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Brave New Worlds of Shared Information

Health and Care Conference 2013

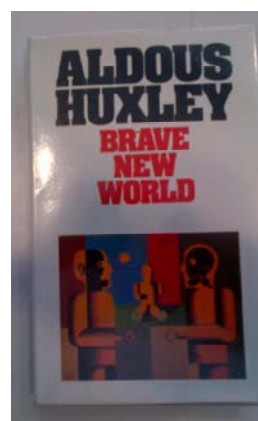
Daniel Ryan



16 May 2013

Brave New World (1932)

- Alpha plus -> Epsilon minus
- Physical & mental conditioning from test-tube to adulthood
- Fixed class hierarchy & dominance of social norms
- No marriage, family, religion or disease – but death at 60
- Progress sacrificed for stability
- Unrelenting focus on shared outcomes



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Building blocks of traditional underwriting

- Importance of medical cohort studies focused on primary condition
- Use of own experience to calibrate and estimate socio-economic differences
- Modification for severity of condition and extent of treatment and/or control
- Multiple or addition to mortality, trending at older ages
- Allowance for anti-selection
- Accept, rating, postpone or decline



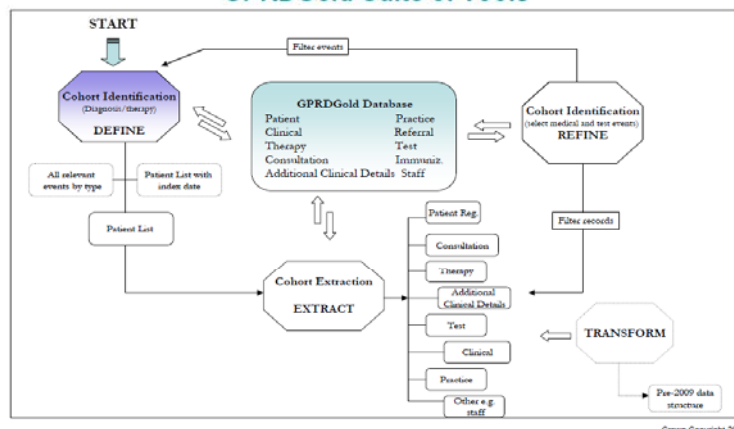
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General Practice Research Database



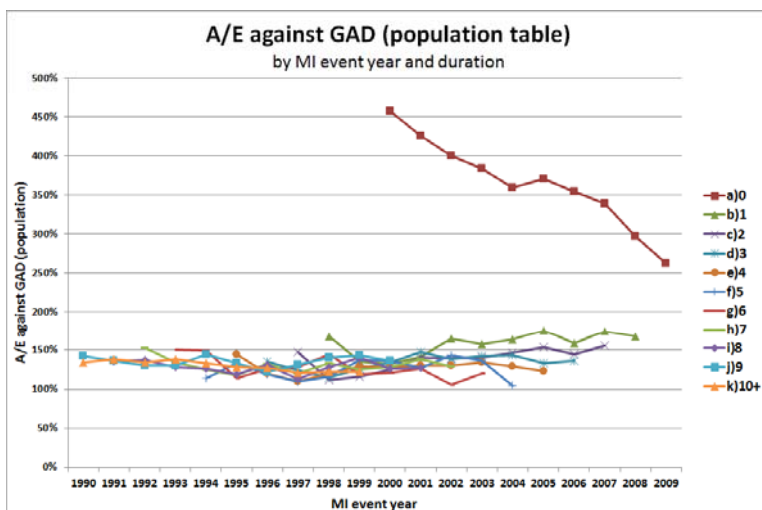
GPRDGold Suite of Tools



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Mortality experience for myocardial infarction GPRD data split by duration since incidence



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The value of predictive underwriting

- The intelligent use of non-medical data held on consumers to reach a view as to their health status
- These insights can be used to reduce the amount of traditional underwriting (where there is an existing data-rich relationship in place)

"You haven't applied for protection, but based on what we know about you, we will pre-approve you and make you an offer"

- Alternatively, predictive techniques can enable you to triage the underwriting process

"Now you are applying for protection, let's run some data on you to remove certain tests, and speed up the process"



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What do we need for predictive underwriting?

Two matchable depersonalised data sources

Risk data:
c. 50,000 final underwriting
decisions from a Life Office
The more cases the better

Descriptive Data:
bank checking account, loyalty card,
potentially home/motor insurance...
The richer the data the better

Correlations are found in the descriptive data (the "predictors")

Model can be run on whole customer universe to highlight the best prospects

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Building a predictive model

- Any information held on a customer **could** be predictive of their health status – let the data do the talking
- Combining all the predictive variables, an algorithm is built that ranks each customer from worst to best prospect, in terms of "likelihood of being given standard rates at application stage"

→ Probability of being a bad risk = $1/(1+e^{-y})$

$$y = a + bx_1 + cx_2 - dx_3 + ex_4 + fx_5 + gx_6 + hx_7 - ix_8 + jx_9 - kx_{10} - lx_{11} + \dots +$$

where:

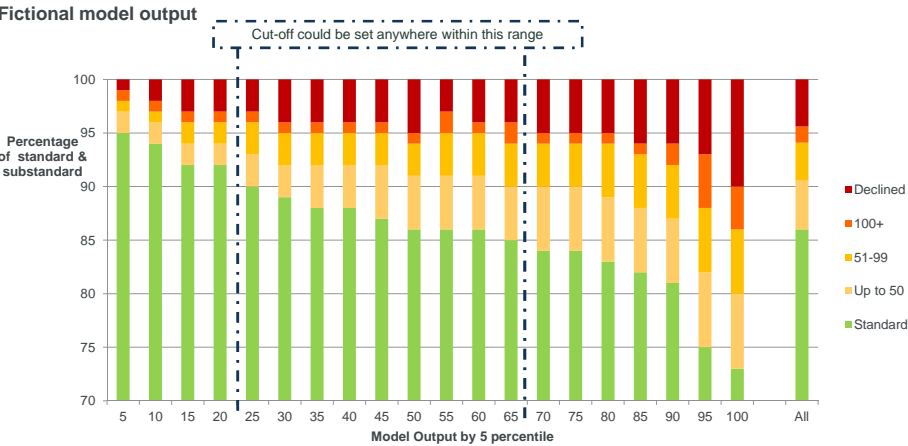
x_1	is age related
x_2	is related to value of home
x_3	is a brand identifier
x_4, x_5, x_7	are related to occupation
x_6, x_9, x_{11}	are account activity related
x_8, x_{10}	are neighbourhood / community related



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What might we learn from the model?



This tells us, for example, that the top 5% of the model contains a "rated or decline" rate of 5%, as opposed to 14% were no model built (see "All" column)



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Who knows what about me?

Married for 16 years

Age: 41

Father of 2

Health & Social Care Information Centre

Swiss Re

TOWERS WATSON

CCTV in operation

AMERICAN EXPRESS

VISA

CACI

SN8 2DD

snapfish

Google

Experian

toptable

Expedia

TOMTOM

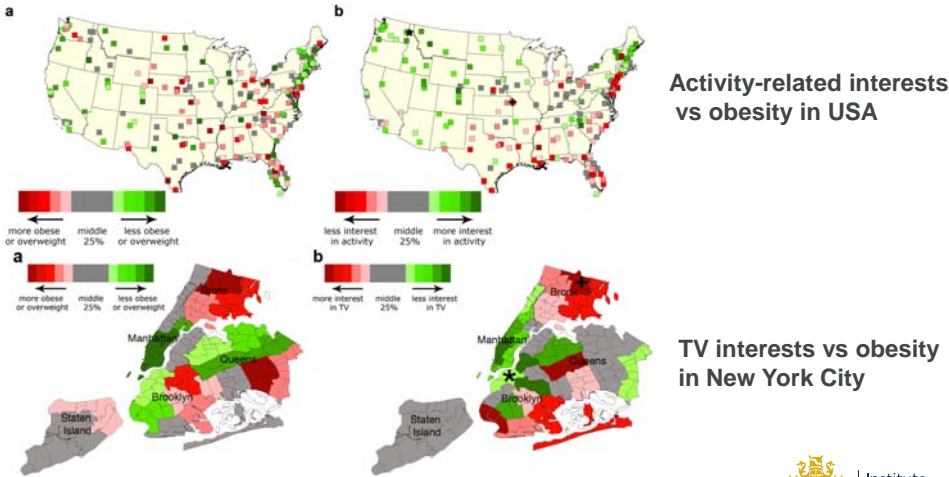
Apple

first direct

MasterCard

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Using social media to link obesity & interests



Chunara R, Bouton L, Ayers JW, Brownstein JS (2013) Assessing the Online Social Environment for Surveillance of Obesity Prevalence. PLoS ONE 8(4): e61373. doi:10.1371/journal.pone.0061373

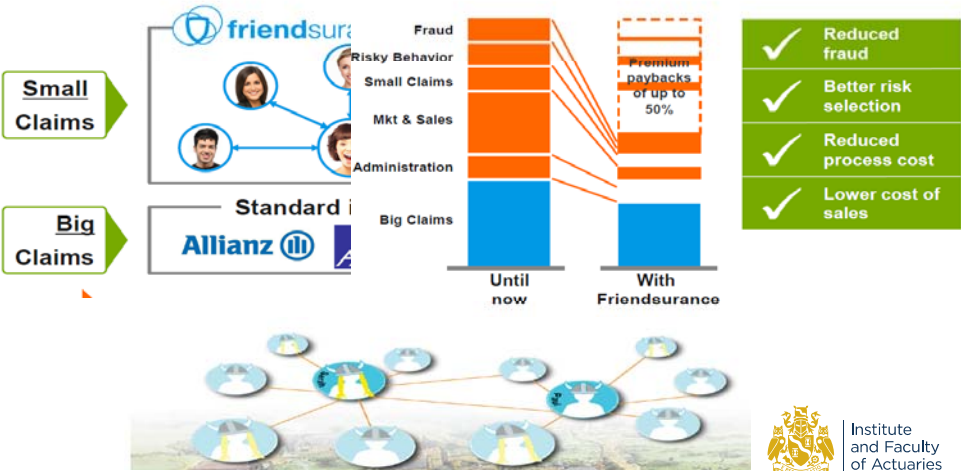
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Using social media to innovate insurance

Friendsurance and Facebook

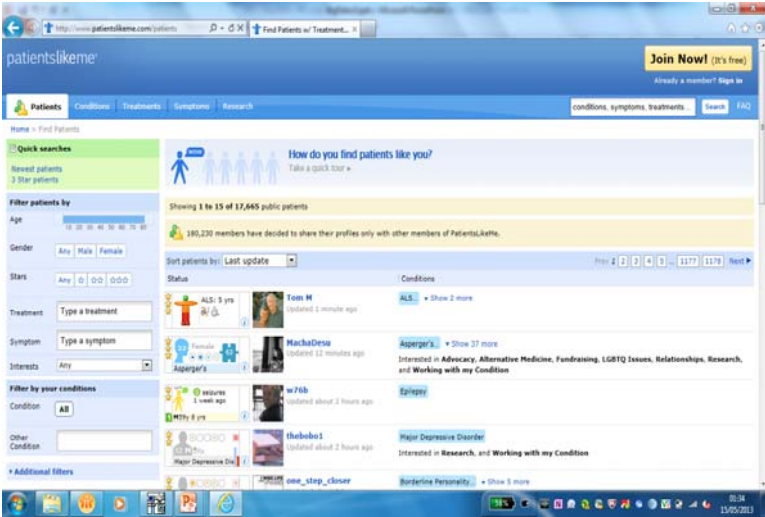


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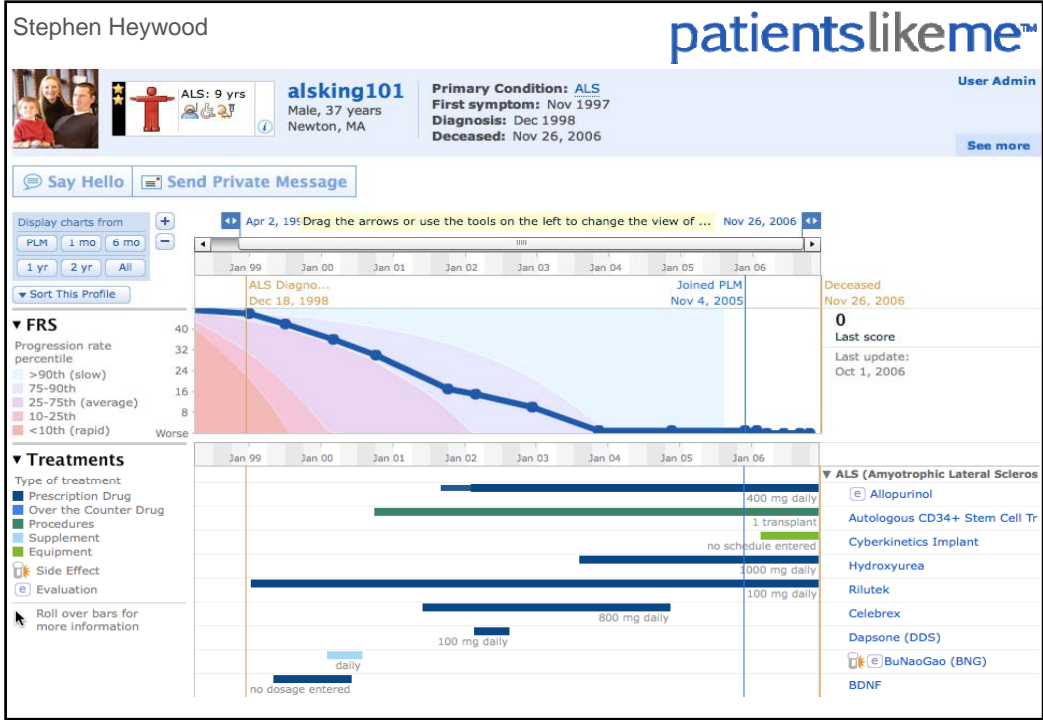


PatientsLikeMe – patient led data sharing



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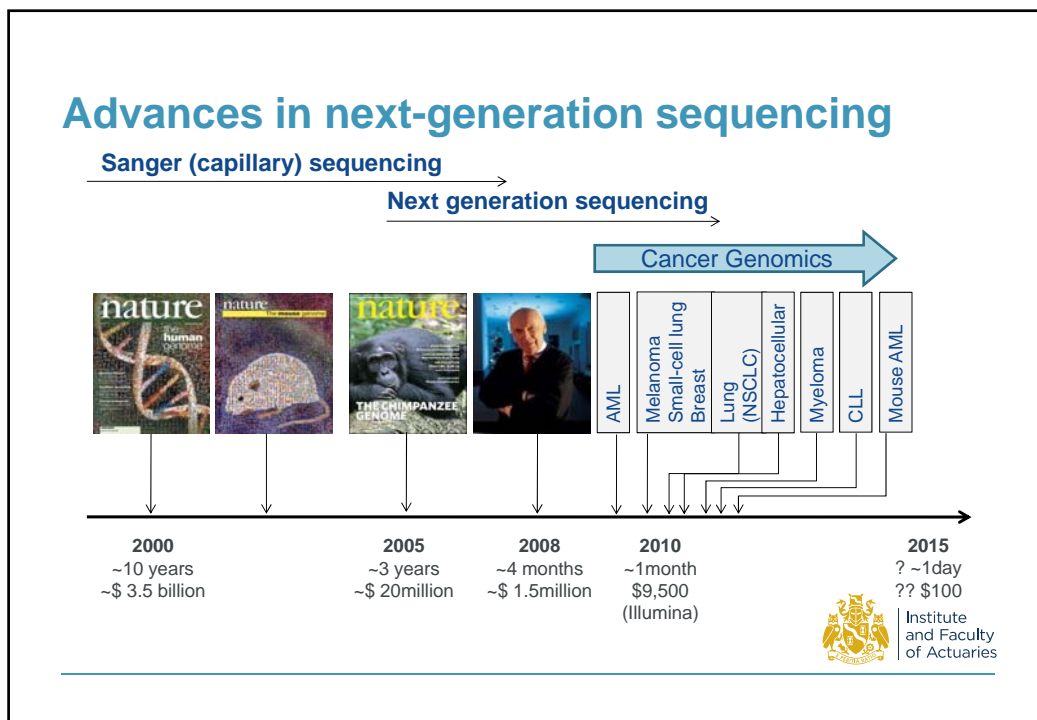
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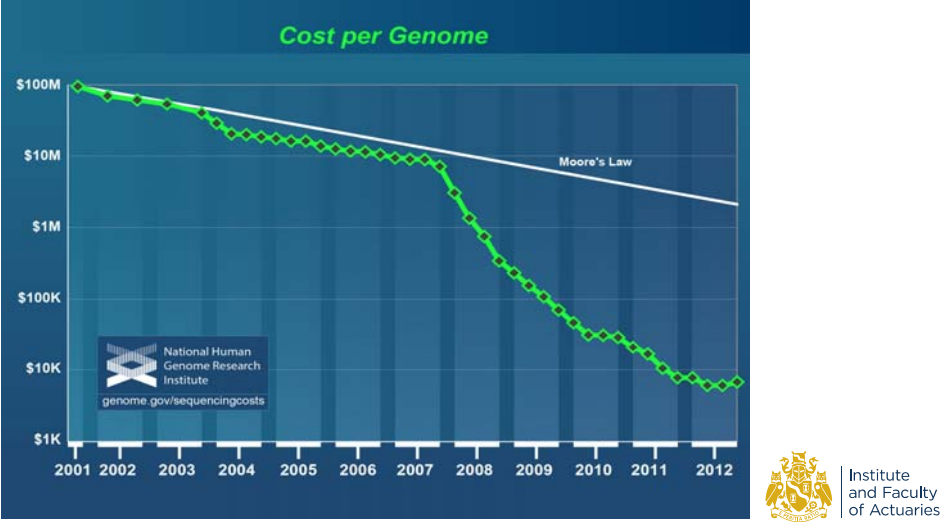
What do I know?

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Rapid reduction in sequencing costs



Number of genetic tests in clinical practice

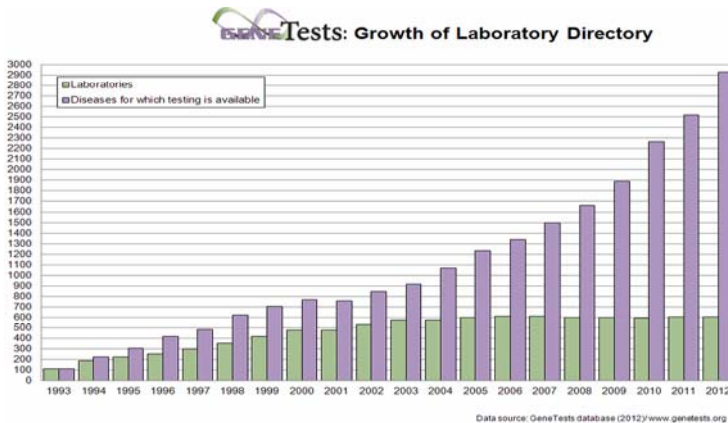
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GeneTests

2,979 disease-genes
1,056 tests in clinics
612 laboratories
581 GeneReviews

UKGTN

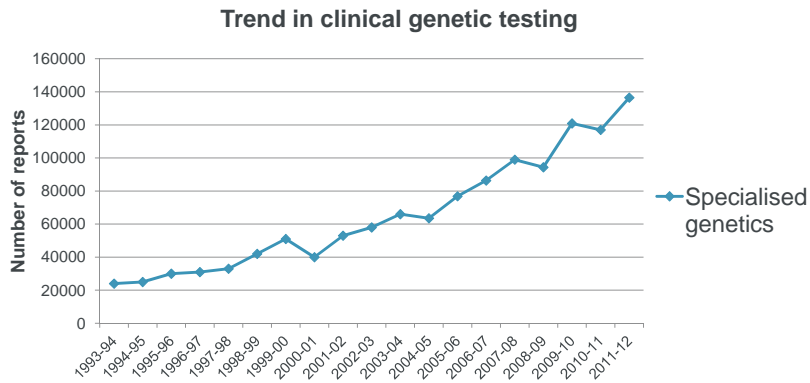
568 genetic diseases
tested in UK Genetic
Testing Network assessed
by ACCE framework:
- Analytical validity
- Clinical validity
- Clinical utility
- Ethical, legal, social



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Genetic tests carried out in NHS

10% annual growth rate



Source: CMGS audit reports

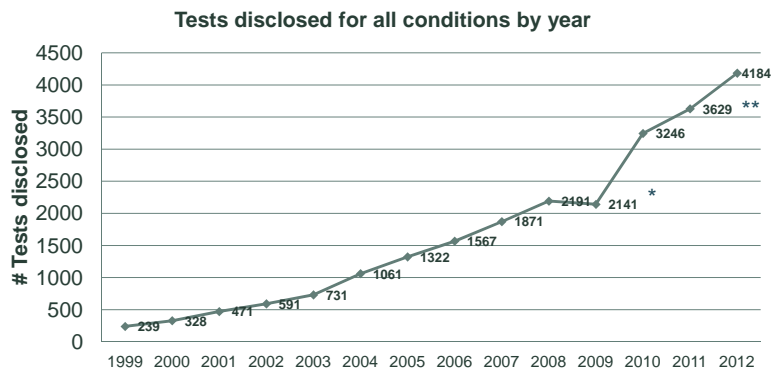


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Genetic tests disclosed to UK insurers

23% annual growth rate



* reduction of life insurance business written during financial crisis

** equals ~2.2% of sold new life protection products in 2011 (1.65 mio)

Source: ABI Compliance Reports



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Variation in disclosure of predictive genetic tests by condition

Disease	Gene(s)	CMGS 2010	ABI 2010	% disclosed
Breast/Ovarian Cancer (BRCA1/2)	BRCA1, BRCA2	2224	291	13
Huntington's Disease	HD	404	148	37
Familial Adenomatous Polyposis (FAP)	APC	256	55	21
Myotonic Dystrophy (MD)	DMPK	147	61	41
Multiple Endocrine Neoplasia (MEN)	RET	105	11	10
Familial Hypertrophic Cardiomyopathy Dilated Cardiomyopathy	MYBPC3, MYH7, TNNT2, TNNI3, TPM1, MYL3, ACTC1, PRKAG2, GLA, MYL2, LMNA	557	37	7
Long QT syndrome	KCNQ1, KCNH2, SCN5A	351	14	4
Familial Hypercholesterolemia	LDLR, APOB, PCSK9	330	7	2
	Total	4374	624 *	14

* 75% of disclosed predictive genetic tests are negative



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23andme – Colorectal cancer marker

New communities for genetic information

Karen Jacobs
0.21 out of 100

people of European ethnicity who share Karen Jacobs's genotype will get Colorectal Cancer between the ages of 30 and 49.

Average
0.26 out of 100

people of European ethnicity will get Colorectal Cancer between the ages of 30 and 49.

Genes vs. Environment

35 %
Attributable to
Genetics

The **heritability** of colorectal cancer is estimated to be 35%. This means that **environmental factors** contribute more to differences in risk for this condition than genetic factors. Genetic factors that play a role in colorectal cancer include both unknown and known factors. Known factors include rare mutations in the MSH2 and MLH1 genes that appear in familial cases of colon cancer (which 23andMe does not genotype), and the **SNP** we describe here. Other factors include a history of previous colorectal cancer, colorectal polyps, or inflammatory bowel disease, being an Ashkenazi Jew or of African descent, a diet high in animal fat, physical inactivity, obesity, smoking, heavy alcohol use, and diabetes. (Note: The contribution of the SNP reported by 23andMe to inherited colorectal cancer risk is minor. If you have a strong family history of early-onset colon cancer, you should consider mutation testing of MSH2 and MLH1.) (sources)

8q24 region

Marker: rs6983267

Citations

Haiman et al. (2007). "A common genetic risk factor colorectal and prostate cancer." *Nat Genet* 39(8):954-6.

Tomlinson et al. (2007). "A genome-wide association scan of tag SNPs identifies a susceptibility variant for colorectal cancer at 8q24.21." *Nat Genet* 39(8):984-988.

Zanke et al. (2007). "Genome-wide association scan identifies a colorectal cancer susceptibility locus on chromosome 8q24." *Nat Genet* 39(8):989-994.



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Source: <http://www.23andme.com>

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Identification of genetic markers for disease



- Identification of new genetic variants for inherited cancer risk
- Comparison of DNA over 200,000 people to find genetic alterations associated with breast, ovarian and prostate cancer
 - 49 new SNPs for breast cancer (2x more than known), 11 new SNPs for ovarian cancer, 26 new SNPs for prostate cancer (total of 78)
- Provides basis for development of new genetic tests for stratification into high- and low risk population groups
- Leading to future advances in screening programmes, preventive strategies, individualized treatment and/or lifestyle changes for people at higher risk



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Personal genome project

- Project started by Professor George Church, Harvard Medical School, in 2006 with target of 100,000 volunteers
- Individuals willing to have their genomes, cells (saliva, blood, skin, iPS), extensive trait data

Genomes + Environments = Traits

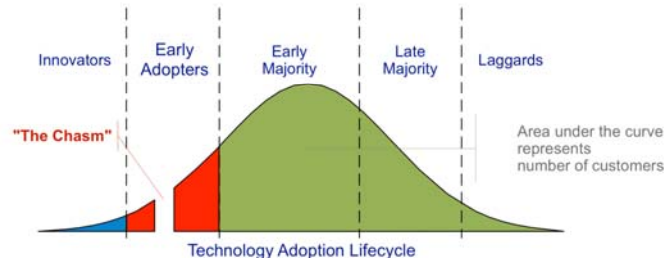


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The likelihood of divided futures

The Savage vs Mustapha Mond



- Health technology is a discontinuous innovation
- Chasm exists because of characteristics of "early majority" or pragmatists
 - desire for integrated solutions at reasonable price
 - appetite for standard, tested solutions



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Google Glass – our attitudes to the future

10% would wear the glasses regularly

44% would not buy at current price of \$1,500

45% would wear glasses for taking photos, video or as phone

39% would not buy at lower price of \$1,000



Study of 1,000 US adults surveyed by BITE Interactive

- **Video sharing and storage:** Physicians could record medical visits and store them for future reference or share the footage with other doctors.
- **A diagnostic reference:** If Glass is integrated with an electronic medical record (EMR), it could provide a real-time feed of the patient's vital signs.
- **A textbook alternative:** Rather than referring to a medical textbook, physicians can perform a search on the fly with their Google Glass.
- **Emergency room/war zone care:** As storied venture capitalist Marc Andreessen proposed in a recent interview, consider "dealing with wounded patients and right there in their field of vision, if they're trying to do any kind of procedure, they'll have step-by-step instructions walking them through it." In a trauma situation, doctors need to keep their hands free.
- **Helping medical students learn:** As suggested by one blogger, a surgeon might live stream a live — and potentially rare — surgery to residents and students.
- **Preventing medical errors:** With an electronic medical record integration, a nurse can scan the medication to confirm whether it's the correct drug dose and right patient.

Is Google Glass the future of connected health?



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What information could they access in the future?



Source: Economist 23.02.13, Jeff Lichtman, Harvard,

IBM Watson in healthcare

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Swiss Re OpenMinds Forum Connecting Generations at 150th anniversary

Open access at openminds.swissre.com

SWISS RE
150
YEARS

OPEN MINDS
CONNECTING
GENERATIONS



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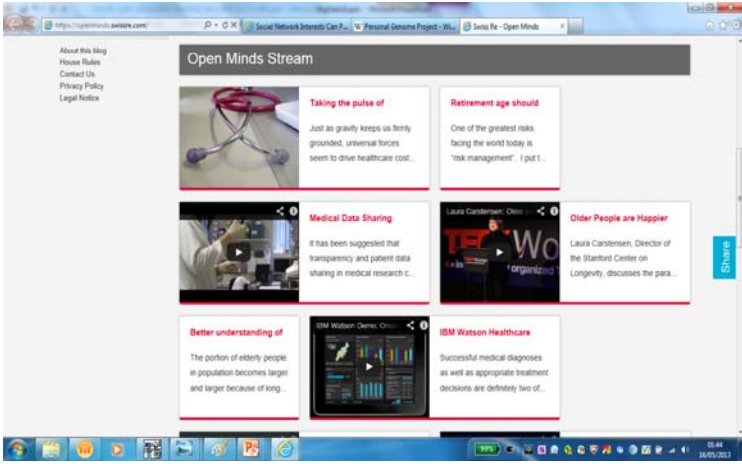
Swiss Re OpenMinds Forum

Connecting Generations at 150th anniversary


Open access at openminds.swissre.com -

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150
YEARS

OPEN MINDS
CONNECTING
GENERATIONS



The screenshot shows the Swiss Re OpenMinds Forum website. The main content area is titled "Open Minds Stream" and features a grid of six articles and videos. The articles include "Taking the pulse of", "Retirement age should", "Medical Data Sharing", "Older People are Happier", "Better understanding of", and "IBM Watson Healthcare". Each article has a thumbnail image and a brief description. The website is displayed in a web browser window with the address bar showing "https://openminds.swissre.com".



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Questions

Comments

Expressions of individual views by members of the Institute and Faculty of Actuaries and its staff are encouraged.

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



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