

Learning from the People: Responsibly Encouraging Adoption of Contact Tracing Apps

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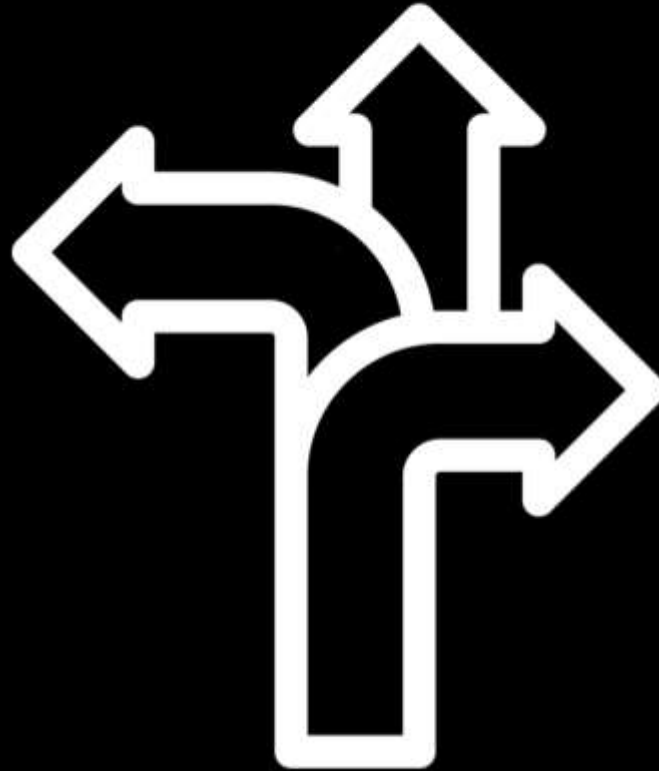
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Computational problems require constant decision-making



Which features are fair to use?



What data should be used & which features prioritized?

Typically: experts set best practices



Which features are fair to use?



What data should be used & which features prioritized?

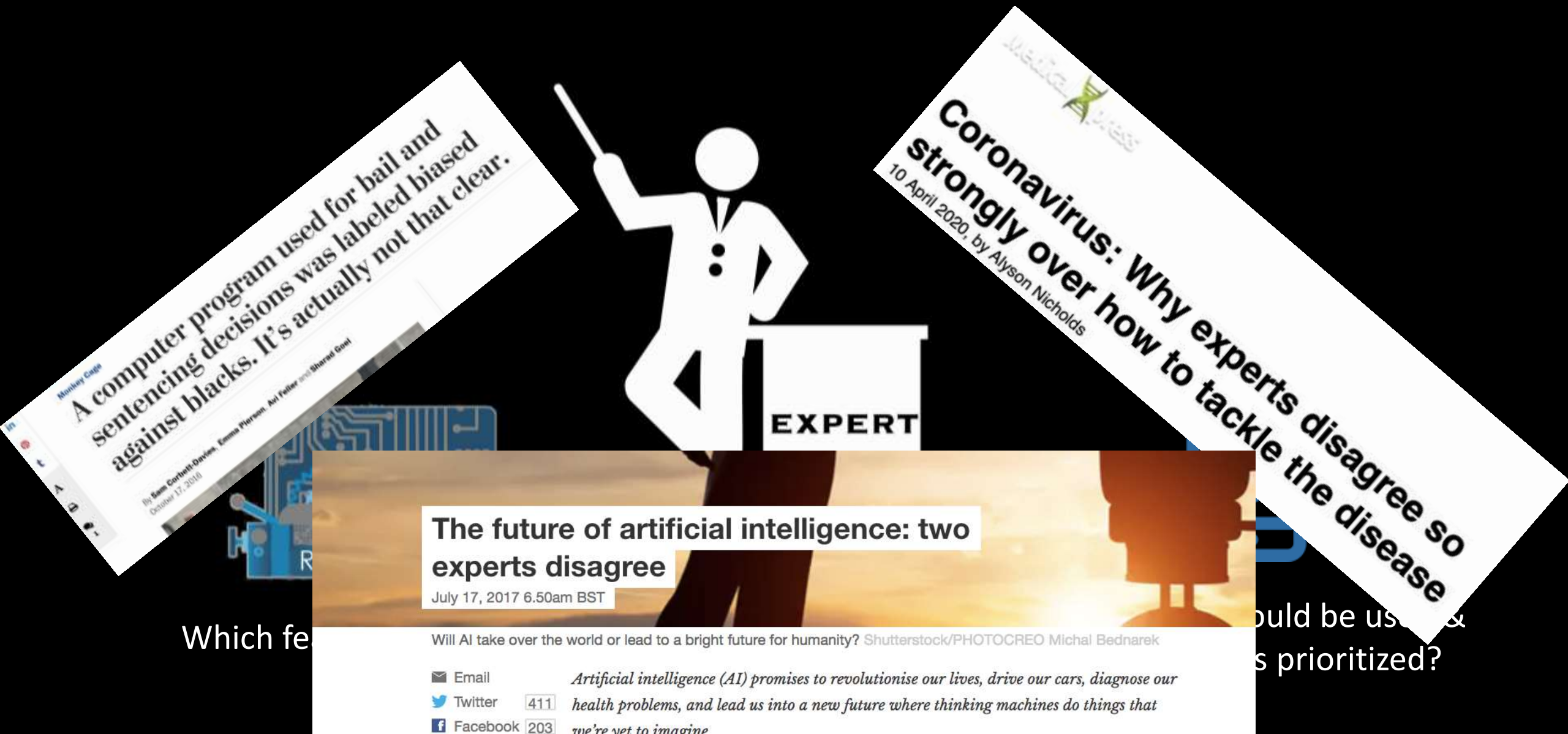
Experts trade off costs and benefits



Inspiration figure credit:

Privacy, ethics, and data access: A case study of the Fragile Families Challenge. Lundberg, I., Narayanan, A., Levy, K., and Salganik, M.J.

Experts do not always agree on best practices



Monkey Cage
A computer program used for bail and sentencing decisions was labeled biased against blacks. It's actually not that clear.
By Sam Corbett-Owens, Emma Pierson, Ari Feller and Shradha Gupt
October 17, 2018

Medicine Express
Coronavirus: Why experts disagree so strongly over how to tackle the disease
10 April 2020, by Alyson Nicholds

The future of artificial intelligence: two experts disagree
July 17, 2017 6.50am BST

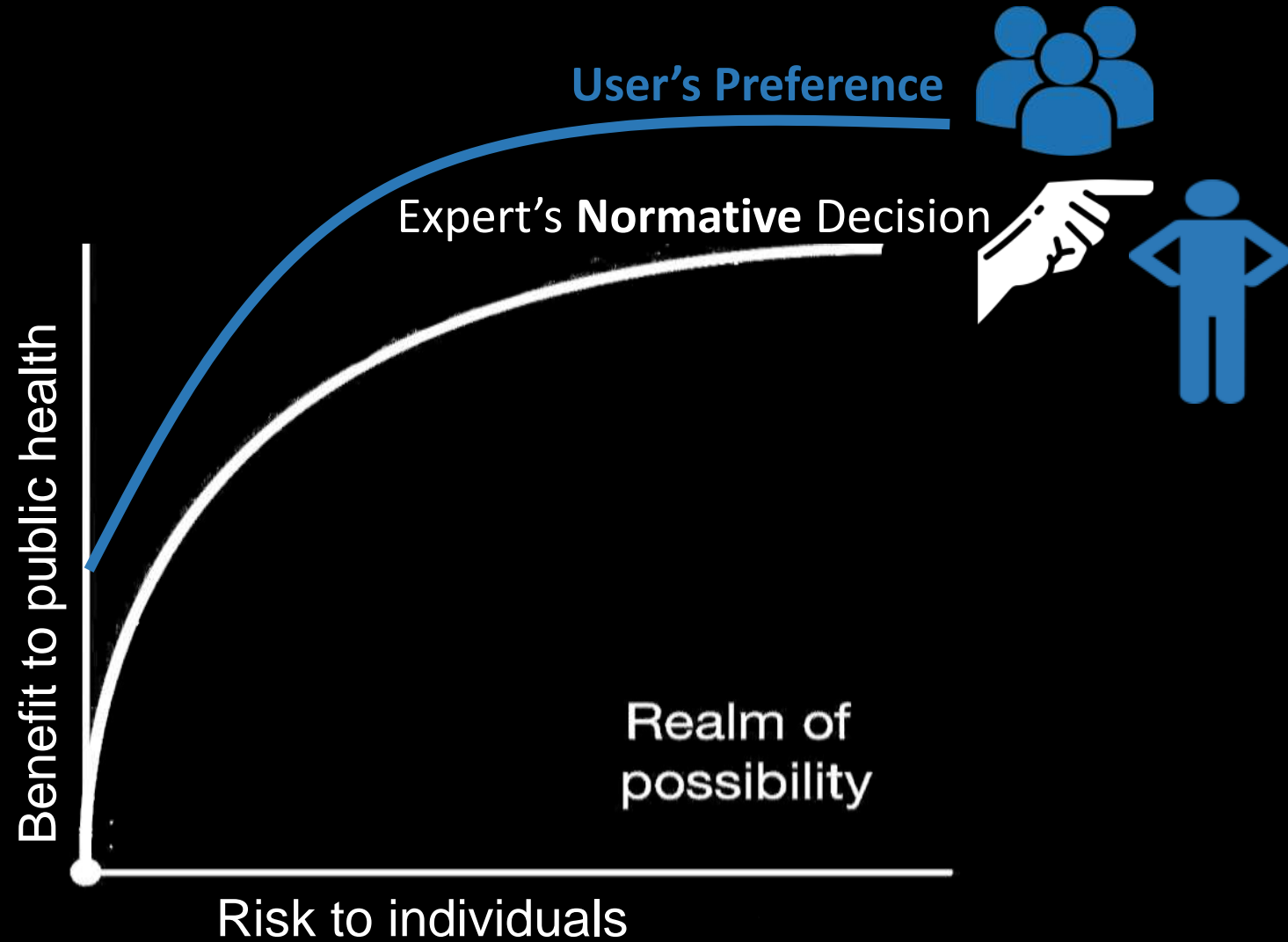
Will AI take over the world or lead to a bright future for humanity? Shutterstock/PHOTOCREO Michal Bednarek

Email
Twitter 411
Facebook 203
Artificial intelligence (AI) promises to revolutionise our lives, drive our cars, diagnose our health problems, and lead us into a new future where thinking machines do things that we're yet to imagine

Which fe

ould be use
s prioritized?

More importantly, users and experts may disagree



This disagreement is a classic tension in moral philosophy

Normative

Experts prescribe best practices



Descriptive

Learn non-expert preference/behavior

Infer best practices



Descriptive ethics approaches to developing technology



Explore descriptive solutions
to computational problems:
Identify ideal / acceptable functionality
from citizen preferences & behavior

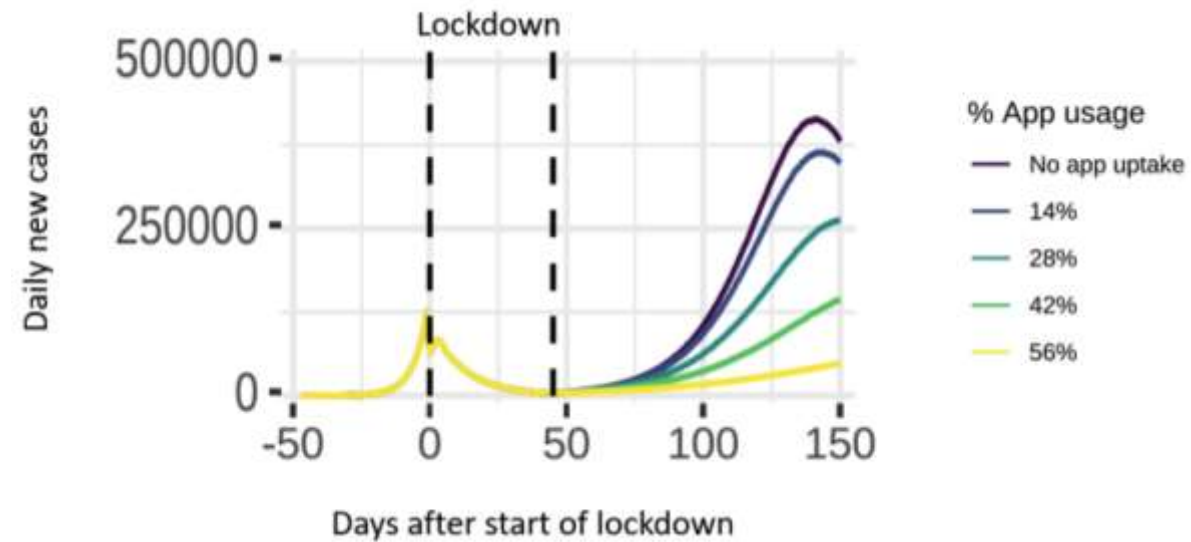
This talk: applying descriptive ethics to increase adoption of COVID19 apps



Contact tracing

Benefit of contact tracing apps scales quadratically with the number of users

Adoption matters



<https://www.research.ox.ac.uk/Article/2020-04-16-digital-contact-tracing-can-slow-or-even-stop-coronavirus-transmission-and-ease-us-out-of-lockdown>

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European scientists and researchers raise privacy concerns over coronavirus contact tracing apps

ZDNet

Coronavirus contact-tracing apps: What are the privacy concerns?

Special smartphone apps could help to reduce the spread of COVID-19, but such moves could also have profound implications for individual privacy in the long term.

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POPULAR SCIENCE

HEALTH

Can smartphone apps track COVID-19 without violating your privacy?

W I P E

SECURITY

Clever Cryptography Could Protect Privacy in Covid-19 Contact-Tracing Apps

Researchers are racing to achieve the benefits of location-tracking without the surveillance.

Experts focused on ensuring apps protected user privacy

EFF Warns COVID-19 Tracing Apps Pose Cybersecurity, Privacy Risks

Google, Apple, and others are racing to develop contract tracing apps to help individuals determine potential COVID-19 exposures, but EFF warns the tech may put privacy and cybersecurity at risk.

Let's get potential users to tell us how to get them to adopt

01

Identify adoption considerations

02

Use descriptive approaches to predict adoption

03

Leverage findings to improve adoption through changes to app design & marketing

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We used a series of carefully constructed online surveys to identify American's adoption considerations



Closed-answer questions regarding willingness to install



Open-answer descriptions of reasoning for install intent



Panel-based online surveys quota sampled to ensure respondent demographics match those of the U.S. census on age, race, gender, education & income

Many possible inputs to COVID19 adoption decisions; privacy is necessary, but may not be sufficient



Benefits



Provider



Privacy



Mobile costs



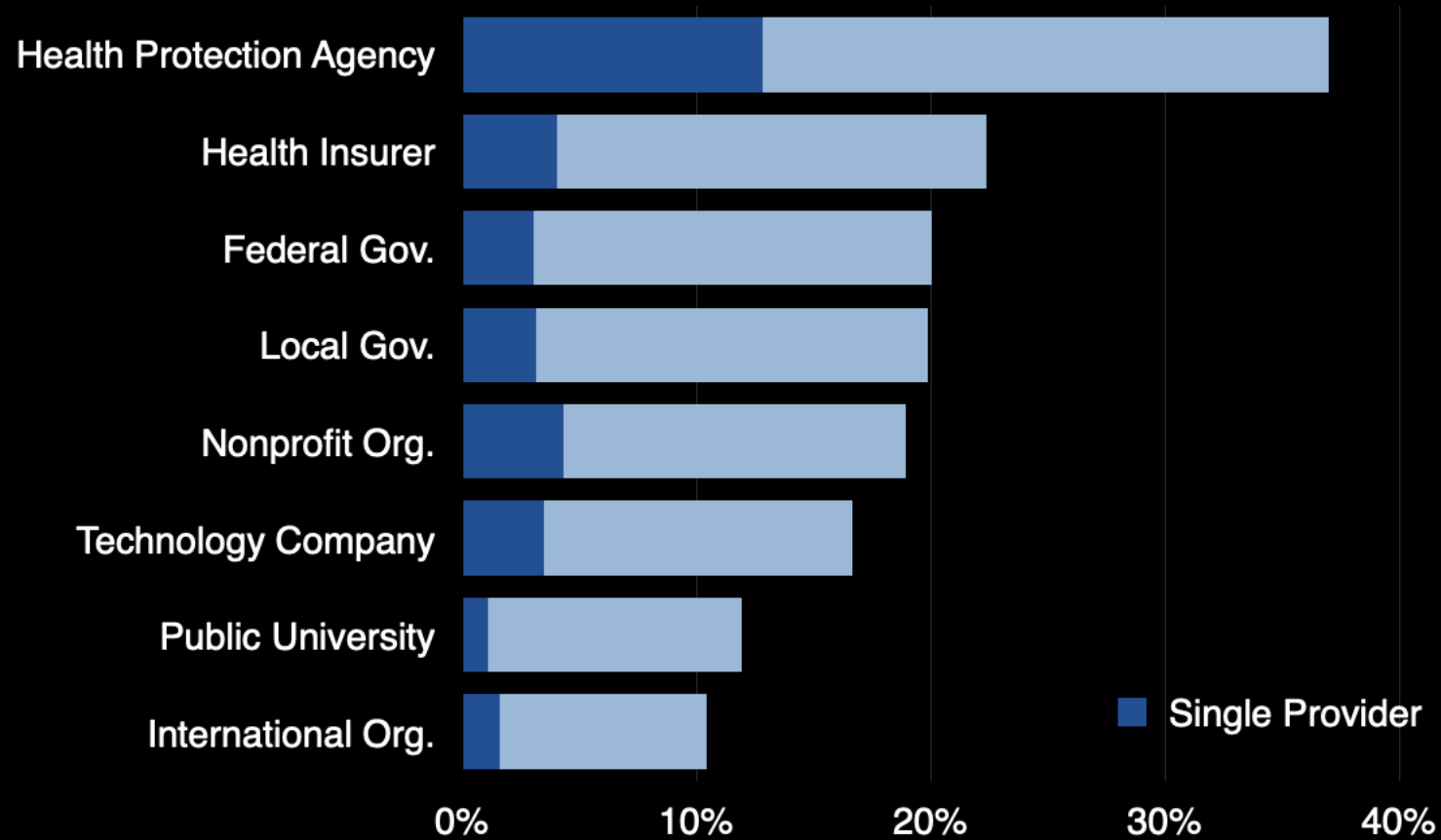
Accuracy



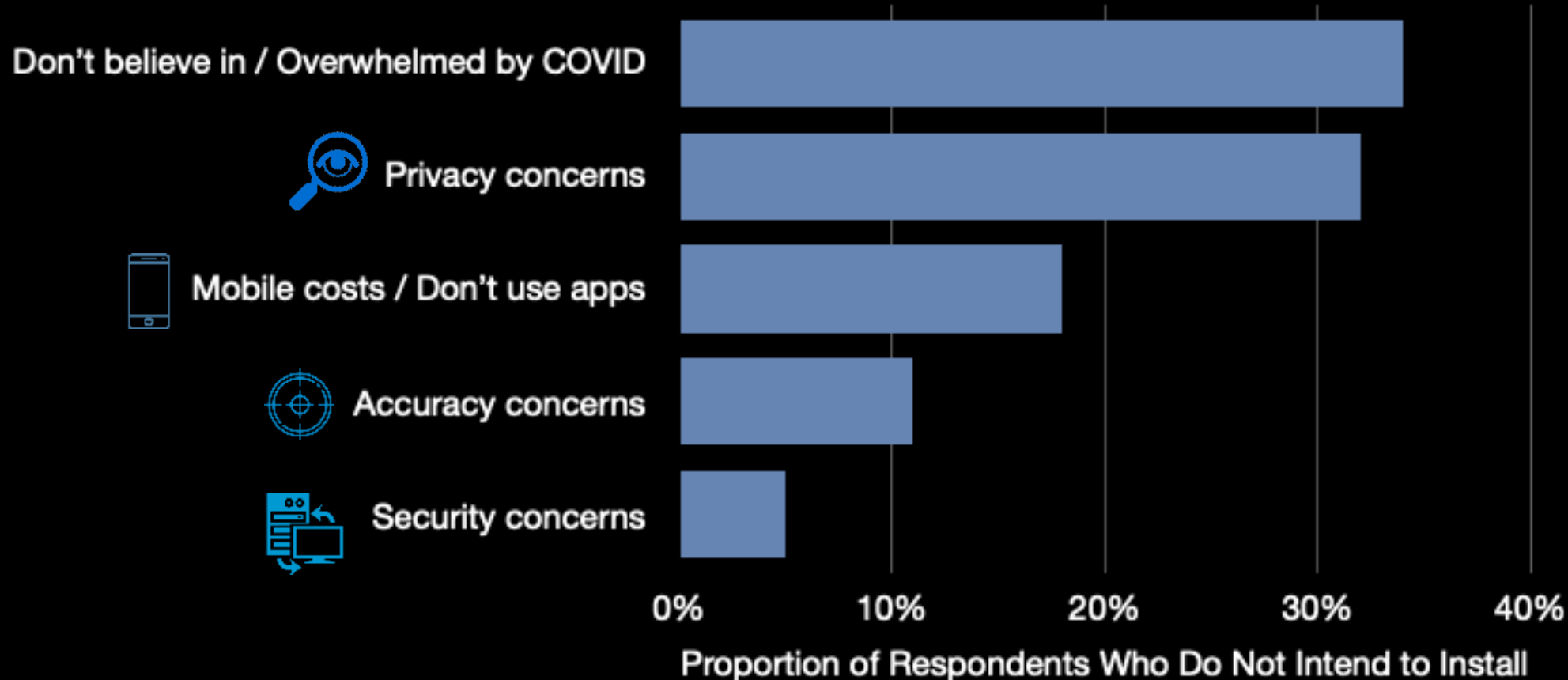
**Architecture:
Security & Agency**

<https://arxiv.org/abs/2004.13219>

Provider influences willingness to install; public health agencies are preferred but not universally



Those who don't want to install are concerned about privacy, accuracy, costs & necessity



Which of these considerations matter *most*?



Benefits



Provider



Privacy



Mobile costs



Accuracy



**Architecture:
Security & Agency**

<https://arxiv.org/abs/2004.13219>

We used conjoint analyses to identify the most important considerations in COVID19 app adoption intent

Imagine that there is a mobile phone app intended to help combat the coronavirus in the U.S.

Different apps have different benefits and risks and may collect different types of information about you.



Please look carefully at the options below. Each column represents an app with different attributes that will be designed and distributed by a health protection agency. Assume both apps are equally popular. Which one would you choose?

(5 of 6)

| | Option 1 | Option 2 |
|------------------------------------|--|---|
| App accuracy | Detects 90 out of 100 exposures to Coronavirus | Detects 99 out of 100 exposures to Coronavirus |
| Mobile data | Uses 300 MB (0.3GB) of your data plan every month | Doesn't use mobile data |
| Battery life | Phone battery lasts 1 hour shorter than usual | Doesn't drain phone's battery |
| Information that could be revealed | No risks | Someone could know where you've been |
| What information is collected | No information is collected | Information about your location |
| Benefits | Reduce the number of people infected with coronavirus. | Alert you if you have been exposed to someone who has coronavirus, without revealing your or their identity |
| Where information is stored | No information is collected | Only on your device |
| | Select | Select |

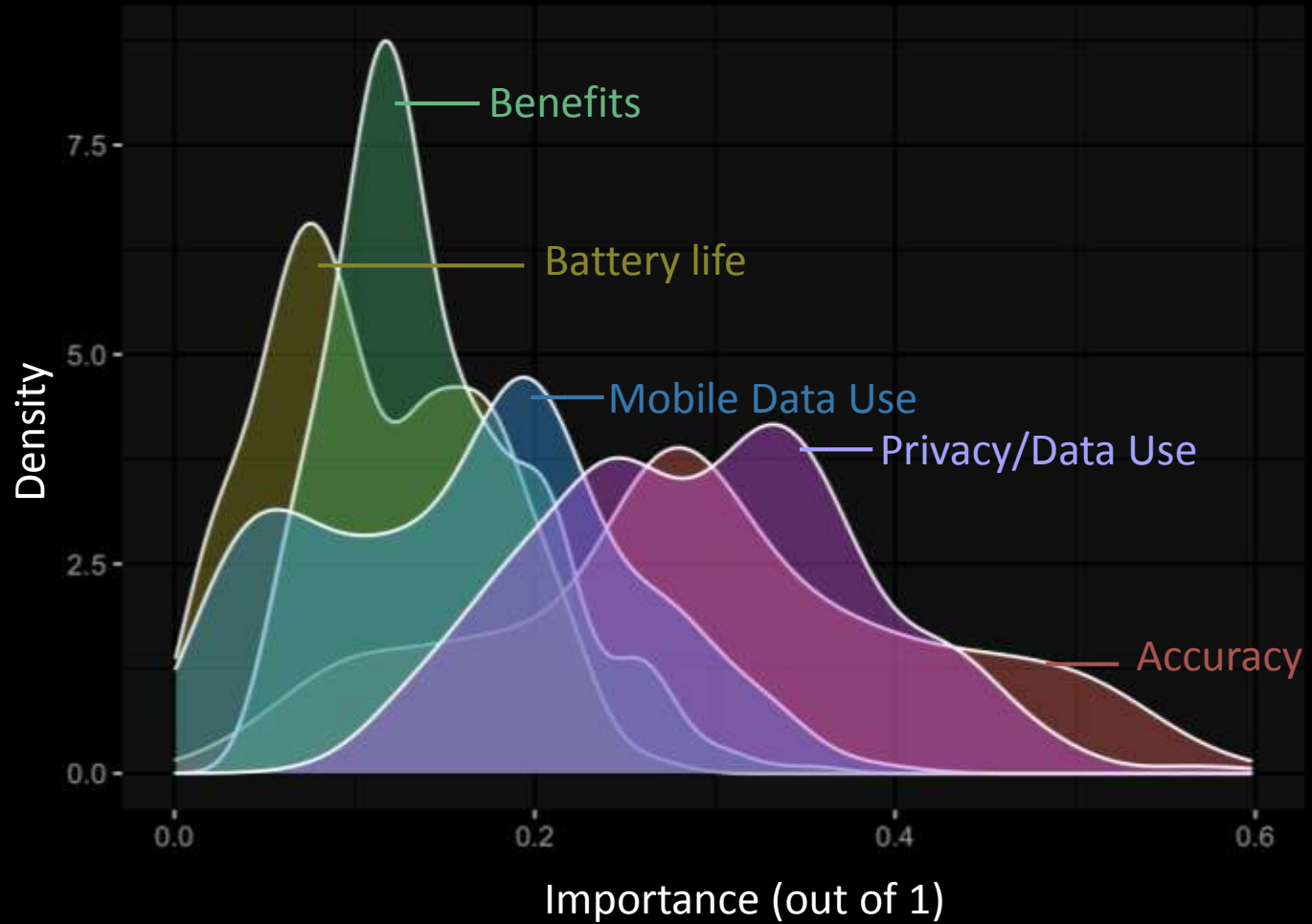
Option 3

NONE: I wouldn't choose any of these.

Select



Accuracy & privacy among the most important factors in American's intent to install COVID19 apps



For the average American surveyed, intent to install COVID19 app depends on:

- 29%** Privacy / Data Use considerations
- 29%** Accuracy considerations
- 16%** Mobile data use considerations
- 14%** App benefits considerations
- 11%** Battery life considerations

Work in collaboration with Dana Turjeman (Univ. Michigan).

But, everyone does not value these attributes equally

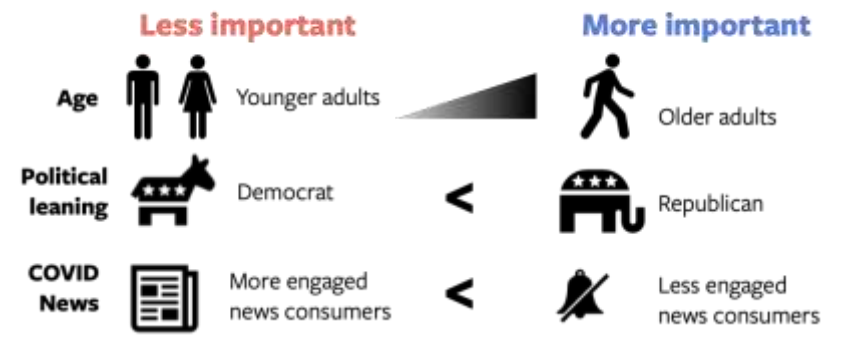
Democrats focus on accuracy; Republicans on privacy

Younger adults: benefits & accuracy; Older adults: privacy & mobile costs

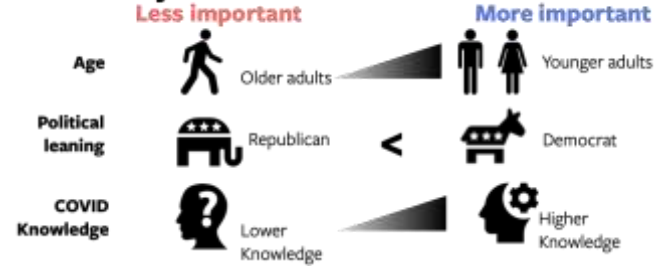
More engaged COVID19 news consumers: benefits; Less engaged: privacy

More knowledgeable about COVID19 more focus on accuracy

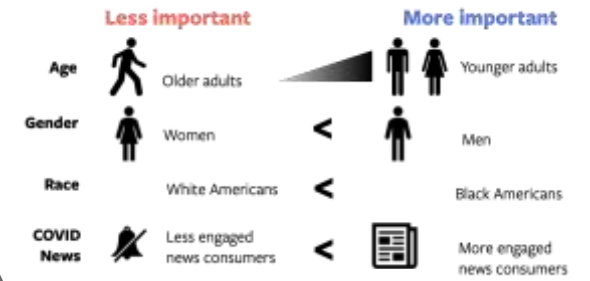
Privacy Risks



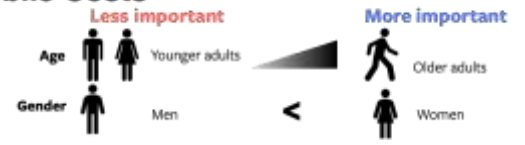
Accuracy



Benefits



Mobile Costs



Linear regression models; significant p<0.05

How good is good enough? Can we predict when adoption intent is sufficiently high to release?

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Leverage findings to improve adoption through changes to app design & marketing

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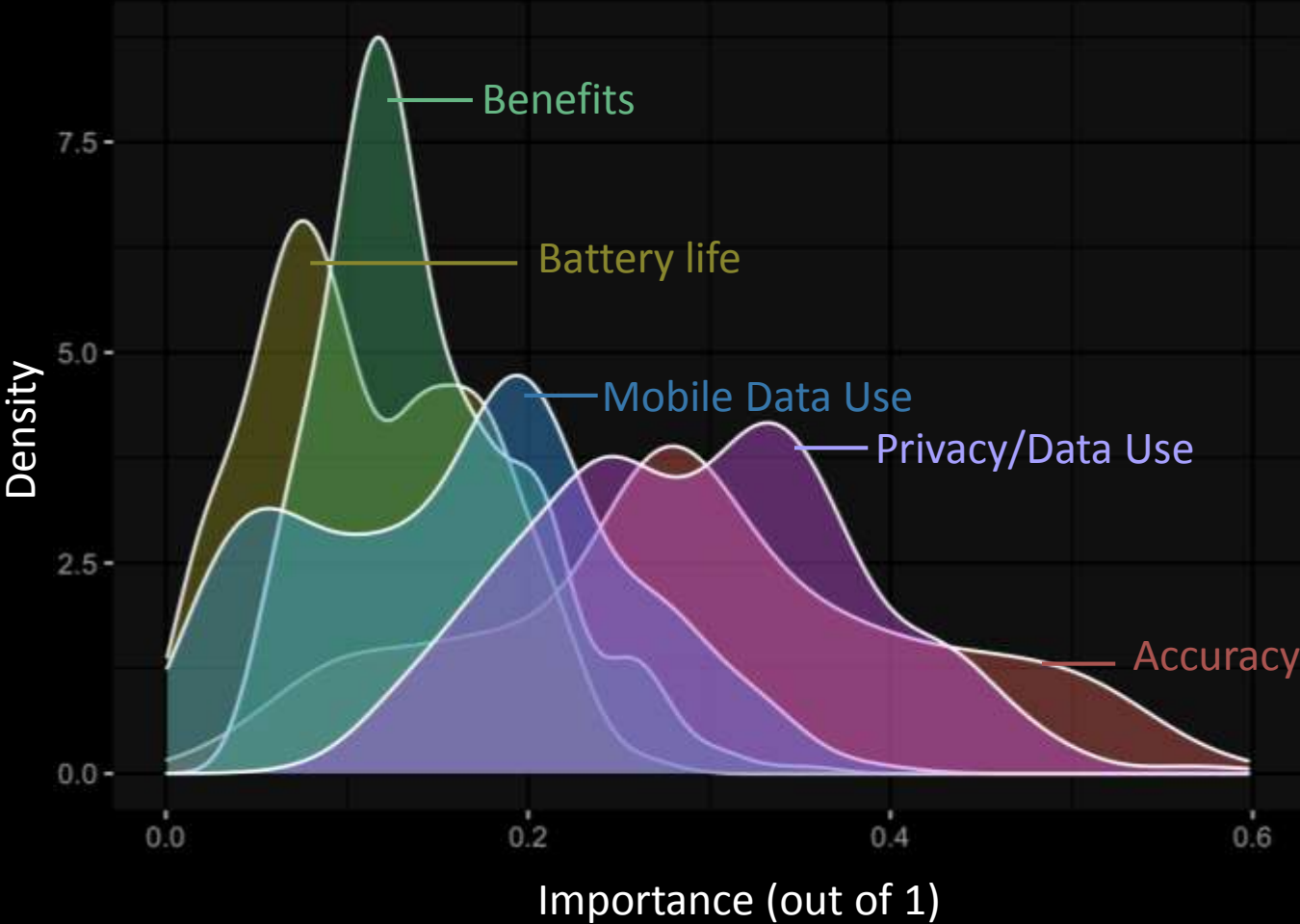
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How private does a COVID19 app have to be? How accurate?



For the average American surveyed, intent to install COVID19 app depends on:

29% Privacy / Data Use considerations
29% Accuracy considerations

16% Mobile data use considerations

14% App benefits considerations

11% Battery life considerations

Does *amount* of privacy
and accuracy predict
adoption intent?

How good is
good enough?

Surveyed nearly 4,000 crowd workers; Predict adoption intent given quantified privacy/accuracy



False Negatives

Implicit assessment of privacy perception



Studies show that despite best attempts to protect the data of those who use this app, some people may have information about who they have been near compromised and used for purposes other than the fight against coronavirus. **Willingness to adopt given concrete FN rate**
Please indicate on the chart below how many app users you think will have this information compromised over the next year.

Imagine that you are exposed to someone who has coronavirus 100 times over the next year. **If you do not use the app**, 1 out of 100 times public health workers will be able to detect and notify you that you were exposed the next year.



False Positives

Implicit assessment of privacy perception



Willingness to adopt given concrete FP rate

If you use the app, of 100 times the app will be able to detect and notify you that you were exposed.



Privacy

Explicit statement of privacy risk



Studies show that despite best attempts to protect the data of those who use this app, some people may have information about who they have been near compromised and used for purposes other than the fight against coronavirus. **Willingness to adopt given concrete FN rate**
 P out of 1000 people who use this app will have this information compromised

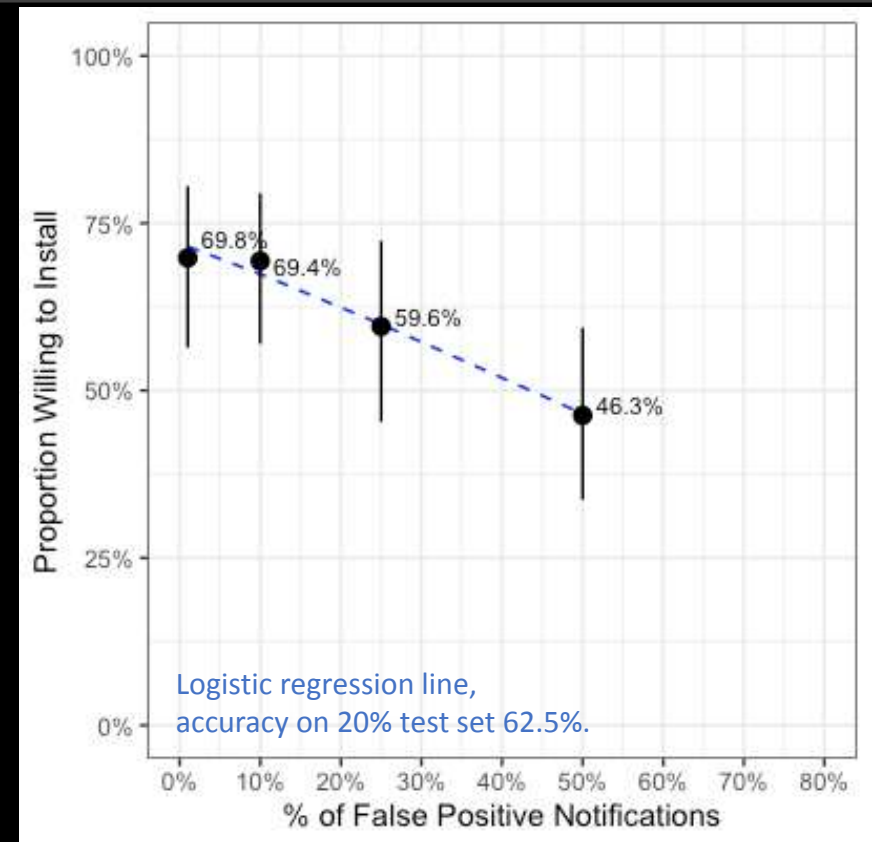
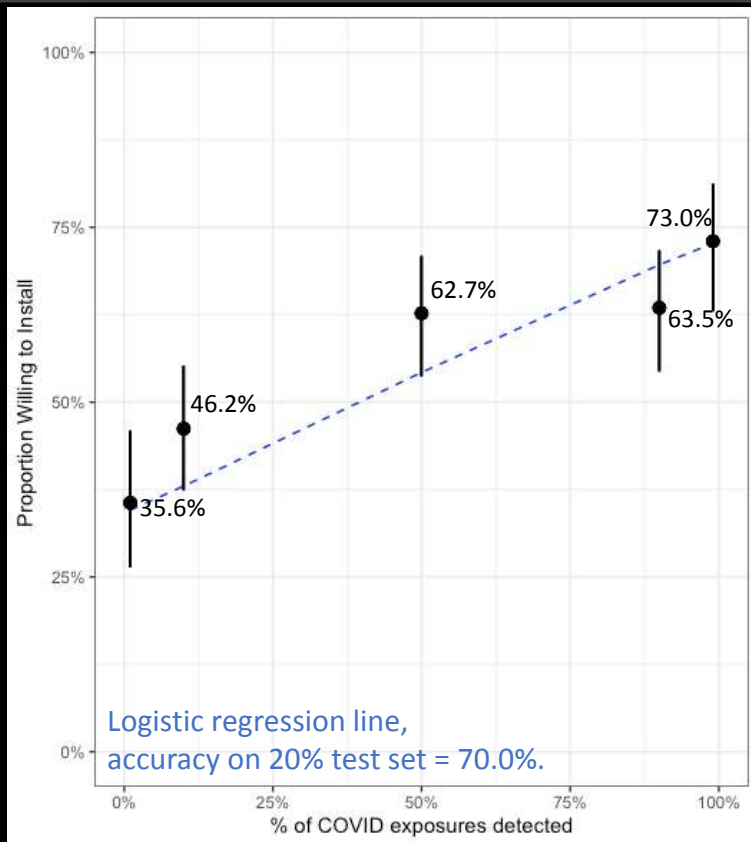


Would you install this app?
The app is not perfect. **If you use the app**, the app will correctly notify you every time that you were exposed (100 out of 100 times). The app will also **incorrectly notify you an additional FP times**, when you were not actually exposed.

Would you install this app?

How good is good enough?

Ideal: 50%+ sensitivity & fewer than 10% false positives



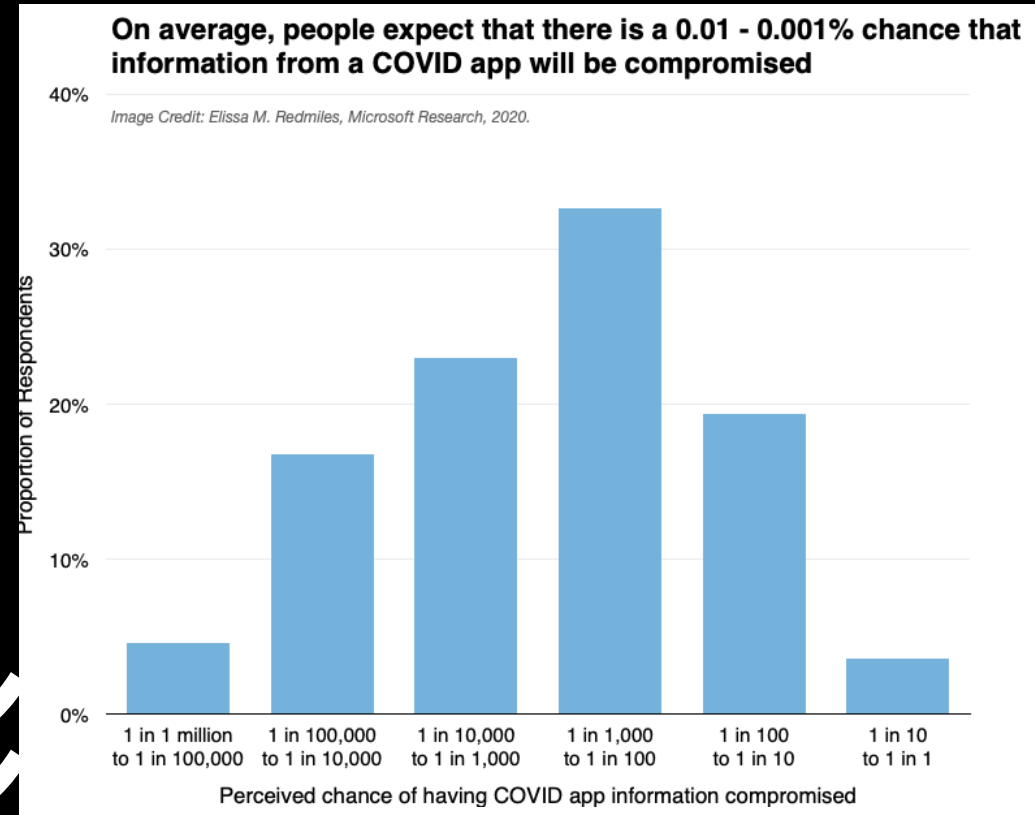
Privacy expectations both improve prediction accuracy & influence behavioral intent



People have a-priori privacy risk expectations
risk quantity influences adoption intent



Intended adoption rate when just asked about false negative rate
with implicit privacy assumption



and made explicit up front

Next: using what people tell us to improve adoption

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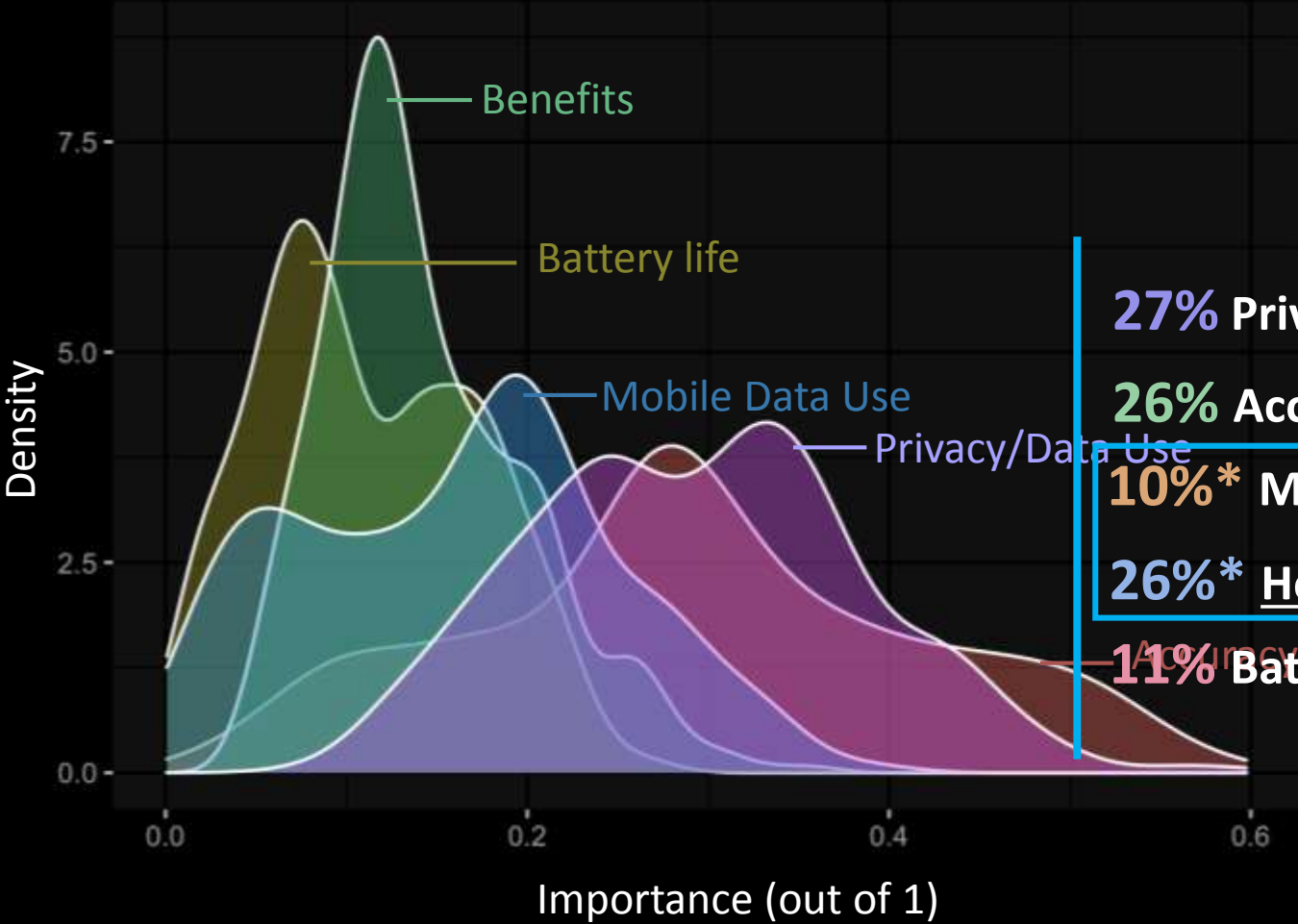
03

Leverage findings to improve adoption through changes to app design & marketing

But wait!
Just pay people
to adopt!



No: Incentives change *what* people will adopt but not *how many* will adopt



For the average American surveyed, intent to install COVID19 app depends on:



| | | | | | |
|------|----------------------|-----|--------------------|------|-----------------------|
| 27% | Privacy / Data Use | 20% | Privacy / Data Use | 25% | Privacy / Data Use |
| 26% | Accuracy | 29% | Accuracy | 25% | Accuracy |
| 10%* | Mobile data use | 16% | Mobile data use | 10%* | Mobile data use |
| 26%* | Health care benefits | 14% | App benefits | 23%* | Notification benefits |
| 11% | Battery life | 11% | Battery life | 13%* | Battery life |

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Next: using what people tell us to improve adoption

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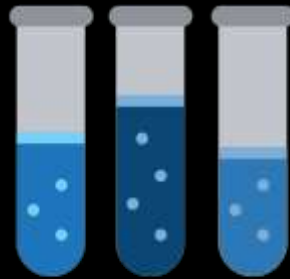
03

Leverage findings to improve adoption through changes to app design & marketing

These results are being used directly in the marketing of COVID19 apps in Israel, Louisiana & other jurisdictions



Survey Results



Experimentation



Measurement

**Advertising field studies to improve
COVID19 app adoption**



Provider



Privacy



Accuracy



Architecture
Data

Responsible data use goes beyond privacy,
to provide tech that respects user preferences

