

## The cost of caring for people with lung cancer at the end of their life

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1. Just what is end of life care?
2. Modelling the cost of end of life care
3. Results for people with lung cancer

End of life care provides for patients when cure is no longer the primary aim of treatment.



End of life care happens over a period of time:

- Where possible from diagnosis of a life limiting or life threatening illness, or ...
- ...after progression to the 'final' stage of such an illness
- At the immediate end of life
- All points in-between
- At any point of contact with health and social care services

- Most people will need end of life or palliative care
  - In 2010 there were 493,242 deaths in England and Wales.
  - Of these, about 450,000 would have required some form of palliative care at some stage
  - The scale of the issue is obvious – most people at some stage in their lives will need palliative care
- Aim: To estimate the cost of providing care to people with lung cancer at the end of their lives

### End of life period defined according to clinical needs of patients

- For cancer patients, this is taken to be when Stage IV disease is reached
- At Stage IV, treatment ceases to be primarily curative in intent
- Societal perspective taken:
  - Direct costs (public health and social care, charity provided care and private/patient funded care)
  - Indirect costs
    - Informal care provision (replacement cost)
    - Morbidity costs (lost wages)

- Modelling based approach
  - Alternatives top-down or bottom-up costing
- All care at the end of life or end of life specific care?
- Uncertainty: all elements in a model are uncertain
  - Survival time, resource use, unit costs
  - Probabilistic analysis combined with Monte Carlo simulation to quantify uncertainty
  - Values for each parameter drawn from probability distributions and combined to give expected mean cost per patient
  - Also provides a range of plausible mean costs using Bayesian credible intervals

## The individual patient model:

$$C_i = \left[ \sum_{a=1}^n r_a c_a \right] \cdot m$$

- $C_i$  is the cost for patient  $i$ ,
- $r$  is the count for each unit of resource used for resources  $a$  through  $n$
- $c$  is the unit cost of each resource
- $m$  is a factor to adjust for variation in unit costs.

Healthcare resource use	Estimate	Distribution	Details	Unit cost
Probability inpatient care	0.90	Beta	Nuffield	N/A
Inpatient admissions	2.50	Log-normal	Nuffield	£2,064
Days per inpatient admission	10.10	Log-normal	Nuffield	N/A
Emergency inpatient admissions	1.50	Log-normal	Nuffield	£3,318
Days per emergency admission	14.50	Log-normal	Nuffield	N/A
Outpatient visits	5.30	Log-normal	Nuffield	£816
A&E visits	1.20	Log-normal	Nuffield	£102
Surgical resection	0.08	Beta	NICE cost-impact	£7,803
Probability radiotherapy	0.40	Beta	NICE cost-impact	£802
Probability chemotherapy	0.15	Beta	NICE cost-impact	£2,561
GP and district nurse contacts	11.92	Log-normal	Nuffield	£36/£64

- Data has been taken from publicly available sources where possible
- Some data relating to hospice care was provided by MCCC

Summary of methodology				
UCL				
Social Care resource use	Estimate	Distribution	Details	Unit cost
Probability home care use	0.12	Beta	Nuffield	N/A
Home care use (hours per day)	1.20	Log-normal	Nuffield	£17
Probability nursing home use	0.05	Beta	Nuffield	N/A
Days in nursing home	115.96	Log-normal	Nuffield	£646
Probability residential home use	0.07	Beta	Nuffield	N/A
Days in residential home	122.41	Log-normal	Nuffield	£529
Probability 'Other Social Care'	0.02	Beta	Nuffield	N/A
Units of 'Other Social Care'	0.02	Log-normal	Nuffield	£2,698
Charity provided care	Estimate	Distribution	Details	Unit cost
Probability hospice inpatient stay	4.70	Beta	MCCC data	N/A
Hospice inpatient days	17.04	Log-normal	MCCC data	419.2
Probability hospice outpatient contact	0.05	Beta	MCCC data	N/A
Hospice outpatient visits	5.85	Log-normal	MCCC data	104.4
Informal care	Estimate	Distribution	Details	Unit cost
Probability informal care	0.34	Beta	Hayman et al	N/A
Hours of informal care provided	15.00	Log-normal	Macmillan	£17
Hours of employment lost	2.14	Gamma	Macmillan	£13
Carer's Allowance received	0.05	Beta	Macmillan	£8

Results					
UCL					
<p>The mean value of all the health, social, informal and charity provided care that a lung cancer patient will receive at the end of life is £31,949.</p>					
Individual					
	Health	Social	Charity	Informal	Total
Mean	£13,855	£13,084	£387	£4,622	£31,949
% of total	43%	41%	1%	14%	100%
Median	£12,252	£11,458	£155	£3,861	£30,607
25% IQR	£8,208	£7,329	£47	£2,364	£23,250
75% IQR	£17,957	£17,340	£425	£6,104	£38,390
BCI 5%	£4,687	£3,225	£6	£903	£16,124
BCI 95%	£27,212	£27,754	£1,654	£11,015	£53,670

Study	Population	Costing method	Direct costs	Indirect costs	Results	Sensitivity analysis
The Nuffield study	All patients with long-term conditions (including cancer, COPD, IHD, organ failure and mental disorders) who died in a one year period in seven PCT/LA areas in England.	Costs were derived from the health care services provided in seven months period.	Inpatient care, payments. <b>£10,130 per study patient</b>	None	Study population £741.9 million Per patient <b>£10,130</b>	No sensitivity analyses were reported.
The RAND study	Incidence based population of patients in the last year of life who died from cancer or organ failure.	Costs were derived from an NHS perspective down appropriate.	Cancer patients <b>£14,236 per cancer patient</b>	None	Cancer patients Total: £1.80b Per patient: <b>£14,236</b>	One-way sensitivity analysis was conducted on selected model inputs. It was not clear how parameters were selected.
			Organ Failure <b>£18,771 per organ failure patient</b>		Organ Failure Total: £0.553 billion Per patient: <b>£18,771</b>	
Gi					Mean cost of palliative care: Breast: £1.75k Colon: £1.54k Lung: £2.24k Uterus: £2.69k Ovaries: 4.79k Prostate: £3.77k Stomach: 3.49k	One-way sensitivity analysis was conducted on selected model inputs.
					<b>Breast: £1,750    Uterus: £2,690    Stomach: £3,490</b> <b>Colon: £1,540    Ovaries: £4,790</b> <b>Lung: £2,240    Prostate: £3,770</b>	

## Interpretation

- Why so different to previous studies?
  - Methodological choices
    - Including health and social care and indirect costs matters
    - Time frame matters
- What does it all mean?
  - Caring for people at the end of their lives is expensive
  - Social care matters as much as health care
  - Reducing hospital stays doesn't guarantee lower costs
    - Residential/nursing care is expensive and long term
    - Caring for people in their own homes only suitable for those without high levels of supportive needs
  - Informal care is an important component of all care

- Modeling approach:
  - Relies on aggregation of multiple data sources
    - Results dependent on assumptions made about data/distributions
    - But assumptions explicit in description of the model
  - Results are uncertain – reflected in wide credible intervals
    - Reflects underlying uncertainty in the data
    - Reflects better the uncertainty of the real world
    - top-down/bottom-up approaches often artificially precise
- What is the relevant time period?
  - Final year? Stage IV onwards?
  - It is very hard to know when someone is in the last phase of life under any definition

# Thank You

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