

The Impact of Cancer Trends on Life Insurers – a worldwide perspective
Darshan Singh and Matthew Smith

22 November 2011

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Agenda

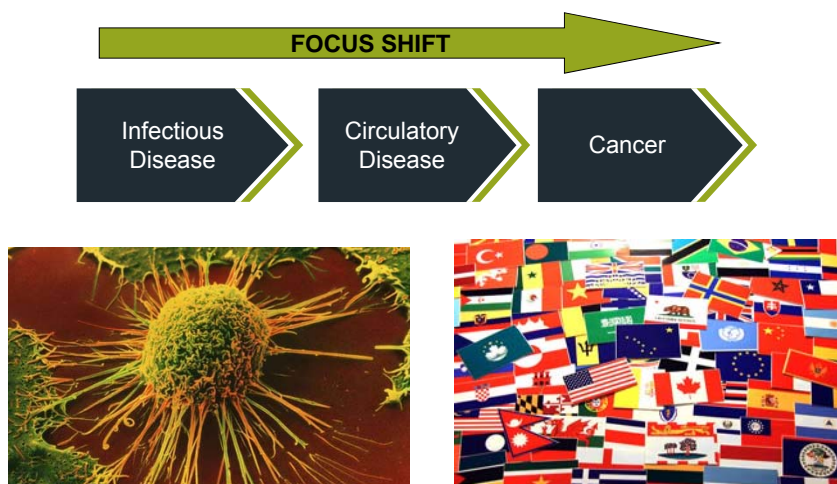
- Why we should focus on cancer
- What happens when our assumptions go wrong?
 - *risk factors and future drivers*
 - *an insight into 99.5th percentile events*
- Building a correlations model
 - *the relationship between incidence and death*

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Why we should focus on cancer

- Introduction

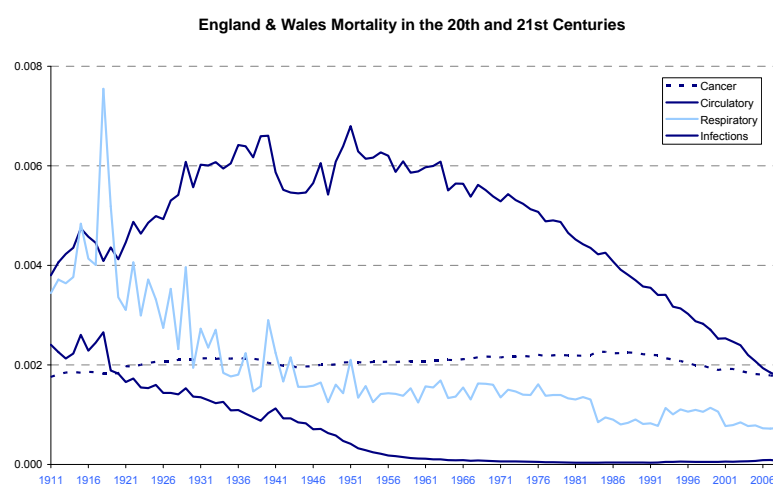


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Why we should focus on cancer

- Stark difference vs circulatory disease!

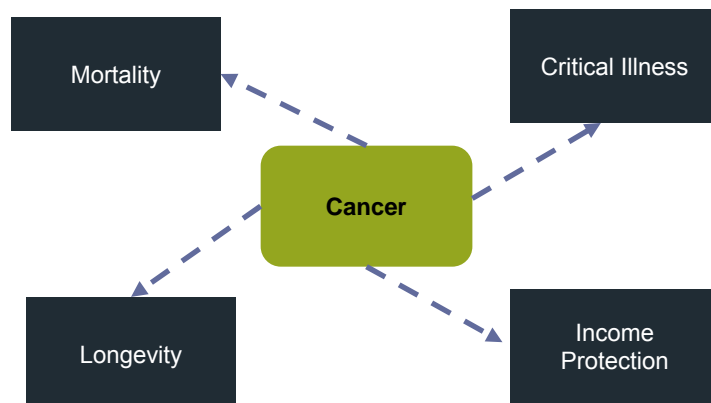


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Why we should focus on cancer

- Cancer affects all our products...

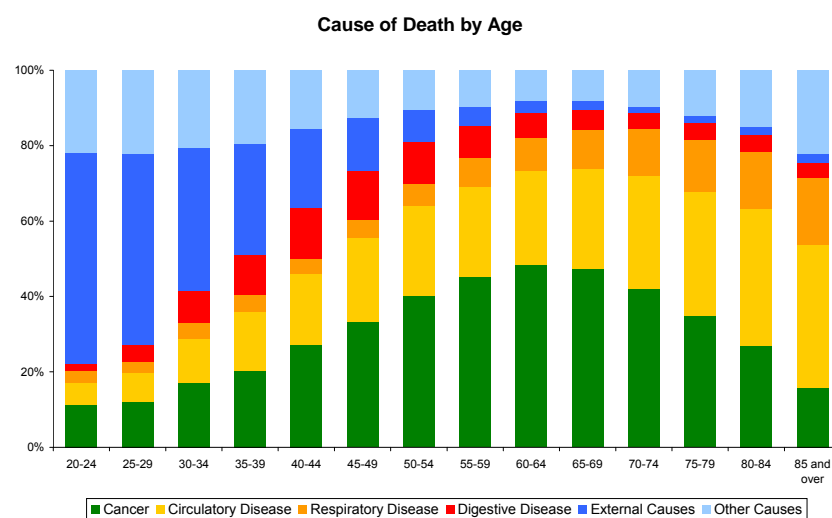


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Why we should focus on cancer

- The current mortality picture in England & Wales



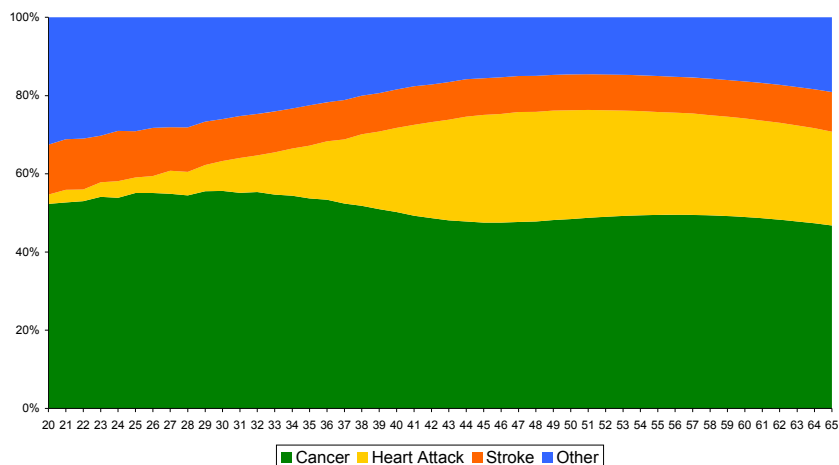
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Why we should focus on cancer

- The current morbidity picture in England & Wales

Cause of Critical Illness by Age



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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%	

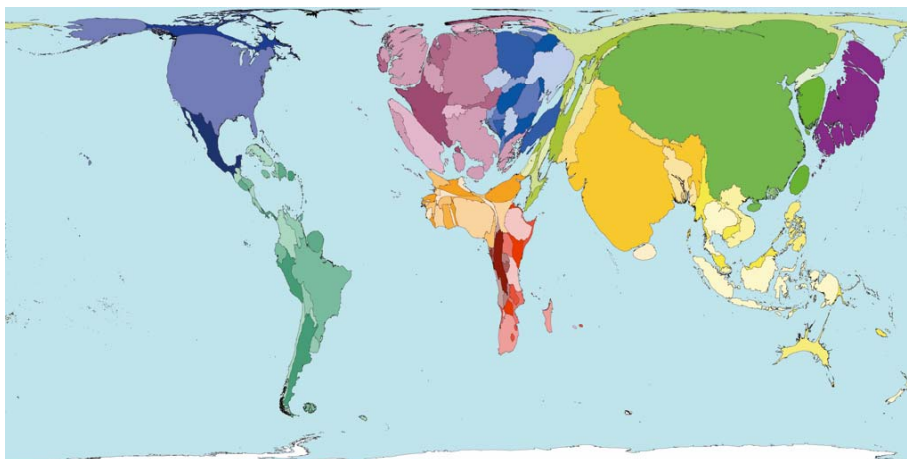
¹ % of reserve release due to cancer

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Why we should focus on cancer

...a worldwide perspective. Cancer Deaths in 2002



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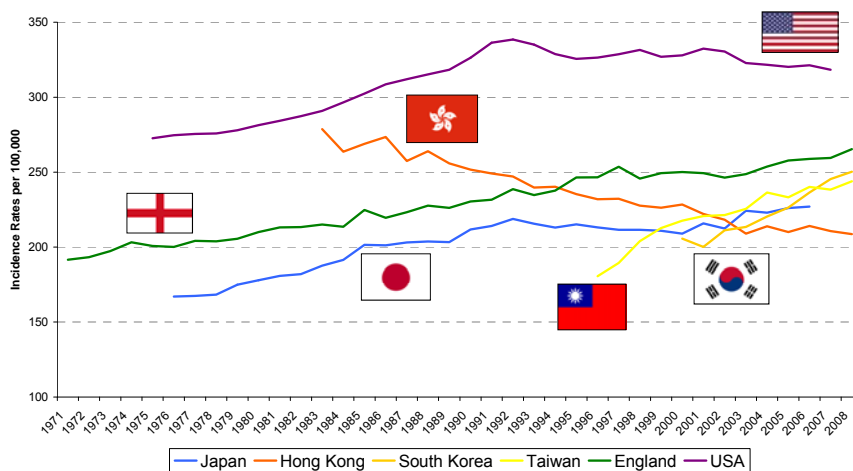
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Why we should focus on cancer

...a worldwide perspective

Cancer Incidence Rates



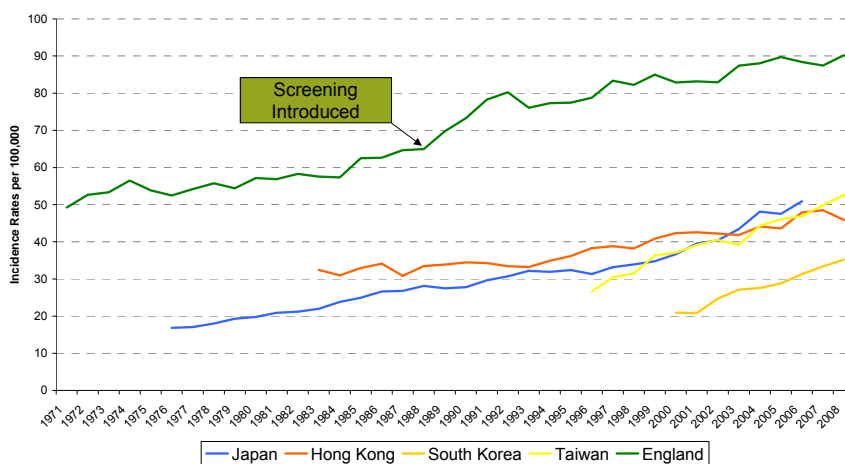
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Why we should focus on cancer

...where does the UK have higher incidence?

Breast Cancer Incidence Rates



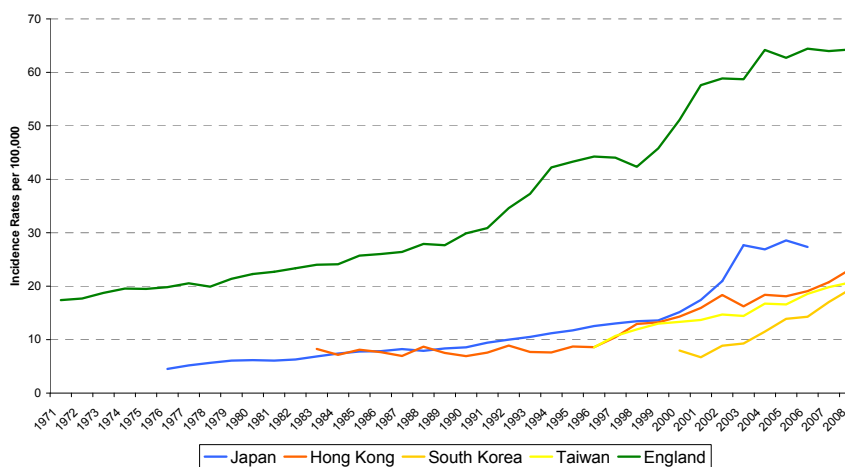
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Why we should focus on cancer

...where does the UK have higher incidence?

Prostate Cancer Incidence Rates



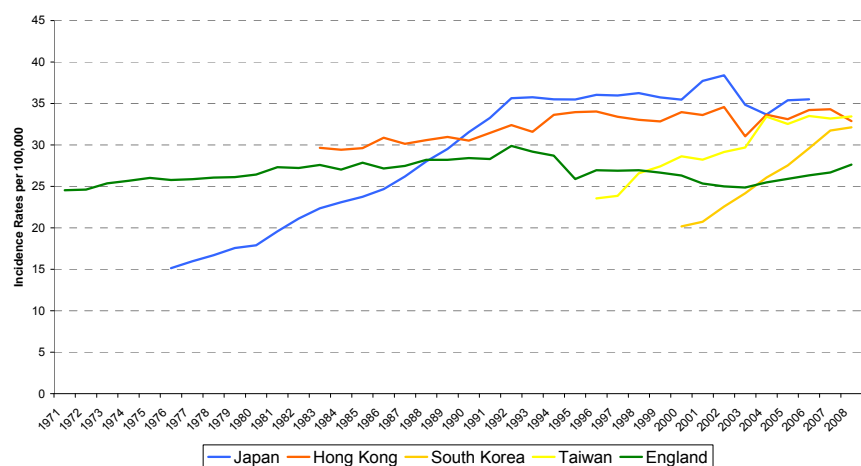
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Why we should focus on cancer

...where does the UK have lower incidence?

Colo-rectal Cancer Incidence Rates

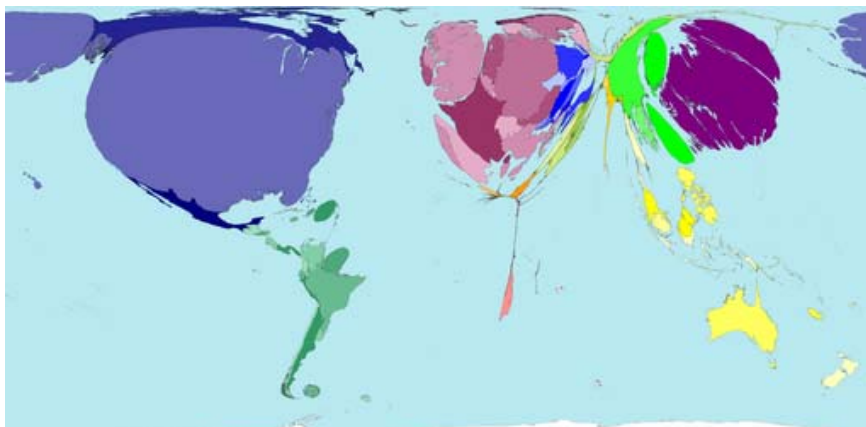


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Why we should focus on cancer

...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

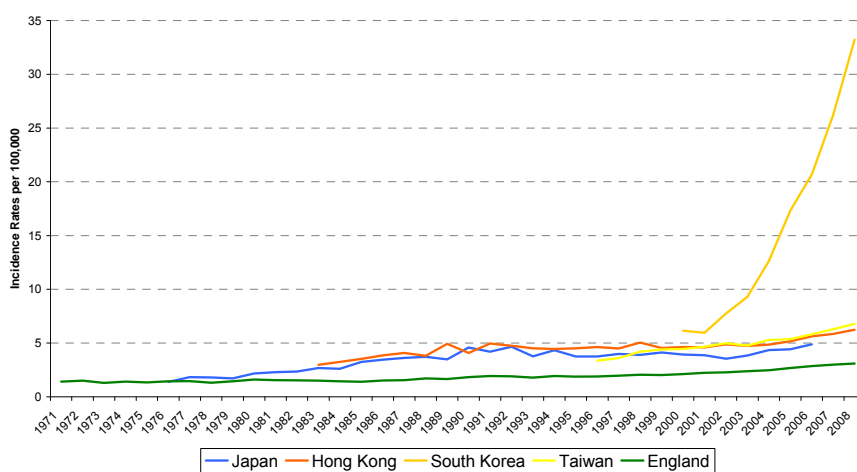
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What happens when our assumptions go wrong?

...Thyroid cancer in Korea

Thyroid Cancer Incidence Rates



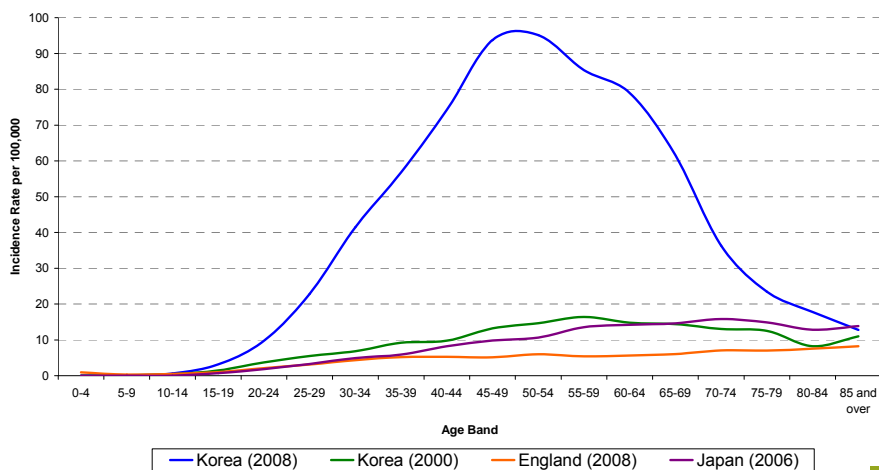
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What happens when our assumptions go wrong?

...Thyroid cancer in Korea

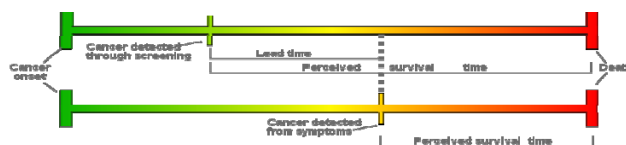
Thyroid Cancer Incidence by Age



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What happens when our assumptions go wrong?

...Thyroid cancer in Korea



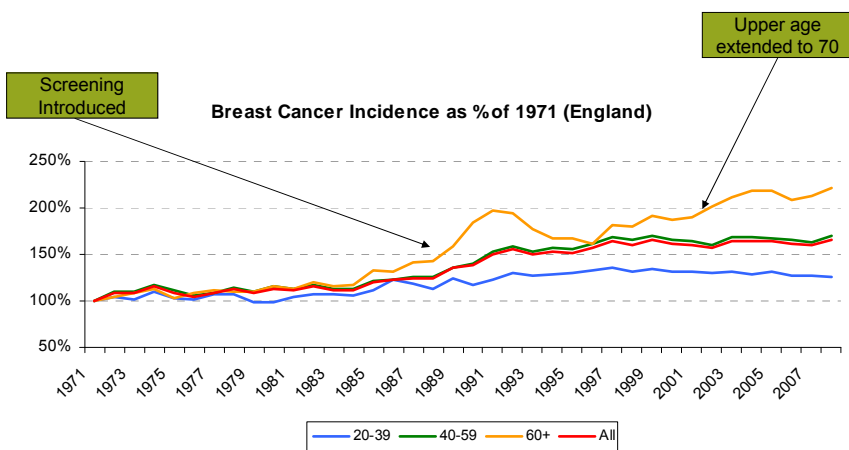
- Screening via ultrasound scanner or CT Scan: X% of people have thyroid nodules
- Followed by a Fine Needle Aspiration Biopsy (nowadays ultrasound guided) of the nodule: Y% of the nodules are cancerous
- X% multiplied by Y% determines how big the problem could be and these numbers change with better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

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What happens when our assumptions go wrong?

- Screening: breast cancer in England

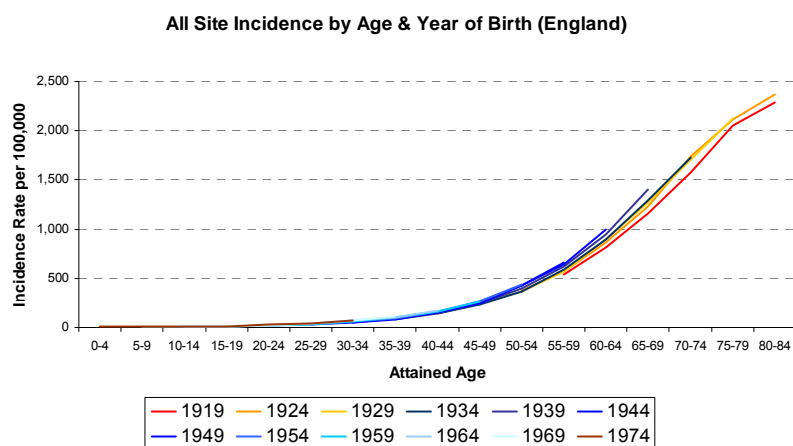


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What happens when our assumptions go wrong?

- Cohort effects in England & Japan



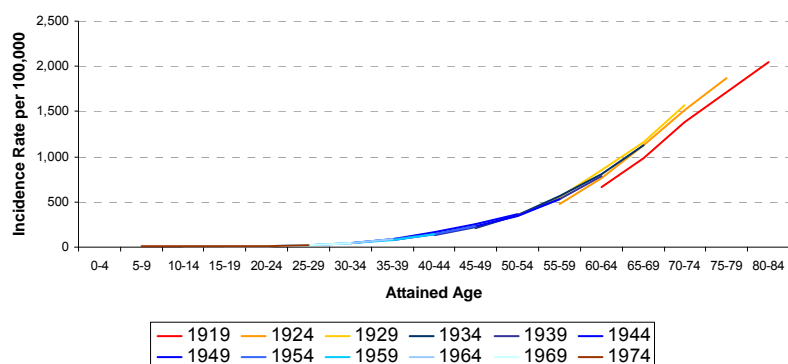
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What happens when our assumptions go wrong?

- Cohort effects in England & Japan

All Site Incidence by Age & Year of Birth (Japan)



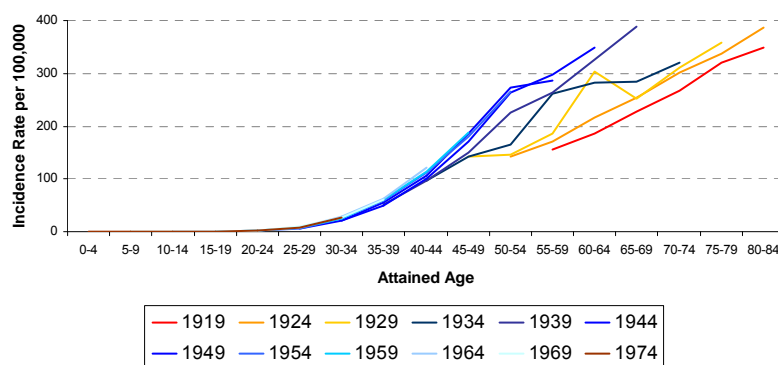
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What happens when our assumptions go wrong?

- Cohort effects in England & Japan

Breast Cancer Incidence by Age & Year of Birth (England)



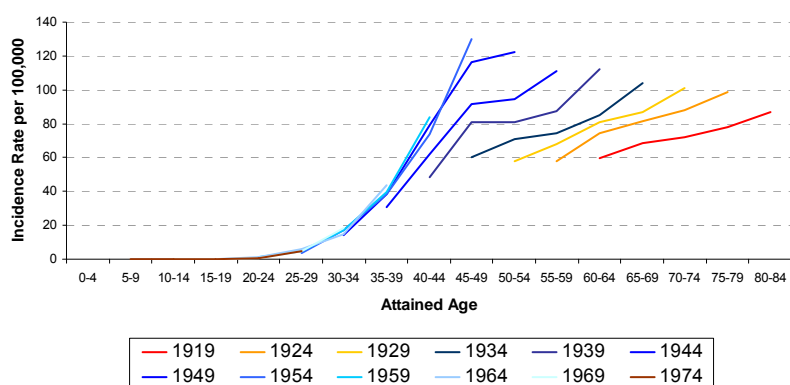
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What happens when our assumptions go wrong?

- Cohort effects in England & Japan

Breast Cancer Incidence by Age & Year of Birth (Japan)



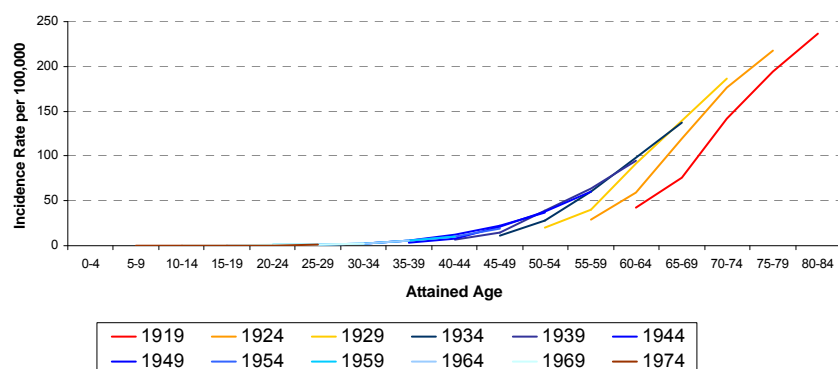
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What happens when our assumptions go wrong?

- Cohort effects in England & Japan

Colon Cancer by Age & Year of Birth (Japan)



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What happens when our assumptions go wrong?

- Cure for cancer: what does this mean?

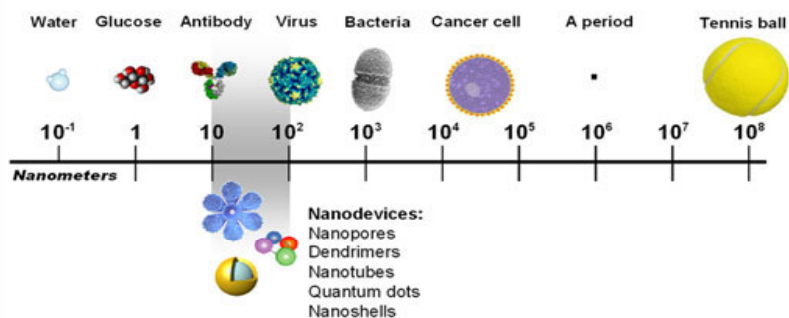
	i_x	q_x
Vaccination against infectious agents that are associated with the development of cancer	▼	▼
Removal of environmental factors that cause cancer	▼	▼
Behavioural changes that elimination consumption of voluntary contaminants	▼	▼
Improved identification of changes that precede cancer either through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

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What happens when our assumptions go wrong?

- Nanotechnology

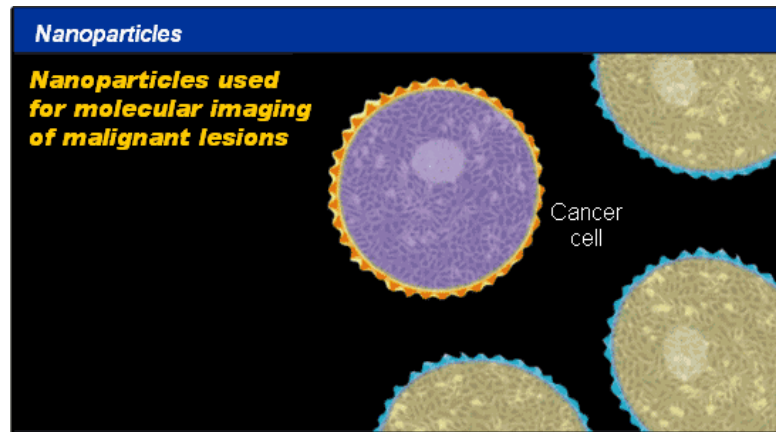


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What happens when our assumptions go wrong?

- Nanotechnology

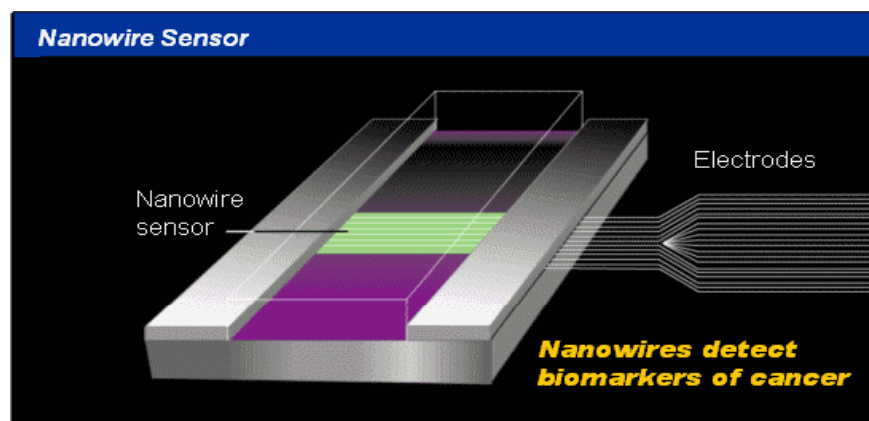


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What happens when our assumptions go wrong?

- Nanotechnology



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Building a correlations model

- Considerations

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

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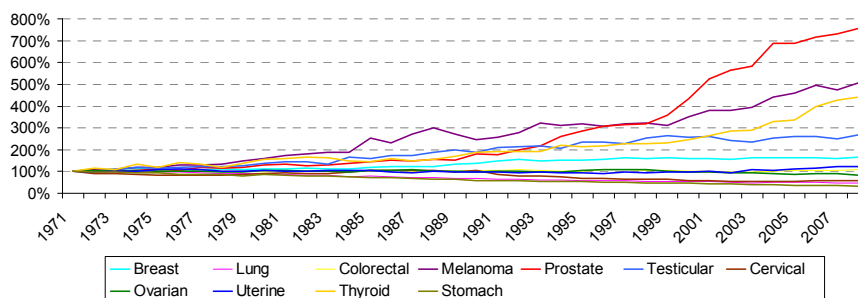
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Building a correlations model

- 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

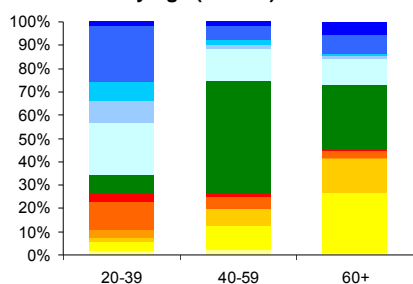


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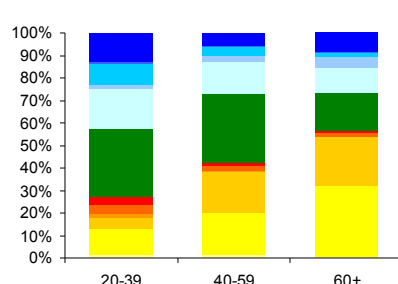
Building a correlations model

- Incidence vs mortality

Cancer Incidence - Site Contribution by Age (Female)



Cancer Mortality - Site Contribution by Age (Female)



Lip, oral cavity and pharynx
 Respiratory and intrathoracic organs
 Skin
 Breast
 Urinary tract
 Thyroid and other endocrine glands

Digestive organs
 bone and articular cartilage
 Mesothelial and soft tissue
 Female genital organs
 Eye, brain and other parts of central nervous system
 Lymphoid, haematopoietic and related tissue

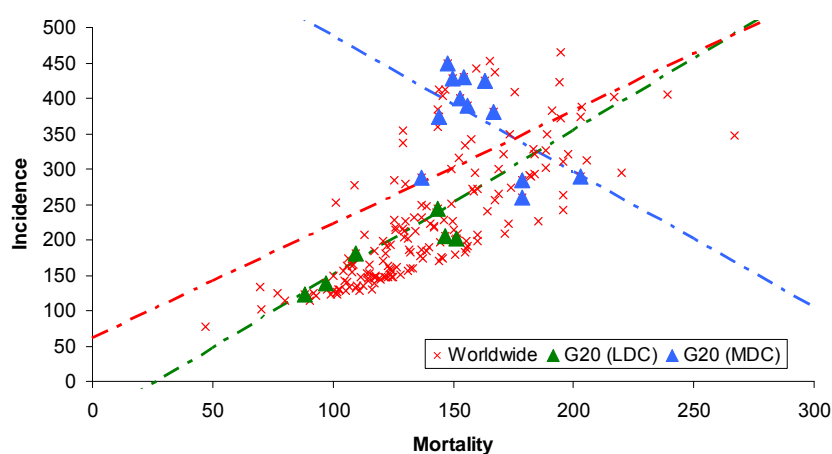
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Building a correlations model

- Incidence vs mortality

Incidence vs Mortality

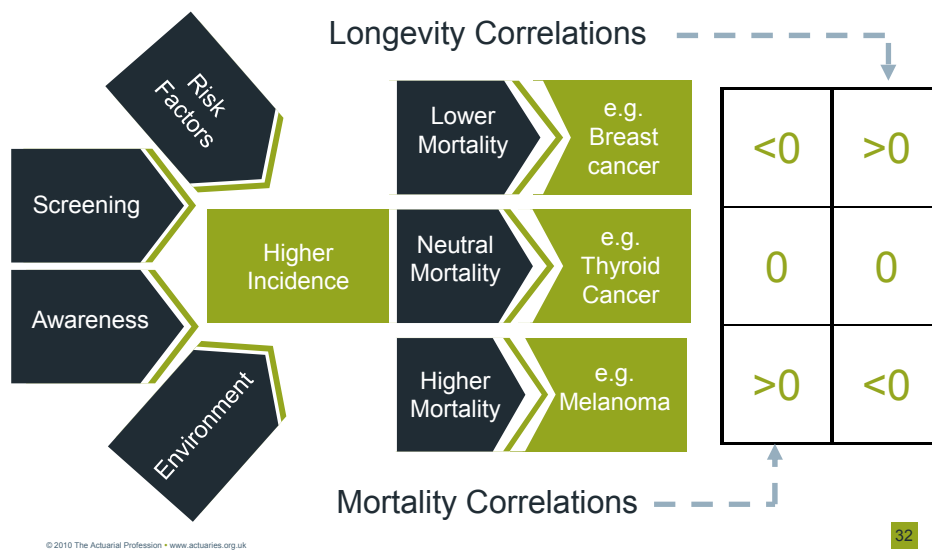


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Building a correlations model

- Incidence vs mortality



Questions or comments?

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