Characterizing the Use of Browser-Based Blocking Extensions To Prevent Online Tracking

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with Jessica Vitak, Arvind Narayanan, and Marshini Chetty

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18 56

Online Tracking

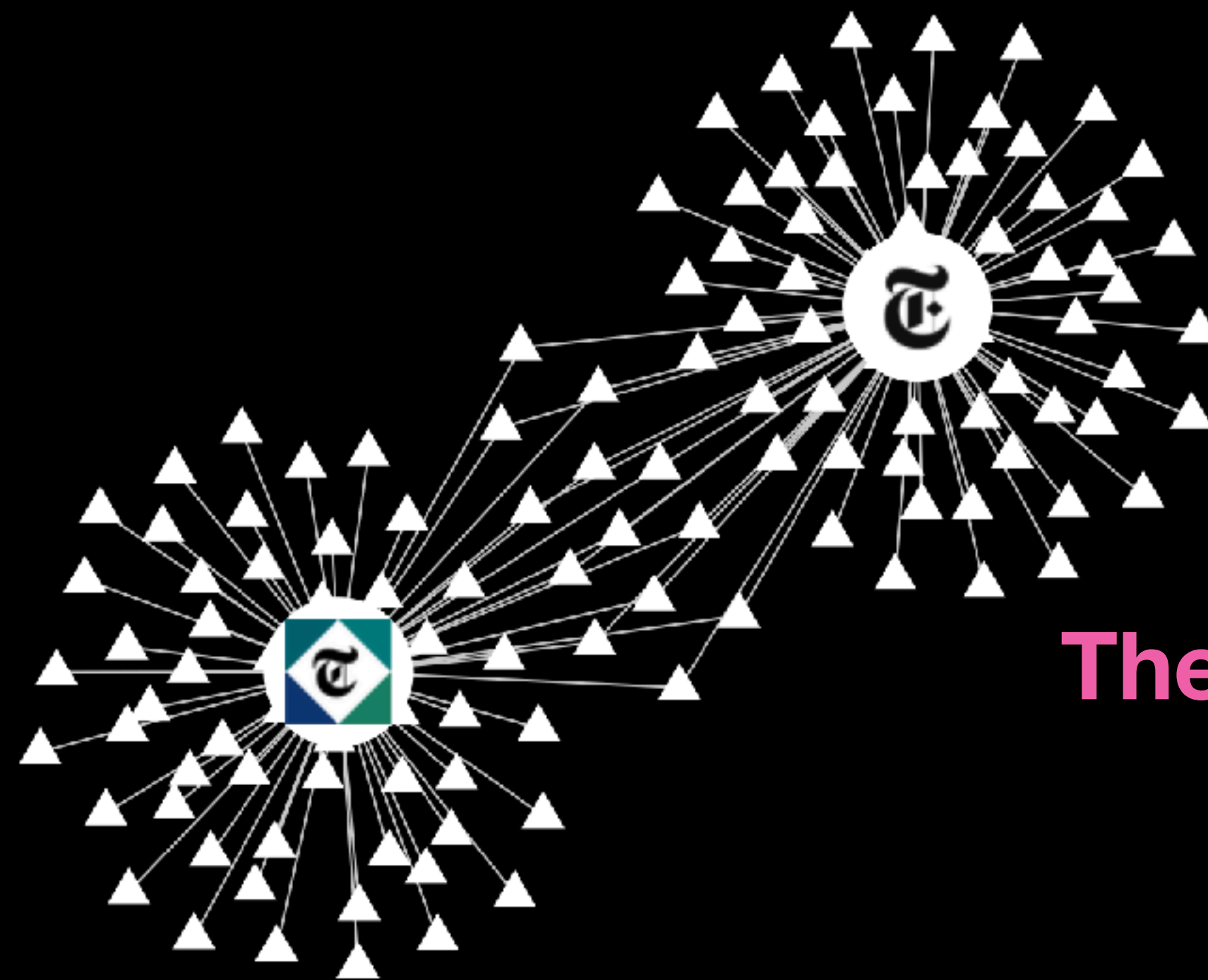DATA GATHERED SINCE
AUG 13 2018

YOU HAVE VISITED
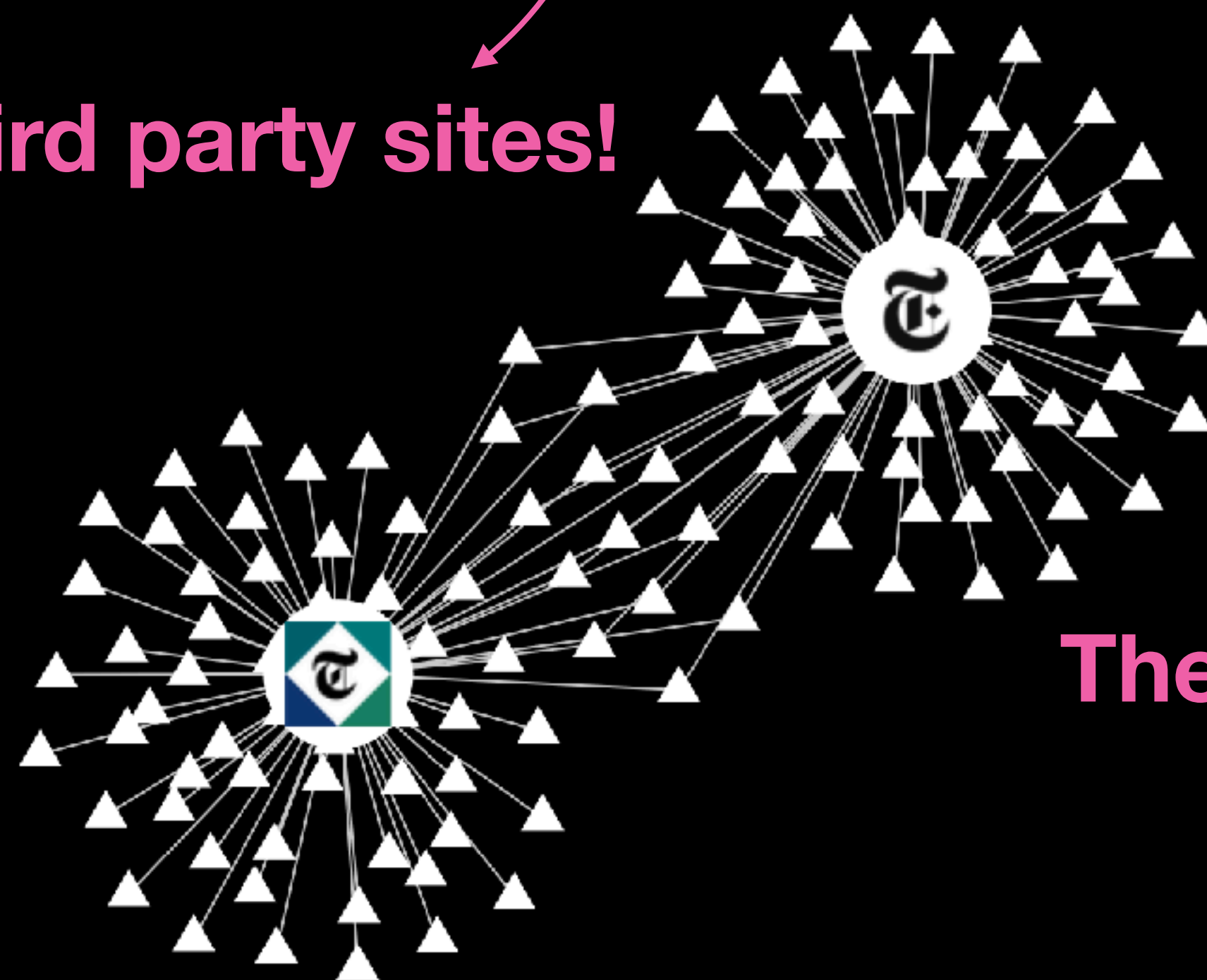2 SITES

YOU HAVE CONNECTED WITH
124 THIRD PARTY SITES

TRACKING PROTECTION OFF

Recent Site

GRAPH VIEW

The New York Times

The Telegraph

Online Tracking

Blocking Extensions

Blocking Extensions

AdBlock Plus   AdBlock

  Ad blockers

Blocking Extensions

AdBlock Plus   AdBlock

Ad blockers

Ghostery   Priv. Badger   Disconnect

Tracker blockers

Blocking Extensions

AdBlock Plus AdBlock

Ad blockers

Ghostery Priv. Badger Disconnect

Tracker blockers

uBlock uBlock Origin

Content blockers

Blocking Extensions

AdBlock Plus AdBlock

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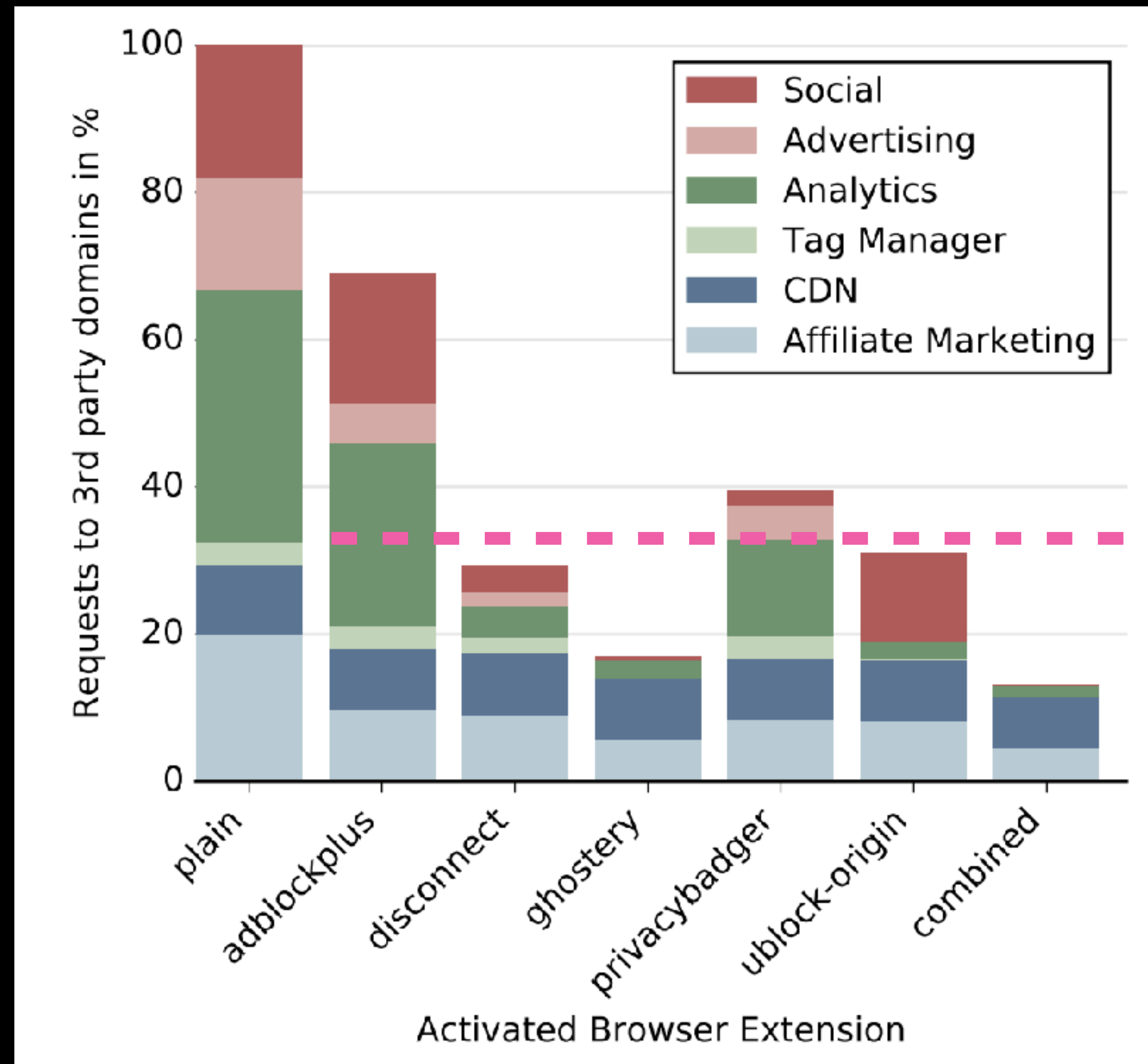uBlock uBlock Origin

Content blockers

Blocking Mechanism

EasyList

Internal lists
Heuristics

EasyList
EasyPrivacy
Misc. Lists

Blocking Extensions Are Effective!

~ 66% reduction in third-party requests

Block Me If You Can: A Large-Scale Study of Tracker-Blocking Tools (Merzdovnik et al)

Missing Piece: Real-World Usage of Blocking Extensions

Mental Models: Does blocking extension use relate with a greater understanding of online tracking?

Motivations: What are the reasons behind users' adoption of blocking extensions?

Experiences: What kind of user experiences result when blocking extensions break websites?

Missing Piece: Real-World Usage of Blocking Extensions

Mental Models: Does blocking extension use relate with a greater understanding of online tracking?

Intentions: What motivates the widespread adoption of blocking extensions?

Experiences: What kind of user experiences result when blocking extensions break websites?

Goal: How can we improve defenses against online tracking?

Method: Surveys + Measurement

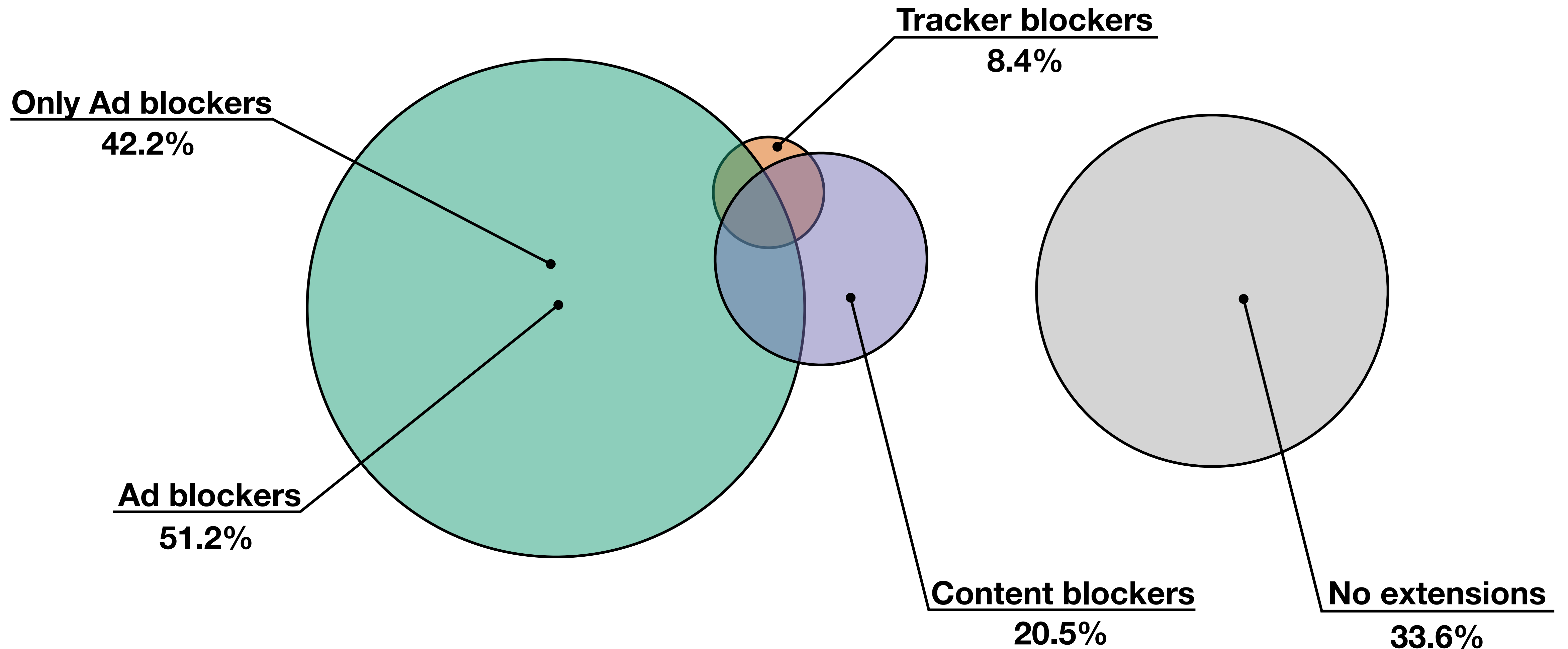Participants: Amazon Mechanical Turk (N = 1000)

Asked:

- Extensions used (Length of use, Learned about from, Reason behind adoption)

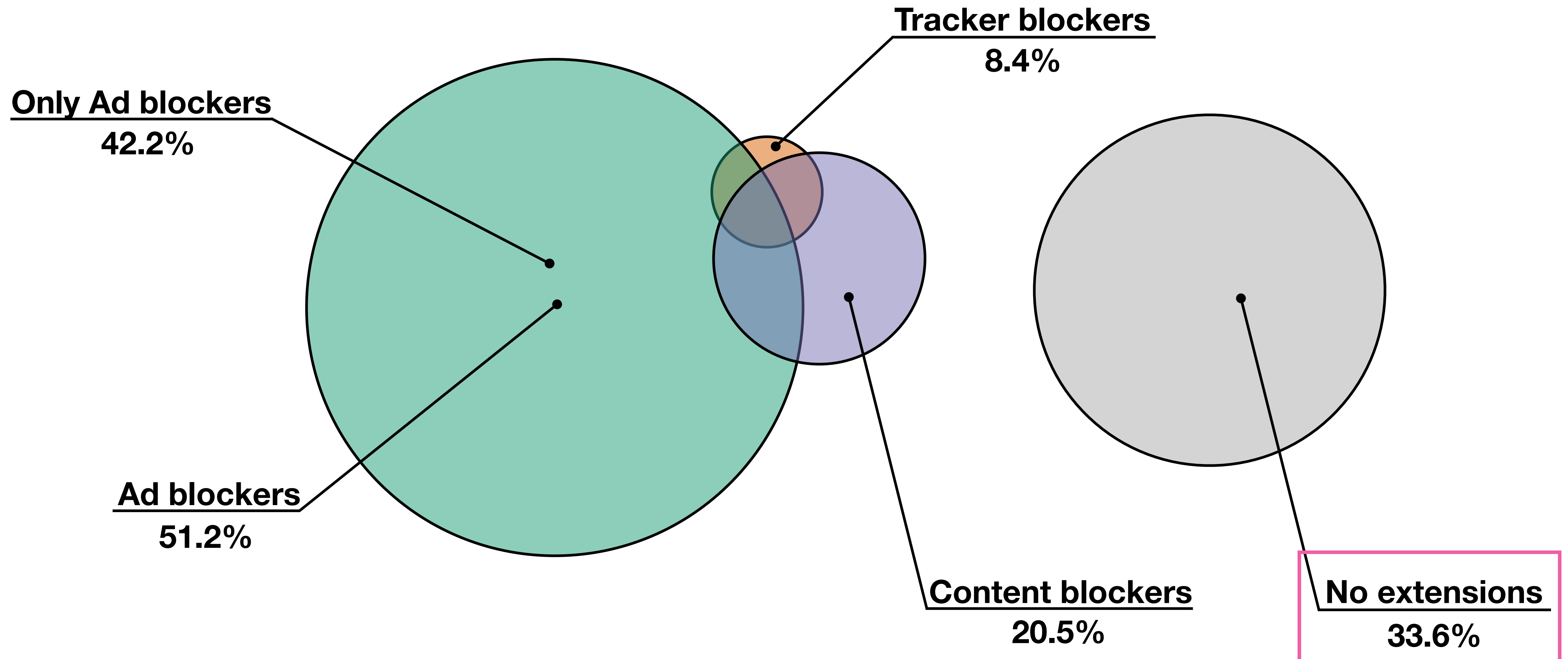- Experiences with website breakage (Websites experienced, Subsequent action)

Measured:

- Blocking trackers?

- Blocking ads?

- Blocking third-party cookies?

- Set Do Not Track?
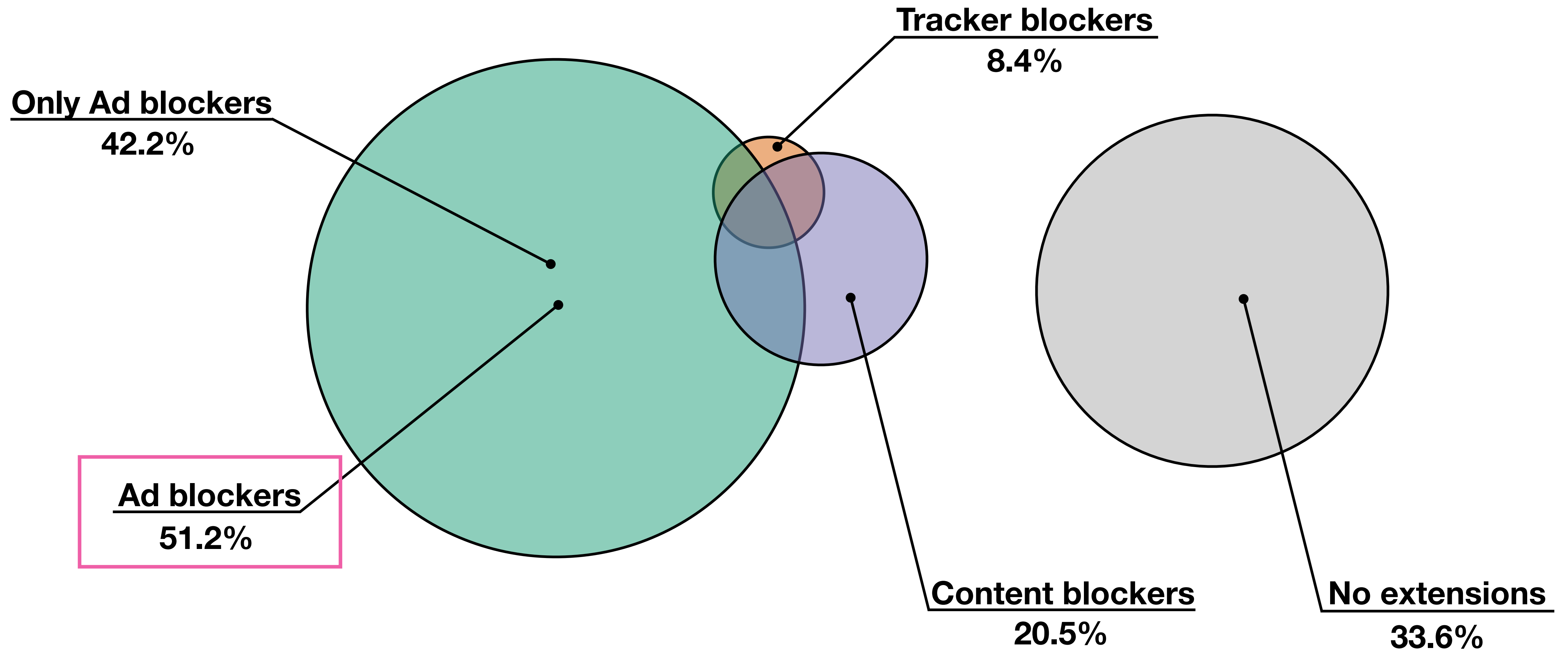
How prevalent are blocking extensions?

Reported Blocking Extension Usage

Tracker blockers
8.4%

Only Ad blockers
42.2%

Ad blockers
51.2%

Content blockers
20.5%

No extensions
33.6%

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Reported Blocking Extension Usage

Tracker blockers
8.4%

Only Ad blockers
42.2%
Measured: 9.95%

Ad blockers
51.2%

Content blockers
20.5%

No extensions
33.6%

Does blocking extension use relate with a greater understanding of online tracking?

Mental Models of Online Tracking

Entities that Track

Information Tracked

Tracking Outcomes

Tracking Mechanisms
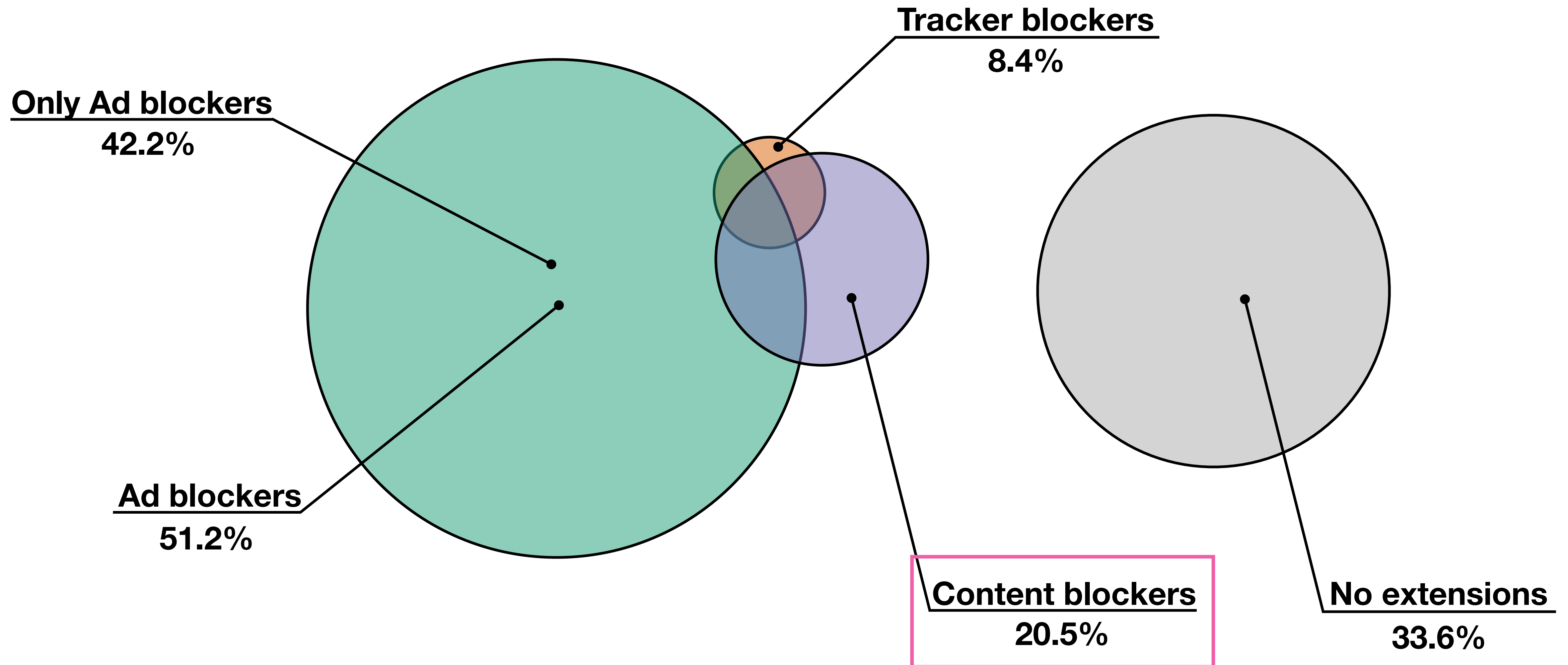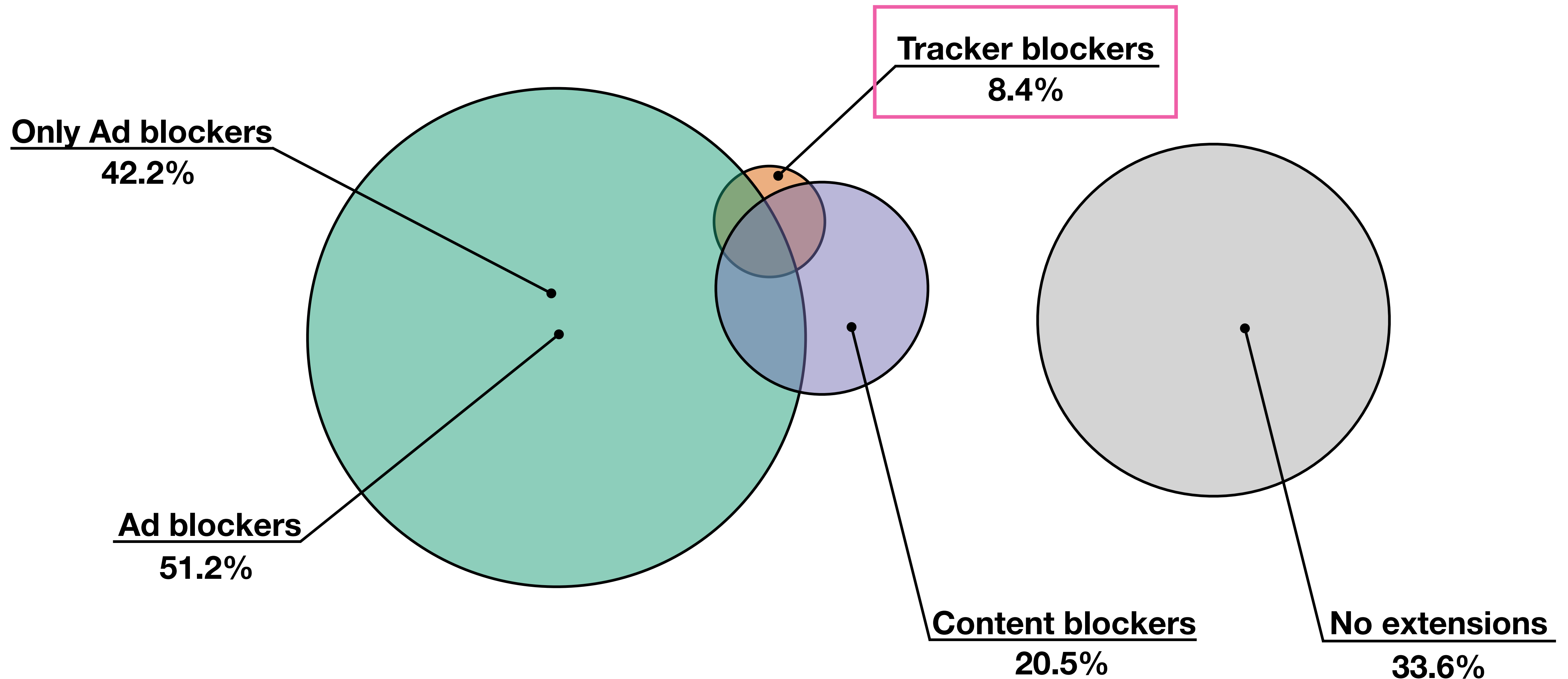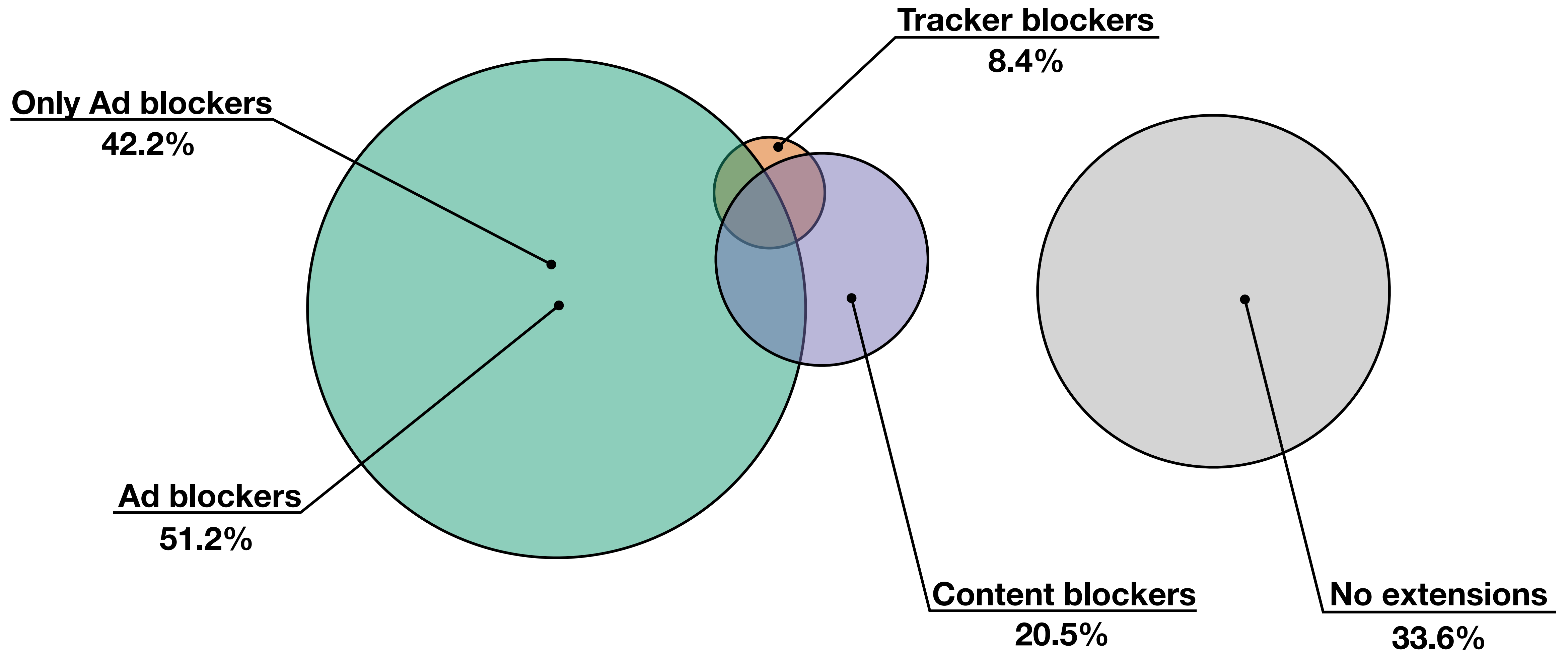
Comfort with Tracking

Mental Models of Online Tracking

Entities that Track

Information Tracked

Tracking Outcomes

Tracking Mechanisms

Comfort with Tracking

Takeaway: Blocking extension usage only weakly relates with an advanced understanding of online tracking
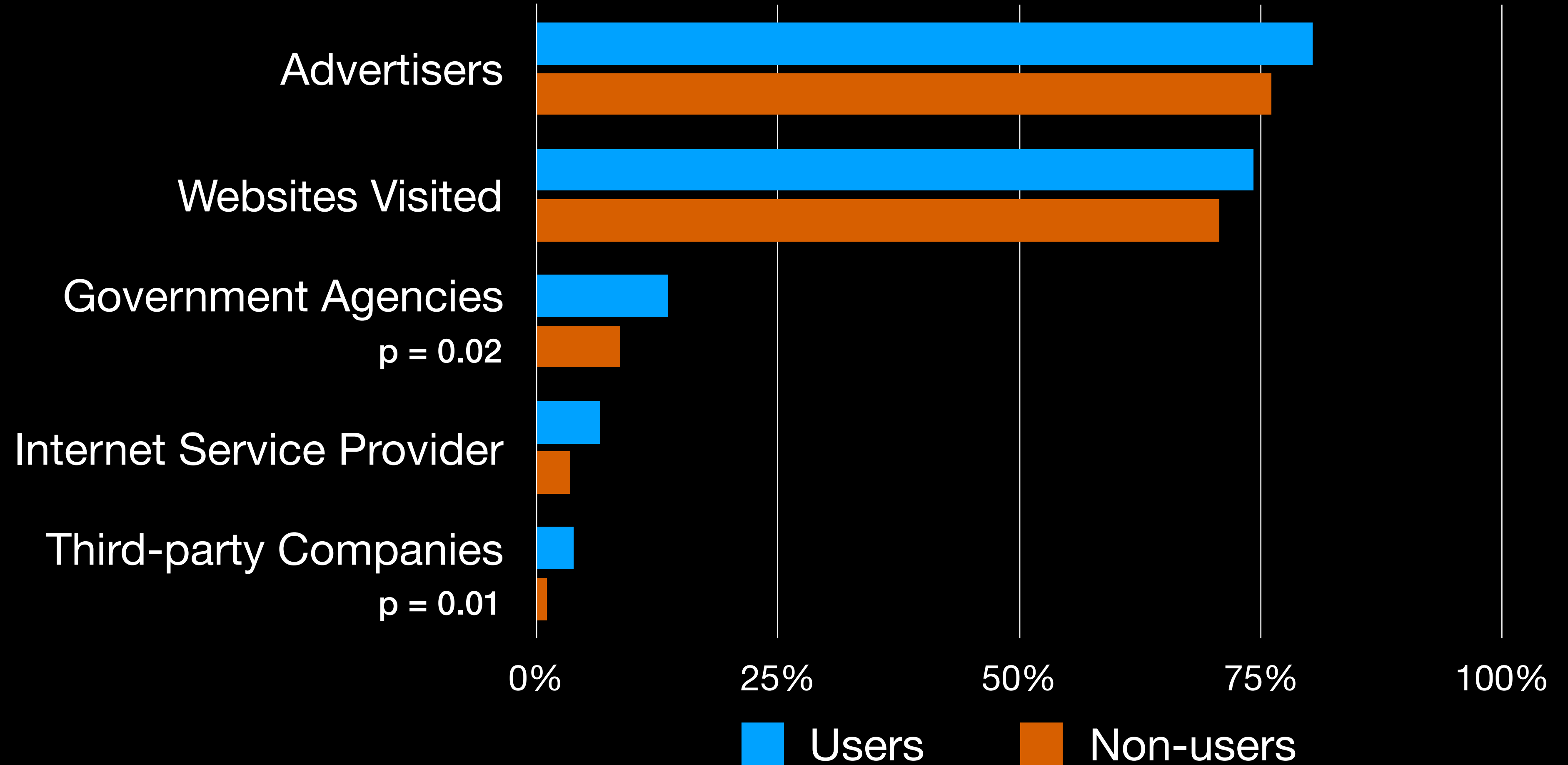
Mental Models of Online Tracking

Entities that Track

Information Tracked

Tracking Outcomes

Tracking Mechanisms

Comfort with Tracking

Advertisers

Websites Visited
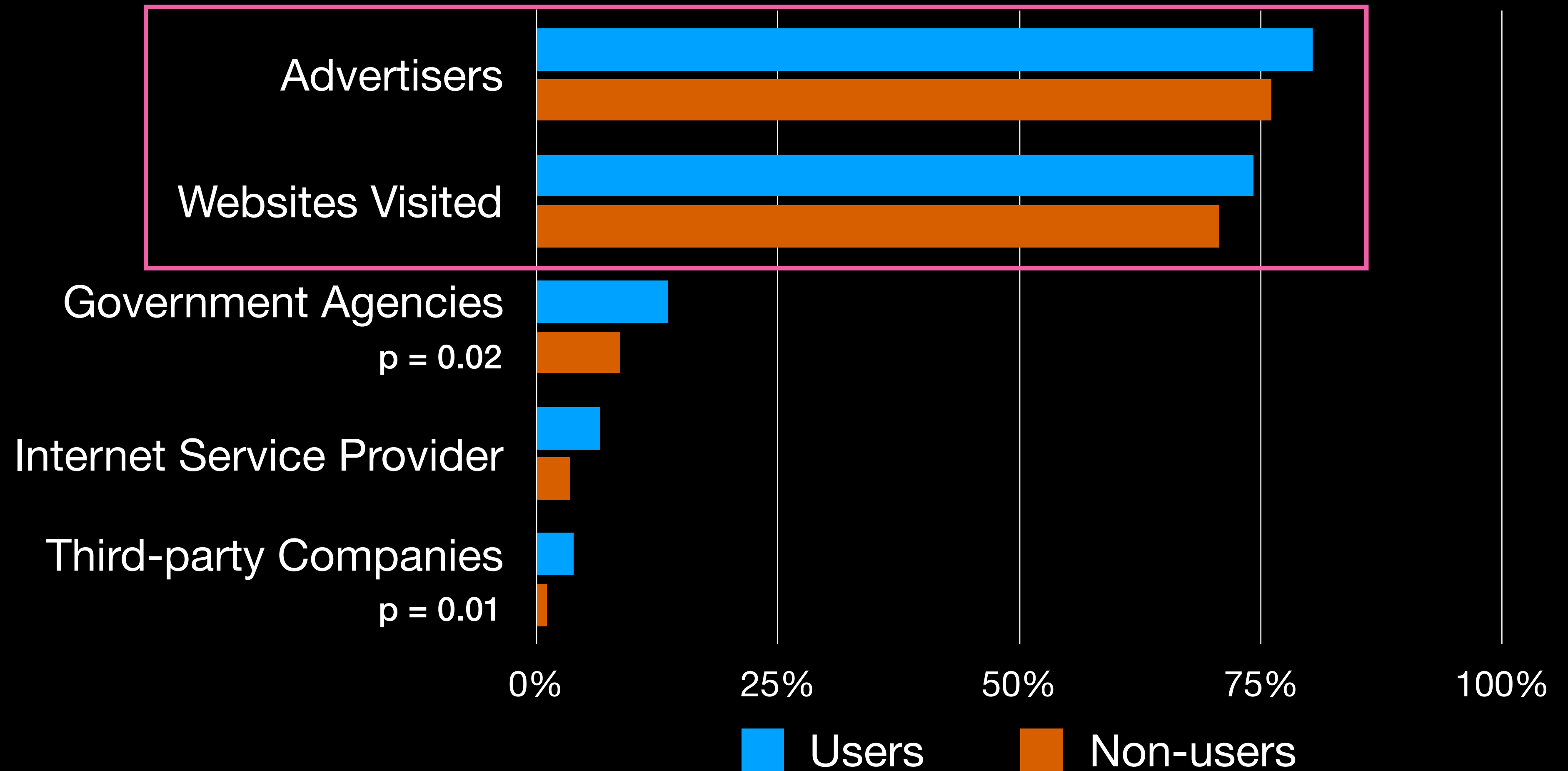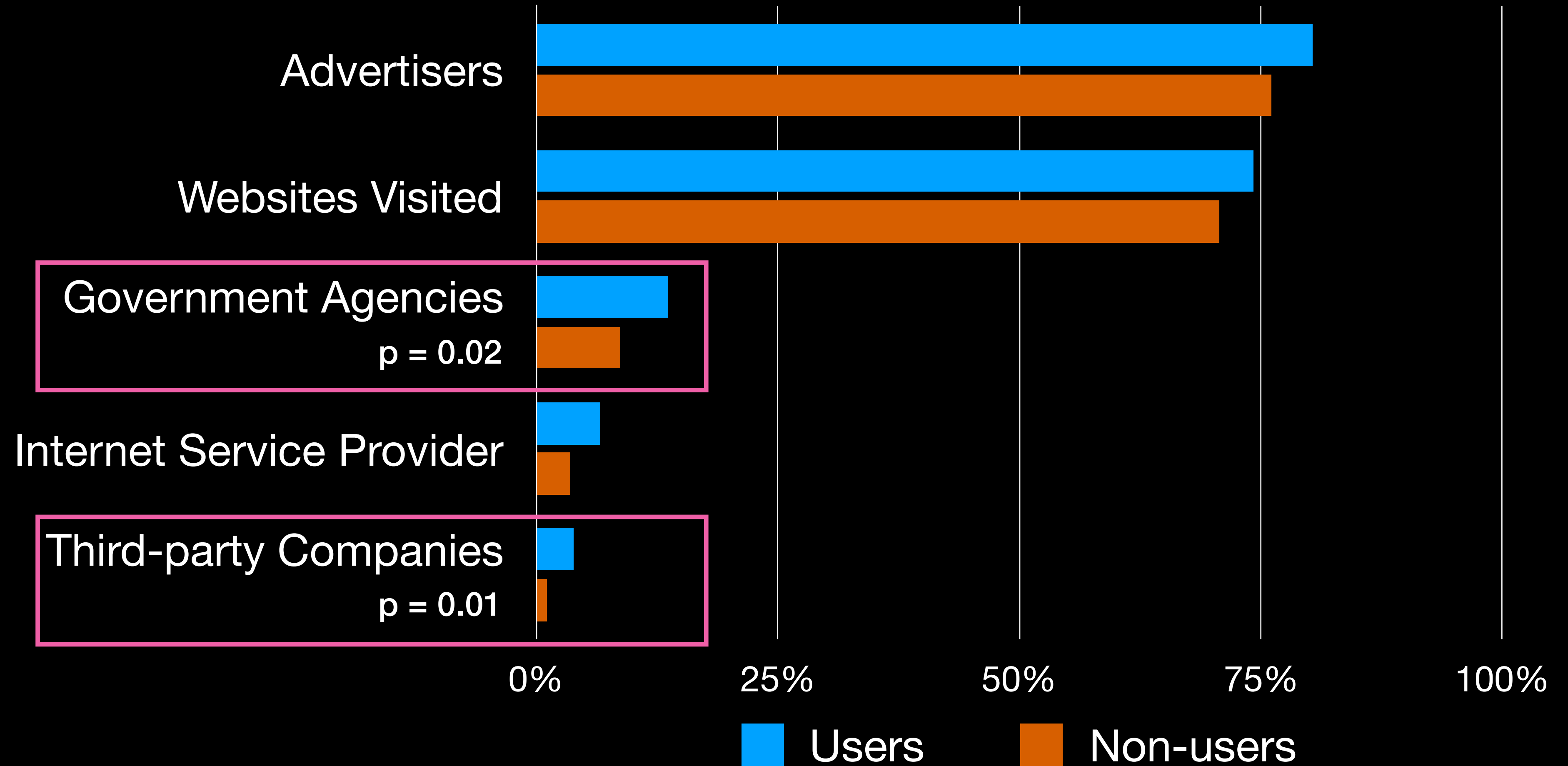
Government Agencies
p = 0.02

Internet Service Provider

Third-party Companies
p = 0.01

0% 25% 50% 75% 100%

■ Users   ■ Non-users

25

Mental Models of Online Tracking

Entities that Track

Information Tracked

Tracking Outcomes

Tracking Mechanisms

Comfort with Tracking

Chart with categories: Advertisers, Websites Visited, Government Agencies (p = 0.02), Internet Service Provider, Third-party Companies (p = 0.01). X-axis: 0%, 25%, 50%, 75%, 100%. Legend: Users, Non-users.

Mental Models of Online Tracking

Entities that Track

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Advertisers

Websites Visited

Government Agencies
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Mental Models of Online Tracking

Entities that Track

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Comfort with Tracking

Visible Outcomes (e.g., targeted ads, personalization)

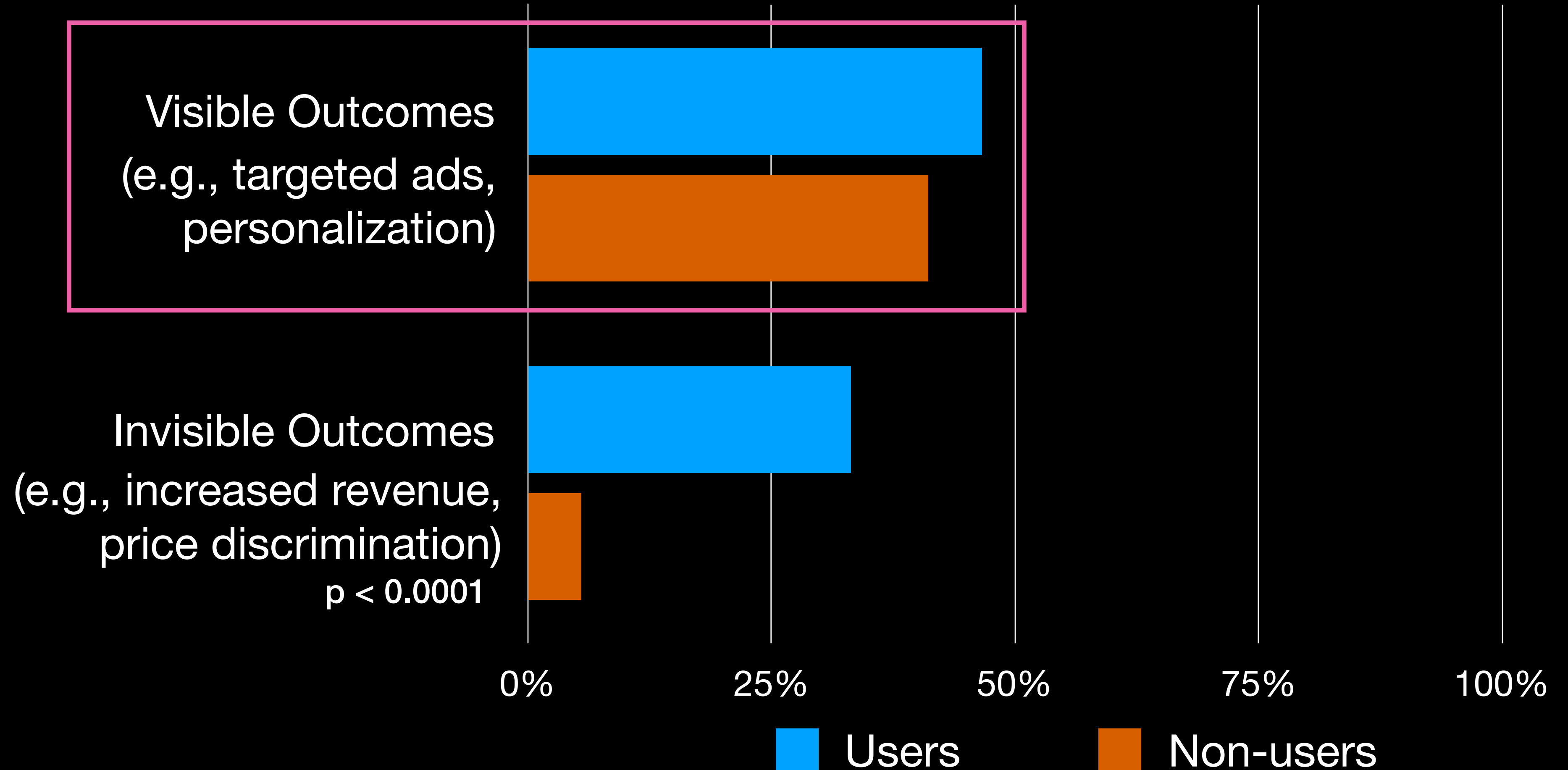Invisible Outcomes (e.g., increased revenue, price discrimination)
p < 0.0001

0% 25% 50% 75% 100%

■ Users   ■ Non-users

Mental Models of Online Tracking

Entities that Track

Information Tracked

Tracking Outcomes

Tracking Mechanisms

Comfort with Tracking

Visible Outcomes (e.g., targeted ads, personalization)

Invisible Outcomes (e.g., increased revenue, price discrimination)
p < 0.0001

0%   25%   50%   75%   100%

Users   Non-users

Mental Models of Online Tracking

Entities that Track

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Visible Outcomes (e.g., targeted ads, personalization)

Invisible Outcomes (e.g., increased revenue, price discrimination)
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Mental Models of Online Tracking

Entities that Track
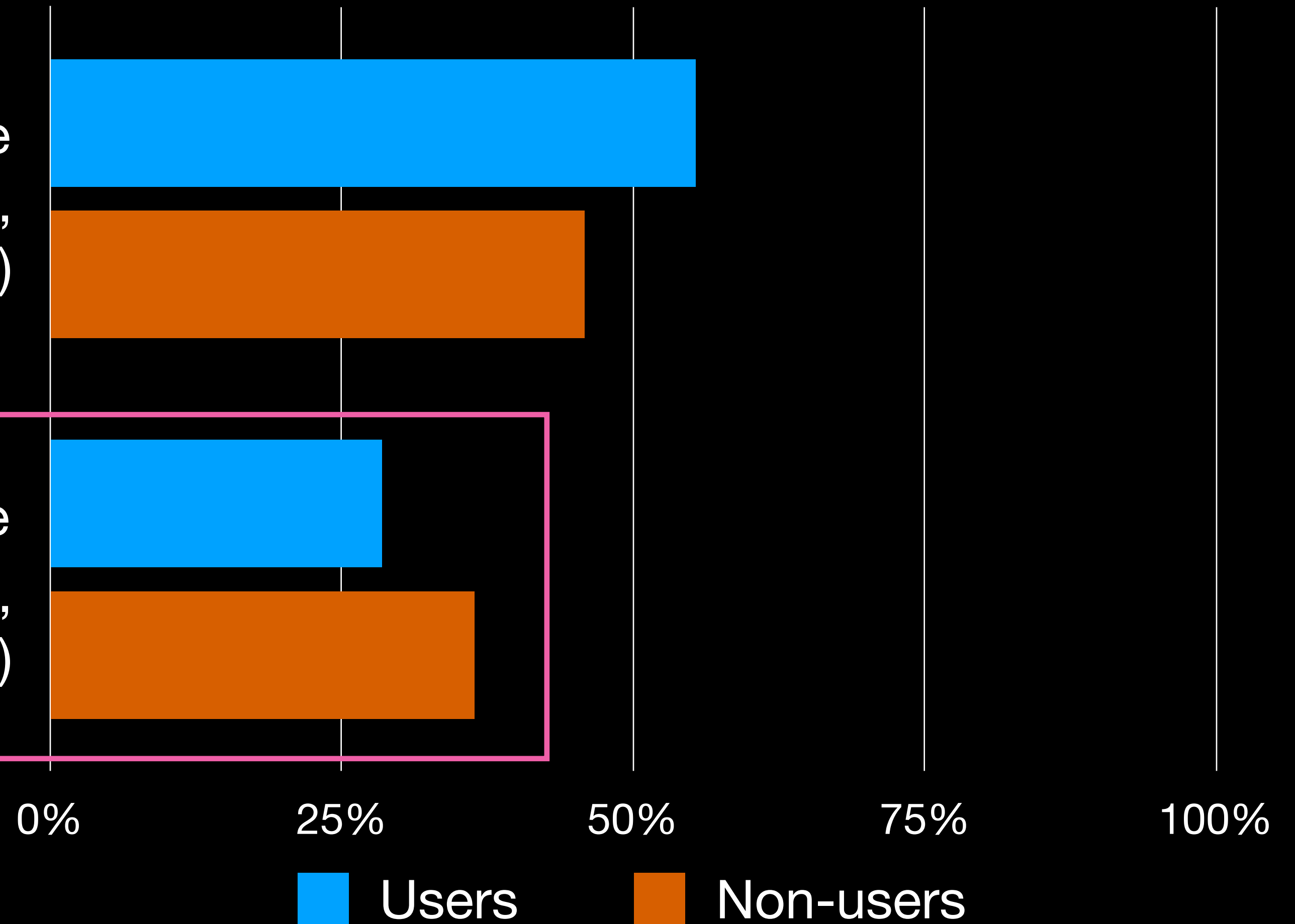
Information Tracked

Tracking Outcomes

Tracking Mechanisms

Comfort with Tracking

Uncomfortable
(suspicion of companies,
data mining concerns)
p = 0.005

Comfortable
(nothing to hide,
nothing is free)
p = 0.011

0%   25%   50%   75%   100%

■ Users   ■ Non-users

Mental Models of Online Tracking

Entities that Track

Information Tracked

Tracking Outcomes

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32

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Tracking Outcomes

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0%   25%   50%   75%   100%

■ Users   ■ Non-users

33

What are the reasons behind users' adoption of blocking extensions?

Reasons Behind Adoption

Ad blockers

Tracker blockers

Content blockers

Takeaway: Each extension type has a primary reason behind adoption:

- User Experience: block pop-ups, reduce clutter on websites

- Privacy: block targeted ads and data mining

- Security: block harmful & malicious content

Reasons Behind Adoption
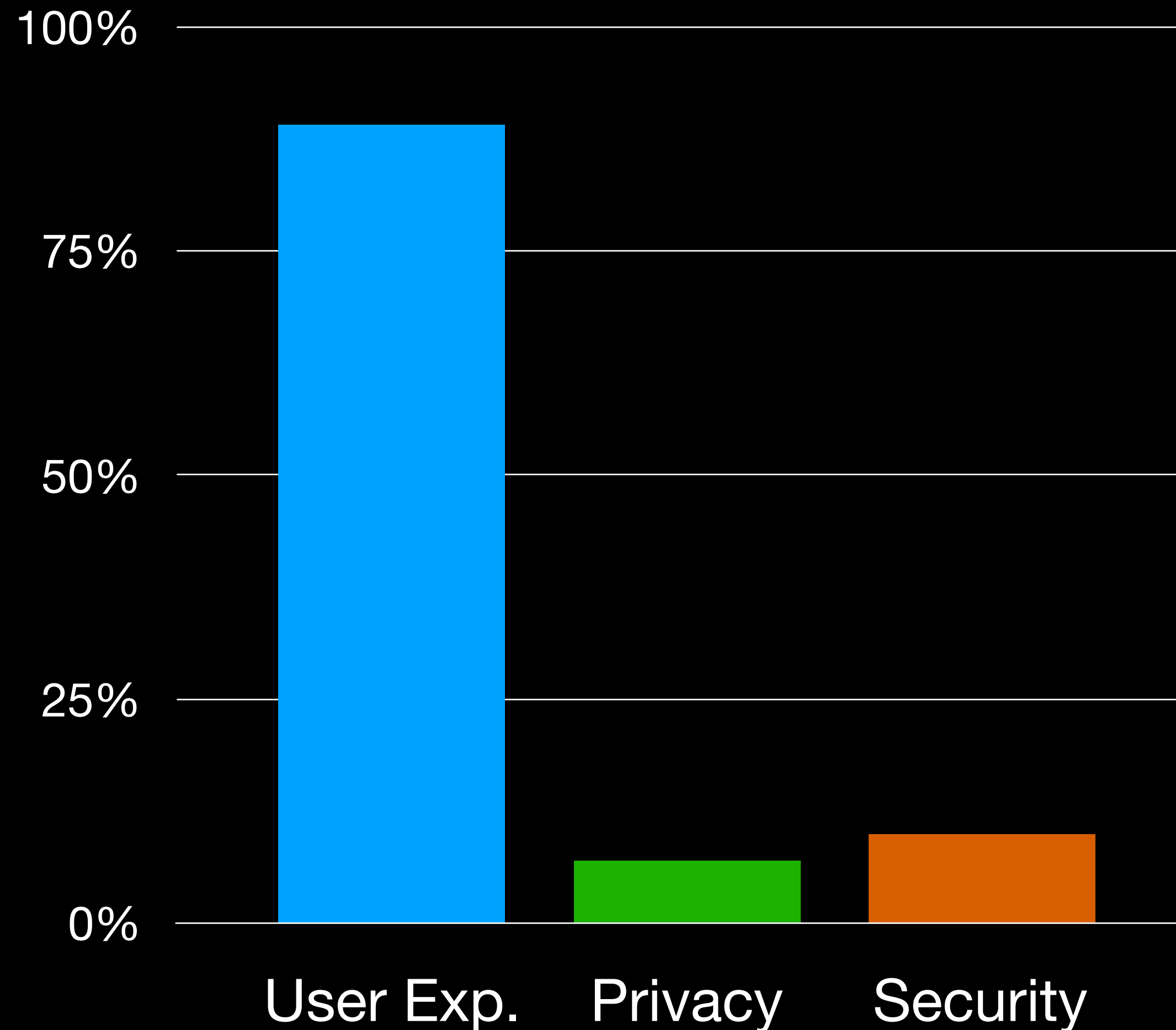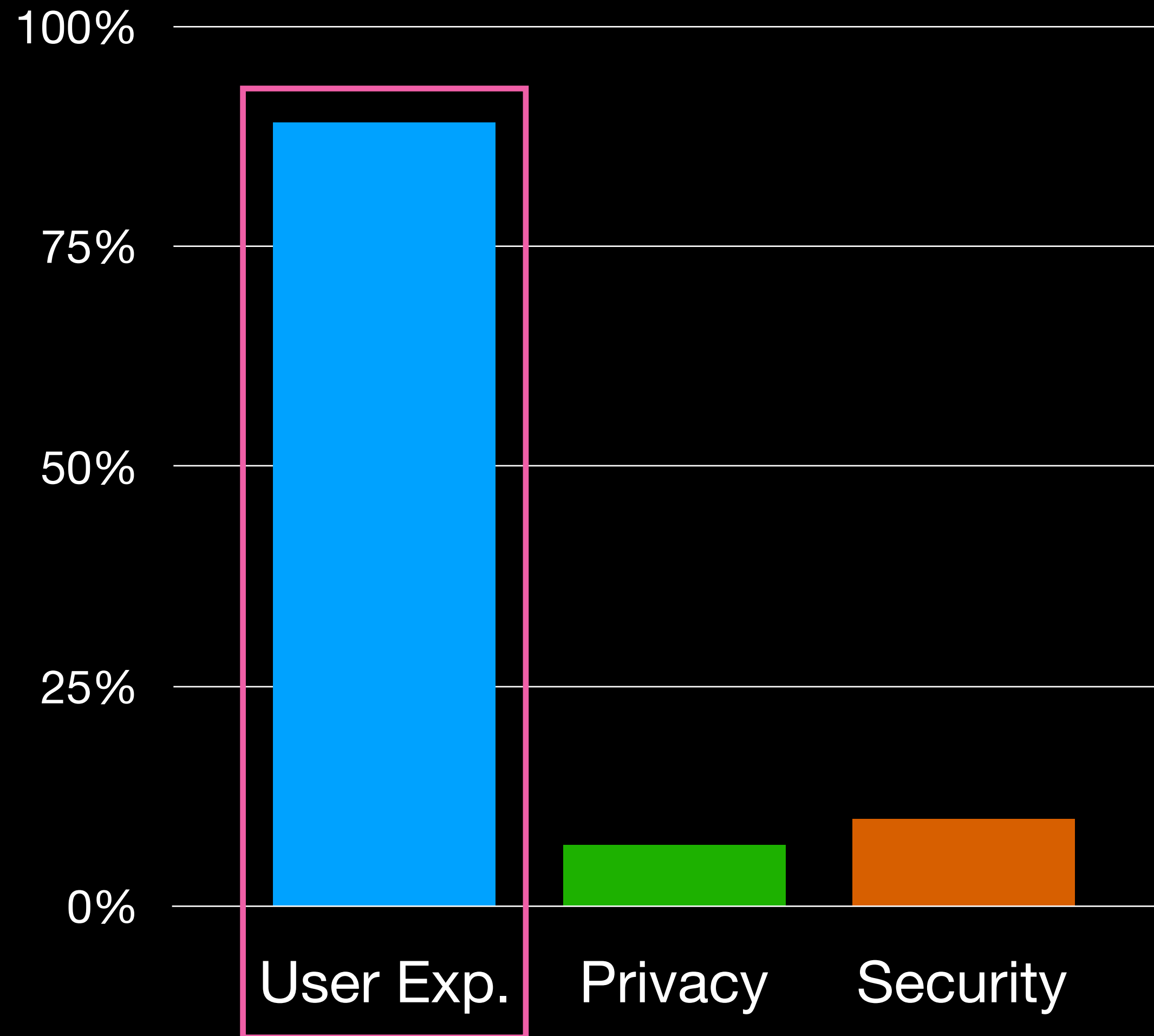
Ad blockers

Tracker blockers

Content blockers

100%

75%

50%

25%

0%

User Exp.   Privacy   Security

AdBlock Plus

AdBlock

Reasons Behind Adoption

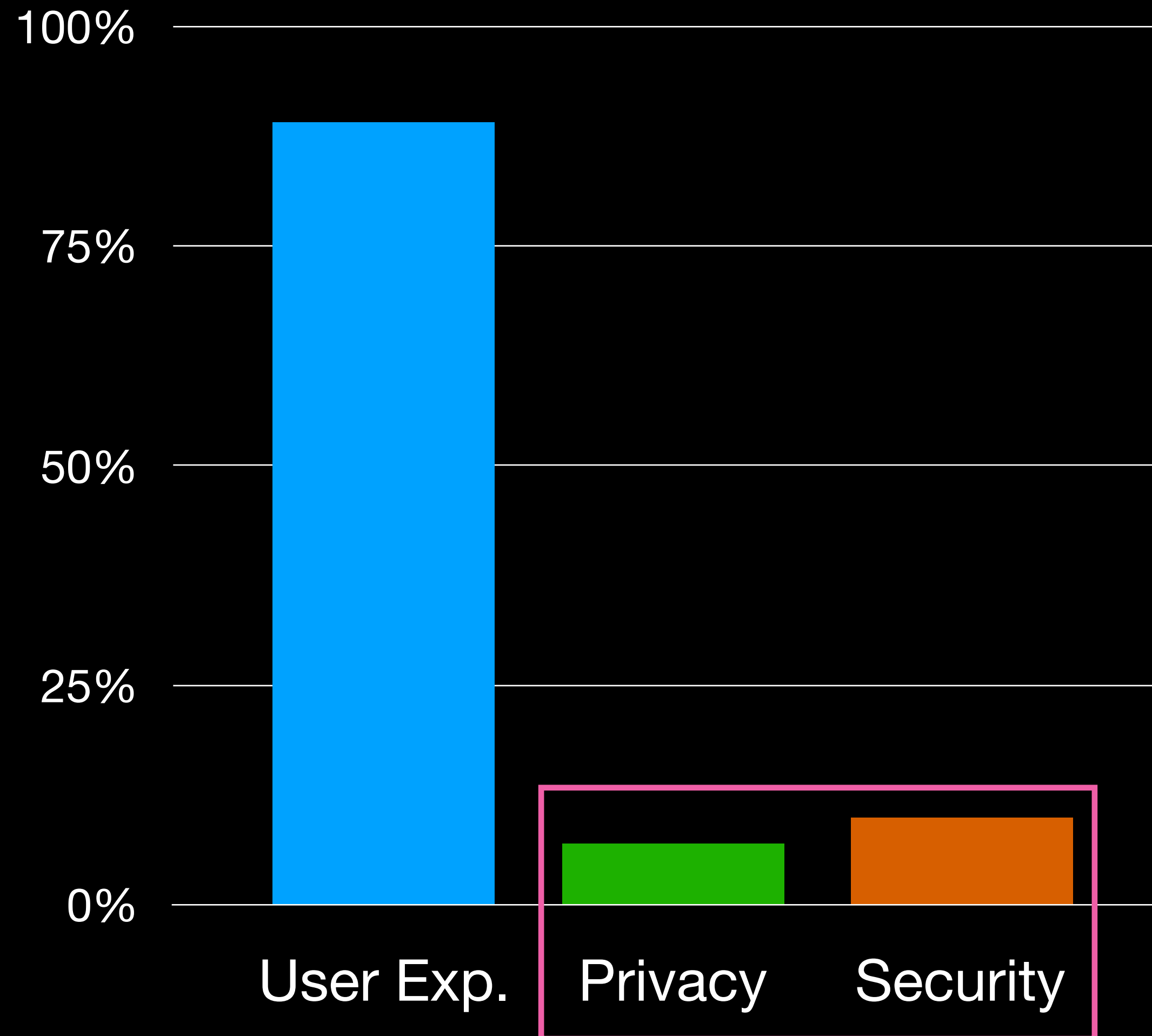# Reasons Behind Adoption

Ad blockers

Tracker blockers

Content blockers

AdBlock Plus

AdBlock

Reasons Behind Adoption

Reasons Behind Adoption

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75%

50%

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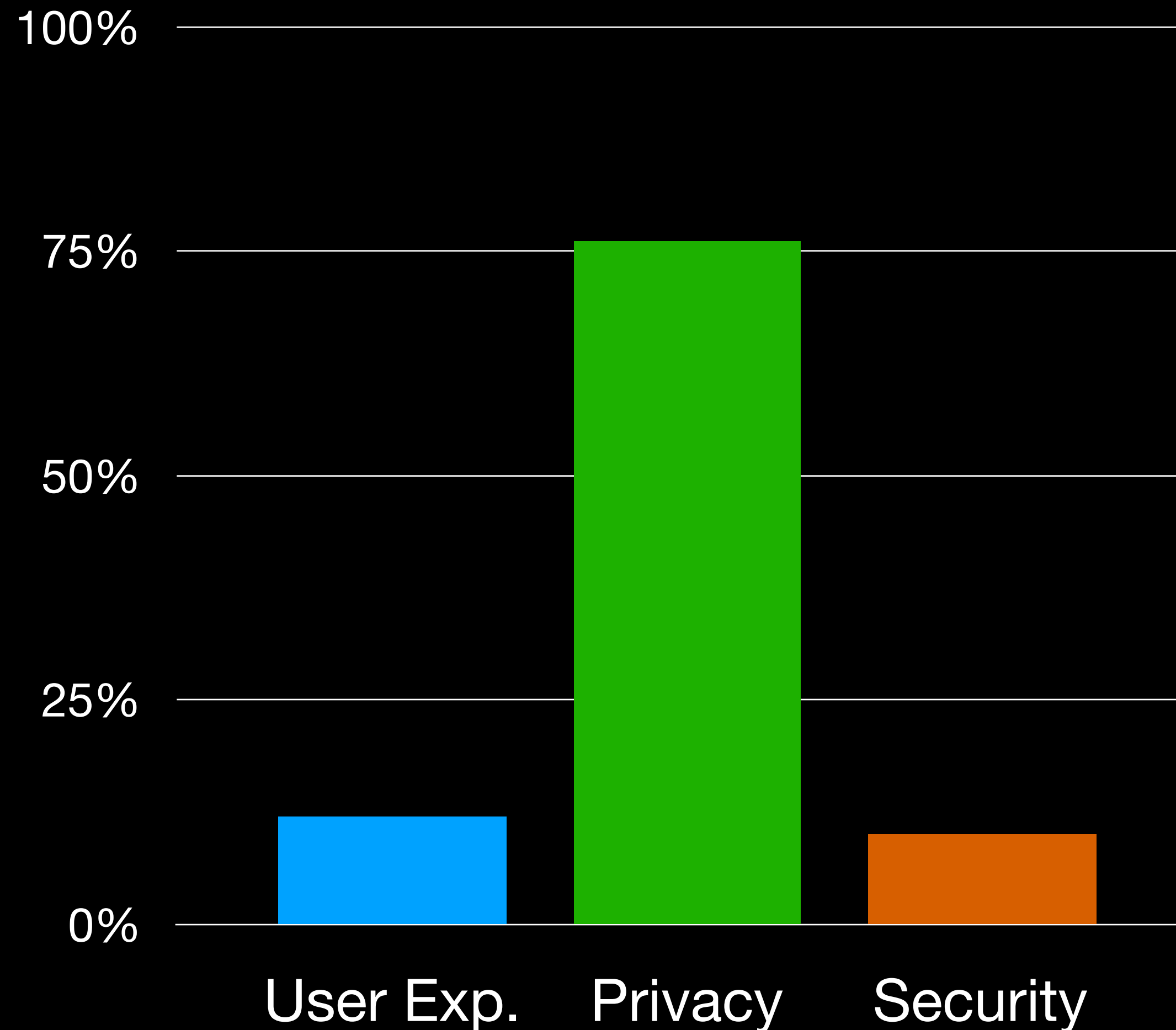
Ghostery

Priv. Badger

Disconnect

Reasons Behind Adoption

Ad blockers

Tracker blockers
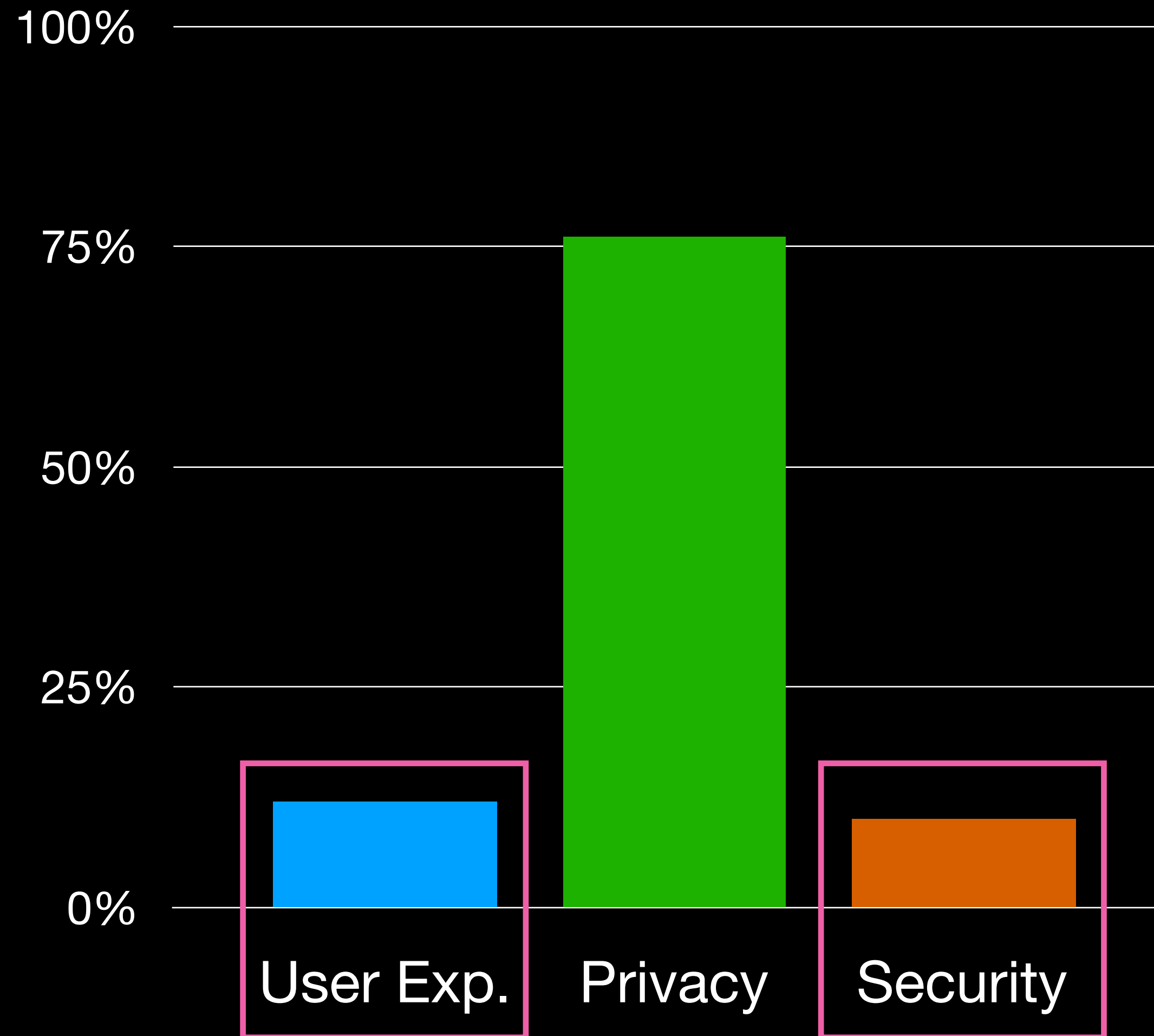
Content blockers

Ghostery

Priv. Badger

Disconnect

100%

75%

50%

25%

0%

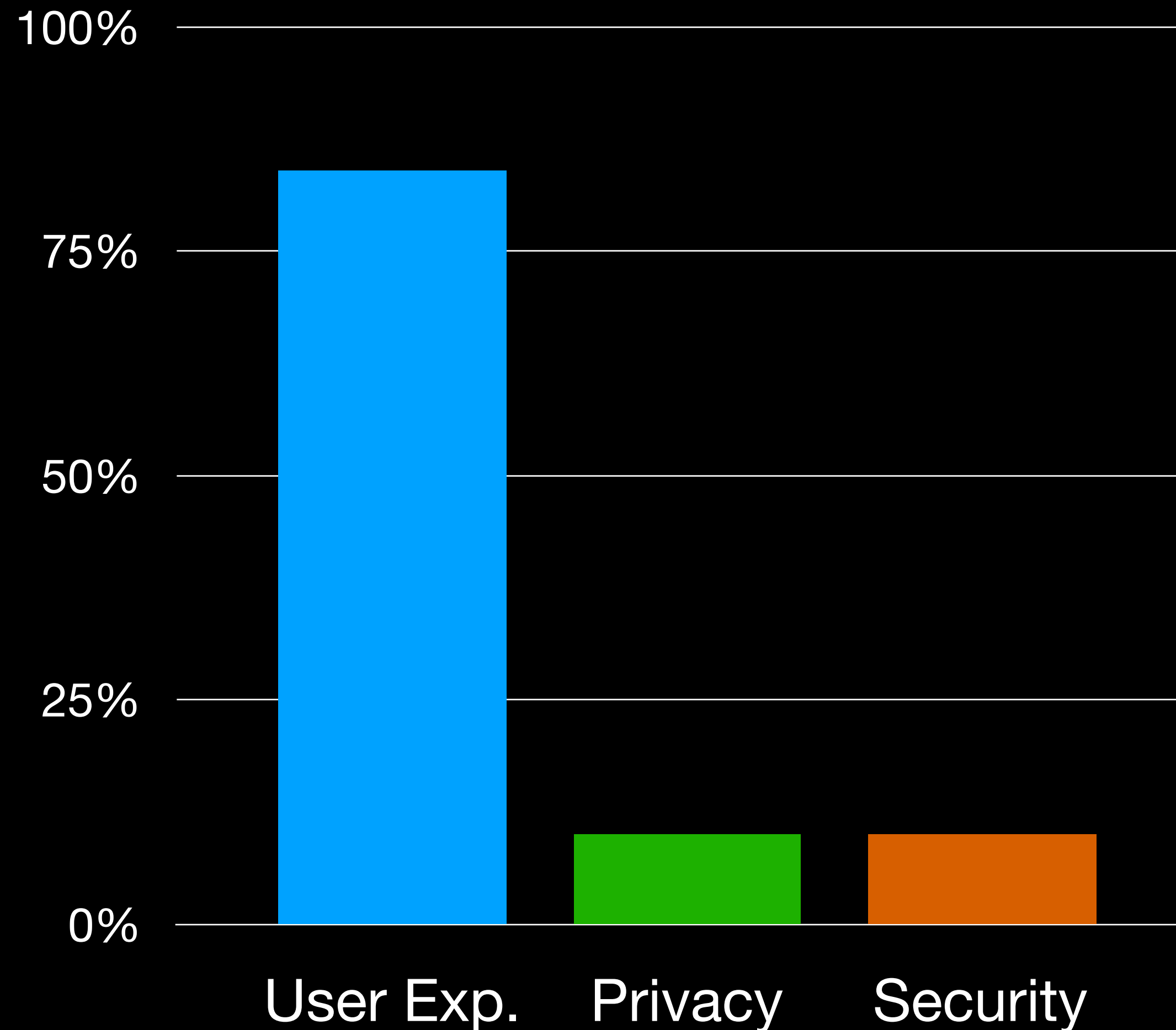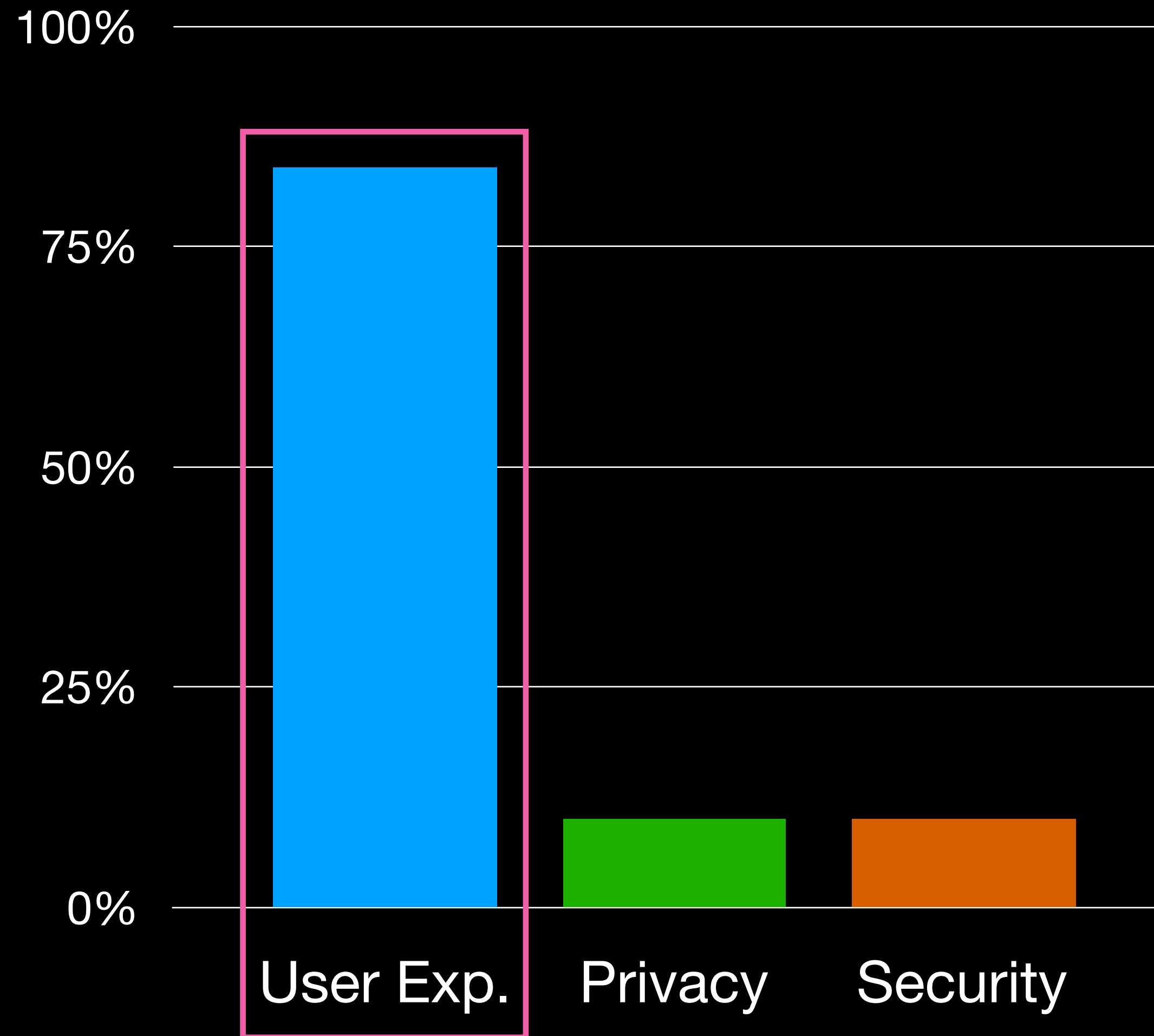User Exp.　　Privacy　　Security

Reasons Behind Adoption

Ad blockers

Tracker blockers

Content blockers

uBlock

uBlock Origin

Reasons Behind Adoption

Ad blockers

Tracker blockers

Content blockers

100%

75%
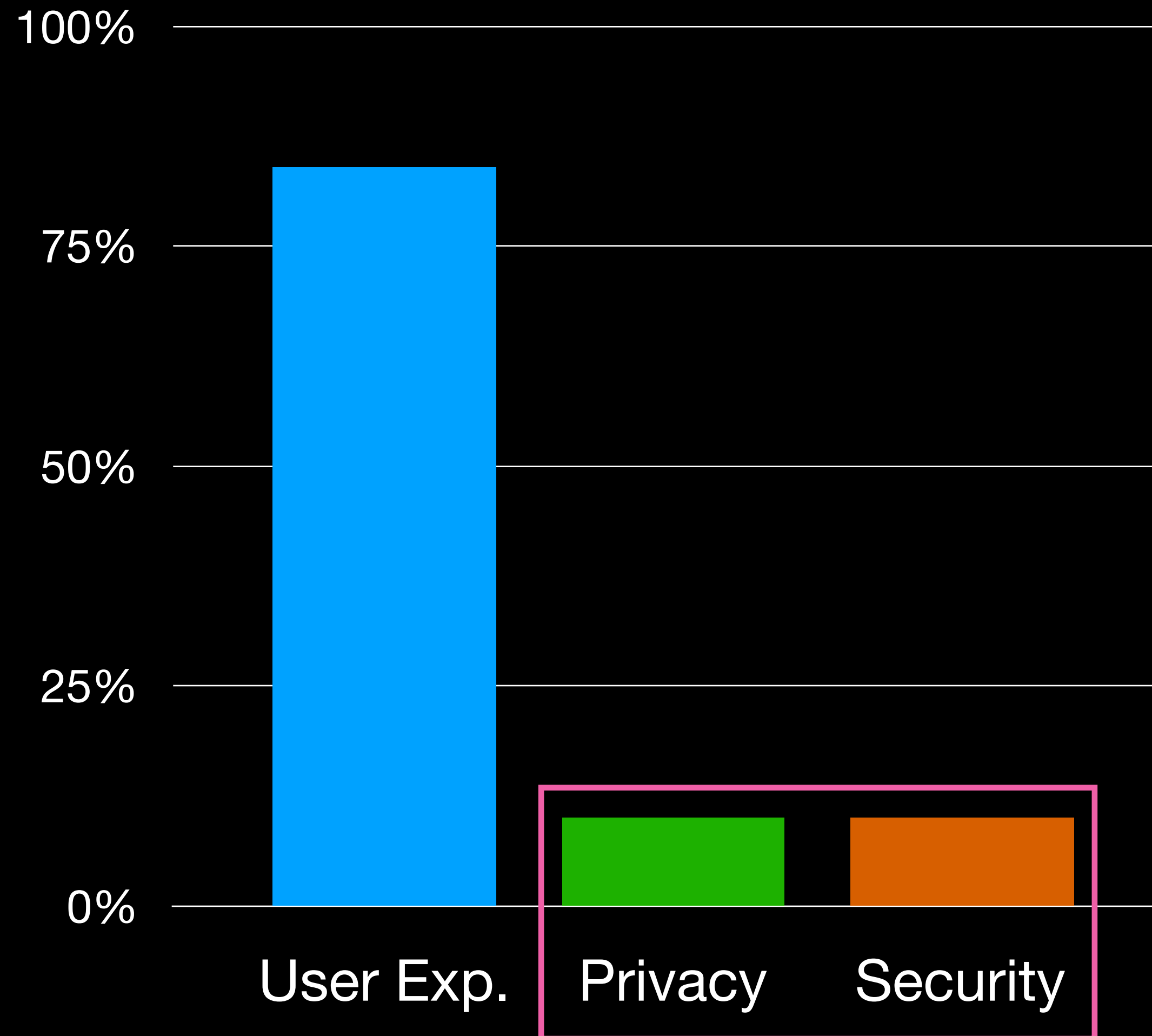
50%

25%

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User Exp.   Privacy   Security

uBlock

uBlock Origin

Reasons Behind Adoption

Ad blockers

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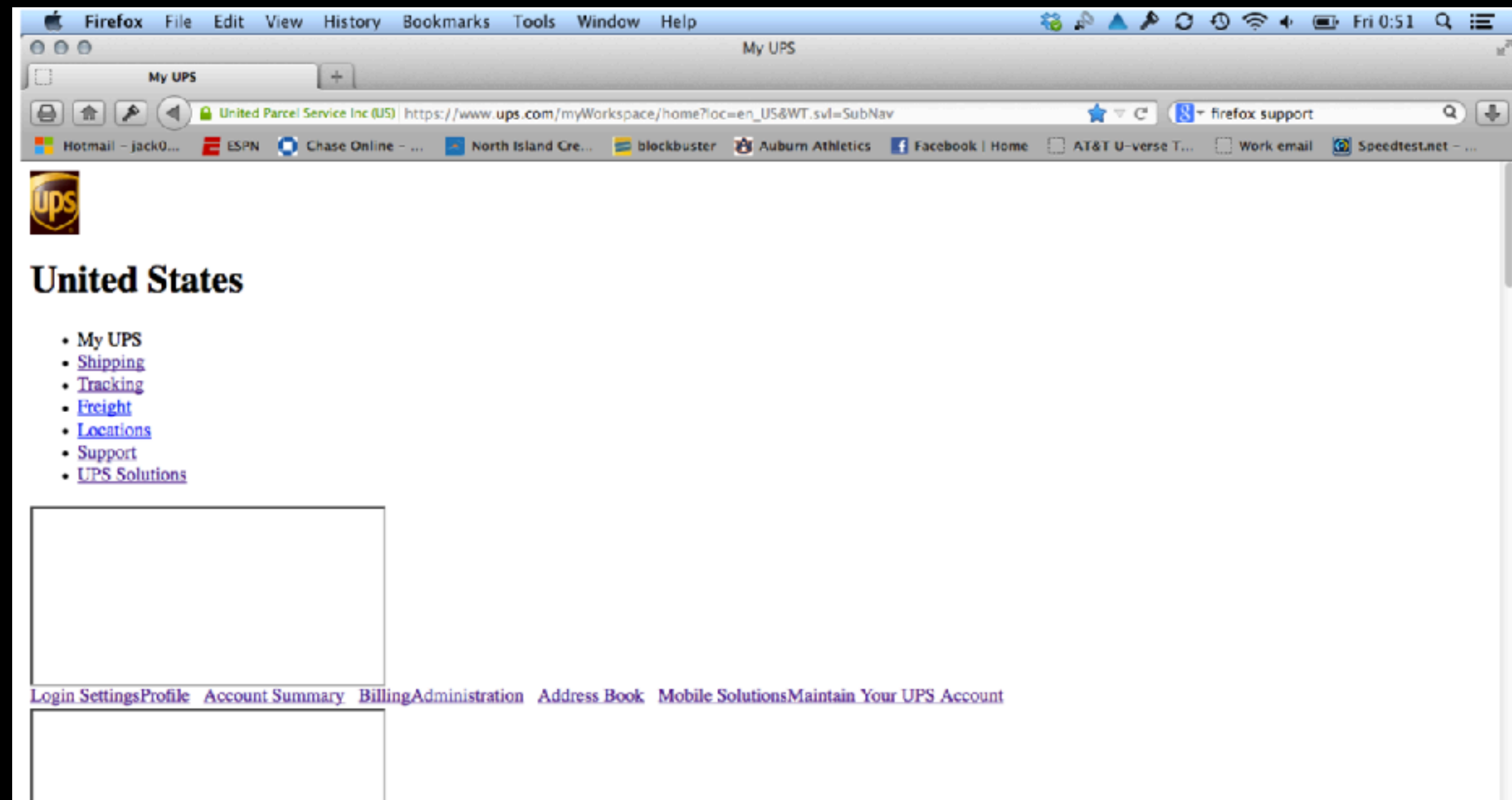
100%

75%

50%

25%

0%

User Exp.   Privacy   Security

44

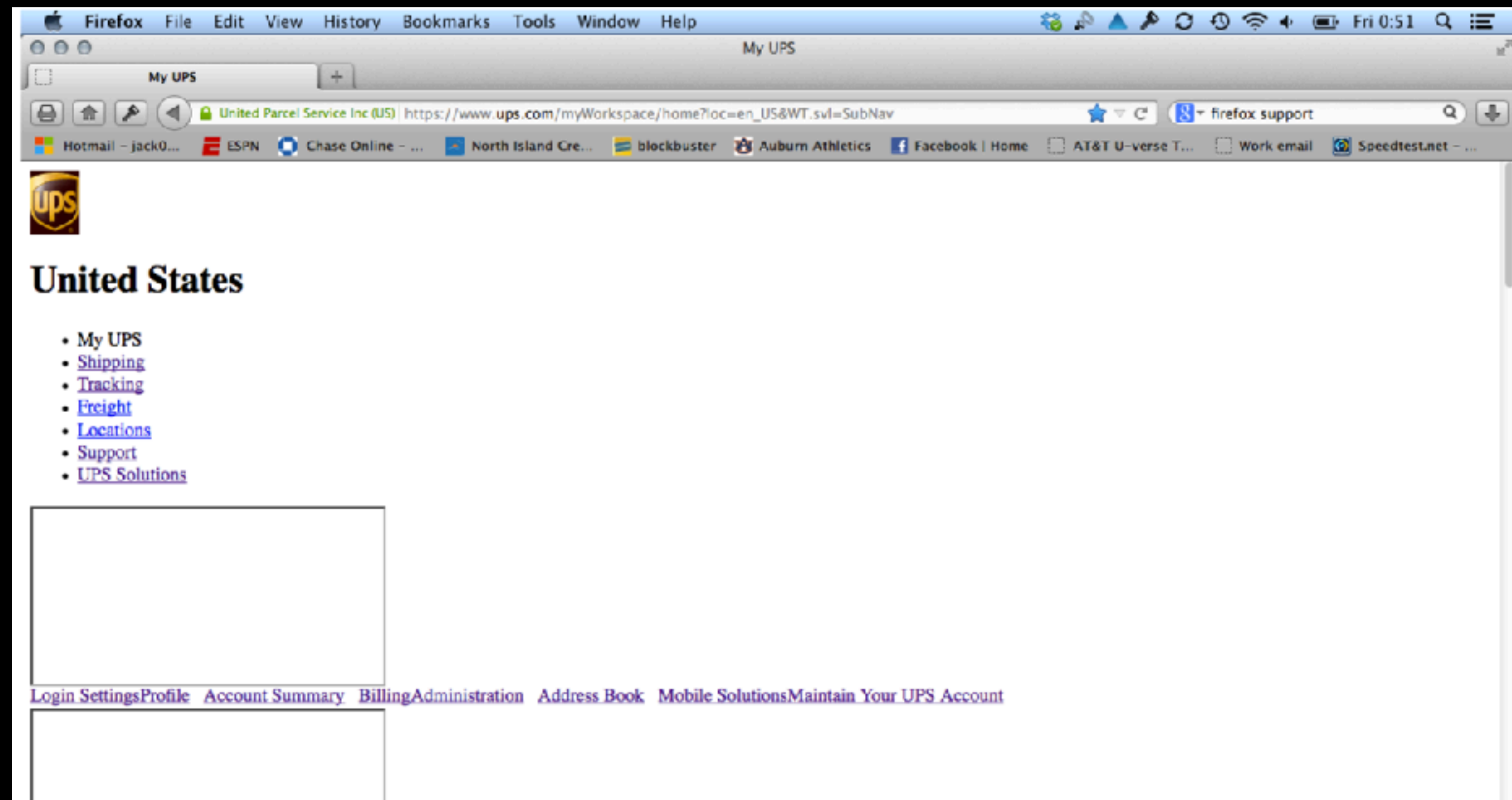What kind of user experiences result when blocking extensions break websites?

Experiences with Broken Websites

Takeaway: Browser extensions are effective in detecting trackers, and only rarely break websites

Users' subsequent reactions vary based on perceived value of content and trust in website

Experiences with Broken Websites

Frequency:

- 40% of extension users experienced broken websites

- 94.6% experienced broken websites either *rarely* or *sometimes* in any given week

Experiences with Broken Websites

Reported Experiences:

Webpages failed to load completely and the content failed to appear	28.7%
Embedded videos failed to play	24.3%
Webpages appeared distorted, and the elements looked out of place	13.0%
Pop-ups that drove functionality failed to appear	8.1%
Images failed to load completely	7.5%

Summary

- **Prevalence**: ~1/3 of participants used no extensions; Ad blockers most prevalent but do not explicitly block trackers

- **Motivations**: Depends on extension type; primarily for user experience reasons

- **Mental Models**: Non-users and users of extensions had similar understandings of online tracking

- **Experiences**: Users rarely experience broken websites; When they do, make decisions based on trust and value of content

Moving Forward

What can we do to better protect users from online tracking?

Suggestion: Offload tracking protection to the browser

Firefox

EDITING TOOLS ▼

EXPLORE MORE TOPICS

BASIC BROWSING

INSTALL AND UPDATE

SYNC AND SAVE

CHAT AND SHARE

DO MORE WITH APPS

PROTECT YOUR PRIVACY

Tracking Protection

Tracking generally refers to the collection of a person's browsing data across multiple sites. The Tracking Protection feature uses a list provided by Disconnect to identify and block trackers.

> You can read more about tracking and the standards Disconnect uses to create its list here. Learn more about the lists used by Firefox for Tracking Protection.

A shield icon 🛡 will appear in your address bar whenever Firefox blocks tracking domains.

← → C ⌂ ⓘ 🛡 🔒 https://www.cnn.com

Intelligent Tracking Prevention 2.0

Jun 4, 2018

by John Wilander

@johnwilander

Today we're happy to bring you Intelligent Tracking Prevention 2.0, or ITP 2.0. It builds upon ITP 1.0, which we released last year, and ITP 1.1, which was released in March, adding the Storage Access API.

Removal of the 24 Hour Cookie Access Window

ITP 2.0, as opposed to earlier versions, immediately partitions cookies for domains determined to have tracking abilities. The previous general cookie access window of 24 hours after user interaction has been removed. Instead, authenticated embeds can get access to their first-party cookies through the Storage Access API. The API requires that the user interacts with the embedded content.

Cookies are partitioned and not persisted in 3rd-party contexts.

Existing cookies are purged.
New cookies are blocked.

52

Moving Forward

How can we better help users report breakage they see on websites?

Suggestion: Improving the reporting interfaces of browser extensions (e.g., Directly by pointing to elements)

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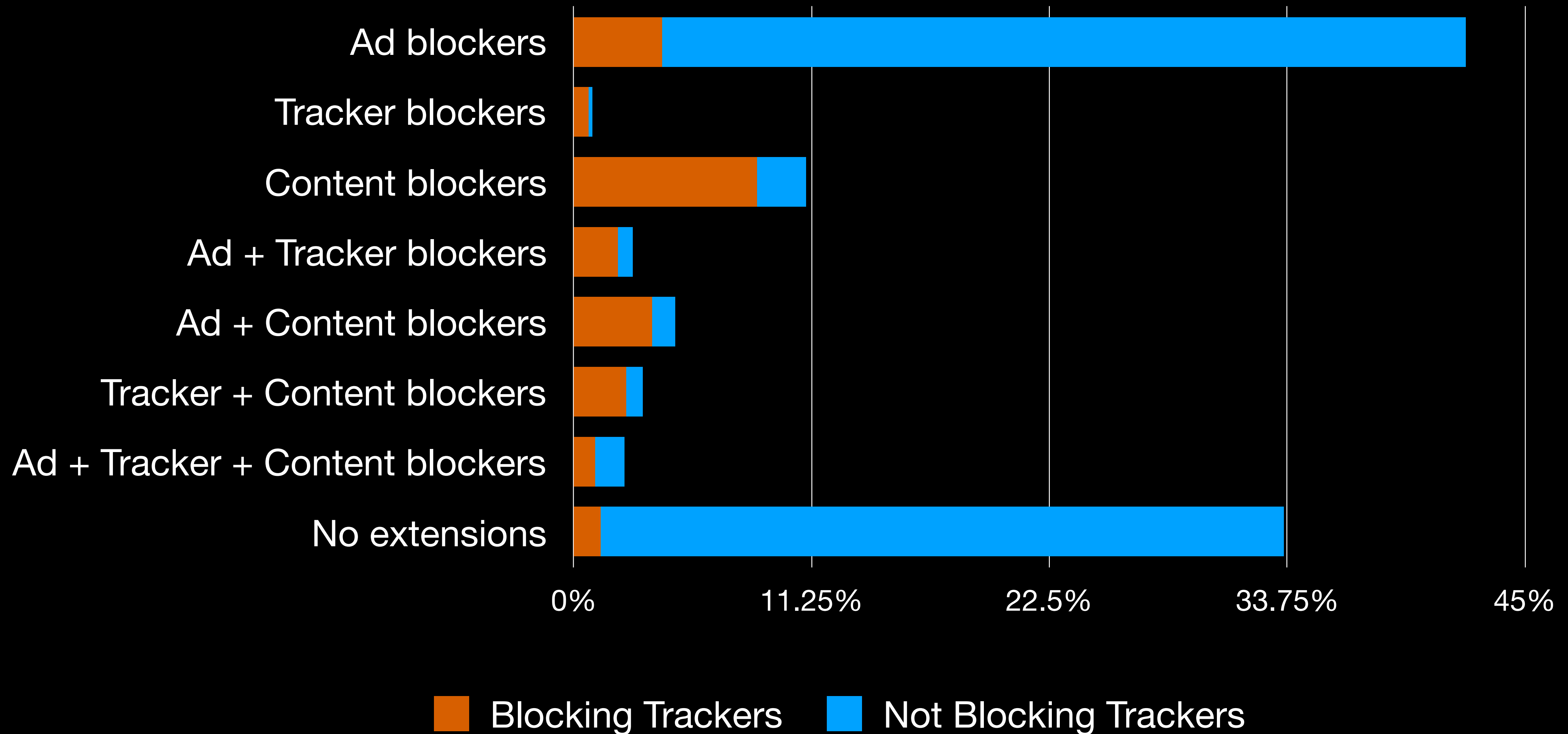with Jessica Vitak, Arvind Narayanan, and Marshini Chetty

Bonus Slides

Blocking Extension Usage

Horizontal bar chart showing blocking extension usage with two categories per bar: Blocking Trackers (orange) and Not Blocking Trackers (blue).

Categories (top to bottom):
- Ad blockers
- Tracker blockers
- Content blockers
- Ad + Tracker blockers
- Ad + Content blockers
- Tracker + Content blockers
- Ad + Tracker + Content blockers
- No extensions

X-axis: 0%, 11.25%, 22.5%, 33.75%, 45%

Legend: ■ Blocking Trackers   ■ Not Blocking Trackers

56

Mental Models of Online Tracking