The Spyware Used in Intimate Partner Violence

Rahul Chatterjee, Periwinkle Doerfler, Hadas Orgad, Sam Havron, Jackeline Palmer, Diana Freed, Karen Levy, Nicola Dell, Damon McCoy, Thomas Ristenpart
Intimate partner violence (IPV): sexual violence, physical violence, or stalking by boyfriend, girlfriend, or spouse

1 in 4 women  1 in 10 men
experienced IPV in their lifetime in US

Source: [https://www.cdc.gov/](https://www.cdc.gov/), 2015
Technology is abused for IPV

Abusers exploit technologies to:
- send harassing texts
- stalk victim online
- distribute non-consensual pornography
- spy on victims using spyware

Burke et al. ’11
Dimond et al. ’11
Citron ’15
Woodlock et al. ’16
Matthews et al. ’17
Freed et al. ’17, ’18

Intimate partner surveillance (IPS)
IPS is both a form of violence and facilitates other forms of violence.

“An abusive partner kicked in our front door and wound up in the lobby of our building by tracking her phone . . . it was some secondary application that the abuser had put on it and knew exactly where she was... it was scary.”

– Case manager

[Freed et al. CSCW ’18]
Spyware threat model in IPV

Abuser

- has physical access
- knows passwords
- might own device

\[\text{Abuser can install spyware}\]
We did not know ... 

1. What spyware tools are available to abusers? 
2. How easy it is to find and (ab)use them? 
3. Are developers of these tools complicit in IPS? 
4. Can anti-spyware apps come to the rescue?
Our work:
First study of the ecosystem of IPS-relevant apps

~4000 IPS-relevant apps:
• Some are overt spyware
• Most are dual-use

Abundant resources (blogs, videos, forums, etc.) to help abusers with IPS

Current anti-spyware doesn’t flag IPS-relevant apps as threat

Some developers promote IPS, others condone it

Spyware ecosystem currently empowering abusers and failing victims
How do abusers find IPS-relevant apps?

Need large number of query terms that an abuser might use

Blogposts comparing spy apps
Videos how-to guides
Ad funnels for spy apps
Spy app websites
Search engines give query suggestions

how to spy on my
how to spy on my husband
how to spy on my boyfriend's phone
how to spy on my boyfriend's iphone
how to spy on my girlfriend's iphone
how to spy on my husband's iphone
how to spy on my boyfriend's Facebook messages
how to spy on my husband's iphone
how to spy on my son's iphone
how to spy on my bf phone
how to spy on my wifi network

Searches related to how to spy on my husband

track my husband's phone for free
track my husband's phone without him knowing
how can I find out who my husband is texting for free
cheaters spy app free
how can I track my husband's cell phone without him knowing and for free
how to hack my husband's whatsapp
how can I track my husband's phone location
spy on cell phone without touching target phone
“Snowball” searching

- how to spy on my girlfriend, track my girlfriend android, how to spy on my husband ...

Query set

Stop when no new query found or # queries more than 10,000

Regex-based filter to remove unrelated terms
Abundant resources for conducting IPS

- Crawled Google and (and iTunes) using snowball searching
- We found:
  - 3,500+ IPS-relevant apps in Google Play
  - (smaller study) 451 IPS-relevant apps in iTunes
  - 23 off-store spyware apps
A typical off-store spyware app

All-Inclusive Mobile Phone Spy

✓ Spy on all iOS and Android devices
✓ Track SMS, Call logs, App chats, GPS etc.
✓ No Rooting or Jailbreaking required
✓ Invisible mode, monitor the activity remotely

Source: https://www.spyzie.com/ad/phone-spy.html
Smooth (ab)user experience with off-store spyware

Installing is easy
Whole process takes less than 5 min

On victim's device:
No app icon, no notification

On abuser end:
Fancy web UI or apps

How-to guides
Abundant resources for conducting IPS

23 off-store IPS-relevant apps

3,500+ IPS-relevant apps in Google Play

(smaller study)

451 IPS-relevant apps in iTunes
Finding on-store IPS-relevant apps

Apps distributed in official application stores

Snowball searching over 3 months on Play Store

15,000+ apps

Prune using ML classifier

~4,500 apps

Filter using human verifier

Found 3,500+ apps usable for IPS

Smaller study (2 weeks) on iTunes App Store:
451 IPS-relevant apps

Looks at app title, description, permissions, and genre as reported in Play Store
Taxonomy of on-store apps

- Personal tracking
  - Find my phone or Anti-theft
  - Automatic call recorder
  - Automatic data/SMS syncing
  - Phone control
  - Personal safety

- Mutual tracking
  - Find-my-family / friend
  - Couple tracking

- Subordinate tracking
  - Employee tracking
  - Parental control
Seemingly innocuous apps are used for IPS

“I’m looking for an app I can install on my wife’s phone that is **hidden** so that I can see **where she is or has been** via cell towers or gps.”

“[Install] **Cerberus** from the market. Once installed and configured, can be set to be invisible in the app drawer. You can also **record audio** and **take pictures remotely** with it! Be sure to silence the camera first though!”

Source: forum.xda-developers.com/showthread.php?t=1266874
Types of IPS-relevant apps

Overt spyware apps (typically off-store)

Dual-use apps (typically on-store)
Are app developers complicit in IPS?
Some developers are promoting IPS

HelloSpy

Mobile Spy App for Personal Catch Cheating Spouses

Cheating by the numbers...

One of the unpleasant truths most married individuals are of is the surprisingly high occurrence of extramarital affairs. A study by Joan D. Atwood & Limor Schwartz, 2002, by the Journal of Couple & Relationship

55% of married women and 50-60% of married men have extramarital sex at some time or another relationship. If that is not alarming enough, it puts the average nonpaternity rate at above

In other words, 33 children in every thousand are not the man everybody thinks they are...
Others are condoning IPS

• Suspicious redirect from IPS-content blogposts to app websites
Others are condoning IPS

- Suspicious redirect from IPS-content blogposts to app websites
- Paid ads coming up on IPS-related search terms
Others are condoning IPS

- Suspicious redirect from IPS-content blogposts to app websites
- Paid ads coming up on IPS-related search terms
- Contacted customer support for 11 apps
  - 6 on-store and 5 off-store
  - posing as an abuser

9 responses:

- 8 condoned IPS
- 1 admonished against IPS use

Jessie:
Hi, If I use this app to track my husband, will he know that I am tracking him?

WebWatcher:
For Android monitoring the app can be hidden from the home screen ...
So far,

1. Thousands of IPS-relevant apps are available
2. Plenty of how-to blogs, videos, and online forums for abusers
3. Some developers promote IPS
Disclosure with Google

We communicated our findings to Google. Google has

- tightened enforcement to disallow any couple tracking apps and taken action against the ones violate policies
- taken action against YouTube videos that violate their policies
- extended restrictions on ad-serving and Play Store search

Dual-use apps will/should remain on stores:
We need detection tools to help (potential) victims
Are anti-spyware tools effective?

- Snowball searched for anti-spyware apps in Play Store
- Found 40 apps that claim to have anti-spyware capabilities

None of the anti-spyware apps suffice: they do not flag dual-use apps as threat

- **Methodology:** Installed IPS-relevant apps in a phone along with one anti-spyware app
  - record the apps flagged by the anti-spyware
“State-of-the-art” spyware detection remains:

Battery Draining Fast

Feel being spied on

or

Getting hot
The Spyware Used in IPV
First in-depth study of IPS app ecosystem

Abundant resources for abusers to do IPS
Some developers are complicit in IPS
Current anti-spyware doesn’t flag IPS apps

Moving forward:

Working with Google and Symantec on IPS detection
Guidelines for honest developers to prevent IPS use-case?

https://ipvtechresearch.org

@rhlchatterjee rahul@cs.cornell.edu

Thanks!