Appendix 3: Direct health service costs by disease

Introduction

The direct costs associated with treatments and services for specific health conditions that are covered by public funds were included in the modelling work. These costs were collected from the literature and included the following type of costs (dependent on data available).[1]

- Primary care is often the primary point of contact of someone seeking care. GP visits are the main source. If available we have included nurse visits, home visits, phone/email/fax consultations.
- Secondary inpatient costs are the total costs of treating a patient at hospital for a specific diagnosis (episode). They include day cases, elective and emergency admissions.
- Secondary outpatient costs capture the costs of visits to specialists.

We have not included in our different costs indirect costs such as the loss of income when hospitalised.
All costs were adjusted using prevalence when necessary to represent the total cost per type of care and per disease group for the UK. Costs for all diseases are in 2016 GBP.

Search strategy

The search terms are summarised in Table 1. We searched for peer-reviewed articles using PubMed. We focused exclusively on costs based on English or UK data. The majority of search results were disregarded because they were theoretical, the cost breakdown was not granular enough or the figures were based on literature that had previously already been stated within the literature review. If the search with Mesh terms on PubMed returned no results, Google was consulted as a supporting search engine.

We rarely had the choice between two references, but in this case our selection criteria were the transparency of the method to estimate the costs with a preference for bottom-up approaches,[2] the clarity of the methodology and definitions, the source of data with a preference for national representative samples, and the years for which the costs were reported.

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[1] We considered using the Programme Budgeting data, as has been used previously, but were advised that it does not fully capture the actual health care expenditures, in particular for social care costs.

[2] A bottom-up approach, in contrast to a top-down approach, reflects the actual needs. It quantifies each resource required to provide the services or treatments to care for patients with a specific condition, multiplied by the input costs. A top-down approach allocates a total figure (e.g. the NHS programme budgeting cost) to different services as such is less likely to capture the actual spending associated with a specific disease.

Final costs, scaled to 2016, are presented in Table 2.

Limitations

The main overall limitation of using costs from the literature is that the estimation methods vary significantly between paper. When the estimates come from a bottom-up approach, the costs are likely to underestimate the true costs as the possible missing components are set to zero. When the estimates come from a top-down approach, the allocation rule is often not clear and it is hard to know how comparable they are to the true cost. Yet, the order of magnitude is likely to represent the true costs for the NHS, as the overall costs are broken down into parts. Furthermore, the authors often argue that their method is conservative and that the estimated costs represent lower-bound estimates.

Table 1: MeSh search terms (PubMed - compiled Jan 2019)

Condition	Search term	Results found by PubMed
AML	((((United Kingdom[MeSH Terms] OR England[Title/Abstract] OR United Kingdom[Title/Abstract])) AND ((cost of disease[MeSH Terms] OR cost of illness[MeSH Terms] OR healthcare costs[MeSH Terms] OR Disease costs[MeSH Terms]))) AND acute myeloid leukemia[MeSH Terms]	1
CML	((((cost of disease[MeSH Terms] OR cost of illness[MeSH Terms] OR healthcare costs[MeSH Terms] OR Disease costs[MeSH Terms]))) AND ((United Kingdom[MeSH Terms] OR England[Title/Abstract] OR United Kingdom[Title/Abstract])) AND chronic myeloid leukaemia[MeSH Terms]	2
Cervical cancer	((cervical cancer[MeSH Terms]) AND ((United Kingdom[MeSH Terms] OR England[Title/Abstract] OR United Kingdom[Title/Abstract])) AND ((cost of disease[MeSH Terms] OR cost of illness[MeSH Terms] OR healthcare costs[MeSH Terms] OR Disease costs[MeSH Terms]))	10
Liver cancer	((Liver cancer[MeSH Terms]) AND ((United Kingdom[MeSH Terms] OR England[Title/Abstract] OR United Kingdom[Title/Abstract])) AND ((cost of disease[MeSH Terms] OR cost of illness[MeSH Terms] OR healthcare costs[MeSH Terms] OR Disease costs[MeSH Terms]))	8
Colorectal cancer	((cancer, colorectal[MeSH Terms]) AND ((cost of disease[MeSH Terms] OR cost of illness[MeSH Terms] OR healthcare costs[MeSH Terms] OR Disease costs[MeSH Terms]))) AND ((United Kingdom[MeSH Terms] OR England[Title/Abstract] OR United Kingdom[Title/Abstract])	47
Oesophageal cancer	(((esophageal cancer[MeSH Terms]) AND oseophageal cancer[MeSH Terms]) AND ((United Kingdom[MeSH Terms] OR England[Title/Abstract] OR United Kingdom[Title/Abstract])) AND ((cost of disease[MeSH Terms] OR cost of illness[MeSH Terms] OR healthcare costs[MeSH Terms] OR Disease costs[MeSH Terms]))	0
Kidney cancer	((kidney cancer[MeSH Terms]) AND ((cost of disease[MeSH Terms] OR cost of illness[MeSH Terms] OR healthcare costs[MeSH Terms] OR Disease costs[MeSH Terms]))) AND ((United Kingdom[MeSH Terms] OR England[Title/Abstract] OR United Kingdom[Title/Abstract])	10
Gastric cancer	((gastric cancer[MeSH Terms]) AND ((United Kingdom[MeSH Terms] OR England[Title/Abstract] OR United Kingdom[Title/Abstract])) AND ((cost of disease[MeSH Terms] OR cost of illness[MeSH Terms] OR healthcare costs[MeSH Terms] OR Disease costs[MeSH Terms]))	4
Lung cancer	((lung cancer[MeSH Terms]) AND ((cost of disease[MeSH Terms] OR cost of illness[MeSH Terms] OR healthcare costs[MeSH Terms] OR Disease costs[MeSH Terms]))) AND ((United Kingdom[MeSH Terms] OR England[Title/Abstract] OR United Kingdom[Title/Abstract])	35

Ovarian cancer	((ovarian cancer[MeSH Terms]) AND ((cost of disease[MeSH Terms] OR cost of illness[MeSH Terms] OR healthcare costs[MeSH Terms] OR Disease costs[MeSH Terms]))) AND ((United Kingdom[MeSH Terms] OR England[Title/Abstract] OR United Kingdom[Title/Abstract])	5
Bladder cancer	((bladder cancer[MeSH Terms]) AND ((United Kingdom[MeSH Terms] OR England[Title/Abstract] OR United Kingdom[Title/Abstract])) AND ((cost of disease[MeSH Terms] OR cost of illness[MeSH Terms] OR healthcare costs[MeSH Terms] OR Disease costs[MeSH Terms]))	4
Pancreatic cancer	((pancreatic cancer[MeSH Terms]) AND ((United Kingdom[MeSH Terms] OR England[Title/Abstract] OR United Kingdom[Title/Abstract])) AND ((cost of disease[MeSH Terms] OR cost of illness[MeSH Terms] OR healthcare costs[MeSH Terms] OR Disease costs[MeSH Terms]))	2
COPD	((COPD[MeSH Terms]) AND ((United Kingdom[MeSH Terms] OR England[Title/Abstract] OR United Kingdom[Title/Abstract])) AND ((cost of disease[MeSH Terms] OR cost of illness[MeSH Terms] OR healthcare costs[MeSH Terms] OR Disease costs[MeSH Terms]))	49
CHD	((Coronary Heart Disease[MeSH Terms]) AND ((cost of disease[MeSH Terms] OR cost of illness[MeSH Terms] OR healthcare costs[MeSH Terms] OR Disease costs[MeSH Terms]))) AND ((United Kingdom[MeSH Terms] OR England[Title/Abstract] OR United Kingdom[Title/Abstract])	61
Stroke	((Stroke[MeSH Terms]) AND ((United Kingdom[MeSH Terms] OR England[Title/Abstract] OR United Kingdom[Title/Abstract])) AND ((cost of disease[MeSH Terms] OR cost of illness[MeSH Terms] OR healthcare costs[MeSH Terms] OR Disease costs[MeSH Terms]))	68
Type 2 diabetes	((Type 2 diabetes[MeSH Terms]) AND ((United Kingdom[MeSH Terms] OR England[Title/Abstract] OR United Kingdom[Title/Abstract])) AND ((cost of disease[MeSH Terms] OR cost of illness[MeSH Terms] OR healthcare costs[MeSH Terms] OR Disease costs[MeSH Terms]))	68
Depression	(((depression[MeSH Terms] OR depressive disorder[MeSH Terms])) AND ((cost of disease[MeSH Terms] OR cost of illness[MeSH Terms] OR healthcare costs[MeSH Terms] OR Disease costs[MeSH Terms]))) AND ((United Kingdom[MeSH Terms] OR England[Title/Abstract] OR United Kingdom[Title/Abstract])	116
Peripheral vascular disease	((peripheral vascular disease[MeSH Terms]) AND ((cost of disease[MeSH Terms] OR cost of illness[MeSH Terms] OR healthcare costs[MeSH Terms] OR Disease costs[MeSH Terms]))) AND ((United Kingdom[MeSH Terms] OR England[Title/Abstract] OR United Kingdom[Title/Abstract])	9

Table 2: Disease costs per patient 2016 (GBP)

Disease		Source	Definition	Costs	Units	Year	FINAL COST 2016 (same unit)	Region	Final Costs 2016 per case (£)
AML	Hospital costs	Georghiou et al. 2012 (1)	All types of cancer and only over the last 12 months prior death	9498	per death	2010-11	10189.31	England	10189.31
CML	Hospital costs	Georghiou et al. 2012 (1)	All types of cancer and only over the last 12 months prior death	9498	per death	2010-11	10189.31	England	10189.31
Stomach	Hospital costs	Georghiou et al. 2012 (1)	All types of cancer and only over the last 12 months prior death	9498	per death	2010-11	10189.31	England	10189.31
Cervical Cancer	Direct costs	Brown, 2016(2)	Cost estimate for the first year of cervical cancer (excluding diagnosis	£10 464	Cost per case	2003	13916.05	UK	13916.05
Liver cancer	Hospital costs	Georghiou et al. 2012(1)	All types of cancer and only over the last 12 months prior death	9498	per death	2010-11	10189.31	England	10189.31
Colorectal cancer	Direct costs	Hall (2015)(4)	Hospital costs	12 643	Per cancer patient	2012	13346.20		13346.2
Oesophageal cancer	Hospital costs	Agus et al, 2013(5)	Hospital costs	£7846.72	Per cancer patient	2005	9853.74	Northern Ireland	9853.74
Kidney cancer	Drug treatment	Georghiou et al. 2012(1)	All types of cancer and only over the last 12 months prior death	9498	per death	2010-11	10189.31	England	10189.31
Oral, lip and pharynx cancer	Direct costs	Keeping et al, 2018{Keeping, 2018 #52}	Cost of head and neck cancers in secondary care facilities in England	£309,000,000	Total	2006/07-2010/11	6306.12	England	6312.12
Lung cancer	Hospital costs	Kennedy et al (2016)(7)	Hospital costs (emergency, inpatient and outpatient and drugs)	£10,009	Per patient	2013-2014	10173.12	Leeds teaching	10173.12

								hospitals NHS trust	
Larynx cancer	Direct costs	Keeping et al, 2018{Keeping, 2018 #52}	Cost of head and neck cancers in secondary care facilities in England	£309,000,000	Total	2006/07-2010/11	6306.12	England	6312.12
Ovarian cancer	Hospital costs	Georghiou et al. 2012(1)	All types of cancer and only over the last 12 months prior death	9498	per death	2010-11	10189.31	England	10189.31
Bladder cancer	Hospital costs	Georghiou et al. 2012 (1)	All types of cancer and only over the last 12 months prior death	9498	per death	2010-11	10189.31	England	10189.31
Pancreatic cancer	Direct costs	Morris (2014)(8)	RCT comparing direct surgery vs PBD	£8221	Per patient	2011-12	8678.25	UK	8678.25
COPD	Direct costs	Collins 2018 (9)	Multiple regression analysis adjusting for age, COPD severity, malnutrition risk, and smoking status overall health care costs were estimated using the UK Department of Health National Health Service (NHS) bed stay costs1	£3,049.10	Mean cost	2007-2008	3514.05	UK	3514.05
CHD	Direct costs	Liu et al. (2002)(10)	Air pollution cost (no social care costs -2460.33 with social))	2350.63	Cost per case	2015	2381.61	England	2381.61
Stroke	Direct costs	Luengo-Fernandez (2012)(11)	Patients from a UK population-based cohort study (Oxford Vascular Study) were recruited from 2002 to 2007. Analysis was based on follow-up until 2010. Hospital resource usage was obtained from patients' hospital records and valued using 2008/09 unit costs.	5148.2	Aver cost per patient per yr	2008-2009	5814.09	UK	5814.09
Type 2 diabetes	Direct costs	Hex et al. (2012)(12)	Air pollution cost (no social care costs -1790.19 with social))	1188.63	Cost per case	2015	1204.29	UK	1204.29

Depression	Direct costs	McCrone, Paul R., et al.2008.(13)	PSSRU data	2085.	Per patient	2007	England	2471.66

Comparison of costs to previous CRUK modelling

In past UKHF-CRUK modelling work, NHS programme budget costs have been used to calculate the cost per disease. We have been advised by PHE that programme budget costs underestimate the cost of care and costs from specific databases or from the literature should instead be utilised. Table 3 shows the comparison between costs used in this work (smoking cessation modelling, 2019) and costs used in the flatling report delivered in 2017. The costs used in the current report are often much higher than previously input.

Table 3: Comparison of disease costs used in past CRUK and UKHF modelling projects

Disease	Cost year	Costs used in SCS report (2019)	Costs used in Flatling report (2017)
AML	2016	£10,189.31	£7,214.91
CML	2016	£10,189.31	£625.07
Cervical cancer	2016	£13,916.05	£327.32
Liver cancer	2016	£10,189.31	£461.66
Colorectal cancer	2016	$12,643	£714.62
Oesophageal cancer	2016	£9,853.74	£571.53
Kidney cancer	2016	£9,529.40	£200.80
Gastric cancer	2016	£10,189.31	£3020.15
Lung cancer	2016	£10,173.12	£327.81
Ovarian cancer	2016	£10,189.31	£453.75
Bladder cancer	2016	£10,189.31	£275.69
Pancreatic cancer	2016	£8,678.25	£549.65
COPD	2016	£3,514.05	£926.92
CHD	2016	£2,381.61	£1,654.15
Stroke	2016	£5,814.09	£759.26
Type 2 diabetes	2016	£1,204.29	£672.28
Depression	2016	£1,465.33	NA
Oral cancer	2016	£6,312.12	£1552.06
Laryngeal cancer	2016	£6,312.12	£1534.13

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