The Actuarial Profession
making financial sense of the future

The Impact of Cancer Trends on Life Insurers – a worldwide perspective

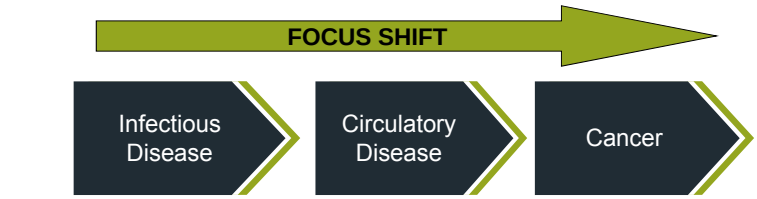
Darshan Singh and Matthew Smith

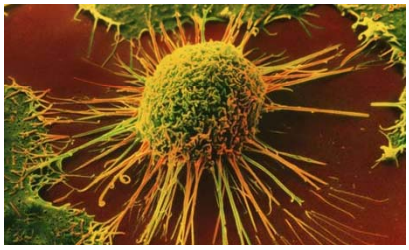
22 November 2011

Agenda

- Why we should focus on cancer
- What happens when our assumptions go wrong?
  - *risk factors and future drivers*
  - *an insight into 99.5th percentile events*
- Building a correlations model
  - *the relationship between incidence and death*

Why we should focus on cancer
- Introduction





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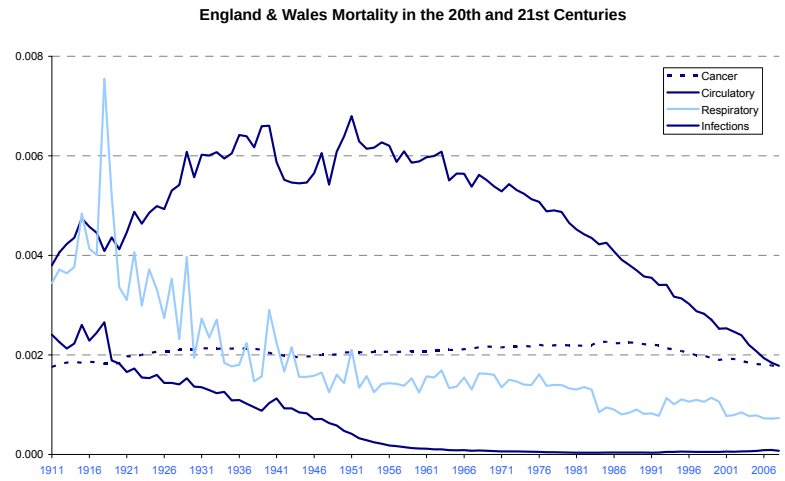
Why we should focus on cancer
- Stark difference vs circulatory disease!



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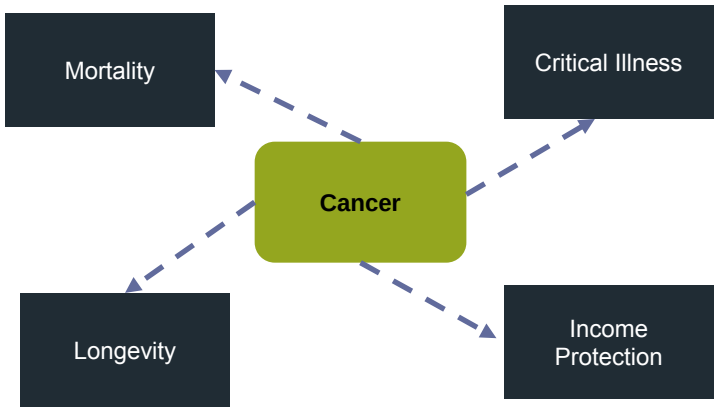
Why we should focus on cancer

- Cancer affects all our products…



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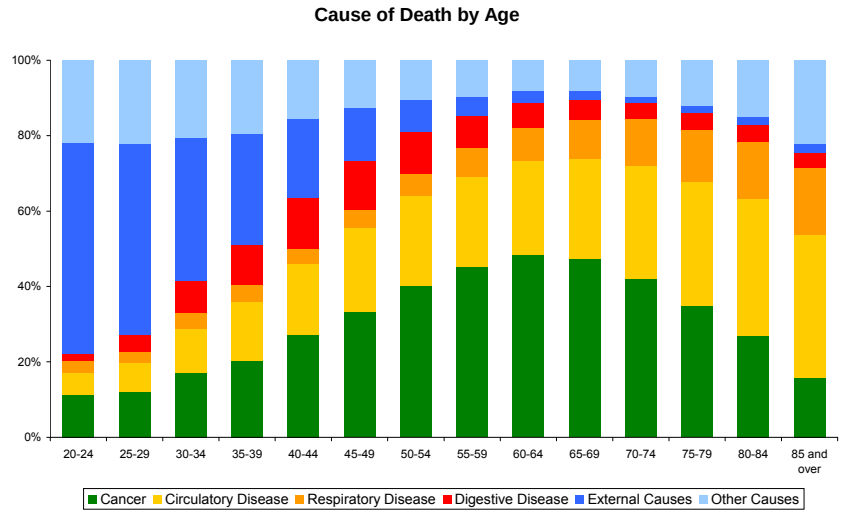
Why we should focus on cancer

- The current mortality picture in England & Wales



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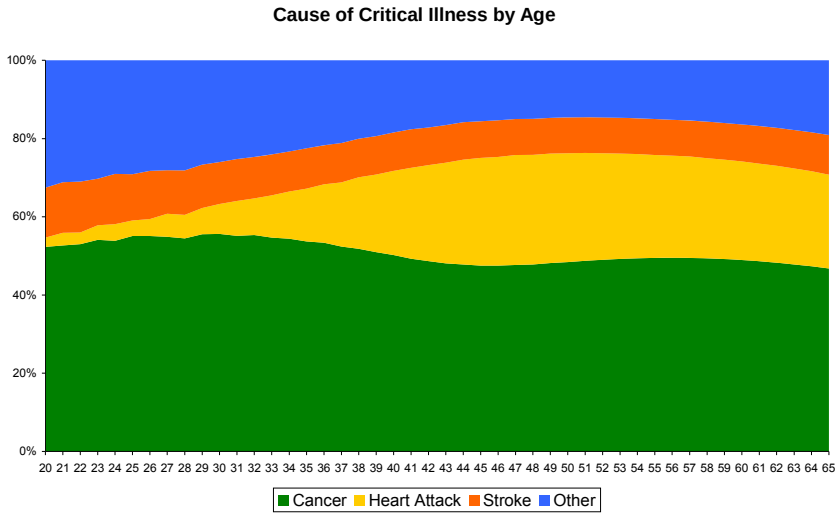

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Why we should focus on cancer

- Difficult to underwrite??

Population (weighted to insured ages)

Product	Males	Females
Mortality	≈35%	≈50%
Critical Illness	≈35%	≈65%

Claims

Product	Males	Females
Mortality	≈40%	≈60%
Critical Illness	≈45%	≈75%
Income Protection	≈8%	≈12%
Annuities/longevity[1]	≈35%	

[1] % of reserve release due to cancer

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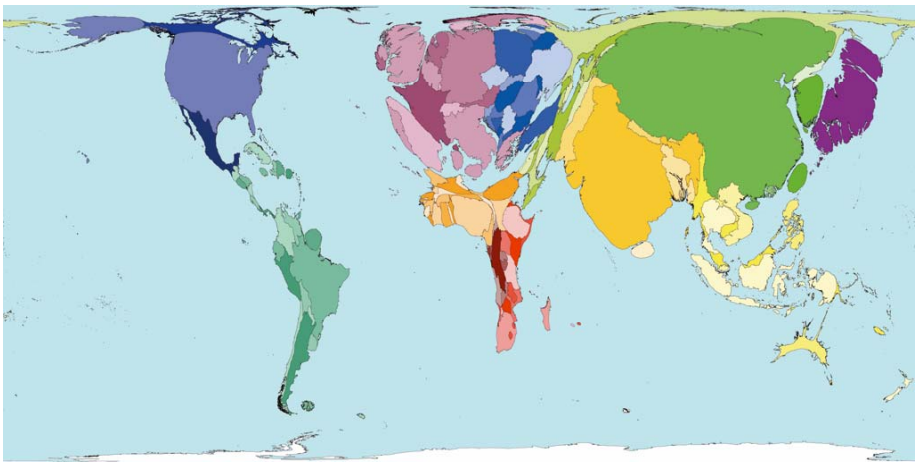
Why we should focus on cancer

...a worldwide perspective. Cancer Deaths in 2002



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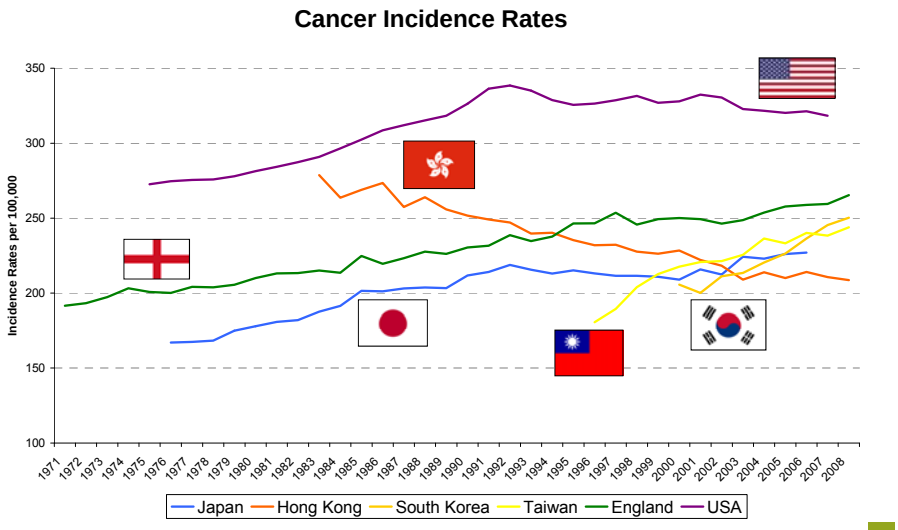
Why we should focus on cancer

...a worldwide perspective



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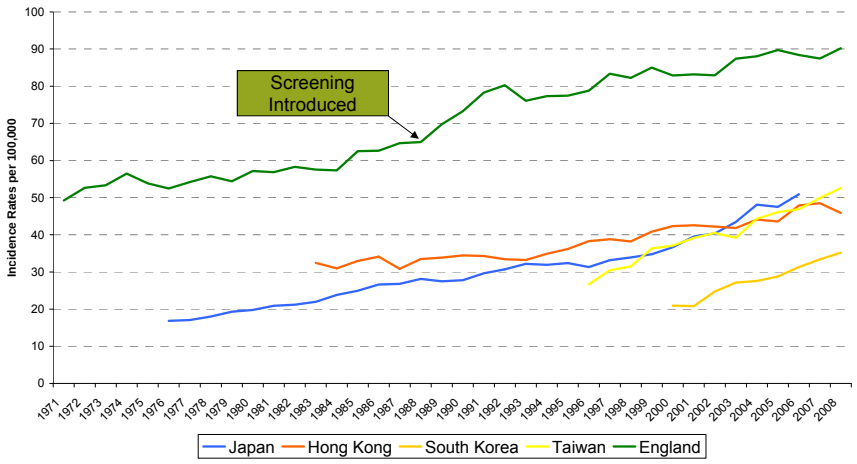
Why we should focus on cancer

...where does the UK have higher incidence?

Breast Cancer Incidence Rates



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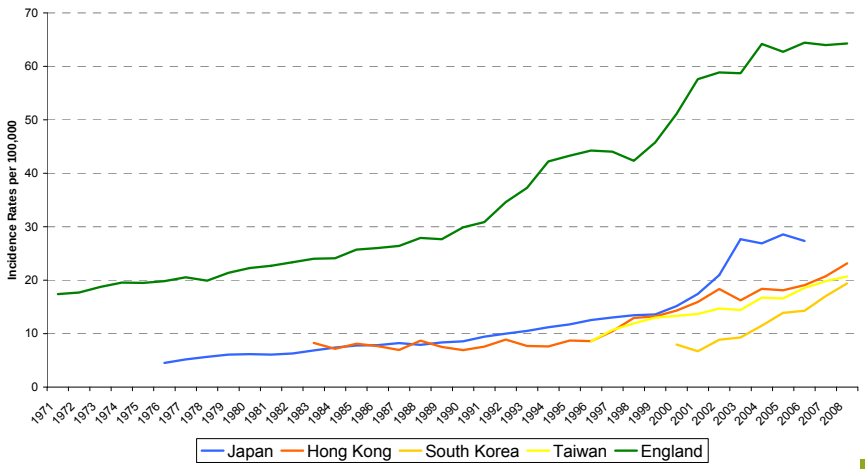
Why we should focus on cancer

...where does the UK have higher incidence?

Prostate Cancer Incidence Rates



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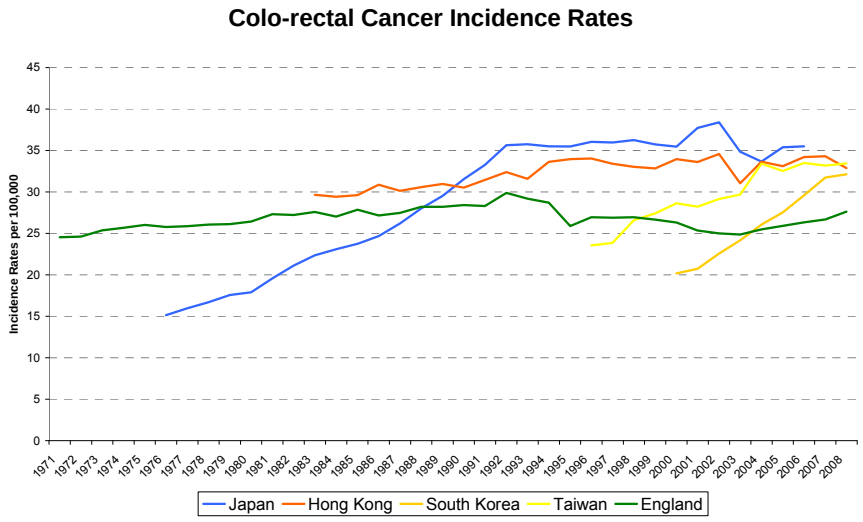
Why we should focus on cancer

...where does the UK have lower incidence?



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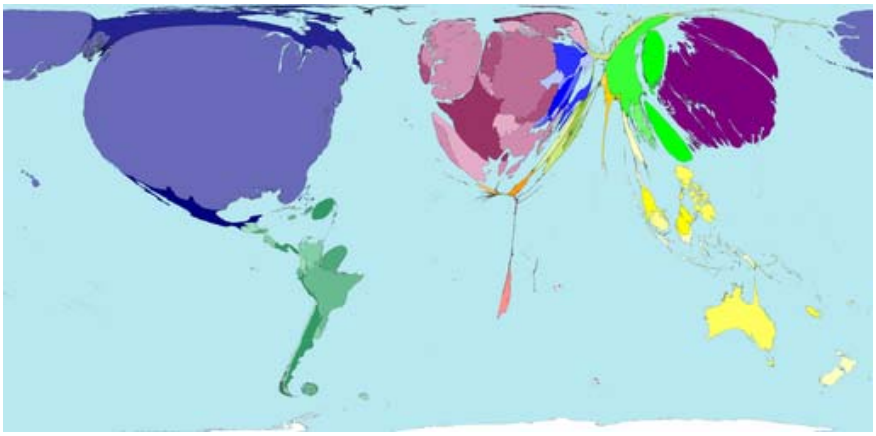
Why we should focus on cancer

...Number of restaurants for a famous fast food company in 2004



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What happens when our assumptions go wrong?

- What's around the corner?

- Screening
- Cohort effects
- Cure for cancer!
- Technology

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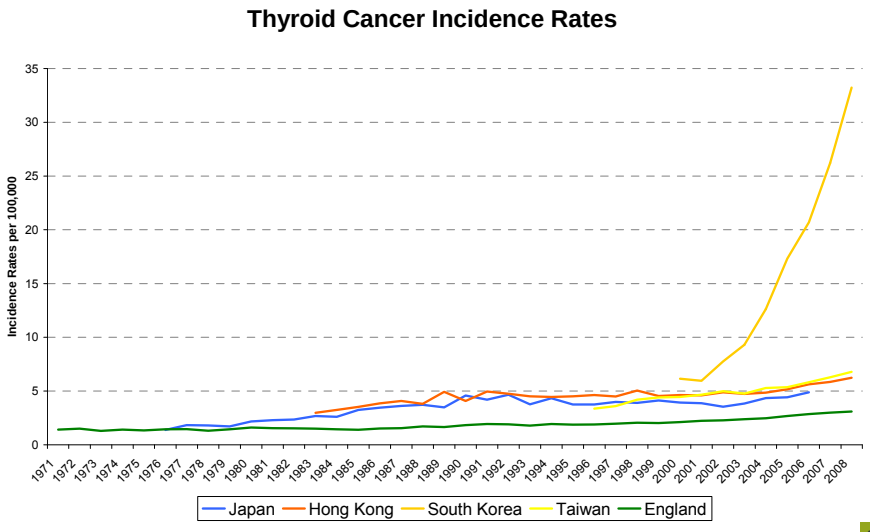
What happens when our assumptions go wrong?

...Thyroid cancer in Korea



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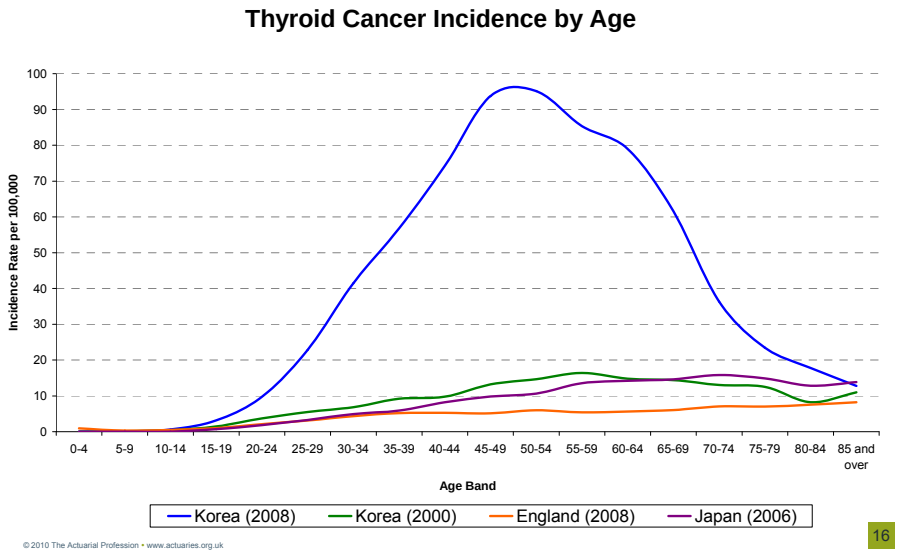

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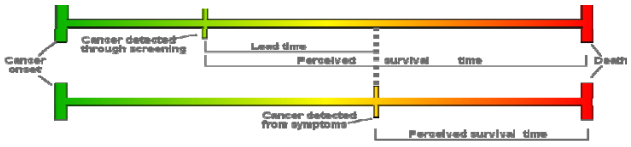
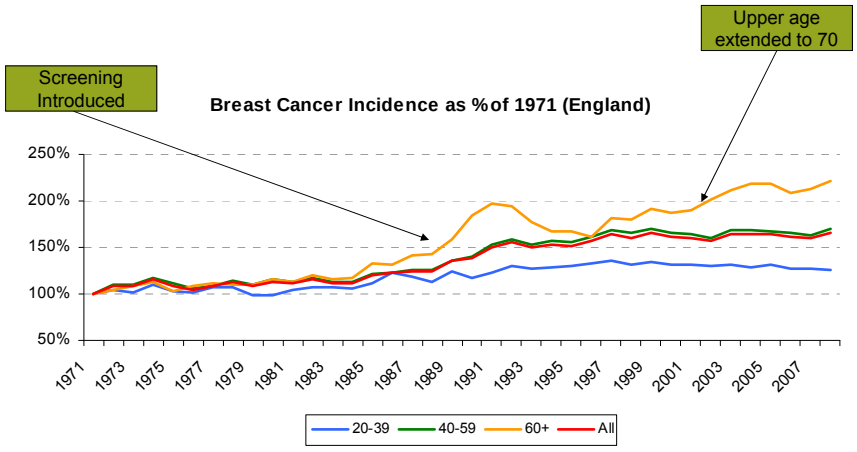


- Screening via ultrasound scanner or CT Scan: X% of people have thyroid nodules
- Followed by a Fine Needle Aspiration Biopsy (nowadays ultrasound guided) of the nodule: Y% of the nodules are cancerous
- X% multiplied by Y% determines how big the problem could be and these numbers change with better and better technology

What happens when our assumptions go wrong?

- Screening: breast cancer in England



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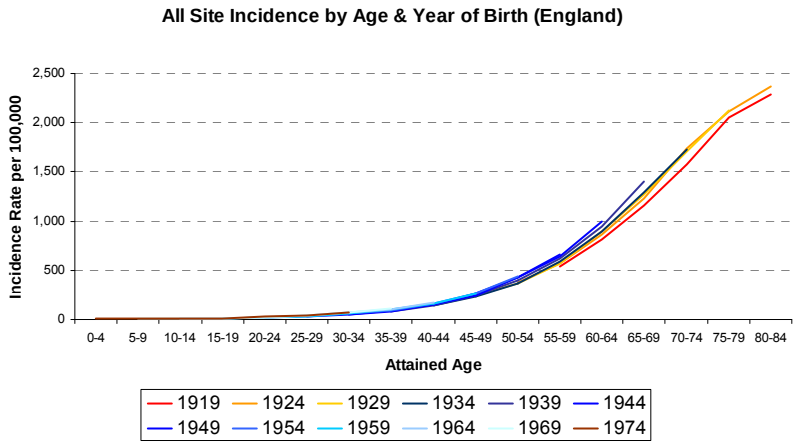
What happens when our assumptions go wrong?

- Cohort effects in England & Japan



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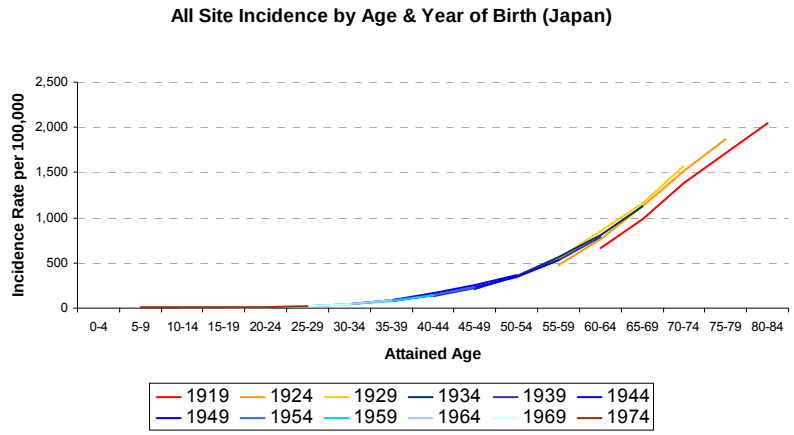

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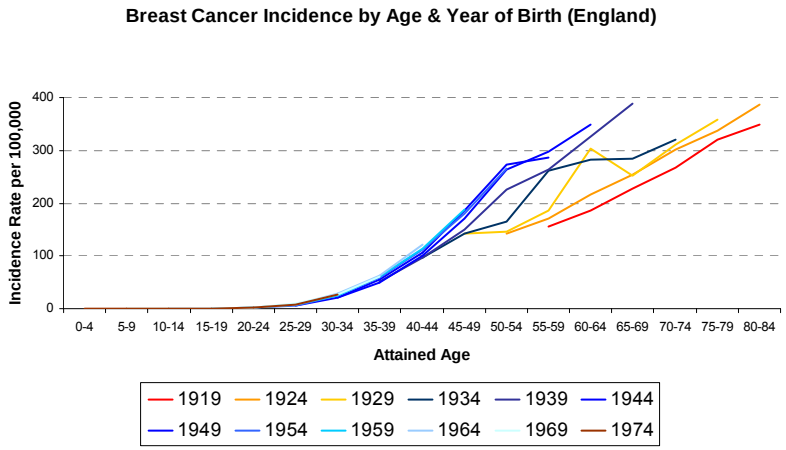

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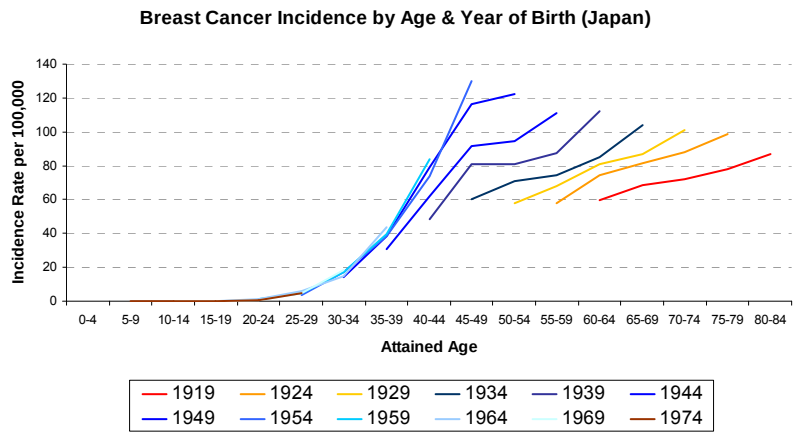

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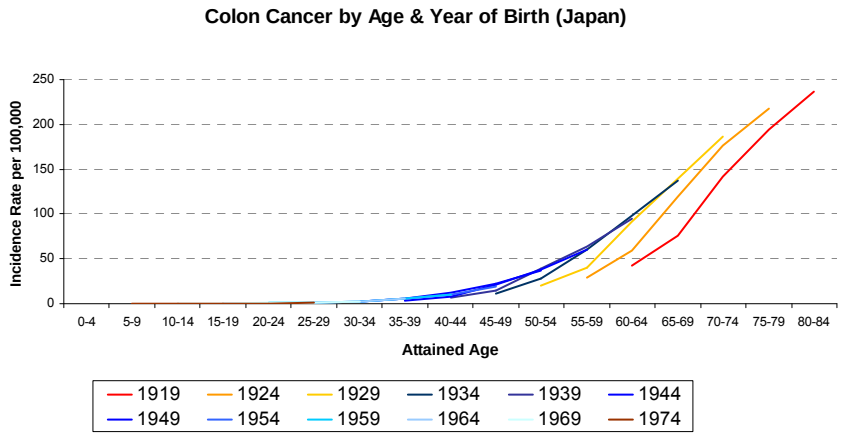


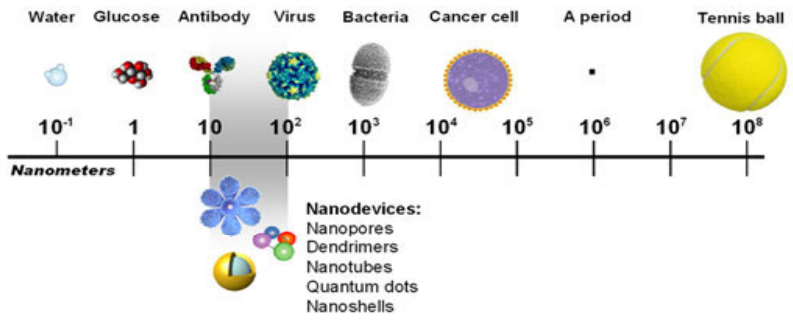
What happens when our assumptions go wrong?

- Cure for cancer: what does this mean?

	i_x	q_x
Vaccination against infectious agents that are associated with the development of cancer	▼	▼
Removal of environmental factors that cause cancer	▼	▼
Behavioural changes that elimination consumption of voluntary contaminants	▼	▼
Improved identification of changes that precede cancer either through biomarkers or screening	▲ / ▼	▼
Tailored treatment regimes to dramatically improve survival rates	▲	▼

What happens when our assumptions go wrong?

- Nanotechnology



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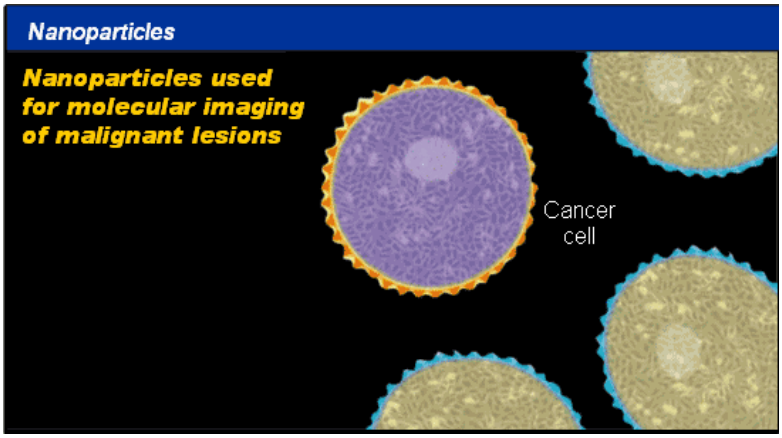

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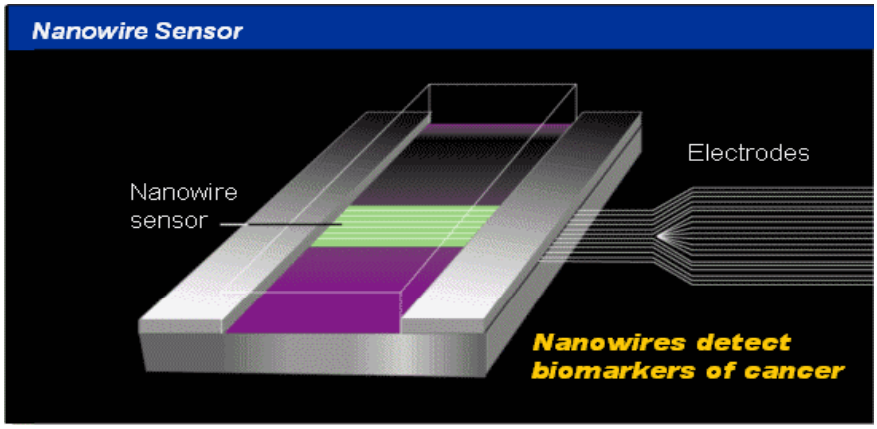
- Nanotechnology



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Building a correlations model

- Considerations

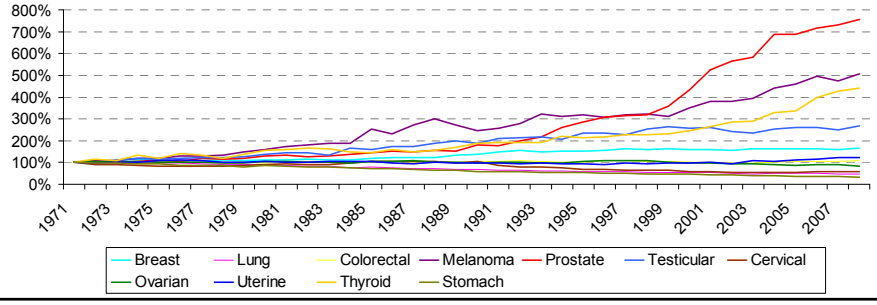
- Bottom-up approach
- Correlation by site
- Relationship between incidence & mortality
- Correlation by territory

Building a correlations model

- Correlation between sites

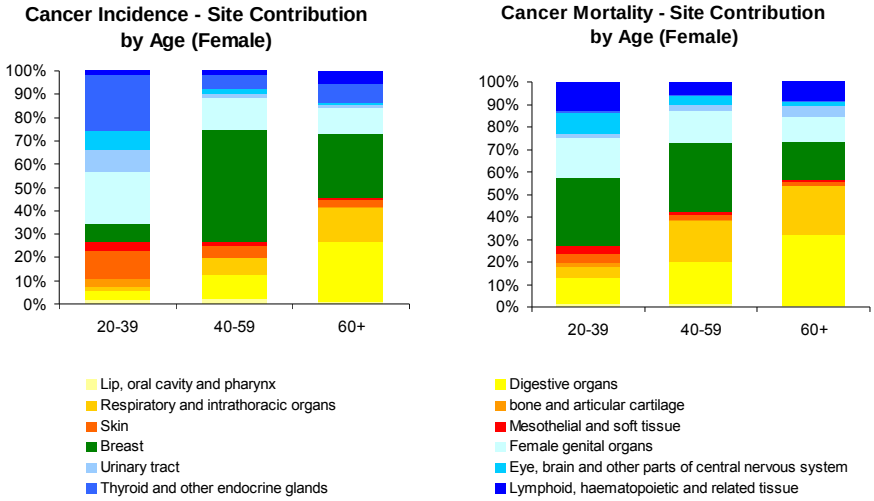
	Breast	Lung	Colorectal	Melanoma	Prostate	Testicular	Cervical	Ovarian	Uterine	Thyroid	Stomach
Breast	100%										
Lung	-71.6%	100%									
Colorectal	-18.2%	56.7%	100%								
Melanoma	-19.5%	-1.5%	20.7%	100%							
Prostate	9.8%	-28.8%	-57.6%	-50.4%	100%						
Testicular	45.8%	-17.0%	29.2%	46.6%	-55.9%	100%					
Cervical	-44.3%	32.6%	54.6%	89.3%	-61.9%	41.6%	100%				
Ovarian	18.8%	-22.2%	-8.0%	-7.6%	-42.8%	52.3%	-3.2%	100%			
Uterine	-62.4%	45.5%	-2.8%	1.8%	50.6%	-69.5%	8.8%	-83.6%	100%		
Thyroid	-52.5%	62.7%	57.1%	-32.3%	10.7%	-59.4%	3.1%	-47.9%	57.9%	100%	
Stomach	-50.8%	53.2%	55.0%	11.1%	-68.0%	23.0%	45.6%	58.7%	-29.1%	26.1%	100%

Correlation coefficients based on 5-year average deteriorations



Building a correlations model

- Incidence vs mortality



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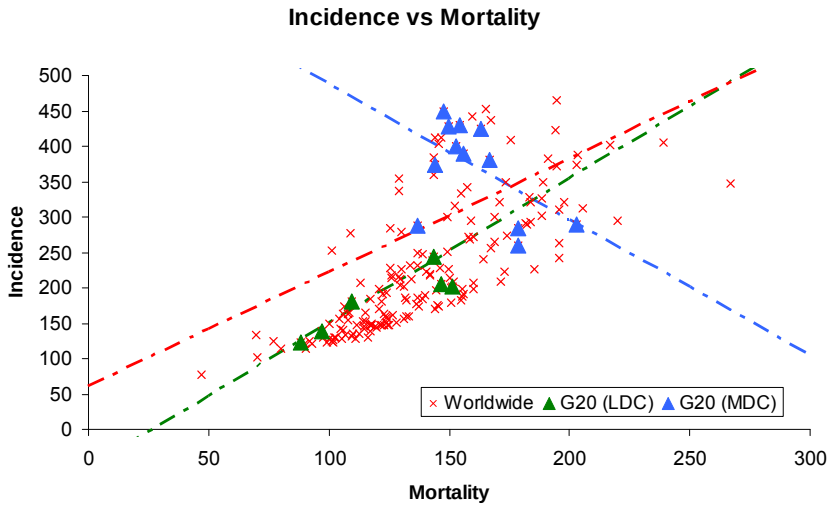
Building a correlations model

- Incidence vs mortality



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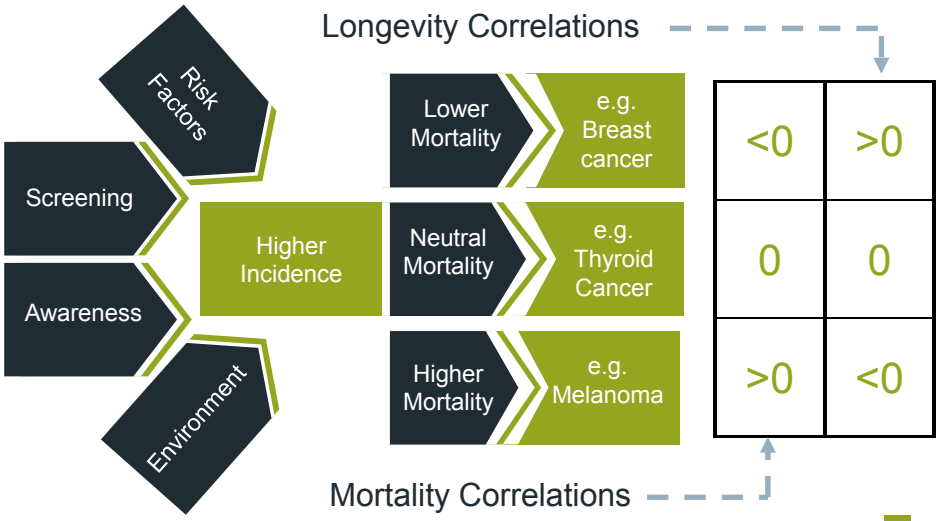
Building a correlations model

- Incidence vs mortality



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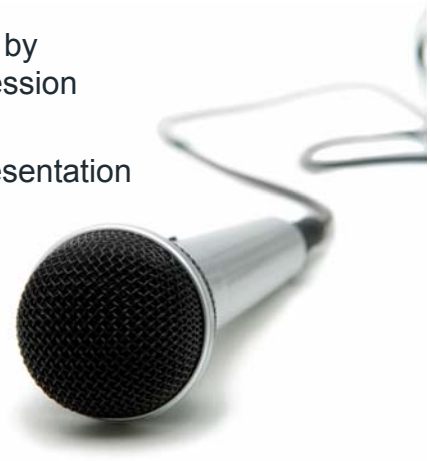
Questions or comments?

Expressions of individual views by members of The Actuarial Profession and its staff are encouraged.

The views expressed in this presentation are those of the presenter.



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