# Session 158: Emerging Topics in Underwriting

# Happy New Year!

NYDFS issued Circular Letter #1 (2019)

"New York Takes the Lead on Insurers' Use of Big Data and Algorithms" **(Faegre Baker Daniels, January 22, 2019)**

"New York Circular Letter No. 1 (2019) takes aim at accelerated underwriting" **(Eversheds Sutherland (US) LLP, February 27, 2019)**

# Use of External Data in Life Insurance Underwriting

- Driven by emergence of unconventional external data sources

- Results of investigation started in 2017

- External data includes data not directly related to the applicant's medical condition

- Also excludes MIB, MVR and criminal history search

# Using external data sources has benefits

- Potential benefits to insurers and consumer

- Simplify and expedite sales and underwriting

- Result is more accurate underwriting and pricing

# BUT

# There are also concerns, regulatory concerns

- Variance in accuracy and reliability

- Not all sources are subject to regulatory oversight & consumer protections

- Clarity on consumer consent

# Use of external data has requirements

Non-discriminatory

Valid rationale

Established guidelines & practices

Transparency

Independently verified

# Unlawful Discrimination

- May not use external data that uses prohibited information
- External data has "potential" to reflect disguised and illegal race-based underwriting
  - Geographical data (incl. community-level mortality, addiction or smoking data)
  - Homeownership data
  - Credit information
  - Educational attainment
  - Licensures
  - Civil judgements and court records
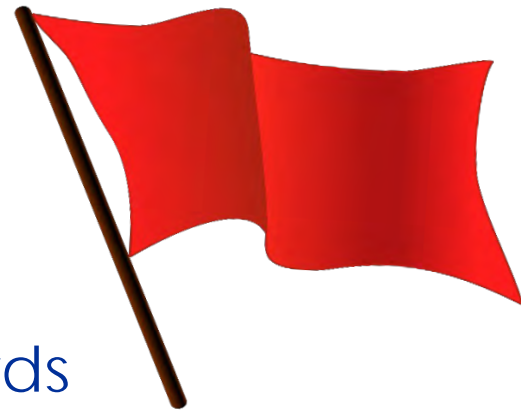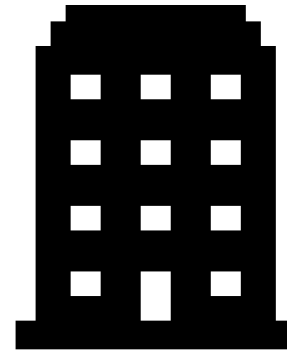
# Adverse Action

- Includes requiring a more robust underwriting path

- Reasons for adverse action must be provided

- Specific source for adverse underwriting decision must  be disclosed

**Burden of proof is on insurer**

ABC
Life

# Closing

- Use ONLY if insurer has determined no prohibited criteria
- Algorithms/predictive models cannot unfairly discriminate
- Must be based on sound actuarial principles
- Must have valid explanation or rationale
- Must disclose content and source of data
- Department has right to audit u/w criteria, programs, algorithms, and models
- Disciplinary action can result.

# Emerging Topics

# New NAIC Working Group focused on Accelerated Underwriting

- Focused on use of external data and data analytics in accelerated life underwriting, including:
    - Consideration of the ongoing work of the Life Actuarial (A) Task Force on the issue;
    - If appropriate, will draft guidance for the states.
    - First meeting October 2
    - Starting with level setting "to gain a better understanding of AUW in life insurance and the different perspectives on the pros, cons, and concerns."

# Rumblings and Restrictions

- Naloxone
- Use of genetic testing
- Wearables
- Use of sex / gender identify
- Data collection and privacy
- Algorithmic accountability

STOP

# Naloxone

- Several states implemented laws which restrict declination or rating of insurance applicants with subscriptions for Naloxone, without further evidence
  - NY required companies to look back and allow applicants previously declined to reapply
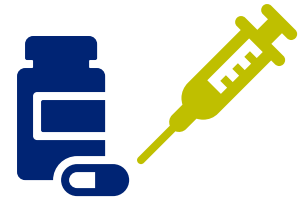
# Genetic testing – Can we or can't we?
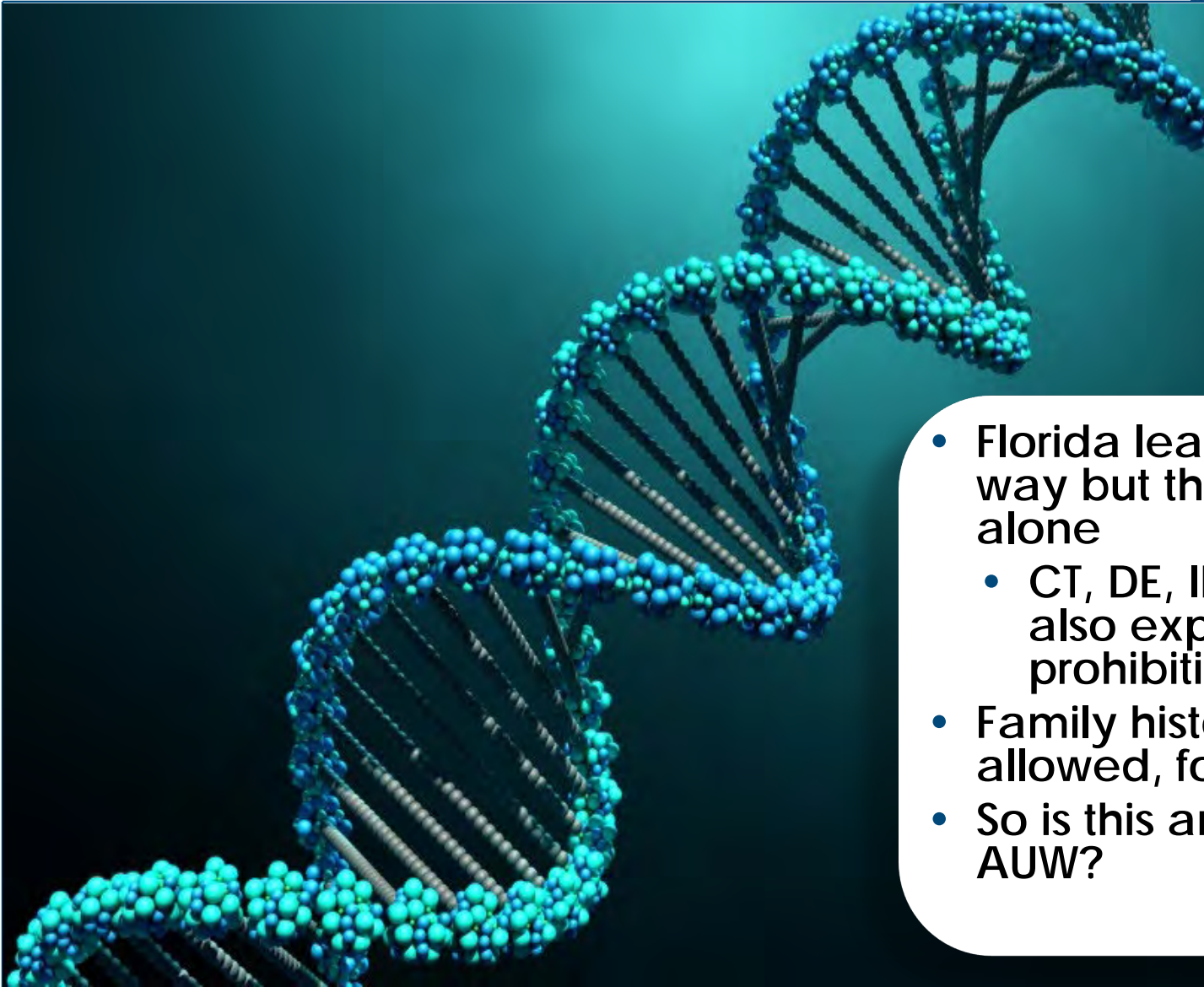
- **Florida leading the way but they are not alone**
  - CT, DE, IL, ME & NC also expanding prohibitions
- **Family history still allowed, for now**
- **So is this an issue for AUW?**

# What about wearables?



## Regulator Concerns:

- Not regulated
- Data not subject to HIPPA
- Accuracy in the data
- Some regulators want to regulate its use similar to genetic and health data
  - ➡ Federal senate bill 1842 (AK, MN)
    - Protecting Personal Health Data Act (PPHDA)
    - Protection of PHI from health technologies such as:
      - Health apps
      - Wearable devices
      - DTC genetic testing kits
    - Currently in Committee on Health, Education, Labor, and Pensions.

# Gender identity – Not specific to AUW

- Gender v Sex
    - More and more states recognizing non-binary identities
    - Carriers may not make inquiry towards identity
- Gender neutral rates
    - Some momentum on P&C and DI, will we see on life?

# Data collection and privacy regulations at both state and federal level



## Regulator Concerns:

- How and what data is collected
- Knowledge of collection
- Consent to collect and purpose of use
- Social media and purchase data
- Disparate impact
- Ability to dispute and correct
- EU GDPR is model for several state proposals on data privacy
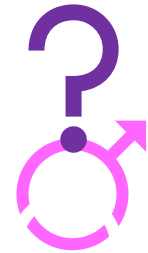
# California's Consumer Privacy Act

**CA**
**CCPA**

- Modeled after EU GDPR
- Effective January 1, 2020
- Focus areas include:
  - Notification to consumers of privacy practices;
  - Handling consumer requests for information such as opt-in, right to be forgotten and data correction;
  - Verifying consumer identities relating to requests; Special rules regarding minors; and
  - Discriminatory practices.

# CA Ballot 3 Initiative is a bit more problematic – Amends CCPA

- The California Privacy Rights and Enforcement Act of 2020
- Exposed October 10 with comment period until December 6
- Includes several troubling requirements for insurance companies:
    - Algorithms used to automatically make decisions about insurance must explain their reasoning to consumers;
    - Creates new rights around the use and sale of sensitive personal information, such as health and financial information, racial or ethnic origin, and precise geolocation;
    - Requires companies to disclose "profiling" that results in a "significant adverse" effect on a consumer with respect to a number of services including insurance.
        - **"Adverse" defined as a "denial, cancellation, increase in charge, reduction in benefit or other such adverse or unfavorable change in terms of coverage or benefit to, consumers."**
    - Furthers extends requirements on "right to be forgotten", data correction
    - A business must provide the length of time that they intend to retain each category of PI  - can't keep PI for longer than is "reasonably necessary" for the specific disclosed purpose.
    - Creates a privacy enforcement agency

# Other state privacy regulations emerging and differ from one another

- ND, MA, MD, NH all have regulations that differ significantly from CCPA and the NAIC Insurance Data Security Model

- State by state regulation is problematic

# Algorithmic accountability

Algorithmic Algorithmic Accountability Act of 2019 (HR.2231; S.1108)

- How to regulate automated decision-making
- Concerned around:
    - Fairness and accuracy;
    - Ability to dispute/correct errors
    - Mistakes around anti-discrimination and bias
- Requires a Data Protection Impact Assessment (DPIA)
    - Relative benefits and costs of the automated decision system in light of its purpose

Gives FTC the power to monitor and audit algorithms of covered entities via third party auditors before allowed to use

Covered entities include companies:

- Under FTC jurisdiction under Section 5(a)(2) of the FTC Act
- With $50 million+ average annual revenue in past 3 years
- Posses data on 1 million+ consumers or 1 million+ consumer devices

# In Conclusion

- 2019 has seen significant regulatory activity which impacts underwriting, use of personal data, algorithms and consumer privacy/rights

- 2020 expected to see an increase in activity at both the state and federal level

# Contact Information

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# Emerging Issues in Underwriting Survey

➢ **Specifics of the 2019 Survey**
- Survey conducted from July – September 2019 with 34 respondents (22 United States and 12 Canadian).
- Survey Focused on:
  - Impact of Genetic Testing
  - Sex and Gender
  - Marijuana
  - E-Cigarettes
  - Financial Underwriting
  - Advances in Medical Technology
  - Communication/Education
  - Behavioral Economics
  - New Data Sources and Social Media
- Caveats – Preliminary Results Pending approval by SOA

# Background Information

| Automated UW Rules Engine (URE) Utilized | Respondents |
|---|---|
| Yes | 20 |
| No | 14 |
| **Total # of Respondents** | **34** |

| How often is URE regularly updated | Respondents |
|---|---|
| Monthly | 2 |
| Quarterly | 3 |
| Twice per year | 2 |
| Annually | 1 |
| Ad hoc | 12 |
| **Total # of Respondents** | **20** |

# Background Information

➤ Including, but not limited to, your last changes to the URE, which of the following reasons impacted your decision? (Choose and Rank)

| Reason behind change to URE | 1st | 2nd | 3rd | Chosen Top 3 |
|---|---|---|---|---|
| New data source | 7 | 4 | 6 | 17 |
| New risk class | 1 | 5 | 4 | 10 |
| Changes in algorithm | 4 | 5 | 4 | 13 |
| Changes in issue ages | 1 | 0 | 0 | 1 |
| Changes in face amount | 0 | 1 | 1 | 2 |
| Changes in risk class | 4 | 2 | 2 | 8 |
| Regulatory changes | 0 | 3 | 2 | 5 |
| Other | 4 | 1 | 2 | 7 |
| **Total # of Respondents** | **21** | **21** | **21** | **21** |

# Background Information

➤ Which of the following impacts your company in making changes to its URE? (Choose and rank)

| Impacts to Making Changes to URE | 1st | 2nd | 3rd | Chosen Top 3 |
|---|---|---|---|---|
| Financial (cost of changes) | 6 | 9 | 2 | 17 |
| IT staff resources | 5 | 6 | 5 | 16 |
| Underwriting resources | 4 | 5 | 7 | 16 |
| Competition | 2 | 0 | 6 | 8 |
| Other | 3 | 0 | 0 | 3 |
| **Total # of Respondents** | **20** | **20** | **20** | **20** |

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# Genetic Testing

| Handling of Predictive Genetic Test (offered to asymptomatic individuals with a family history of a genetic disorder to predict future risk of disease) | Respondents |
|---|---|
| Refer to Medical Director | 15 |
| Follow company underwriting guidelines without referring | 11 |
| Refer to Chief Underwriter | 10 |
| Refer to specialized underwriting unit | 2 |
| Other | 6 |
| **Total # of Respondents** | **33** |

| Handling of Diagnostic Genetic Test (to confirm or rule out a known or suspected genetic disorder) | Respondents |
|---|---|
| Follow company underwriting guidelines without referring | 13 |
| Refer to Medical Director | 12 |
| Refer to Chief Underwriter | 10 |
| Refer to specialized underwriting unit | 2 |
| Other | 5 |
| **Total # of Respondents** | **33** |

# Genetic Testing

| Handling of genetic test information received where use is prohibited by law | Respondents |
|---|---|
| Don't redact, but document that it's not to be used for underwriting purposes | 28 |
| Redact information from file | 4 |
| Other | 2 |
| **Total # of Respondents** | **34** |

| Acceptable sources of genetic testing to be used in UW where not prohibited by law | Respondents |
|---|---|
| Information in a doctors report | 24 |
| Information provided by the client (application, paramed, tele-interview) | 14 |
| None | 6 |
| Other | 3 |
| **Total # of Respondents** | **33** |

# Genetic Testing

➤ If an at-home testing kit is used, does your company have rules in place to restrict the use of discriminatory information such as race, ethnic origin, etc?

| Rules Used | Respondents |
|---|---|
| Yes | 9 |
| No | 17 |
| **Total # of Respondents** | **26** |

➤ Level of Underwriting Department's monitoring regulatory changes:

| Regulatory Changes | Respondents |
|---|---|
| Actively Monitoring | 30 |
| Not Actively Monitoring | 3 |
| **Total # of Respondents** | **33** |

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# Genetic Testing

➢ Which of the following best describes your company's reactions to possible future regulations prohibiting the use of genetic information?

| Reaction to | Pricing Impact | Operational Impact (new business) | Operational Impact (inforce) | Reputational Risk |
|---|---|---|---|---|
| Minimal to No Impact | 8 | 11 | 19 | 12 |
| Mild Impact | 12 | 11 | 3 | 6 |
| Significant Impact | 4 | 4 | 3 | 10 |
| Unknown | 8 | 5 | 7 | 4 |
| **Total # of Respondents** | **32** | **31** | **32** | **32** |

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# Genetic Testing

➢In response to the increasing focus on genetics and its impact on underwriting, which of the following best describes the changes your company is contemplating?

| | Application Questions | Family History Criteria | Financial Underwriting Guidelines | Medical Underwriting Guidelines |
|---|---|---|---|---|
| Not Actively Considering | 15 | 17 | 26 | 11 |
| Thinking About It | 8 | 10 | 3 | 11 |
| In Process | 2 | 1 | 1 | 4 |
| Implemented | 8 | 5 | 3 | 7 |
| **Total # of Respondents** | **33** | **33** | **33** | **33** |

# Sex and Gender

| Differentiation between sex and gender | Respondents |
|---|---|
| Yes, we treat them differently based on state/province regulation | 7 |
| Yes, we treat them differently | 12 |
| No, but we plan to | 4 |
| No, we use them interchangeably | 11 |
| **Total # of Respondents** | **34** |

| What does your company ask in its application | Respondents |
|---|---|
| Gender | 13 |
| Sex | 18 |
| Sex at Birth | 3 |
| **Total # of Respondents** | **34** |

| UW Department Monitoring of Regulatory Changes | Respondents |
|---|---|
| Actively Monitoring | 30 |
| Not Actively Monitoring | 4 |
| **Total # of Respondents** | **34** |

# Sex and Gender

➢ Which of the following best describes your company's reactions to regulations regarding sex and gender?

|  | Pricing Impact | Operational Impact (new business) | Operational Impact (inforce) | Reputational Risk |
|---|---|---|---|---|
| Minimal to No Impact | 10 | 11 | 16 | 9 |
| Mild Impact | 9 | 15 | 9 | 9 |
| Significant Impact | 6 | 3 | 3 | 9 |
| Unknown | 7 | 3 | 4 | 5 |
| **Total # of Respondents** | **32** | **32** | **32** | **32** |

# Sex and Gender

| Handling of Inforce Business when sex/gender changed | Sex | Gender |
|---|---|---|
| Change with Underwriting | 12 | 8 |
| Change without Underwriting | 15 | 18 |
| Don't Allow Changes | 5 | 6 |
| **Total # of Respondents** | **32** | **32** |

| Adjust UW based on sex at birth versus current gender | Respondents |
|---|---|
| Yes | 9 |
| No | 25 |
| **Total # of Respondents** | **34** |

| Company Philosophy Relative to Sex and Gender | Respondents |
|---|---|
| Underwrite and rate based on sex at birth, but correspond with client based on current gender | 16 |
| Underwrite, rate, and correspond with client based on current gender | 16 |
| Underwrite, rate, and correspond with client based on sex or gender at birth | 2 |
| **Total # of Respondents** | **34** |

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# Marijuana

➤ For marijuana, does your company differentiate by delivery type (smoked or taken orally)?

| Differentiate by Delivery Type | Respondents |
|---|---|
| Yes | 9 |
| No | 25 |
| **Total # of Respondents** | **34** |

➤ If yes, how do you differentiate?

| | Joints | Vaping/Juuling | Edibles | Pills/Capsules | Other |
|---|---|---|---|---|---|
| Non-Smoker Rates | 3 | 3 | 9 | 9 | 7 |
| Smoker Rates | 6 | 6 | 0 | 0 | 0 |
| Total | 9 | 9 | 9 | 9 | 7 |

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# Marijuana

| Differentiate by Amount or Frequency | Respondents |
|---|:---:|
| Both | 17 |
| Frequency Only | 16 |
| Neither | 1 |
| **Total # of Respondents** | **34** |

| Differentiate by Medicinal versus Recreational | Respondents |
|---|:---:|
| Yes | 8 |
| No | 24 |
| Considering | 2 |
| **Total # of Respondents** | **34** |

# Marijuana

| How asked on application | Respondents |
|---|---|
| Amongst listing of other illicit drugs | 14 |
| As a standalone question | 12 |
| Combined with the smoking questions | 4 |
| Other | 4 |
| **Total # of Respondents** | **34** |

| Age Related Guidelines | Respondents |
|---|---|
| Yes | 17 |
| No | 17 |
| **Total # of Respondents** | **34** |

| Age Guidelines | Respondents |
|---|---|
| 18 | 13 |
| 21 | 2 |
| 25 | 1 |
| **Total # of Respondents** | **16** |

# Marijuana

| Do you test for marijuana | Respondents |
|---|---|
| Yes, as an age and amount screening test on some basis | 5 |
| Yes, as a reflexive test in some context | 7 |
| Yes, both | 2 |
| No, but we are considering doing so on some basis | 2 |
| No, we considered doing this and decided against it | 2 |
| No, we have not considered doing this | 16 |
| **Total # of Respondents** | **34** |

| How is a positive test handled for non-disclosure | Respondents |
|---|---|
| Continue underwriting, but request additional details/evidence to address the client's non-disclosure (i.e. questionnaire in addition to an APS, etc.) | 13 |
| Decline due to nondisclosure | 1 |
| **Total # of Respondents** | **14** |

# E-Cigarettes

➢ Does your company specifically ask about e-cigarettes, vaping, etc. on its application?

| Asked on application | Respondents |
|---|---|
| Yes | 23 |
| No | 11 |
| **Total # of Respondents** | **34** |

➢ Does your company consider e-cigarette use as non-smoker?

| Consider as Non-smoker | Respondents |
|---|---|
| Yes | 6 |
| No | 28 |
| **Total # of Respondents** | **34** |

# E-Cigarettes

➢Does your company distinguish between different delivery systems, such as vaping, hookah, juuling?

| Deliver Differentiation | Respondents |
|---|---|
| Yes | 5 |
| No | 29 |
| **Total # of Respondents** | **34** |

➢Does your company have age-related e-cigarette guidelines?

| Age-related guidelines | Respondents |
|---|---|
| Yes | 1 |
| No | 33 |
| **Total # of Respondents** | **34** |

# Financial Underwriting

➤ Has mortality experience caused any changes in your financial guidelines?

| Changes in Financial Guidelines due to Mortality Experience | Respondents |
|---|---|
| Yes, we have maintained and avoided increasing our income multiples | 1 |
| No, we have increased our income multiples | 2 |
| No changes | 30 |
| **Total # of Respondents** | **33** |

➤ How often does your company review its financial guidelines?

| Review Frequency | Respondents |
|---|---|
| Annually | 9 |
| Twice per year | 2 |
| Ad Hoc | 22 |
| **Total # of Respondents** | **33** |

# Advances in Medical Technology

➢ Is your company monitoring medical advances, such as Wearables and liquid biopsy?

| Company Monitoring | Respondents |
|---|---|
| Yes, we talk about it regularly | 8 |
| Yes, we are aware, but not actively discussing | 8 |
| We rely on third party information | 7 |
| Under Consideration | 4 |
| No | 6 |
| **Total # of Respondents** | **33** |

# Advances in Medical Technology

➢ Is your company's underwriting department monitoring legislative changes, such as Truvada, Naloxone, or privacy-related issues?

| Company Monitoring | Respondents |
| --- | --- |
| Yes, we talk about it regularly | 19 |
| Yes, we are aware but not actively discussing | 7 |
| We rely on third party information | 4 |
| No, we rely on our compliance department | 1 |
| No | 2 |
| **Total # of Respondents** | **33** |

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# Communication & Education

| Underwriters and Actuaries Collaboration | Respondents |
|---|---|
| Product Development | 28 |
| Mortality Studies | 16 |
| Claims Experience | 15 |
| Industry Training | 6 |
| Other | 7 |
| **Total # of Respondents** | **32** |

| How does company encourage communication between Actuarial and Underwriting | Respondents |
|---|---|
| Shared Resources | 19 |
| Informal Education | 17 |
| Joint Education Sessions | 11 |
| Formal Education | 4 |
| None | 5 |
| Other | 6 |
| **Total # of Respondents** | **33** |

| Plans to improve Collaboration | Respondents |
|---|---|
| Yes | 18 |
| No | 6 |
| **Total # of Respondents** | **24** |

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# Behavioral Economics

➢Has your company implemented behavioral economics in your application process?

| Implemented in Application Process | Respondents |
|---|---|
| Yes | 12 |
| No, but we have discussed it and plan on implementing in the future | 10 |
| No, we have not yet discussed it | 11 |
| **Total # of Respondents** | **33** |

➢If yes, how would your company rate its overall success with the use of behavioral economics?

| Level of Success | Respondents |
|---|---|
| Some success | 4 |
| Too soon to tell | 8 |
| Total # of Respondents | 12 |

# Behavioral Economics

➢What does your company consider success with the use of behavioral economics?

| Consideration for Success | Reduced Fraud | Improved Mortality | Higher Quality of Responses | Improved Customer Experience |
|---|---|---|---|---|
| Very Important | 18 | 18 | 21 | 18 |
| Somewhat Important | 5 | 4 | 3 | 4 |
| Still Looking Into It | 8 | 9 | 7 | 7 |
| Not Important At All | 0 | 0 | 0 | 2 |
| **Total # of Respondents** | **31** | **31** | **31** | **31** |

# New Data Sources

| Incorporation of social media or internet searches in underwriting process | Respondents |
|---|---|
| Yes | 28 |
| No | 5 |
| **Total # of Respondents** | **33** |

| What is Used Regularly | Respondents |
|---|---|
| Google Searches | 26 |
| LinkedIn | 9 |
| Facebook | 6 |
| Instagram | 2 |
| Twitter | 2 |
| Other | 2 |
| **Total # of Respondents** | **28** |

| Used at time of claim | Respondents |
|---|---|
| Yes | 18 |
| No | 9 |
| **Total # of Respondents** | **27** |

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# New Data Sources

| Prompt Company to perform social media or internet search | Age | Face Amount | High Profile Person | Lab Scoring Results | Other Predictive Score Results | Other |
|---|---|---|---|---|---|---|
| Yes | 5 | 26 | 24 | 4 | 6 | 11 |
| No | 18 | 4 | 6 | 17 | 15 | 2 |
| **Total # of Respondents** | **23** | **30** | **30** | **21** | **21** | **13** |

| How are files documented | Respondents |
|---|---|
| General Description | 19 |
| Screen Capture | 8 |
| URL | 1 |
| Other | 3 |
| **Total # of Respondents** | **31** |

# New Data Sources

| Public data sources used to make an underwriting decision or prompt further investigation | Respondents |
|---|---|
| Yes | 20 |
| No | 13 |
| **Total # of Respondents** | **33** |

| Sources used | Respondents |
|---|---|
| Rx Database | 16 |
| Credit Score | 9 |
| Other | 7 |
| **Total # of Respondents** | **20** |

# New Data Sources

➤ Has your company made any adjustments to underwriting in response to New York Circular Letter #1 (2019) or other such letter that would impact accelerated underwriting (unlawful discrimination and transparency to consumers)? If yes, explain.

| Adjustment Made | Respondents |
|---|---|
| Yes | 5 |
| No | 27 |
| **Total # of Respondents** | **32** |

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# Thank You

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# The Speed of Change

RGA

# Major Milestones in the Modern History of Life Insurance



Edmund Halley Survival Table

Equitable Life Founded

Institute of Actuaries

U.S. Mortality Studies

| 1600 | 1693 | 1755 | 1762 | 1810-1830 | 1848 | 1889 | 1890 |

Friendly Societies

Age-Based Rates

First U.S. Life Insurance Companies Formed

Actuarial Society of America

U.S. Preferred Discounts

HIV Testing

AIDs Epidemic

Society of Actuaries

'Information Age'

| 1920 | 1949 | 1960s | 1980s | 1990s | 2000 | 2010s |

Formation of Underwriting Profession

Smoker Rates
U.S. Surgeon General Smoking & Health Report (1964)

Automated Underwriting of Application Forms

Digital Algorithmic Mortality Scoring

RGA

3

# Advances in Technology

That will impact our industry

**RGA**

# Computers Are Getting Smarter

**Artificial Intelligence**

Goal: Build systems that can do intelligent things

AI is a label that covers a lot of ground!

**ASI**
Super = beyond human

**AGI**
General = human level

**ANI**
Narrow = basic tasks
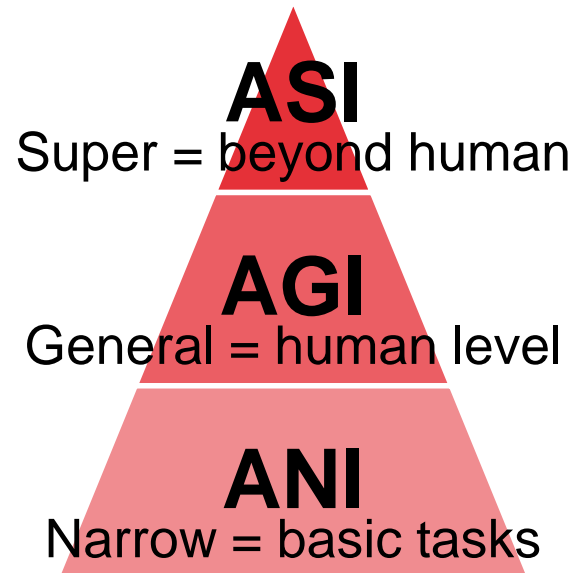
Tasks usually requiring human intelligence:

- Learning
- Problem-solving
- Reasoning
- Visual perception
- Speech recognition
- Processing languages
- Decision making

# Computers Can Hear

**Speech Recognition (type of AI)**

- Converting Voice-to-Text

- Main purpose is to <u>create data</u> that can be processed by a machine

- <u>Example</u>:  Could be used to convert a doctor consultation to text
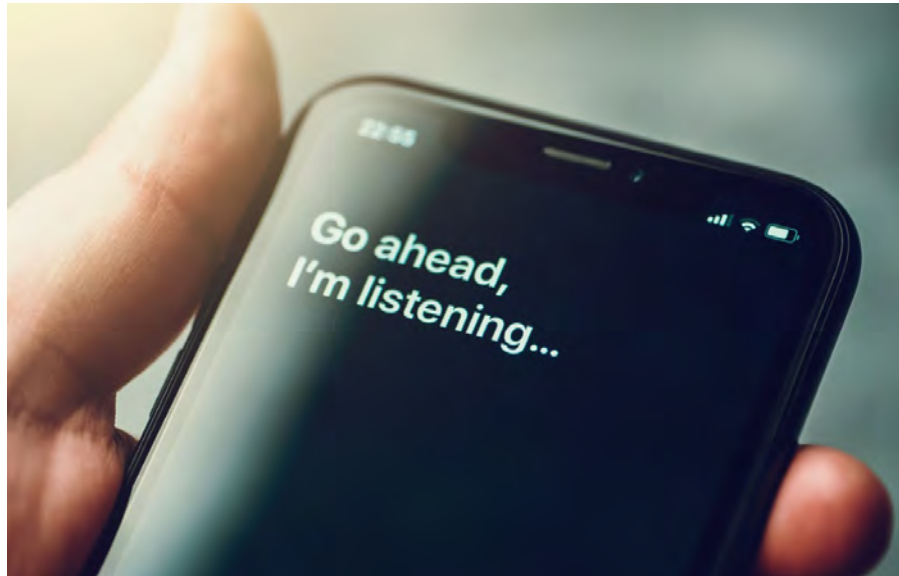
# …and See

**Radar, Lidar, Scanning, Cameras**

- Driverless cars utilize this tech

- OCR Technology (converting scanned images to text)

- <u>Example</u>:  Converting medical reports and other handwriting to digital data

# Computers Can Read and Understand

**Natural Language Processing (NLP)**

Goal:  Make computers as smart as humans at understanding language

- NLU = Extracting meaning from unstructured text

- NLG = Creating readable text from structured data

Examples:
- Med reports
- Recognition & prediction of disease
- Sentiment analysis
- Voice assistants & Samuel L. Jackson
- Spam filters
- Recruit talent
- Legal assistance
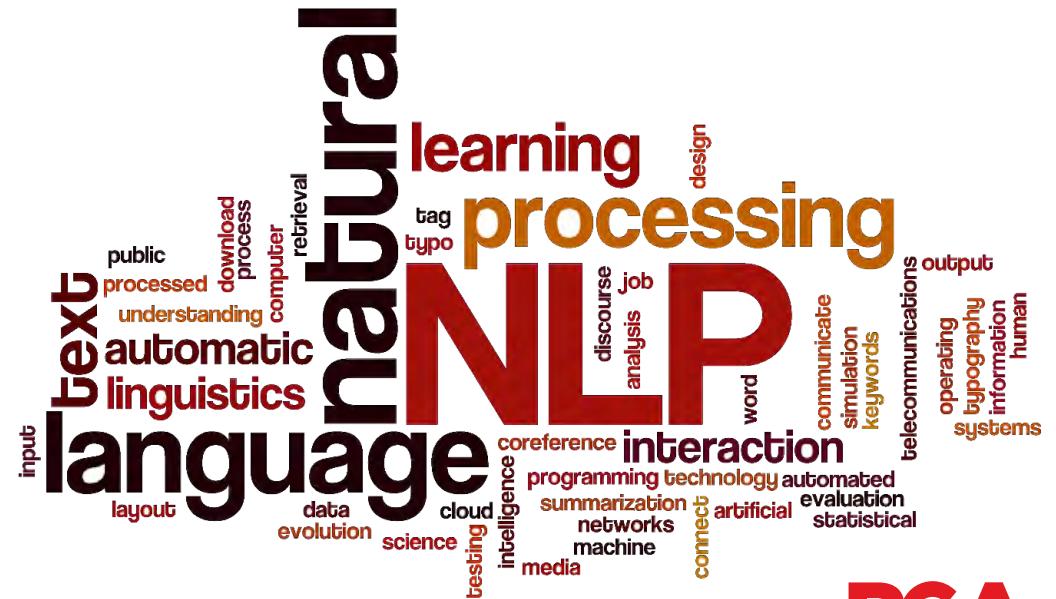
# Computers Can Learn and Connect Data
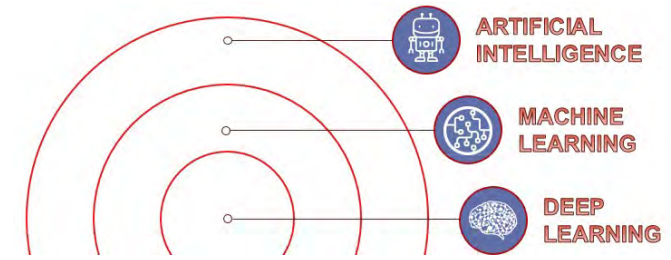
**Machine Learning (ML)**

- <u>Goal</u>: Devise algorithms to learn from experiences without human help
- Iterative in nature (utilizing NN's) – becoming better over time
- Results can be predictive, rankings, forecasts, scores, groupings, etc.

- <u>Examples</u>: Fraud detection, Review UW files and e-HR's (quicker and less invasive); Sentiment analysis; Read handwriting

Google's AI Detects 26 Skin Diseases with Accuracy Comparable to Dermatologists

By Jack Carfagno - September 17, 2019

**Deep Learning (DL)**

- <u>Goal</u>: Similar to ML, but has numerous layers of algorithms (deep NN's)
- vs. ML: Better with A LOT of data; needs more processing power; less feature engineering; longer run times; results are harder to interpret

- <u>Examples</u>: very good at image recognition; Google Translate now based on DL
    - 20 years ago… "Out of Sight, Out of Mind" = "Invisible Idiot"

**So, how reliable is Language Translation today?**

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# English → Language X → English

**How much wood could a woodchuck chuck if a woodchuck could chuck wood?**

**Better →**

**Spanish:** How much wood would a woodchuck throw if a woodchuck could throw wood?
**German:** How much wood would a woodchuck throw if a woodchuck could chuck wood?
**Japanese:** If wood chuck can chuck wood, how much wood does wood chuck chuck?
**French:** How much wood would a marmot chuck be if a marmot could put wood?
**Italian:** How much wood could a log send if a log could send the wood?
**Polish:** How much wood would a wood marmot knock off if it pulls wood?
**Welsh:** How much wood would the woodpecker throw if the woodpecker could fell trees?

**← Worse**

**Czech:** How much wood would fall if the wood fell wood?
**Hindi:** If a woodcutter can cut firewood, how much firewood will it choke?
**Hindi:** A logger can chuck, a logger can chuck **(removed the "?")**
**Romanian:** How much sausage would a woodchuck be if a woodchuck could play wood?
**Romanian:** How much wood could a tree crawl if a grain of wood could crack? **(1 day later)**
**Kurdish:** If a chick was able to grow a forest himself, what would a chick be?
**Kurdish:** If a chick can kill a chick, buy a chick **(removed the "?")**

**Conclusion… Always improving??**
**Very sensitive to the data provided**

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# Further Innovation

**The Cloud**

- Massive processing power and storage on demand
- Like a water utility – take what you need; turning tap vs. maintaining well
- Comfort with security and privacy still developing (education needed)

**Robotic Process Automation (RPA)**

- Computer runs routine tasks as a user would
- <u>Examples</u> of what RPA can do for insurers:
    - Gather, validate and analyze data
    - Communicate and assist customers
    - Monitor and report performance

**Edge Computing and IoT**

- Computing done at (or near) the source of the data
- IoT devices – by 2020, there will be 50 billion connected gadgets
- Regulation risk

"Medical" Advances

That will impact our industry

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# Digital Health Data (DHD)

**Very Complex data source**

What is DHD?



Electronic clinical & claims data

Claims Data | Diagnoses | Rx | Procedures | Tests | Labs

Obtained from a variety of digital health sources

Healthcare Payers & PBMs | Healthcare Provider EHR | Health Info Exchanges (HIEs) | Consumer Health Portals | Aggregators

| Code Category | Code Sets | Total Code Volume |
|---|---|---|
| Drugs | RxNorm; NDC | 625,000+ |
| Labs | LOINC | 85,000+ |
| Procedures | ICD-9-PCS; HCPCS/CPT; ICD-10-PCS | 100,000+ |
| Diagnoses | ICD-9: ICD-10; SNOMED-CT | 420,000+ |

- Hundreds of thousands of codes

- Difficult to interpret a full record

- Scoring tools are beneficial for converting data into effective UW

# Wearables

**Current Metrics**

- Steps and Activity

- Inactivity

- Sleep Tracker

- Heart Rate (recovery, max, min, night-time, etc.)

- Stress

- VO2 Max (max oxygen that can be used during exercise)

- Body Composition (fat and muscle mass)

- Body Temperature

**Fitness Levels & Inactivity**
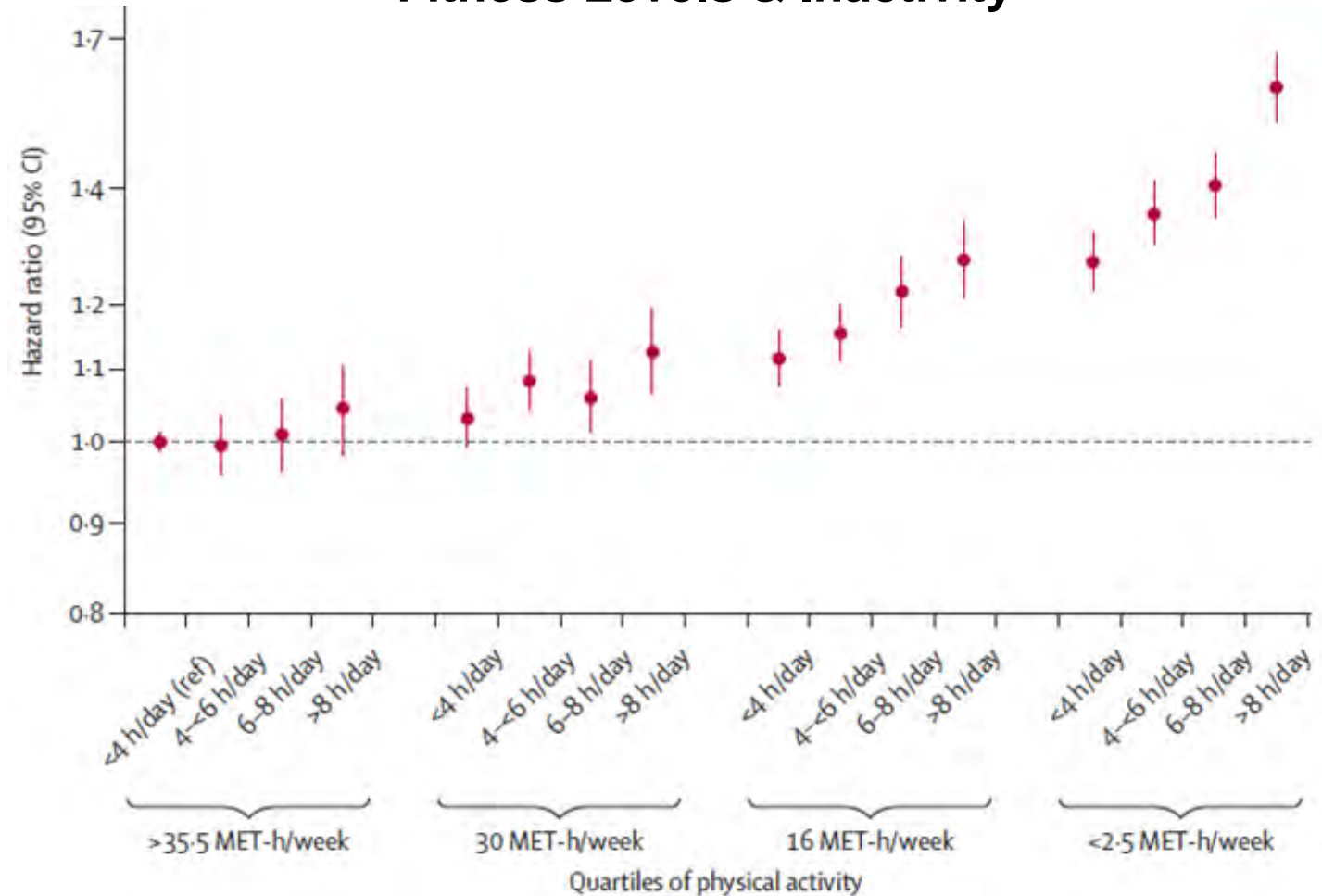


Ekelund et al (2016), http://dx.doi.org/10.1016/S0140-6736(16)30370-1

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# Wearables

**Emerging Metrics**

- Blood Pressure
- Pulse Wave Velocity
- Muscle Oxygen Levels
- Hydration
- Detecting / Monitoring Illness

**Future of Wearables in Insurance**

- Increase engagement with the customers
- Customer segmentation and Cross-sell
- Risk-based pricing
- Post-issue underwriting & Claims (CI business?)
- Distribution (in the wearables ecosystem)
- Even detect smoking??





https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4631252/pdf/nihms728785.pdf
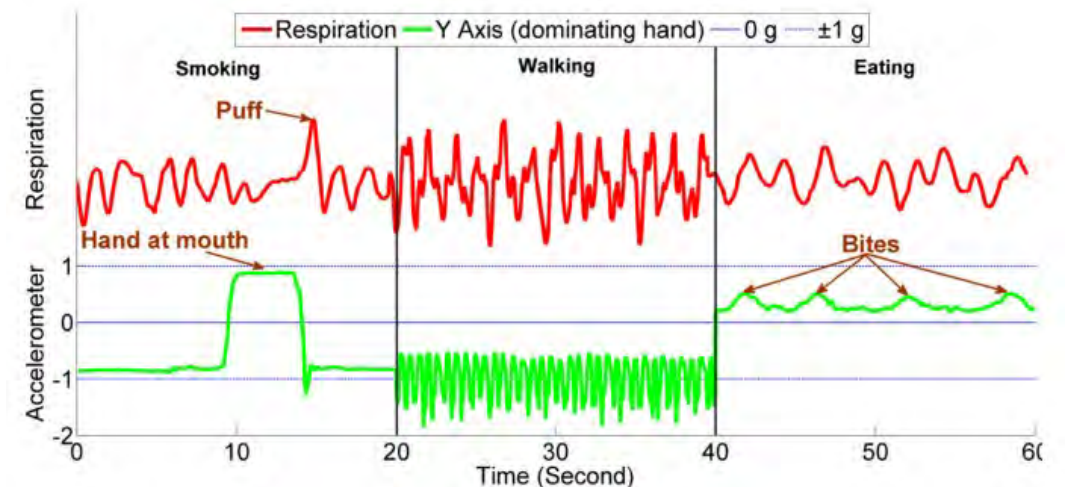
# Many Other Wearable Sensors

**Examples**

1. Blood Testing Lab
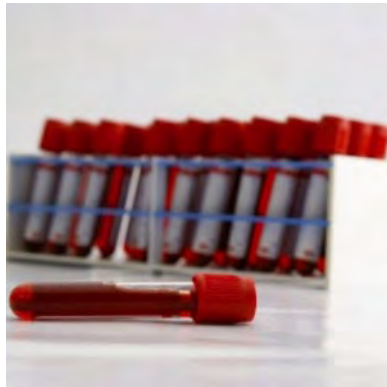


2. Skin Patches



3. EKG



4. CGM



5. Health Monitoring Devices



6. Mobile Disease Diagnosis



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# Genetic Testing

**Why Do We Care?**

- Longer life; Precision medicine and pharmacogenomics
- More accurate disease prediction and prognosis, including Polygenic Risk Scores
- Motivating lifestyle modification to prevent disease
- Risks: Reputational risk; Growing potential for anti-selection
- Regulations: evolving by state/country and product
- Many related technologies; Epigenetics
- Unbelievable amounts of new data!!

| 26 million | 600,000 | 800+ | No. 14 | 40 billion |
|---|---|---|---|---|
| Consumer genetic tests sold since 2012 | DNA variants measured by 23andMe | Diseases tested for genetic susceptibility | Genetic counselors are the 14th fastest growing occupation | Gigabytes of new genomic data generated a year by 2030 |
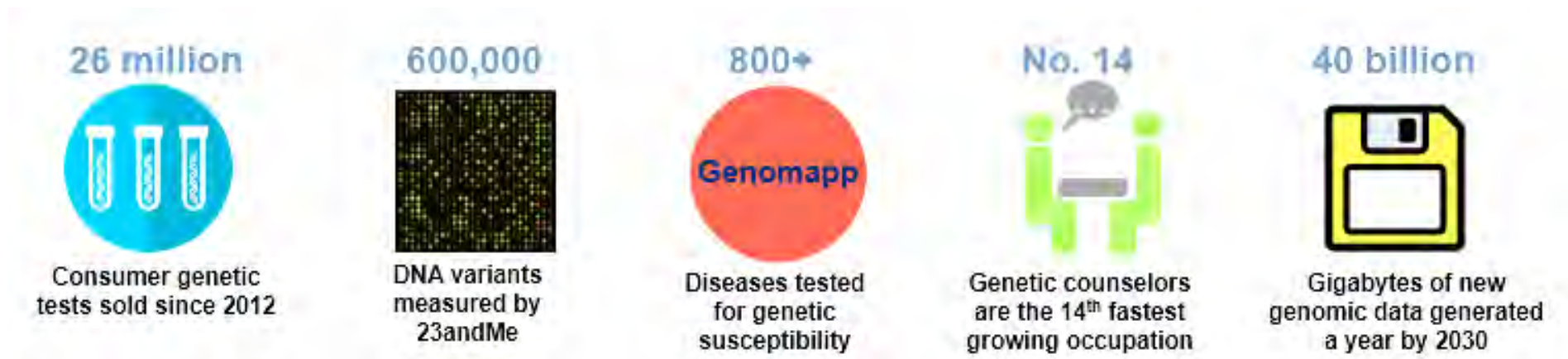
# Genetics

## Genome-Wide Association Studies

- Help scientists identify genetic variants associated with human diseases by testing millions of variants (SNPs)

- p-value has to be incredibly significant to claim association with a disease

Could be 1 million or more
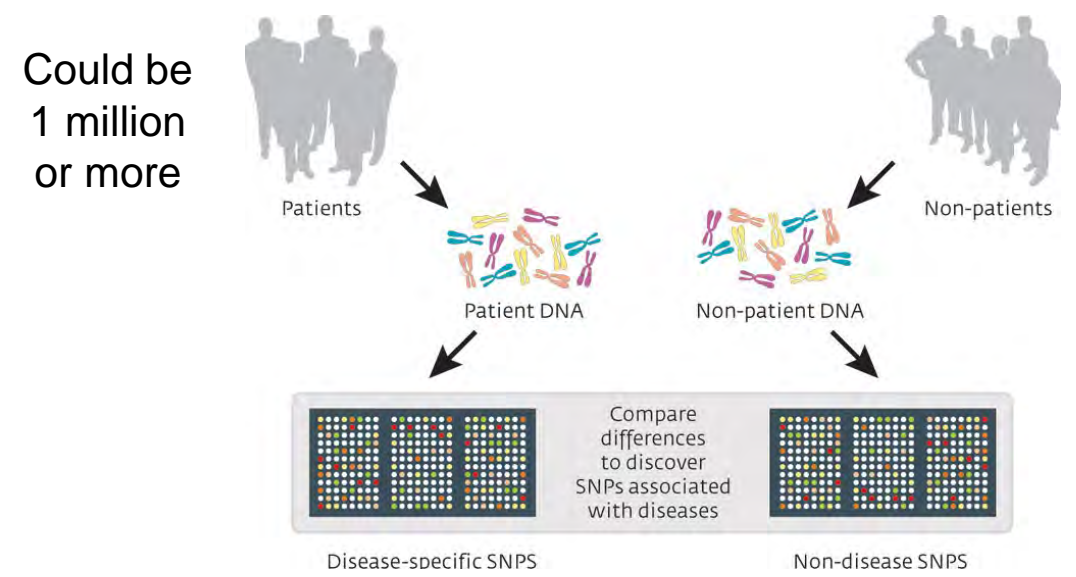


## Polygenic Risk Scores

- Have been a game changer in the field of genetics!

- PRS essentially add up the risk ratios of all relevant SNPs to get a genetic risk score

- Provides quantitative measure of risk

Identify SNP's from several studies

Add up SNPs

Compute PRS for each person
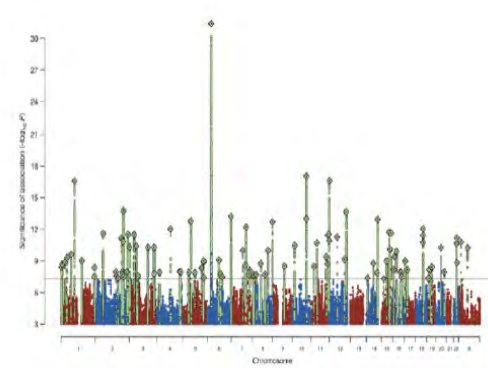
Independent study
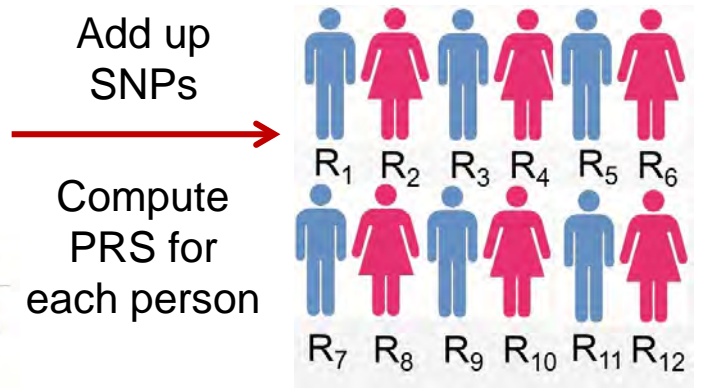
# Genetics

## Polygenic Risk Scores (PRS) in Practice

- **For those at highest risk, could**:
  - Offer regular screening
  - Support therapeutic interventions
  - Encourage lifestyle modification

- **Example**: UK mammogram screening at 47
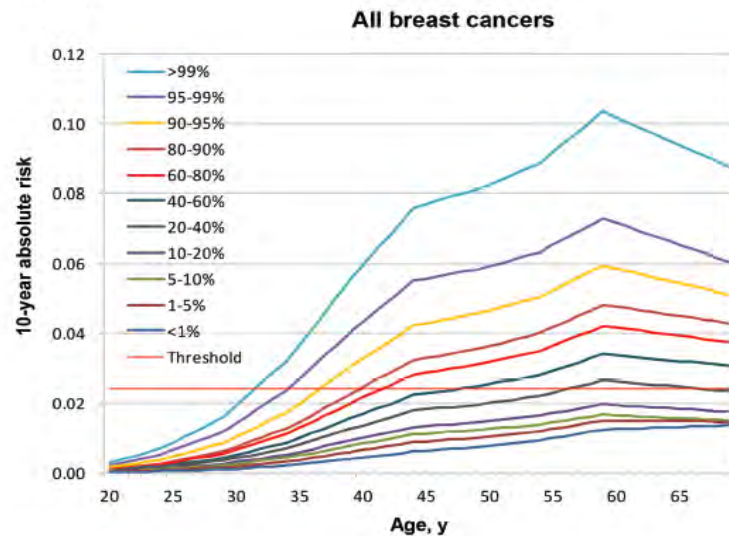


- Women in top 5% of PRS-risk reach the average level at age 37

- Women in lowest 20% of PRS-risk will never reach average level

Paper: Mavaddat et al., Prediction of breast cancer risk based on profiling with common genetic variants. J Natl Cancer Inst 2015, 107(5)

- A few other examples (of nearly 800 published papers on this topic)

- Studies control for many common risk factors

### Sample of PRS in Literature*

| Disorder | No. of Genetic Variants | Relative risk, comparing top 20% to bottom 20% PRS | Reference |
|---|---|---|---|
| Coronary artery disease | 50 | 2.0 | Khera AV. et al. (2016) |
| Coronary artery disease | 49,310 | 1.8 to 4.5 | Abraham G. et al. (2016) |
| Type 2 diabetes | 1000 | 3.5 | Läll K. et al. (2017) |
| Ischemic stroke | 10 | 1.2 to 2.0 | Hachiya T. et al. (2017) |
| Breast cancer | 77 | 3.0 | Mavaddat N. et al. (2015) |
| Breast cancer (East Asian ancestry) | 44 | 2.9 | Wen W. et al. (2016) |
| Prostate cancer | 25 | 3.7 (25%) | Amin Al Olama A. et al. (2015) |
| Lung cancer | 38 | 4.6 (25%) | Cheng Y. et al. (2016) |

*793 PubMed results for "polygenic risk score" on 7th August 2019 (over half results published in 2018 and 2019)

Wrap Up

# Old vs. New

**On the Evolution of Medicine**

| Old **Underwriting** | New **Underwriting** |
|---|---|
| Population-Based | Individualized |
| One-Off, Doctor's Office | Real-Time Streaming, Real World |
| Doctor Ordered Data | Patient Generated Data |
| Doctor's Notes, Unshared | Our Notes, Patient Edited |
| Information Owned by Doctors and Hospitals | Information Owned by Rightful Owner |
| Expensive, Big-Ticket Tech | Cheap Chips, Moore's Law |
| Data Limited | Panoromic |

**Eric Topol** @EricTopol · 28 Feb 2015
Some features contrasting old and new medicine

↩     ⟲ 2K     ♥ 1.5K     •••

# Why Do We Care?

- All of these advances mentioned today result in more structured, usable data

- Will lead to more automation… and even digital transformation of our industry

- More data shouldn't equate to more granular risk selection

| Negative | Positive |
|---|---|
| • Anti-selection<br>• Challenge of regulations<br>• Too much data<br>• Fast pace of change | • Faster<br>• Cheaper<br>• Better (data, accuracy, products, automation) |

**Underwriting of the future will be different than it is today!**

Companies that can pull it all together will come out ahead!

# Will We Still Need Underwriters?

**The Answer is YES**

- Not all science.  There is a lot of ART to UNDERWRITING

| | |
|---|---|
| Careful balance of UW philosophy, competition, agents, customer motivations and transparency | Recognize outliers, misrepresentation, and areas of frequent anti-selection |
| Sparse data, emerging data, conflicting evidence, or explain unusual data | Ask the right questions and understand sentinel effect to screening risk |
| Conduct follow-up investigations | Creativity in structuring offers |

- Chief Underwriters must ensure teams evolve, adapt and utilize tech to augment the profession …

- But underwriters should retain the final authority

The best near-term future is one where Actuaries, Underwriters, Doctors, Data Scientists and technology work together seamlessly to streamline our business and better serve our customers. Stay relevant, because the future isn't waiting around for anyone.

My two cents
Scott Rushing, RGA
Head of Global Research

**Thank you for your attention**