Hitchhiker's Guide to the Gene Galaxy

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Agenda

Say Hello to the Gene

- Past: what have we learnt?
- Future: the power of prediction and alteration
- DTC trends

Genetics and Insurance

- Regulatory boundaries
- Outlook of implications to the industry

SAY HELLO TO THE GENE

Past: What have we learnt

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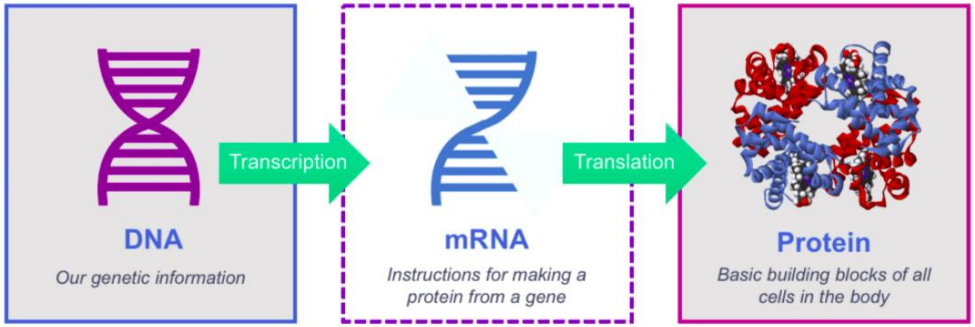
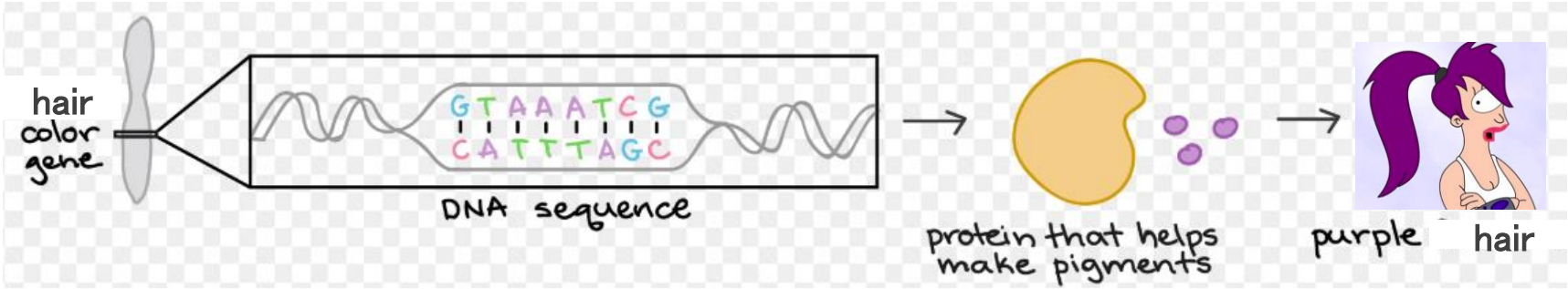
How do GENEs code for cells and bodies?



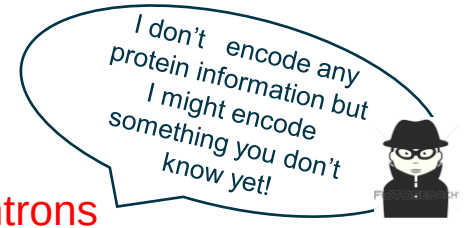


It is not about quantity!

The language of GENE

Genes

Introns

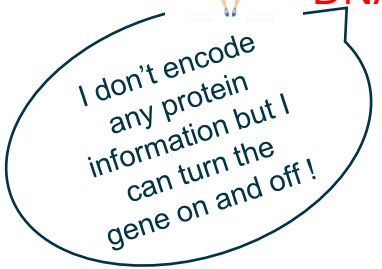


This…is……the….(…)…s…truc…ture..of…..your….gen…ome;

Intergenic DNA

Regions of DNA that regulate genes

Regions of DNA that regulate genes



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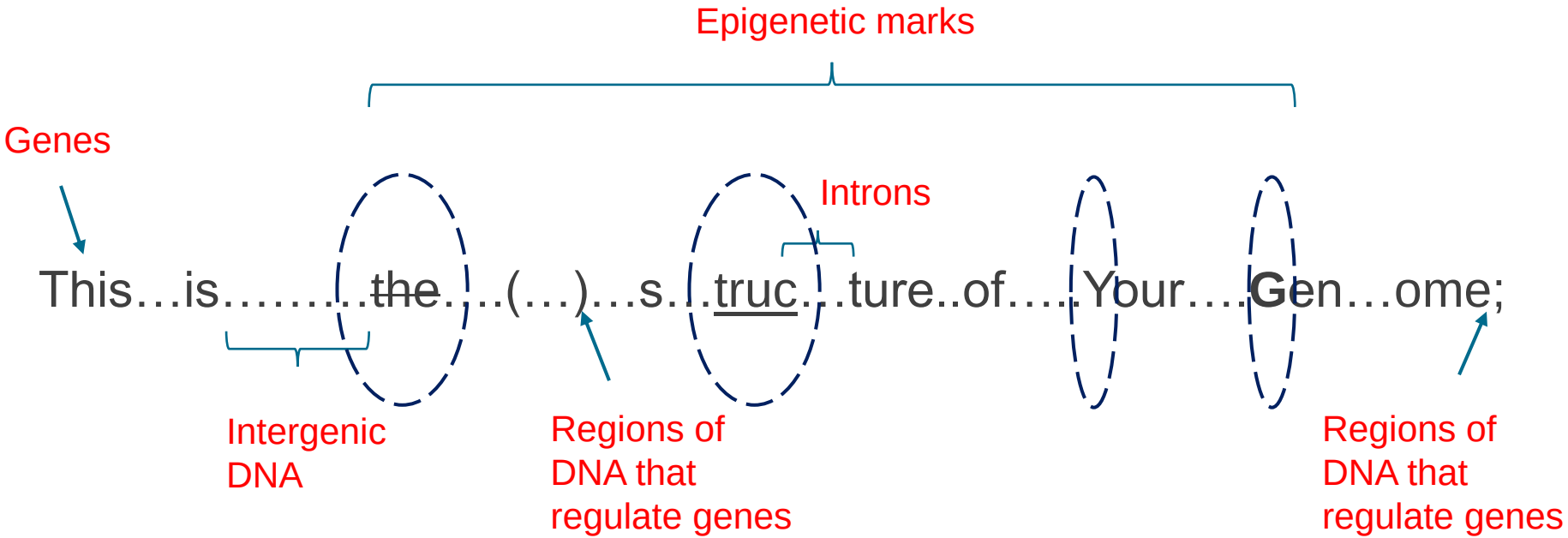
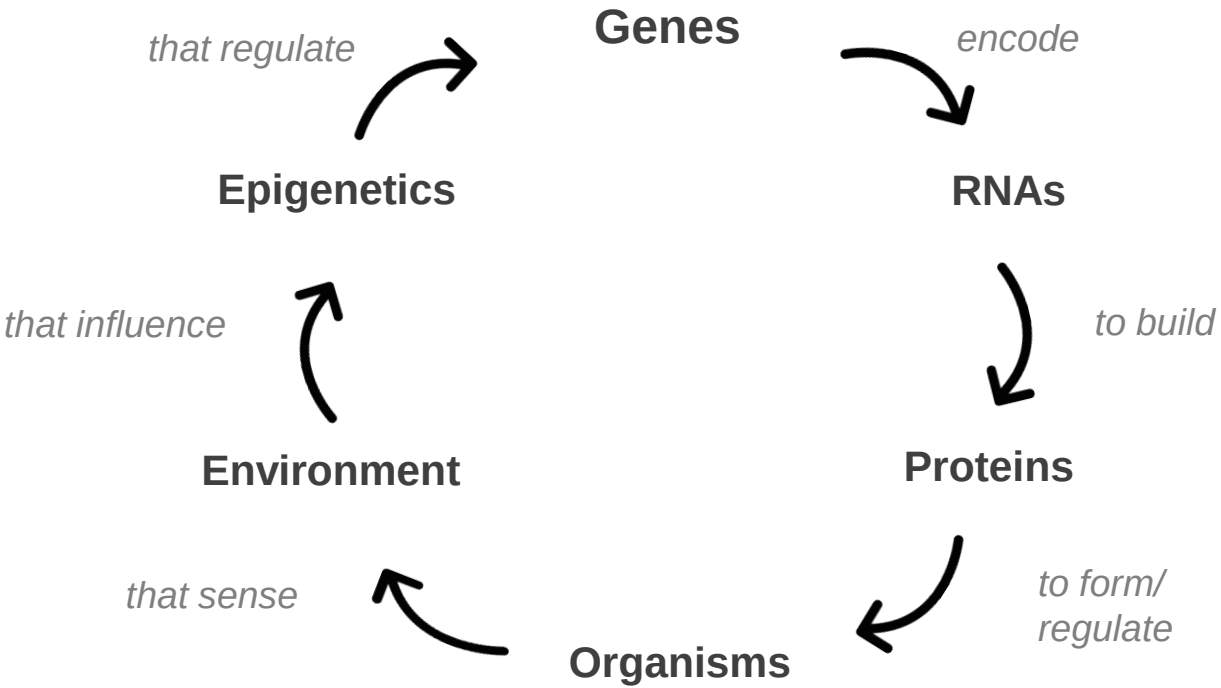
GENE's got memory!



To complete the picture…



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Future: The power of prediction and alteration

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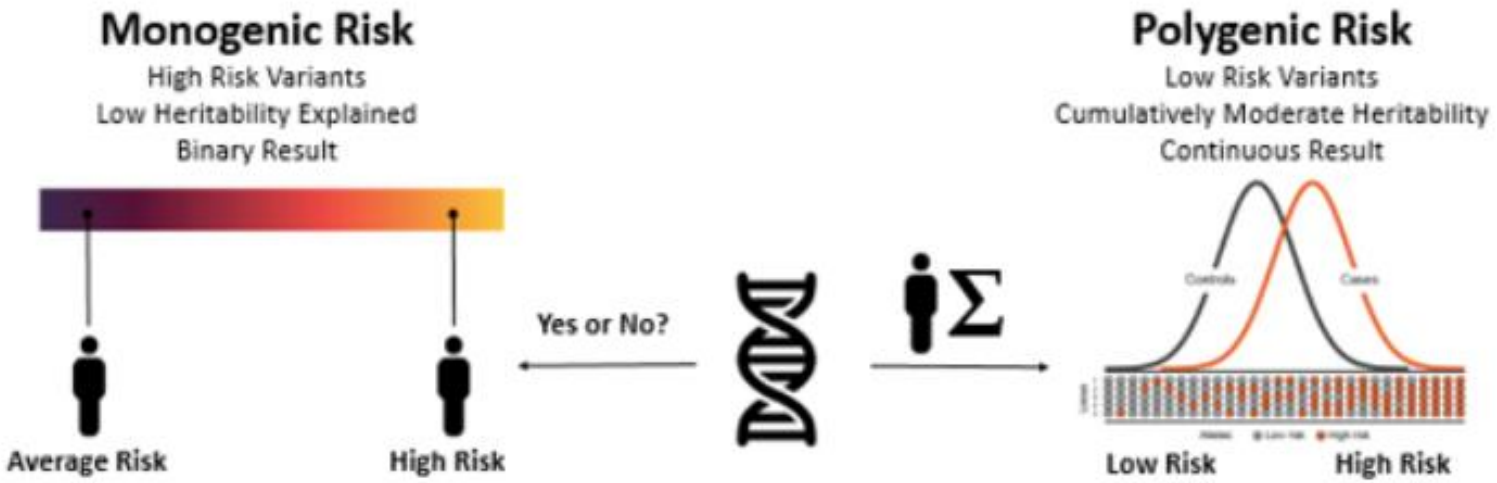
Predictive power: towards a brand new world

Current state

Future state



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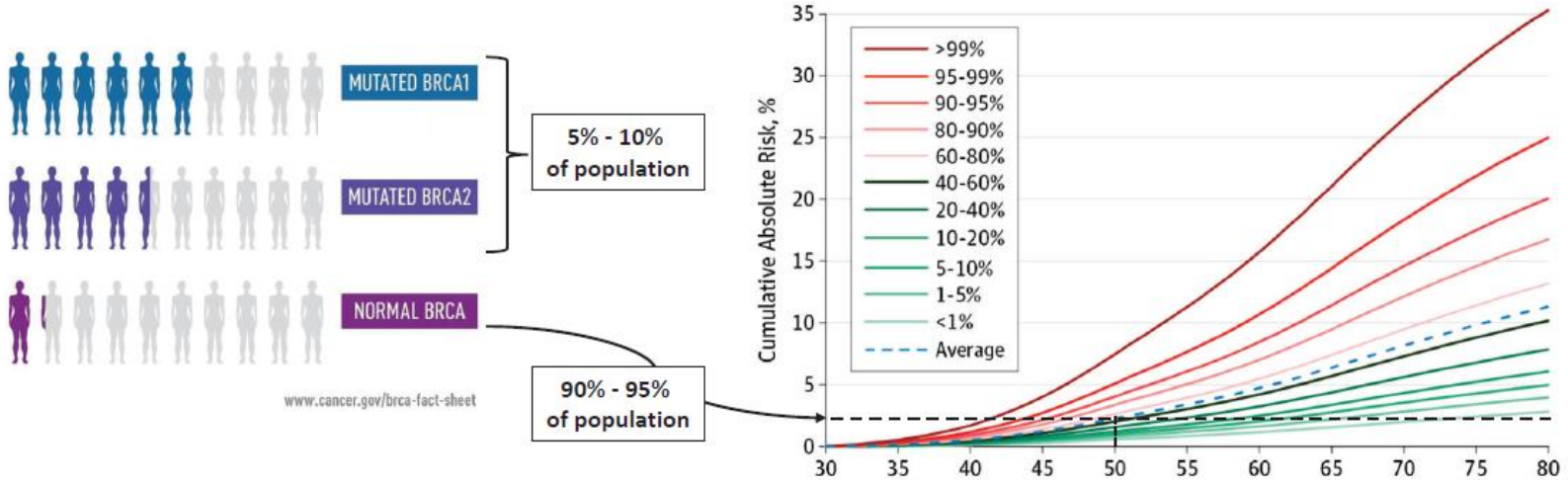
Source: Scripps Research

Predictive power: potential change in social progress



Risk-based initiation of screening mammography would allow:

- **Accelerated screening:** 16% of the population at 40 years of age have risk that is higher than that of an average 50-year-old
- **Delayed screening:** 32% of the population at 50 years of age have risk that is lower than that of an average 50-year-old

(Screening for breast cancer: US Preventive Services Task Force recommendation statement. Ann. Intern. 2016).

(Maas et al. JAMA Oncology 2018)

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Source: Scripps Research

Alteration power: example of BRCA1 gene carrier

What did she do?

- The patient underwent preventive breast and ovarian surgery
- She then was closely followed up medically for more than regular checkups
- She decided to reinforce physical activities and improve diet to lose weight

What are consequences?

- The overall survival in BRCA carrier is not different from that of the general population
- By doing prevention her individual risk is not different that the general population
- Her intrinsic risk of recurrence from the primary breast cancer is limited
- She is improving her health potential by more regular medical follow up and improving her health skill

Her personal risk of developing cancer is now considerably reduced

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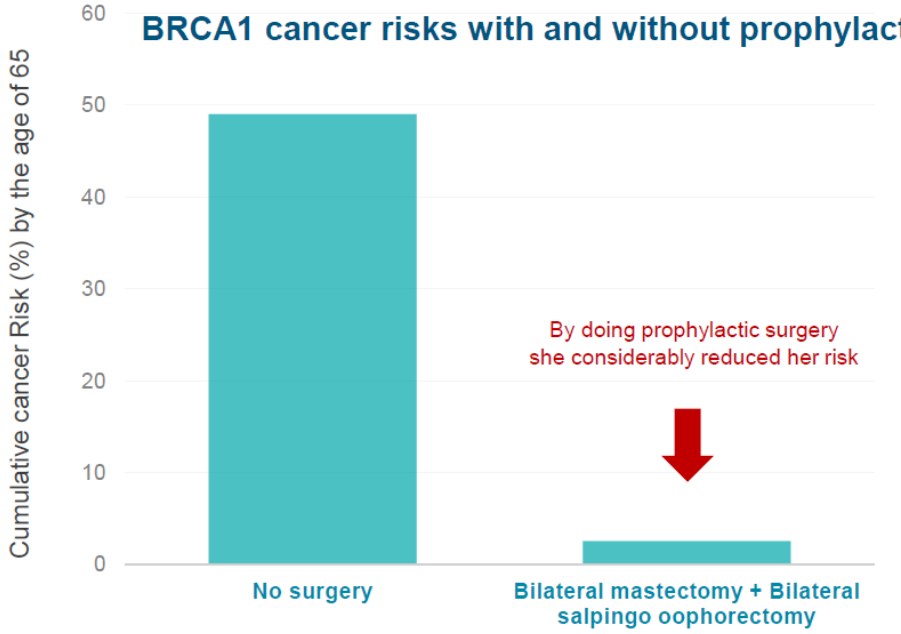
Alteration power: example of BRCA1 gene carrier



When preventively treated, the risk of developing breast and ovarian cancers for patient with BRCA1 mutation is the same as that in the general population

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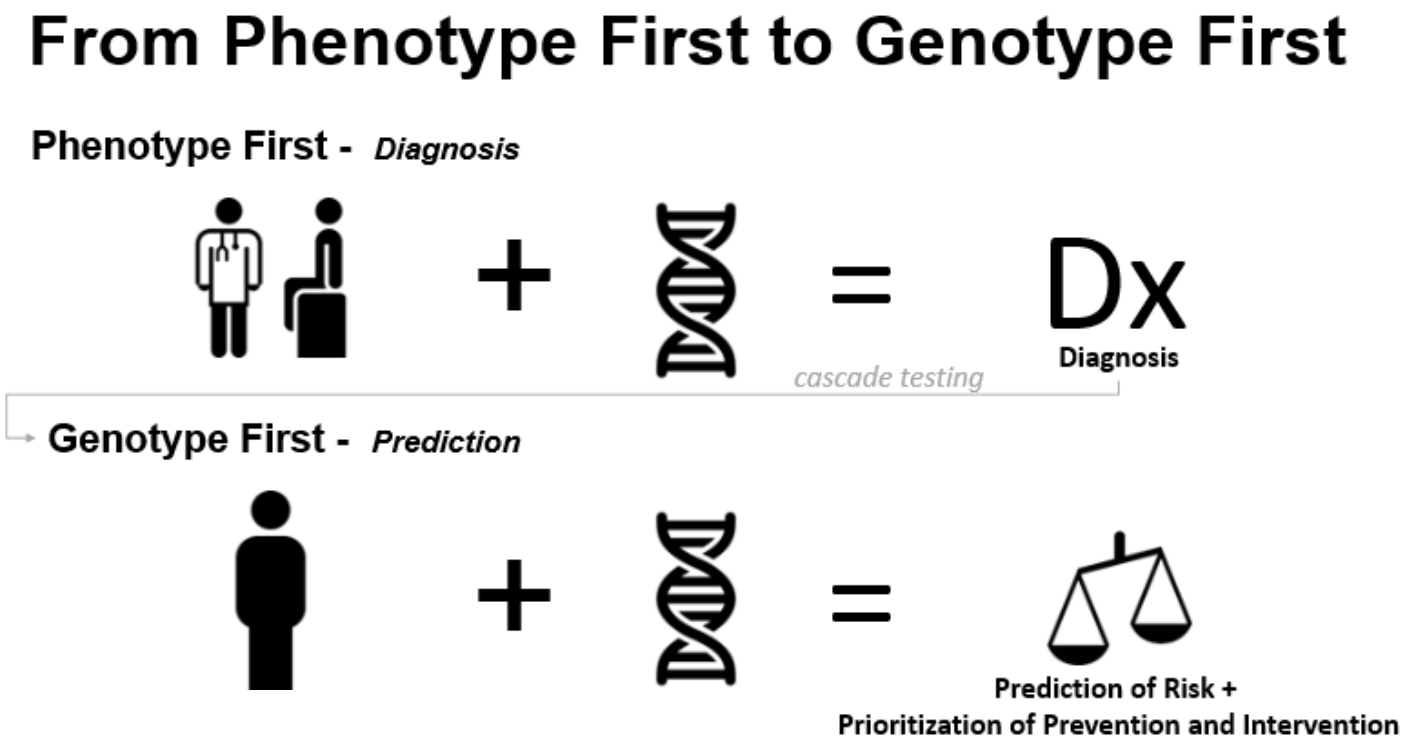
Predictive power: from monogenetic to polygenetic



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Source: Scripps Research

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DTC trends

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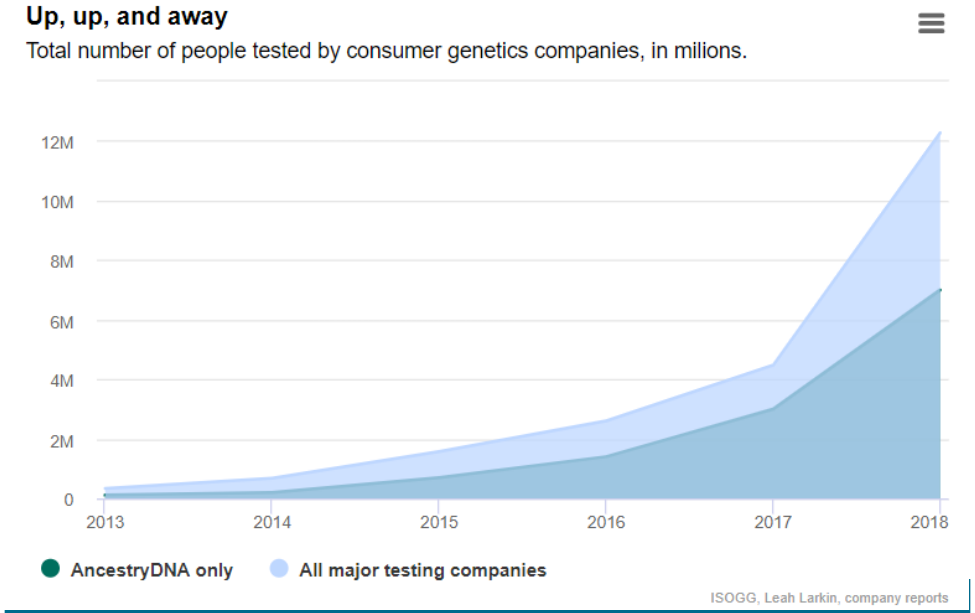
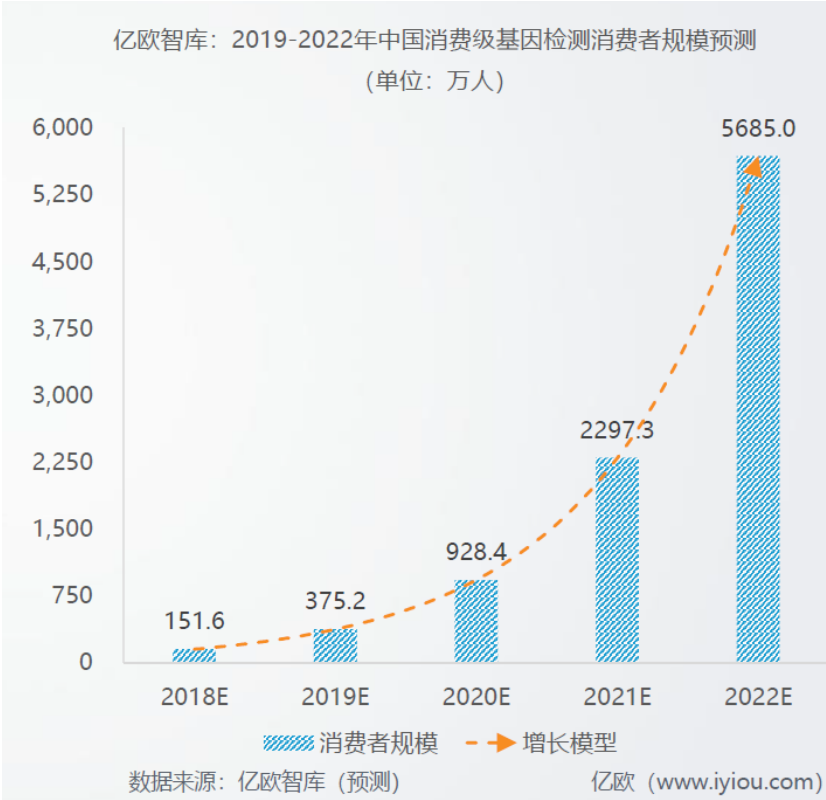
DTC trend





In US, according to PitchBook, 300,000 Americans have access to their genetic data; this number increased to 12 million in 2017. The penetration has increased from 0.1% to 3.75% within 5 years.

In China, 100,000 people have access to their genetic data in 2016; and this number increased to 300,000 in 2017.

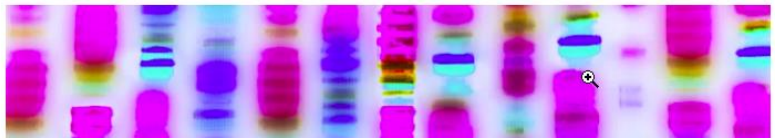
Source: EO Intelligence: 2018中国消费级基因检测市场研究报告
technologyreview.com/s/610233/2017-was-the-year-consumer-dna-testing-blew-up

Concerns about DTC genetic testing

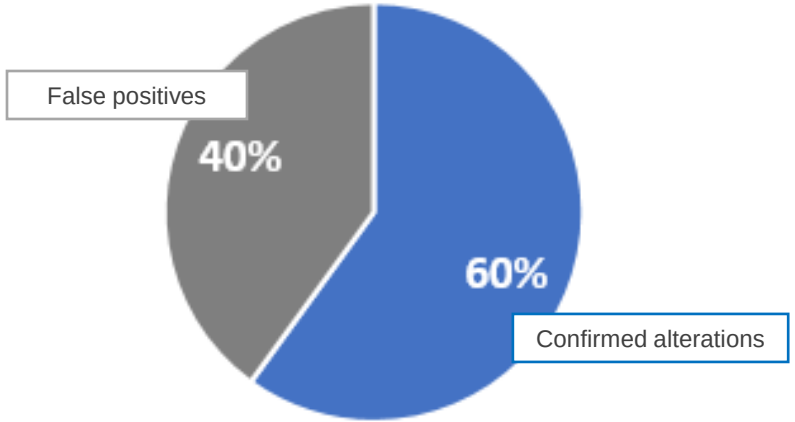
Inconsistent results among companies

I Took 9 Different Commercial DNA Tests and Got 6 Different Results

By Rafi Letzter, Staff Writer | November 5, 2018 09:42am ET



False-positive in DTC tests 2018



Tandy-Connor S et al. False-positive results released by direct-to consumer genetic tests highlight the importance of clinical confirmation testing for appropriate patient care. Genet Med. 2018 Mar 22

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Regulatory boundaries

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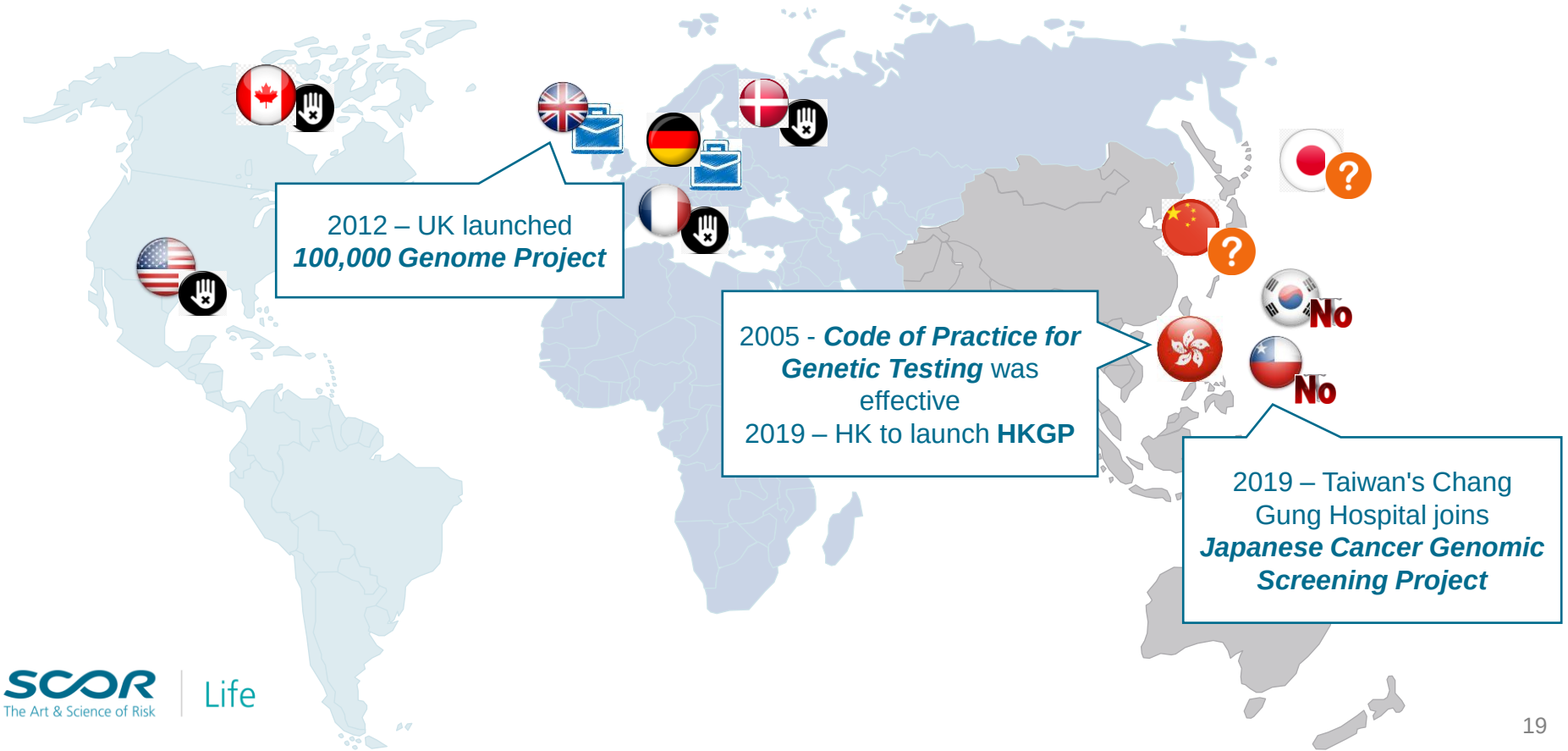
Regulatory developments around the world



GENETICS AND INSURANCE

Outlook of implications to the industry

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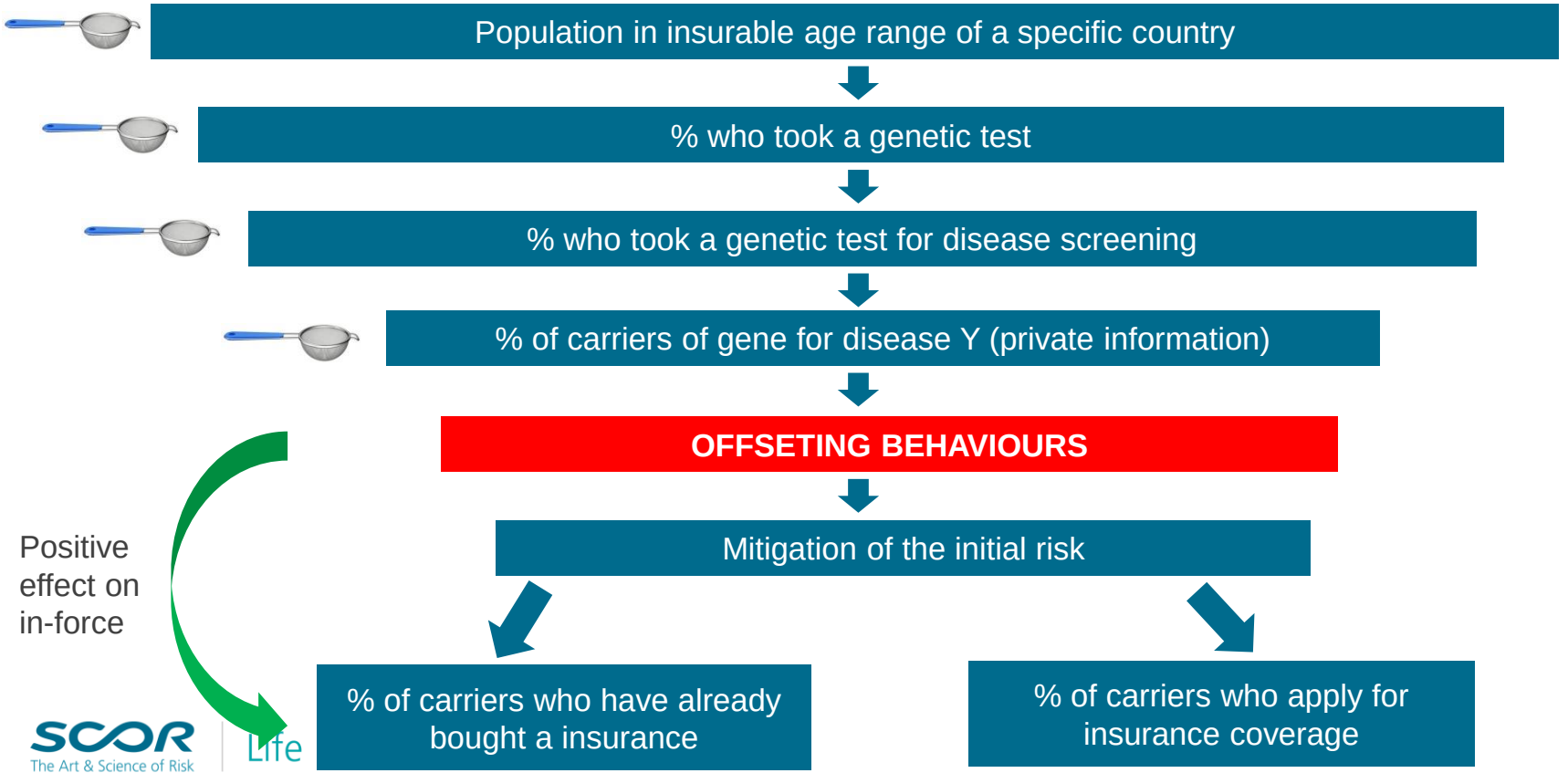
Anti-selection – filters that mitigate such due to GT



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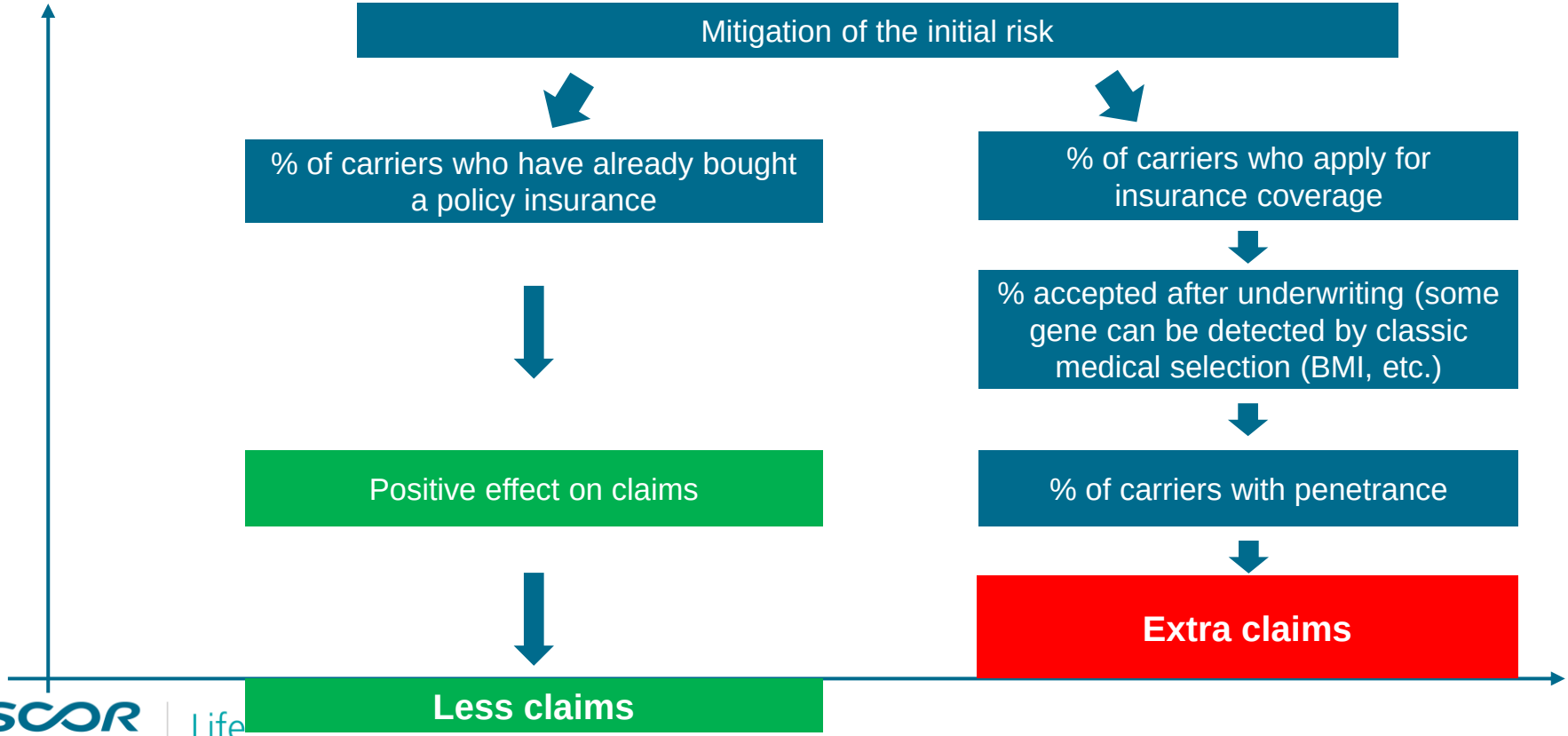

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Product design

Now and going forward

- Treatment / disease management
  - drug targets identification

- Prevention and mitigation
  - early screening / change in lifestyle
  - more aggressive prevention (e.g. preventive mastectomy)

- Wellness

  - e.g. combining genetic and lifestyle risk can improve cardiovascular risk evaluation and promotes positive lifestyle in 20% of persons who know their polygenetic profile

Underwriting

- Still less useful than family history, but for how long?

- currently for high penetrance diseases, it is not clear to what extent genetic testing will be more informative than traditional underwriting, because these diseases are often known because of family history

- The more we crack for low penetrance but common diseases, more likely it will have a bigger impact on underwriting

To end…

- Progress is one way – only gets better
- Social good/government will push for population having better understanding of relative risk for screening and treatment
- Adapt through underwriting restrictions, or product design, or both?
- How to turn risks into opportunities?

THANK YOU