Estimating the **economic burden of respiratory illness** in the UK

Prepared by:
David Trueman Director, Source HEOR
Fionn Woodcock Health Economist, DRG Abacus
Elizabeth Hancock Health Economist, Source HEOR

We would like to thank Pro Bono Economics for their help in preparing this report.

PRO BONO ECONOMICS

#BattleforBreath
blf.org.uk/policy

Contents

About Pro Bono Economics (www.probonoeconomics.com)

Pro Bono Economics (PBE) helps charities and social enterprises understand and improve the impact and value of their work. Set up in 2009 by Martin Brookes (Tomorrow's People) and Andy Haldane (Bank of England), PBE matches professional economists who want to use their skills to volunteer with charities. PBE has over 500 economists on its books and has helped over 300 charities large and small, covering a wide range of issues including education, employment, mental health and complex needs.

PBE is supported by high-profile economists, including Andy Haldane (Bank of England) and Dave Ramsden (HM Treasury) as trustees, and Kate Barker, Lord Jim O'Neill, Robert Peston, Martin Wolf and Lord Adair Turner as patrons. Lord Gus O'Donnell joined the Board of Trustees as Chair in September 2016.

Abbreviations

CCG	Clinical Commissioning Group
COPD	Chronic obstructive pulmonary disease
DALY	Disability-adjusted life year
DH	Department of Health
GHE	Global health estimate
GP	General practitioner
HRAF	Health Research Analysis Forum
ICD	International Statistical Classification of Diseases and Related Health Problems
QALY	Quality-adjusted life year
UKCRC	UK Clinical Research Collaboration
WHO	World Health Organization
WTP	Willingness to pay
YLD	Years of healthy life lost due to disability
YLL	Years of life lost from mortality

Foreword

Professor Sir Michael Marmot

As a country, we need to stop thinking about lung conditions as just the concern of the 12 million of us diagnosed. This report shows that lung disease costs the UK over £11 billion each year, in costs to the NHS and in lost productivity. In addition, there is the huge personal cost in lost years of good health. These costs and suffering have national significance – for the NHS, for business, and for all of us. We cannot continue to ignore them.

For those working in the health service, it will be no surprise that lung diseases such as COPD cost the NHS £1.9 billion each year and asthma £3 billion. Employers will also recognise that the cost of lung conditions to patients and businesses through work days lost is similar to the cost of mental health conditions.

But what is shaming is the picture behind the £11 billion figure in this report. Progress in tackling lung disease has stagnated in the last 10 years. We have wide variations in care and the fourth highest lung disease mortality rate in Europe.

I often talk of social injustice and lung disease. Respiratory conditions are responsible for a major part of the gap in life expectancy between the poorest and wealthiest in the UK. You are twice as likely to develop lung cancer or COPD if you are in the most deprived 10% of the population, compared to the national average.

Added to this social injustice is the long-term neglect and under-prioritisation of lung disease, leading to underinvestment in research, diagnosis and treatment. Shockingly, for a disease area that will affect so many of us, there is no strategy or plan in place to drive improvements.

My hope is that, with this report, the spotlight will fall on lung disease. We have seen over recent years how concerted efforts to tackle cancer and cardiovascular disease can yield real progress. We need a strategy in place to improve respiratory outcomes too.

The case for improving care for patients could not be stronger. The UK has one of the highest emergency admission and death rates for childhood asthma in Europe and COPD is the only major cause of death that is on the increase.

With this report, the financial case is made. We cannot continue to ignore a disease area which costs the UK £11 billion each year. We do injustice to taxpayers, the untapped skill of our doctors and nurses, and of course the millions of us living with a lung disease.

Foreword
Dr Penny Woods

Lung disease is the UK's third biggest killer and places a huge burden on those who have a condition and their loved ones. But action to prevent, diagnose and treat lung disease lags way behind other major illnesses, and we've suffered as a result. That's why we need new plans in place to improve services and the nation's lung health.

Over 12 million people have been diagnosed with a lung condition and, as this report details, it costs the UK a shockingly high £11 billion each year. But as our *Battle for Breath* report last year showed, despite this phenomenally high financial burden, mortality rates from lung disease haven't improved in the last ten years – we are now the fourth worst in Europe.

Behind these numbers lies wide variation in treatment and care across the country, as well as issues beyond health services, such as low awareness of signs and symptoms, smoking rates and air pollution.

Lung disease is a UK wide-issue, demanding tailored solutions in each of our nations. That's why we are calling for the governments in Westminster and Scotland to support a taskforce for lung health to develop ambitious but achievable five year strategies to improve outcomes. These would be designed to fit the distinct challenges and services of each country and, crucially, they would investigate how to invest scarce health service resources in the most effective way possible. We believe the improvement plans already in place in Wales need extending and enhancing if they are to be effective, while in Northern Ireland we want to see stronger evidence on how current respiratory plans are delivering improvements in lung health.

The cancer and mental health taskforces are already transforming care in their respective fields: lung disease too needs this level of attention if we are to end our shameful track record.

Improvements in respiratory health could be the rising tide that lifts all boats. The inter-relationship between different disease areas, which has been recognised in medical research for years, is an increasing concern for a health service dealing with more patients with multi-morbidities.

Improvements in respiratory services will help the NHS meet its wider challenges. For example, hospitals transforming A&E services to meet additional demand over winter will be supported by a strategy that would reduce the rising number of respiratory admissions.

This report is only the first stage. Over the coming months we will be working alongside other charities, patients and healthcare professionals to campaign for government action and lay the groundwork for the taskforce. And we will carry out further research into cost effective respiratory interventions which could help deliver services in a sustainable way.

As a country, we can no longer afford to ignore lung disease. The government, NHS, healthcare professionals and charities must now come together to find a better way. It's the right thing to do for patients and carers, and it's essential for the future of our health services.

Executive summary

Respiratory disease represents a significant economic burden to the individual, to the health service, and to society;[1] the British Thoracic Society have previously estimated the cost of respiratory disease in the UK to be £6.6 billion in 2004.[2]

This analysis provides estimates of the total costs to the UK of respiratory disease in 2014. The aim of the analysis is to provide within and between-disease comparisons of total costs to the UK of respiratory illness in order to inform future activities of the British Lung Foundation.

Costs included direct (costs which fall on the healthcare system), indirect (costs which fall on society including lost productivity), and intangible (the human cost of excess morbidity and mortality).

The total costs of all respiratory illness were estimated to be £165 billion including intangible costs. Excluding intangible costs provides an estimated total cost to the UK of £11.1 billion; representing 0.6% of UK GDP in 2014.

Sensitivity analysis indicates that a key determinant of the total cost of all respiratory conditions when including intangible costs is the willingness to pay for a disability-adjusted life-year (DALY). However, the impact on the results with respect to the proportion of spending is more limited, and 15–16% of the total disease burden was attributable to all respiratory conditions at willingness to pay thresholds of £20,000 and £100,000 per DALY.

Within respiratory illness, 29% of the total cost of respiratory illness was associated with chronic obstructive pulmonary disease (COPD); similarly, 28% was attributable to trachea, bronchus and lung cancers.

These costs are placed in the context of research funding; 9% of the total economic burden of illness is attributable to conditions included in the 'diseases of the respiratory system' ICD-10 code,[a] whilst only 1.68% of total research expenditure is allocated to the respiratory health category.

The findings of this analysis suggest that respiratory illness continues to represent a substantial burden to individuals, wider society, and the healthcare system, and that research funding allocation for respiratory illness does not currently reflect this.

[a] This rises to 16% if other respiratory conditions contained within other ICD-10 codes are included, but this figure cannot be compared to the available research expenditure estimates.

1 Introduction

Respiratory disease represents a significant economic burden to the individual, to the health service, and to society. This burden is a consequence of disability, premature mortality, direct medical resource use (including drug costs), and indirect costs. In 2013, the total cost of respiratory illness in the EU was estimated to be €380 billion annually.[1] The British Thoracic Society have previously estimated the cost of respiratory disease in the UK to be £6.6 billion in 2004.[2]

This analysis provides estimates of the total costs to the UK of respiratory disease in 2014. In addition to the total costs of respiratory illness, the analysis provides estimates of cost by respiratory condition and estimates of costs of other disease categories, to enable cross-disease comparison.

The aim of the analysis is to provide within and between-disease comparisons of total costs to the UK of respiratory illness in order to inform future activities of the British Lung Foundation.

2 Methods

2.1. Direct costs

2.1.1. Secondary care

Direct costs in secondary care were derived using the Programme Budgeting Benchmark estimates of Clinical Commissioning Group (CCG) spend across disease categories.[3] Costs were aggregated by International Statistical Classification of Diseases and Related Health Problems (version 10; ICD-10) chapter across CCGs and care settings to provide estimates of total direct costs. This dataset provides estimates for England only, and therefore costs were multiplied by an England to UK scaling of 1.2 to provide UK-wide costs, based on identifiable health expenditure in England and the UK in 2013-14.[4]

2.1.2. Primary care

The number of general practitioner (GP) visits in England was estimated to be 340 million, based on DH projections.[5] The cost per GP visit was assumed to be £37, based on published estimates.[6] This provided a total cost of primary care in England of approximately £13 billion. This estimate was assumed to be subject to the same England to UK scaling factor as applied in secondary care (see 2.1.1).

In the absence of data, primary care costs were assumed to be incurred for each disease category in the same proportion as attributable to primary care prescribing costs, for example the *diseases of the nervous system* category was associated with 8.6% of primary prescribing care costs. Therefore, 8.6% of primary care costs were assumed to be associated with *diseases of the nervous system*.

2.1.3. Non-government expenditure

Costs detailed above relate to NHS expenditure only, and exclude out-of-pocket and insurance financed expenditure. However, total private spending amounted to approximately 25.8% of public spending in 2014.[7,b] Therefore, in order to estimate the true burden of these costs to society, direct NHS costs are scaled by this factor to include additional spending, assuming that this scaling could be applied equally across ICD-10 codes.

[b] Government expenditure on healthcare was £142.6 billion in 2014, which accounted for 79.5% of all healthcare expenditure[7]

2.2. Indirect costs

Indirect costs are an essential component of estimating the true burden of illness and most notably include the losses in production (or income) which are associated with lost current (and possibly future) consumption.[8] The estimation of indirect costs is methodologically controversial and heterogeneous.[8,9] A full costing exercise by ICD-10 chapter for all disease classifications is beyond the scope of this analysis, and so the analysis adopts the ratio of direct to indirect costs observed in a previous study by the Public Health Agency of Canada.[10] The analysis employs a friction-cost methodology and estimates costs for a relatively limited range of activities related to lost productivity of the affected individual.

By ignoring non-labour market activities such as non-remunerated caring, this approach is likely to underestimate the true indirect costs for all diseases. Indeed, the British Thoracic Society estimated the indirect costs of respiratory disease to be £3.64 billion in 2004/5 versus approximately £0.8 billion in the present analysis.

Costs are available by diagnostic category, and where required these were mapped to the relevant ICD-10 chapter, and the ratio of indirect to direct costs are applied to the direct costs estimated in Section 2.1. Table 1 summarises the data used and total indirect costs by ICD-10 chapter.

> "…only the value of lost production due to an individual's 'own' illness, injury or premature death associated with time away from labour market activities was considered (costs associated with presenteeism, non-labour market activities and informal caregiving were not included)."[10]

"I was never able to hold down a full-time job. Even at 21-22, which was when my Bronchiectasis was diagnosed, I had bad infections 4 or 5 times a year and no employer wants someone who can't be depended on.

So I worked around my condition, taking temporary jobs, doing things from home that fitted with bringing up my children. For about 10 years I worked as a freelance writer, doing work for in-house magazines, brochures, newsletters etc. But there was a lot of stress with deadlines, especially when I had chest infections and as the workload continued to increase, I had to eventually give it up."

Anonymous

"I left work because of my lung condition. I am a social worker and couldn't speak to people without coughing my guts out. I reduced my days at work but still couldn't manage to carry out my duties as I have constant dizziness and fatigue.

As soon as I am on treatment I will be looking to go back to some kind of employment. I'd be devastated if I couldn't. My job, as for other people, is a major part of my life and my identity."

Minsha (Barking, Essex)

Table 1: **Indirect costs**

ICD-10 Chapter		Mapped diagnostic category (as used by Public Health Agency of Canada)	Costs as reported by Public Health Agency of Canada		Ratio of indirect to direct costs	Estimated indirect costs for UK
			Total direct costs ($ million)	Total indirect costs ($ million)		
I	Certain infectious and parasitic diseases	Certain infectious and parasitic diseases	2,077.0	839.9	0.40	£552,456,977
	Lower respiratory infections	**Respiratory infections**	**2,593.3**	**2,817.6**	**1.09**	**£865,769,348**
	Upper respiratory infections	**Respiratory infections**	**2,593.3**	**2,817.6**	**1.09**	**£39,700,511**
II	Neoplasms	Malignant neoplasms	3,828.2	586.1	0.12	£600,451,135
		Other neoplasms	965.1	1.8		
	Trachea, bronchus and lung cancers	-	-	-	**0.12**	**£19,979,724**
III/ IV	Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism/ Endocrine, nutritional and metabolic diseases	Endocrine disorders	2,739.2	6.3	0.03	£247,339,130
		Diabetes mellitus	2,178.2	145.2		
		Nutritional deficiencies	343.9	0.3		
V	Mental and behavioural disorders	Neuropsychiatric disorders	11,418.6	1,043.4	0.09	£1,278,002,344
VI	Diseases of the nervous system	Neuropsychiatric disorders	11,418.6	1,043.4	0.09	£561,200,432
VII/ VIII	Diseases of the eye and adnexa†	Sense organ diseases	2,132.9	0.0	0.00	£0
IX	Diseases of the circulatory system	Cardiovascular diseases	11,692.7	362.0	0.03	£277,424,241
X	**Diseases of the respiratory system**	**Respiratory diseases**	**3,648.3**	**121.3**	**0.03**	**£295,862,220**
	Chronic obstructive pulmonary disease	**Respiratory diseases**	**3,648.3**	**121.3**	**0.03**	**£61,417,600**
	Asthma	**Respiratory diseases**	**3,648.3**	**121.3**	**0.03**	**£97,799,339**
	Other respiratory problems	**Respiratory diseases**	**3,648.3**	**121.3**	**0.03**	**£136,645,281**
XI	Diseases of the digestive system	Digestive diseases	5,506.0	175.6	0.03	£258,432,141
XII	Diseases of the skin and subcutaneous tissue	Skin diseases	1,923.9	0.4	0.00	£733,451
XIII	Diseases of the musculoskeletal system and connective tissue	Musculoskeletal diseases	5,780.8	1,398.0	0.24	£1,952,867,945
XIV	Diseases of the genitourinary system	Genitourinary diseases	3,796.5	160.3	0.04	£252,839,985
XV	Pregnancy, childbirth and puerperium	Maternal conditions	2,233.3	0.2	0.00	£393,774
XVI	Certain conditions originating in the perinatal period	Perinatal conditions	980.4	0.1	0.00	£33,133

Abbreviations: ICD, International Statistical Classification of Diseases and Related Health Problems.
† Including diseases of the ear and mastoid process.

2.3. Intangible costs

Intangible costs represent the costs associated with pain, suffering and excess mortality, and represent the most challenging aspect of estimating economic burden of illness.[8] Department of Health advice suggests that estimating these effects is required to estimate health impacts.[11] However, many studies exclude such costs (for example the aforementioned Public Health Agency of Canada study[10]), and the World Health Organization (WHO) suggest that these costs be reported separately from empirically-based estimates of cost.[8]

Intangible costs are difficult to quantify, yet there remains a need to quantify the economic welfare cost of mortality and morbidity.[8] Summarising these losses in welfare requires a cross-disease composite measure of health, such as the quality-adjusted life year (QALY) or disability-adjusted life year (DALY). In the absence of QALY weights by ICD-10 chapter, the DALY is adopted, estimates for which are available from the WHO Global Burden of Disease estimates.[12]

2.3.1. The disability-adjusted life year

The disability-adjusted life year (DALY) is a composite health measure designed to reflect the burden of illness through both the years of life lost (YLL; measured against a theoretical maximum) and the number of years lived in less than perfect health. One DALY can be thought of as one lost year of 'healthy' life; the measured disease burden is the gap between a population's health status and that of a normative reference population.[13] For given cause, age, sex and year, DALYs can be defined as:

DALYs = years of life lost from mortality + years of healthy life lost due to disability

Whilst the concept of DALYs themselves are widely understood and accepted, attaching a monetary value to a DALY is more problematic. A willingness to pay £60,000 to avoid a single DALY is assumed based on the monetised value of a QALY reported by the DH.[14]

Table 2: 'Intangible' costs assuming willingness to pay £60,000 to avoid one DALY

ICD-10 Chapter		GHE cause (as used by the WHO)	No. of DALYs (thousand)	Intangible costs
I	Certain infectious and parasitic diseases	Infectious and parasitic diseases	711.3	£42,676,970,566
	Lower respiratory infections	**Lower respiratory infections**	**414.9**	**£24,892,116,925**
	Upper respiratory infections	**Upper respiratory infections**	**19.0**	**£1,141,446,913**
II	Neoplasms	Malignant neoplasms	3,417.5	£208,745,109,788
		Other neoplasms	61.6	
	Trachea, bronchus and lung cancers	**Trachea, bronchus, lung cancers**	**761.3**	**£45,679,609,705**
III/ IV	Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism/Endocrine, nutritional and metabolic diseases	Endocrine, blood, immune disorders	183.0	£29,715,484,785
		Diabetes mellitus	230.8	
		Nutritional deficiencies	81.5	
V	Mental and behavioural disorders	Mental and behavioural disorders	2,440.0	£146,402,910,014
VI	Diseases of the nervous system	Neurological conditions	1,244.5	£74,672,459,850
VII/ VIII	Diseases of the eye and adnexa/Diseases of the ear and mastoid process	Sense organ diseases	274.3	£16,459,298,870
IX	Diseases of the circulatory system	Cardiovascular diseases	2,874.9	£172,495,717,438
X	**Diseases of the respiratory system**	**Respiratory diseases**	**1,375.5**	**£82,527,941,770**
	Chronic obstructive pulmonary disease	**Chronic obstructive pulmonary disease**	**777.3**	**£46,636,349,080**
	Asthma	**Asthma**	**309.0**	**£18,540,187,696**
	Other respiratory problems	**Other respiratory diseases**	**289.2**	**£17,351,404,574**
XI	Diseases of the digestive system	Digestive diseases	713.7	£42,824,542,705
XII	Diseases of the skin and subcutaneous tissue	Skin diseases	163.4	£9,804,849,615
XIII	Diseases of the musculoskeletal system and connective tissue	Musculoskeletal diseases	1,661.9	£99,711,996,862
XIV	Diseases of the genitourinary system	Genitourinary diseases	501.4	£30,083,367,564
XV	Pregnancy, childbirth and puerperium	Maternal conditions	5.5	£330,462,651
XVI	Certain conditions originating in the perinatal period	Neonatal conditions	214.8	£12,888,377,091

Abbreviations: DALY, disability-adjusted life year; GHE, global health estimate; ICD, International Statistical Classification of Diseases and Related Health Problems; WHO, World Health Organization.

3 Results

3.1. Total costs

The total costs of all respiratory illness (assumed to include all conditions in the 'diseases of the respiratory system' ICD-10 chapter, lower and upper respiratory infections, and trachea, bronchus and lung cancers) were estimated to be £165 billion. The vast majority of this total (>93%) was attributable to the intangible costs associated with excess mortality and reduced quality of life. Excluding these costs provides an estimated total cost to the UK of £11.1 billion; representing 0.6% of UK GDP.[c] This estimate of direct and indirect costs compares to an estimate of £6.6 billion in the 2004-5 estimate produced by the British Thoracic Society.[2] However, it is difficult to compare such estimates directly due to the methodological differences between studies:

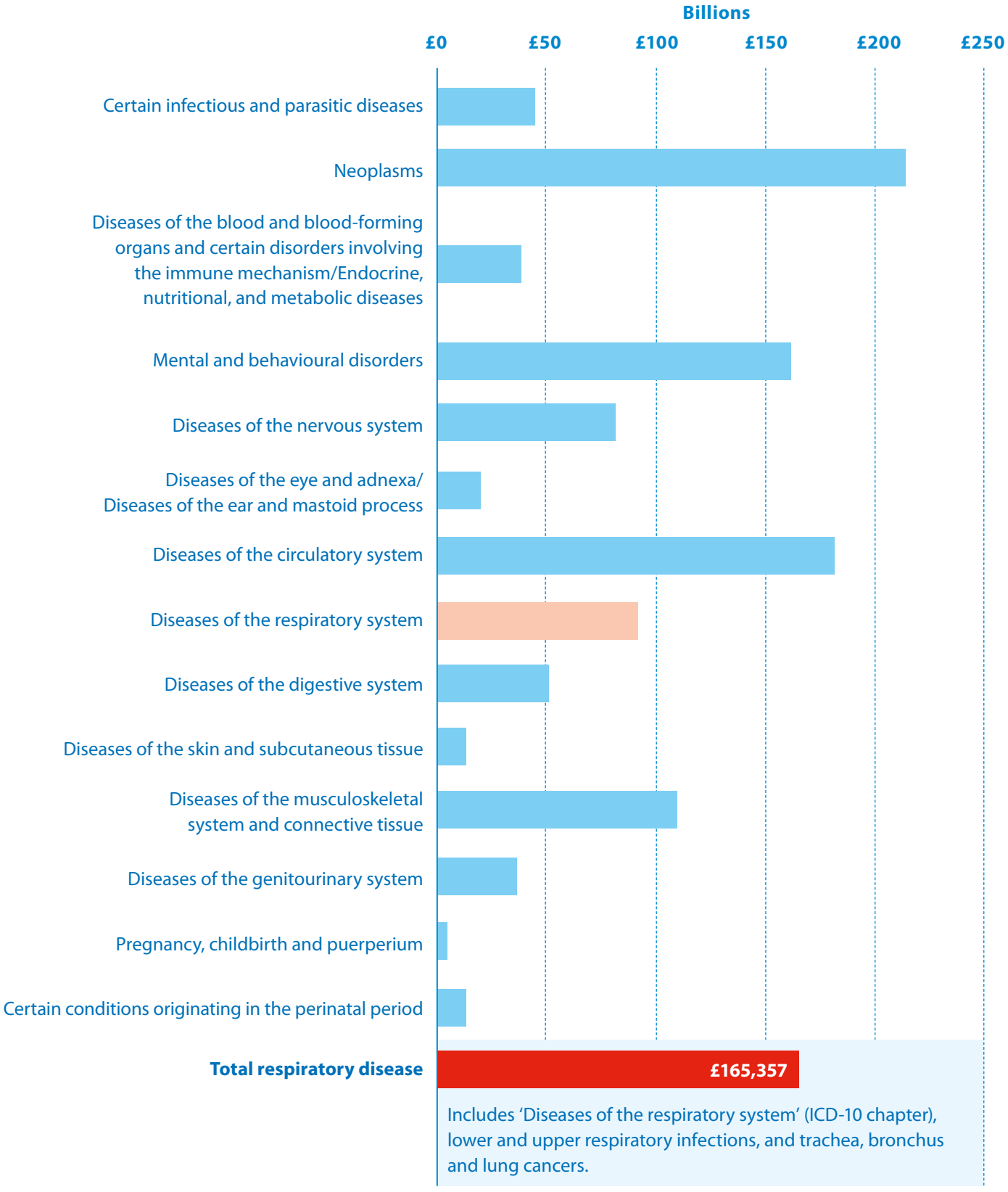
- The present study includes healthcare costs which fall on private spending, the British Thoracic Society do not. Excluding such costs, the estimates of direct and indirect costs in the present analysis fall to £8.8 billion.

- Methods for estimating the total production loss are particularly different between the studies, with the British Thoracic Society estimates using reported days of incapacity by ICD-10 code. In real terms, the estimated indirect costs from the British Thoracic Society are more than five times those estimated in the present analysis.

Total costs are presented in Figure 1 and Table 3.

[c] Based on Gross Domestic Product: chained volume measures seasonally adjusted, 2014. Available from the Office of National Statistics at http://www.ons.gov.uk/economy/grossdomesticproductgdp/timeseries/abmi/qna. If intangible costs are included, this proportion rises to 9.2% of GDP.

Figure 1: **Total costs for respiratory illness and by ICD-10 chapter** (includes intangible costs)



Abbreviations: ICD, International Statistical Classification of Diseases and Related Health Problems.

Table 3: **Total costs by ICD-10 chapter**

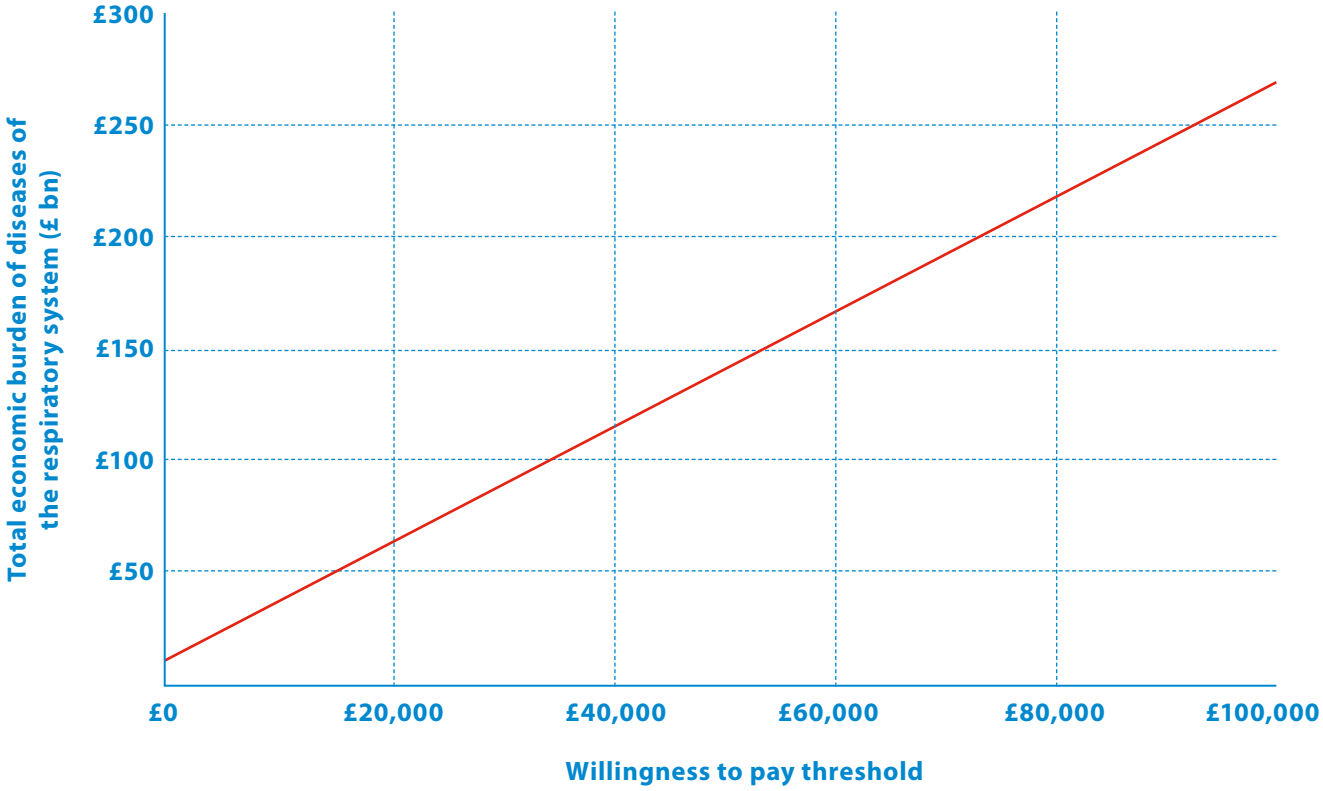
ICD-10 Chapter		Direct costs (£m)	Indirect costs (£m)	Intangible costs (£m)	Total costs (£m; excluding intangible costs)	Total costs (£m; including intangible costs)
I	Certain infectious and parasitic diseases	£1,366	£552	£42,677	£1,919	£44,596
	Lower respiratory infections	**£797**	**£866**	**£24,892**	**£1,663**	**£26,555**
	Upper respiratory infections	**£37**	**£40**	**£1,141**	**£76**	**£1,218**
II	Neoplasms	£4,896	£600	£208,745	£5,496	£214,241
	Trachea, bronchus and lung cancers	**£163**	**£20**	**£45,680**	**£183**	**£45,862**
III/ IV	Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism/Endocrine, nutritional and metabolic diseases	£8,573	£247	£29,715	£8,820	£38,535
V	Mental and behavioural disorders	£13,986	£1,278	£146,403	£15,264	£161,667
VI	Diseases of the nervous system	£6,142	£561	£74,672	£6,703	£81,375
VII/ VIII	Diseases of the eye and adnexa/Diseases of the ear and mastoid process	£3,430	£0	£16,459	£3,430	£19,890
IX	Diseases of the circulatory system	£8,961	£277	£172,496	£9,238	£181,734
X	**Diseases of the respiratory system**	**£8,899**	**£296**	**£82,528**	**£9,194**	**£91,722**
	Chronic obstructive pulmonary disease	**£1,847**	**£61**	**£46,636**	**£1,909**	**£48,545**
	Asthma	**£2,941**	**£98**	**£18,540**	**£3,039**	**£21,579**
	Other respiratory problems	**£4,110**	**£137**	**£17,351**	**£4,246**	**£21,598**
XI	Diseases of the digestive system	£8,103	£258	£42,825	£8,362	£51,186
XII	Diseases of the skin and subcutaneous tissue	£3,528	£1	£9,805	£3,528	£13,333
XIII	Diseases of the musculoskeletal system and connective tissue	£8,075	£1,953	£99,712	£10,028	£109,740
XIV	Diseases of the genitourinary system	£5,988	£253	£30,083	£6,241	£36,324
XV	Pregnancy, childbirth and puerperium	£4,397	£0	£330	£4,397	£4,728
XVI	Certain conditions originating in the perinatal period	£325	£0	£12,888	£325	£13,213
All respiratory illness†		**£9,895**	**£1,222**	**£154,241**	**£11,116**	**£165,357**

Abbreviations: ICD, International Statistical Classification of Diseases and Related Health Problems.
†Includes: 'Diseases of the respiratory system' (ICD-10 chapter), lower and upper respiratory infections, and trachea, bronchus and lung cancers

3.2. The role of willingness to pay

The total cost of disease is driven largely by the total intangible costs (see Section 3.1). This, in turn, is driven largely by the willingness to pay (WTP) for a DALY. The total cost of all respiratory problems increases linearly with respect to WTP. At a WTP of £20,000 per DALY, the total cost falls to £63 billion. At a WTP of £100,000, the total cost increases to £268 billion.

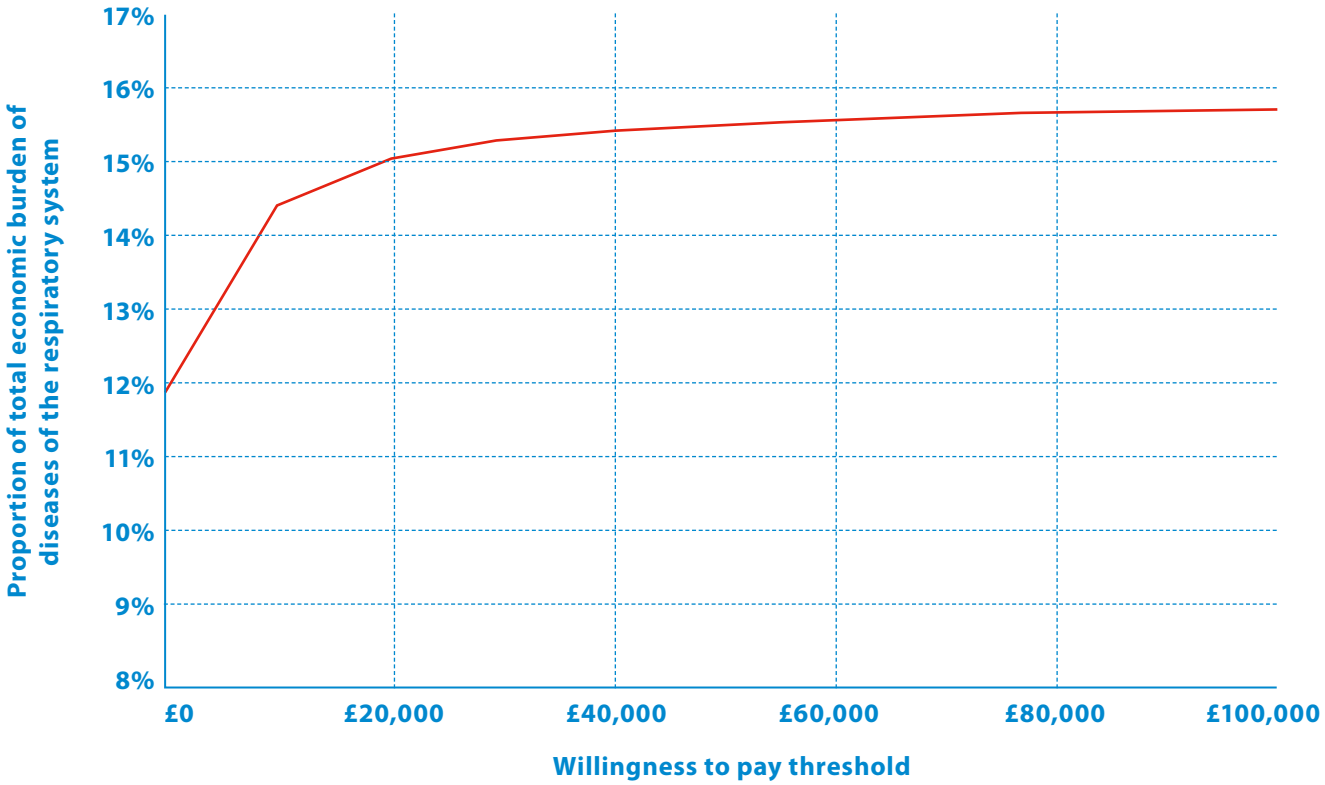
Figure 2: **Sensitivity of total cost of all respiratory problems to WTP for a DALY**



Abbreviations: DALY, disability-adjusted life year; WTP, willingness to pay.

Although the absolute total cost is highly sensitive to this parameter, this is less true of the proportion of the total disease burden; at WTP thresholds for a DALY of £20,000 and £100,000, this value changes to 15% and 15.7%, respectively (Figure 3).

Figure 3: **Proportion of total disease burden for all respiratory disease by WTP for a DALY**



Abbreviations: DALY, disability-adjusted life year; WTP, willingness to pay.

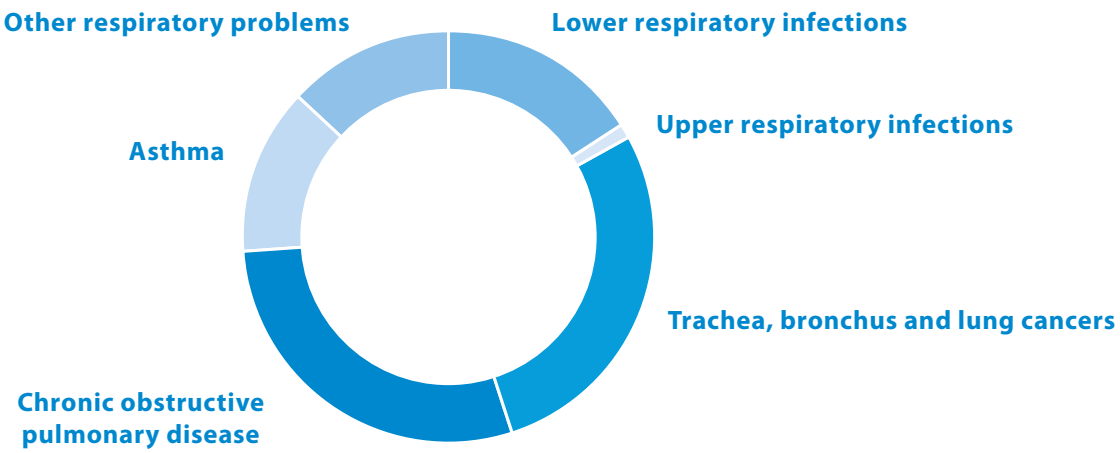
3.3. Costs of respiratory conditions

Within respiratory illness, 29% of the total cost of respiratory illness was associated with chronic obstructive pulmonary disease (COPD); similarly, 28% was attributable to trachea, bronchus and lung cancers (Table 4 and Figure 4).

Table 4: **Costs by respiratory condition**

Condition	Direct costs (£m)	Indirect costs (£m)	Intangible costs (£m)	Total costs (£m; excluding intangible costs)	Total costs (£m; including intangible costs)	Proportion
Lower respiratory infections	£797	£866	£24,892	£1,663	£26,555	16%
Upper respiratory infections	£37	£40	£1,141	£76	£1,218	1%
Trachea, bronchus and lung cancers	£163	£20	£45,680	£183	£45,862	28%
Chronic obstructive pulmonary disease	£1,847	£61	£46,636	£1,909	£48,545	29%
Asthma	£2,941	£98	£18,540	£3,039	£21,579	13%
Other respiratory problems	£4,110	£137	£17,351	£4,246	£21,598	13%
All respiratory problems	**£9,895**	**£1,222**	**£154,241**	**£11,116**	**£165,357**	**100%**

Figure 4: **Costs of specific respiratory conditions** (including intangible costs)



3.4. Comparison across disease areas

The total costs of conditions vary considerably based on the inclusion/exclusion of intangible costs. The impact is largely correlated with the extent to which conditions within each ICD-10 chapter impact mortality. For example, *neoplasms* are the most costly disease category when including intangible costs, because these conditions are frequently associated with reduced life expectancy, but are the ninth most costly when these costs are excluded. Conversely, *mental and behavioural disorders* are the most costly chapter when excluding intangible costs because the mortality effects for many of these conditions are not as pronounced; they are only the third most costly when intangible costs are included. *Diseases of the respiratory system* are the fourth and fifth most costly ICD-10 code when excluding and including intangible costs, respectively.

Table 5: **Comparison of costs across ICD-10 chapter**

ICD-10 Chapter		Excluding intangible costs			Including intangible costs		
		Total costs (£m)	% of respiratory illness cost	Rank within ICD-10	Total costs (£m)	% of respiratory illness cost	Rank within ICD-10
I	Certain infectious and parasitic diseases	£1,919	17%	13	£44,596	27%	8
II	Neoplasms	£5,496	49%	9	£214,241	130%	1
III/IV	Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism/ Endocrine, nutritional and metabolic diseases	£8,820	79%	5	£38,535	23%	9
V	Mental and behavioural disorders	£15,264	137%	1	£161,667	98%	3
VI	Diseases of the nervous system	£6,703	60%	7	£81,375	49%	6
VII/ VIII	Diseases of the eye and adnexa/Diseases of the ear and mastoid process	£3,430	31%	12	£19,890	12%	11
IX	Diseases of the circulatory system	£9,238	83%	3	£181,734	110%	2
X	Diseases of the respiratory system	£9,194	83%	4	£91,722	55%	5
XI	Diseases of the digestive system	£8,362	75%	6	£51,186	31%	7
XII	Diseases of the skin and subcutaneous tissue	£3,528	32%	11	£13,333	8%	12
XIII	Diseases of the musculoskeletal system and connective tissue	£10,028	90%	2	£109,740	66%	4
XIV	Diseases of the genitourinary system	£6,241	56%	8	£36,324	22%	10
XV	Pregnancy, childbirth and puerperium	£4,397	40%	10	£4,728	3%	14
XVI	Certain conditions originating in the perinatal period	£325	3%	14	£13,213	8%	13
All respiratory illness		**£11,116**	**100%**	**-**	**£165,357**	**100%**	**-**

Abbreviations: ICD, International Statistical Classification of Diseases and Related Health Problems.

4 Economic burden and research funding

The UK Health Research Analysis 2014 reports that UK Clinical Research Collaboration (UKCRC) Health Research Analysis Forum (HRAF) members spent 1.64% of total research funding on respiratory illness, and all funders spent 1.68% of total research funding on respiratory illness.[15] These figures cannot be directly compared to the 'all respiratory illness' estimates provided previously due to differences in reporting (the UK Health Research Analysis 2014 does not provide sufficient breakdown to allow the inclusion of respiratory infections and trachea, bronchus and lung cancers). However, 'diseases of the respiratory system' (which includes COPD, asthma, and 'other respiratory problems') alone account for 9% of total economic burden of disease (including intangible costs).

5 Conclusion

Sensitivity analysis indicates that a key determinant of the total cost of all respiratory conditions is the willingness to pay for a DALY. However, the impact on the results with respect to the proportion of spending is more limited, and 15–16% of the total disease burden was attributable to all respiratory conditions at willingness to pay thresholds of £20,000 and £100,000 per DALY.

The use of the DALY as a metric to capture the impact of mortality and morbidity is itself a limitation, with the DALY subject to criticisms previously.[16] The calculation of indirect costs is methodologically disputed; the method employed in this analysis relies on Canadian data which takes a narrow view of these costs, and therefore may underestimate this aspect of cost.

The estimated direct and indirect costs of all respiratory illness exceed £11.1 billion. Including the intangible costs associated with excess mortality and morbidity, these costs rise to £165 billion. These costs are placed in the context of research funding; 9% of the total economic burden of illness is attributable to conditions included in the 'diseases of the respiratory system' ICD-10 code,[d] whilst only 1.68% of total research expenditure is allocated to the respiratory health category.

[d] This rises to 16% if other respiratory conditions contained within other ICD-10 codes are included, but this figure cannot be compared to the available research expenditure estimates.

6 References

1. Gibson GJ, Loddenkemper R, Sibille Y, Lundback B. The European Lung White Book: Respiratory Health and Disease in Europe [Internet]. European Respiratory Society; 2013 [cited 2016 May 5]. Available from: http://www.erswhitebook.org

2. British Thoracic Society. The Burden of Lung Disease [Internet]. 2006 [cited 2016 May 5]. Available from: https://www.brit-thoracic.org.uk/document-library/delivery-of-respiratory-care/burden-of-lung-disease/burden-of-lung-disease-2006

3. NHS England. 2013-14 CCG Programme Budgeting Benchmarking Tool [Internet]. [Cited 2016 Apr 8]. Available from: http://www.england.nhs.uk/resources/resources-for-ccgs/prog-budgeting

4. HM Treasury. Public expenditure statistical analyses 2015. London: Stationery Office; 2015.

5. NHS England Analytical Service. Improving General Practice – a call to action [Internet]. 2013 Aug [cited 2016 May 5]. Available from: https://www.england.nhs.uk/wp-content/uploads/2013/09/igp-cta-evid.pdf

6. Curtis L. Unit costs of health & social care 2014. Kent: Personal Social Services Research Unit; 2014.

7. UK Health Accounts – Office for National Statistics [Internet]. [Cited 2016 Oct 1]. Available from: https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/healthcaresystem/bulletins/ukhealthaccounts/2014

8. Department of Health Systems Financing. WHO guide to identifying the economic consequences of disease and injury [Internet]. World Health Organization; 2009 [cited 2016 May 5]. Available from: http://www.who.int/choice/publications/d_economic_impact_guide.pdf

9. McIntyre D, Thiede M, Dahlgren G, Whitehead M. What are the economic consequences for households of illness and of paying for health care in low- and middle-income country contexts? Soc Sci Med 1982. 2006 Feb;62(4):858–65.

10. Public Health Agency of Canada. Economic burden of illness in Canada, 2005-2008 [Internet]. 2014 [cited 2016 May 5]. Available from: http://epe.lac-bac.gc.ca/100/201/301/weekly_checklist/2014/internet/w14-44-U-E.html/collections/collection_2014/aspc-phac/HP50-1-2013-eng.pdf

11. Department of Health. Policy Appraisal and Health [Internet]. 2004 [cited 2016 May 5]. Available from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/191503/policy_appraisal_and_health.pdf

12. WHO | Estimates for 2000–2012 [Internet]. WHO [cited 2016 May 5]. Available from: http://www.who.int/healthinfo/global_burden_disease/estimates/en

13. Department of Health Statistics and Information Systems. WHO methods and data sources for global burden of disease estimates 2000-2011 [Internet]. Geneva: World Health Organization; 2013 [cited 2016 May 5]. Available from: http://www.who.int/healthinfo/statistics/GlobalDALYmethods_2000_2011.pdf?ua=1

14. Glover D, Henderson J. Quantifying health impacts of government policies: A how-to guide to quantifying the health impacts of government policies [Internet]. Department of Health; 2010 [cited 2017 Feb 28]. Available from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/216003/dh_120108.pdf

15. UK Clinical Research Collaboration. UK Health Research Analysis 2014. Medical Research Council; 2015.

16. Li V. The Rise, Critique and Persistence of the DALY in Global Health. J Glob Health [Internet]. 2014 [cited 2016 May 21]. Available from: http://www.ghjournal.org/the-rise-critique-and-persistence-of-the-daly-in-global-health

We're the only charity in the UK looking after the nation's lungs. We offer hope, help and a voice.

Our research finds new treatments and cures.

Our support gives people who struggle to breathe the skills, knowledge and confidence to take control of their lives.

And our work means that one day everyone will breathe clean air with healthy lungs.

British Lung Foundation
03000 030 555
facebook.com/britishlungfoundation
@lunguk
blf.org.uk