

Health and Genetics

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**Engineering &
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Agenda

- Quiz
- Schedule change
- Homework
- Intro to genetic privacy
- GINA: Employment Discrimination
- DNA Testing for Consumers

Schedule

- Guest Lecturer November 25th on Drones
 - The readings will stay the same but the lectures switched.
- Today's lecture – Genetic Privacy
- Reminder: November 20 – Draft project paper due

Homework Questions

How much do you already know about genomics?

- What is a genome?
- <http://www.pbs.org/wgbh/nova/body/public-genomes.html>

Genetic diversity

Our genomes are over 99% identical.

Remaining <1% difference => *GENETIC VARIATION*



Terminology:
How do we talk about our genetic differences?

MUTATIONS

VARIANTS

Complex relationship between your DNA and environment



Environment and
Social Factors

Examples:

PKU (phenylketonuria):
A genetic disease with an
environmental cure (diet).

Inherited cancer susceptibility:
Women with same BRCA1 variant
differ in whether they develop
cancer, type of cancer and age
of onset.

Type 2 Diabetes:
Common disease with
environmental and genetic
contributions.

DNA Testing for Consumers

- DTC testing does not produce full genome sequence (unlike Human Genome Project)
- Can report on
 - Ability to taste bitter flavors
 - Photic sneeze reflex
 - Risk for developing heart disease
 - Diabetes

23andme

- Sells genetic profiles on-line: \$99
- Previously offered
 - health reports
 - chances of getting dozens of diseases
 - likely response to various drugs
- FDA said need to be approved as ‘medical device’
- Main business model ‘create a massive database’ so pharmaceutical and academic researchers can do trials more cheaply

Robert Hof “Seven Months After FDA Slapdown, 23andMe Returns With New Health Report Submission” Forbes.com 6/20/2014

<http://www.forbes.com/sites/roberthof/2014/06/20/seven-months-after-fda-slapdown-23andme-returns-with-new-health-report-submission/>

Drug response

Alcohol Consumption, Smoking and Risk of Esophageal Cancer	★★★★★
Oral Contraceptives, Hormone Replacement Therapy and Risk of Venous Thromboembolism ♀	★★★★★
Fluorouracil Toxicity	★★★★★
Pseudocholinesterase Deficiency	★★★★★
Thiopurine Methyltransferase Deficiency new	★★★★★
Caffeine Metabolism	★★★
Hepatitis C Treatment Side Effects	★★★
Metformin Response	★★★
Antidepressant Response	★★
Beta-Blocker Response	★★
Floxacin Toxicity	★★
Heroin Addiction	★★

Genetic Information Nondiscrimination Act (GINA)

- Signed into law 2008
- Protect people to encourage them to participate in DNA testing and research
- Employers can not use genetic info for hiring or promotion decisions
- Insurers can not use it to make decisions to add or drop people from policies

Class Discussion Choice

- GINA: Employment discrimination
- Personal Kits debate

GINA: Group Discussions

- You will be in an 'expert' and 'home' group.
- Each expert group will receive information on a case, which you will discuss.
- Then return to your home group and summarize what you learned.

GINA: Expert group questions

- How did the company use or try to use genetic information about its employees or job applicants?
- Was a person fired or not hired because of a genetic test or medical condition?
- Was there a lawsuit? If so, what was the result? Was an employee rehired, was there a settlement, etc.?
- Do you agree with how the case you studied was resolved? Why or why not?

DTC: Congressional Hearing

Characters who support direct-to-consumer (DTC) genetic testing (Panel A):

- Doctor A - Believes DTC testing is beneficial
- Patient A – Wants access to DTC genetic testing
- Founder of a DTC company
- Senator A – Leaning toward supporting DTC testing; questions witnesses

Characters who are against or doubtful of DTC genetic testing (Panel B):

- Doctor B - Thinks genetic testing through a doctor is valuable, but is skeptical of DTC testing
- Patient B – Against DTC genetic testing
- Senator B – Is skeptical of DTC tests; questions witnesses

DTC: Schedule

- 10 minutes: Work with your group to research or develop the position of your character
- Select one person to represent your group and make a quick statement (3-5 sentences)
- Senators will take turns ask questions

Genetics

- <http://video.pbs.org/video/2215641935/>
- www.pbs.org/nova/body/tanzi-genetic-tests.html
www.pbs.org/nova/body/public-genomes.html