

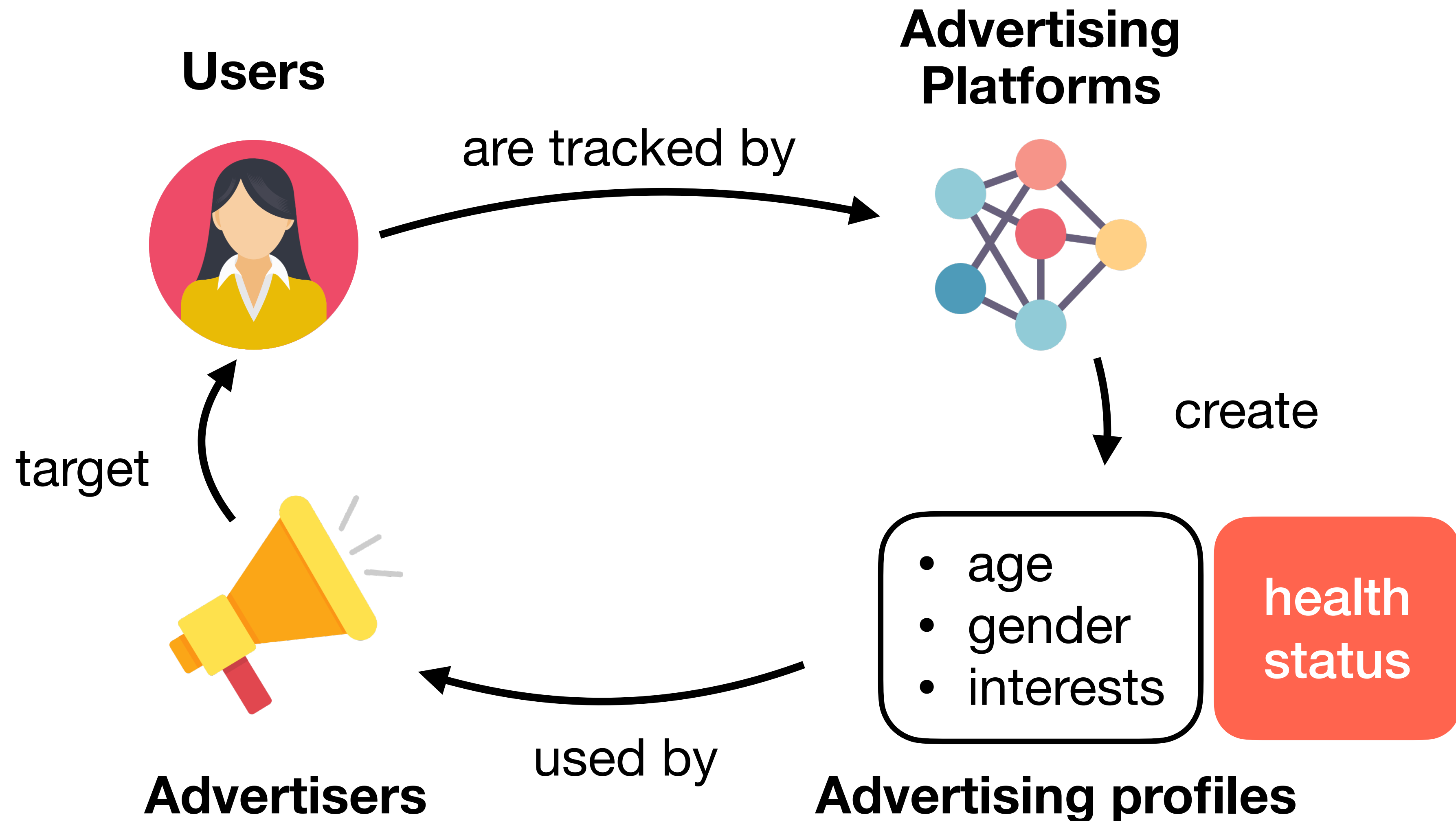
# Measuring Risks to Users' Health Privacy Posed by Third-Party Web Tracking and Targeted Advertising

Eric Zeng

Georgetown University

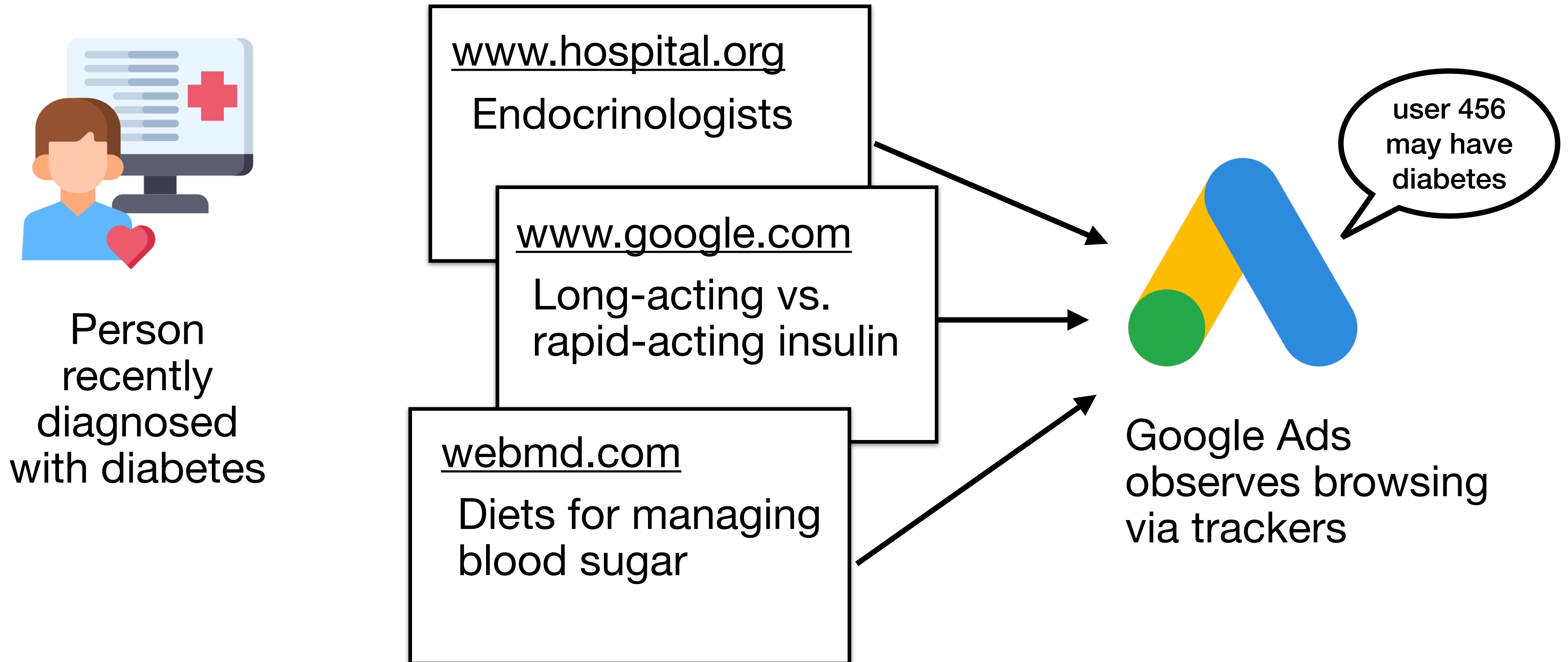
With Xiaoyuan Wu, Emily Ertmann, Lily Huang, Danielle Johnson, Anusha Mehendale, Brandon Tang, Karolina Zhukoff, Michael Adjei-Poku, Lujo Bauer, Ari Friedman, and Matthew McCoy

# Tracking and targeted advertising harms privacy



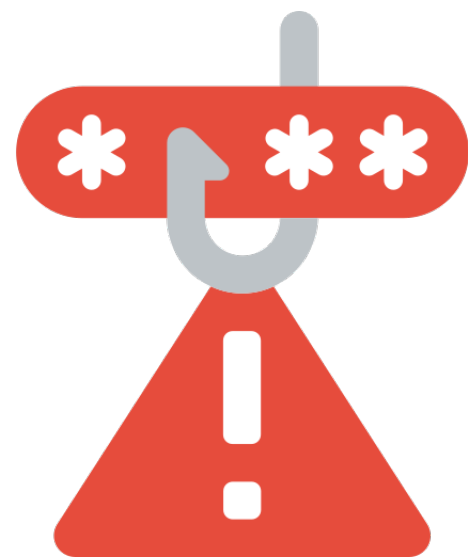
# How ad platforms could learn about your health

Engages in health information-seeking



# If ad platforms learn about users' health status...

**Advertisers could target users with harmful ads**



Medical  
scams



Distressing  
ads

[Gak et al. 2022]

**Ad platforms could disclose users' health status**



Embarrassment  
and shame



Economic  
discrimination

# Are ad platforms tracking users' health status?

## Trackers are widespread on health-related sites

- Hospital websites  
[Friedman et al. 2023]
- Medical journal websites  
[Gupta et al. 2023]
- Reproductive healthcare clinic websites  
[Friedman et al. 2022]

Pixel Hunt

### How California sent residents' personal health data to LinkedIn

The state's health insurance exchange transmitted pregnancy and domestic abuse data during a marketing campaign. It is reviewing its website practices.

## Ad platforms have labels for users' health conditions

### The Markup

Privacy

### From "Heavy Purchasers" of Pregnancy Tests to the Depression-Prone: We Found 650,000 Ways Advertisers Label You

By [Jon Keegan](#) and [Joel Eastwood](#)

Depression Propensity - Reach Tier 2 (Adstra)

Health & Fitness::**Depression** - comScore (audience interest)

Epsilon: Healthcare > Medications > **Depression** Medications

Kantar > US > Custom > Use Any Rx Treatment for **Depression**

# Research Questions

**RQ1:** Do users with health conditions **browse more health-related websites?**

**RQ2:** Are users' health-related browsing activities tracked by **third-party trackers?**

**RQ3:** Are users with health conditions **targeted by more health-related ads?**

**RQ4:** Are users being served **deceptive health-related ads?**

Introduction

**Methods**

Results

Discussion


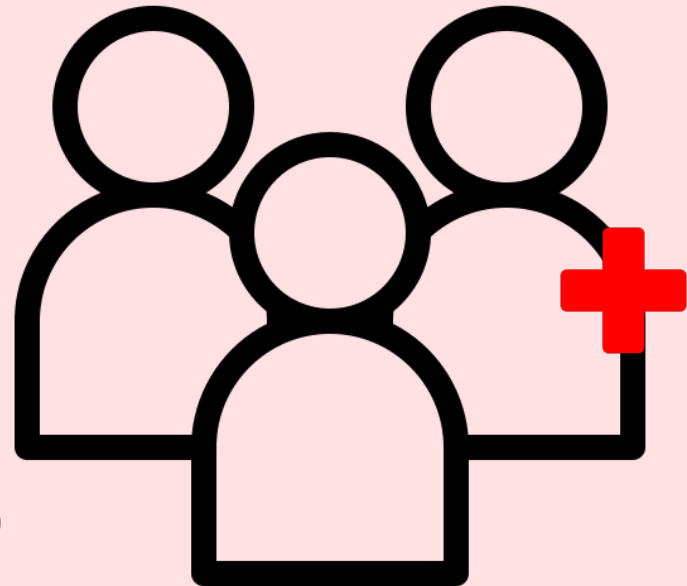
# Study design

Web history

Simulated  
user profiles

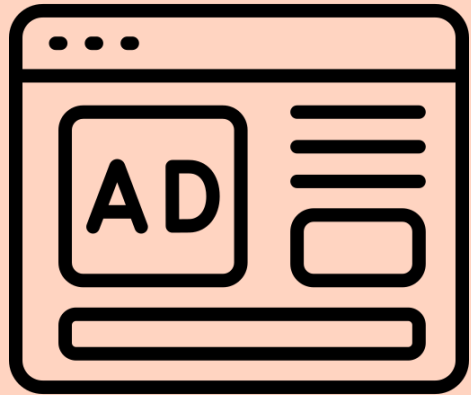
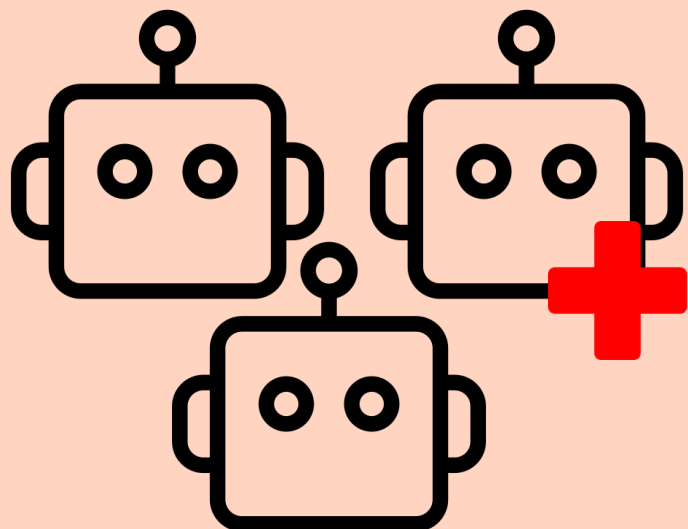
Ads from the  
*same set of*  
400 sites

People with health conditions  
(diabetes, cancer, etc.)  
n=73

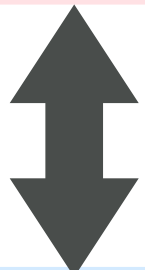


90 days


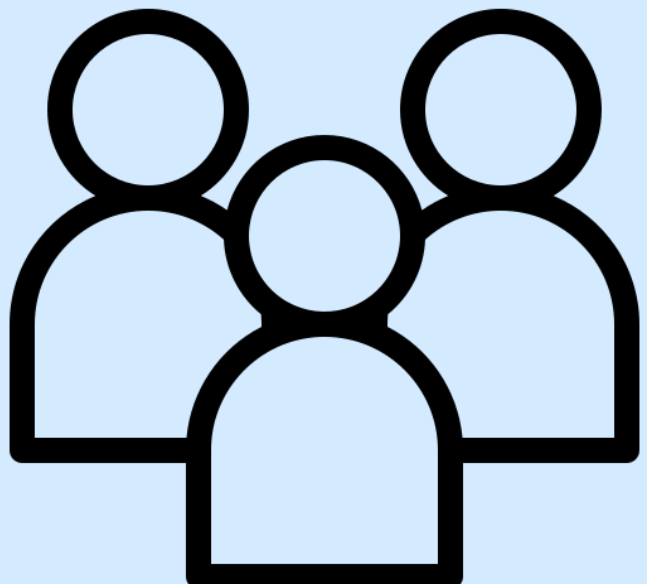
Crawl  
histories



Compare between groups

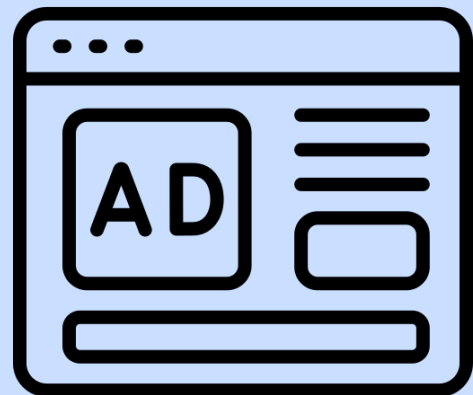
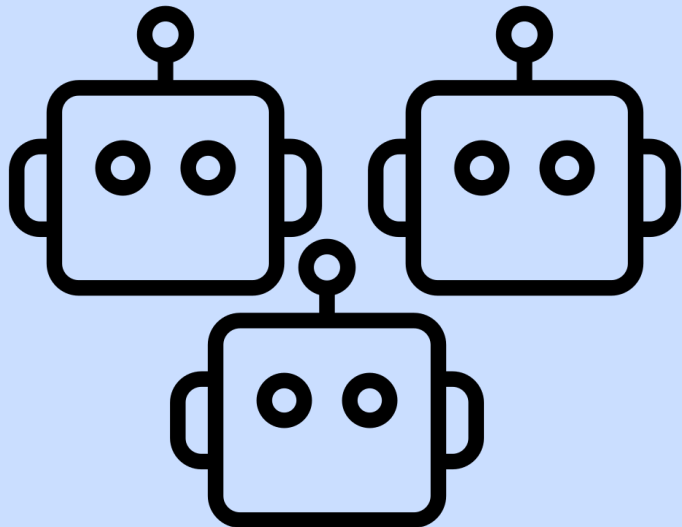


People with no health conditions  
n=34

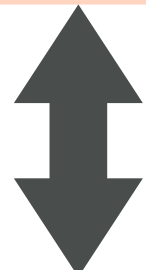


90 days

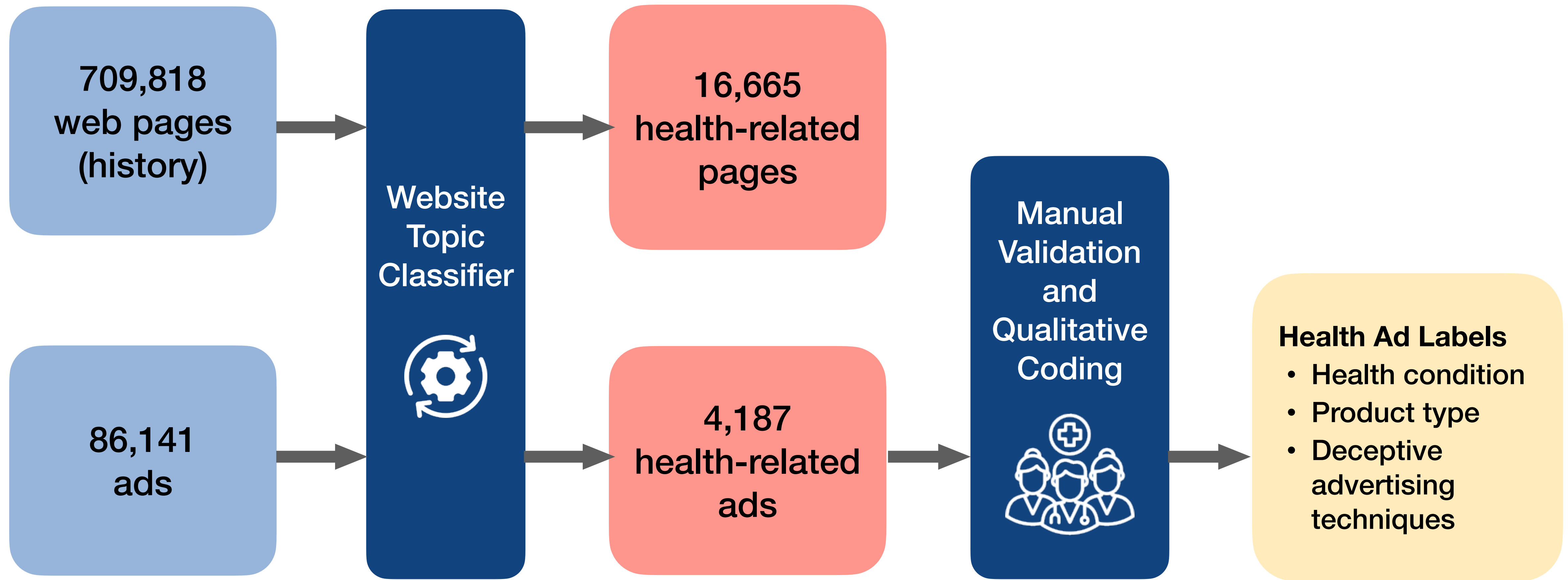
Crawl  
histories



Compare between groups



# Data labeling



Introduction

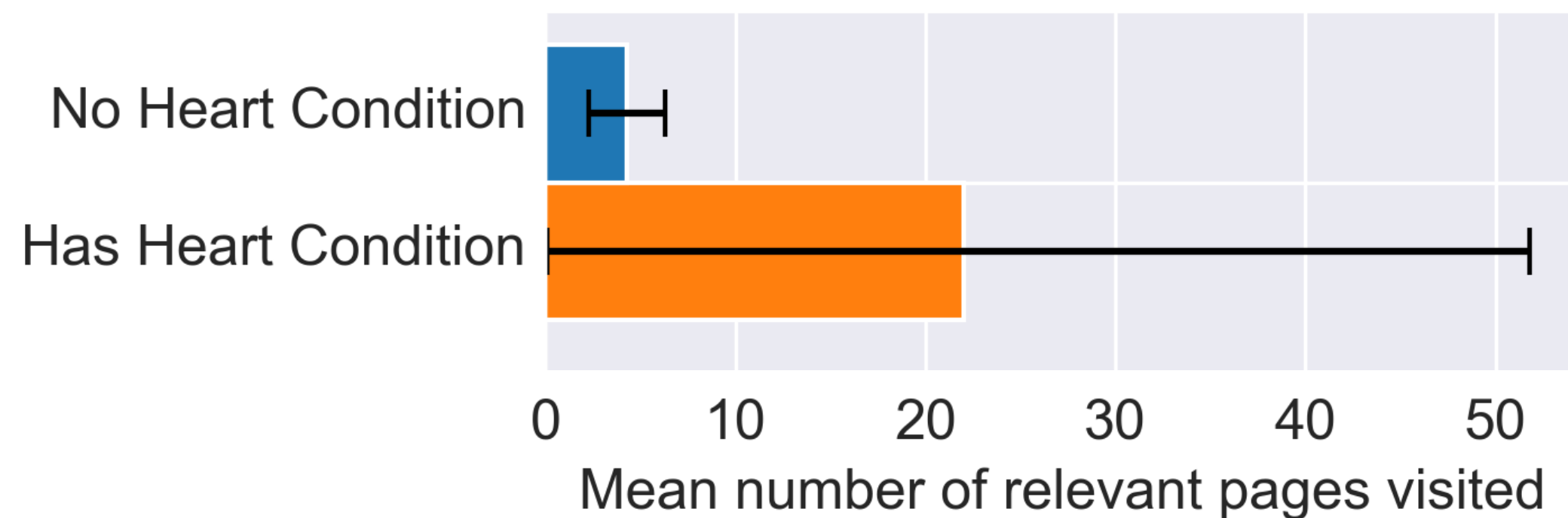
Methods

**Results**

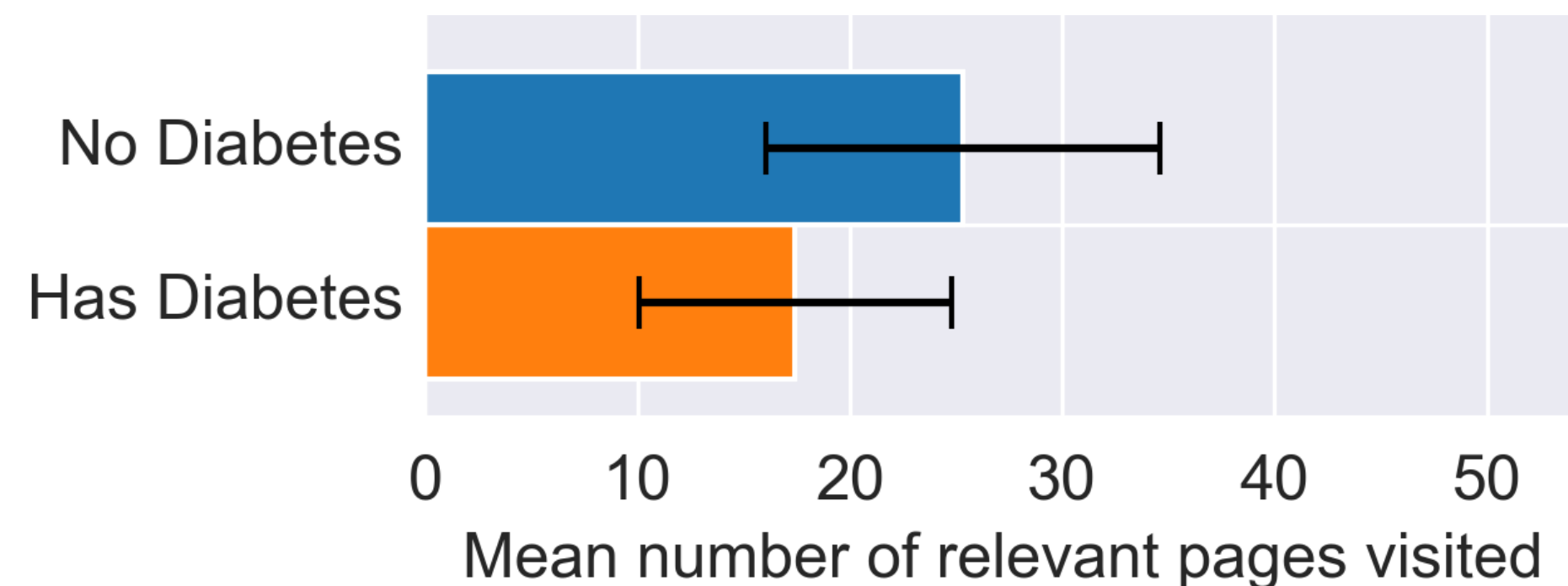
Discussion

# Did users with health conditions visit more pages about their condition? (RQ1)

Pages about Heart Conditions Visited



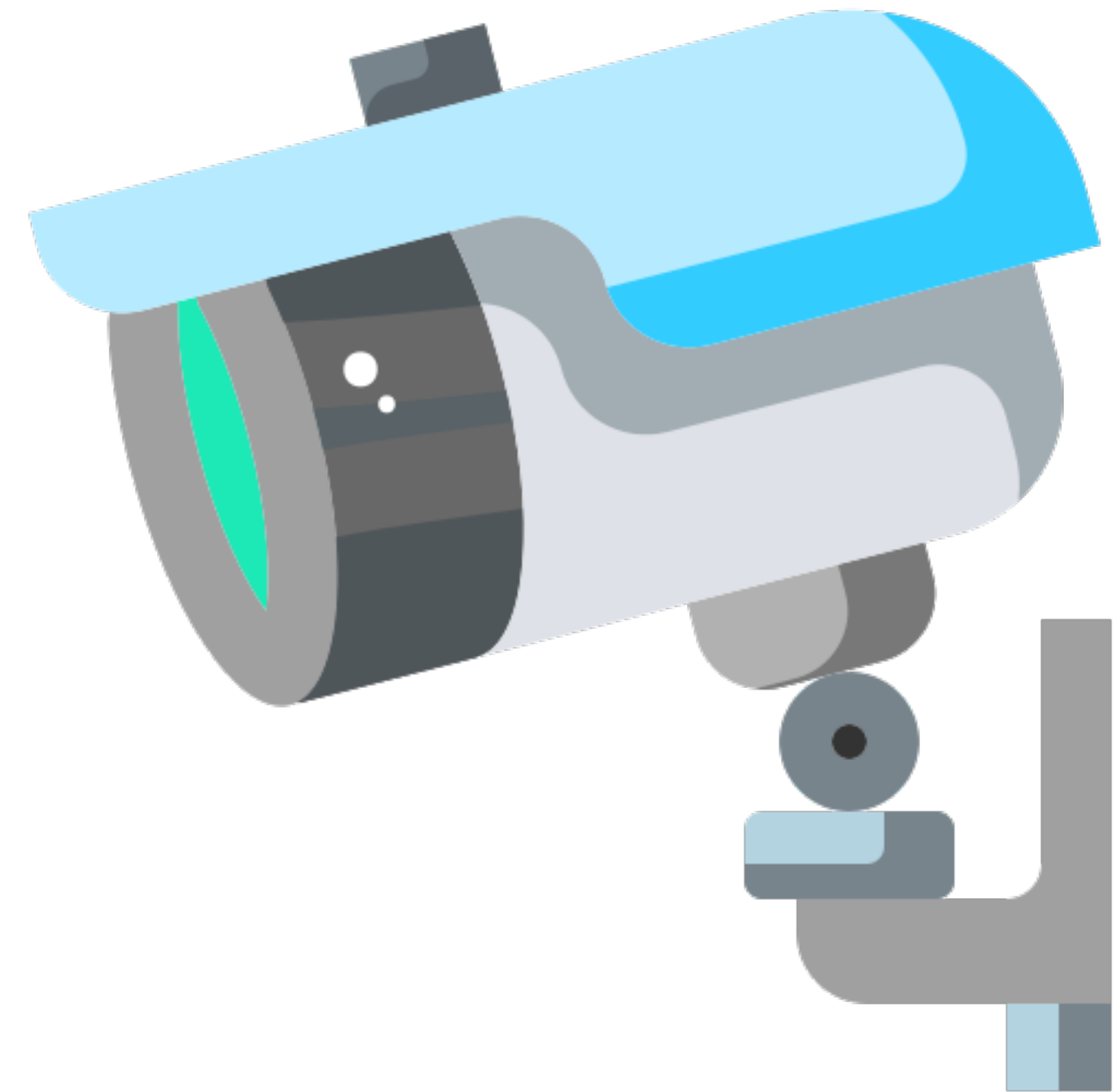
Pages about Diabetes Visited



- **Inconclusive:** no significant differences
- **Why?** Limited 90-day browsing history window
- **Takeaway:** browsing history may not be an obvious signal for specific health conditions

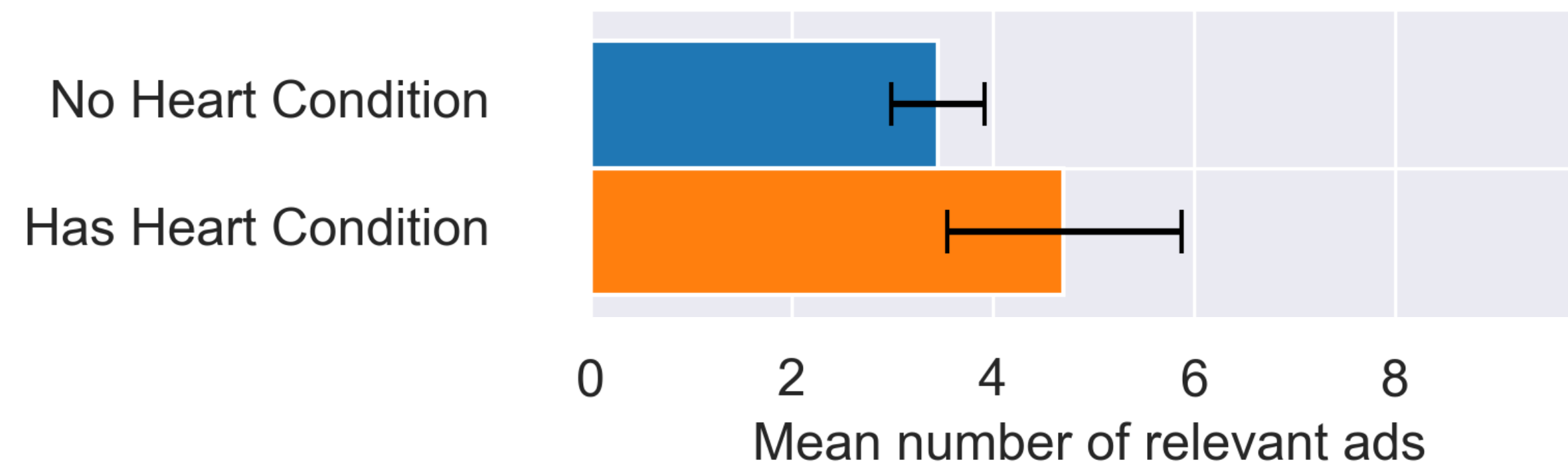
# Are users' health-related browsing activities tracked by third-party trackers? (RQ2)

- **Yes** - trackers observe most of users' health-related browsing
- **70%** of health-related pages participants visited contained a third-party tracker
- Top trackers can link participants' health-related browsing across sites
- Google's trackers were present on **>50%** of health-related pages for **70%** of participants



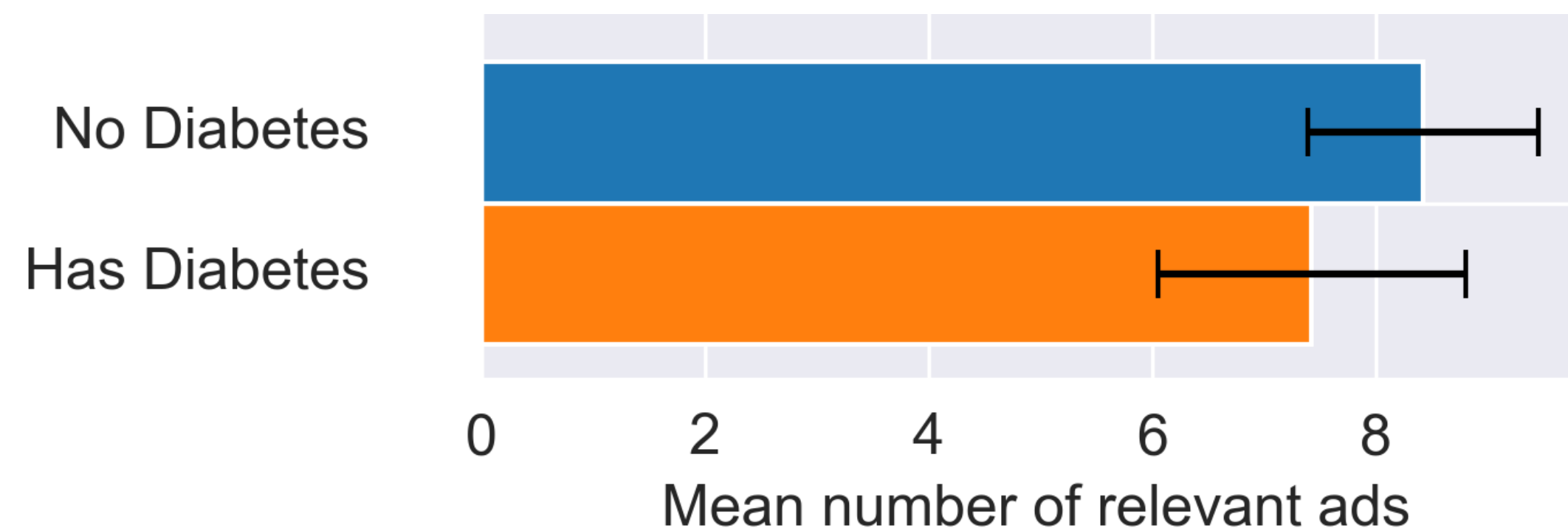
# Did the profiles of users with health conditions receive ads targeting their condition? (RQ3)

## Number of Ads about Heart Conditions Received



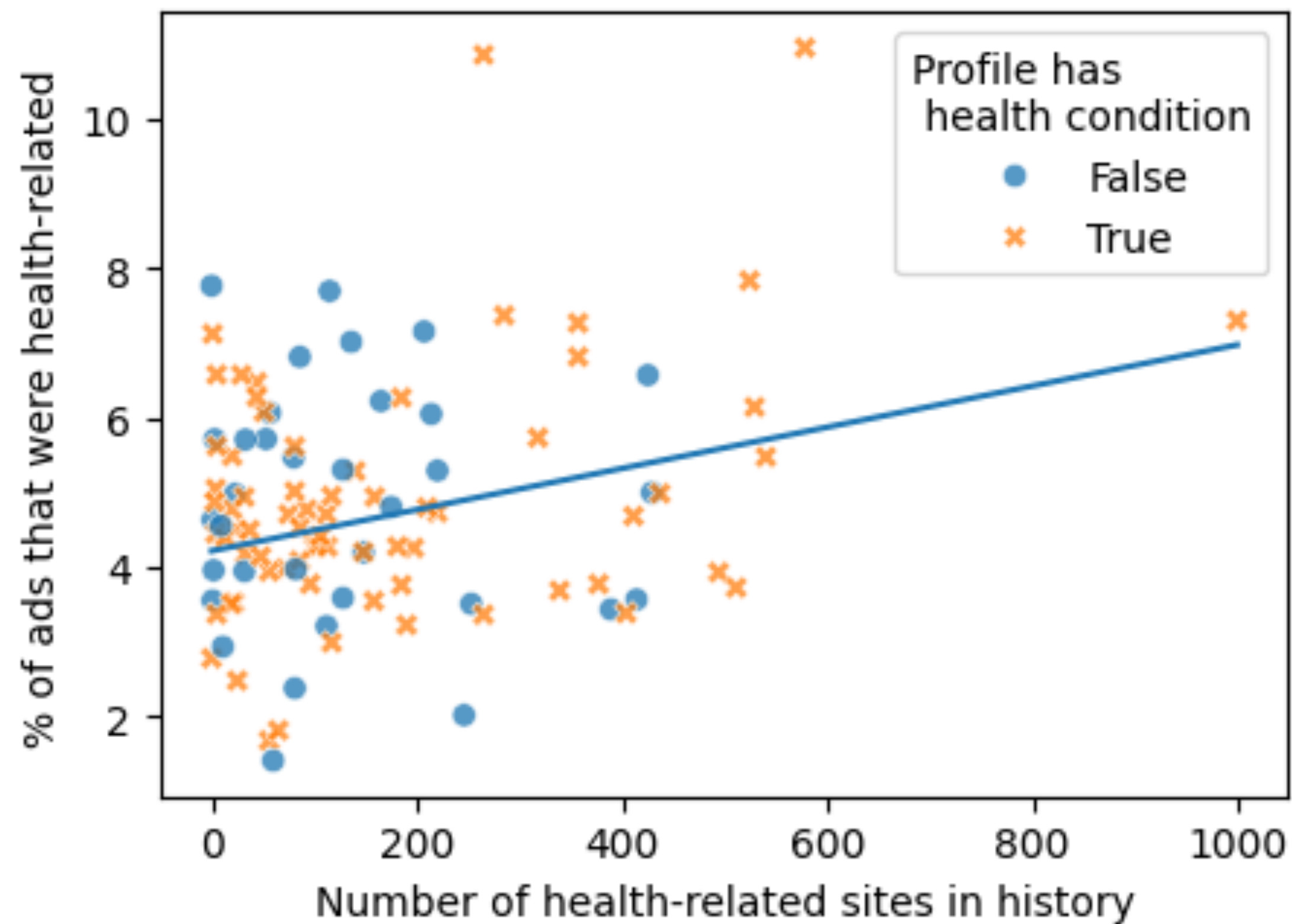
- **Inconclusive:** no significant differences in number of health ads, comparing people with and without conditions

## Number of Ads about Diabetes Received



# Health-related browsing history leads to more health-related ads

## Health-Related History vs. Health-Related Ads



- **Correlation:** each 100 health pages visited increased ads served by 2.2
- **Takeaway:** ad platforms are enabling targeting of users generally interested in health topics

# Are users being served deceptive health-related ads? (RQ4)

- **Yes:** 49% of health-related ads used deceptive advertising techniques
  - e.g. overstating benefits, fake endorsements, pseudoscience
- Deceptive techniques most common in dietary supplements, skincare, weight loss

## Exotic Coffee Loophole **Dissolves** **Stubborn Fat**

(Watch Video)



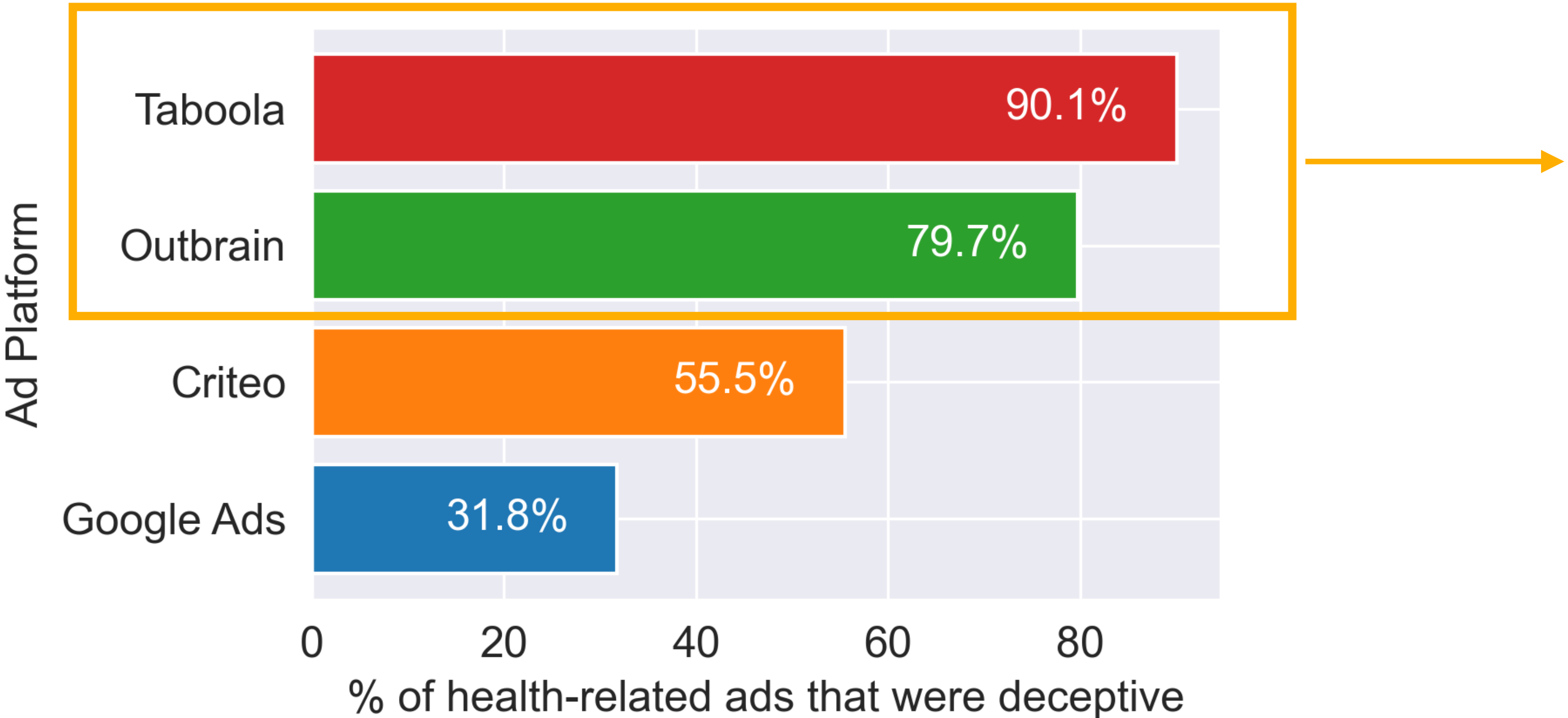
[Click Here To Watch The Video](#)

More and more people are using this new "Coffee-Loophole" that can trigger weight loss. This new method is taking the industry by storm, changing everything we knew about our body...

Top Scientists have discovered that this ONE thing could make all the difference between losing or gaining it.

# Which platforms serve deceptive health-related ads?

## Deceptive health-related ads by ad platform



## Native ad platforms “chumboxes”

A native advertisement featuring a man in a suit and glasses pointing upwards. The background shows a kitchen scene with a frying pan and a yellow egg yolk. The text below the image reads: 'Doctor Reveals One Tasty food that “forces” FAT into ENERGY'. Below this, it says 'Top doctor urges people over 60 to stop making this huge mistake for the...'. At the bottom, it says 'Gundry MD | Ad'.

[Zeng et al. '20, '21, '22]

Introduction

Methods

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# Policy recommendations

- **Health-related sites** should not embed third-party trackers
- **Online advertising platforms** should not:
  - Track users' visits to health-related sites
  - Use health-related browsing activity in ad targeting and delivery algorithms
- **Regulators** should bring enforcement actions against ad platforms that host deceptive health ads



# Thanks for watching!

## My fantastic collaborators on this project:



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# Thanks for watching!

## Summary

- Browsing health-related websites increases the amount of targeted health-related advertising a user sees
- Health-related advertising on the web is highly deceptive
- Policy changes are needed to protect users' health privacy and reduce deceptive health advertising

## Contact

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Dataset and Adscraper  
measurement platform:



images and icons from: Freepik and [flaticon.com](https://flaticon.com)