


New Tab

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Your Secrets Are Safe: How Browsers' Explanations Impact Misconceptions About Private Browsing Mode

Yuxi Wu, Panya Gupta, Miranda Wei,
Yasemin Acar, Sascha Fahl, Blase Ur



THE UNIVERSITY OF
CHICAGO

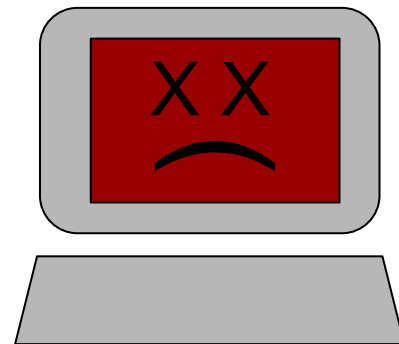
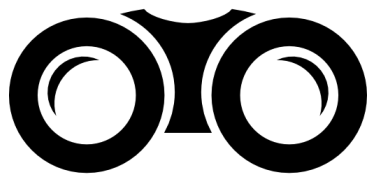


Leibniz
Universität
Hannover

<https://FancyWines.com>



Users have misconceptions about private mode



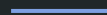
Study Motivation

Consider the role of browsers

in communicating what private
mode actually does

i.e., protection from local threats

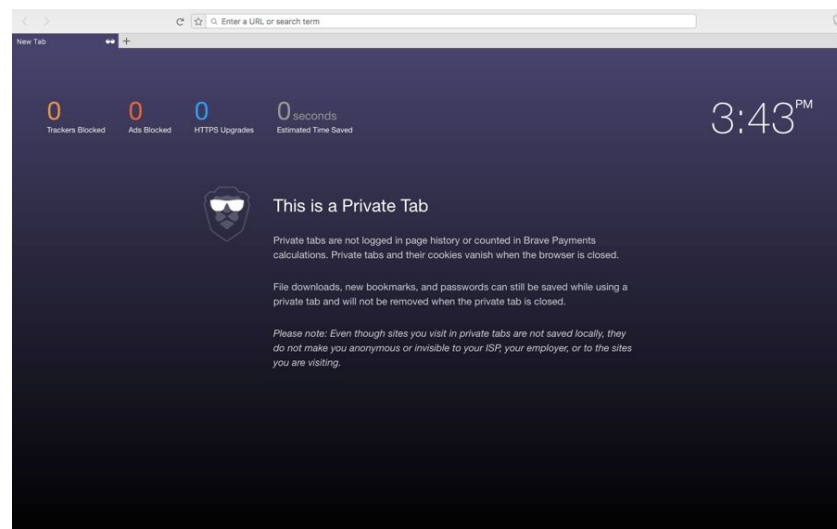
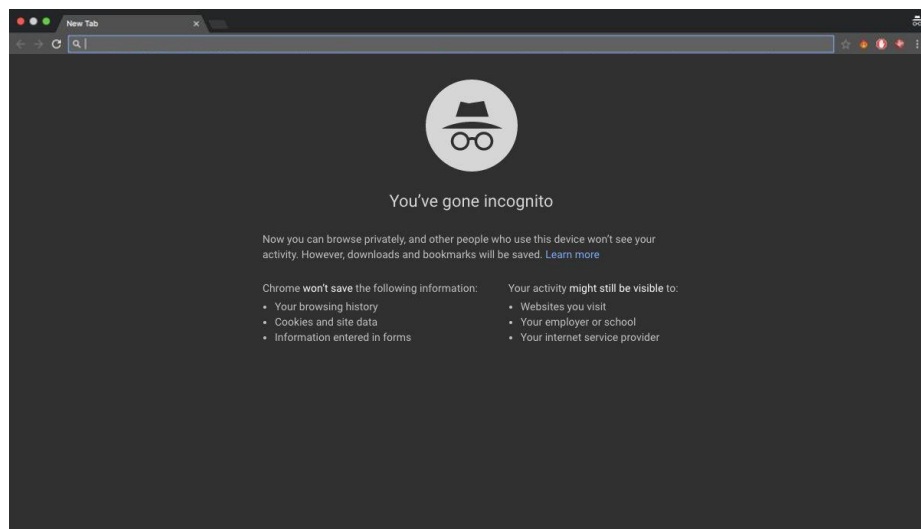
(and not most remote ones)



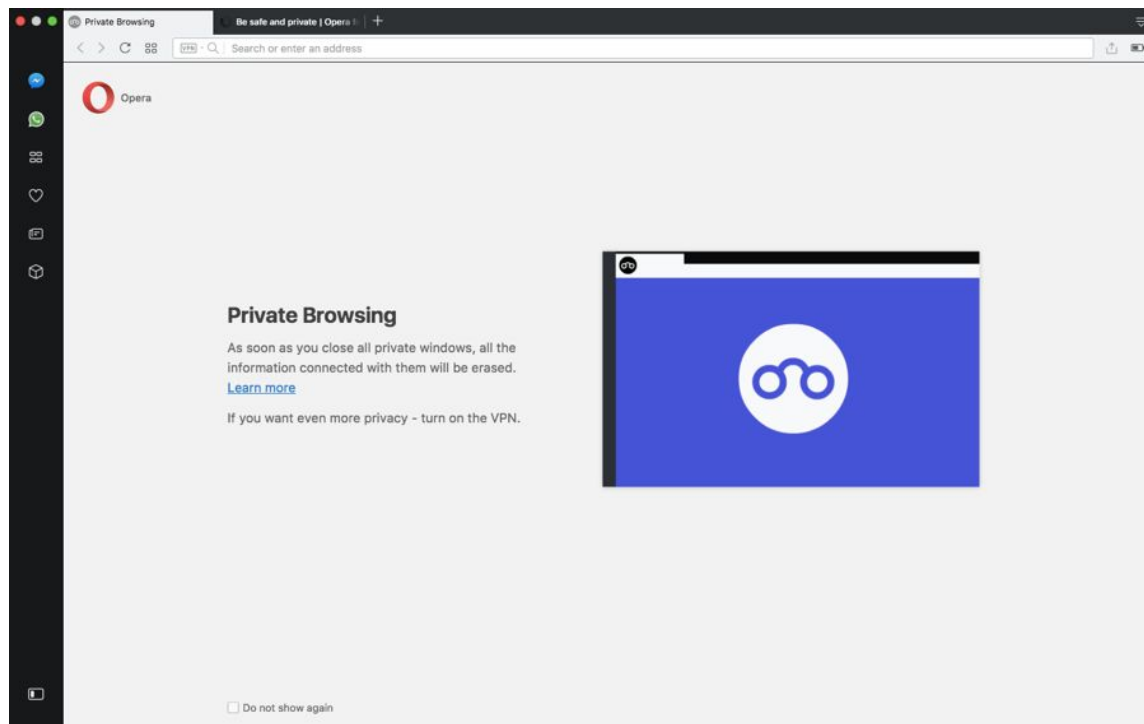
Disclosure

the explanation that a browser presents when users open a new window in private mode

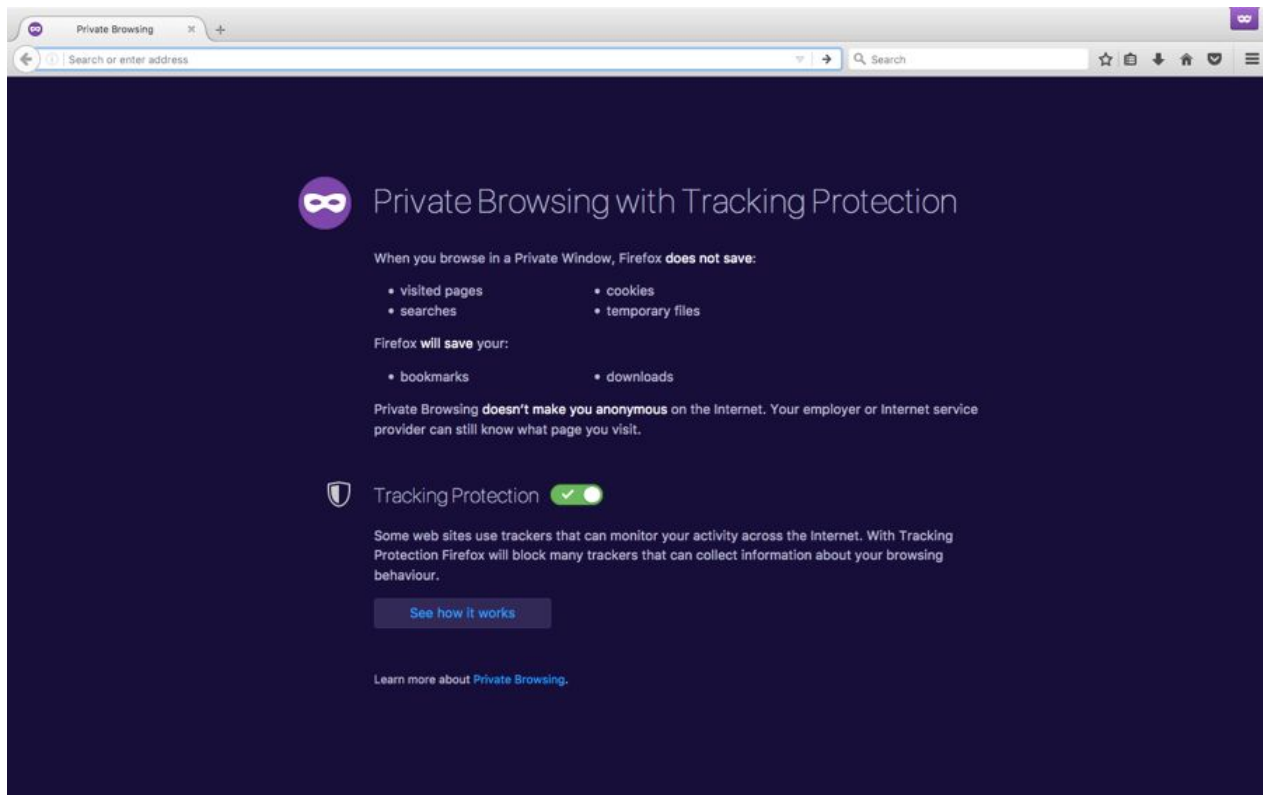
Disclosures vary



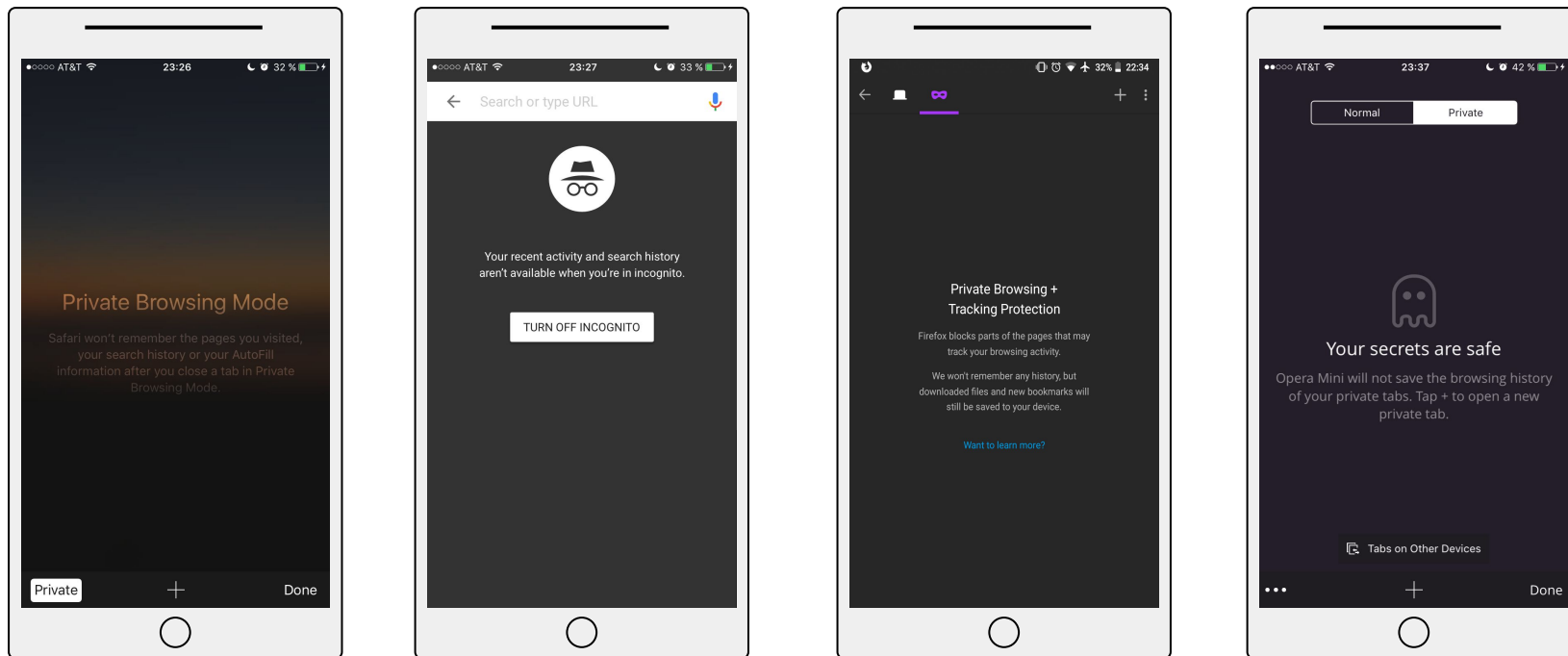
Disclosures vary



Disclosures vary



Mobile disclosures vary even more



Survey Methodology

460 participants on Amazon's Mechanical Turk

30 minutes, \$5 compensation

13 conditions

- 12 conditions based on disclosures from the wild
- 1 control condition

this is a private tab

Private tabs are not logged in page history. Private tabs and their cookies vanish when the browser is closed.

File downloads, new bookmarks, and passwords can still be saved while using a private tab and will not be removed when the private tab is closed.

Please note: Even though sites you visit in private tabs are not saved locally, they do not make you anonymous or invisible to your ISP, your employer, or to the sites you are visiting.



you've gone incognito

Pages that you view in incognito tabs won't stick around in your browser's history, cookie store or search history after you've closed all of your incognito tabs. Any files you download or bookmarks you create will be kept.

However, you aren't invisible. Going incognito doesn't hide your browsing from your employer, your Internet service provider or the websites that you visit.



you've gone incognito

Now you can browse privately, and other people who use this device won't see your activity. However, downloads and bookmarks will be saved.

Onyx won't save the following information:

- Your browsing history
- Cookies and site data
- Information entered in forms

Your activity might still be visible to:

- Websites that you visit
- Your employer or school
- Your Internet service provider



browsing inprivate

When you use InPrivate tabs, your browsing data (like cookies, history, or temporary files) isn't saved on your device after you're done.

Onyx deletes temporary data from your device after all of your InPrivate tabs are closed.



Desktop

private browsing with tracking protection

When you browse in a Private Window, Onyx does not save:

- visited pages
- cookies
- searches
- temporary files

Onyx will save:

- bookmarks
- downloads

Private Browsing doesn't make you anonymous on the Internet. Your employer or Internet service provider can still know what page you visit.

tracking protection

Some web sites use trackers that can monitor your activity across the Internet. With Tracking Protection Onyx will block many trackers that can collect information about your browsing behaviour.



private browsing

As soon as you close all private windows, all the information connected with them will be erased.

If you want even more privacy - turn on the VPN.



private browsing enabled

Onyx will keep your browsing history private for all tabs in this window. After you close this window, Onyx won't remember the pages you visited, your search history, or your AutoFill information.



Mobile

private browsing

Onyx won't remember any of your history or cookies and new bookmarks will be saved.



incognito mode

Your recent activity and search history aren't available when you're in incognito.



private browsing + tracking protection

Onyx blocks parts of the pages that may track your browsing activity. We won't remember any history, but downloaded files and new bookmarks will still be saved to your device.



your secrets are safe

Onyx won't save the browsing history of your private tabs.



private browsing mode

Onyx won't remember the pages you visited, your search history, or your AutoFill information after you close a tab in Private Browsing Mode.



Control Condition

private browsing mode

Onyx's private browsing mode protects your privacy and keeps you safe as you browse the Internet.

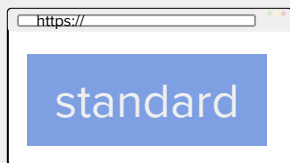
It was carefully designed by Onyx's engineers to let you stay incognito as you browse.

Survey Content

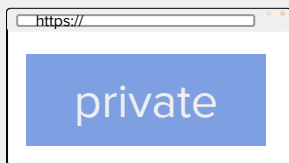
20 different scenarios

Two sets of questions:

Distinguishing

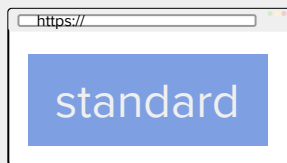


?

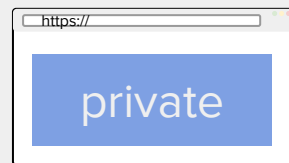


?

Comparative



?



[>, <, ==]

Results

Our participants (n = 460)

Gender

54.6% male

44.6% female

0.8% nonbinary/NA

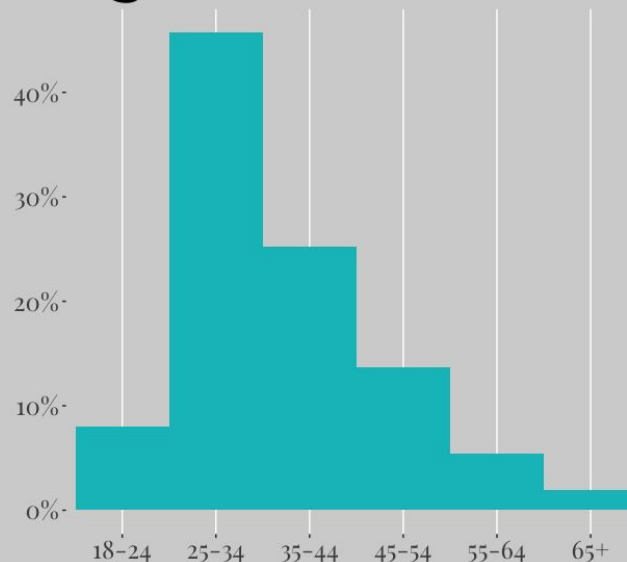
Tech background

86.5% no background

11.5% worked, educated in tech

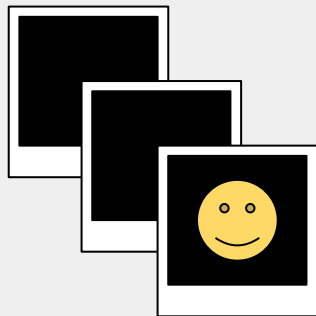
2.0% NA

Age Distribution



Non-misconceptions

89.8% correct



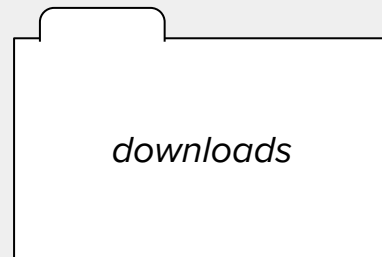
Photos not cached

94.8% correct

3:14 pm	<i>picturesofcorgis.com</i>
3:15 pm	<i>picturesofcorgis.com</i>
3:16 pm	<i>picturesofcorgis.com</i>
3:17 pm	<i>picturesofcorgis.com</i>
3:18 pm	<i>picturesofcorgis.com</i>
3:19 pm	<i>picturesofcorgis.com</i>
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3:24 pm	<i>picturesofcorgis.com</i>
3:25 pm	<i>picturesofcorgis.com</i>
3:26 pm	<i>picturesofcorgis.com</i>

History not saved in menu

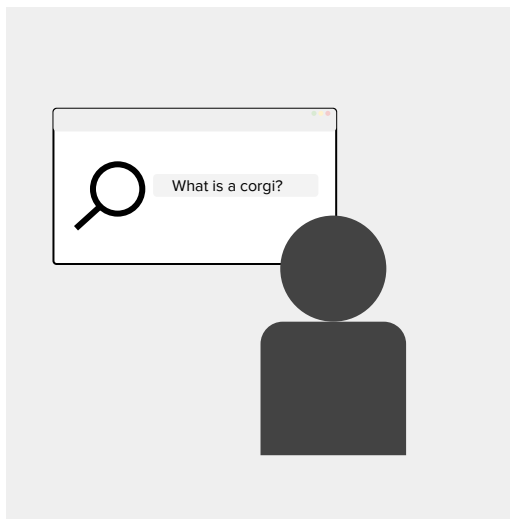
99.3% correct



Downloaded files remain

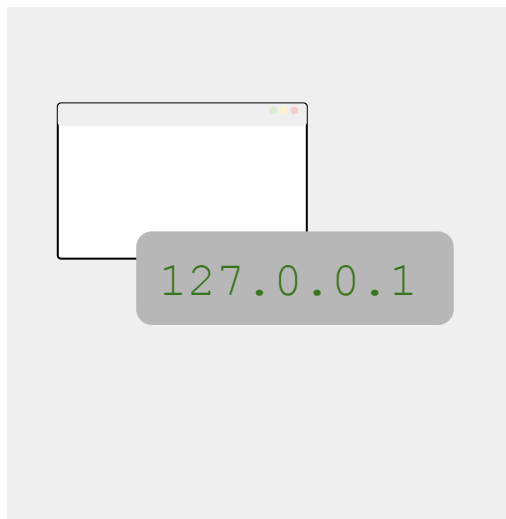
Overestimated Protections

56.3% incorrectly believed



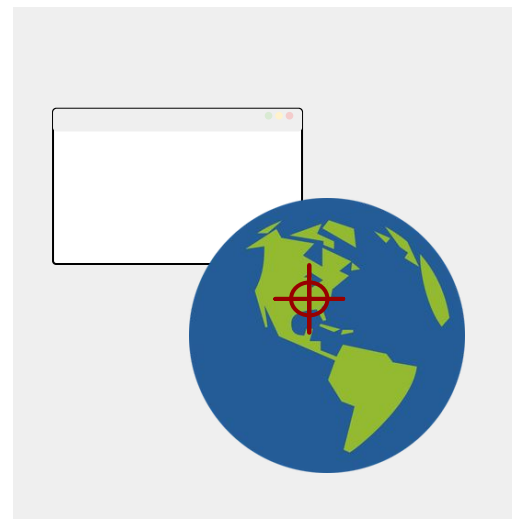
**...that searches could
not be associated
(while logged in)**

25.2% incorrectly believed



**...that IP address could not
be collected**

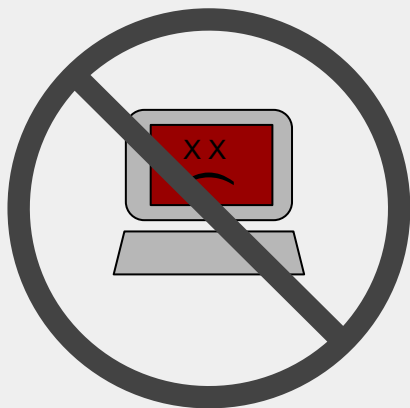
40.2% incorrectly believed



**...that geolocation could
not be estimated**

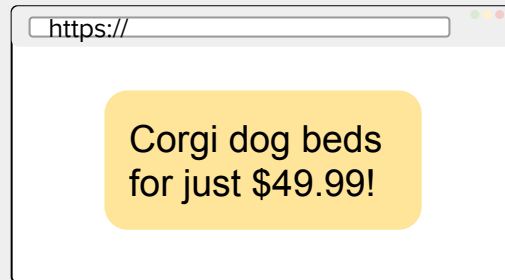
Misconceptions - comparative differences

27.1% incorrectly believed



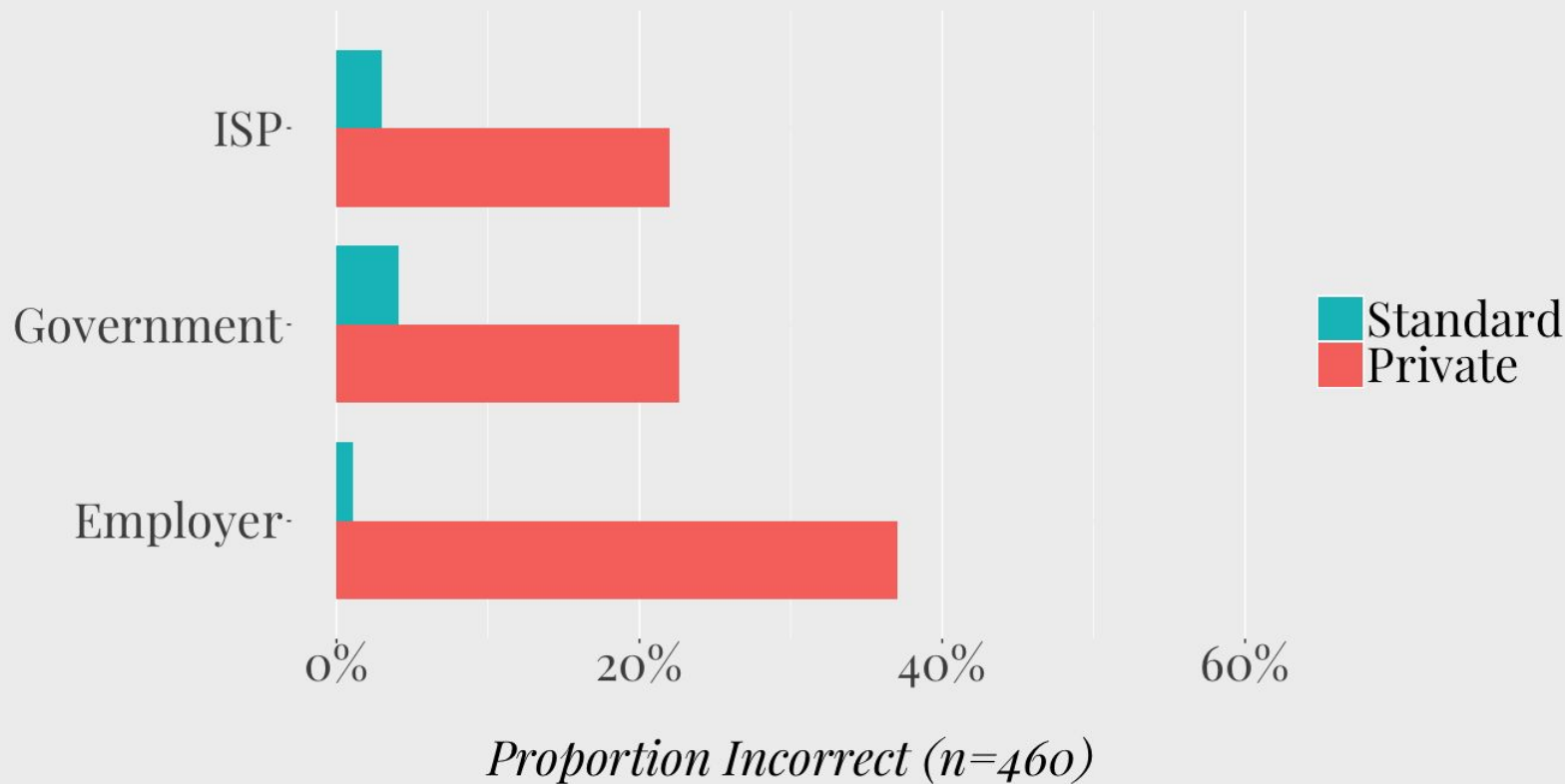
...that there was a difference in the level of virus and malware protection between modes

30.9% incorrectly believed



...that the proportion of targeted ads was the same between modes or higher in private mode

Overestimated Protections - Tracking




Individual disclosure results

this is a private tab

Private tabs are not logged in page history. Private tabs and their cookies vanish when the browser is closed.

File downloads, new bookmarks, and passwords can still be saved while using a private tab and will not be removed when the private tab is closed.


Please note: Even though sites you visit in private tabs are not saved locally, they do not make you anonymous or invisible to your ISP, your employer, or to the sites you are visiting.



you've gone incognito

Pages that you view in Incognito tabs won't stick around in your browser's history, cookie store or search history after you've closed all of your incognito tabs. Any files you download or bookmarks you create will be kept.

However, you aren't invisible. Going incognito doesn't hide your browsing from your employer's, your Internet service provider or the websites that you visit.



you've gone incognito


Now you can browse privately, and other people who use this device won't see your activity. However, downloads and bookmarks will be saved.

Onyx won't save the following information:

- Your browsing history
- Cookies and site data
- Information entered in forms

Your activity might still be visible to:


- Websites that you visit
- Your employer or school
- Your Internet service provider



browsing in private

When you use InPrivate tabs, your browsing data (like cookies, history, or temporary files) isn't saved on your device after you're done.

Onyx deletes temporary data from your device after all of your InPrivate tabs are closed.



Desktop

private browsing with tracking protection

When you browse in a Private Window, Onyx does not save:

- visited pages
- cookies
- searches
- temporary files


Onyx will save:

- bookmarks
- downloads

Private Browsing doesn't make you anonymous on the Internet. Your employer or Internet service provider can still know what page you visit.

tracking protection


Some web sites use trackers that can monitor your activity across the Internet. With Tracking Protection Onyx will block many trackers that can collect information about your browsing behaviour.



Mobile


private browsing

Onyx won't remember any of your history or cookies. New bookmarks will be saved.




incognito mode

Your recent activity and search history aren't available while you're in incognito.




private browsing + tracking protection

Onyx blocks parts of the pages that may track your browsing activity. We won't remember any history, but downloaded files and new bookmarks will still be saved to your device.




your secrets are safe

Onyx won't save the browsing history of your private tabs.



private browsing mode

Onyx won't remember the pages you visited, your search history, or your AutoFill information after you close a tab in Private Browsing Mode.



Control

private browsing mode

Onyx's private browsing mode protects your privacy and keeps you safe as you browse the Internet.

It was carefully designed by Onyx's engineers to let you stay incognito as you browse.

vs.

Yuxi Wu, Miranda Wei | Your Secrets Are Safe: How Browsers' Explanations Impact Misconceptions About Private Browsing Mode

20

No different than control

this is a private tab

Private tabs are not logged in page history. Private tabs and their cookies vanish when the browser is closed.

File downloads, new bookmarks, and passwords can still be saved while using a private tab and will not be removed when the private tab is closed.

Please note: Even though sites you visit in private tabs are not saved locally, they do not make you anonymous or invisible to your ISP, your employer, or to the sites you are visiting.

incognito mode

Your recent activity and search history aren't available when you're in incognito.

private browsing enabled

Onyx will keep your browsing history private for all tabs in this window. After you close this window, Onyx won't remember the pages you visited, your search history, or your AutoFill information.

private browsing with tracking protection

When you browse in a Private Window, Onyx does not save:

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- searches
- cookies
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Onyx will save:

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Private browsing doesn't make you anonymous on the Internet. Your employer or Internet service provider can still know what page you visit.

tracking protection

Some web sites use trackers that can monitor your activity across the Internet. With Tracking Protection Onyx will block many trackers that can collect information about your browsing behaviour.

private browsing mode

Onyx won't remember the pages you visited, your search history, or your AutoFill information after you close a tab in Private Browsing Mode.

private browsing

When you use InPrivate tabs, your browsing data (like cookies, history, or temporary files) isn't saved on your device after you're done.

Onyx deletes temporary data from your device after all of your InPrivate tabs are closed.

private browsing + tracking protection

Onyx blocks parts of the pages that may track your browsing activity. We won't remember any history, but downloaded files and new bookmarks will still be saved to your device.

private browsing

As soon as you close all private windows, all the information connected with them will be erased.

If you want even more privacy - turn on the VPN.

your secrets are safe

Onyx won't save the browsing history of your private tabs.

Better than control

you've gone incognito

Now you can browse privately, and other people who use this device won't see your activity. However, downloads and bookmarks will be saved.

Onyx won't save the following information:

- Your browsing history
- Cookies and site data
- Information entered in forms

Your activity might still be visible to:

- Websites that you visit
- Your employer or school
- Your Internet service provider

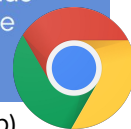


Chrome v60 (desktop)

you've gone incognito

Pages that you view in incognito tabs won't stick around in your browser's history, cookie store or search history after you've closed all of your incognito tabs. Any files you download or bookmarks you create will be kept.

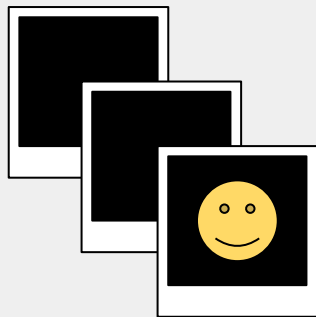
However, you aren't invisible. Going incognito doesn't hide your browsing from your employer, your Internet service provider or the websites that you visit.



Chrome v59 (desktop)

Key Takeaways

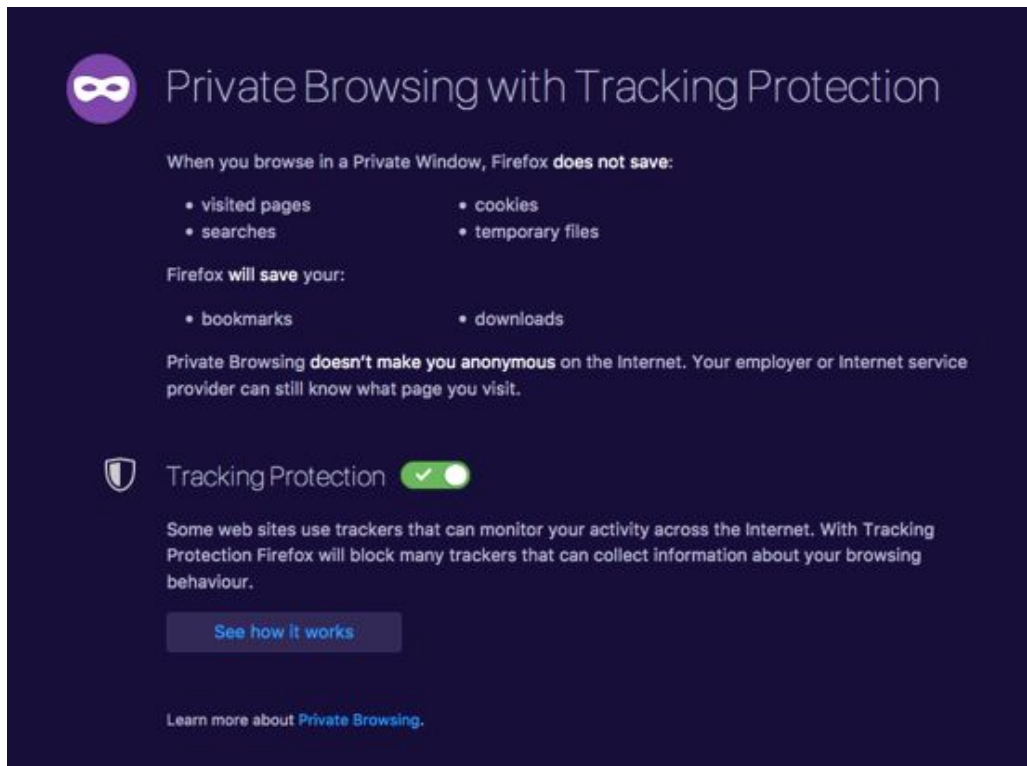
Understanding comes from interaction



3:14 pm	<i>picturesofcorgis.com</i>
3:15 pm	<i>picturesofcorgis.com</i>
3:16 pm	<i>picturesofcorgis.com</i>
3:17 pm	<i>picturesofcorgis.com</i>
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3:26 pm	<i>picturesofcorgis.com</i>



Language matters



The screenshot shows the Firefox Private Browsing interface. At the top, there is a purple mask icon and the title "Private Browsing with Tracking Protection". Below this, it states "When you browse in a Private Window, Firefox **does not save**:" followed by a list of items: "visited pages", "searches", "cookies", and "temporary files". It then says "Firefox **will save** your:" followed by "bookmarks" and "downloads". A warning message follows: "Private Browsing **doesn't make you anonymous** on the Internet. Your employer or Internet service provider can still know what page you visit." Below this is a section for "Tracking Protection" with a shield icon and a green toggle switch. It explains that some websites use trackers and that Firefox will block many of them. A button labeled "See how it works" is present. At the bottom, there is a link to "Learn more about Private Browsing."

Private Browsing with Tracking Protection

When you browse in a Private Window, Firefox **does not save**:

- visited pages
- searches
- cookies
- temporary files

Firefox **will save** your:

- bookmarks
- downloads

Private Browsing **doesn't make you anonymous** on the Internet. Your employer or Internet service provider can still know what page you visit.

Tracking Protection ☒

Some web sites use trackers that can monitor your activity across the Internet. With Tracking Protection Firefox will block many trackers that can collect information about your browsing behaviour.

[See how it works](#)

[Learn more about Private Browsing.](#)

Private Browsing + Tracking Protection

Firefox blocks parts of the pages that may track your browsing activity.

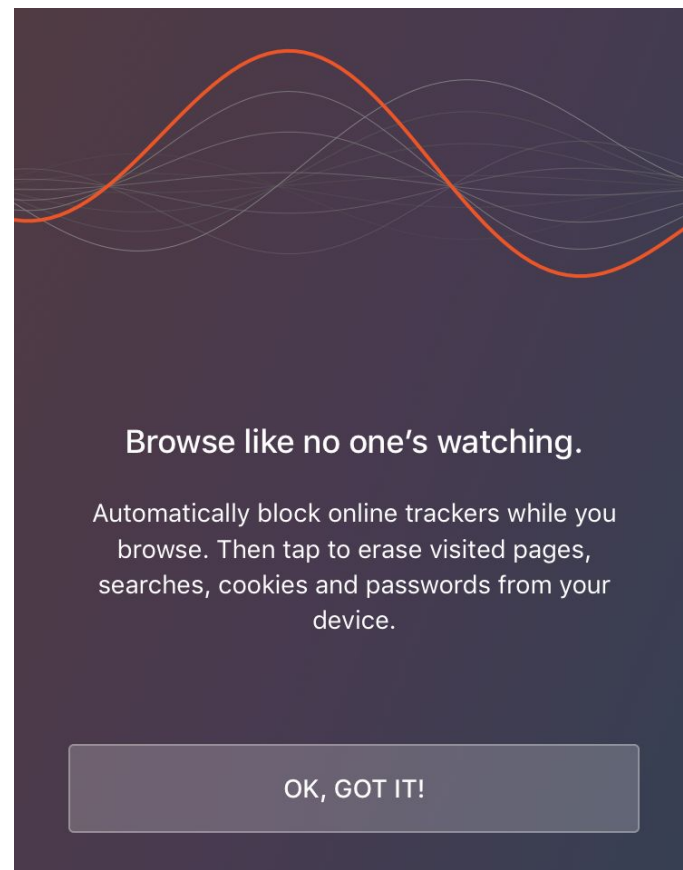
We won't remember any history, but downloaded files and new bookmarks will still be saved to your device.

[Want to learn more?](#)

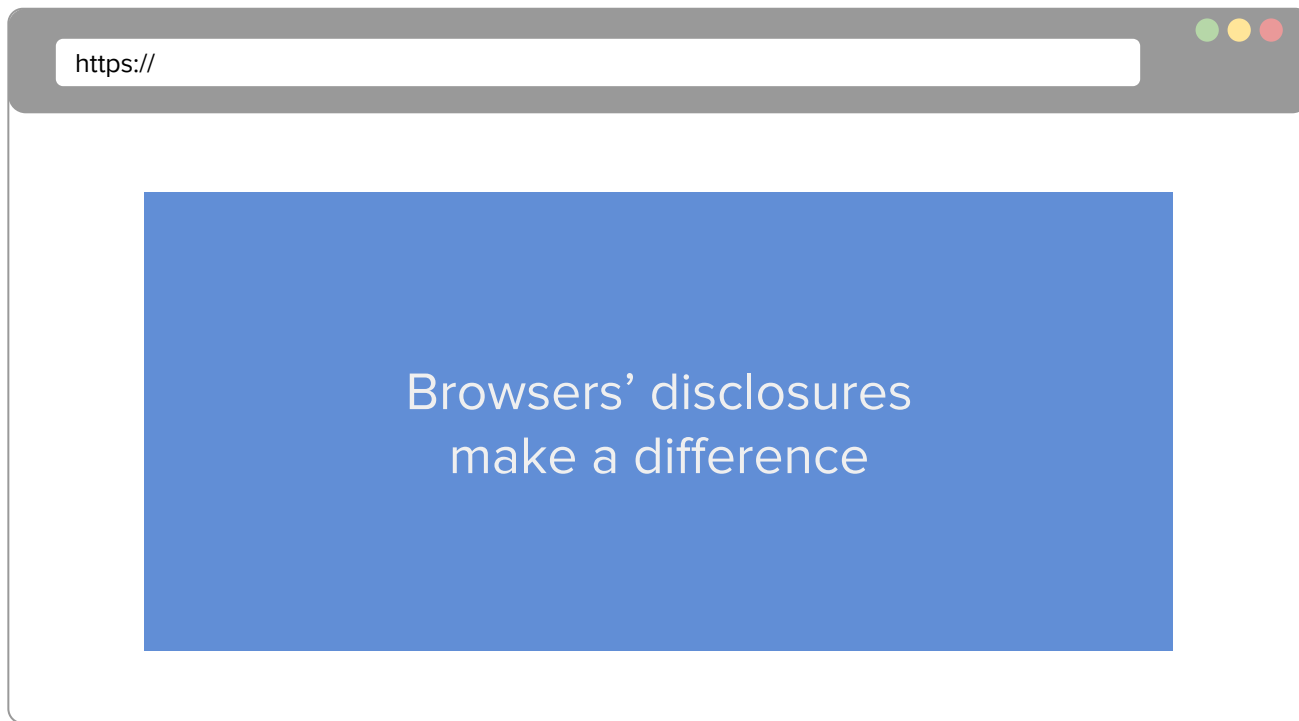
Language matters



Opera (mobile)



Firefox Focus (mobile)



RQ: Do disclosures impact misconceptions of private browsing mode? If so, how?

Methodology: 460-participant survey testing 13 disclosures in 20 scenarios

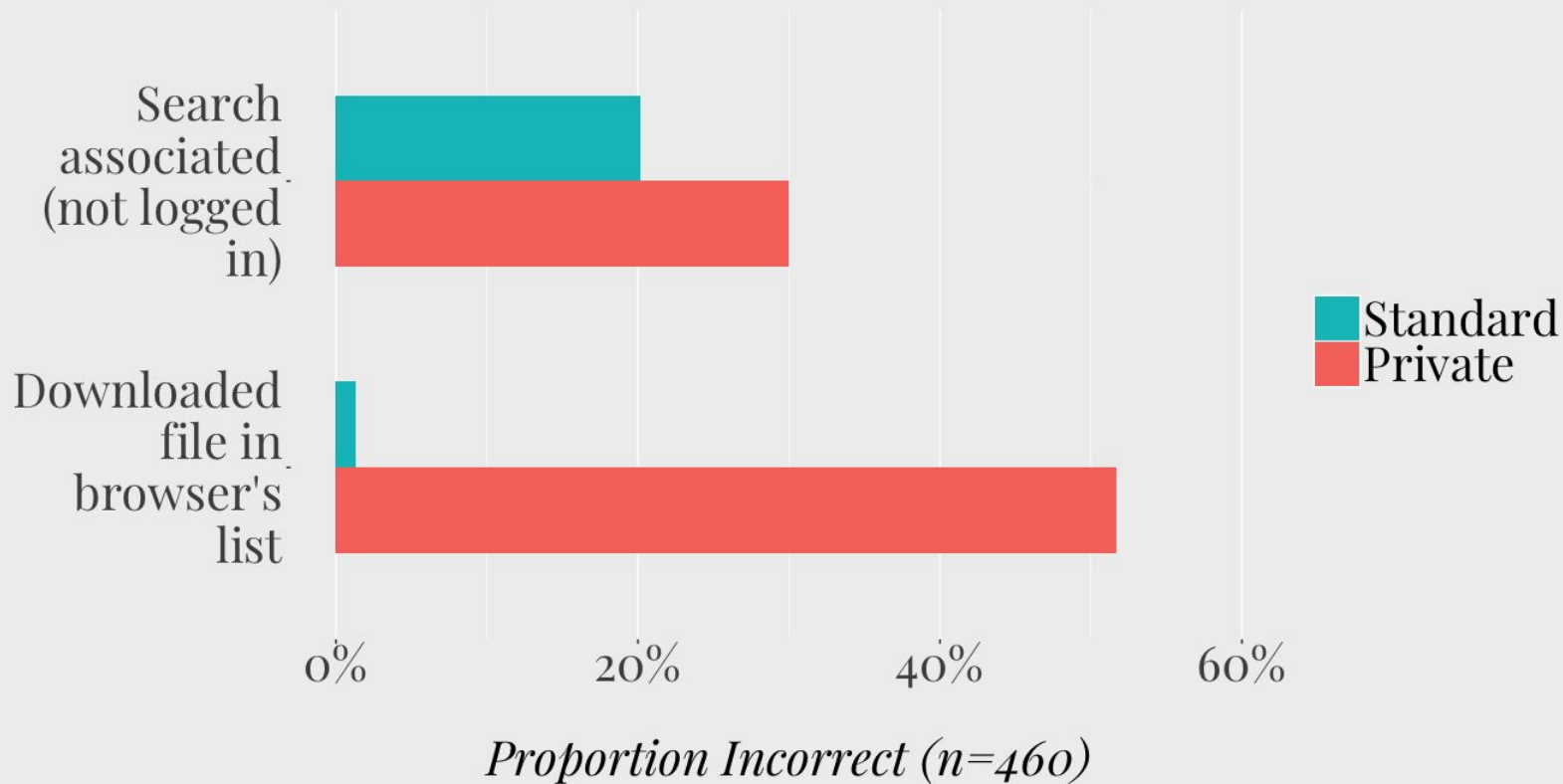
Results: Disclosures have an impact and contribute to many misconceptions

Your Secrets Are Safe:
How Browsers' Explanations
Impact Misconceptions About
Private Browsing Mode

Yuxi Wu, Panya Gupta, Miranda Wei,
Yasemin Acar, Sascha Fahl, Blase Ur
{yuxiwu, weim}@uchicago.edu



Underestimated Protections



Roadmap

1. Why use private browsing mode?
2. Past work
3. Study motivation
4. Survey methodology
5. Results
6. Key takeaways

Aggregate Confidence

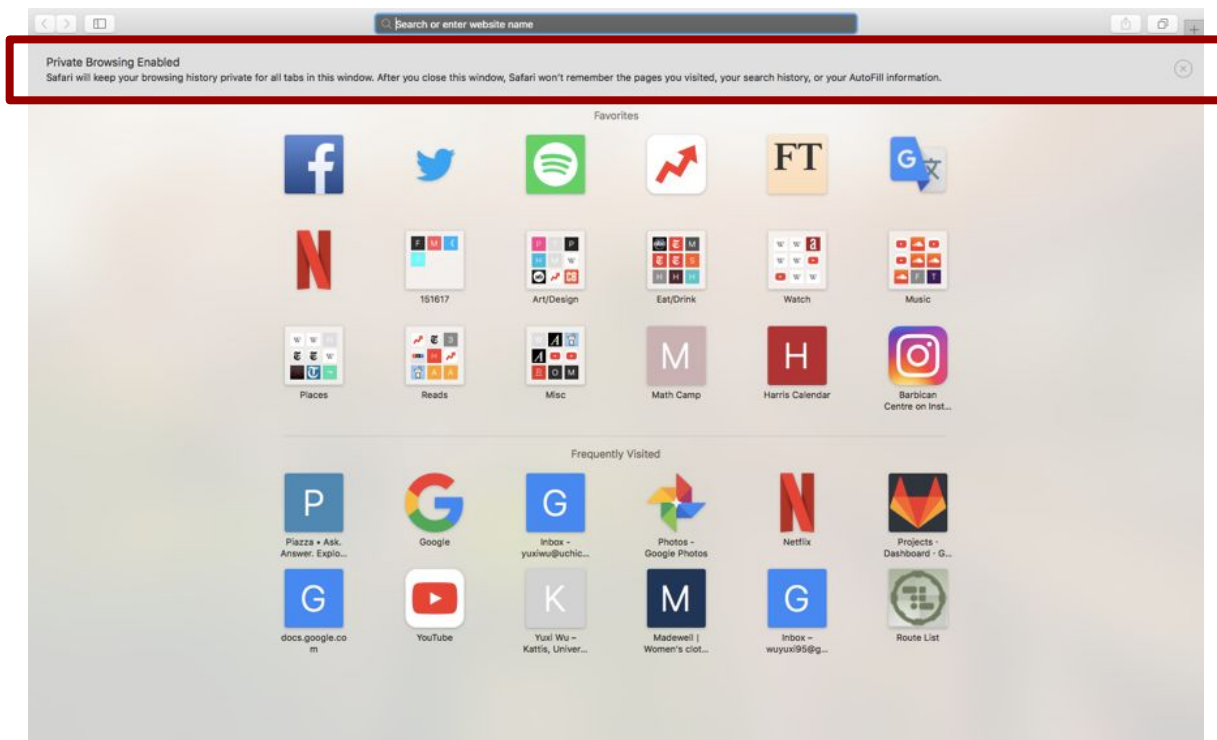
Males were 3.46 times more confident ...

Younger participants were ...

Less time in private mode were more confident ...

What do we use private browsing for?

Disclosures vary



Questions we anticipate getting:

But no one reads disclosures?

What were all of the correct answers, anyways?

Have disclosures been updated since publication?

What should disclosures say?

Notes from Blase

~~make title slide look like private mode disclosure~~
~~include universities~~

~~start with motivation~~

- ~~—people have misconceptions about private browsing mode~~
- ~~—all major browsers have private mode, meant to be local~~
- ~~—some limited prior work on misconceptions~~
- ~~—our main research question: browsers differ by how they explain what private mode does~~
- ~~—show real disclosures, show 3 different ones in full page; maybe mobile versions~~
- ~~—to what extent do the disclosure impact whether people have misconceptions~~
- ~~—no citations~~
- ~~“previously documented misconceptions”~~

~~survey methodology~~

- ~~—keep main lines, remove dots~~

~~move the walk through to right before 460 participants~~

- ~~—maybe flip; abstract or example~~

~~results~~

- ~~—participant demographics: as briefly as possible, more graphics; separate reasons and usage~~
- ~~—drop reasons for using~~
- ~~—start with the scenarios, confidence/which disclosure did best at the end~~
- ~~—4 types of scenarios —> remove org slide~~
- ~~—make axes bigger, explain how to read the slide (incorrect answers)~~
- ~~—no graph for non-misconceptions~~
- ~~—show blank graph, then insert data~~
- ~~—separate distinguishing and comparative~~
- ~~—“overestimated protections”~~
- ~~—have quotes in notes~~

~~implications/discussion~~

- ~~—less words~~
- ~~—screenshot of disclosure language and show the logo of each browser~~

~~how do the disclosures impact misconceptions~~

- ~~—at beginning of results: show results for disclosures in aggregate~~
- ~~—then specific disclosures at the end~~
- ~~—meaninglessly vague control, read it outloud; see how the other~~

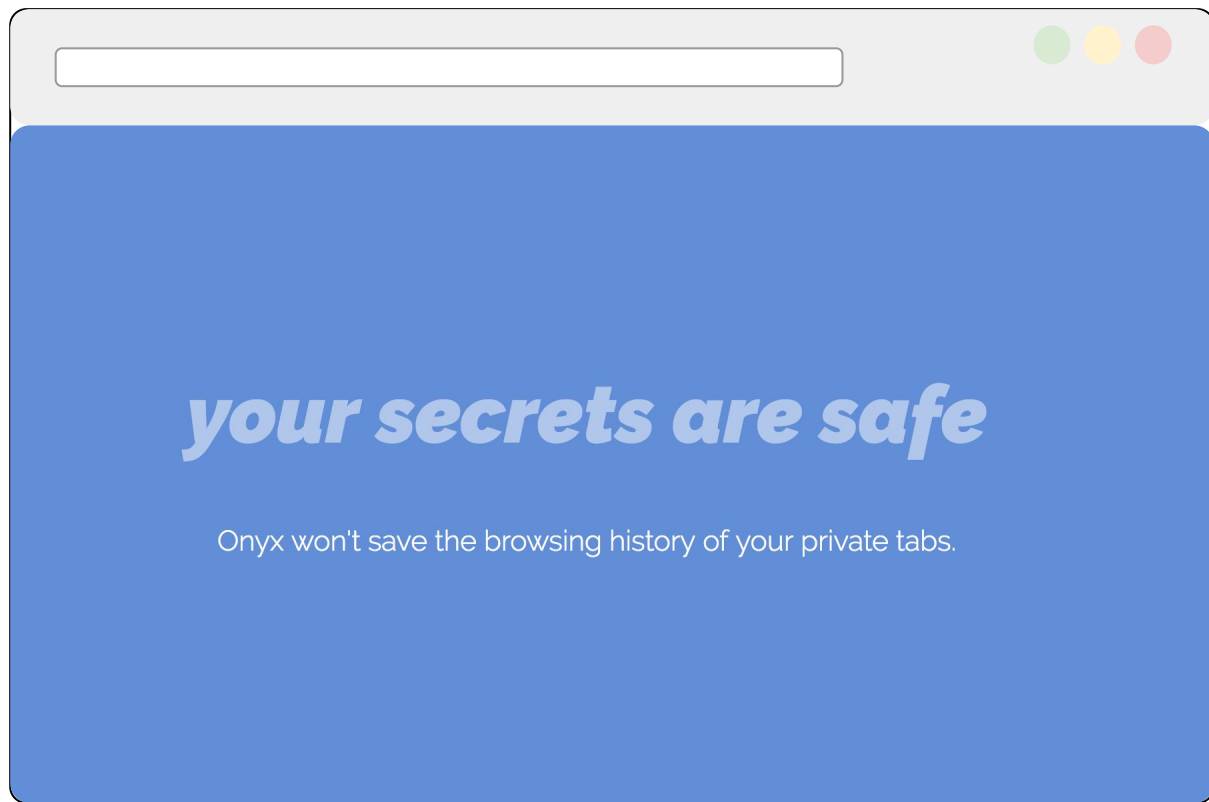
~~ones compare~~

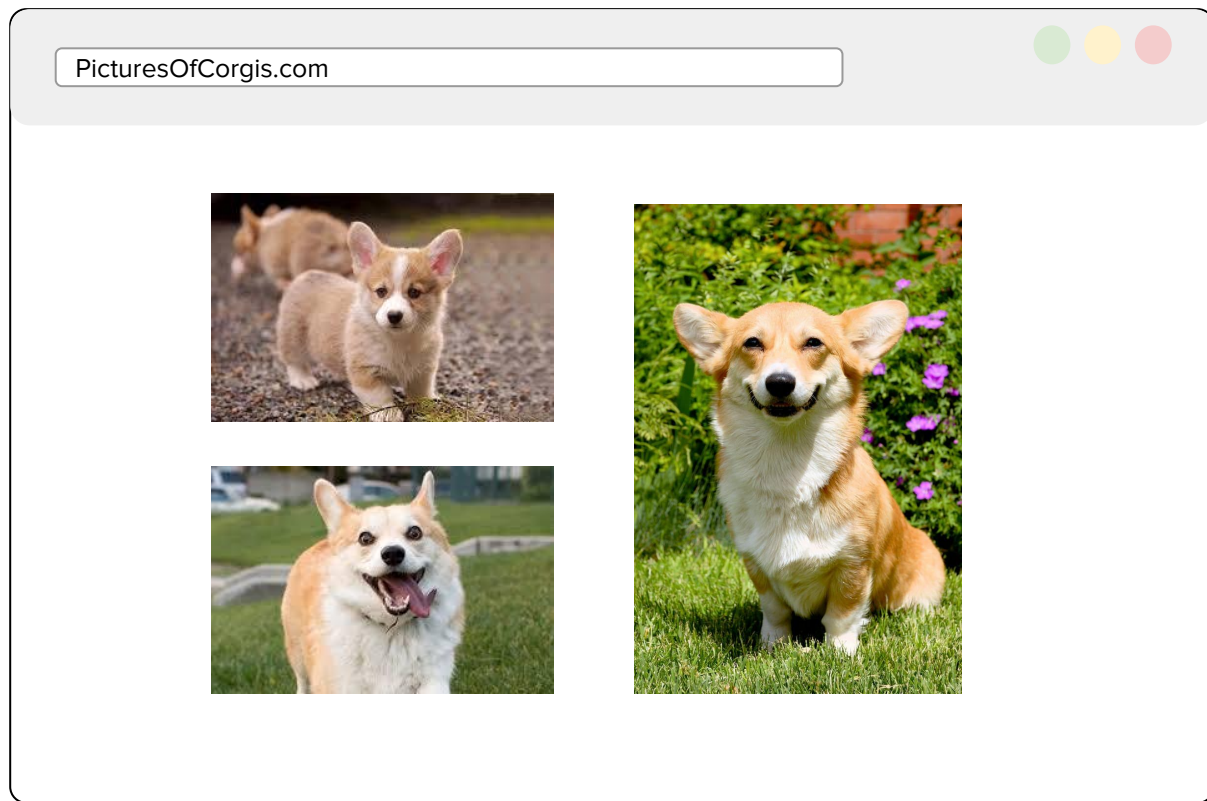
- ~~—scale of how many they got right~~

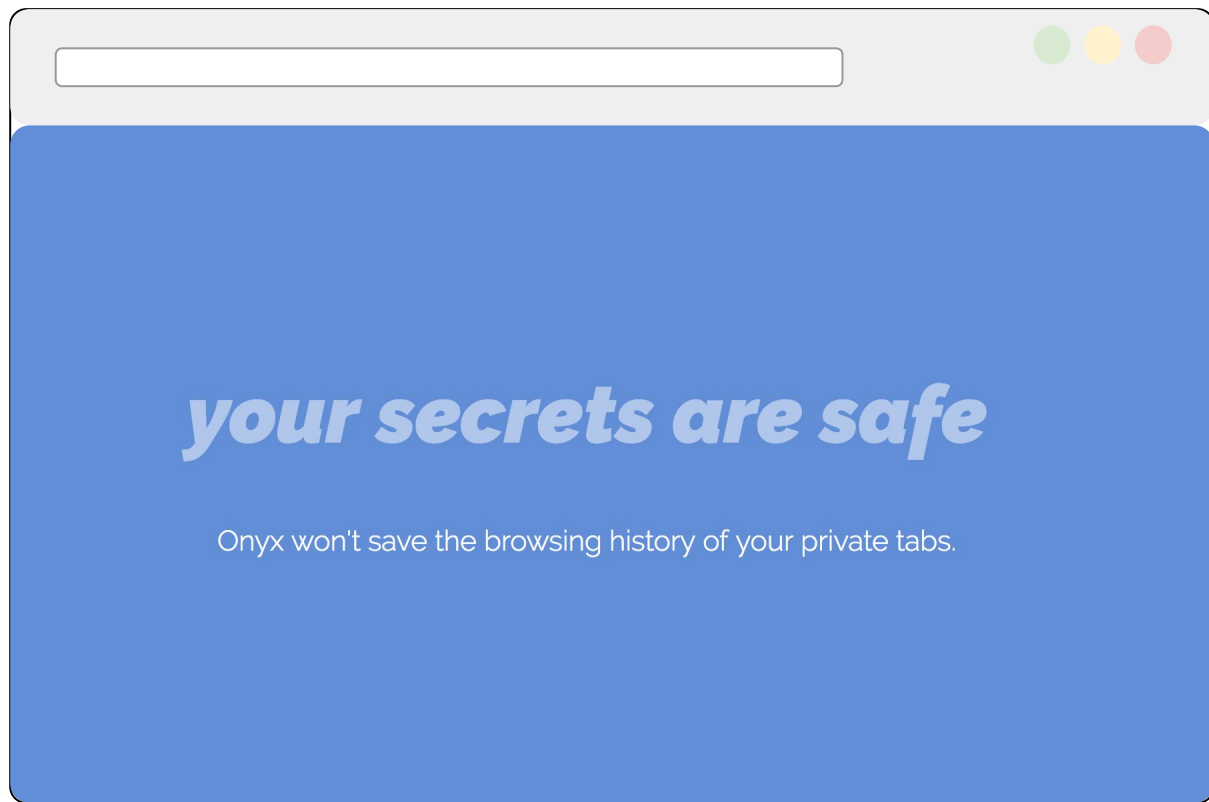
~~—misconceptions that disclosures particularly emphasized~~

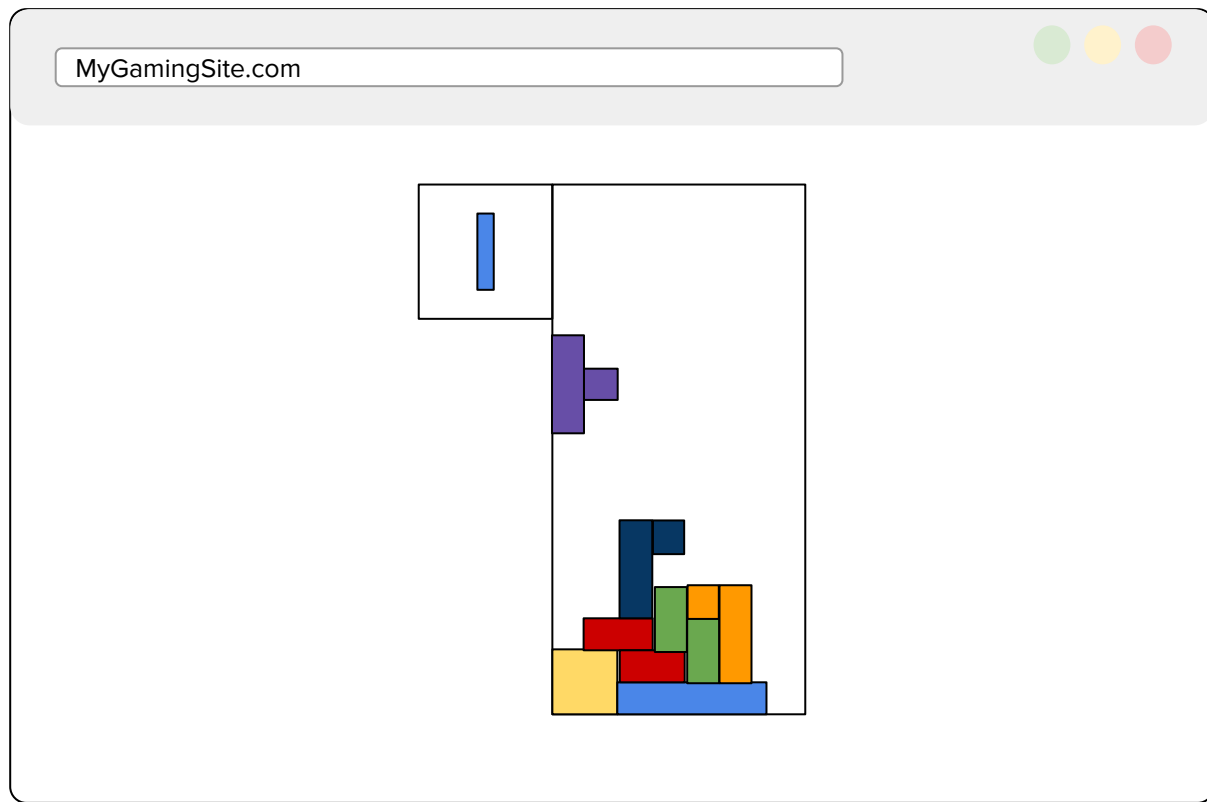
Imagine there is a
new web browser
called Onyx.

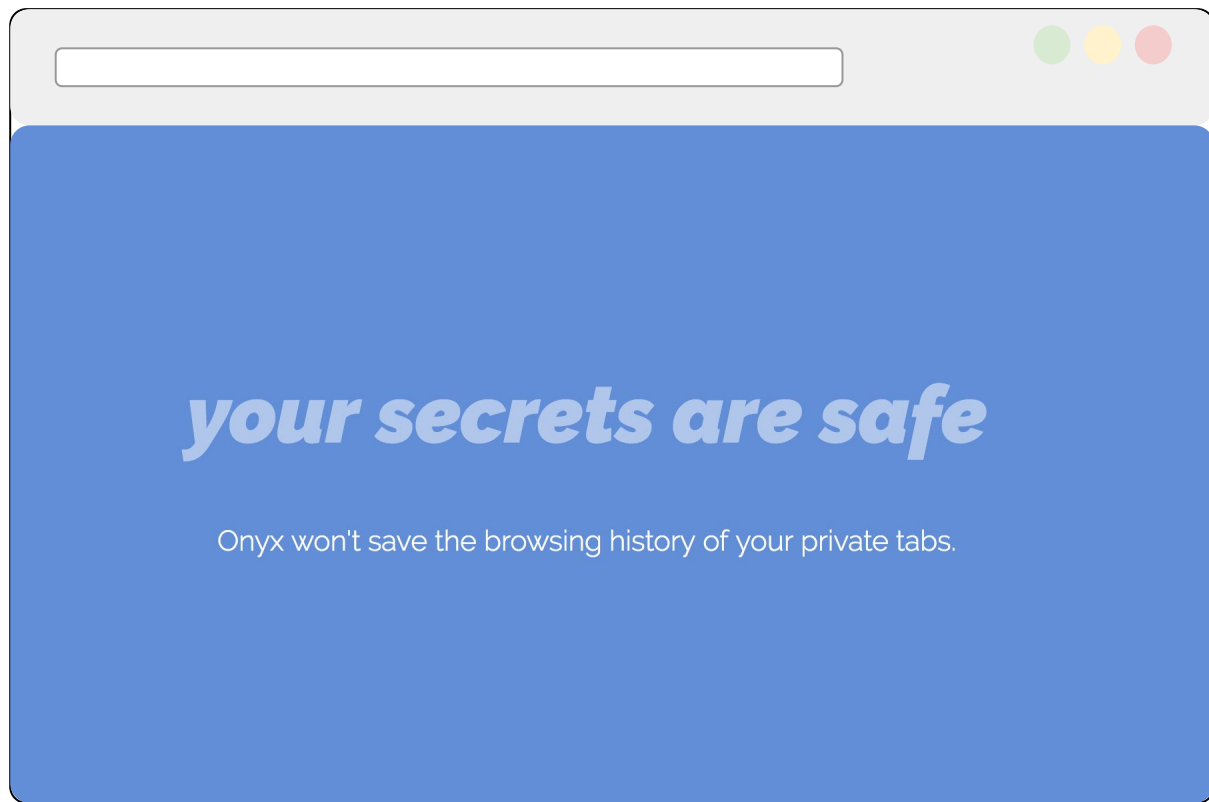
Onyx has a mode
called “private
browsing mode.”

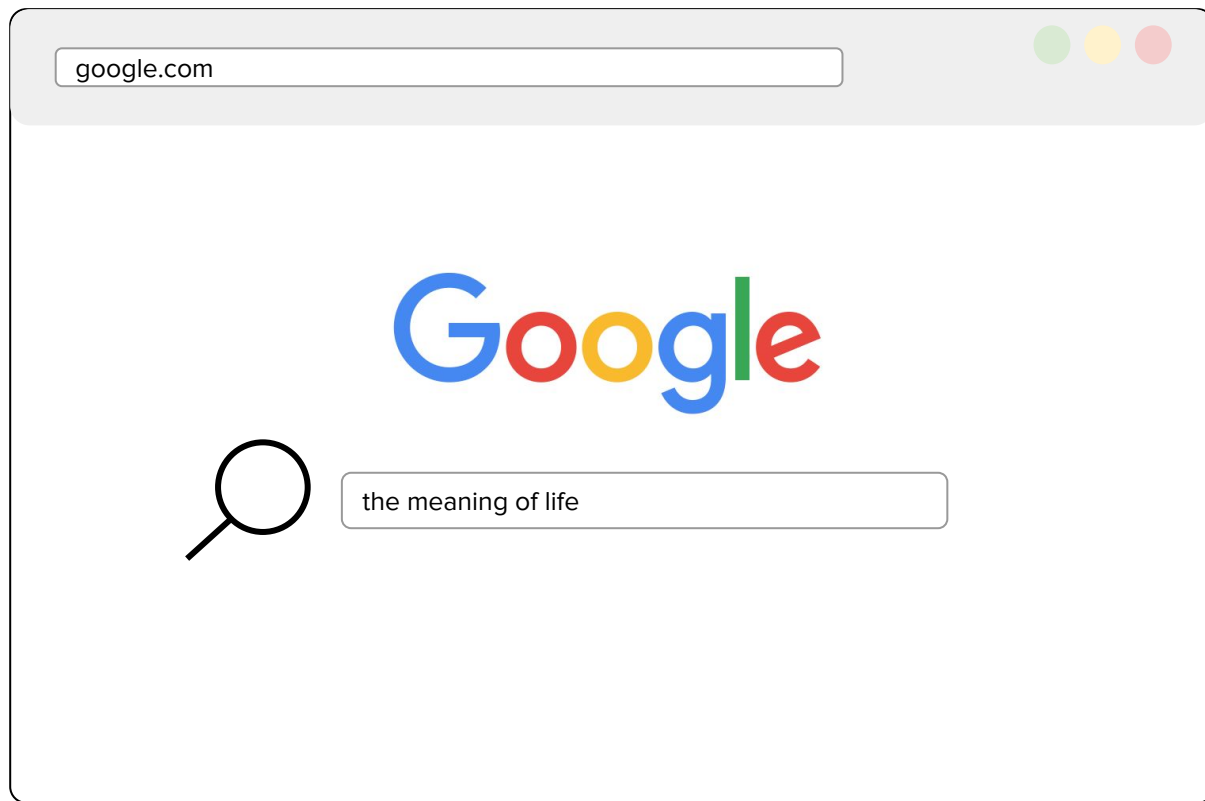


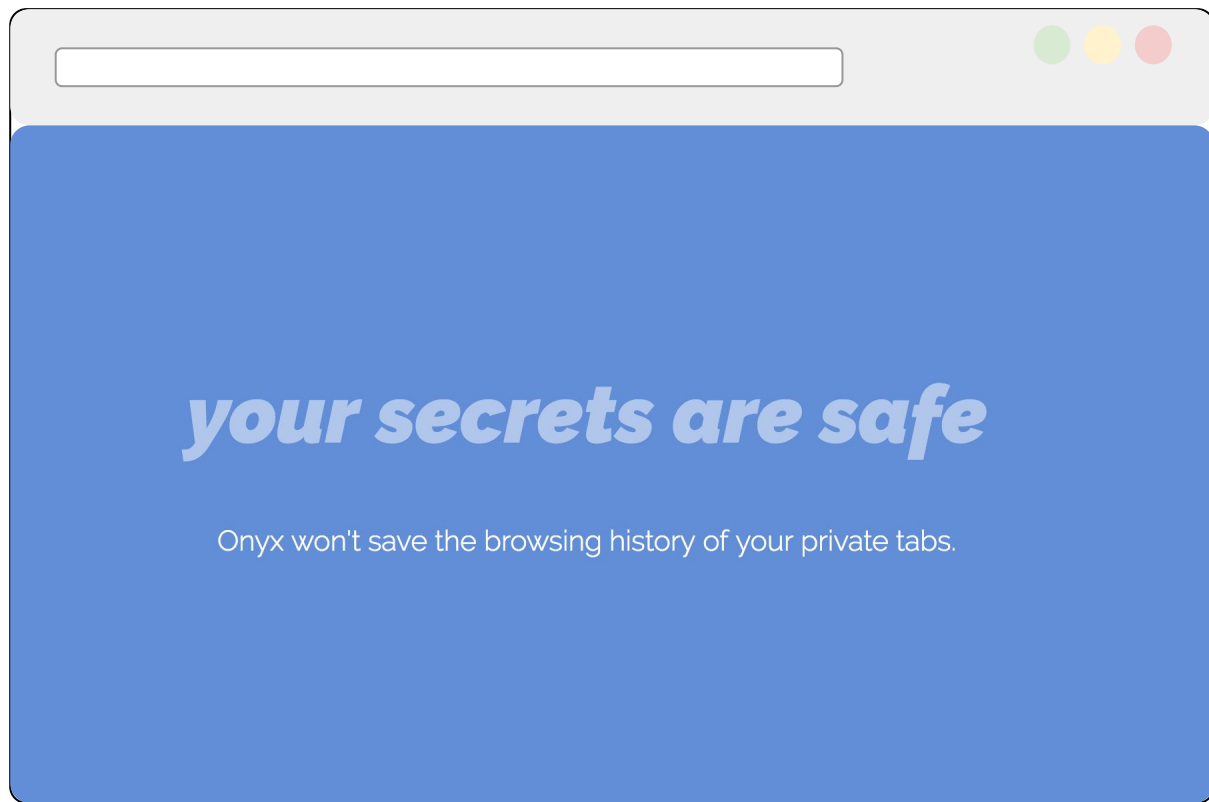






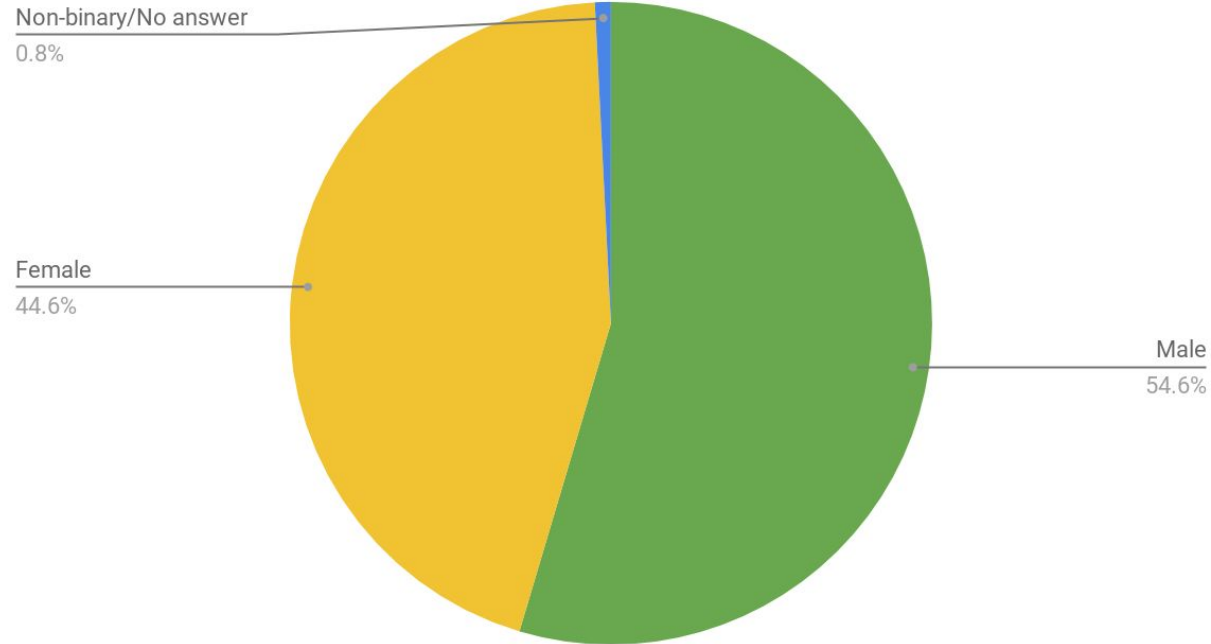






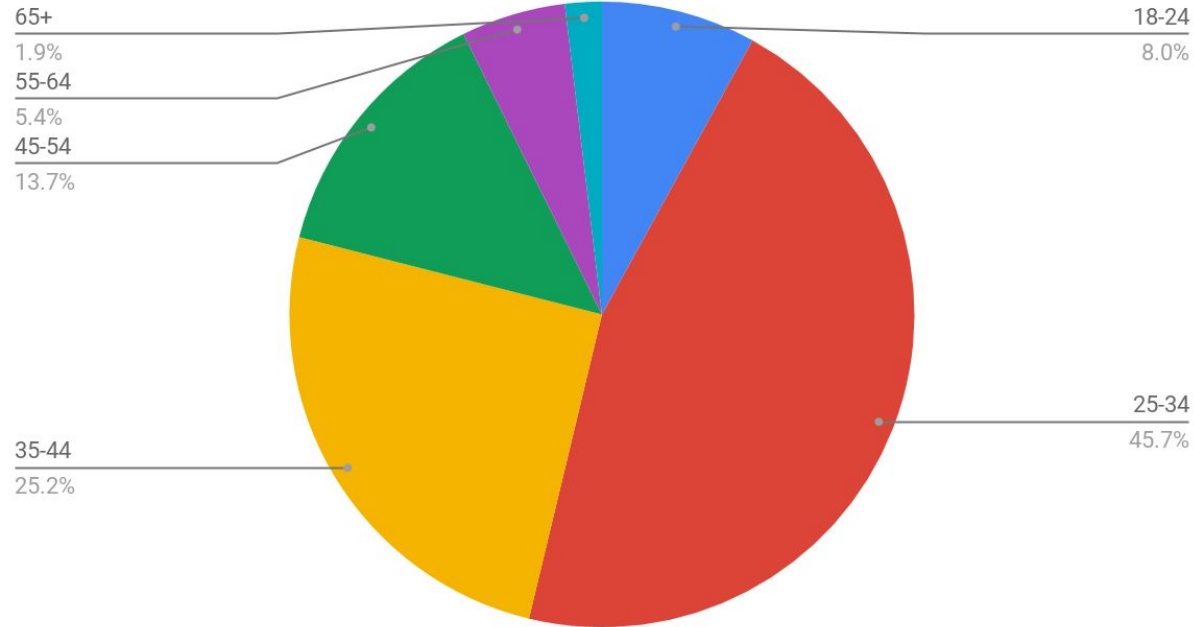
Our Participants (N=460)

Gender



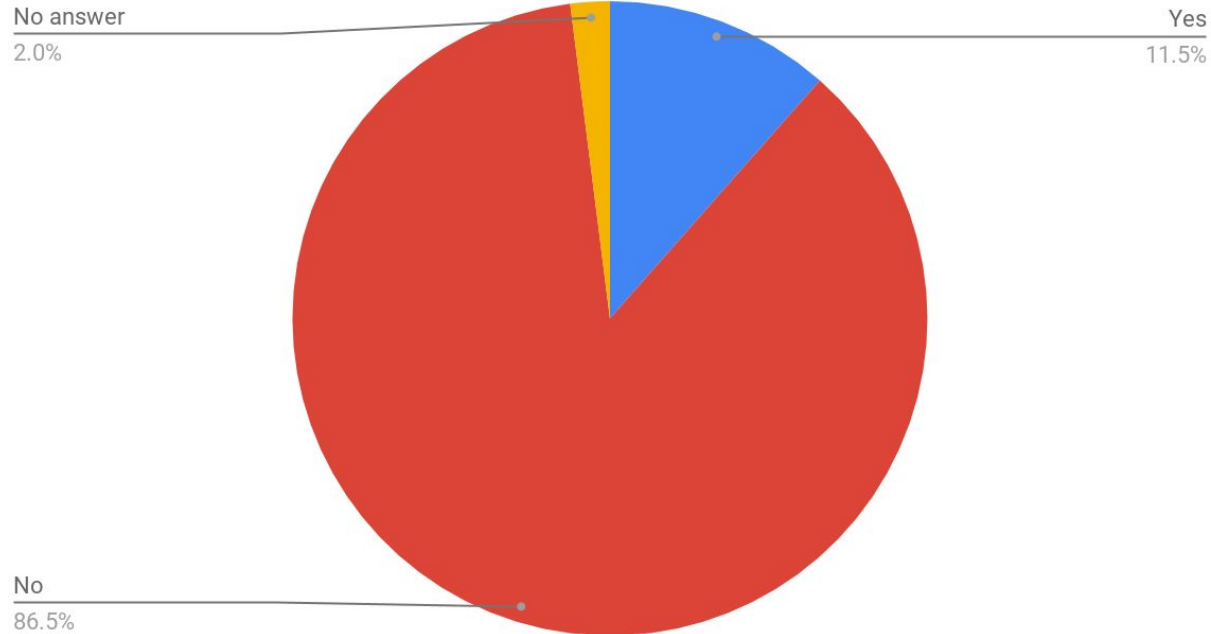
Our Participants (N=460)

Age

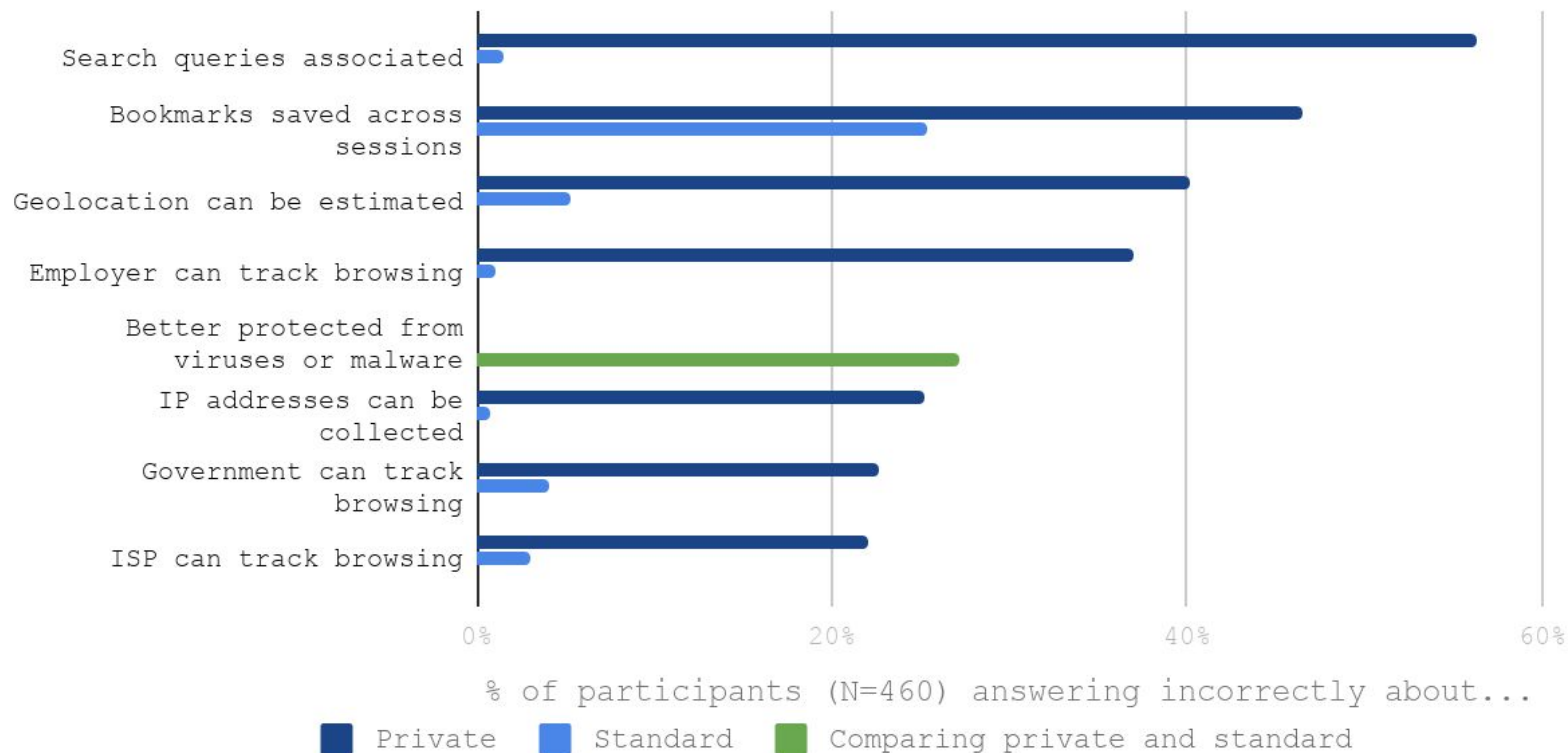


Our Participants (N=460)

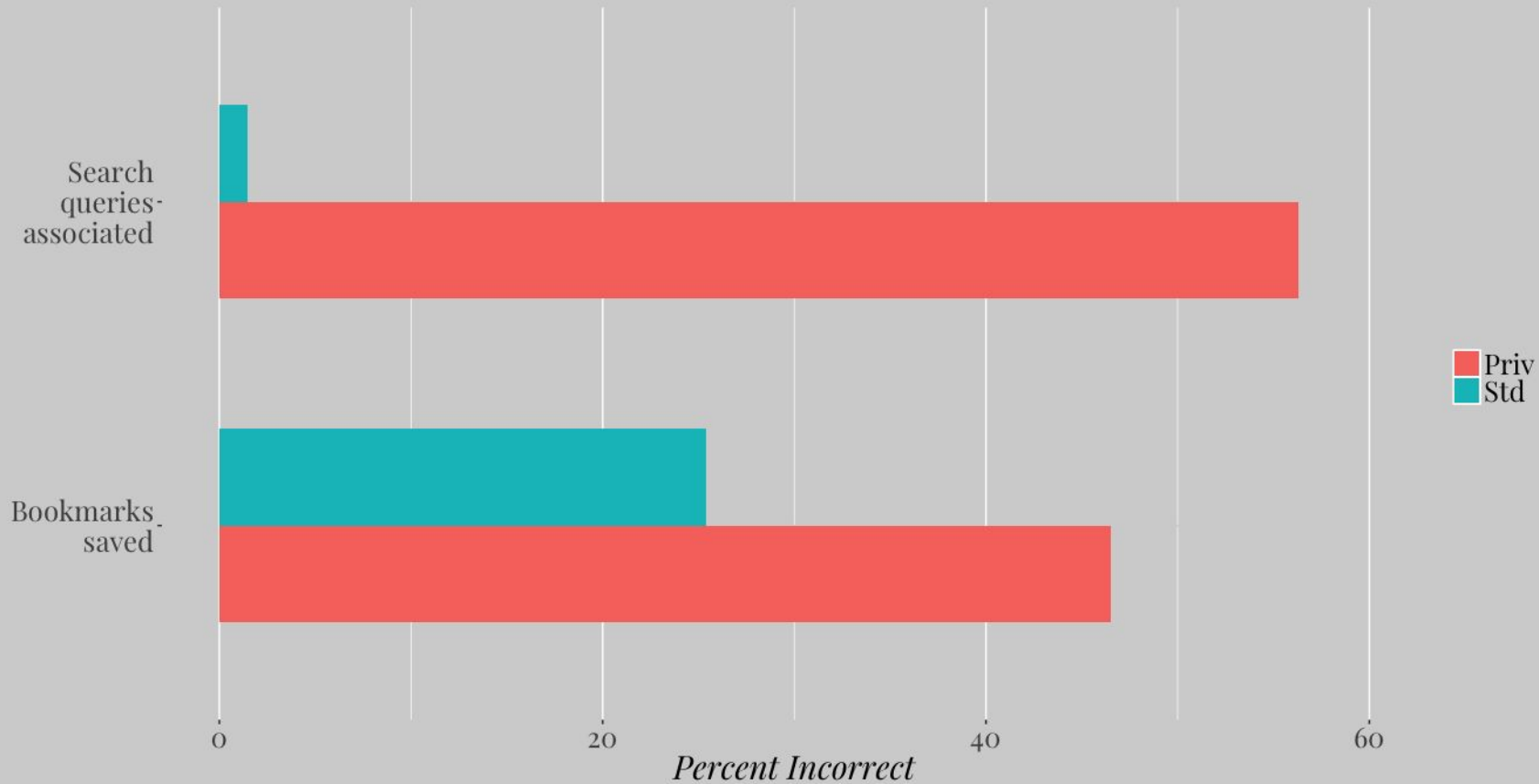
Tech background



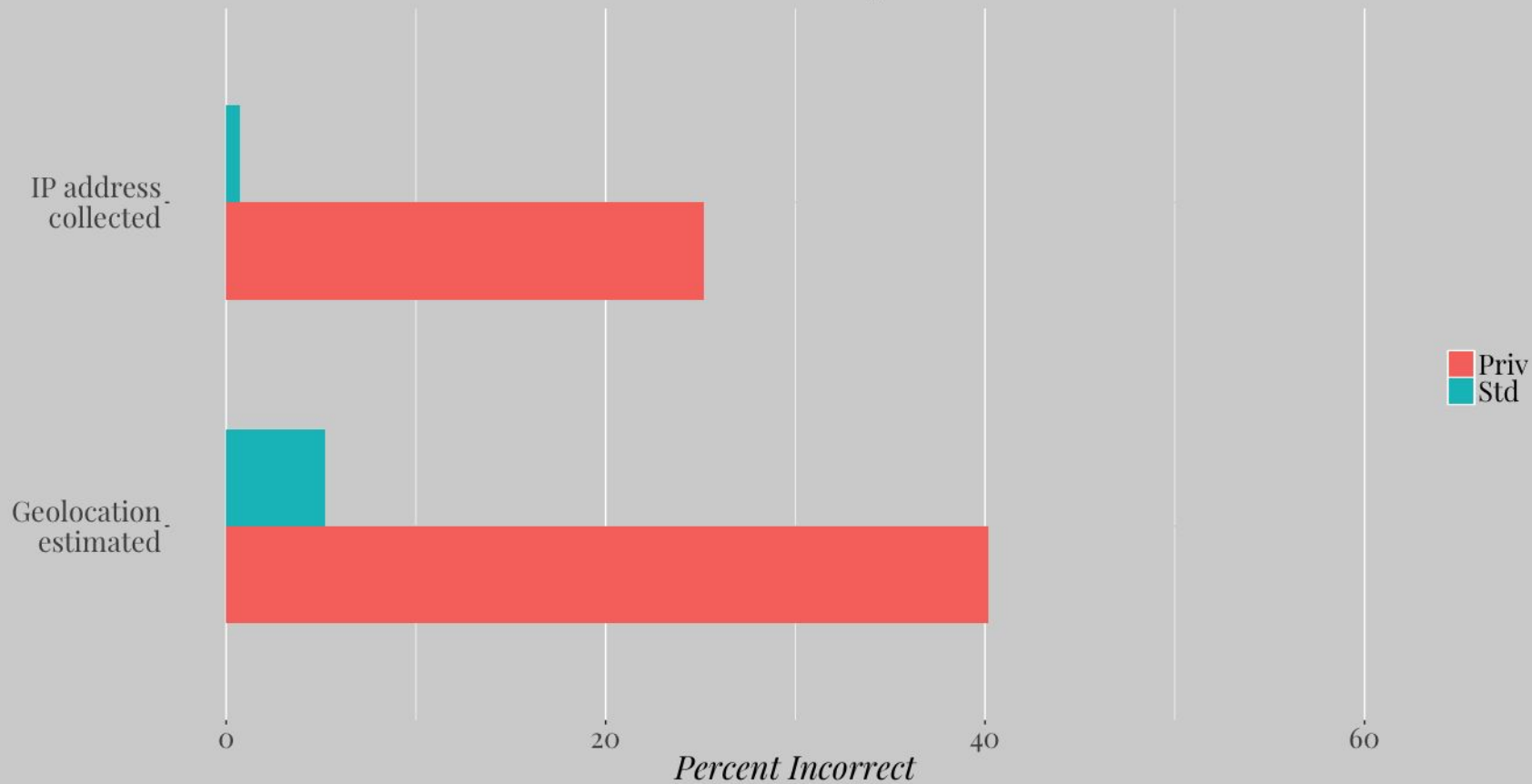
Overestimated Protections



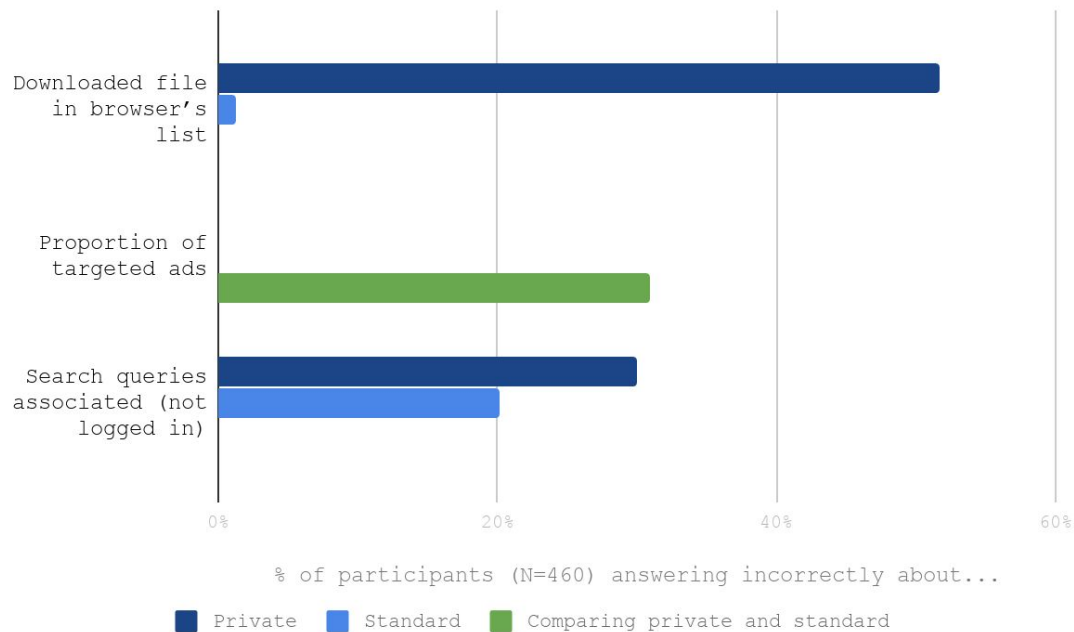
Overestimated - Saving



Overestimated - Geolocation/IP



Underestimated Protections



Our Participants (N=460)

Browser Usage

