

RISK AND OPPORTUNITY OF GENETIC TEST

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**INTEGRATION
&
COLLABORATION**
AMIDST TRANSFORMATIONAL CHANGES

11 NOVEMBER 2018

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What Is Genetic Test?

*A test identifies changes in chromosomes, genes, or proteins to **confirm** or **rule out** a suspected genetic condition or help determine a person's chance of developing a genetic disorder*



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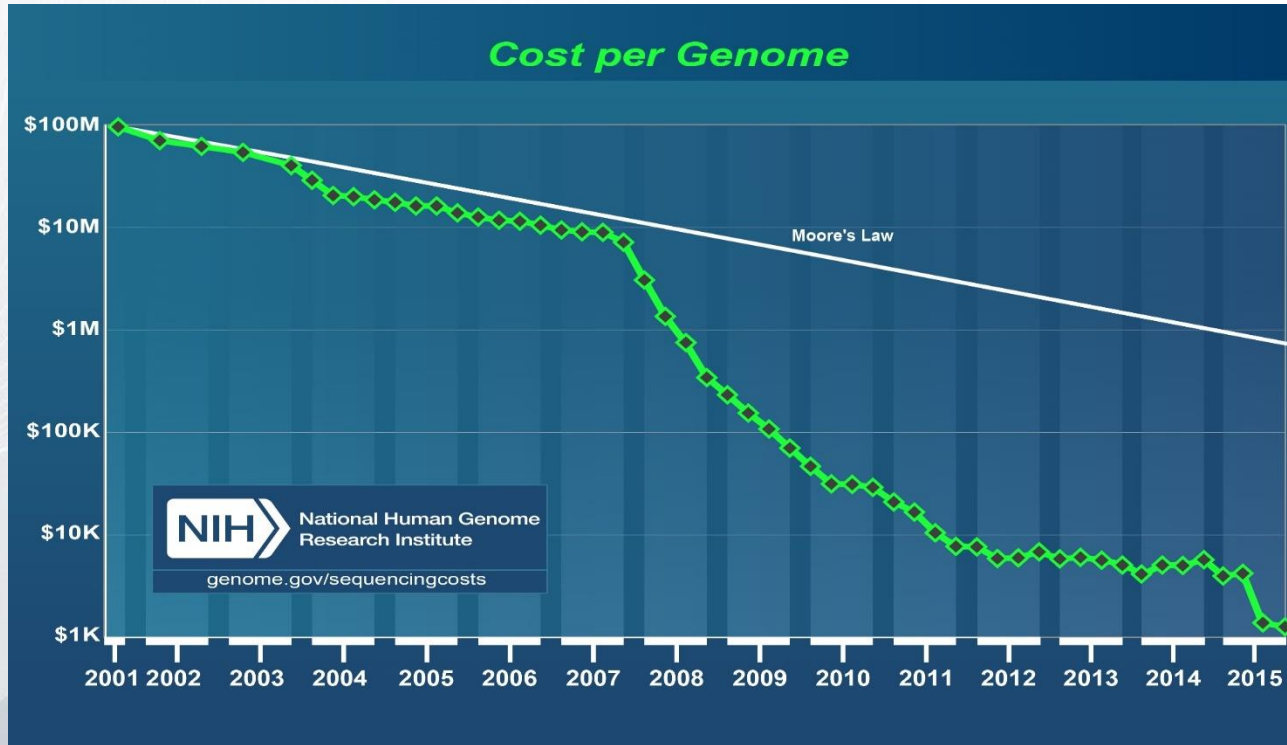
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General Perception of Genetic Test



High-Tech
GIMMICK
Confusing
Illness
Family Ancestry
Afraid of finding out something
we don't know
PERSONALIZED
Curious
Not Sure What it is
Food Allergy
Intriguing
Risk Assessment
UNIQUE
Don't know what it does

Affordable Genetic Test



Technology

Competition

- Higher than expected US genetic testing consumer adoption rates of 15% observed in 2016
- Additional 45% of consumers considering to get tested as prices for testing drop

Type of Genetic Tests

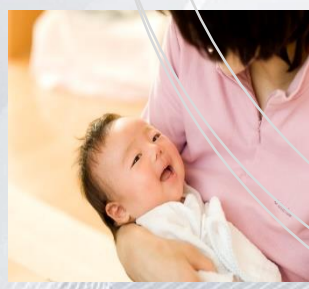
Pharmacogenomics
Cancer Profiling



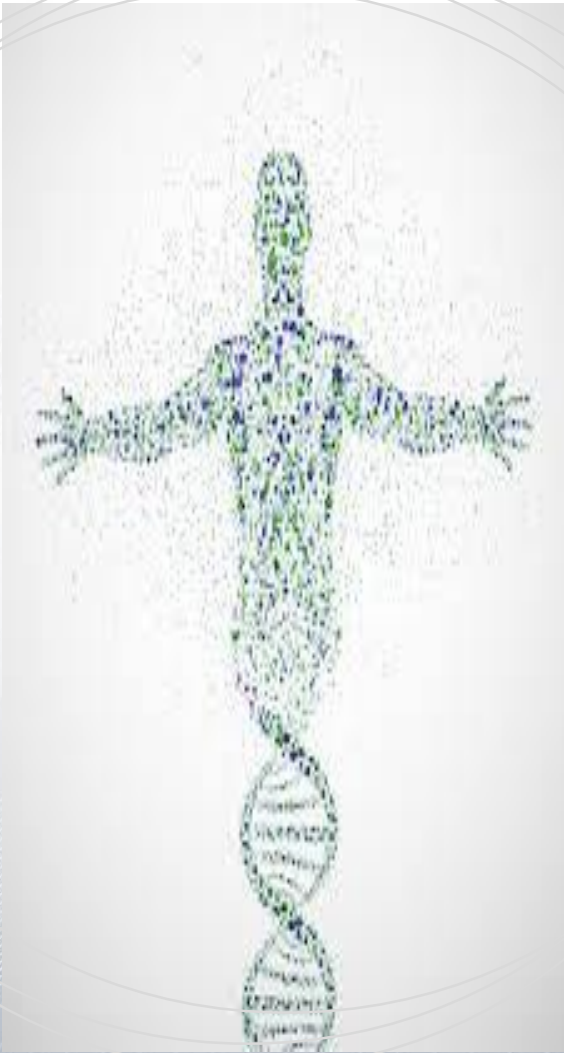
Predictive Test



Prenatal test
Newborn screening



Nutrigenomic Test





NUTRIGENOMIC TEST

Nutrigenomic Test

How genes affect your response to foods and nutrients ...



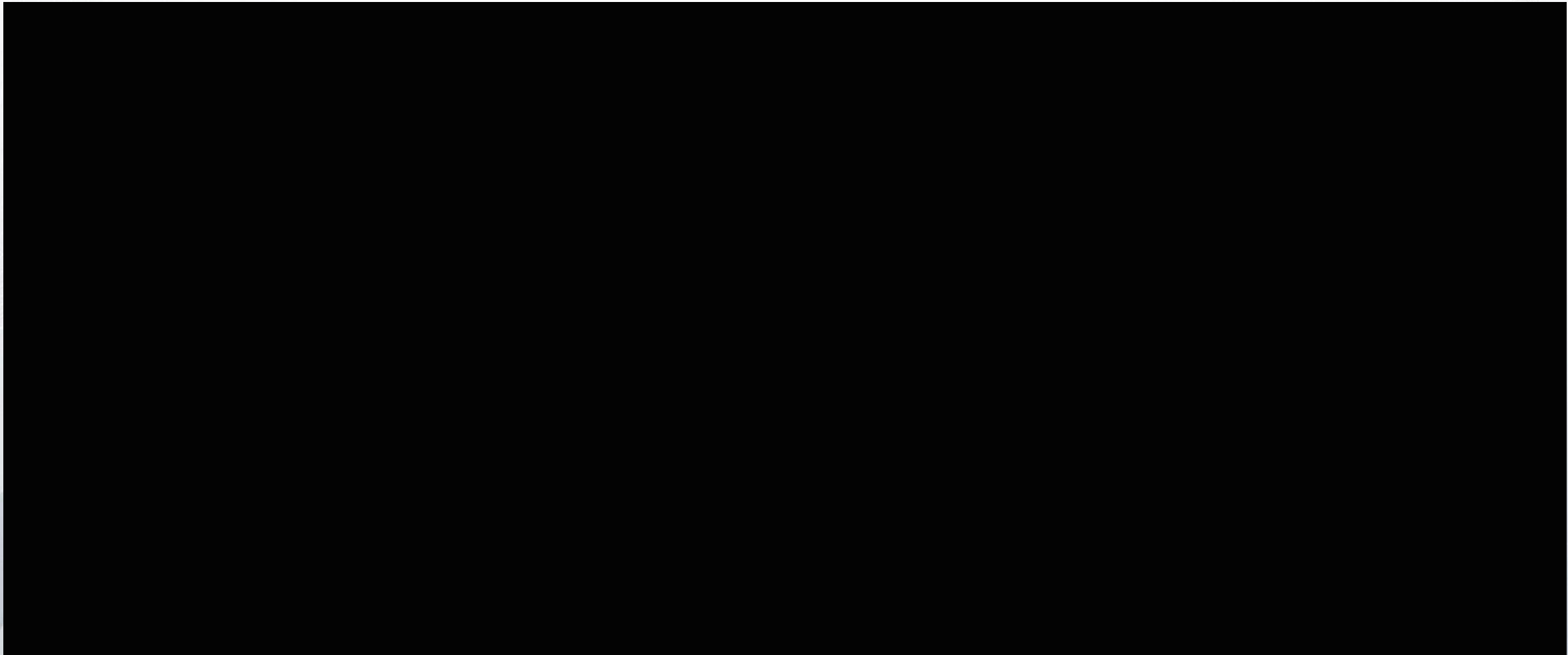
- Optimal carbohydrate, protein and fat ratio
- Vitamin deficiencies
- Alcohol and caffeine metabolism

⋮

- Optimal mix of endurance and strength training
- Potential for injury risk

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Nutrigenomic Test



Source: Advanced Genomic Solutions

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Nutrigenomic Test – Benefits to companies



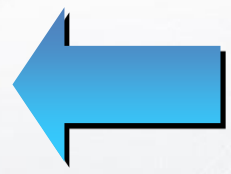
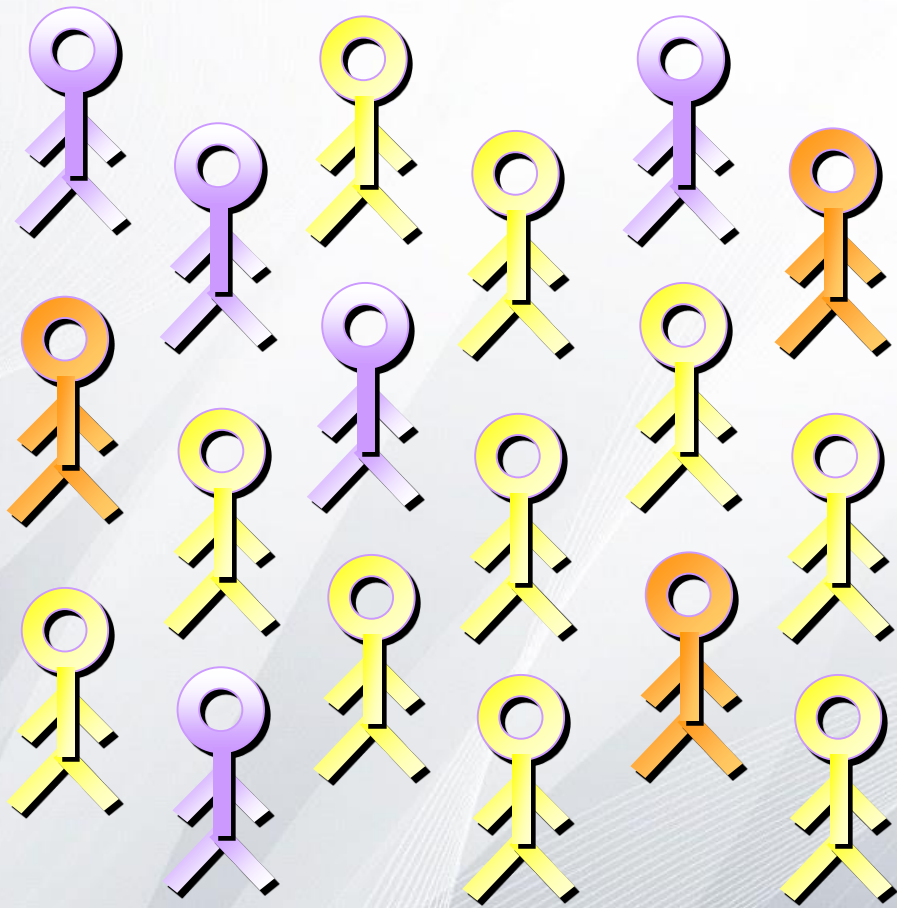
Aetna Study – 2800 patients were provided the Nutrigenomic testing and followed for 1 year with only 3 genes tested.

1. 76% of patients lost an average of 10 pounds and kept weight off when compared to non-participants
2. Measured improvements in waist circumference, triglyceride levels and HDL (bad) cholesterol
3. Average healthcare savings of \$122 per patient and overall health savings of nearly \$600,000 and positive net return in the first year of implementation of a wellness program



PHARMACOGENOMICS TEST

Pharmacogenomics Test



Treat all patients with the same diagnosis with the same medications

Pharmacogenomics Test

A study of how genes affect a person's response to medications and use genetic information to deliver

The **Right** Dose of

The **Right** Drug for

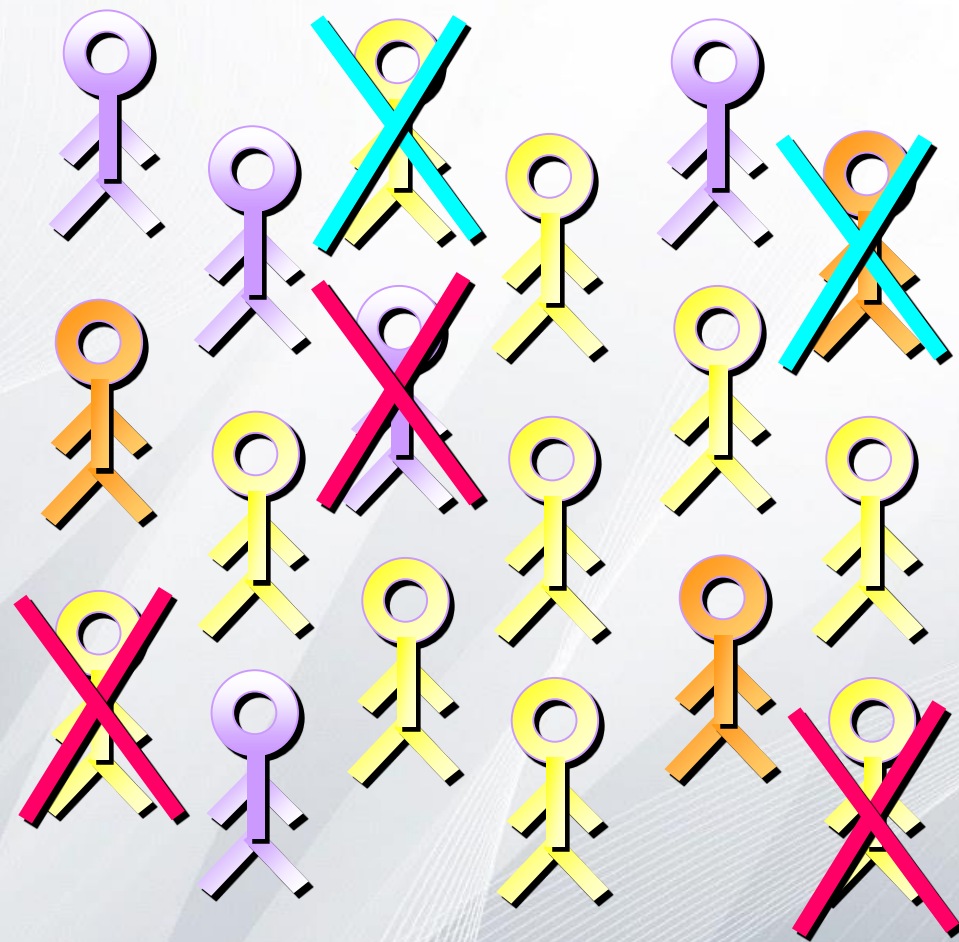
The **Right** Indication for

The **Right** Patient at

The **Right** Time



Pharmacogenomics Test



Non-responders



Toxicity

Pain Management

Cardiovascular

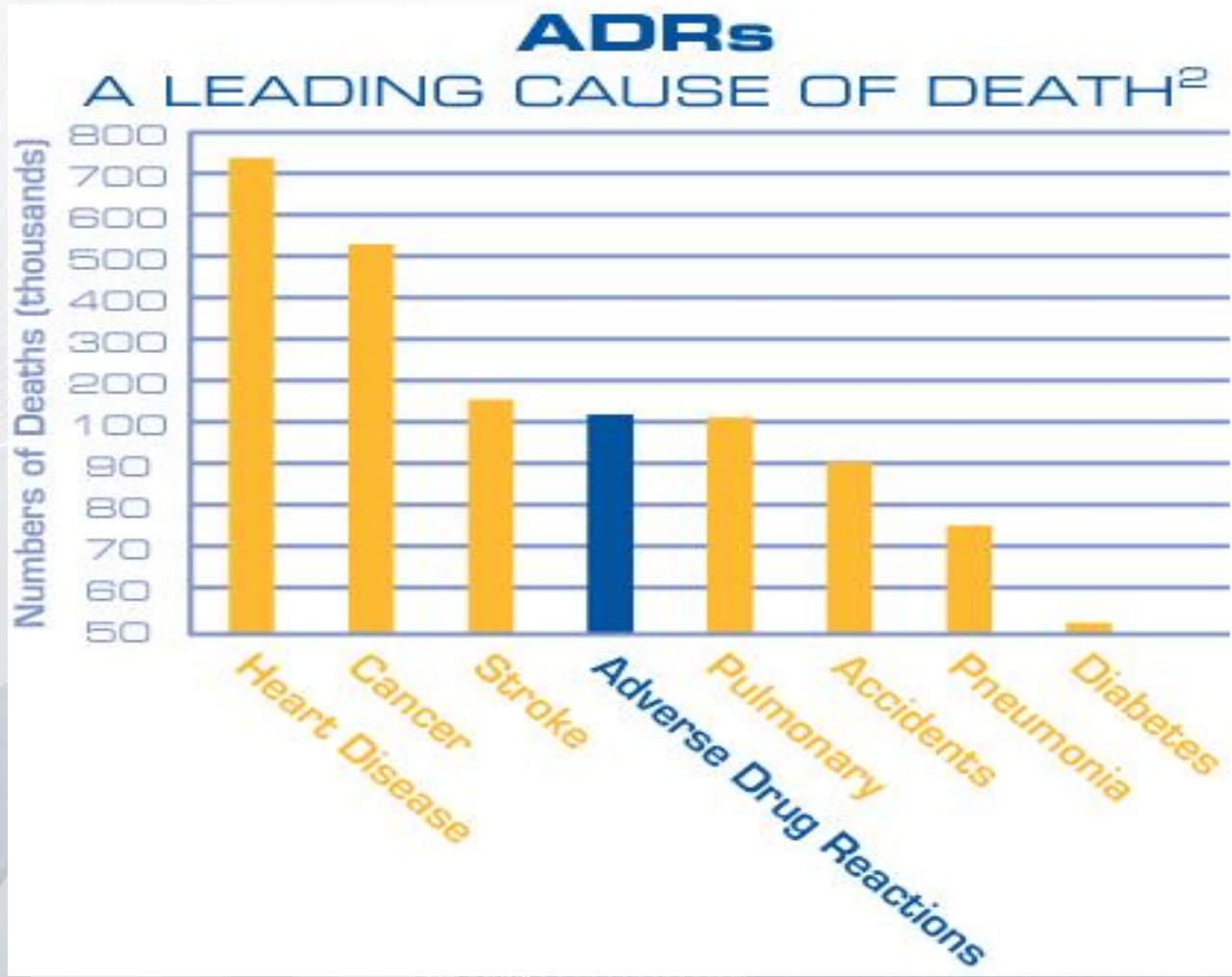
Oncology

Mental Health

Internal Medicine



Pharmacogenomics Test (PGx)



2016 Study for 4 months

- Hospitalization rate of PGx tested group was **9.8% vs. 16.1%** in untested group
- Emergency department visit rate was **4.4% in PGx group vs. 15.4%** in untested group

2016 Journal of Medical Economic Study⁴ compared healthcare resource costs and clinical decision-making in **elderly patients**

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Customers Journey

We make it easy for you.



1
Acquire
Collection Kit



2
Complete
Simple Forms



3
Collect Cheek
Swabs



4
Tested at
Laboratory



5
Report Delivered
in 2 Weeks



6
1x1
Consultation

- Nutritionists
- Doctors

Consumers' View of Genetic Tests



Why take the test?

1. *Get to know more about themselves*
2. *Simple and Convenient*
3. *Curiosity and see values after the briefing*
4. *No out-of-pocket money*
5. *Get result that can be applied life-long*

Why not take the test?

1. *Can't see the benefit – can manage it themselves*
2. *Prefer Health Check-up*
3. *Bad experiences from previous genetic tests*

Regulatory View on Genetic Test



No regulation/ Code of conduct	Code of conduct from industry	Prohibited to require genetic test	Prohibited to use tests below given SA	Complete Prohibition
China Finland India Spain US Life	Greece Hong Kong Japan Philippines	Australia* ('02)	Germany ('01) Netherlands Switzerland United Kingdom('96)	Australia Belgium ('92) Canada ('17) Denmark France ('94) Ireland South Korea Poland Portugal Singapore US (Health) ('08)

* Can use existing test

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Regulatory View on Genetic Test

China

Zhong An – Colon Cancer Product

DNA Test



Positive: Cancer screen test



Negative: 1-year Colon Cancer policy



Hong Kong

2016 – ManuLife

2017 - Prudential, HSBC, SunLife & FT

- *Free test if purchased with a minimum of premium size*
- *Embedded to insurance product*
- *Tests sometimes can be transferrable*
- *Including consultation, intervention program, Mobile App*
- *DNA data remains with the test providers*

Impact on Insurance

Risk

1. Non-disclosure
2. Anti-Selection
3. Increased health care cost due to more screening, counseling
4. Increase in lapsation

Opportunity

1. Non-invasive
2. New way of health prevention
3. Become personalized health management
4. Increase customer engagement

Potential Pricing impact



Critical illness definitions at risk from genetic testing

Cox discussed a study from the Canadian Institute of Actuaries. The study found that if underwriters did not have access to genetic testing results, for insurance applicants diagnosed with a genetic disease, average CI claim rates are likely to increase by about **26% overall**, or **16%** for males and **41%** for females, in the age range 30-65; there would be a concomitant increase in CI premium rates.

Genetic Testing Model for CI: If Underwriters of Individual Critical Illness Insurance Had No Access to Known Results of Genetic Tests, Canadian Institute of Actuaries, Robert C. W. (Bob) Howard, January 2016

Potential Pricing impact

Proportion of the population who obtain genetic tests

The most significant factor that would impact the financial results of insurers is the proportion of the population who obtain genetic tests. See below the sensitivity for variations in this assumption:

	Base		Variation	
% of population who obtain PRS-based genetic tests	0.5%	1%	2%	5%
Increase in claims from NB anti-selection	1.8%	3.5%	7.0%	17.5%
% of in-force lapsed due to low risk result	0.1%	0.2%	0.3%	0.8%
% increase in lapse rate	0.5%	1.0%	1.9%	4.8%

Source: Institute of Actuaries of Australia “Think about life insurance through a genetic lens” prepared by Dr Damjan Vukcevic and Jessica Chen, May 2017

What's Next?



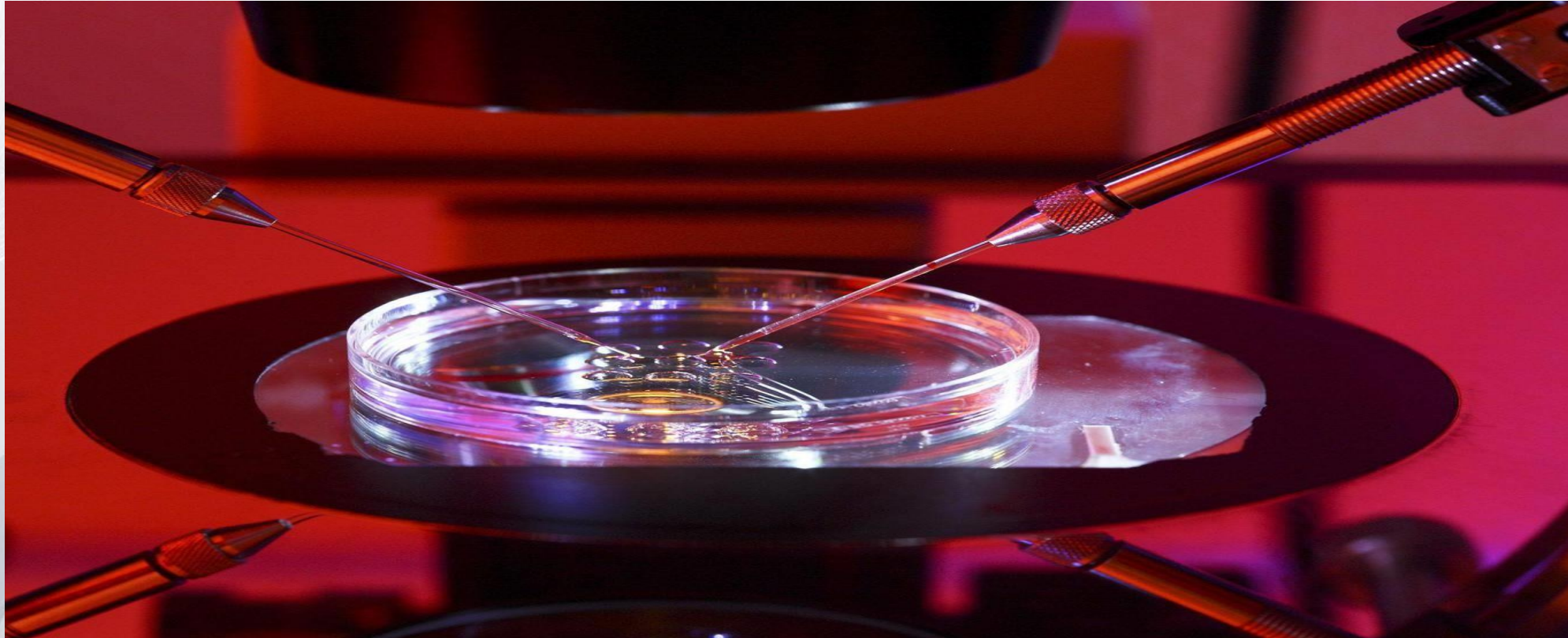
Could become normal for people to own the genetic profile

How to maintain a sustainable risk pool in the long run

Rethink the boundaries between insurable and uninsurable

What's Next?

Gene editing breakthrough allows precise fixes of humans and could destroy thousands of most deadly diseases



The new method could one day spell the end for inherited conditions such as genetic blindness to sickle-cell anaemia Rex

Thank you.

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