The cost of lost productivity due to premature cancer-related mortality: an alternative measure of the cancer burden

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Introduction

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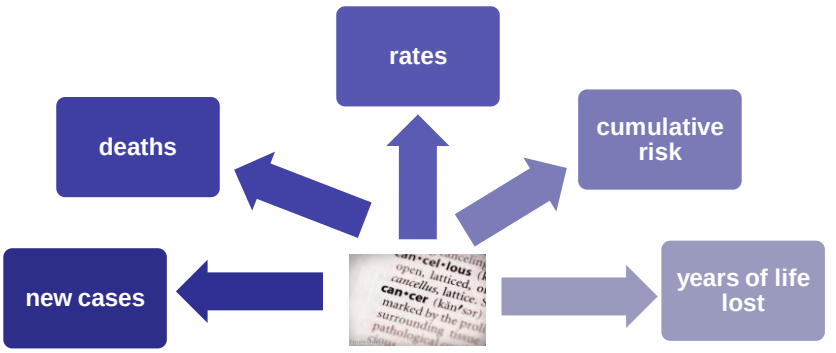
- There are a variety of different measures of the cancer burden
- Most take a population health perspective



Introduction

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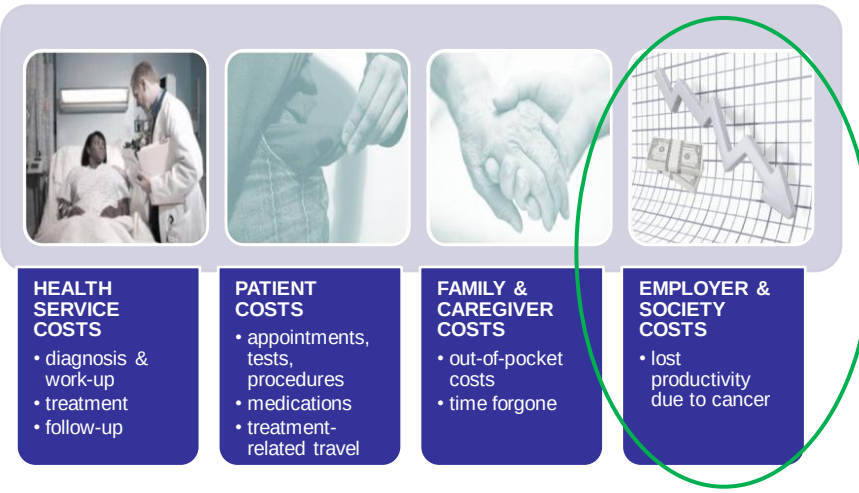
- Cancer also places an economic burden on society



Aims

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- To estimate
  - years of potential productive life lost (YPPLL) due to cancer
  - costs of lost productivity due to cancer-related premature mortality
- To compare these indicators with "conventional" measures to illustrate how each provides a different perspective on the cancer burden on society

Methods: cancer sites

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Cancer deaths, Ireland, 2005-2009

- all cancer deaths (C00-97)
- top 10 most common causes of cancer death in adult males and females

males	females
oesophagus (C15)	oesophagus (C15)
stomach (C16)	stomach (C16)
colorectal (C18-21)	colorectal (C18-20)
pancreas (C25)	pancreas (C25)
lung (C33 & 34)	lung (C33 & 34)
prostate (C61)	breast (C50)
bladder (C67)	uterus (C53-55)
brain & central nervous system (CNS) (C70-72)	ovary (C56)
non-Hodgkin's lymphoma (C82-85, 96)	brain & central nervous system (CNS) (C70-72)
leukaemia (C91-95)	non-Hodgkin's lymphoma (C82-85, 96)

Measuring lost productivity

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Human Capital Approach

Treats individuals as human capital – humans have a stock of productive ability

Individuals produce a stream of output over their lifetime (valued by the wage rate)

Illness (cancer) interrupts the productive flow and results in production loss

The human capital approach measures this lost productivity

Methods

For all cancers combined and each site separately:

1. Calculate years of potential productive life lost (YPPLL) for each person who died from cancer
   - years of potential life lost (YPLL), truncated to "working age" (adults below retirement age i.e.15-64 years)

   e.g. death in 50-54 age-group, assume 52.5 years old at death: YPPLL= 64-52.5=11.5

Methods

2. Value YPPLL for each person who died from cancer
   - multiply YPPLL by age and gender specific wages, from age of death until 64
     - adjust wages for workforce participation and unemployment

     e.g. woman died at age 40 in 2009; average wage=€37,140; 0.69 probability of workforce participation; 0.93 probability of being employed if participating

     wage rate = €37,140*0.69*0.93
     - wage growth – inflate wages by 2.6% per annum
     - present value of forgone earnings – apply 4% discount rate

3. Sum across all people who died from cancer
   - express as total cost overall and per cancer (€2009), total cost for males & females; average cost per cancer death (15-64 years)

Results: all cancers, males & females

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Measure of cancer burden, per annum	
Total number of deaths: all ages	8,067
15-64 years	2,276
Total YPPLL (years of potential productive life lost)	22,992
Total cost of lost productivity due to cancer-related premature mortality	€593.6 million
Average lost productivity cost per cancer death*	€260,821

* total cost/no. of deaths aged 15-64

Results: all cancers, by sex

National Cancer Registry Ireland

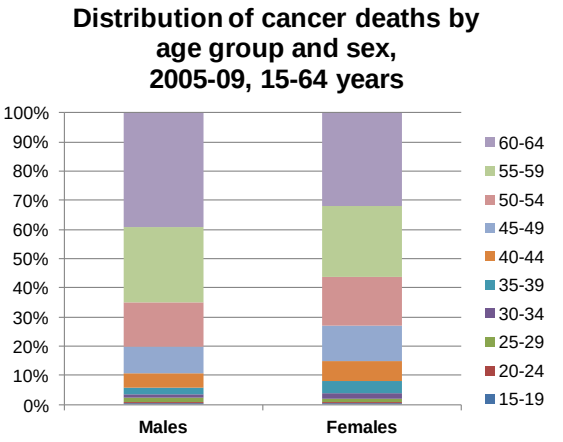
Measure of cancer burden, per annum	Males	Females	M:F
Total number of deaths: all ages	4,276	3,791	1.13
15-64 years	1,158	1,118	1.05
Total YPPLL (years of potential productive life lost)	10,873	12,119	0.90
Total cost of lost productivity due to cancer-related premature mortality	€369.2 m	€224.4 m	1.65
Average lost productivity cost per cancer death*	€322,488	€202,472	1.60

* total cost/no. of deaths aged 15-64

Results: all cancers, by sex

National Cancer Registry Ireland

- Lower YPPLL in males than females (M:F=0.90)
  - ➢ due to gender differences in the distribution of age at death



Results: all cancers, by sex

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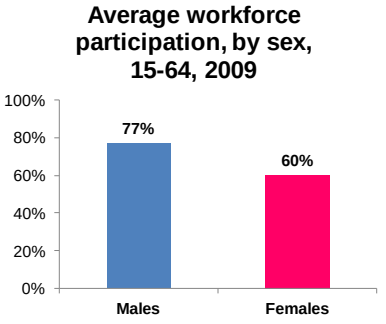
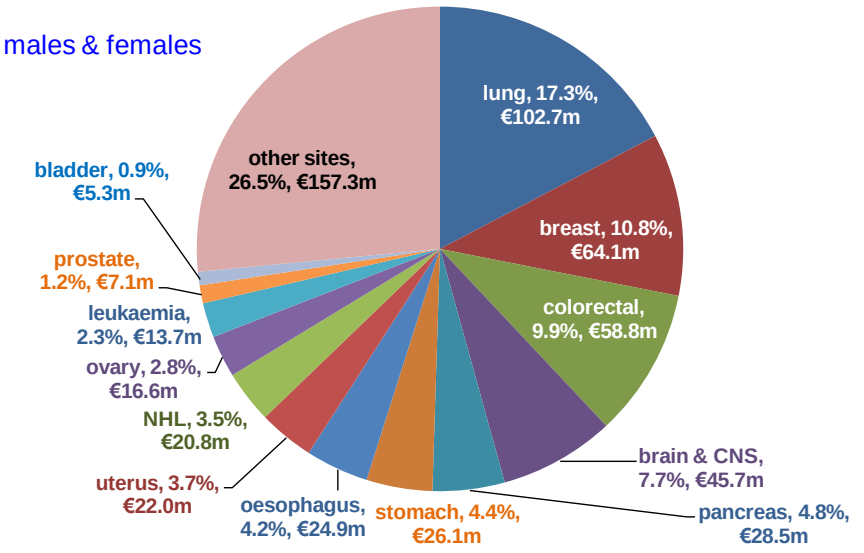
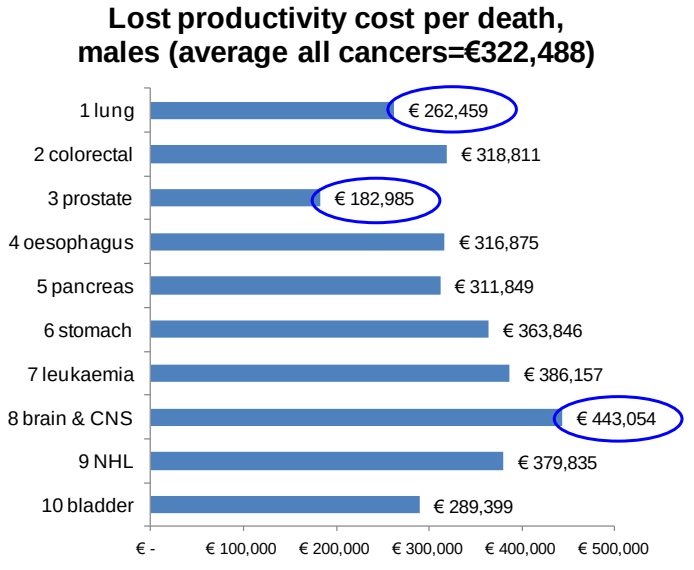
- Higher lost productivity costs in males than females (M:F=1.65)
  - ➢ due to gender differences in workforce participation and wages



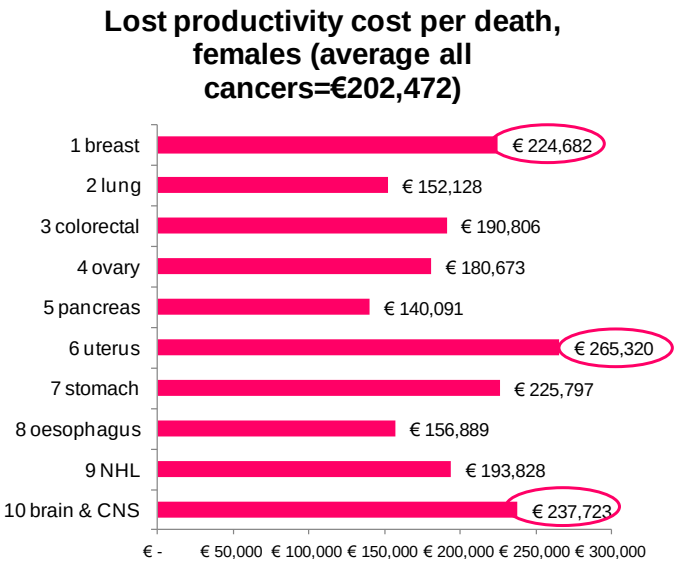
Results: total lost productivity costs, by site



Results: cost per death



Results: cost per death



Discussion 1

- Costs of lost productivity due to cancer-related premature mortality are significant in economic terms

  Ireland: €593.6 million per annum = 0.5% GDP

- Similar magnitude to other countries

  USA, $115.8 billion in 2000 = almost 1% of GDP

  (Bradley et al., 2008)

- Lost productivity cost per cancer death in Ireland (€260,821): 6-7 times the average wage

Discussion 2

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- Premature mortality costs dwarf the direct medical costs associated with cancer

Colorectal cancer

premature mortality costs per death (€2009) = €269,551

diagnosis, treatment & 5-year follow-up costs per new case (€2008) = €39,607 (Tilson et al., 2012)

- Similar pattern seen in studies of other individual cancer sites in other countries (e.g. Lindgren et al., 2007; Morris et al., 2009; Tingstedt et al., 2011)

Discussion 3

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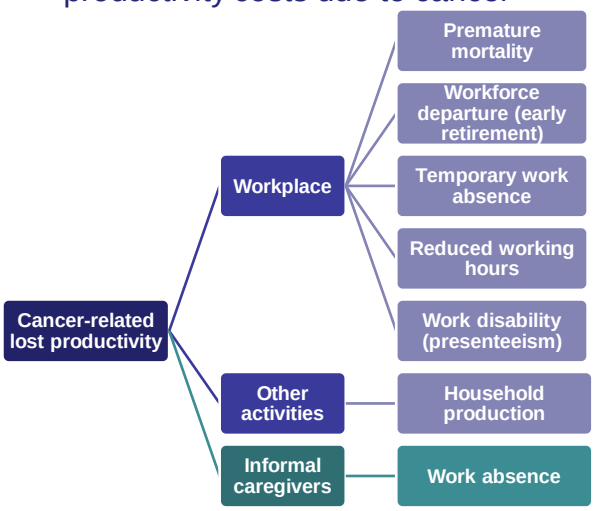
- Premature mortality costs are not the only lost productivity costs due to cancer



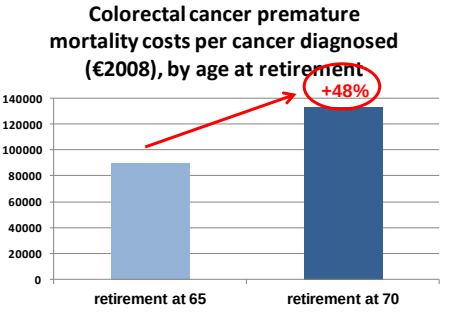
"Total" lost productivity costs due to cancer will be greater than these estimates

Discussion 4

- As the retirement age increases, cancer-related lost productivity costs will rise (substantially)

Number of deaths by age group and sex

Age-group	Males	Females
15-64	1,158	1,118
65-69	565	401



Hanly et al., 2013

Conclusions

- The costs of cancer-related lost productivity are significant (€593.6 million per annum; 0.5% GDP)
  - dwarf direct medical costs of diagnosing and treating cancer
  - lower bound on total lost productivity costs due to cancer
- Total cost and cost per death higher for men than women
  - gender differences in workforce participation and wages
- Cancers with high incidence - or early age at onset and poor survival - have relatively high lost productivity costs
  - different ranking of cancer sites compared to more "conventional" measures of cancer burden

Cost estimates such as these provide an alternative perspective on the cancer burden on society

Acknowledgements

- Information on cancer deaths was obtained from the WHO Cancer Mortality Database
- Wages, and labour force participation and unemployment rates, were obtained from the Central Statistics Office

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