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

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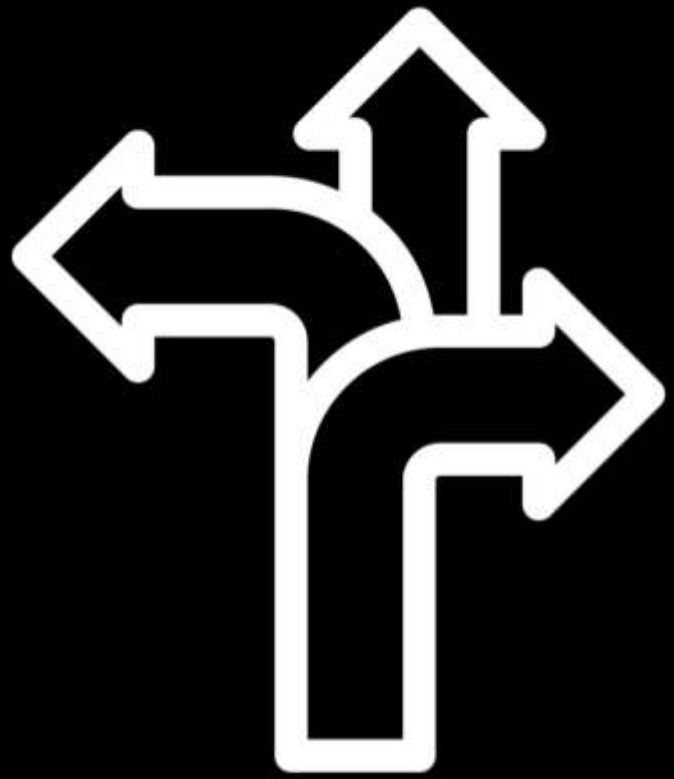
Computational problems require constant decision-making



Which features are fair to use?

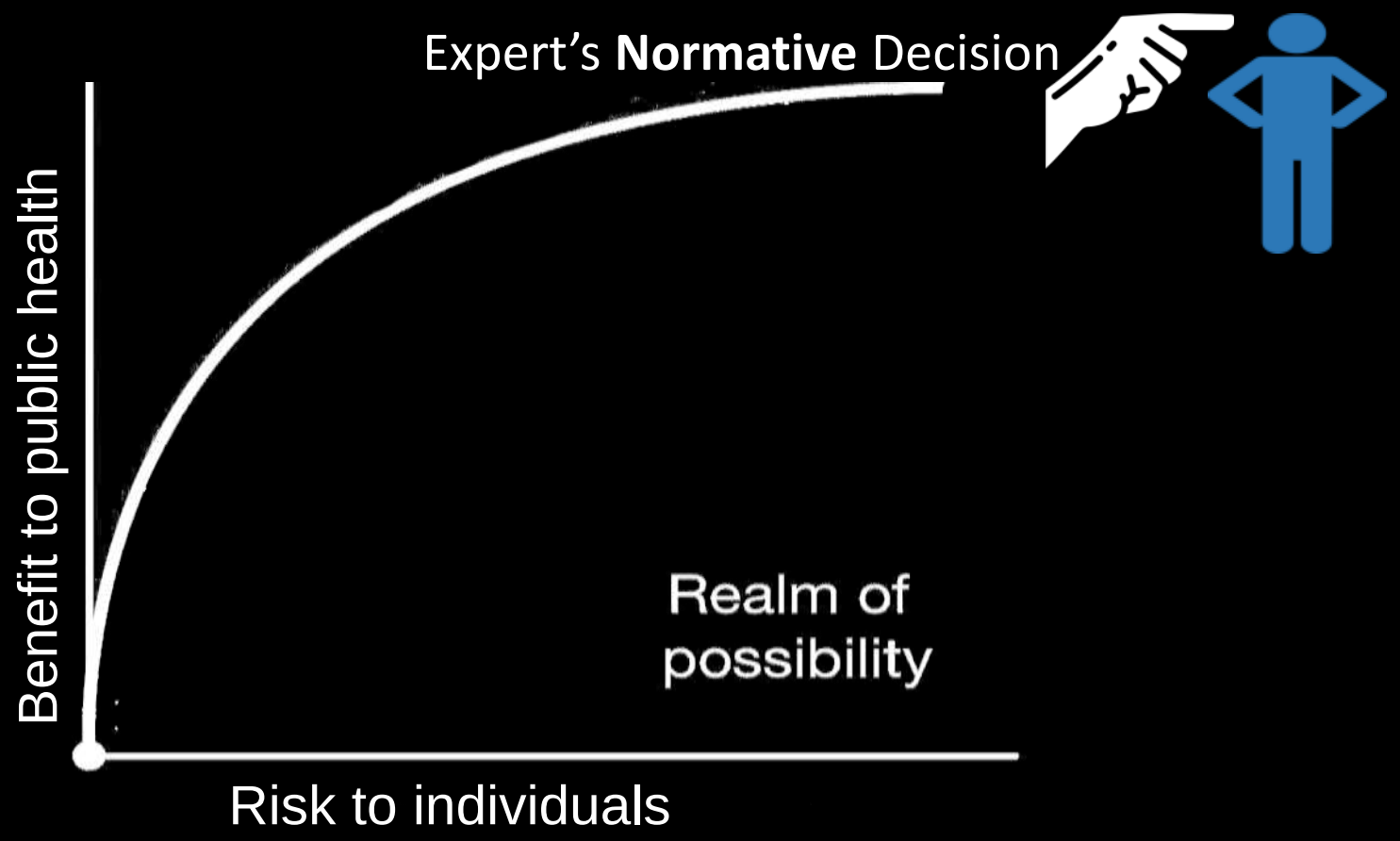
What data should be used & which features prioritized?

Typically: experts set best practices

Which features are fair to use?

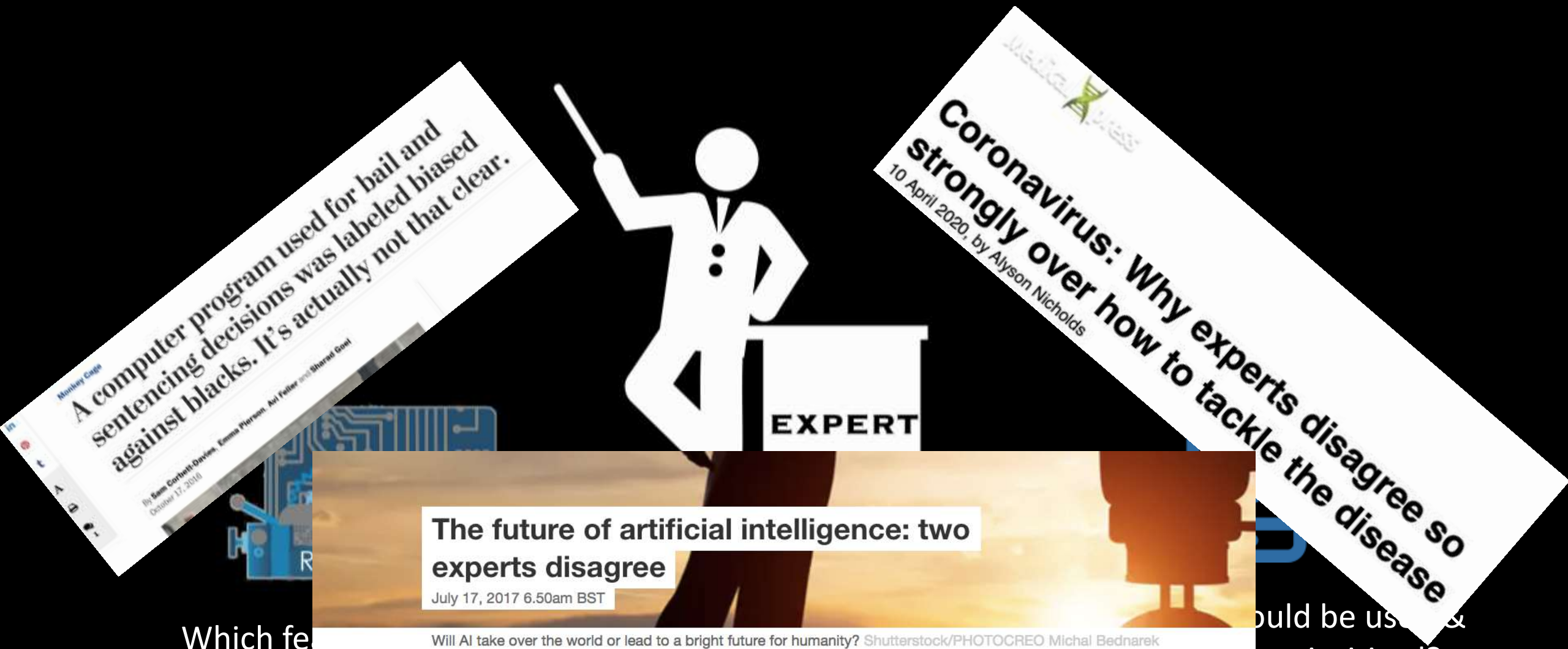
What data should be used & which features prioritized?

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



Which fe

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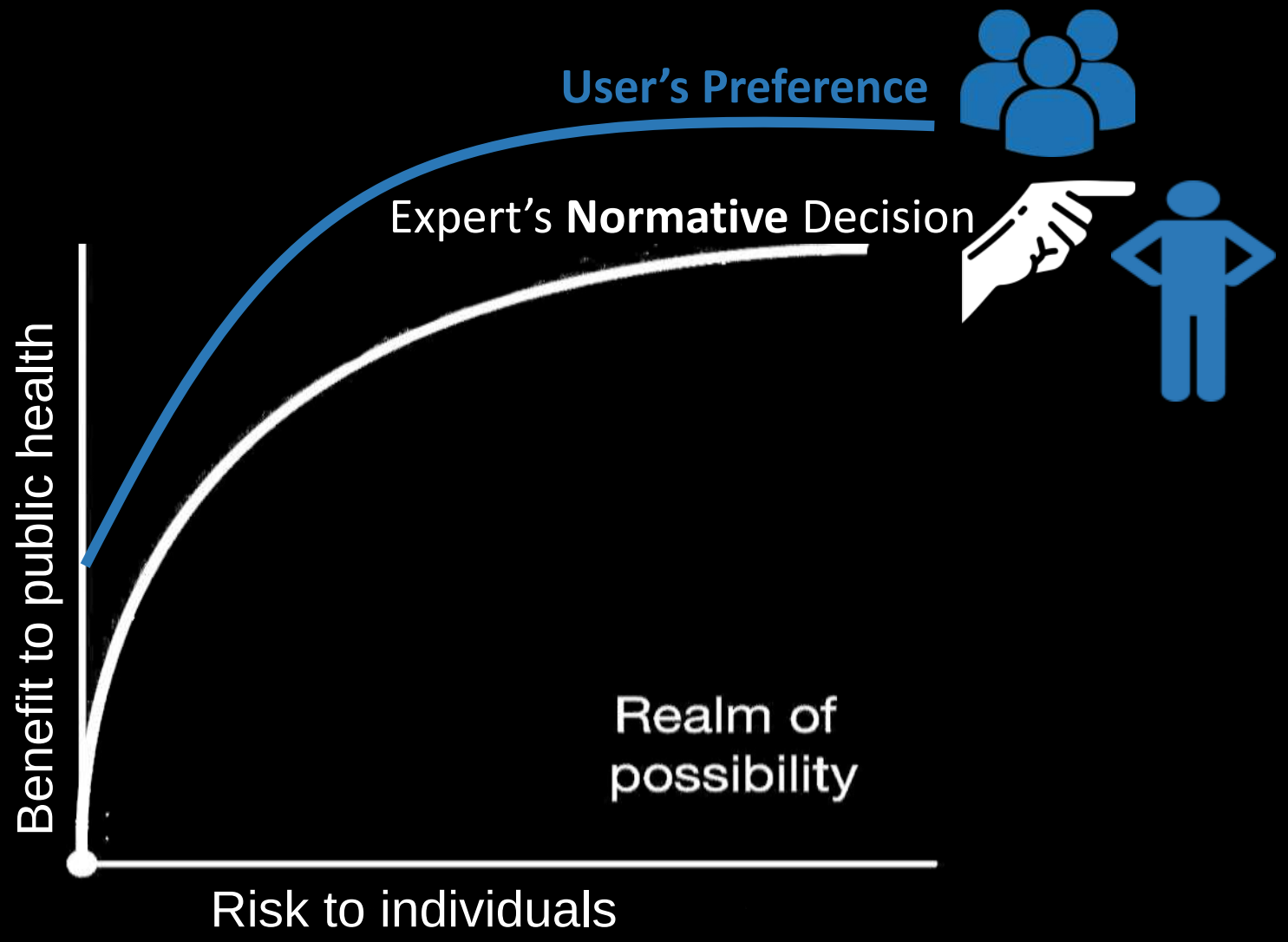
s prioritized?

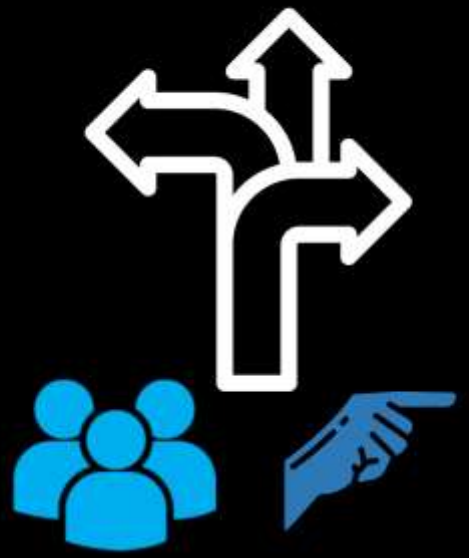
More importantly, users and experts may disagree



This disagreement is a classic tension in moral philosophy

Normative	Descriptive
Experts prescribe best practices	**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

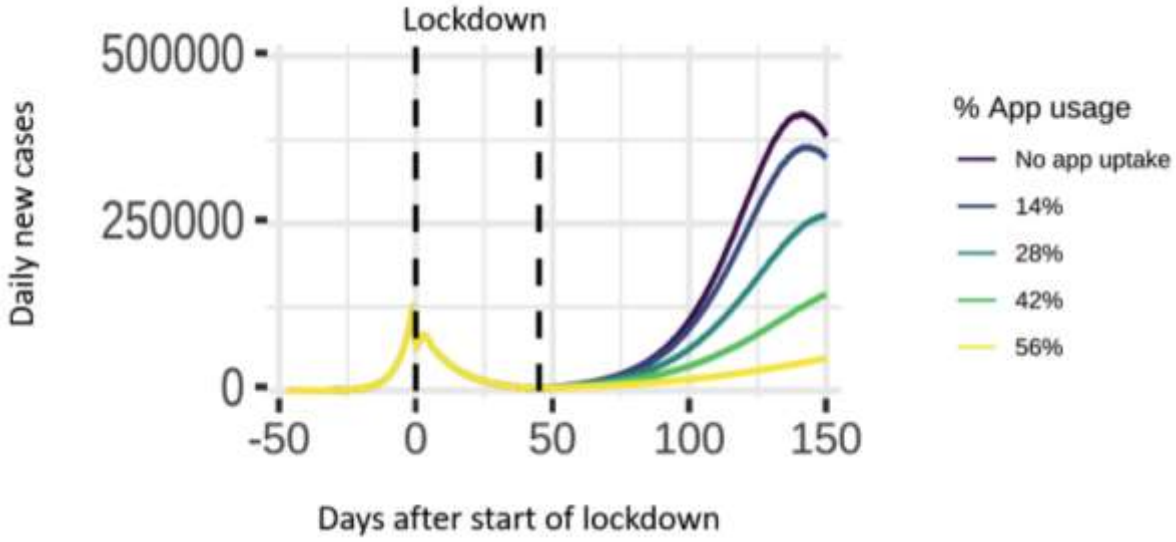
This talk: applying descriptive ethics to increase adoption of COVID19 apps

Contact tracing

https://www.microsoft.com/en-us/research/project/descriptive-ethics-for-covid19-apps/

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

Experts focused on ensuring apps protected user privacy

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

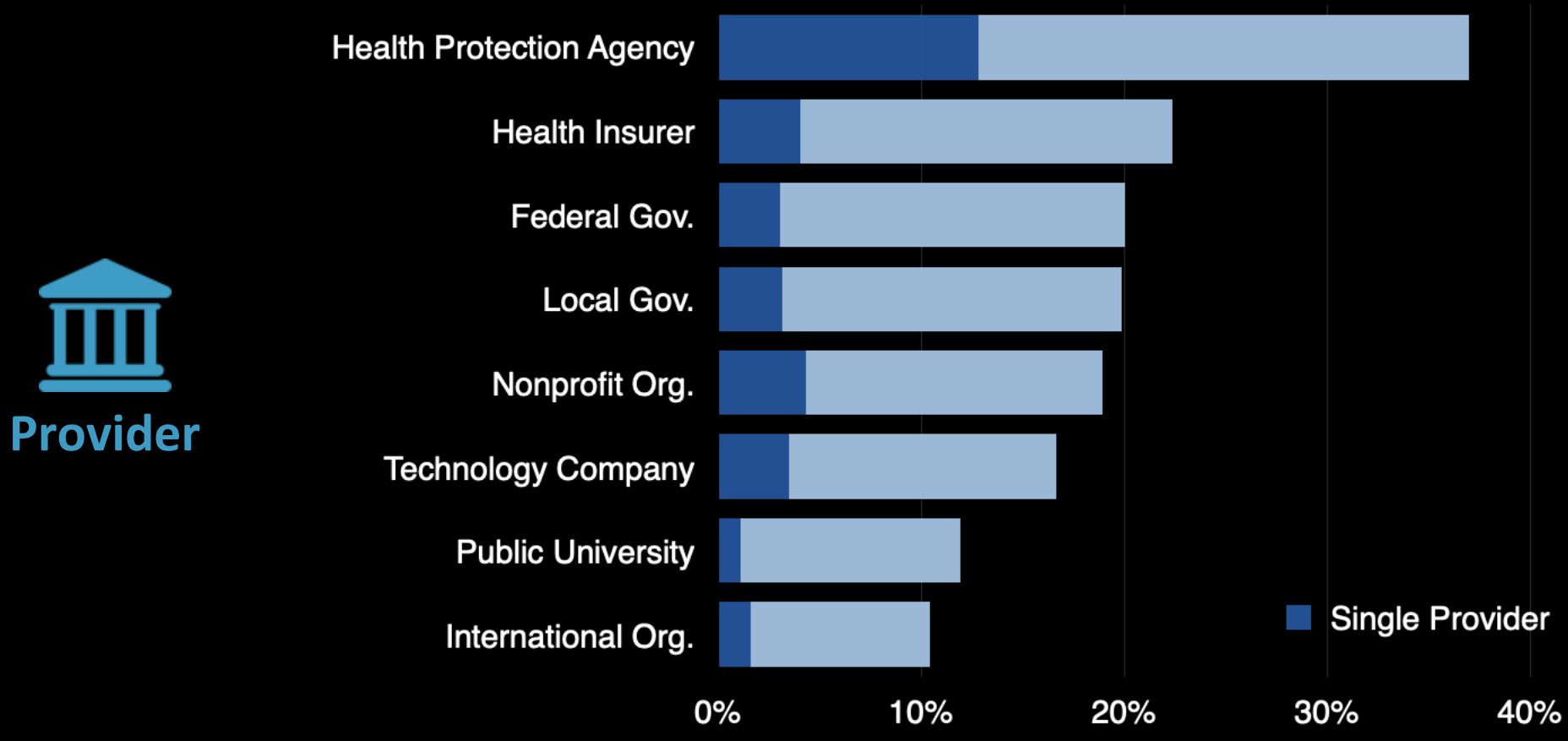
Redmiles, E.M. *User Concerns & Tradeoffs in Technology-Facilitated Contact Tracing.* ACM Digital Government 2020

Used by

dp3t

PathCheck Foundation

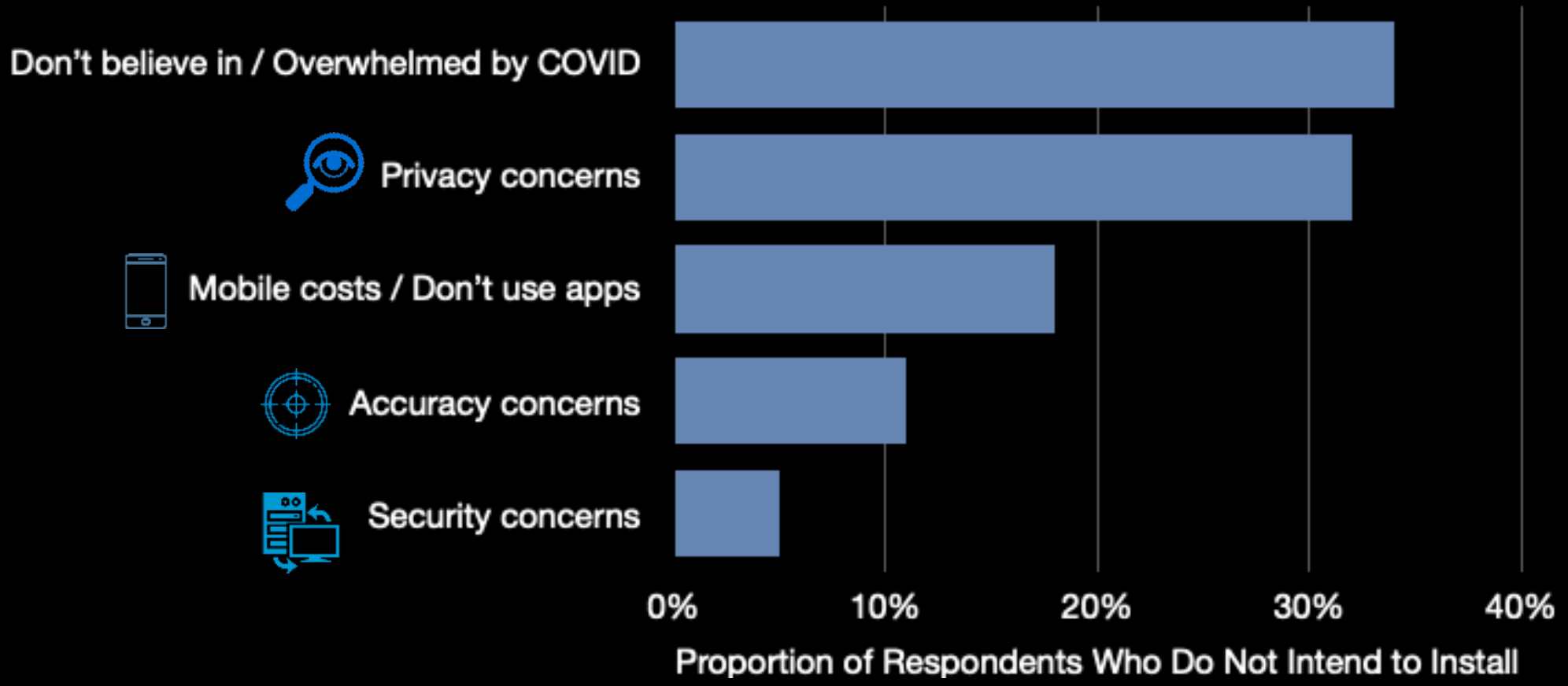
Provider influences willingness to install; public health agencies are preferred but not universally



Hargittai, E., Redmiles, E.M., Vitak, J., and Zimmer, M.
Americans' Willingness to Adopt a COVID-19 Tracking App: The Role of App Distributor. First Monday 2020.

Featured in SCIENTIFIC AMERICAN.

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

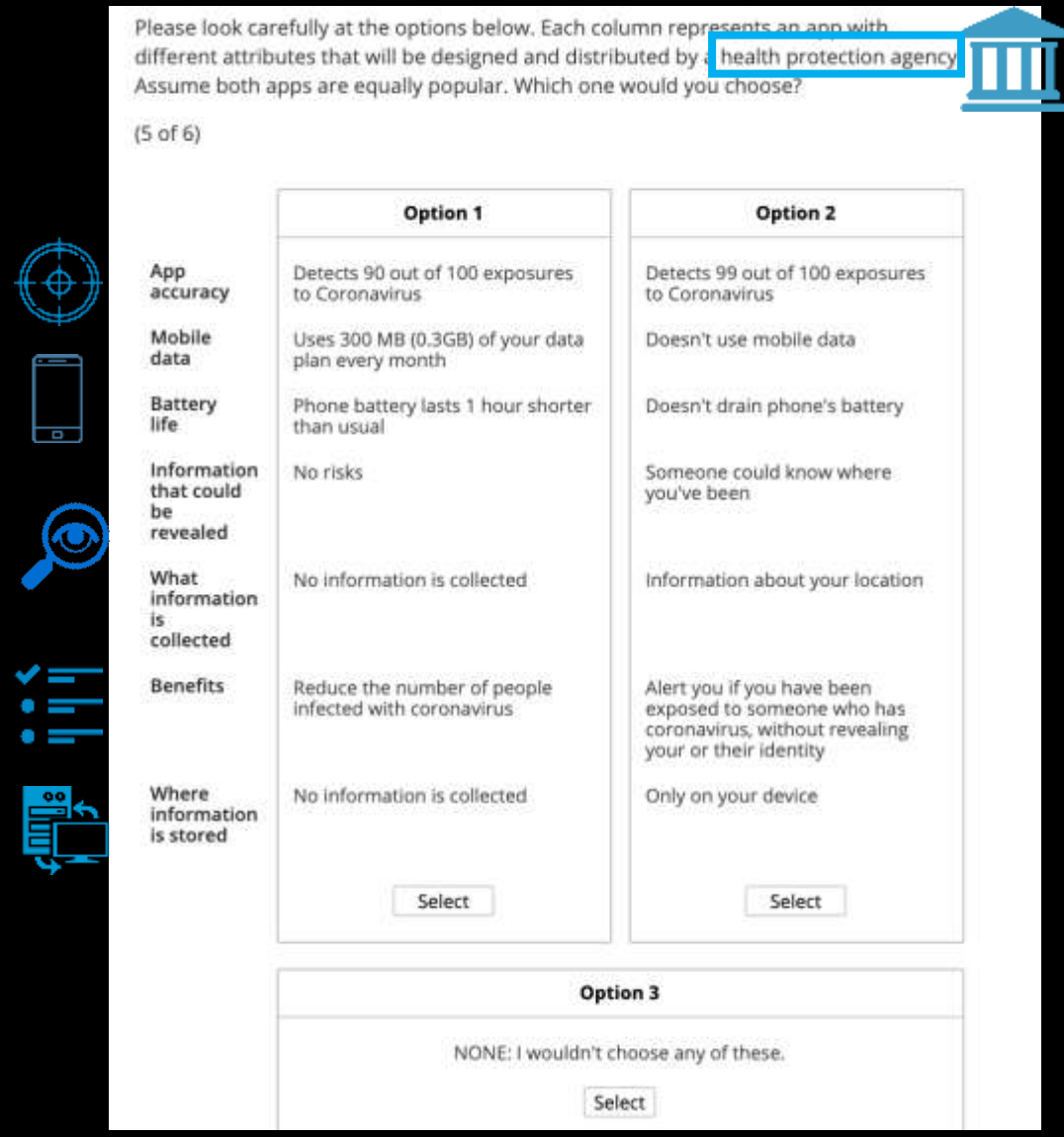
Architecture: Security & Agency

https://arxiv.org/abs/2004.13219

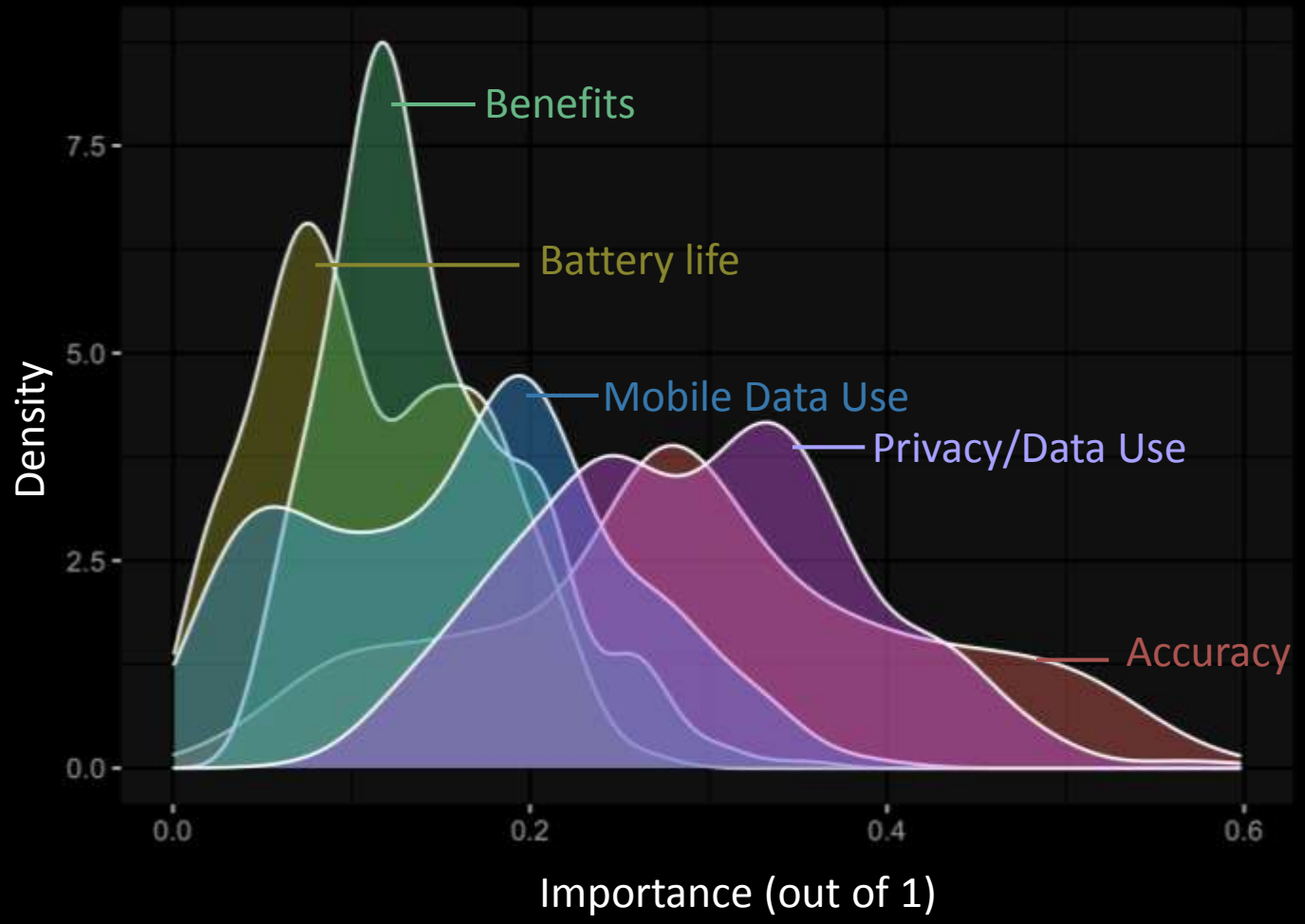
We used conjoint analyses to identify the most important considerations in COVID19 app adoption intent

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.



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).

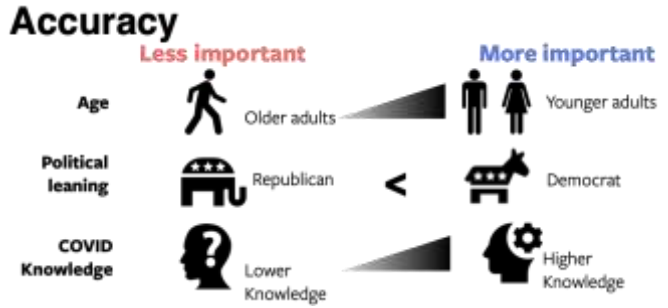
But, everyone does not value these attributes equally

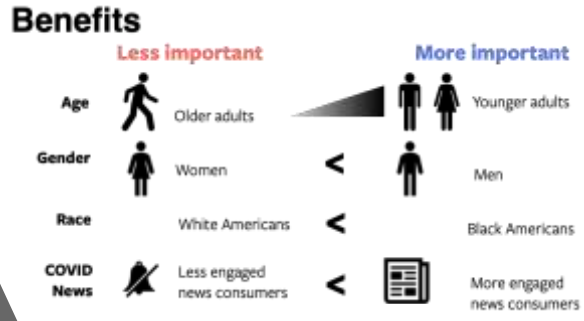
Democrats focus on accuracy; **Republicans** on privacy

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





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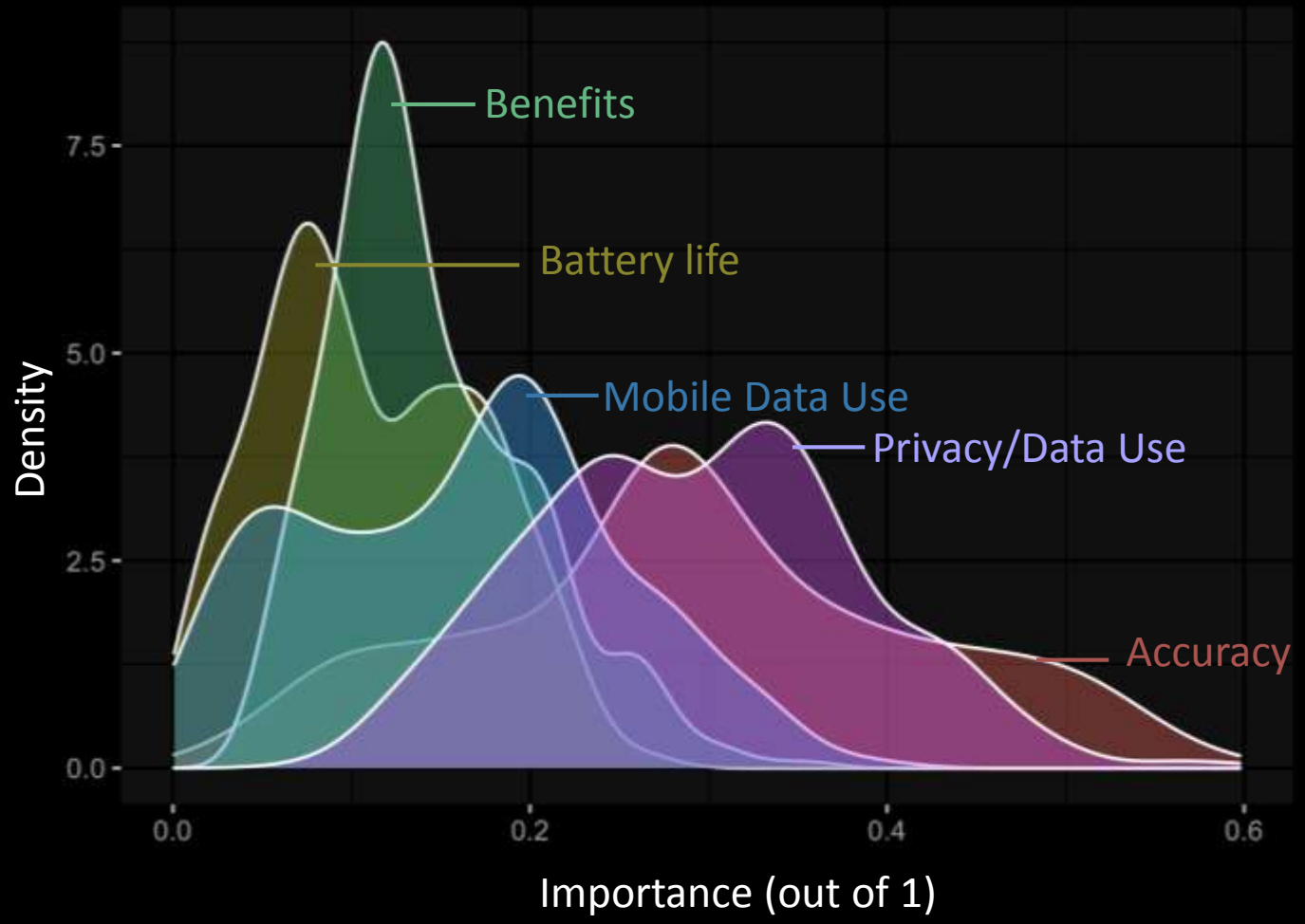
How private does a COVID19 app have to be? How accurate?



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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

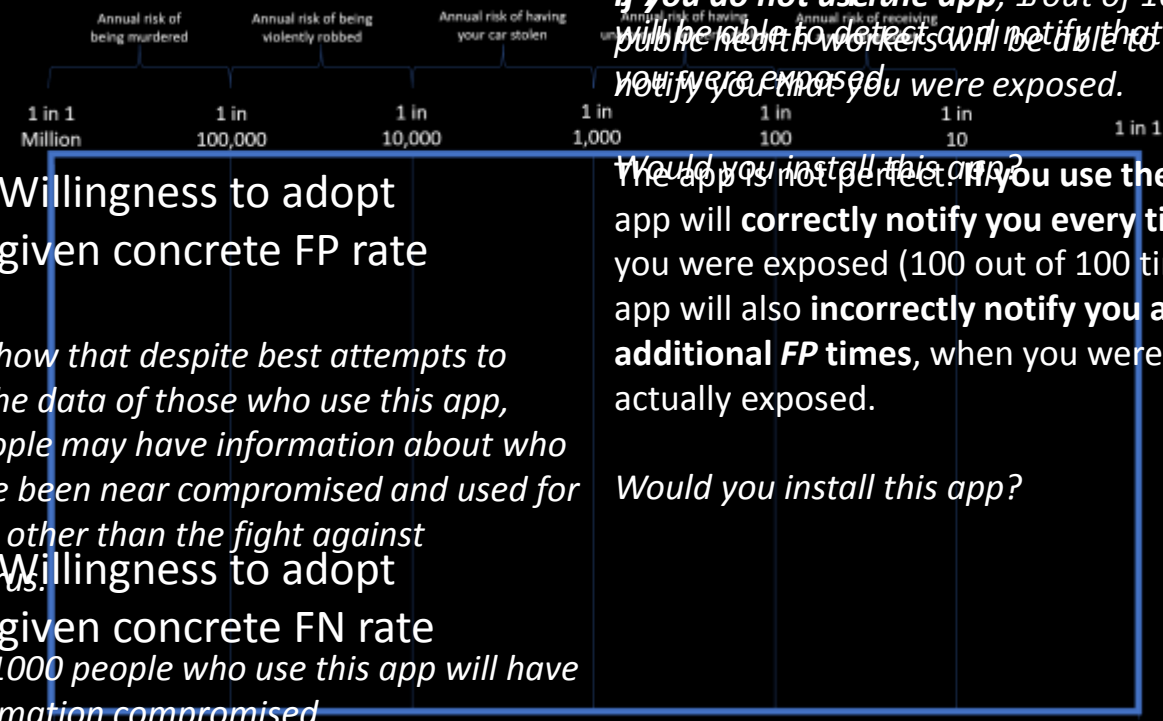
Implicit assessment of privacy perception

+ Willingness to adopt given concrete FN rate

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.

Please indicate on the chart below how many app users you think will have this information compromised over the next year.

P out of 1000 people who use this app will have this information compromised



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.*

Imagine that you are exposed to someone who has coronavirus 100 times over the next year.

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

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.

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?

False Positives

Implicit assessment of privacy perception

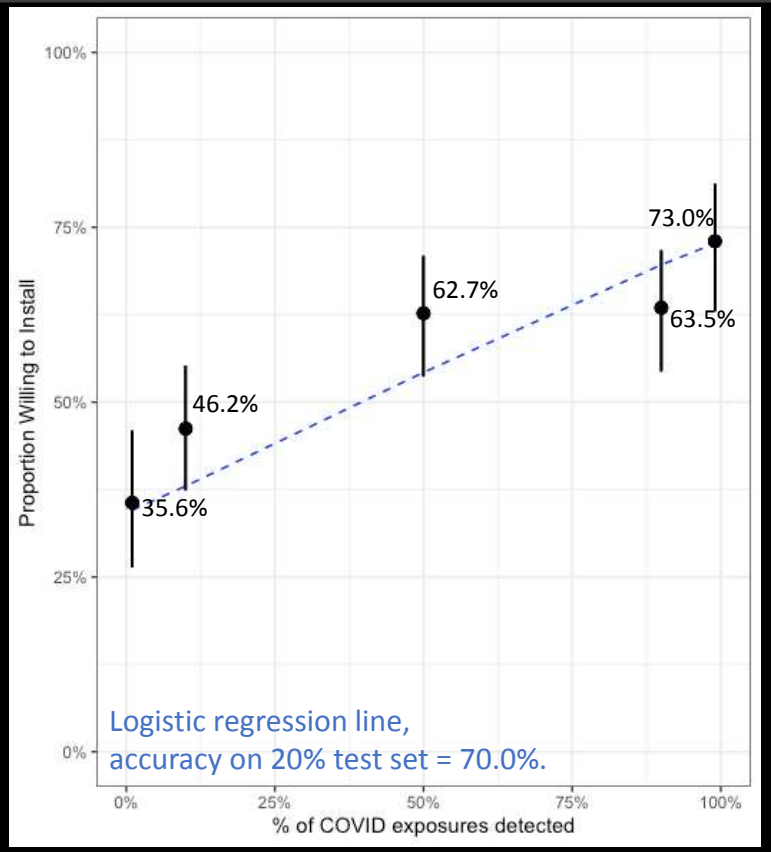
+ Willingness to adopt given concrete FP rate

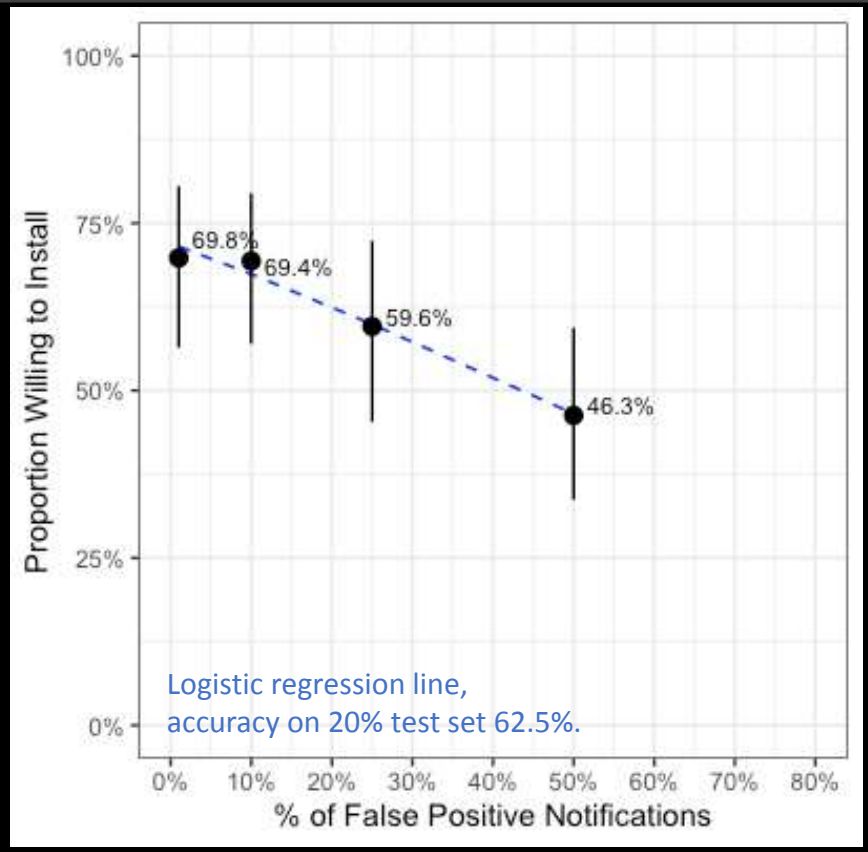
Privacy

Explicit statement of privacy risk

+ Willingness to adopt given concrete FN rate

How good is good enough?
Ideal: 50%+ sensitivity & fewer than 10% false positives





Kaptchuk, G., Goldstein, D. G., Hargittai, E., Hofman, J., Redmiles, E.M.
How good is good enough for COVID19 apps? https://arxiv.org/abs/2004.13219.

Featured in WIRED SCIENTIFIC AMERICAN STAT

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

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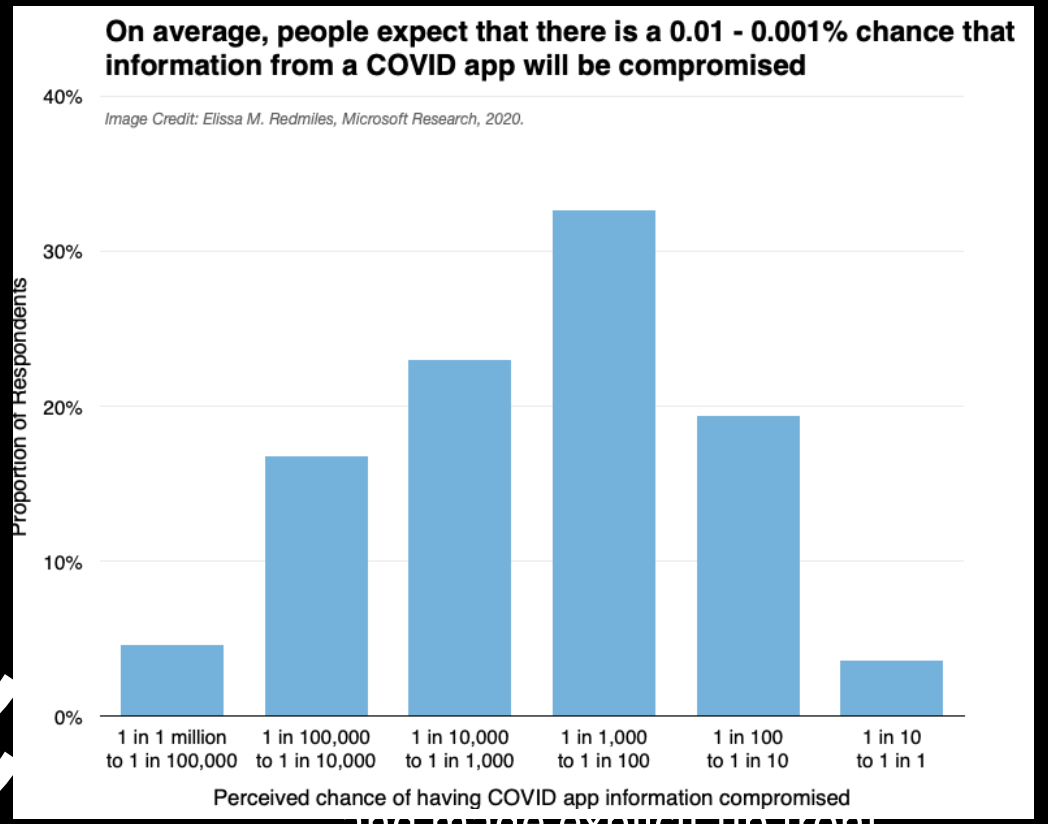

and made explicit up front

Next: using what people tell us to improve adoption

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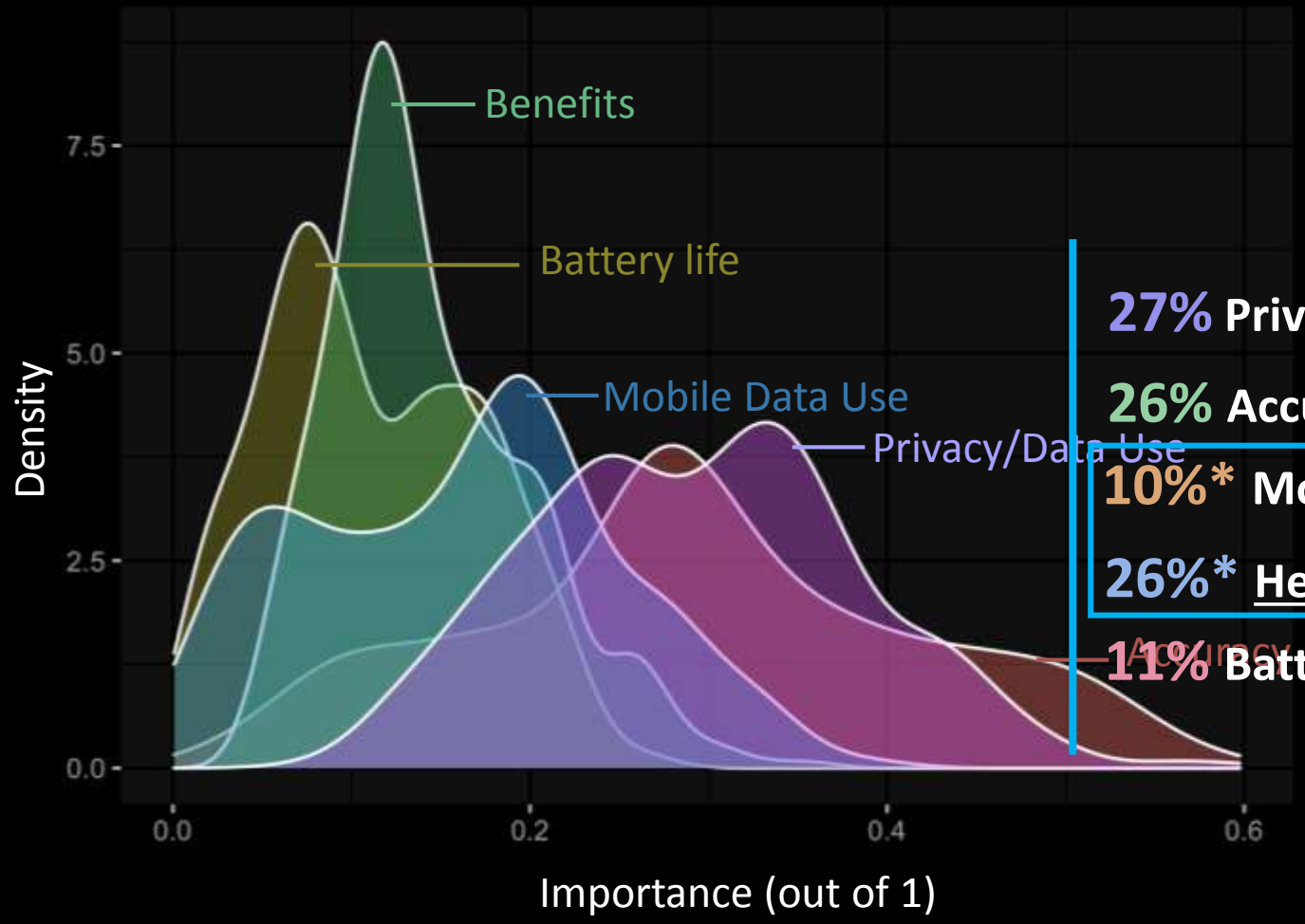
But wait!
Just pay people to adopt!

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	**29%**	Privacy / Data Use	**25%**	Privacy / Data Use
26%	Accuracy	**29%**	Accuracy	**25%**	Accuracy
10%*	Mobile data	**16%**	Mobile data use	**10%***	Mobile data
26%*	Health care benefits	**14%**	App promises benefits	**28%***	Monetary benefits
11%	Battery life	**11%**	Battery life	**13%***	Battery life

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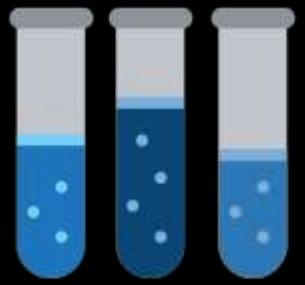
These results are being used directly in the marketing of COVID19 apps in Israel, Louisiana & other jurisdictions

Survey Results



Experimentation

Measurement

Advertising field studies to improve COVID19 app adoption

Provider

Privacy

Accuracy

Arc
Di

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

Questions? Elissa M. Redmiles | eredmiles@gmail.com | @eredmil1

Microsoft Research

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