economic burden of malignant blood disorders across Europe: a population-based cost analysis*. Lancet Haematol. 2016;3(8):e362-70.

23. Hanly P, Soerjomataram I, Sharp L. *Measuring the societal burden of cancer: the cost of lost productivity due to premature cancer-related mortality in Europe*. Int J Cancer. 2015;136(4):E136-45.

24. Hilhorst S, Lockey A. *Cancer Costs - A 'ripple effect' analysis of cancer's wider impact*. Demos. 2019.

25. Irish Cancer Society. *The real cost of cancer*. Dublin: Irish Cancer Society. 2019.

26. Lansdorp-Vogelaar I, Knudsen AB, Brenner H. *Cost-effectiveness of colorectal cancer screening*. Epidemiol Rev. 2011;33:88-100.

27. Bray F, Sankila R, Ferlay J, Parkin DM. *Estimates of cancer incidence and mortality in Europe in 1995*. Eur J Cancer. 2002;38(1):99-166.

28. Ferlay J, Colombet M, Soerjomataram I, Dyba T, Randi G, Bettio M, et al. *Cancer incidence and mortality patterns in Europe: Estimates for 40 countries and 25 major cancers in 2018*. Eur J Cancer. 2018;103:356-87.

29. Arnold M, Abnet CC, Neale RE, Vignat J, Giovannucci EL, McGlynn KA, et al. *Global Burden of 5 Major Types Of Gastrointestinal Cancer*. Gastroenterology. 2020.

30. OECD. *Cancer Care: Assuring Quality to Improve Survival*. OECD Health Policy Studies. OECD Publishing. 2013.

31. OECD. Estimating Expenditure by Disease, Age and Gender. Available from: https://www.oecd.org/els/health-systems/estimating-expenditure-by-disease-age-and-gender.htm [accessed June 10, 2020].

32. Kruse M, Hostenk G. *The socioeconomic costs of cancer [De samfundsøkonomiske omkostninger ved kræft]*. Center for Sundhedsøkonomisk Forskning (COHERE). 2016.

33. Danckert B, Ferlay J, Engholm G, Hansen HL, Johannesen TB, Khan S, et al. NORDCAN: Cancer Incidence, Mortality, Prevalence and Survival in the Nordic Countries, Version 8.2 (26.03.2019). Available from: https://www-dep.iarc.fr/NORDCAN/english/frame.asp [accessed June 10, 2020].

34. Garg CC, Evans DB. *What is the Impact of Noncommunicable Diseases on National Health Expenditures: A Synthesis of Available Data*. Geneva: WHO - Department of Health Systems Financing. 2011.

35. Lai T, Habicht T, Kahur K, Reinap M, Kiivet R, van Ginneken E. *Estonia: Health system review*. Health Systems in Transition. 2013;15(6):1-196.

36. Torkki P, Leskela RL, Linna M, Maklin S, Mecklin JP, Bono P, et al. *Cancer costs and outcomes for common cancer sites in the Finnish population between 2009-2014*. Acta Oncol. 2018;57(7):983-8.

37. National Health Insurance Fund (CNAM - Caisse nationale de l'assurance maladie). Reports Charges & Products of Health Insurance [Rapports Charges & produits de l'Assurance Maladie]. Available from: https://www.ameli.fr/l-assurance-maladie/statistiques-et-publications/rapports-et-periodiques/rapports-charges-produits-de-l-assurance-maladie/index.php [accessed June 9, 2020].

38. Federal Statistical Office (Destatis - Statistisches Bundesamt). Health data - Cost of illness [Gesundheitsdaten - Krankheitskostenrechnung]. Available from: http://www.gbe-bund.de/gbe10/trecherche.prc_them_rech?tk=100000&tk2=100005&p_uid=gast&p_aid=0&p_sprache=D&cnt_ut=0&ut=100005 [accessed June 10, 2020].

39. Ministry of Health. National Action Plan on Cancer, 2011-2015. Available from: http://www.anticancer.gov.gr/ [accessed September 16, 2015].

40. Boncz I, Zemplényi A, Horváthné Kívés Z, Vajda R, Kovács A, Budai A, et al. *Health Insurance Treatment Cost of Colorectal Cancer in Hungary*. Value in Health. 2016;19(7):PA610.

41. Kalseth J, Halsteinli V, Halvorsen T, Kalseth B, Anthun K, Peltola M, et al. *Costs of cancer in the Nordic countries - A comparative study of health care costs and public income loss compensation payments related to cancer in the Nordic countries in 2007*. Trondheim: SINTEF Technology and Society. 2011.

42. Francisci S, Guzzinati S, Mezzetti M, Crocetti E, Giusti F, Miccinesi G, et al. *Cost profiles of colorectal cancer patients in Italy based on individual patterns of care*. BMC Cancer. 2013;13:329.

43. Oslo Economics. *Cancer in Norway: Costs for patients, health services and society [Kreft i Norge: Kostnader for pasientene, helsetjenesten og samfunnet]* Oslo: Oslo Economics. 2016.

44. National Health Fund (NFZ - Narodowy Fundusz Zdrowia). *Realization of benefits in oncology 2009 - 2011 [Realizacja świadczeń onkologicznych 2009 - 2011]*.

45. Ministry of Health - Department of Drug Policy and Pharmacy. *Information of the Ministry of Health on the treatment of oncological diseases [Informacja Ministerstwa Zdrowia na temat leczenia chorób onkologicznych]*. Warsaw: Polish Ministry of Health. January 5, 2011.

46. Ruszkowski J. *Colorectal cancer management in Poland: current improvements and future challenges*. Eur J Health Econ. 2010;10 Suppl 1:S57-63.

47. Lopes JM, Goncalves FR, Borges M, Redondo P, Laranja-Pontes J. *The cost of cancer treatment in Portugal*. Ecancermedicalscience. 2017;11:765.

48. Badia X, Tort M, Manganelli AG, Camps C, Diaz-Rubio E. *The burden of cancer in Spain*. Clin Transl Oncol. 2019;21(6):729-34.

49. Lundqvist A, Andersson E, Steen Carlsson K. *Cost of cancer in Sweden today and year 2040 [Kostnader för cancer i Sverige idag och år 2040]*. IHE Rapport 2016:1. Lund: IHE. 2016.

50. Wieser S, Riguzzi M, Pletscher M, Huber CA, Telser H, Schwenkglenks M. *How much does the treatment of each major disease cost? A decomposition of Swiss National Health Accounts*. Eur J Health Econ. 2018;19(8):1149-61.

51. NHS Networks. Programme Budgeting Aggregate PCT Expenditure for all programmes and subcategories for financial years 2003/04 to 2012/13. Available from: https://www.networks.nhs.uk/nhs-networks/health-investment-network/news/2012-13-programme-budgeting-data-is-now-available [accessed June 11, 2020].

52. Williamson S. *Co-payment schemes - when patients pay for high cost drugs*. Hospital Pharmacist. 2008;15:154.

Appendix

A1. Calculation of direct costs

For the calculation of the direct costs in a top-down manner, two central pieces of information were identified[16] for each country in 2018 (or latest available year):

- Health care spending on cancer as a share of total health expenditure
- Health care spending on each cancer type as a share of total health care spending on cancer

Table A1 lists the results of this exercise. A description of the data and sources for every country is provided further below. It should be noted that most identified studies were based on cancer-specific cost-of-illness studies. The completeness in terms of including all relevant sources of expenditure varies. Several studies left out expenditure on primary prevention and long-term care, resulting in an underestimation of the true costs of cancer. Some cost categories in these studies were re-classified in order to yield comparable results across countries.

Few studies provided cost estimates for specific cancer types. These studies also typically only reported costs for colorectal cancer instead of separately for colon cancer and rectal cancer. In these cases, the cost estimates were split according the proportions seen in incidence cases for colon cancer (C18) and rectal cancer (C19-20) in Global Cancer Observatory (GLOBOCAN) data in 2018 (2).

[16] Search terms used were: “cost of illness [esophagus/stomach/ etc.] cancer COUNTRY”, “economic burden of [esophagus/stomach/ etc.] cancer COUNTRY”.

Table A1: Health care spending on cancer

	All cancers	Esophagus	Stomach	Colon	Rectum	Liver	Pancreas
	Spending as a share of THE	Spending as a share of total spending on cancer					
Austria	6.3%*	1.4%	1.7%	7.0%	3.6%	1.2%	2.6%
Belgium	7.0%*	1.4%	1.7%	7.0%	3.6%	1.2%	2.6%
Bulgaria	7.1%*	1.4%	1.7%	7.0%	3.6%	1.2%	2.6%
Croatia	6.8%*	1.4%	1.7%	7.0%	3.6%	1.2%	2.6%
Cyprus	6.3%	1.4%	1.7%	7.0%	3.6%	1.2%	2.6%
Czechia	7.0%	1.4%	1.7%	7.0%	3.6%	1.2%	2.6%
Denmark	4.8%	1.6%†	1.9%†	9.6%†	5.1%†	1.0%†	2.6%†
Estonia	5.8%	1.4%	1.7%	7.0%	3.6%	1.2%	2.6%
Finland	4.0%	1.4%	1.7%	6.1%†	3.4%†	1.2%	2.6%
France	7.1%	1.4%	1.7%	6.5%†	3.4%†	1.2%	2.6%
Germany	6.8%	1.4%	2.5%†	5.1%†	3.3%†	1.2%	3.1%†
Greece	6.5%	1.4%	1.7%	7.0%	3.6%	1.2%	2.6%
Hungary	7.1%	1.4%	1.7%	8.4%†	4.4%†	1.2%	2.6%
Iceland	3.8%	1.4%	1.7%	7.0%	3.6%	1.2%	2.6%
Ireland	5.0%*	1.4%	1.7%	7.0%	3.6%	1.2%	2.6%
Italy	6.7%	1.4%	1.7%	7.0%	3.6%	1.2%	2.6%
Latvia	6.4%*	1.4%	1.7%	7.0%	3.6%	1.2%	2.6%
Lithuania	6.4%*	1.4%	1.7%	7.0%	3.6%	1.2%	2.6%
Luxembourg	7.0%*	1.4%	1.7%	7.0%	3.6%	1.2%	2.6%
Malta	6.5%*	1.4%	1.7%	7.0%	3.6%	1.2%	2.6%
Netherlands	7.0%	1.3%†	0.7%†	7.3%†	3.1%†	1.2%	1.8%†
Norway	4.2%	1.4%	1.7%	9.3%†	4.6%†	1.2%	2.6%†
Poland	7.0%	1.4%	1.7%	7.0%	3.6%	1.2%	2.6%
Portugal	5.4%	1.4%	1.7%	7.0%	3.6%	1.2%	2.6%
Romania	7.1%*	1.4%	1.7%	7.0%	3.6%	1.2%	2.6%
Slovakia	7.1%*	1.4%	1.7%	7.0%	3.6%	1.2%	2.6%
Slovenia	6.4%	1.4%	1.7%	7.0%	3.6%	1.2%	2.6%
Spain	4.9%	1.4%	1.7%	7.0%	3.6%	1.2%	2.6%
Sweden	3.7%	1.2%†	1.8%†	6.5%†	3.4%†	1.3%†	2.9%†
Switzerland	5.8%	1.4%	1.7%	7.0%	3.6%	1.2%	2.6%
United Kingdom	5.0%	1.4%	1.7%	4.2%†	2.0%†	1.2%	2.6%

Notes: THE = total health expenditure. * Estimated share based on data from similar countries; see below. † The average of these cancer type-specific shares in these countries was used for all remaining countries.

Austria

The share used for cancer is the arithmetic mean of the shares in Germany and Switzerland.

The shares used for all six gastrointestinal cancers are the arithmetic means of the proportions of cancer type-specific health expenditures in countries with available data.

Belgium

The share used for cancer is the arithmetic mean of the shares in France, Germany, and the Netherlands.

The shares used for all six gastrointestinal cancers are the arithmetic means of the proportions of cancer type-specific health expenditures in countries with available data.

Bulgaria

The share used for cancer is the arithmetic mean of the shares in Hungary and Poland.

The shares used for all six gastrointestinal cancers are the arithmetic means of the proportions of cancer type-specific health expenditures in countries with available data.

Croatia

The share used for cancer is the arithmetic mean of the shares in Hungary and Slovenia.

The shares used for all six gastrointestinal cancers are the arithmetic means of the proportions of cancer type-specific health expenditures in countries with available data.

Cyprus

The OECD reports that cancer (not including benign cancers) accounted for 6.3% of total health expenditure in 2010, citing the OECD Questionnaire on Systems of Cancer Care 2010 (30). In the absence of any other data, 6.3% is used as the best available estimate.

The shares used for all six gastrointestinal cancers are the arithmetic means of the proportions of cancer type-specific health expenditures in countries with available data.

Czechia

The OECD provides disease-specific estimates for 2011 under the SHA framework (31). Expenditures on cancer (ICD-10 C00-D48) were 9.0% (CZK 19.717 billion) of current health expenditure. However, 29% of all health expenditures in this year are not allocated to a disease, and the sum of all – allocated and unallocated – expenditures deviates greatly from the official figures in the OECD's main database (11). Compared to the official current health expenditure in 2011 (CZK 281.431 billion), the cancer expenditures equal 7.0%. The latter estimate is used in the analysis.

The shares used for all six gastrointestinal cancers are the arithmetic means of the proportions of cancer type-specific health expenditures in countries with available data.

Denmark

A report by the Center for Health Economic Research (COHERE) estimated the health expenditure for a cancer patient (ICD-10 C00-D48, though some non-malignant types seem to be excluded) based on matching techniques comparing cancer patients to a healthy control group (32). Patients diagnosed between 2009 and 2013 and followed up until 2014 were included and all prices were adjusted to the price level in 2010. The costs included were expenditure on inpatient care and ambulatory care at hospitals (including medicine use) and on primary care for general practitioner (GP) visits. Expenditure on drugs dispensed outside the hospital, primary prevention measures, screening, and long-term care are missing. The additional health expenditure of a cancer patient amount to DKK 259,960 over a five-year period ranging from one year prior to the diagnosis to three years after it. However, the costs of DKK 17,710 in the year prior to the cancer diagnosis can, in line with a cost-of-illness approach, not be assigned to cancer as cancer cannot have been the main diagnosis. This puts the costs per patient to DKK 242,250. According to NORDCAN (33), there were 37,238 cancer patients diagnosed in Denmark in 2010. The total costs thus amount to DKK 9,021 million, which puts the share of cancer-specific expenditure on the current health expenditure (DKK 187,126 million in 2010 (11)) to 4.8%. This estimate is used in the analysis.

The same report by COHERE also provides data for all six gastrointestinal cancers. Costs per patient were calculated in the same manner as above and multiplied with incidence numbers from NORDCAN in 2010, after subtracting anal cancers cases based on GLOBOCAN data from 2018. This yields costs of DKK 145 million for esophageal cancer, DKK 175 million for stomach cancer, DKK 869 million for colon cancer[17], DKK 464 million for rectal cancer[18], DKK 95 million for liver cancer, and DKK 238 million for pancreatic cancer.

Estonia

In a discussion paper the WHO estimated the share of cancer-related expenditure on total health expenditure to be 9.4% in 2004 (34). The WHO's analysis for Estonia was based on personal communication and presentation on Health Expenditures by Patient Characteristics, Luxembourg 2006, Natalja Eigo. Note that the disease-specific allocation of health expenditure was only available for the Estonian Health Insurance Fund which comprised over 62% of total health expenditure. The

[17] Costs per patient were based on patients diagnosed with ICD-10 C18-19.
[18] Costs per patient were based on patients diagnosed with ICD-10 C20-21.

unallocated health expenditures were allocated in the same proportions as the allocated ones. However, this methodology leads probably to an overestimation of the true share of cancer expenditure, since people with chronic illnesses and retired people were (and still are) subject to lower co-payments in Estonia (35). If all cancer expenditure were exclusively paid for by the Health Insurance Fund, the share of cancer expenditure on total health expenditure would be about 5.8% (9.4%*62%). But since there are some co-payments, this estimate represents probably an underestimation of the true expenditure. Following the principle of providing conservative estimates, 5.8% is used as the best available estimate.

The shares used for all six gastrointestinal cancers are the arithmetic means of the proportions of cancer type-specific health expenditures in countries with available data.

Finland

A cost-of-illness study estimated the health expenditure of cancer (ICD-10 C00-C97) to be €775 million in 2014 (21). The costs include expenditure on inpatient episodes in secondary care (€202 million), outpatient visits in secondary care (€283), inpatient episodes in primary and private care (€87), rehabilitation (€4), outpatient medication (€160), and screening (€39). All treatment costs are reported as gross costs, i.e. including both the public expenditure and the patient's co-payment or deductible. Drugs administered in secondary care are included in the respective categories. Expenditure on primary prevention measures and long-term care are missing. The share of cancer-specific expenditure on the current health expenditure (€19,506 million in 2014 (11)) thus amounted to 4.0%. This estimate is used in the analysis.

The authors of the above-cited study also calculated the costs of selected cancer types in 2014 (36). Health expenditure for colon cancer amounted to €47 million and for rectal cancer to €26 million.[19] The shares used for the four remaining gastrointestinal cancers are the arithmetic means of the proportions of cancer type-specific health expenditures in countries with available data.

France

The National Health Insurance Fund (CNAM) publishes annual reports on public health expenditures by disease group (37). The latest publicly available report covers 2017. Public health expenditure on cancer amounted to €18.4 billion. The share of cancer-specific expenditure on the current health expenditure (€259.6 billion in 2017 (11)) thus amounted to 7.1%. This estimate is used in the

[19] Health expenditure were split based on incidence numbers from NORDCAN in 2014 and the incidence numbers for anal cancer from GLOBOCAN in 2018.

analysis, although it does not include out-of-pocket payments, which leads to an underestimation of the costs.

The same report by CNAM also provides data for colorectal cancer. Health expenditure for colon cancer amounted to €1.2 billion and for rectal cancer to €0.6 billion.[20] The shares used for the four remaining gastrointestinal cancers are the arithmetic means of the proportions of cancer type-specific health expenditures in countries with available data.

Germany

The Federal Statistical Office (Destatis) provides disease-specific health expenditures for selected years under the SHA framework (38). Expenditures on cancer (ICD-10 C00-D48) amounted to €23.002 billion in 2015. The share of cancer-specific expenditure on the current health expenditure (€338.1 billion in 2015 (11)) thus amounted to 6.8%. This estimate is used in the analysis.

Destatis also provides data for selected gastrointestinal cancers. Health expenditure for stomach cancer amounted to €576 million, for colon cancer to €1,171 million, for rectal cancer[21] to €756 million, and for pancreatic cancer to €721 million. The shares used for the two remaining gastrointestinal cancers are the arithmetic means of the proportions of cancer type-specific health expenditures in countries with available data.

Greece

In its "National Action Plan on Cancer, 2011-2015" the Ministry of Health states that "[i]nformation on the direct costs [of cancer] in Greece is not available, however it is estimated that the cost of treating cancer is around 6.5% of total expenditure on health." (39). In the absence of any other data, 6.5% is used as the best available estimate.

The shares used for all six gastrointestinal cancers are the arithmetic means of the proportions of cancer type-specific health expenditures in countries with available data.

Hungary

The OECD provides disease-specific estimates for the year 2006 under the SHA framework (31). Expenditures on cancer (ICD-10 C00-D48) were HUF 134.989 billion, corresponding to a share of 7.1% of current health expenditure (HUF 1,893.601 billion (11)). However, 31% of all health

[20] Health expenditure were split based on incidence numbers from GLOBOCAN in 2018.
[21] Only patients diagnosed with ICD-10 C20.

expenditures in 2006 are not allocated to a disease. In the absence of any other data, 7.1% is used as the best available estimate.

A cost-of-illness study estimated the health expenditure for colorectal cancer (ICD-10 C18-21) by the Hungarian National Health Insurance Fund Administration (NHIFA) to HUF 21.2 billion in 2014 (40). This corresponds to health expenditure for colon cancer of HUF 13.9 billion and for rectal cancer of HUF 7.3 billion.[22] The shares used for the four remaining gastrointestinal cancers are the arithmetic means of the proportions of cancer type-specific health expenditures in countries with available data.

Iceland

A comparative cost-of-illness study for the Nordic countries estimated that the cancer costs (primary diagnosis ICD-10 C00-C97) in Iceland amounted to ISK 4,573 million in 2007 (41). These costs include expenditure on hospital treatment (inpatient, day patient, and outpatient activities) (ISK 3,867 million), prescription drugs (ISK 228 million), and screening programs for breast and cervical cancer (ISK 479 million). Expenditure on primary care, primary prevention measures, and long-term care were not included. The share of cancer-specific expenditure on the current health expenditure (ISK 118,962 million in 2007 (11)) thus amounted to 3.8%. In the absence of any other data, 3.8% is used as the best available estimate.

The shares used for all six gastrointestinal cancers are the arithmetic means of the proportions of cancer type-specific health expenditures in countries with available data.

Ireland

The share used for cancer is the same as in the UK.

The shares used for all six gastrointestinal cancers are the arithmetic means of the proportions of cancer type-specific health expenditures in countries with available data.

Italy

Referring to a publication from the National Institute for Statistics (Istat) from 2011, a study published in BMC Cancer provides information on the cost of cancer (42). According to this study, expenditures on cancer amounted to €7.5 billion and total health expenditure to €110 billion (not

[22] Health expenditure for colorectal cancer were split based on incidence numbers from GLOBOCAN in 2018.

specifying a year), resulting in a share of 6.7%. In the absence of any other data, 6.7% is used as the best available estimate.

The shares used for all six gastrointestinal cancers are the arithmetic means of the proportions of cancer type-specific health expenditures in countries with available data.

Latvia

The share used for cancer is the arithmetic mean of the shares in Estonia and Poland.

The shares used for all six gastrointestinal cancers are the arithmetic means of the proportions of cancer type-specific health expenditures in countries with available data.

Lithuania

The share used for cancer is the arithmetic mean of the shares in Estonia and Poland.

The shares used for all six gastrointestinal cancers are the arithmetic means of the proportions of cancer type-specific health expenditures in countries with available data.

Luxembourg

The share used for cancer is the arithmetic mean of the shares in France, Germany, and the Netherlands.

The shares used for all six gastrointestinal cancers are the arithmetic means of the proportions of cancer type-specific health expenditures in countries with available data.

Malta

The share used for cancer is the arithmetic mean of the shares in Cyprus, Greece, and Italy.

The shares used for all six gastrointestinal cancers are the arithmetic means of the proportions of cancer type-specific health expenditures in countries with available data.

Netherlands

The National Institute for Public Health and the Environment (RIVM) provides disease-specific health expenditures for selected years under the SHA framework [22]. Expenditures on cancer (ICD-10 C00-D48) amounted to €5,205 million in 2017. The share of cancer-specific expenditure on the current health expenditure (€74,448 million in 2017 (11)) thus amounted to 7.0%. This estimate is used in the analysis.

RIVM also provides data for selected gastrointestinal cancers. Health expenditure for esophageal cancer amounted to €69 million, for stomach cancer to €38 million, for colon cancer to €379 million, for rectal cancer to €161 million, and for pancreatic cancer to €92 million.[23] The share used for liver cancer is the arithmetic mean of the proportions of cancer type-specific health expenditures in countries with available data.

Norway

A cost-of-illness report estimated the health expenditure of cancer (ICD-10 C00-D48, though some benign neoplasms seem to be excluded) to be NOK 12,456 million in 2014 (43). These costs include expenditure on primary care services, specialized health care (private specialized practitioners, day patient care, inpatient care, polyclinical contacts, polyclinical imaging, polyclinical laboratory services), and drugs (including some non-cancer drugs) dispensed at pharmacies. Expenditure on primary prevention measures, screening, and long-term care were not included in the study. Note that "other costs" among the specialized health care expenditure are excluded, since they are not part of the definition of current health expenditure used in this report. The share of cancer-specific expenditure on the current health expenditure (NOK 293,507 million in 2014 (11)) thus amounts to 4.2%. This estimate is used in the analysis.

The same report also provides data for selected gastrointestinal cancers. Health expenditure for colon cancer amounted to NOK 1,159 million, for rectal cancer to NOK 571 million, and for pancreatic cancer to NOK 326 million.[24] The shares used for the three remaining gastrointestinal cancers are the arithmetic means of the proportions of cancer type-specific health expenditures in countries with available data.

Poland

The National Health Fund (NFZ), responsible for financing public health care, spent PLN 6,292 million on cancer care (ICD-10 C00-C97, D00-D09, D37-D48) in 2011 (44). This includes expenditures for inpatient care (including chemotherapy, hospital wards, therapeutic programs, and radiation therapy), outpatient care, palliative and hospice care, psychiatric care and treatment for addiction, preventive health programs (screening), rehabilitation, nursing and care services, and other services. However, the expenditures for cancer drugs reimbursed under the list of pharmaceutical refund (i.e. cancer drugs distributed by pharmacies) are not included. In 2009 and 2010, these

[23] Health expenditure for colorectal cancer were split based on incidence numbers from GLOBOCAN in 2018.
[24] Health expenditure were split based on incidence numbers from NORDCAN in 2014 and the incidence numbers for anal cancer from GLOBOCAN in 2018.

expenditures amounted to just over PLN 500 million according to the Ministry of Health and the NFZ (45). Adding these PLN 500 million to the expenditures above, yields health expenditure of PLN 6,792 million in 2011. The share of cancer-specific expenditure on the current health expenditure (PLN 97,673 million in 2011 (11)) thus amounted to 7.0%. This estimate is used in the analysis, even though private co-payments for oncology services and cancer drugs are not included, yet they are very small compared with other health care provisions in Poland (46).

The shares used for all six gastrointestinal cancers are the arithmetic means of the proportions of cancer type-specific health expenditures in countries with available data.

Portugal

A cost-of-illness study estimated the direct costs of cancer to be €867.0 million in 2015 (note that most unit costs refer to this year) (47). The direct costs include expenditures for scheduled and unscheduled outpatient care (€232 million), day hospital sessions for medical treatment (€27 million), radiotherapy sessions (€74 million), hospitalization (€230 million), drugs (€273 million), and primary care (€30 million), whereas expenditures on, e.g., screening and primary prevention are missing. The share of cancer-specific expenditure on the current health expenditure (€16,132 million in 2015 (11)) thus amounted to 5.4%. This estimate is used in the analysis.

The shares used for all six gastrointestinal cancers are the arithmetic means of the proportions of cancer type-specific health expenditures in countries with available data.

Romania

The share used for cancer is the arithmetic mean of the shares in Hungary and Poland.

The shares used for all six gastrointestinal cancers are the arithmetic means of the proportions of cancer type-specific health expenditures in countries with available data.

Slovakia

The share used for cancer is the arithmetic mean of the shares in Czechia and Hungary.

The shares used for all six gastrointestinal cancers are the arithmetic means of the proportions of cancer type-specific health expenditures in countries with available data.

Slovenia

The OECD provides disease-specific estimates for the year 2006 under the SHA framework (31). Expenditures on cancer (ICD-10 C00-D48) were €157.1 million, corresponding to a share of 6.4% of current health expenditure (€2,462 million in 2006 (11)). Only 2% of all health expenditures in 2006 were not allocated to a disease. In the absence of any other data, 6.4% is used as the best available estimate.

The shares used for all six gastrointestinal cancers are the arithmetic means of the proportions of cancer type-specific health expenditures in countries with available data.

Spain

A cost-of-illness study estimated the direct costs of cancer to be €4,818 million in 2015 (48). The direct costs include expenditures for hospital care (€2,797 million), cancer drugs (€1,717 million), and primary care (€304 million), whereas expenditures on, e.g., screening and primary prevention are missing. The share of cancer-specific expenditure on the current health expenditure (€98,486 million in 2015 (11)) thus amounted to 4.9%. This estimate is used in the analysis.

The shares used for all six gastrointestinal cancers are the arithmetic means of the proportions of cancer type-specific health expenditures in countries with available data.

Sweden

A cost-of-illness study estimated the health expenditure of cancer (ICD-10 C00-C97) to be SEK 15,537 million in 2013 (49). The costs include expenditure on inpatient care (SEK 6,513 million), specialized outpatient care (SEK 4,145 million), cancer drugs (SEK 2,766 million), screening (SEK 642 million), primary care (SEK 265 million), and palliative care and other care services (SEK 1,207 million). Expenditure on primary prevention measures, some screening (PSA tests), other treatment-related drugs (e.g. antiemetic drugs) and patient fees related health care visits were not included. The share of cancer-specific expenditure on the current health expenditure (SEK 418,490 million in 2013 (11)) thus amounted to 3.7%. This estimate is used in the analysis.

The same study also provides data for all six gastrointestinal cancers. Health expenditure for esophageal cancer amounted to SEK 192 million, for stomach cancer to SEK 273 million, for colon

cancer to SEK 1,008 million, for rectal cancer to SEK 526 million, for liver cancer to SEK 198 million, and for pancreatic cancer to SEK 457 million.[25]

Switzerland

A cost-of-illness study estimated disease-specific health expenditures for 2011 (50). Expenditures on cancer (ICD-10 C00-D48) amounted to CHF 3.880 billion. The share of cancer-specific expenditure on the current health expenditure (CHF 66.900 billion in 2011 (11)) thus amounted to 5.8%. This estimate is used in the analysis.

The shares used for all six gastrointestinal cancers are the arithmetic means of the proportions of cancer type-specific health expenditures in countries with available data.

United Kingdom

The NHS England provides disease-specific expenditure data broken down by 23 so-called "programme budgeting categories" for the financial years 2003/04 to 2012/13 (51). The NHS' expenditures on "cancers & tumours" amounted to GBP 5.68 billion in 2012/13, while total NHS expenditures amounted to GBP 94.78 billion. This equals a share of 6.0% for England. However, public expenditures only comprised 83% of the current health expenditure in the UK in 2012 (11). Assuming that the public share of health expenditures is the same in England and that all cancer expenditures were exclusively paid for by the NHS, cancer expenditures' share on the current health expenditure would be 5.0% (6.0%*83%). Note that this estimate represent an underestimation of the true expenditures, as co-payments for cancer drugs occur (52). In the absence of data covering all of the UK, the estimate for England is used in the analysis.

The NHS England also provides data for lower gastrointestinal cancers, which we interpret as ICD-10 C18-21. Health expenditure for colon cancer amounted to GBP 0.24 billion and for rectal cancer to GBP 0.12 billion.[26] The shares used for the four remaining gastrointestinal cancers are the arithmetic means of the proportions of cancer type-specific health expenditures in countries with available data.

[25] Health expenditure were split based on incidence numbers from NORDCAN in 2013 and the incidence numbers for anal cancer from GLOBOCAN in 2018.
[26] Health expenditure were split based on incidence numbers from GLOBOCAN in 2018.

A2. Calculation of costs of cancer drugs

Table A2: Estimated use of cancer drugs by cancer types in Europe, 2018

	Esophagus	Stomach	Colorectum*	Liver	Pancreas	Other cancers
Chemotherapy						
Capecitabine	X 5%	X 9%	X 42%	X 7%	X 11%	A, BR, C, HN 25%
Carboplatin	X 6%	X 12%				BA, HN, LU, O, TE 82%
Cisplatin	X 3%	X 6%		X 5%	X 7%	BL, BA, BR, C, HN, LU, LY, ME, O, TE 79%
Docetaxel	X 3%	X 5%			X 7%	BR, HN, LU, O, P 85%
Doxorubicin				X 5%		BL, BR, KA, LE, LU, LY, MU, O, TH 95%
Epirubicin	X 4%	X 8%				BR, LU, LY, O 88%
Fluorouracil	X 5%	X 9%	X 42%	X 7%	X 11%	A, BR, C, HN 25%
Gemcitabine				X 3%	X 50%	BL, BR, LU, O 47%
Irinotecan	X 4%	X 8%	X 39%		X 10%	LU 39%
Mitoxantrone				X 47%		LE 53%
Oxaliplatin	X 3%	X 6%	X 80%	X 5%	X 7%	-
Paclitaxel	X 2%	X 5%			X 6%	BL, BR, C, KA, LU, MA, O, P 87%
Trifluridine & tipiracil			X 100%			-
Targeted therapy						
Aflibercept			X 100%			-
Bevacizumab			X 67%			BR, C, LU, KI, O 33%
Cabozantinib				X 5%		KI, TH 95%
Cetuximab			X 90%			HN 10%
Erlotinib					X 2%	LU 98%
Everolimus					X 0%	BR, KI, N 100%
Lenvatinib				X 15%		TH 85%
Panitumumab			X 100%			-
Ramucirumab		X 9%	X 50%			LU 41%
Regorafenib			X 80%	X 19%		G 1%
Sorafenib				X 29%		KI, TH 71%
Trastuzumab		X 4%				BR 96%

Notes: X for chemotherapy drugs denotes that this drug is used according to the American Cancer Society (www.cancer.org), and for targeted therapy drugs it denotes that this drugs had a marketing authorization for this cancer type according to the European Medicines Agency (www.ema.europa.eu). Trifluridine & tipiracil received a marketing authorization for stomach cancer in 2019 and ramucirumab received a marketing authorization for liver cancer in 2019. * In the cost calculations, the use of cancer drugs for colorectal cancer was split according to the country-specific proportions of incidence cases of colon cancer and rectal cancer (mostly a 2:1 ratio) in 2018. Abbreviations: A=anal cancer, BL=bladder cancer, BA=brain cancer, BR=breast cancer, C=cervical cancer, G=gastrointestinal stromal tumors, HN=head and neck cancers, KA= Kaposi's sarcoma, KI=kidney cancer, LE=leukemia, LU=lung cancer, LY=lymphomas, MA=malignant melanoma, ME=mesothelioma, MU=multiple myeloma, N=neuroendocrine tumors, O=ovarian cancer, P=prostate cancer, TE=testicular cancer, TH=thyroid cancer.

A3. Calculation of informal care costs

Table A3: Incidence cases as a share of all cancers (all ages)

	Esophagus	Stomach	Colon	Rectum	Liver	Pancreas
Austria	1.1%	2.8%	6.8%	3.2%	2.6%	4.5%
Belgium	1.5%	2.2%	8.7%	3.9%	1.4%	3.1%
Bulgaria	0.7%	3.9%	7.9%	5.6%	1.7%	3.9%
Croatia	0.9%	3.6%	9.3%	4.6%	2.6%	3.4%
Cyprus	0.5%	2.5%	7.9%	3.0%	1.6%	2.6%
Czechia	1.2%	2.3%	7.6%	4.9%	1.7%	3.6%
Denmark	1.8%	1.4%	9.4%	4.8%	1.6%	2.8%
Estonia	1.0%	4.4%	7.6%	4.6%	1.4%	3.8%
Finland	1.0%	1.9%	7.1%	3.8%	1.8%	3.8%
France	1.3%	1.9%	7.2%	3.7%	2.6%	3.4%
Germany	1.5%	2.7%	7.0%	3.5%	1.7%	3.6%
Greece	0.4%	2.9%	9.3%	1.7%	2.5%	3.4%
Hungary	1.1%	3.1%	10.6%	5.6%	1.6%	3.5%
Iceland	1.8%	1.9%	8.7%	3.2%	1.1%	2.4%
Ireland	1.8%	2.6%	7.3%	3.9%	1.4%	2.1%
Italy	0.6%	3.4%	9.2%	3.5%	3.2%	3.6%
Latvia	1.2%	4.7%	7.0%	5.9%	1.3%	3.9%
Lithuania	1.3%	5.5%	6.8%	4.6%	1.6%	3.3%
Luxembourg	1.3%	2.4%	7.4%	3.3%	2.4%	3.3%
Malta	1.0%	2.9%	9.7%	3.7%	1.0%	3.8%
Netherlands	2.3%	1.7%	9.8%	4.2%	1.0%	2.8%
Norway	1.1%	1.5%	10.2%	4.8%	1.0%	2.4%
Poland	1.0%	3.7%	7.3%	6.0%	1.4%	3.2%
Portugal	1.3%	5.2%	10.1%	8.0%	2.5%	2.9%
Romania	0.9%	4.3%	7.4%	5.8%	4.2%	3.8%
Slovakia	1.3%	4.1%	9.3%	6.7%	1.8%	3.6%
Slovenia	0.9%	3.5%	9.9%	5.3%	2.3%	3.3%
Spain	0.9%	3.1%	9.7%	5.0%	2.7%	3.1%
Sweden	1.0%	1.4%	7.6%	3.6%	1.7%	3.6%
Switzerland	1.4%	2.2%	6.3%	3.4%	2.1%	3.3%
United Kingdom	2.5%	1.6%	7.8%	3.8%	1.9%	2.8%

Notes: All cancers are ICD-10 C00-97/C44. Source: (2).

A4. Calculation of indirect costs

Table A4: Incidence cases as a share of all cancers (15–64 years)

	Esophagus	Stomach	Colon	Rectum	Liver	Pancreas
Austria	1.3%	1.8%	4.1%	2.8%	2.0%	3.0%
Belgium	1.5%	1.6%	5.6%	3.2%	1.3%	2.3%
Bulgaria	0.8%	2.9%	6.0%	4.7%	1.4%	3.3%
Croatia	1.0%	2.4%	6.5%	3.9%	1.9%	2.4%
Cyprus	0.4%	2.1%	5.6%	2.1%	0.8%	2.1%
Czechia	1.6%	1.8%	5.2%	4.6%	1.0%	2.7%
Denmark	1.6%	1.2%	5.8%	3.9%	1.4%	1.9%
Estonia	1.2%	3.8%	4.6%	3.2%	0.8%	2.8%
Finland	0.9%	1.4%	5.0%	3.2%	1.0%	2.4%
France	1.2%	1.2%	4.6%	2.9%	2.3%	2.2%
Germany	1.5%	2.3%	4.3%	3.1%	1.3%	2.3%
Greece	0.4%	2.0%	6.2%	1.7%	1.7%	2.2%
Hungary	1.5%	2.1%	7.7%	5.0%	1.4%	2.6%
Iceland	1.4%	1.1%	6.0%	2.6%	0.9%	2.1%
Ireland	1.3%	1.6%	4.7%	3.2%	1.0%	1.2%
Italy	0.5%	2.0%	6.3%	3.0%	2.7%	2.0%
Latvia	1.5%	4.1%	4.5%	4.2%	0.9%	3.2%
Lithuania	1.7%	4.1%	4.4%	3.2%	1.1%	2.2%
Luxembourg	1.3%	1.8%	4.8%	2.9%	2.0%	1.6%
Malta	0.5%	2.2%	6.3%	3.2%	0.9%	3.2%
Netherlands	2.1%	1.2%	6.6%	3.6%	0.7%	1.8%
Norway	0.9%	1.0%	6.4%	4.1%	1.2%	1.6%
Poland	1.1%	3.0%	5.3%	5.2%	1.1%	2.5%
Portugal	1.6%	3.9%	7.5%	6.4%	1.9%	1.7%
Romania	1.1%	3.1%	5.5%	4.5%	3.4%	2.9%
Slovakia	1.7%	3.0%	7.1%	5.9%	1.4%	2.9%
Slovenia	0.9%	2.5%	7.5%	4.8%	1.6%	2.3%
Spain	0.9%	2.2%	6.6%	4.5%	2.5%	2.0%
Sweden	0.7%	1.0%	4.5%	2.9%	1.6%	2.0%
Switzerland	1.3%	1.9%	4.1%	3.0%	1.5%	2.2%
United Kingdom	2.0%	1.0%	5.8%	3.5%	1.5%	1.9%

Notes: All cancers are ICD-10 C00-97/C44. Source: (2).

A5. Results by country and cancer type

Table A5: Total cost of esophageal cancer (in million €) in 2018

	Direct costs		Informal care costs	Indirect costs		Total costs
	Health expenditure	Cancer drugs*		Mortality	Morbidity	
Austria	34.3	1.8	4.5	31.4	3.6	73.7
Belgium	45.4	1.2	10.4	38.1	18.2	112.1
Bulgaria	4.4	0.1	0.3	2.1	0.4	7.2
Croatia	3.2	0.3	0.8	4.9	4.1	13.0
Cyprus	1.2	-	0.1	0.2	0.0	1.6
Czechia	14.9	0.3	2.3	16.4	5.2	38.9
Denmark	24.2	0.2	13.4	27.5	11.2	76.2
Estonia	1.3	0.0†	0.2	2.3	0.8	4.8
Finland	11.6	0.3	3.3	13.5	1.4	29.8
France	255.2	8.2	42.0	194.9	54.4	546.5
Germany	349.0	11.8	74.8	370.0	63.0	856.8
Greece	12.9	0.1†	1.3	7.0	0.6	21.7
Hungary	8.6	0.4	1.8	10.4	1.3	22.2
Iceland	0.9	0.0	0.4	1.0	0.5	2.8
Ireland	15.7	0.7	3.1	27.1	1.4	47.3
Italy	142.5	6.8	28.1	77.2	1.4	249.3
Latvia	1.5	0.0	0.4	2.8	0.6	5.3
Lithuania	2.7	0.0	0.4	4.1	1.3	8.6
Luxembourg	3.1	0.0†	0.4	2.9	0.5	6.9
Malta	1.0	-	0.1	0.4	0.0	1.6
Netherlands	70.0	2.0	22.7	103.1	28.9	224.7
Norway	21.5	1.1	3.8	16.2	5.9	47.4
Poland	29.9	0.4	5.6	35.6	8.5	79.7
Portugal	13.7	0.2	4.6	22.3	3.0	43.7
Romania	10.2	0.2	1.4	11.1	1.8	24.5
Slovakia	5.8	0.1	0.9	9.5	3.0	19.1
Slovenia	3.2	0.1	0.7	5.0	1.3	10.2
Spain	71.3	4.4	23.0	88.8	8.7	191.8
Sweden	23.1	0.3	4.8	15.7	7.0	50.5
Switzerland	57.7	1.0	8.5	42.4	6.1	114.5
United Kingdom	161.8	11.0	79.4	356.8	28.8	626.8

Notes: Total costs might deviate from the sum of costs because of rounding. No adjustment to costs for price differentials (PPP). * Cancer drug costs are a subset of health expenditure. Cancer drug expenditure do not include confidential rebates. Data on cancer drugs for Cyprus and Malta could not be obtained. † Data for Estonia, Greece, and Luxembourg only include retail sales but not hospital sales.

Table A6: Cost of esophageal cancer per capita (in €) in 2018

	Direct costs		Informal care costs	Indirect costs		Total costs
	Health expenditure	Cancer drugs*		Mortality	Morbidity	
Austria	3.9	0.2	0.5	3.6	0.4	8.3
Belgium	4.0	0.1	0.9	3.3	1.6	9.8
Bulgaria	0.6	0.0	0.0	0.3	0.1	1.0
Croatia	0.8	0.1	0.2	1.2	1.0	3.2
Cyprus	1.4	-	0.1	0.3	0.0	1.9
Czechia	1.4	0.0	0.2	1.5	0.5	3.7
Denmark	4.2	0.0	2.3	4.7	1.9	13.2
Estonia	1.0	0.0†	0.2	1.8	0.6	3.6
Finland	2.1	0.1	0.6	2.5	0.2	5.4
France	3.8	0.1	0.6	2.9	0.8	8.2
Germany	4.2	0.1	0.9	4.5	0.8	10.3
Greece	1.2	0.0†	0.1	0.7	0.1	2.0
Hungary	0.9	0.0	0.2	1.1	0.1	2.3
Iceland	2.7	0.0	1.0	2.7	1.6	8.0
Ireland	3.2	0.1	0.6	5.6	0.3	9.7
Italy	2.4	0.1	0.5	1.3	0.0	4.1
Latvia	0.8	0.0	0.2	1.5	0.3	2.7
Lithuania	1.0	0.0	0.2	1.5	0.5	3.1
Luxembourg	5.1	0.0†	0.7	4.8	0.8	11.3
Malta	2.1	-	0.2	0.8	0.0	3.2
Netherlands	4.1	0.1	1.3	6.0	1.7	13.0
Norway	4.0	0.2	0.7	3.0	1.1	8.9
Poland	0.8	0.0	0.1	0.9	0.2	2.1
Portugal	1.3	0.0	0.5	2.2	0.3	4.3
Romania	0.5	0.0	0.1	0.6	0.1	1.3
Slovakia	1.1	0.0	0.2	1.7	0.5	3.5
Slovenia	1.5	0.0	0.3	2.4	0.6	4.9
Spain	1.5	0.1	0.5	1.9	0.2	4.1
Sweden	2.3	0.0	0.5	1.5	0.7	5.0
Switzerland	6.8	0.1	1.0	5.0	0.7	13.5
United Kingdom	2.4	0.2	1.2	5.4	0.4	9.4

Notes: see Table A5.

Table A7: Total cost of stomach cancer (in million €) in 2018

	Direct costs		Informal care costs	Indirect costs		Total costs
	Health expenditure	Cancer drugs*		Mortality	Morbidity	
Austria	43.3	5.9	11.1	51.8	5.0	111.1
Belgium	57.3	5.2	14.9	44.9	19.2	136.3
Bulgaria	5.5	1.2	1.7	9.0	1.4	17.6
Croatia	4.1	1.2	3.3	10.2	10.1	27.7
Cyprus	1.5	-	0.6	1.8	0.2	4.1
Czechia	18.8	0.8	4.3	19.6	6.2	48.9
Denmark	28.8	1.6	10.8	37.3	8.5	85.3
Estonia	1.7	0.0†	1.0	4.6	2.8	10.2
Finland	14.6	1.7	6.2	21.3	2.2	44.3
France	322.1	25.8	59.9	237.5	55.3	674.8
Germany	638.4	44.8	135.4	518.9	100.7	1393.4
Greece	16.2	0.2†	9.2	25.6	3.2	54.2
Hungary	10.8	2.1	5.2	19.2	1.9	37.1
Iceland	1.2	0.1	0.4	1.7	0.4	3.7
Ireland	19.8	2.3	4.6	22.2	1.8	48.4
Italy	179.9	28.3	169.4	251.9	5.5	606.7
Latvia	1.9	0.3	1.5	6.8	1.6	11.8
Lithuania	3.4	0.2	1.8	8.6	3.3	17.2
Luxembourg	3.9	0.0†	0.8	4.0	0.6	9.3
Malta	1.3	-	0.3	0.9	0.0	2.6
Netherlands	37.7	7.0	16.9	75.4	16.2	146.2
Norway	27.1	2.9	5.2	25.2	6.6	64.2
Poland	37.8	3.4	20.8	82.9	23.0	164.5
Portugal	17.3	1.6	19.0	56.7	7.5	100.5
Romania	12.8	1.2	6.8	33.1	4.9	57.6
Slovakia	7.3	0.7	2.9	11.7	5.2	27.1
Slovenia	4.0	0.5	2.7	6.6	3.5	16.7
Spain	90.0	16.3	76.3	165.1	20.0	351.4
Sweden	34.6	2.1	6.7	33.7	9.2	84.2
Switzerland	72.8	3.8	13.1	81.5	8.8	176.2
United Kingdom	204.2	29.2	50.2	191.6	14.8	460.8

Notes: see Table A5.

Table A8: Cost of stomach cancer per capita (in €) in 2018

	Direct costs		Informal care costs	Indirect costs		Total costs
	Health expenditure	Cancer drugs*		Mortality	Morbidity	
Austria	4.9	0.7	1.3	5.9	0.6	12.6
Belgium	5.0	0.5	1.3	3.9	1.7	11.9
Bulgaria	0.8	0.2	0.2	1.3	0.2	2.5
Croatia	1.0	0.3	0.8	2.5	2.5	6.8
Cyprus	1.8	-	0.7	2.1	0.2	4.7
Czechia	1.8	0.1	0.4	1.8	0.6	4.6
Denmark	5.0	0.3	1.9	6.4	1.5	14.7
Estonia	1.3	0.0†	0.8	3.5	2.1	7.7
Finland	2.7	0.3	1.1	3.9	0.4	8.0
France	4.8	0.4	0.9	3.5	0.8	10.1
Germany	7.7	0.5	1.6	6.3	1.2	16.8
Greece	1.5	0.0†	0.9	2.4	0.3	5.1
Hungary	1.1	0.2	0.5	2.0	0.2	3.8
Iceland	3.4	0.2	1.1	4.8	1.2	10.4
Ireland	4.1	0.5	1.0	4.6	0.4	9.9
Italy	3.0	0.5	2.8	4.2	0.1	10.0
Latvia	1.0	0.1	0.8	3.5	0.8	6.1
Lithuania	1.2	0.1	0.7	3.1	1.2	6.1
Luxembourg	6.4	0.0†	1.3	6.5	1.0	15.3
Malta	2.7	-	0.7	1.8	0.1	5.3
Netherlands	2.2	0.4	1.0	4.4	0.9	8.5
Norway	5.1	0.5	1.0	4.7	1.2	12.1
Poland	1.0	0.1	0.5	2.2	0.6	4.3
Portugal	1.7	0.2	1.8	5.5	0.7	9.8
Romania	0.7	0.1	0.3	1.7	0.3	3.0
Slovakia	1.3	0.1	0.5	2.1	1.0	5.0
Slovenia	1.9	0.2	1.3	3.2	1.7	8.1
Spain	1.9	0.3	1.6	3.5	0.4	7.5
Sweden	3.4	0.2	0.7	3.3	0.9	8.3
Switzerland	8.5	0.4	1.5	9.6	1.0	20.7
United Kingdom	3.1	0.4	0.8	2.9	0.2	6.9

Notes: see Table A5.

Table A9: Total cost of colon cancer (in million €) in 2018

	Direct costs		Informal care costs	Indirect costs		Total costs
	Health expenditure	Cancer drugs*		Mortality	Morbidity	
Austria	175.7	49.3	26.7	57.1	11.4	270.9
Belgium	232.4	43.3	59.8	68.1	69.0	429.3
Bulgaria	22.4	18.1	3.4	11.0	2.9	39.8
Croatia	16.6	11.8	8.6	13.9	27.6	66.6
Cyprus	6.2	-	1.9	3.2	0.5	11.9
Czechia	76.4	6.1	14.4	26.4	17.4	134.7
Denmark	145.4	15.9	71.2	52.6	41.9	311.1
Estonia	6.8	0.1†	1.8	3.1	3.4	15.1
Finland	51.7	16.9	23.5	28.1	7.7	111.0
France	1213.8	261.1	229.7	365.7	201.7	2010.9
Germany	1302.4	406.9	353.0	554.6	187.4	2397.3
Greece	65.9	0.3†	29.1	30.1	9.9	135.1
Hungary	52.6	32.9	17.5	33.9	6.9	110.9
Iceland	4.8	0.8	1.7	2.2	2.3	11.0
Ireland	80.5	12.9	13.1	26.0	5.2	124.8
Italy	730.0	225.9	461.3	301.3	17.4	1510.0
Latvia	7.6	1.3	2.3	3.2	1.8	14.9
Lithuania	13.8	0.9	2.3	3.6	3.5	23.3
Luxembourg	15.8	0.0†	2.4	3.9	1.7	23.9
Malta	5.3	-	1.2	1.3	0.1	7.9
Netherlands	393.2	46.5	94.8	163.4	90.1	741.6
Norway	146.3	13.9	35.9	60.5	41.5	284.3
Poland	153.3	21.1	41.5	81.7	40.2	316.7
Portugal	70.3	16.3	37.1	44.5	14.2	166.1
Romania	52.1	21.9	11.7	28.2	8.8	100.8
Slovakia	29.8	11.5	6.6	14.6	12.3	63.2
Slovenia	16.3	4.9	7.7	7.7	10.4	42.1
Spain	365.3	154.9	239.5	223.9	61.2	890.0
Sweden	124.9	15.4	36.6	64.3	42.8	268.6
Switzerland	295.3	31.7	37.1	93.3	19.5	445.2
United Kingdom	497.2	97.8	245.4	328.7	83.4	1154.6

Notes: see Table A5.

Table A10: Cost of colon cancer per capita (in €) in 2018

	Direct costs		Informal care costs	Indirect costs		Total costs
	Health expenditure	Cancer drugs*		Mortality	Morbidity	
Austria	19.9	5.6	3.0	6.5	1.3	30.6
Belgium	20.3	3.8	5.2	6.0	6.0	37.6
Bulgaria	3.2	2.6	0.5	1.6	0.4	5.7
Croatia	4.0	2.9	2.1	3.4	6.7	16.3
Cyprus	7.2	-	2.2	3.7	0.6	13.6
Czechia	7.2	0.6	1.4	2.5	1.6	12.7
Denmark	25.1	2.7	12.3	9.1	7.2	53.7
Estonia	5.2	0.1†	1.4	2.3	2.6	11.4
Finland	9.4	3.1	4.3	5.1	1.4	20.1
France	18.1	3.9	3.4	5.5	3.0	30.0
Germany	15.7	4.9	4.3	6.7	2.3	28.9
Greece	6.1	0.0†	2.7	2.8	0.9	12.6
Hungary	5.4	3.4	1.8	3.5	0.7	11.3
Iceland	13.7	2.2	4.8	6.2	6.6	31.3
Ireland	16.5	2.6	2.7	5.3	1.1	25.6
Italy	12.1	3.7	7.6	5.0	0.3	25.0
Latvia	4.0	0.7	1.2	1.7	0.9	7.7
Lithuania	4.9	0.3	0.8	1.3	1.3	8.3
Luxembourg	26.1	0.1†	3.9	6.5	2.9	39.3
Malta	10.9	-	2.4	2.7	0.3	16.2
Netherlands	22.8	2.7	5.5	9.5	5.2	43.0
Norway	27.5	2.6	6.8	11.4	7.8	53.5
Poland	4.0	0.6	1.1	2.2	1.1	8.3
Portugal	6.8	1.6	3.6	4.3	1.4	16.1
Romania	2.7	1.1	0.6	1.5	0.5	5.2
Slovakia	5.5	2.1	1.2	2.7	2.3	11.6
Slovenia	7.9	2.4	3.7	3.7	5.0	20.3
Spain	7.8	3.3	5.1	4.8	1.3	19.0
Sweden	12.3	1.5	3.6	6.3	4.2	26.4
Switzerland	34.7	3.7	4.4	11.0	2.3	52.3
United Kingdom	7.5	1.5	3.7	4.9	1.3	17.4

Notes: see Table A5.

Table A11: Total cost of rectal cancer (in million €) in 2018

	Direct costs		Informal care costs	Indirect costs		Total costs
	Health expenditure	Cancer drugs*		Mortality	Morbidity	
Austria	91.2	23.6	12.8	32.2	7.7	143.8
Belgium	120.6	19.4	26.8	34.6	39.6	221.6
Bulgaria	11.6	<11.6	2.4	3.6	2.3	19.9
Croatia	8.6	5.9	4.3	9.1	16.3	38.3
Cyprus	3.2	-	0.7	0.6	0.2	4.8
Czechia	39.7	3.9	9.3	24.2	15.5	88.6
Denmark	77.2	8.2	36.4	26.2	27.9	167.7
Estonia	3.5	0.0†	1.1	1.4	2.4	8.4
Finland	28.8	9.0	12.5	17.3	4.9	63.5
France	634.9	136.1	119.8	152.7	126.4	1033.7
Germany	842.7	205.3	178.1	397.3	135.8	1554.0
Greece	34.2	0.0†	5.3	6.2	2.7	48.5
Hungary	27.6	17.3	9.2	24.0	4.5	65.2
Iceland	2.5	0.3	0.6	0.5	1.0	4.7
Ireland	41.8	6.8	6.9	34.2	3.6	86.5
Italy	378.9	85.7	175.0	134.0	8.2	696.1
Latvia	4.0	1.1	1.9	2.7	1.6	10.2
Lithuania	7.2	0.6	1.6	3.1	2.6	14.4
Luxembourg	8.2	0.0†	1.0	2.2	1.0	12.5
Malta	2.7	-	0.4	0.4	0.1	3.6
Netherlands	167.0	19.7	40.2	85.6	49.6	342.4
Norway	72.4	6.5	16.9	29.0	26.3	144.6
Poland	79.6	17.4	34.1	61.7	39.7	215.2
Portugal	36.5	12.8	29.2	20.0	12.2	97.9
Romania	27.0	17.1	9.2	15.8	7.3	59.3
Slovakia	15.4	8.3	4.8	12.3	10.2	42.7
Slovenia	8.5	2.6	4.1	6.5	6.6	25.6
Spain	189.6	80.7	124.8	100.8	41.5	456.8
Sweden	65.4	7.3	17.4	40.8	27.3	150.9
Switzerland	153.3	17.2	20.2	51.8	13.9	239.1
United Kingdom	236.8	47.5	119.2	361.9	50.4	768.2

Notes: see Table A5. The estimated cost of cancer drugs in Bulgaria (12.7) would exceed health expenditures, which is impossible. This is partly a result of confidential rebates for cancer drugs and parallel export as well as the crude calculation of the use of cancer drugs in different indications in this report.

Table A12: Cost of rectal cancer per capita (in €) in 2018

	Direct costs		Informal care costs	Indirect costs		Total costs
	Health expenditure	Cancer drugs*		Mortality	Morbidity	
Austria	10.3	2.7	1.4	3.6	0.9	16.3
Belgium	10.6	1.7	2.3	3.0	3.5	19.4
Bulgaria	1.7	<1.7	0.3	0.5	0.3	2.8
Croatia	2.1	1.4	1.0	2.2	4.0	9.4
Cyprus	3.7	-	0.8	0.7	0.2	5.5
Czechia	3.7	0.4	0.9	2.3	1.5	8.3
Denmark	13.3	1.4	6.3	4.5	4.8	29.0
Estonia	2.7	0.0†	0.8	1.1	1.8	6.4
Finland	5.2	1.6	2.3	3.1	0.9	11.5
France	9.5	2.0	1.8	2.3	1.9	15.4
Germany	10.2	2.5	2.1	4.8	1.6	18.7
Greece	3.2	0.0†	0.5	0.6	0.3	4.5
Hungary	2.8	1.8	0.9	2.5	0.5	6.7
Iceland	7.1	0.8	1.8	1.4	2.9	13.2
Ireland	8.6	1.4	1.4	7.0	0.7	17.8
Italy	6.3	1.4	2.9	2.2	0.1	11.5
Latvia	2.1	0.6	1.0	1.4	0.8	5.3
Lithuania	2.6	0.2	0.6	1.1	0.9	5.1
Luxembourg	13.5	0.0†	1.7	3.6	1.7	20.6
Malta	5.6	-	0.9	0.8	0.1	7.5
Netherlands	9.7	1.1	2.3	5.0	2.9	19.9
Norway	13.6	1.2	3.2	5.5	5.0	27.2
Poland	2.1	0.5	0.9	1.6	1.0	5.7
Portugal	3.5	1.2	2.8	1.9	1.2	9.5
Romania	1.4	0.9	0.5	0.8	0.4	3.0
Slovakia	2.8	1.5	0.9	2.3	1.9	7.8
Slovenia	4.1	1.2	2.0	3.1	3.2	12.4
Spain	4.1	1.7	2.7	2.2	0.9	9.8
Sweden	6.4	0.7	1.7	4.0	2.7	14.8
Switzerland	18.0	2.0	2.4	6.1	1.6	28.1
United Kingdom	3.6	0.7	1.8	5.4	0.8	11.6

Notes: see Table A5. The estimated cost of cancer drugs in Bulgaria (1.8) would exceed health expenditures, which is impossible. This is partly a result of confidential rebates for cancer drugs and parallel export as well as the crude calculation of the use of cancer drugs in different indications in this report.

Table A13: Total cost of liver cancer (in million €) in 2018

	Direct costs		Informal care costs	Indirect costs		Total costs
	Health expenditure	Cancer drugs*		Mortality	Morbidity	
Austria	28.9	3.7	10.4	45.1	5.5	89.9
Belgium	38.2	2.6	9.5	41.5	15.7	105.0
Bulgaria	3.7	1.4	0.7	5.7	0.7	10.8
Croatia	2.7	0.5	2.5	6.0	8.0	19.1
Cyprus	1.0	-	0.4	2.0	0.1	3.5
Czechia	12.6	0.4	3.3	13.6	3.3	32.7
Denmark	15.1	1.1	12.2	25.7	10.3	63.3
Estonia	1.1	0.1†	0.3	2.2	0.6	4.2
Finland	9.8	1.4	5.8	22.2	1.6	39.4
France	214.7	20.6	82.4	333.7	100.3	731.2
Germany	293.7	19.2	84.8	351.9	55.2	785.6
Greece	10.8	0.1†	8.0	24.7	2.7	46.2
Hungary	7.2	1.7	2.7	11.8	1.3	23.0
Iceland	0.8	0.1	0.2	1.5	0.3	2.8
Ireland	13.2	0.9	2.5	18.9	1.2	35.8
Italy	119.9	17.2	163.0	279.6	7.4	570.0
Latvia	1.3	0.1	0.4	3.5	0.3	5.5
Lithuania	2.3	0.2	0.5	4.0	0.9	7.7
Luxembourg	2.6	0.0†	0.8	1.8	0.7	5.9
Malta	0.9	-	0.1	1.0	0.0	2.0
Netherlands	61.9	2.4	9.2	64.4	9.0	144.5
Norway	18.1	1.0	3.7	20.5	7.7	49.9
Poland	25.2	2.7	8.0	34.3	8.7	76.2
Portugal	11.5	1.5	9.1	36.2	3.6	60.4
Romania	8.6	4.7	6.6	30.7	5.4	51.3
Slovakia	4.9	0.9	1.3	5.4	2.5	14.1
Slovenia	2.7	0.5	1.7	6.6	2.2	13.2
Spain	60.0	12.0	65.8	170.2	23.0	319.1
Sweden	25.0	1.2	8.4	28.6	15.4	77.4
Switzerland	48.5	2.3	12.2	70.5	7.1	138.3
United Kingdom	136.1	12.8	60.0	244.8	21.1	462.0

Notes: see Table A5.

Table A14: Cost of liver cancer per capita (in €) in 2018

	Direct costs		Informal care costs	Indirect costs		Total costs
	Health expenditure	Cancer drugs*		Mortality	Morbidity	
Austria	3.3	0.4	1.2	5.1	0.6	10.2
Belgium	3.3	0.2	0.8	3.6	1.4	9.2
Bulgaria	0.5	0.2	0.1	0.8	0.1	1.5
Croatia	0.7	0.1	0.6	1.5	2.0	4.7
Cyprus	1.2	-	0.4	2.3	0.1	4.0
Czechia	1.2	0.0	0.3	1.3	0.3	3.1
Denmark	2.6	0.2	2.1	4.4	1.8	10.9
Estonia	0.8	0.1†	0.2	1.6	0.4	3.2
Finland	1.8	0.2	1.1	4.0	0.3	7.1
France	3.2	0.3	1.2	5.0	1.5	10.9
Germany	3.5	0.2	1.0	4.2	0.7	9.5
Greece	1.0	0.0†	0.7	2.3	0.2	4.3
Hungary	0.7	0.2	0.3	1.2	0.1	2.4
Iceland	2.3	0.1	0.6	4.3	1.0	8.1
Ireland	2.7	0.2	0.5	3.9	0.2	7.3
Italy	2.0	0.3	2.7	4.6	0.1	9.4
Latvia	0.7	0.1	0.2	1.8	0.2	2.8
Lithuania	0.8	0.1	0.2	1.4	0.3	2.7
Luxembourg	4.3	0.0†	1.3	3.0	1.2	9.7
Malta	1.8	-	0.2	2.1	0.0	4.2
Netherlands	3.6	0.1	0.5	3.7	0.5	8.4
Norway	3.4	0.2	0.7	3.9	1.4	9.4
Poland	0.7	0.1	0.2	0.9	0.2	2.0
Portugal	1.1	0.1	0.9	3.5	0.3	5.9
Romania	0.4	0.2	0.3	1.6	0.3	2.6
Slovakia	0.9	0.2	0.2	1.0	0.5	2.6
Slovenia	1.3	0.2	0.8	3.2	1.1	6.4
Spain	1.3	0.3	1.4	3.6	0.5	6.8
Sweden	2.5	0.1	0.8	2.8	1.5	7.6
Switzerland	5.7	0.3	1.4	8.3	0.8	16.2
United Kingdom	2.0	0.2	0.9	3.7	0.3	7.0

Notes: see Table A5.

Table A15: Total cost of pancreatic cancer (in million €) in 2018

	Direct costs		Informal care costs	Indirect costs		Total costs
	Health expenditure	Cancer drugs*		Mortality	Morbidity	
Austria	65.3	7.6	17.6	79.4	8.3	170.5
Belgium	86.3	3.4	21.0	72.3	28.2	207.8
Bulgaria	8.3	0.3	1.7	8.7	1.6	20.4
Croatia	6.2	1.0	3.2	8.8	10.1	28.3
Cyprus	2.3	-	0.6	4.1	0.2	7.2
Czechia	28.4	1.0	6.8	33.0	9.1	77.3
Denmark	39.4	1.7	21.0	60.8	13.7	134.8
Estonia	2.5	0.0†	0.9	3.7	2.1	9.2
Finland	22.0	1.3	12.7	39.5	3.7	77.9
France	485.5	22.9	108.3	404.1	97.8	1095.7
Germany	791.6	34.8	182.1	714.6	97.1	1785.4
Greece	24.5	0.4†	10.5	35.7	3.5	74.3
Hungary	16.3	1.1	5.8	30.0	2.4	54.4
Iceland	1.8	0.0	0.5	3.2	0.8	6.3
Ireland	29.9	1.6	3.7	26.8	1.4	61.8
Italy	271.1	23.4	179.9	325.1	5.6	781.7
Latvia	2.8	0.1	1.3	6.1	1.2	11.4
Lithuania	5.1	0.2	1.1	5.6	1.8	13.6
Luxembourg	5.9	0.0†	1.1	5.5	0.6	13.0
Malta	2.0	-	0.4	2.4	0.1	4.9
Netherlands	97.0	5.1	27.2	138.4	24.4	287.0
Norway	40.9	3.2	8.6	39.3	10.1	99.0
Poland	56.9	1.4	18.1	73.4	18.9	167.3
Portugal	26.1	0.6	10.6	30.4	3.2	70.3
Romania	19.3	0.7	6.0	25.7	4.7	55.7
Slovakia	11.1	0.4	2.6	14.1	4.9	32.7
Slovenia	6.0	0.5	2.5	7.8	3.2	19.6
Spain	135.7	17.3	77.1	206.8	18.9	438.5
Sweden	55.7	0.8	17.2	57.1	18.6	148.7
Switzerland	109.7	3.7	19.1	97.2	10.2	236.2
United Kingdom	307.8	33.8	89.6	349.2	26.9	773.5

Notes: see Table A5.

Table A16: Cost of pancreatic cancer per capita (in €) in 2018

	Direct costs		Informal care costs	Indirect costs		Total costs
	Health expenditure	Cancer drugs*		Mortality	Morbidity	
Austria	7.4	0.9	2.0	9.0	0.9	19.3
Belgium	7.6	0.3	1.8	6.3	2.5	18.2
Bulgaria	1.2	0.0	0.2	1.2	0.2	2.9
Croatia	1.5	0.2	0.8	2.2	2.5	6.9
Cyprus	2.7	-	0.7	4.7	0.2	8.3
Czechia	2.7	0.1	0.6	3.1	0.9	7.3
Denmark	6.8	0.3	3.6	10.5	2.4	23.3
Estonia	1.9	0.0†	0.7	2.8	1.6	7.0
Finland	4.0	0.2	2.3	7.2	0.7	14.1
France	7.3	0.3	1.6	6.0	1.5	16.4
Germany	9.5	0.4	2.2	8.6	1.2	21.5
Greece	2.3	0.0†	1.0	3.3	0.3	6.9
Hungary	1.7	0.1	0.6	3.1	0.2	5.6
Iceland	5.1	0.1	1.3	9.1	2.3	17.9
Ireland	6.1	0.3	0.8	5.5	0.3	12.7
Italy	4.5	0.4	3.0	5.4	0.1	12.9
Latvia	1.5	0.1	0.7	3.2	0.6	5.9
Lithuania	1.8	0.1	0.4	2.0	0.6	4.9
Luxembourg	9.7	0.0†	1.7	9.0	1.0	21.4
Malta	4.0	-	0.9	4.9	0.1	10.0
Netherlands	5.6	0.3	1.6	8.0	1.4	16.7
Norway	7.7	0.6	1.6	7.4	1.9	18.6
Poland	1.5	0.0	0.5	1.9	0.5	4.4
Portugal	2.5	0.1	1.0	3.0	0.3	6.8
Romania	1.0	0.0	0.3	1.3	0.2	2.9
Slovakia	2.0	0.1	0.5	2.6	0.9	6.0
Slovenia	2.9	0.2	1.2	3.8	1.5	9.4
Spain	2.9	0.4	1.6	4.4	0.4	9.4
Sweden	5.5	0.1	1.7	5.6	1.8	14.6
Switzerland	12.9	0.4	2.2	11.4	1.2	27.7
United Kingdom	4.6	0.5	1.3	5.3	0.4	11.6

Notes: see Table A5.

Table A17: Total cost of cancer (in million €) in 2018

	Direct costs		Informal care costs	Indirect costs		Total costs
	Health expenditure	Cancer drugs*		Mortality	Morbidity	
Austria	2510	952	398	1104	281	4293
Belgium	3320	1024	693	1310	1244	6568
Bulgaria	320	216	43	165	49	578
Croatia	237	149	94	201	427	958
Cyprus	89	-	24	40	9	163
Czechia	1092	174	192	466	341	2090
Denmark	1514	513	764	849	726	3853
Estonia	97	5†	24	64	75	260
Finland	848	331	337	529	154	1868
France	18,673	5184	3288	7216	4542	33,719
Germany	25,537	7584	5141	11,222	4370	46,270
Greece	942	44†	314	578	159	1993
Hungary	626	388	167	522	91	1406
Iceland	69	21	20	42	39	169
Ireland	1150	308	180	541	113	1983
Italy	10,429	4517	5165	4889	284	20,767
Latvia	109	26	33	99	39	280
Lithuania	197	55	34	114	82	427
Luxembourg	226	7†	33	78	37	373
Malta	75	-	12	25	2	114
Netherlands	5386	1072	982	2440	1387	10,195
Norway	1573	366	356	647	655	3232
Poland	2190	583	582	1582	784	5138
Portugal	1004	404	371	693	192	2259
Romania	744	351	159	570	160	1633
Slovakia	425	166	72	255	173	925
Slovenia	233	105	77	165	139	614
Spain	5219	2841	2529	3448	950	12,145
Sweden	1922	572	491	862	960	4236
Switzerland	4219	801	592	1566	474	6850
United Kingdom	11,838	3249	3213	6827	1465	23,343

Notes: see Table A5.

Table A18: Cost of cancer per capita (in €) in 2018

	Direct costs		Informal care costs	Indirect costs		Total costs
	Health expenditure	Cancer drugs*		Mortality	Morbidity	
Austria	284	108	45	125	32	486
Belgium	291	90	61	115	109	575
Bulgaria	46	31	6	23	7	82
Croatia	58	37	23	49	104	234
Cyprus	102	-	28	46	11	188
Czechia	103	16	18	44	32	197
Denmark	261	89	132	147	125	665
Estonia	74	4†	18	49	57	197
Finland	154	60	61	96	28	339
France	279	77	49	108	68	504
Germany	308	91	62	135	53	558
Greece	88	4†	29	54	15	186
Hungary	64	40	17	53	9	144
Iceland	196	59	55	118	110	479
Ireland	236	63	37	111	23	407
Italy	173	75	85	81	5	344
Latvia	57	13	17	51	20	145
Lithuania	70	20	12	41	29	152
Luxembourg	372	12†	54	128	60	614
Malta	155	-	25	52	4	236
Netherlands	313	62	57	142	80	592
Norway	296	69	67	122	123	608
Poland	58	15	15	42	21	135
Portugal	98	39	36	67	19	220
Romania	38	18	8	29	8	84
Slovakia	78	30	13	47	32	170
Slovenia	112	50	37	79	67	296
Spain	112	61	54	74	20	260
Sweden	189	56	48	85	94	416
Switzerland	495	94	70	184	56	805
United Kingdom	178	49	48	103	22	351

Notes: see Table A5.

The Swedish Institute for Health Economics (IHE) was founded in 1979 to give researchers within the field of health economics, a broad platform to conduct their research from. IHE is a pioneer health economic research centre and has always been a central hub for health economic research.

As an independent research institute, working multidisciplinary with a broad array of public and private clients, IHE aims to contribute to sound decision-making in the health care setting by bridging the gap between academia, the life science sector and health care providers.

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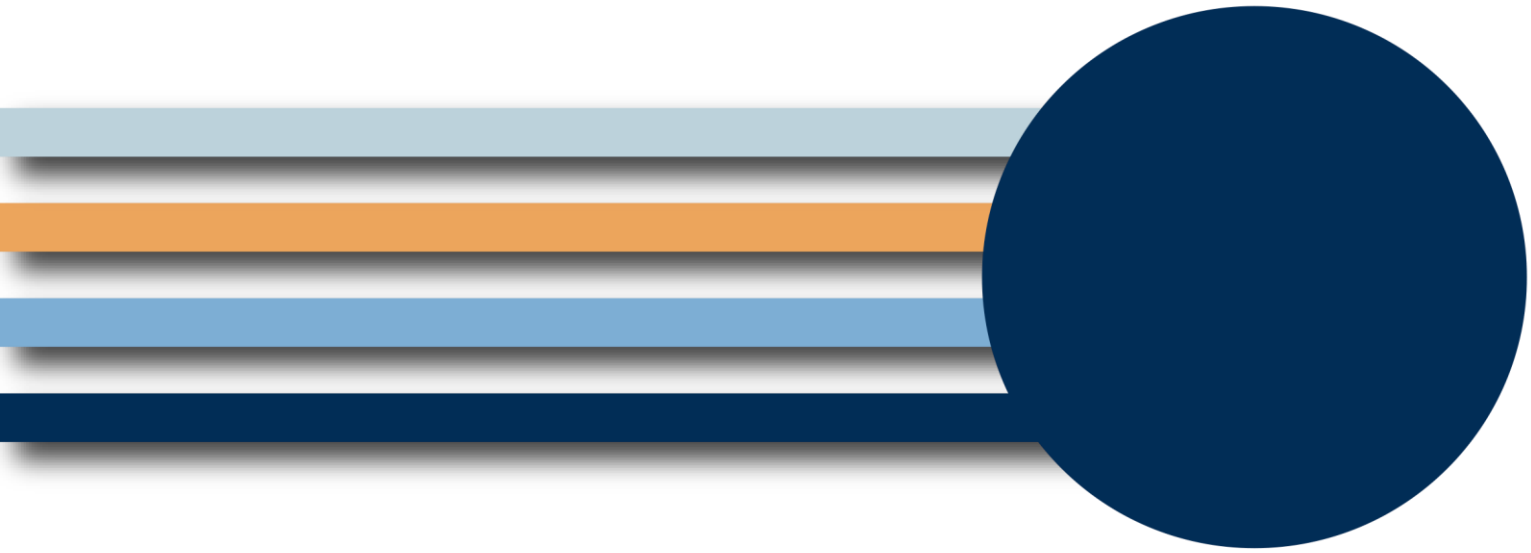

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