



Institute  
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## Double Helix or Double Whopper ? Family history risk in life insurance

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Head of CoC Medical Underwriting and Claims Consulting

24 October 2014

### Workshop agenda

1. Genes, environment and lifestyle
2. Breast cancer risk: Family history, mutation carrier or both?
3. The right to ask for family history in life insurance
4. What is the impact of not asking for family history?
5. Summary

## Genes, environment and lifestyle



## What determines our lifespan



**Genes** are passed down by parents to their offspring.



**Environmental** factors include exposures to agents in food, water and air



**Lifestyle** factors include diet, physical activity, smoking, health awareness etc.

## Mechanisms of inheritance

### Mendelian inheritance

A mutation in a single gene can cause a disease that is inherited according to Mendel's laws, e.g. autosomal dominant or autosomal recessive.

Examples:

Cystic Fibrosis, Huntington's

### Multifactorial inheritance

Multifactorial inheritance is a net effect of genetic, environmental and lifestyle factors that may influence an individual's susceptibility to develop a condition

Examples:

Coronary Heart Disease, Diabetes Type II

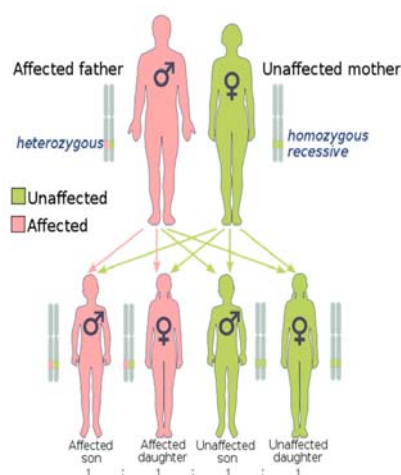
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## Monogenetic inheritance

### BRCA1 and BRCA2

- A BRCA mutation is a mutation in either of the genes BRCA1 and BRCA2
- BRCA1 and BRCA2 are expressed in breast and other tissue, where they help repair damaged DNA
- Harmful mutations in these genes produce a hereditary *breast-ovarian cancer syndrome* in affected families.



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## Multifactorial inheritance

### Genes

Good lifestyle,  
bad genes



#### Jim Fixx:

Jogging Guru of the 70's  
Sudden Death age 54 due to  
coronary artery disease  
Father died age 43

Bad lifestyle,  
good genes



#### Helmut Schmidt:

German Chancellor in the 70's  
Now age 95 and only German  
allowed to smoke on TV  
Father died age 93

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## Multifactorial inheritance

### Lifestyle



70 kcal/100 gr



270 kcal/100 gr



598 kcal/100 gr  
+ Acrylamide

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## Multifactorial inheritance

### Lifestyle



According to a recent *National Geographic* survey:  
**MORE DOCTORS SMOKE CAMELS**  
**THAN ANY OTHER CIGARETTE**



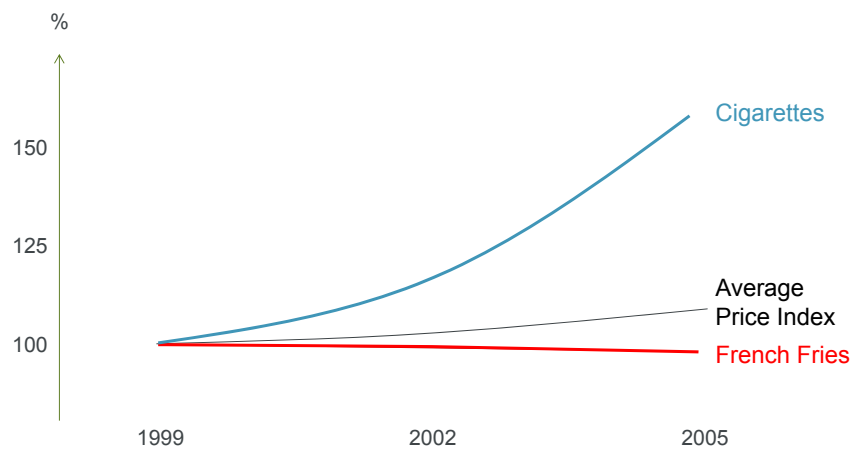
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## Multifactorial inheritance

### Lifestyle

#### Price Trend Germany 1999-2005



Family History © Munich Re

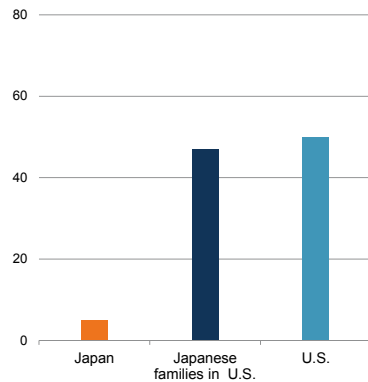
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## Multifactorial inheritance

### Environment

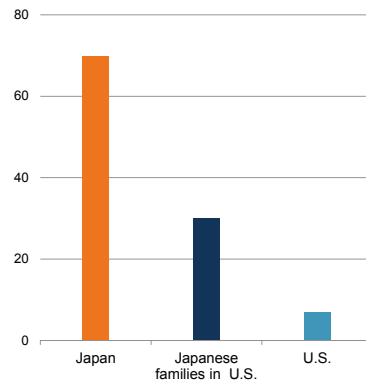
#### Colon cancer

new cases per 100,000



#### Stomach cancer

new cases per 100,000

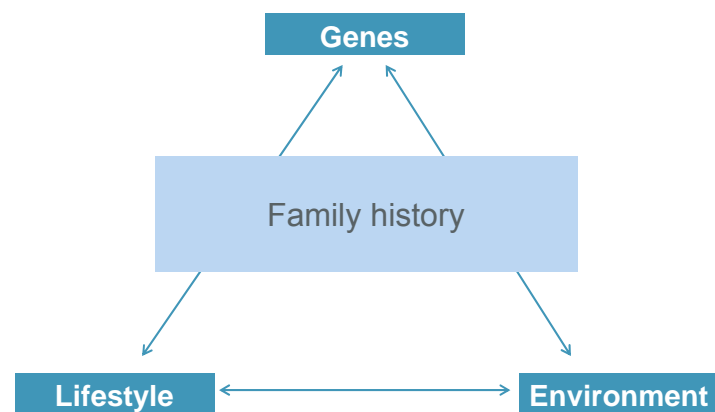


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## Genes, environment and lifestyle

All three factors interact with each other to cause disease



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## Breast cancer risk

### Family history of breast cancer



## Breast cancer risk factors

### Lifestyle factors

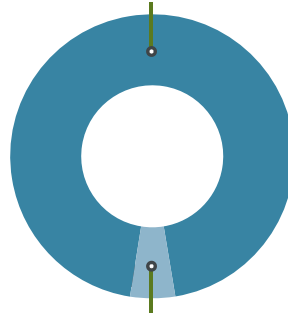
- Body size
- Physical activity
- Dietary factors (e.g. fat intake, red meat, alcohol)
- Smoking
- Socioeconomic status (e.g. parity, breastfeeding)

### Genetic factors

- BRCA1 and BRCA2
- Other unknown or spontaneous mutations

## Cause of breast cancer

Sporadic (unknown) (93 %)



Hereditary ( $\approx 5\%$ )

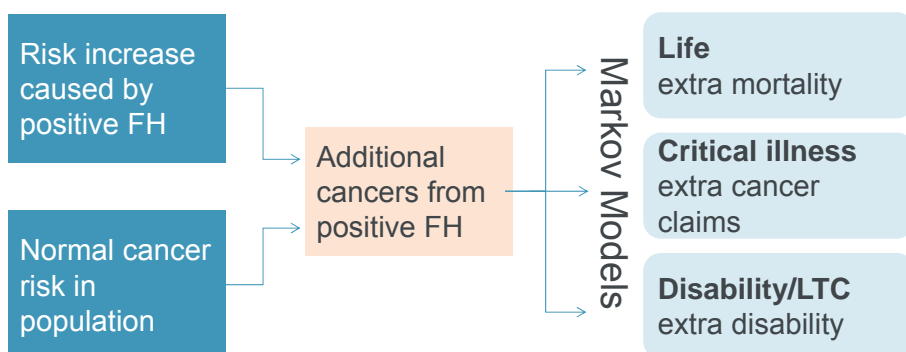
Most breast cancers are not caused by a known mutation like BRCA1 or BRCA2

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## Methodology

Family history risk only, no BRCA testing



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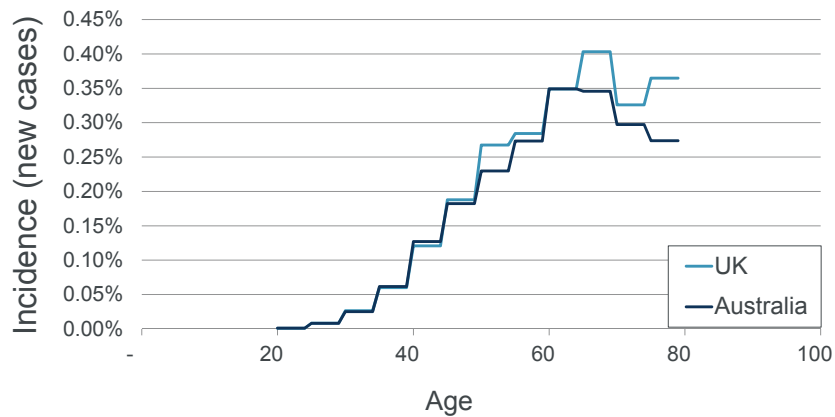
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## Breast cancer

### Incidence rates in the population

#### Normal breast cancer incidence by age



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## Breast cancer

### Relative risk with positive family history

#### Relative risk with one first degree relative with breast cancer

Woman's age (years)	Relative's age at diagnosis of breast cancer					
	< 40 years		40-49 years		50-59 years	
	Cases/Controls	Risk ratio (99% CI)	Cases/Controls	Risk ratio (99% CI)	Cases/Controls	Risk ratio (99% CI)
< 40	125/41	5.7 (2.7- 1.8)	173/96	2.9 (1.9-4.4)	150/87	2.8 (1.7-4.5)
40-49	132/76	3.0 (1.8-4.9)	304/196	2.0 (1.5-2.8)	291/199	2.3 (1.7-3.2)
50-59	94/107	2.0 (1.2-3.4)	251/257	2.2 (1.6-3.0)	286/322	1.6 (1.2-2.1)
≥ 60	87/122	1.4 (0.9-2.1)	181/241	1.4 (1.0-2.0)	245/330	1.5 (1.2-2.0)

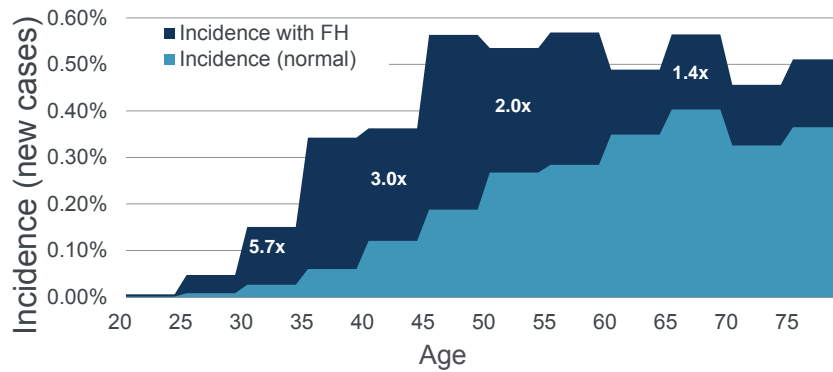
Collaborative Group on Hormonal Factors in Breast Cancer: Familial breast cancer: collaborative reanalysis of individual data from 52 epidemiological studies including 58 209 women with breast cancer and 101 986 women without the disease. Lancet, 2001; 358: 1389-1399

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## Breast cancer

### Incidence rates with positive family history

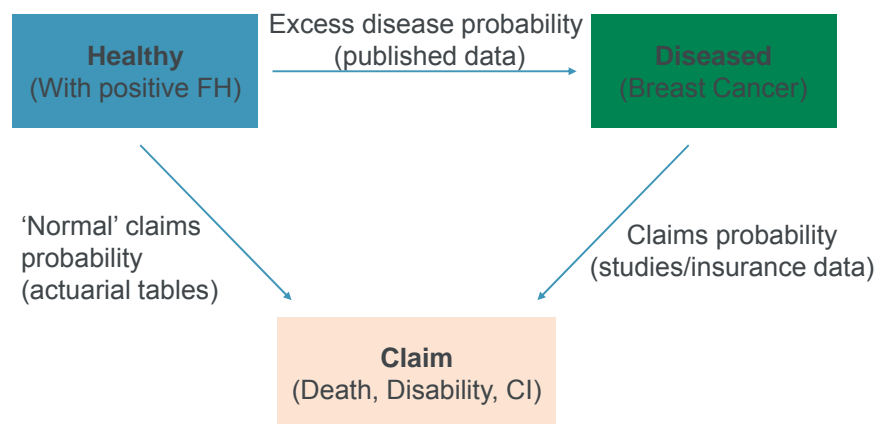
Incidence of breast cancer in individuals with one first degree relative diagnosed with breast cancer before age 40



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## Prototype of a Markov Model for family history



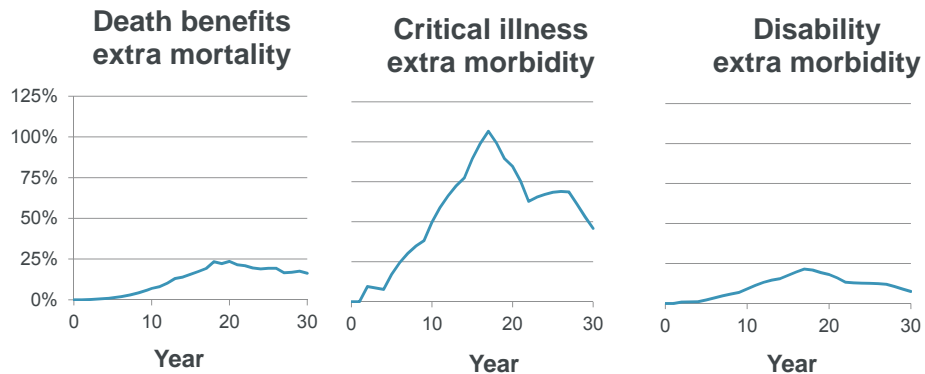
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## Family history of breast cancer

### Impact on lines of business

Example: 20 year old women with one affected first degree relative before age 40

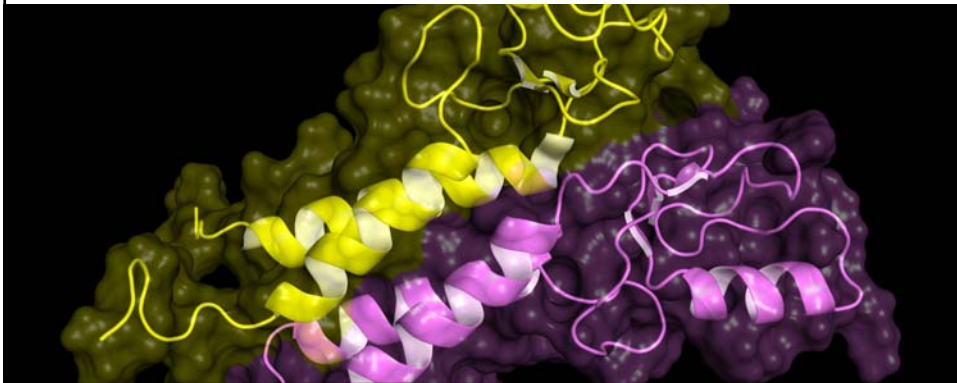


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## Breast cancer risk

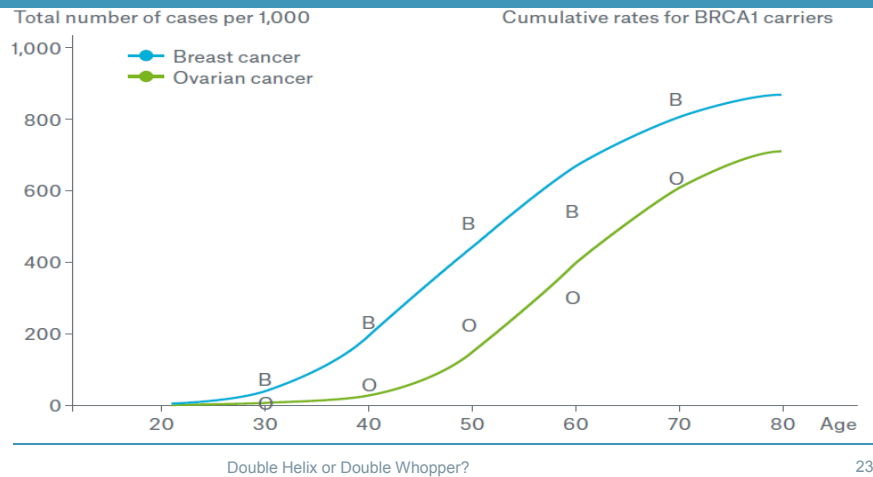
### BRCA mutation carrier



## Breast cancer risk

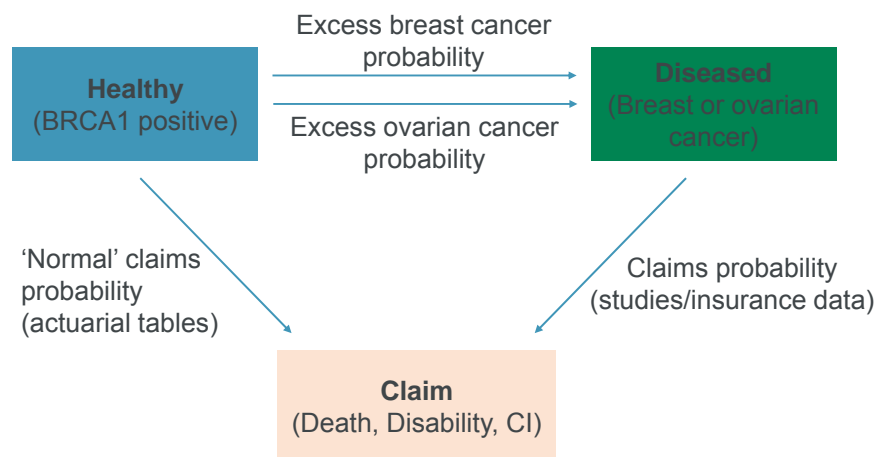
### BRCA1 mutation

#### Life-time risk of BRCA1 mutation carriers to develop breast or ovarian cancer



## Markov model for BRCA1 mutation carriers

### Without preventive surgery



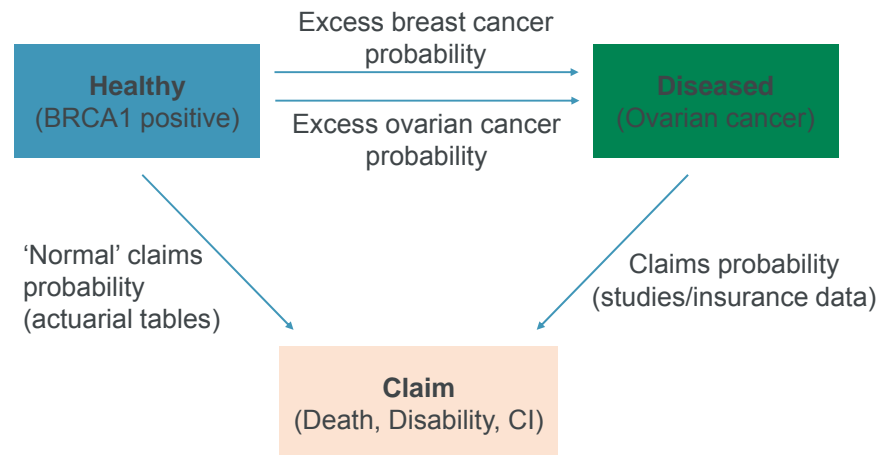
Example woman < 45 years: 300% e.m.

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## Markov model for BRCA1 mutation carriers

### With mastectomy



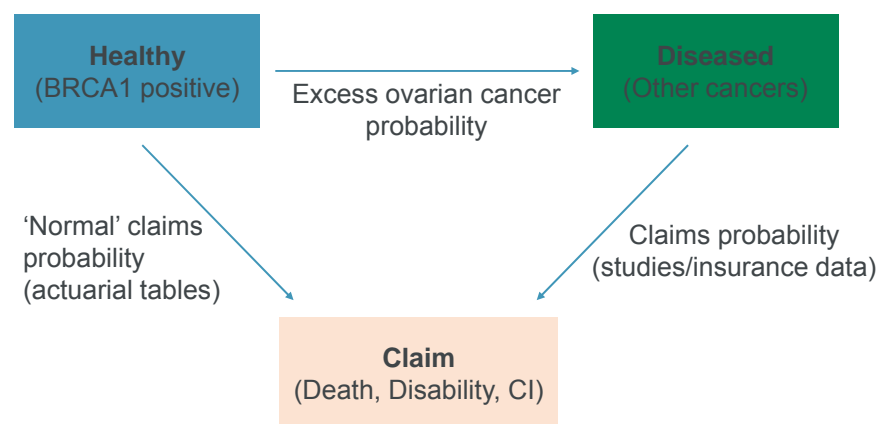
Example woman < 45 years: 200% e.m.

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## Markov model for BRCA1 mutation carriers

### With mastectomy and oophorectomy



Example woman < 45 years: 25% e.m.

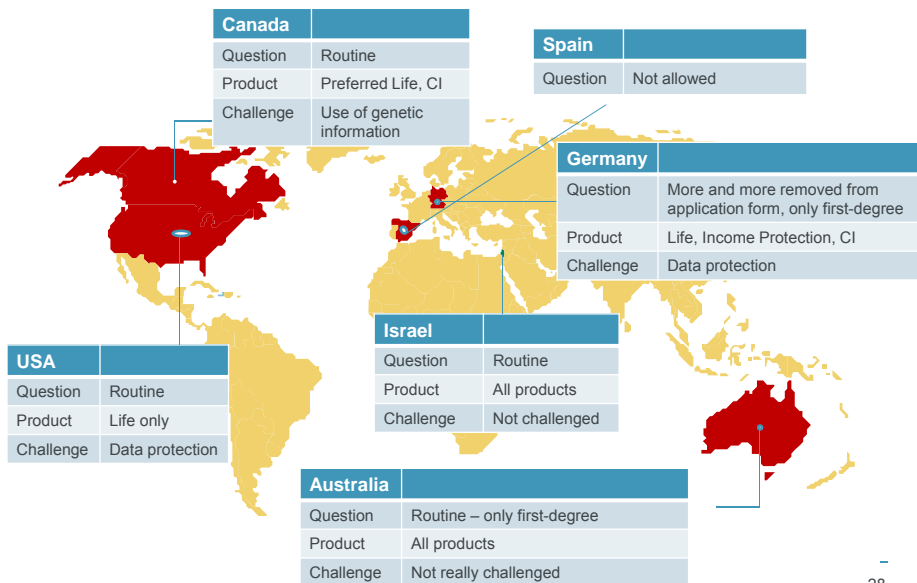
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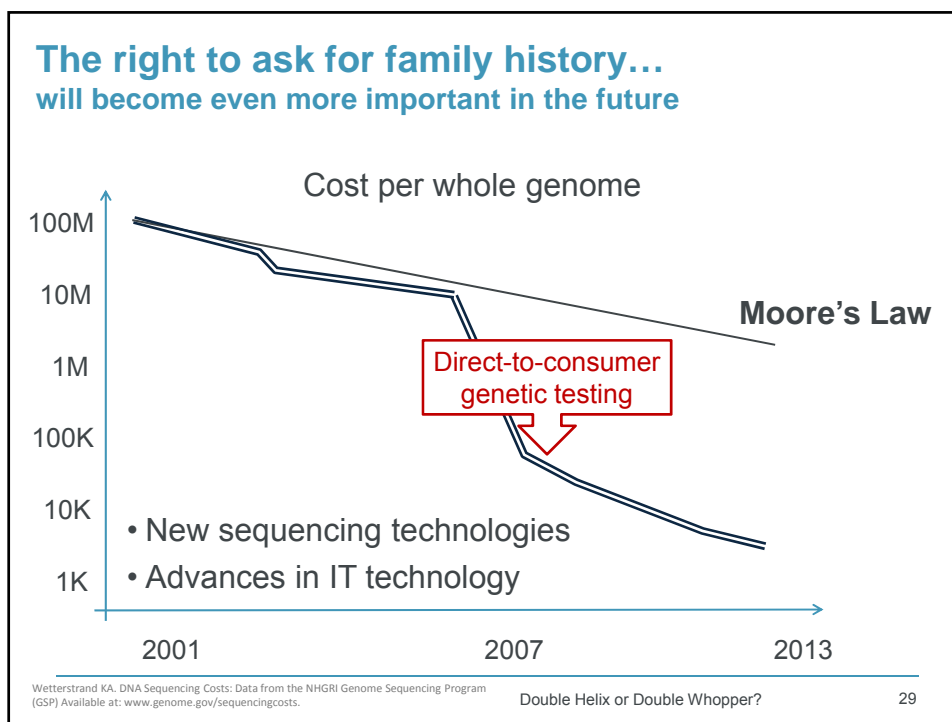
## The right to ask for family history in life insurance



## Asking for family history Regulations and restrictions



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## Direct-to-consumer genetic testing

Direct-to-consumer genetic testing available since 2007

Customers saliva tested for up to 200 monogenetic diseases or disease susceptibilities for multifactorial diseases

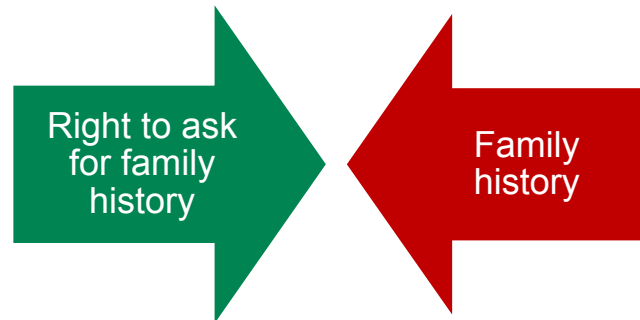
The price for genetic self testing dropped to around \$99

Not a 'medical-grade' test: no need to disclose

Advertisement: "By knowing more about your own health, you can make more informed decisions".

## Balance of knowledge

Up to now

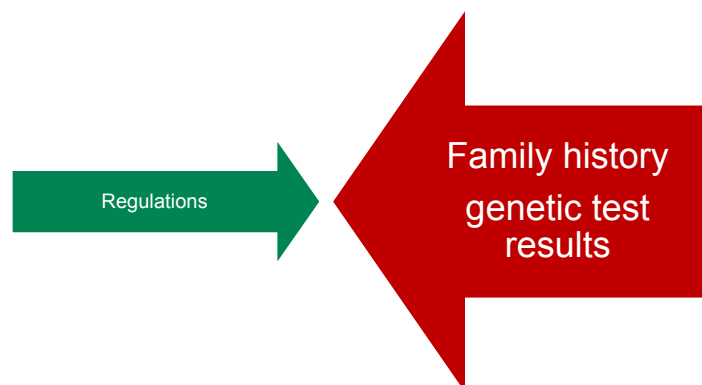


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## Imbalance of knowledge

In the future?

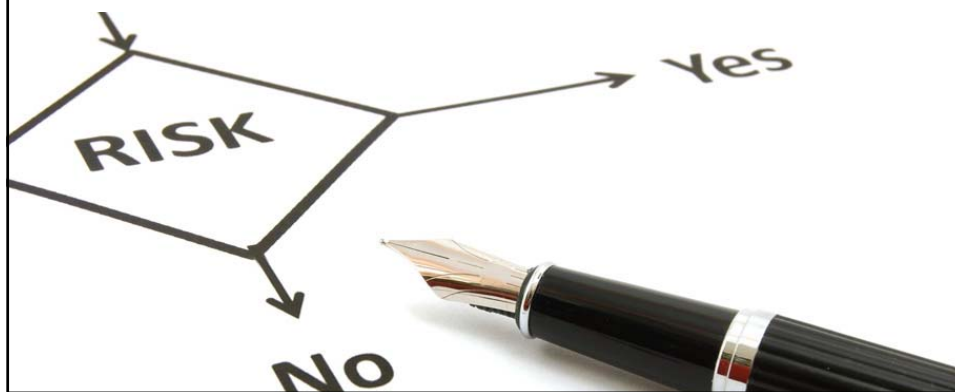


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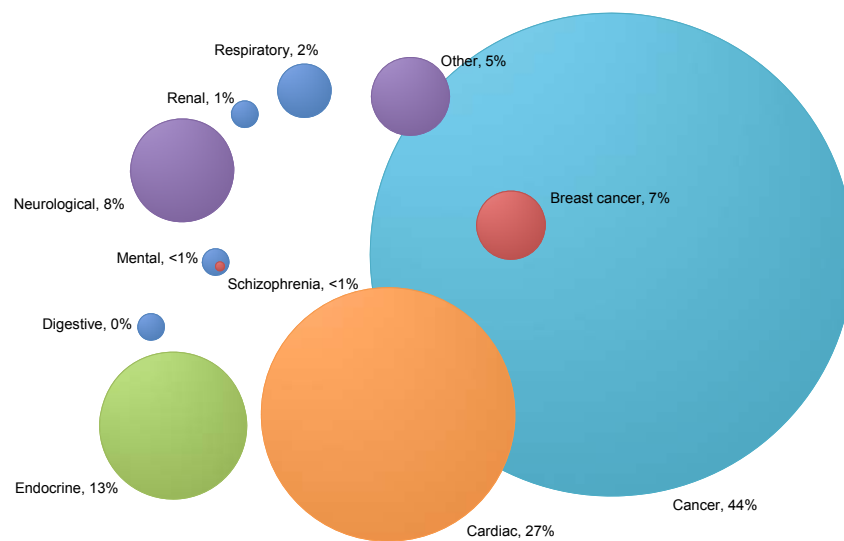
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## The impact of not asking for family history



## Family history disclosures in the UK



Source: Munich Re UK Life Branch, 2012-2013

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## Removing family history question

### Impact on claims

Patricia and Jennifer apply for life cover



Patricia's mother recovered from breast cancer.

The insurer is provided with this information.



Jennifer's mother recovered from breast cancer.

The insurer is **not** provided with this information.

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## Removing family history question

### Additional claims

Munich Re Case Study:

Additional claims due to breast cancer			
Term Life	CI	DII	TPD
0.50%	2.20%	0.39%	0.40%

- Only accounting for one first degree relative affected with breast cancer
- Basic model without negative selection.

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## Removing family history question

### Additional claims

Munich Re Case Study:

Additional claims due to Schizophrenia			
Term Life	CI	DII	TPD
0.06%	0.03%	0.46%	0.34%

- Total effect on all lines of business for 'all' family histories several fold higher.

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## Summary



## Summary family history

- Family history ratings: use a Markov model
- Regulations vs. direct-to-consumer genetic testing may lead to an imbalance of knowledge in the UK
- Removing 'family history' from the application form will result in a significant number of additional claims
- The final question:

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**Is there any lifestyle associated with exceptional longevity ?**



## Lifestyle factors and extreme longevity

### Lifestyle Factors of People With Exceptional Longevity

Swapnil N. Rajpathak, MBBS, DrPH; Yingheng Liu, PhD; Orrit Ben-David, BA; Saritha Reddy, MBBS; Gil Atzmon, PhD; Jill Crandall, MD; Nir Barzilai, MD



Posted: 09/23/2011; J Am Geriatr Soc. 2011;59(8):1509–1512 © 2011 Blackwell Publishing

#### Abstract and Introduction

##### Abstract

**Objectives:** To assess lifestyle factors including physical activity, smoking, alcohol consumption, and dietary habits in men and women with exceptional longevity.

**Design:** Retrospective cohort study.

**Setting:** A cohort of community-dwelling Ashkenazi Jewish individuals with exceptional longevity defined as survival and living independently at age 95 and older.

People with exceptional longevity are not distinct in terms of lifestyle factors from the general population, suggesting that people with exceptional longevity may interact with environmental factors differently than other.

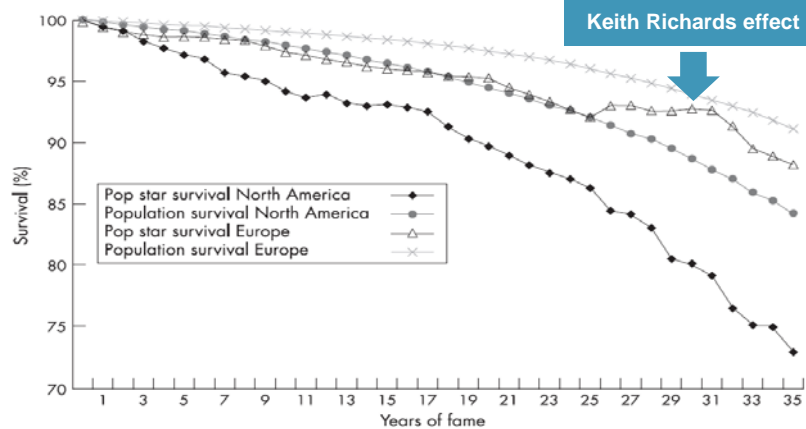
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## Lifestyle factors and premature death

### Survival of rock stars

#### Survival curves for American and European pop stars



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**Thank you for your kind attention!**

Dr. Karsten Filzmaier

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Community  
Sessional Meetings  
Education  
Working parties  
Volunteering  
Research  
Shaping the future  
Networking  
Professional support  
Enterprise and risk  
Learned society  
Opportunity  
International profile  
Journals  
Support