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SOCIAL CYBERSECURITY

Reshaping Security Through An Empirical Understanding of Human Social Behavior

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How can we design systems that encourage better cybersecurity behaviors?


“password123”

What makes people…

…use a PIN on their phone?

…enable two-factor authentication?

…keep their software updated?

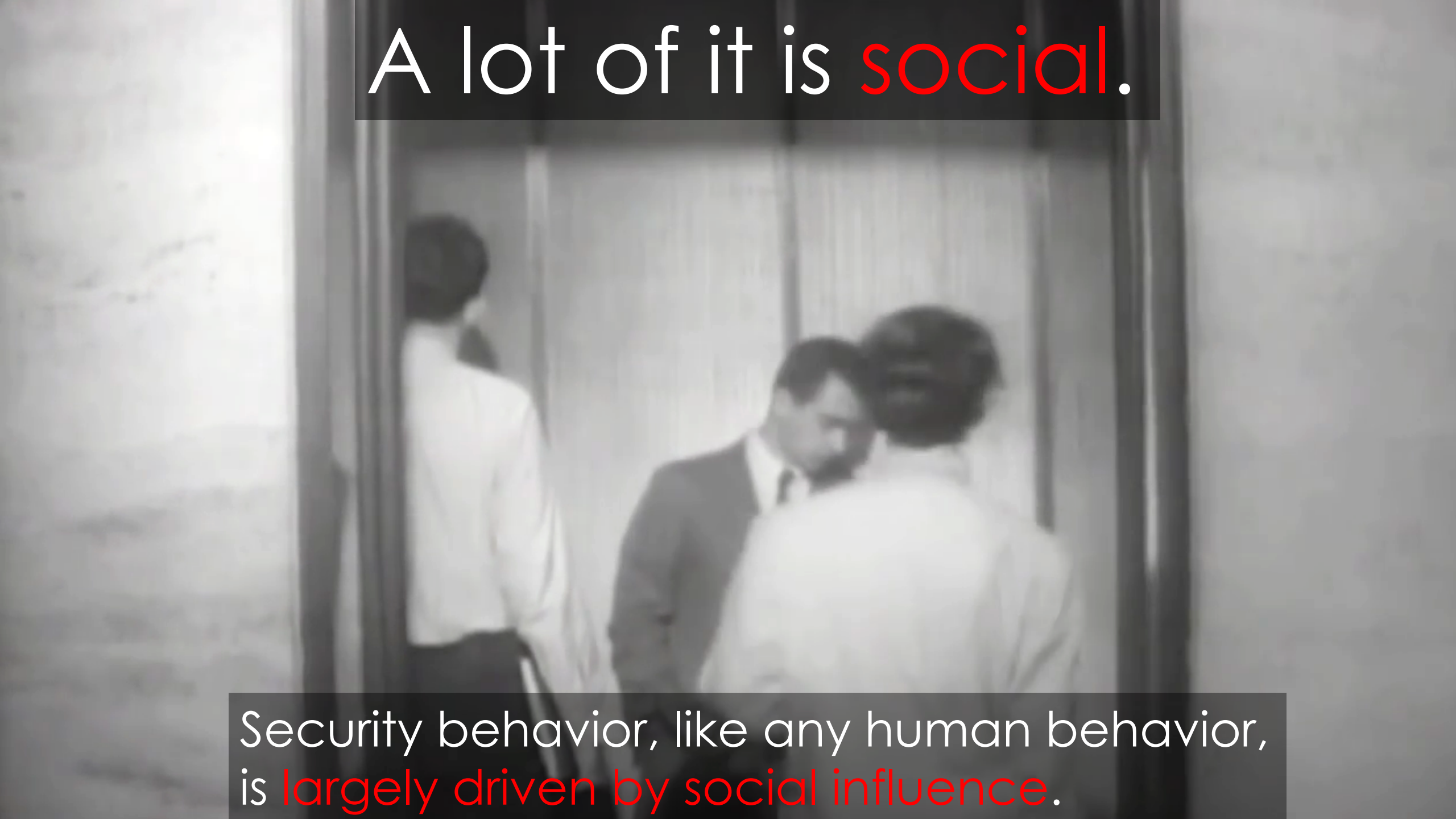
…behave "securely"?

"I started using [a PIN] because ***everyone around me had a [PIN]*** *so I kind of felt a group pressure to also use a [PIN].*


"One of my boys wanted to use my phone…**so I gave them my passcode**. And not that I have anything that I don't care for them to see or anything, **but after they did that then I changed it**"

*"**my friends...have a lot of different accounts, the same as me. But they didn't get into any trouble**. So I think maybe it will not be dangerous [to reuse passwords]."*

A lot of it is social.



Security behavior, like any human behavior, is largely driven by social influence.


HACKERS, TOM
~50%
of behaviors were socially driven
HACKERS EVERYWHERE

Absent knowledge of how security and social behaviors interact, we have little hope of doing better

Social influence strongly affects security behaviors, and this effect is contingent upon the design of a security tool affects its potential for social spread.

Making cybersecurity systems more social can encourage better security behaviors.

Social influences strongly affect cybersecurity behaviors, and we can encourage better behaviors by designing more social cybersecurity systems.


Measuring Social Influence In Security Behaviors


Improving Security Behaviors with Social Influence

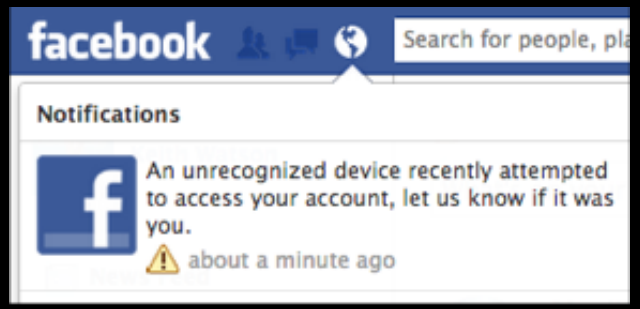
MEASURING SOCIAL INFLUENCE IN SECURITY BEHAVIORS

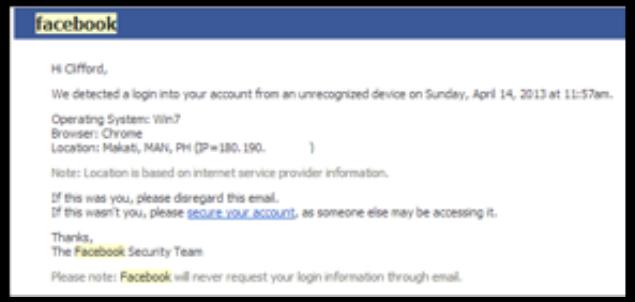
Das, S., Kramer, A., Dabbish, L., and Hong, Jason I. The Role of Social Influence in Security Feature Adoption. Proc. *CSCW'15*.

Analyzed how the (non)-use of three optional security tools was affected by friends' use of those tools for 1.5 million Facebook user's social networks.

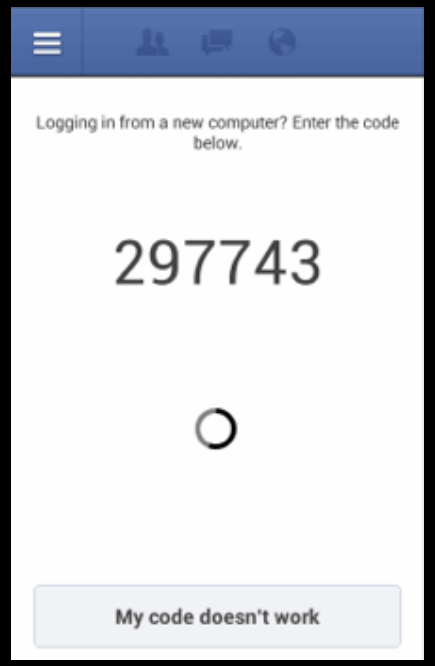
Standard

Social

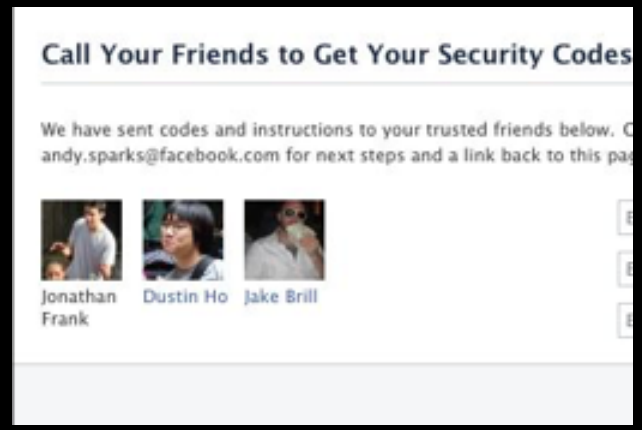




Login Notifications



Login Approvals



Trusted Contacts

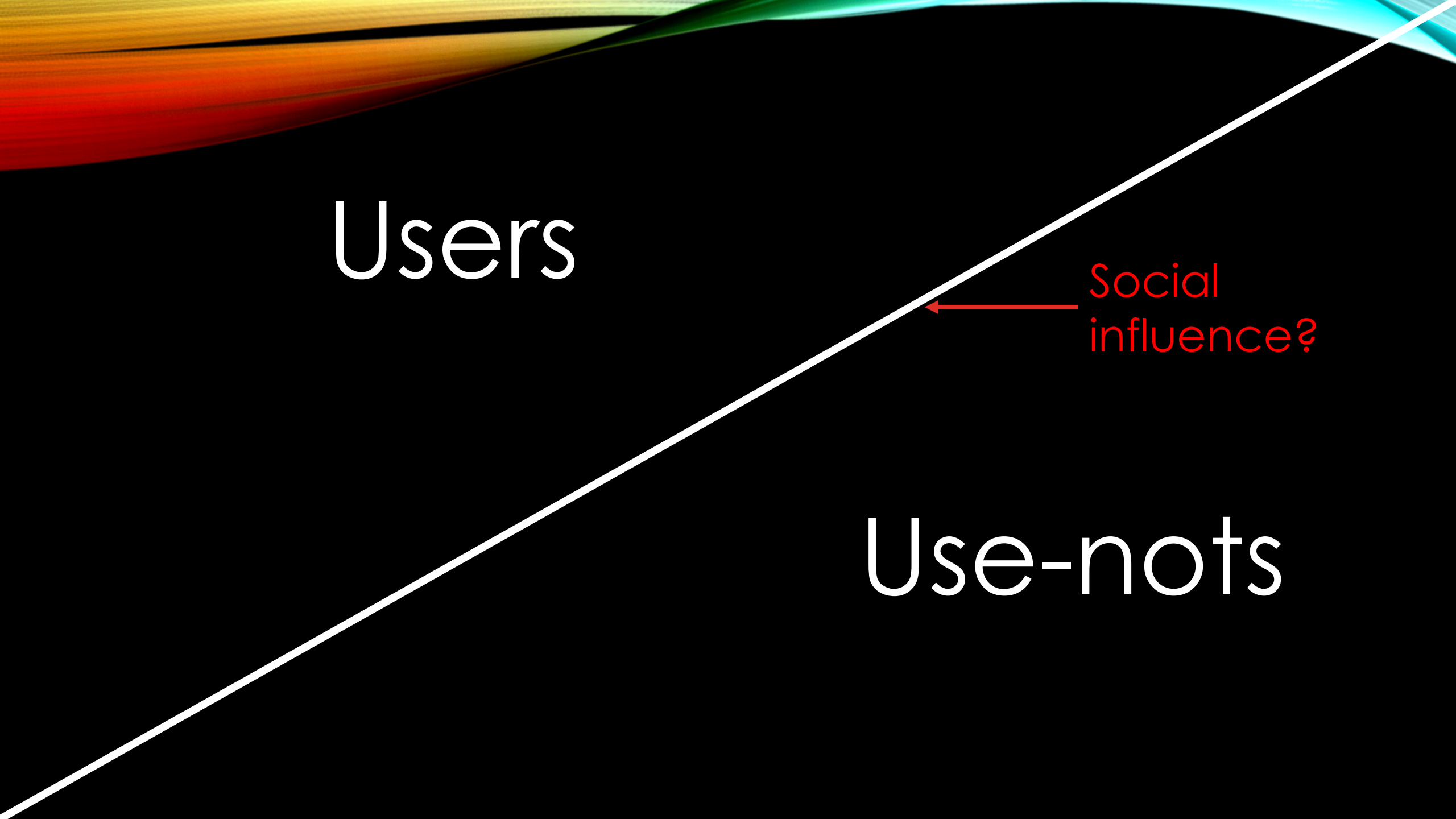
DATA COLLECTED

750k

users who newly adopted one of the aforementioned security tools.

750k

"use-nots" who had not adopted one of the aforementioned security tools.


Users
Social influence?
Use-nots

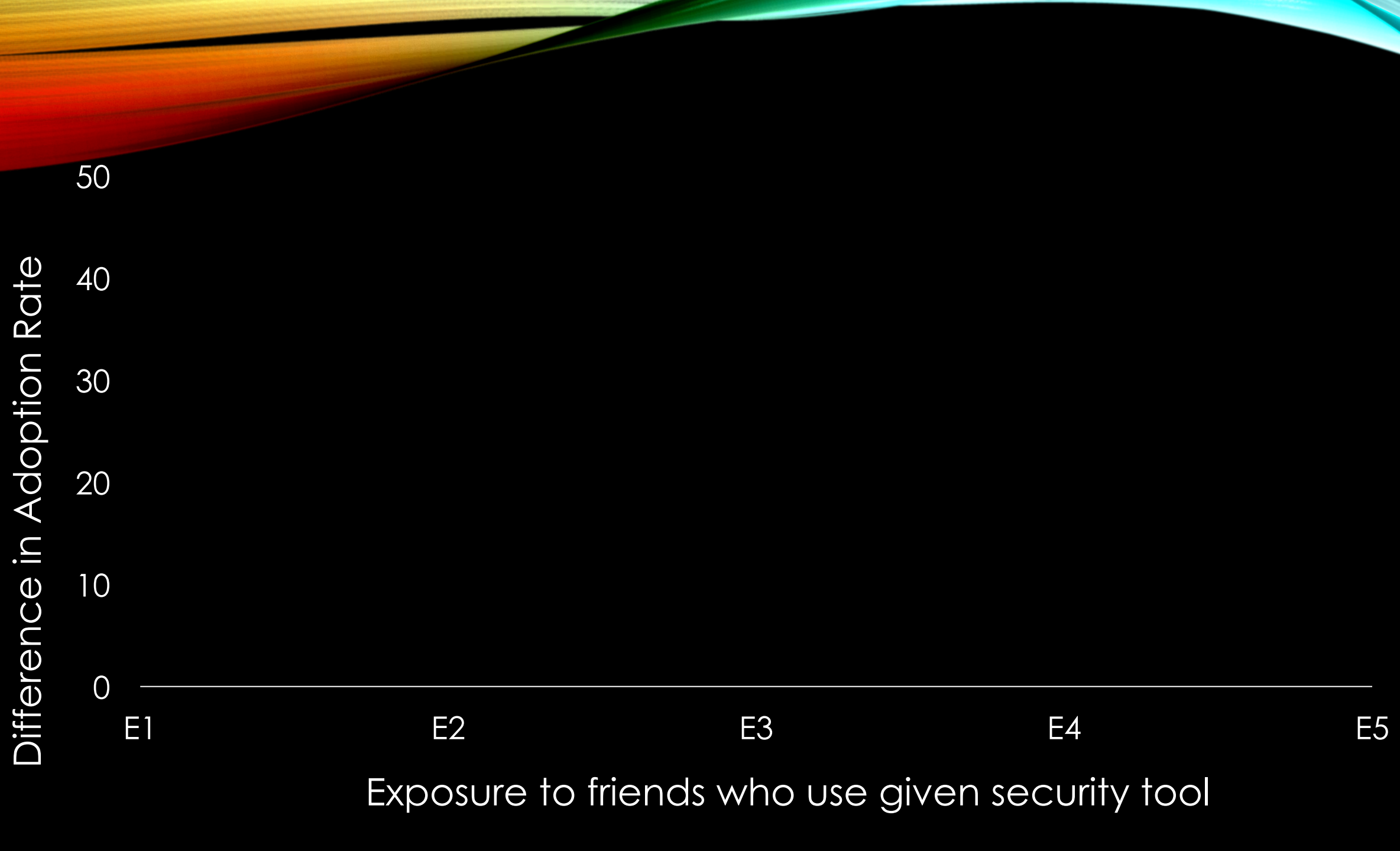
MATCHED PROPENSITY SAMPLING

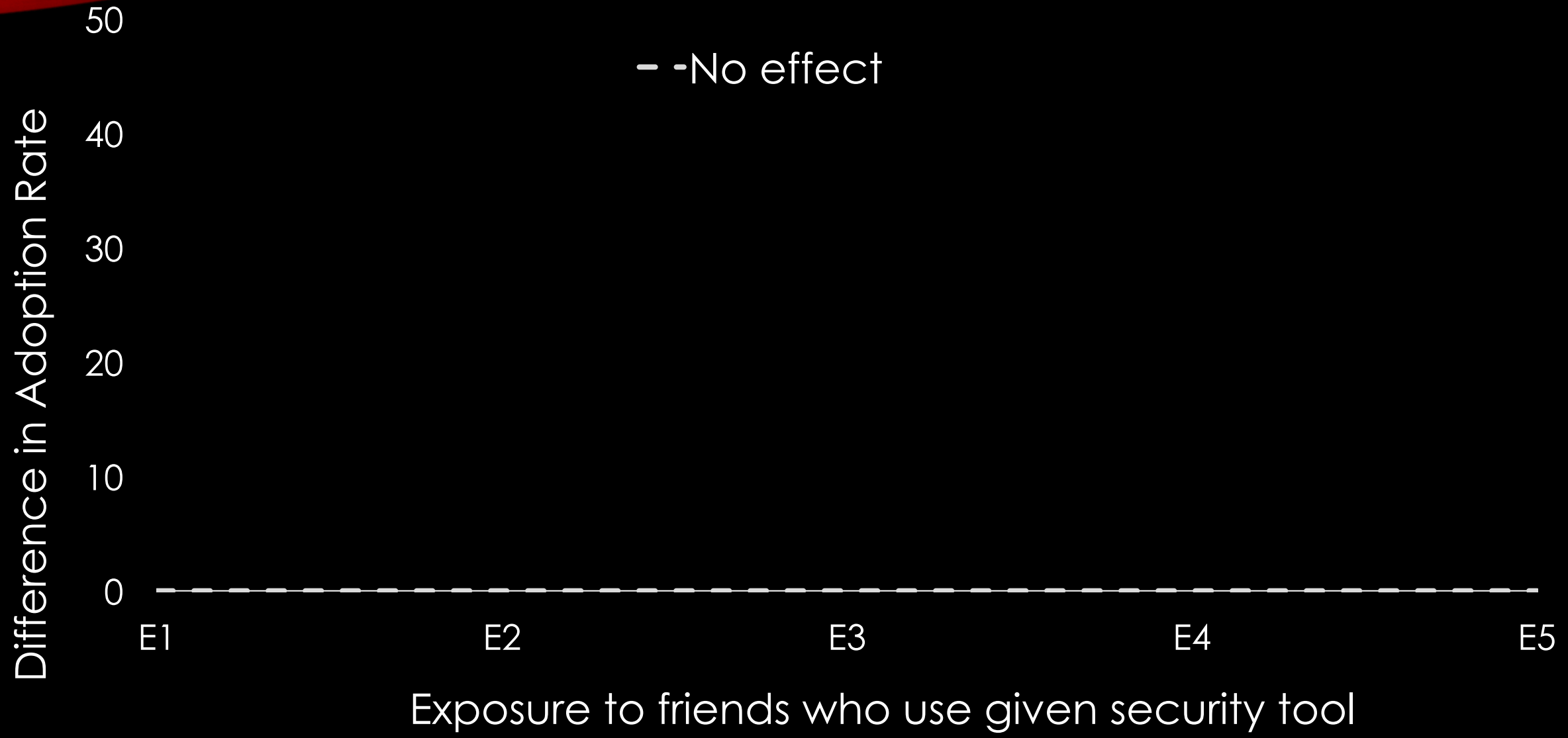
For a given security tool, empirically select exposure levels to friends who use that tool.

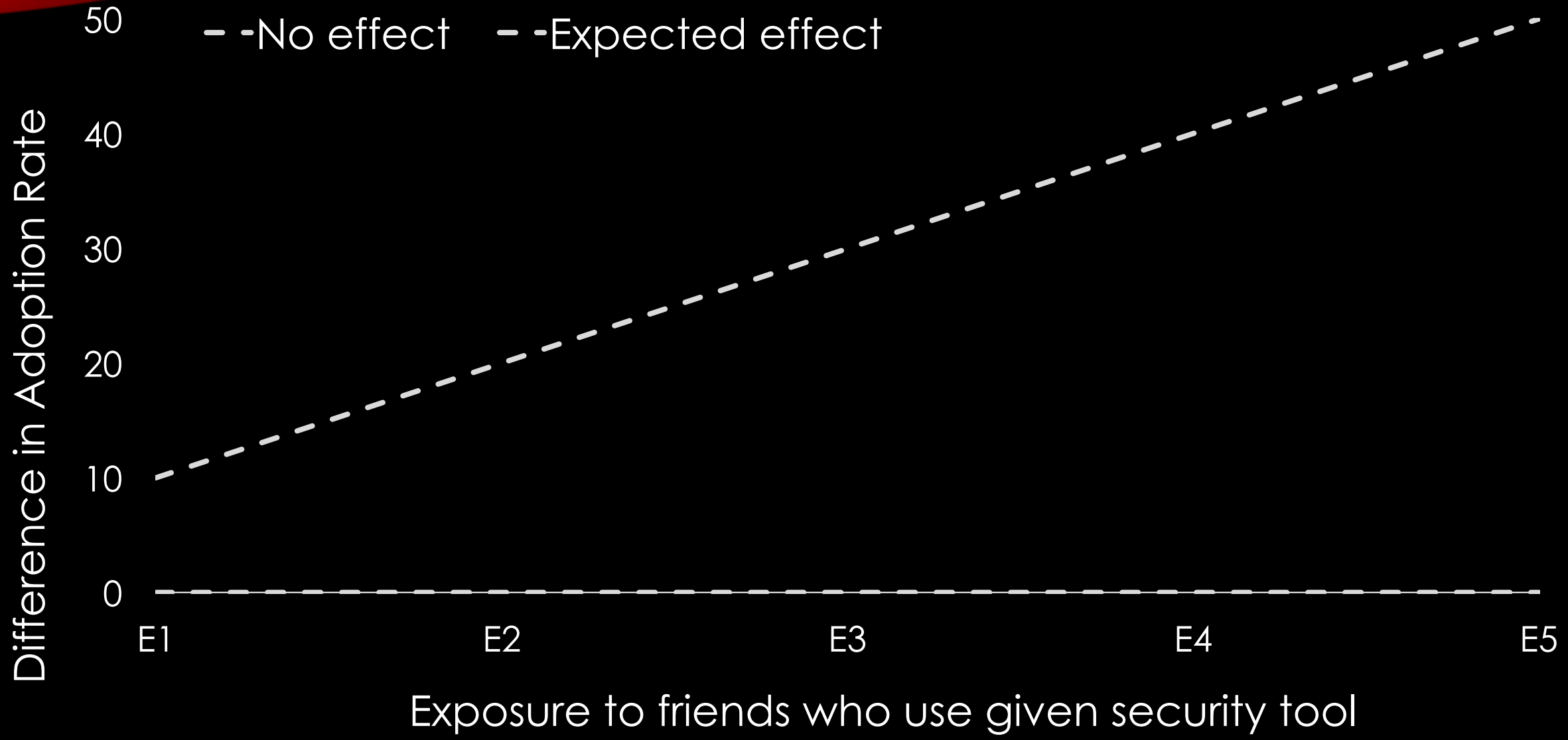
e.g., 1%, 5%, 10%...

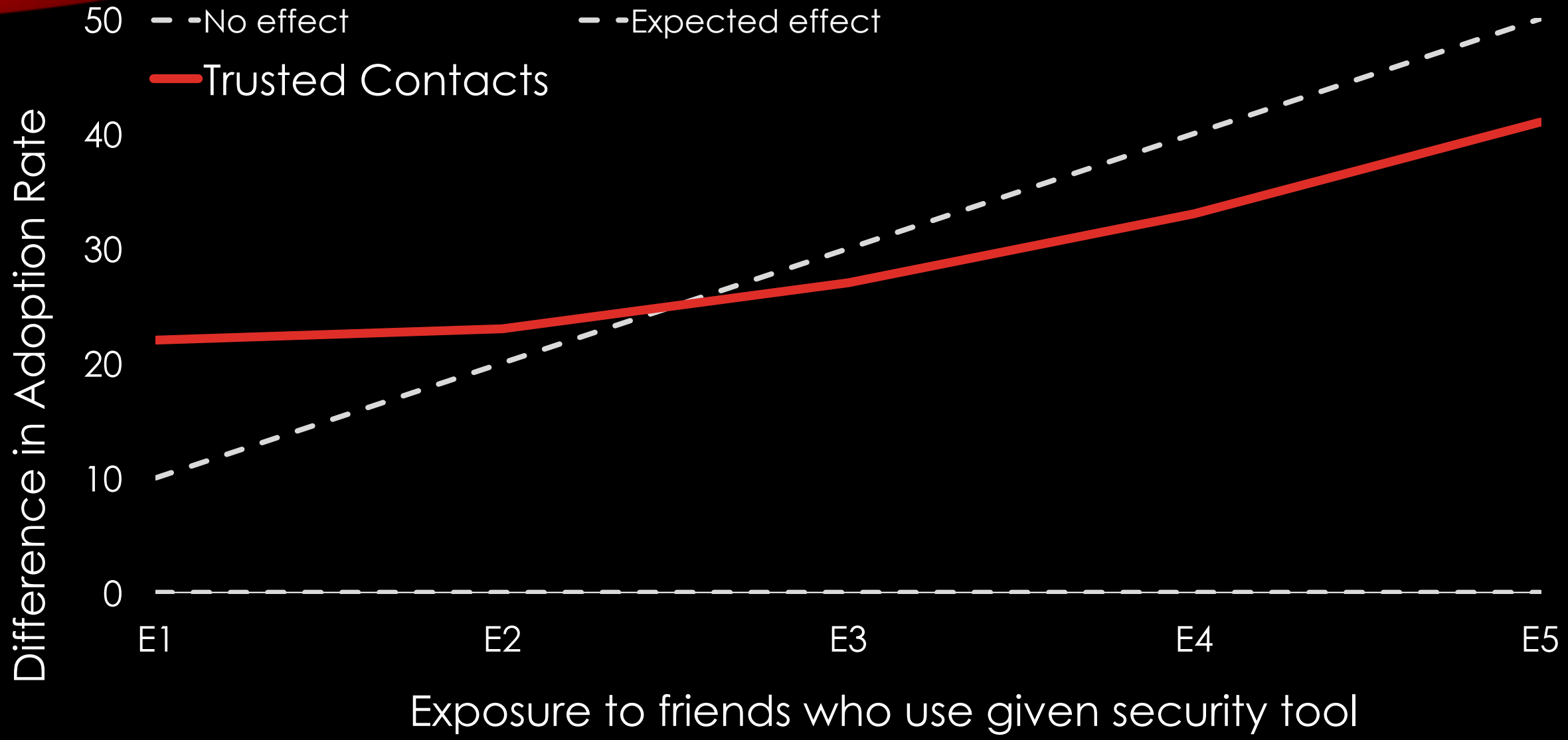
For each exposure level, compare adoption rate of those who are exposed versus those who are not. This is the effect of social influence.

Aral, S, Muchnik, L., and Sundarajan, A. Distinguishing influence-based contagion from homophily-driven diffusion in dynamic networks. PNAS 106 (51). 2009.


50
40
30
20
10
0
Difference in Adoption Rate
E1
E2
E3
E4
E5
Exposure to friends who use given security tool


50
40
30
20
10
0
Difference in Adoption Rate
No effect
E1
E2
E3
E4
E5
Exposure to friends who use given security tool


No effect
Expected effect
50
40
30
20
10
0
Difference in Adoption Rate
E1
E2
E3
E4
E5
Exposure to friends who use given security tool


No effect
Expected effect
Trusted Contacts
50
40
30
20
10
0
Difference in Adoption Rate
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E2
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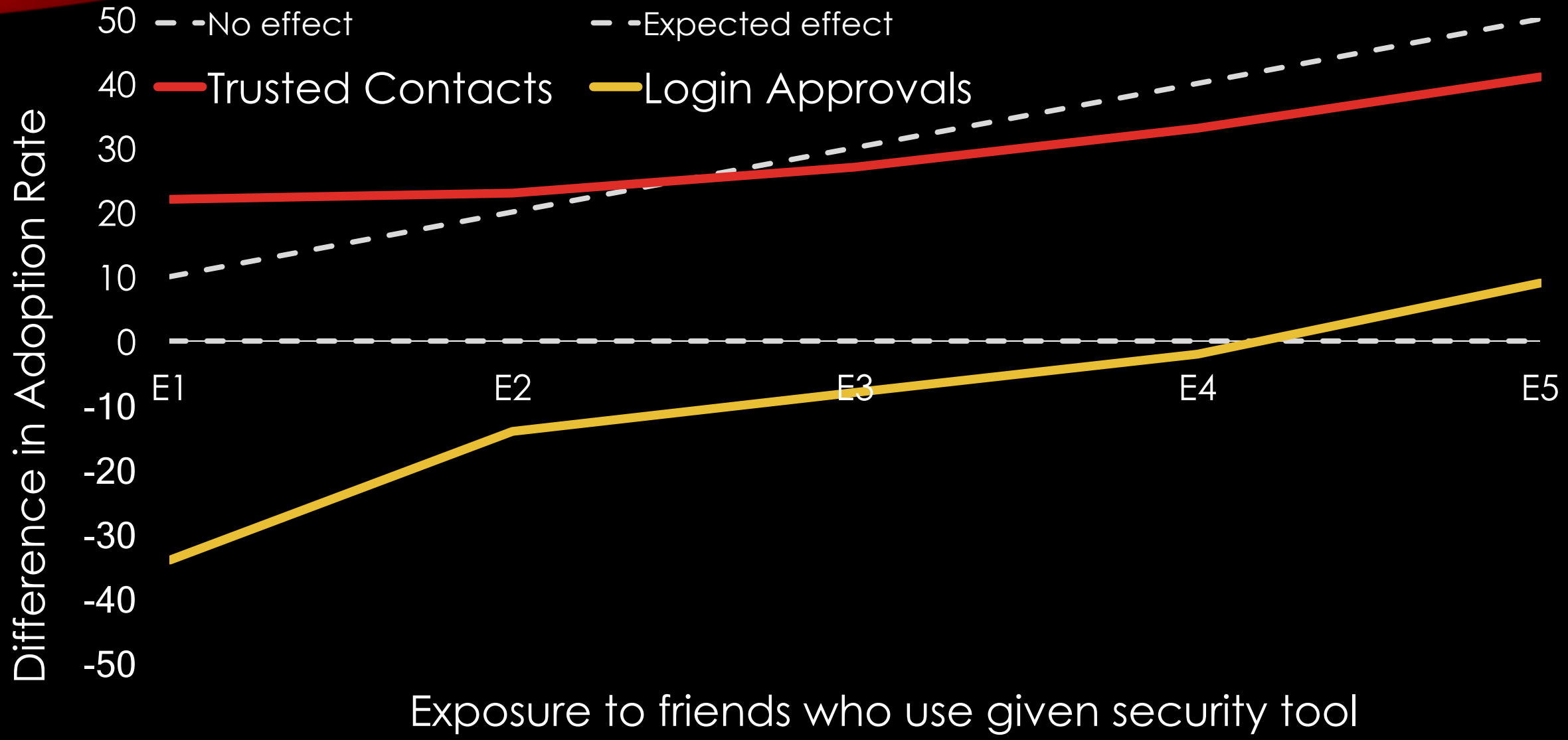
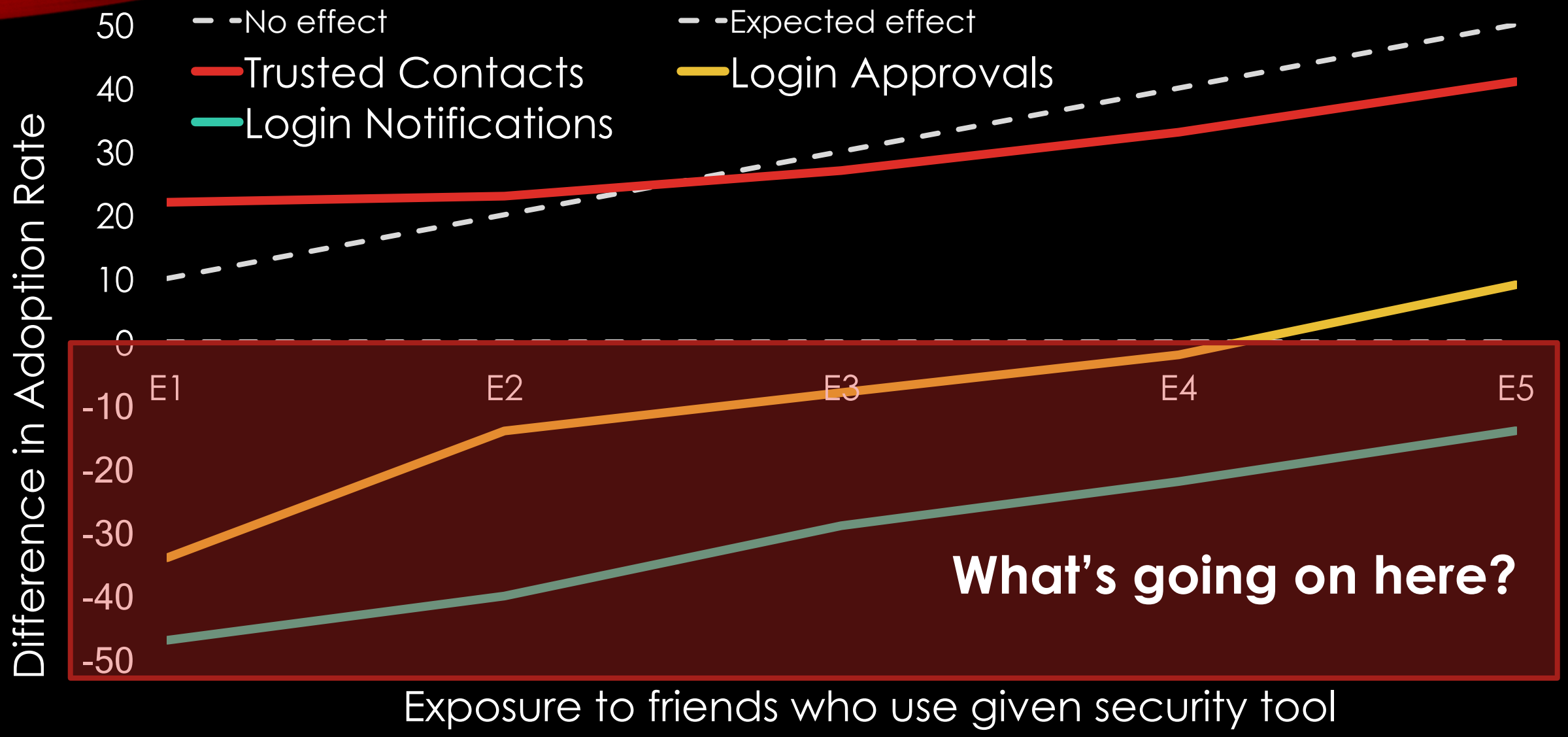
Exposure to friends who use given security tool

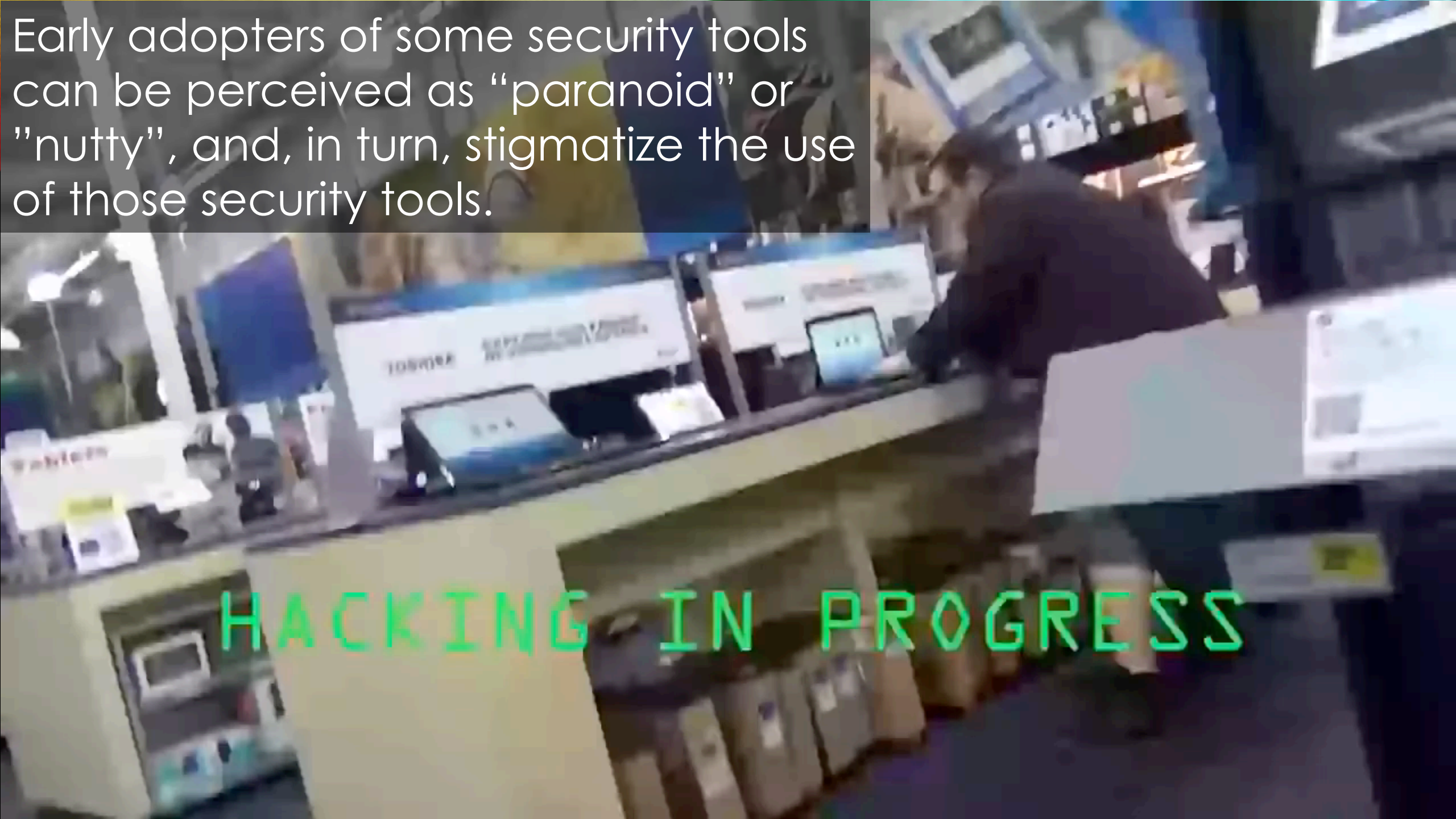

No effect
Expected effect
Trusted Contacts
Login Approvals
50
40
30
20
10
0
-10
-20
-30
-40
-50
E1
E2
E3
E4
E5
Difference in Adoption Rate
Exposure to friends who use given security tool


No effect
Expected effect
Trusted Contacts
Login Approvals
Login Notifications
50
40
30
20
10
0
-10
-20
-30
-40
-50
E1
E2
E3
E4
E5
Difference in Adoption Rate
Exposure to friends who use given security tool
What's going on here?

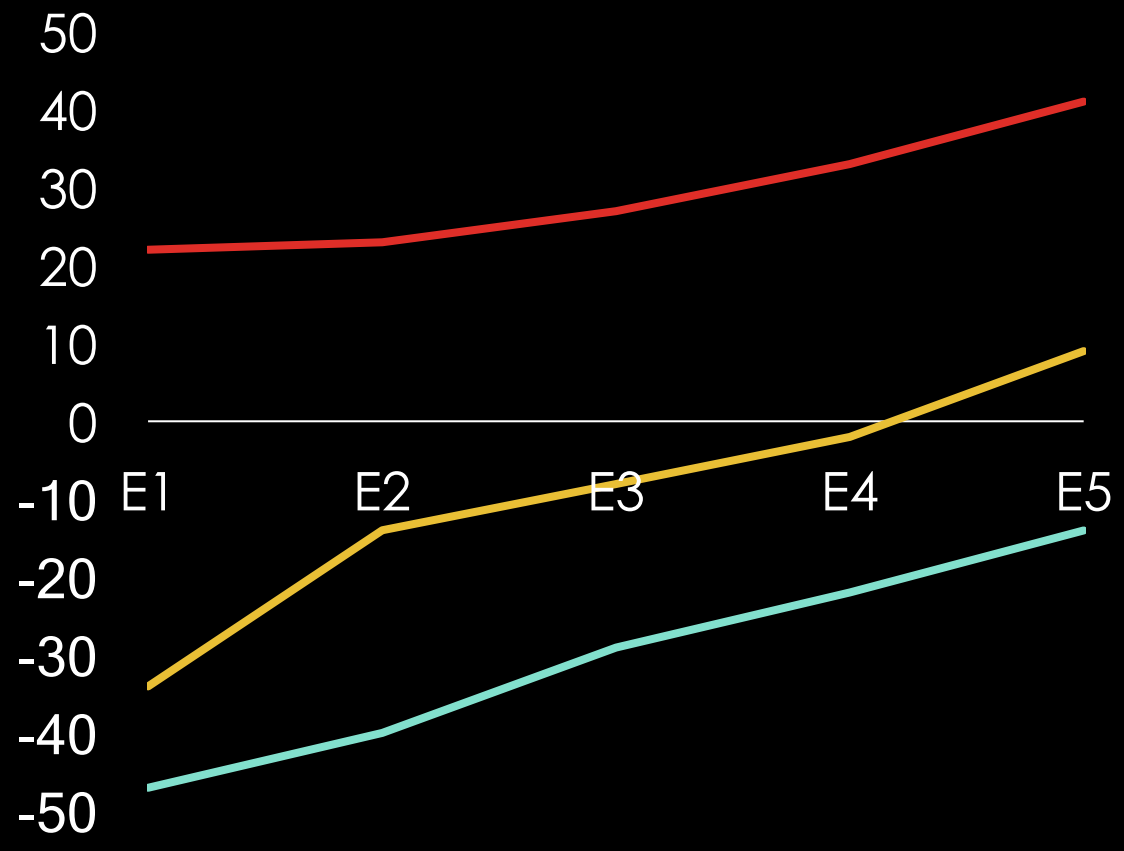
DISAFFILIATION

e.g., teenagers who dislike facebook because parents now use it

Early adopters of some security tools can be perceived as “paranoid” or ”nutty”, and, in turn, stigmatize the use of those security tools.

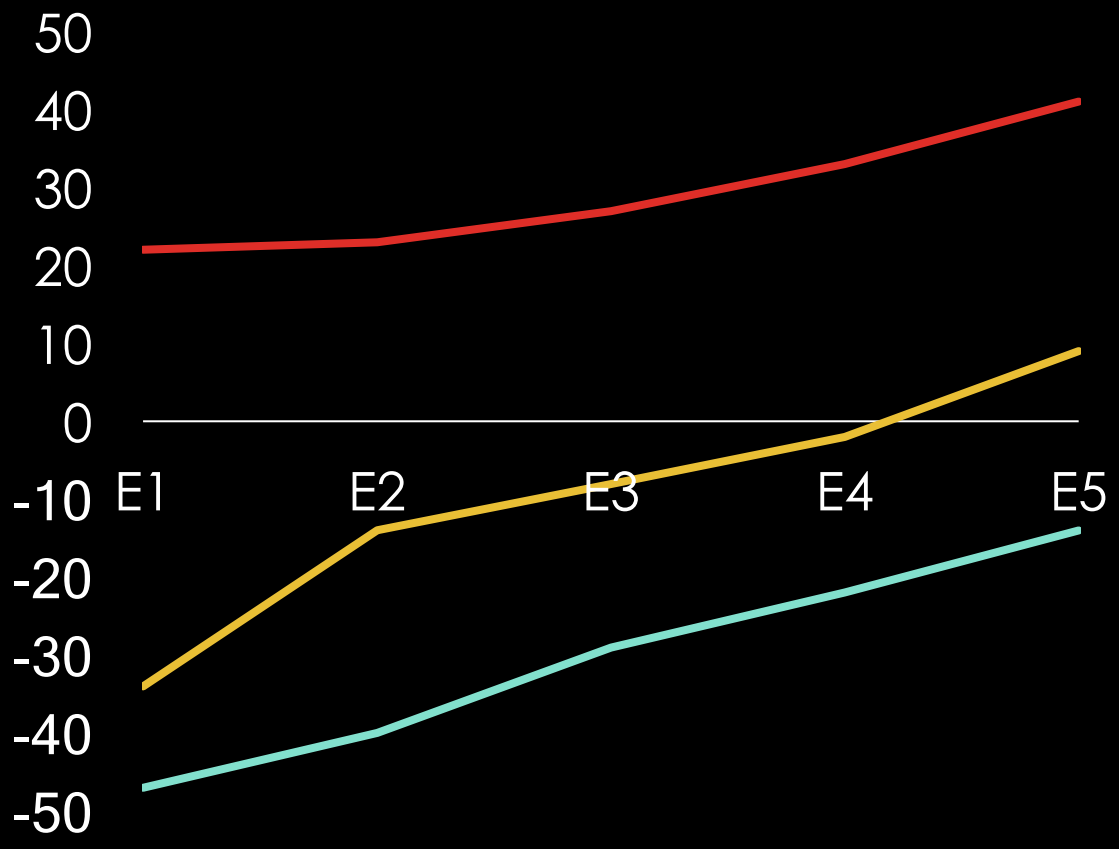


GOOD NEWS



All effects go up and to the right.
More exposure is good!

GOOD NEWS



The design of a security tool affects its potential for social spread.

Observability

Cooperation

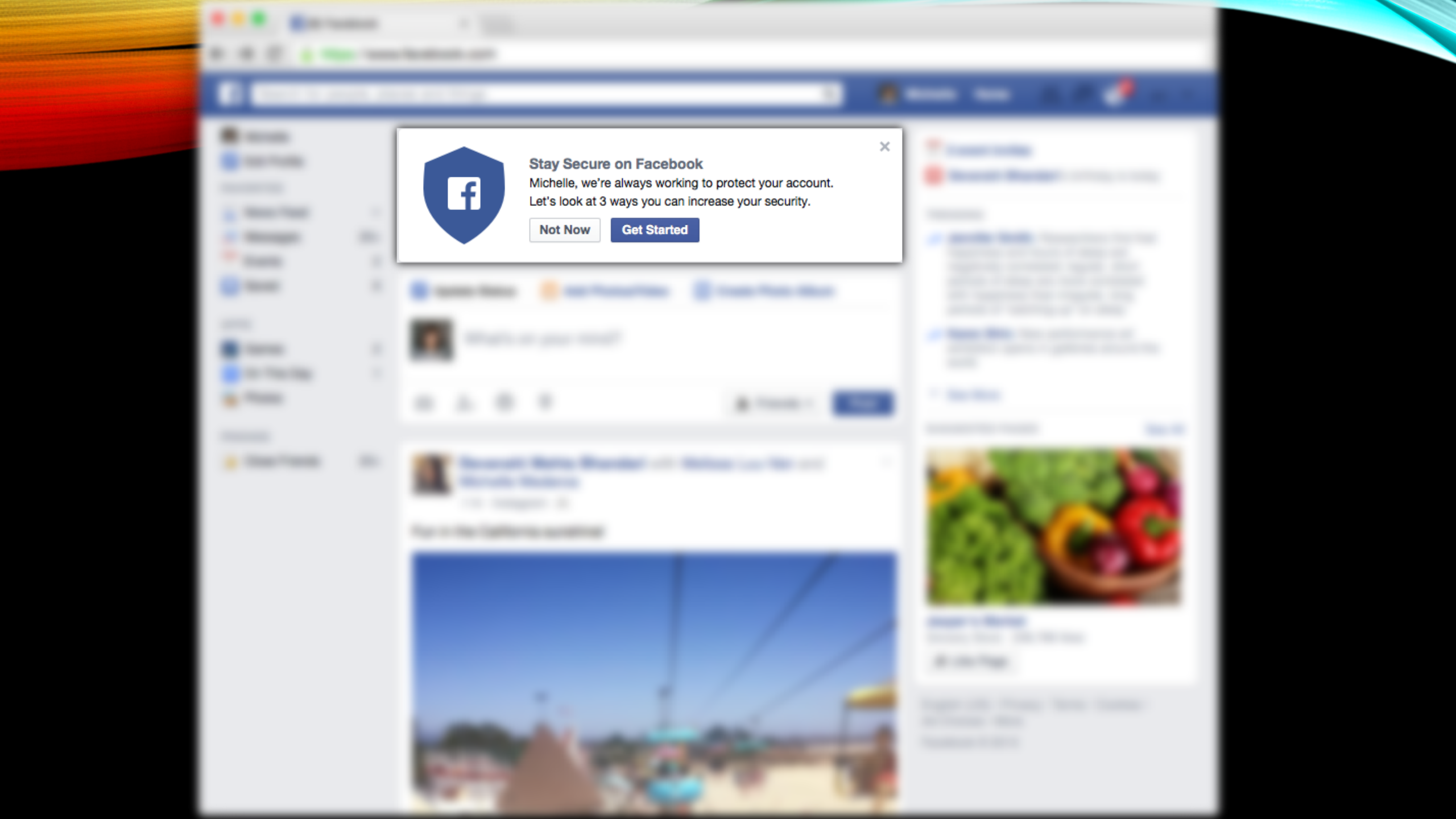
Stewardship

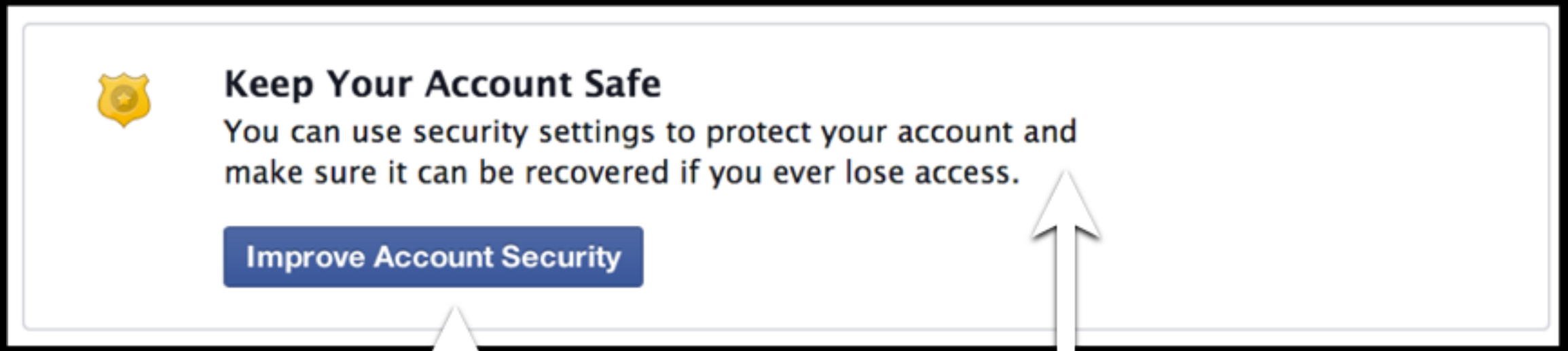
Social influence strongly affects security behaviors, and this effect is contingent upon the design of a security tool affects its potential for social spread.

IMPROVING SECURITY BEHAVIORS WITH SOCIAL INFLUENCE

Das, S., Kramer, A., Dabbish, L., and Hong, Jason I. Increasing Security Sensitivity With Social Proof: A Large-Scale Experimental Confirmation. Proc. *CCS'14*.

Randomized experiment with 50,000 Facebook users.


Stay Secure on Facebook
Michelle, we're always working to protect your account.
Let's look at 3 ways you can increase your security.
Not Now
Get Started

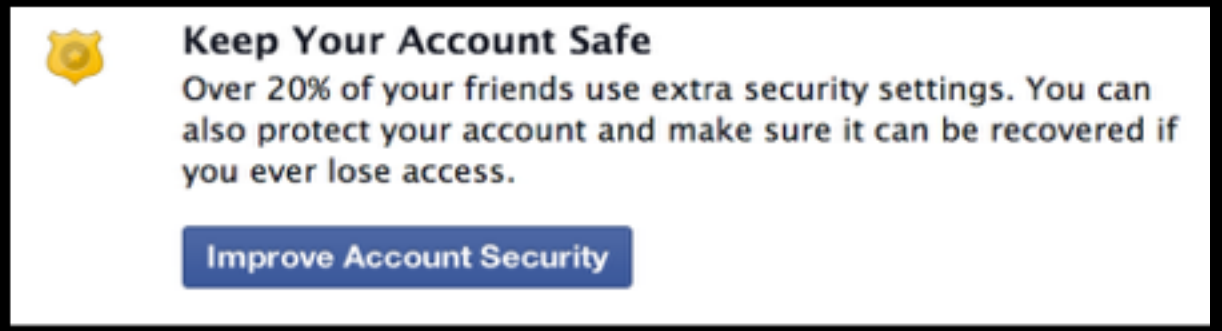


Announcement text

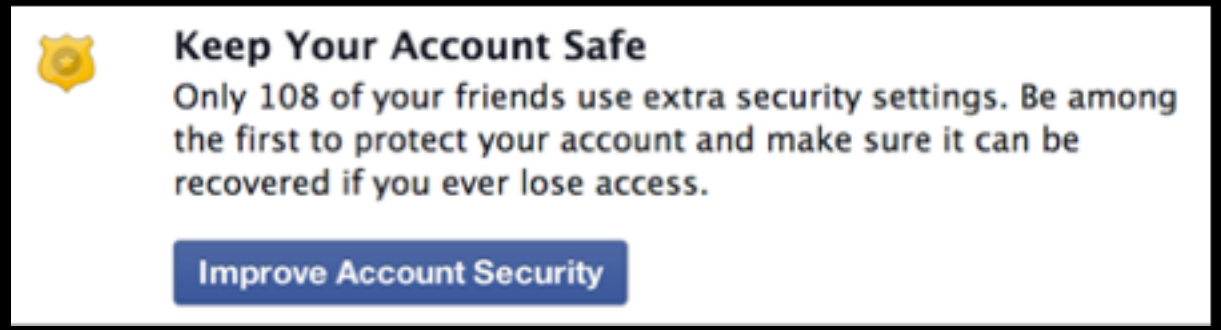
Call-to-action button

Raw (#/%)

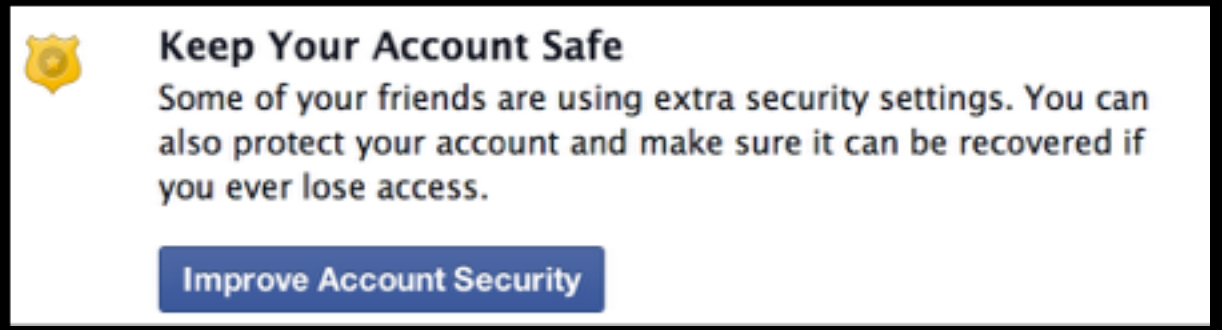
Over (#/%)



Only (#/%)



Some



8 conditions: 7 social + 1 non-social control

6250 randomly assigned participants per condition

Experiment ran for 3 days

MEASURES

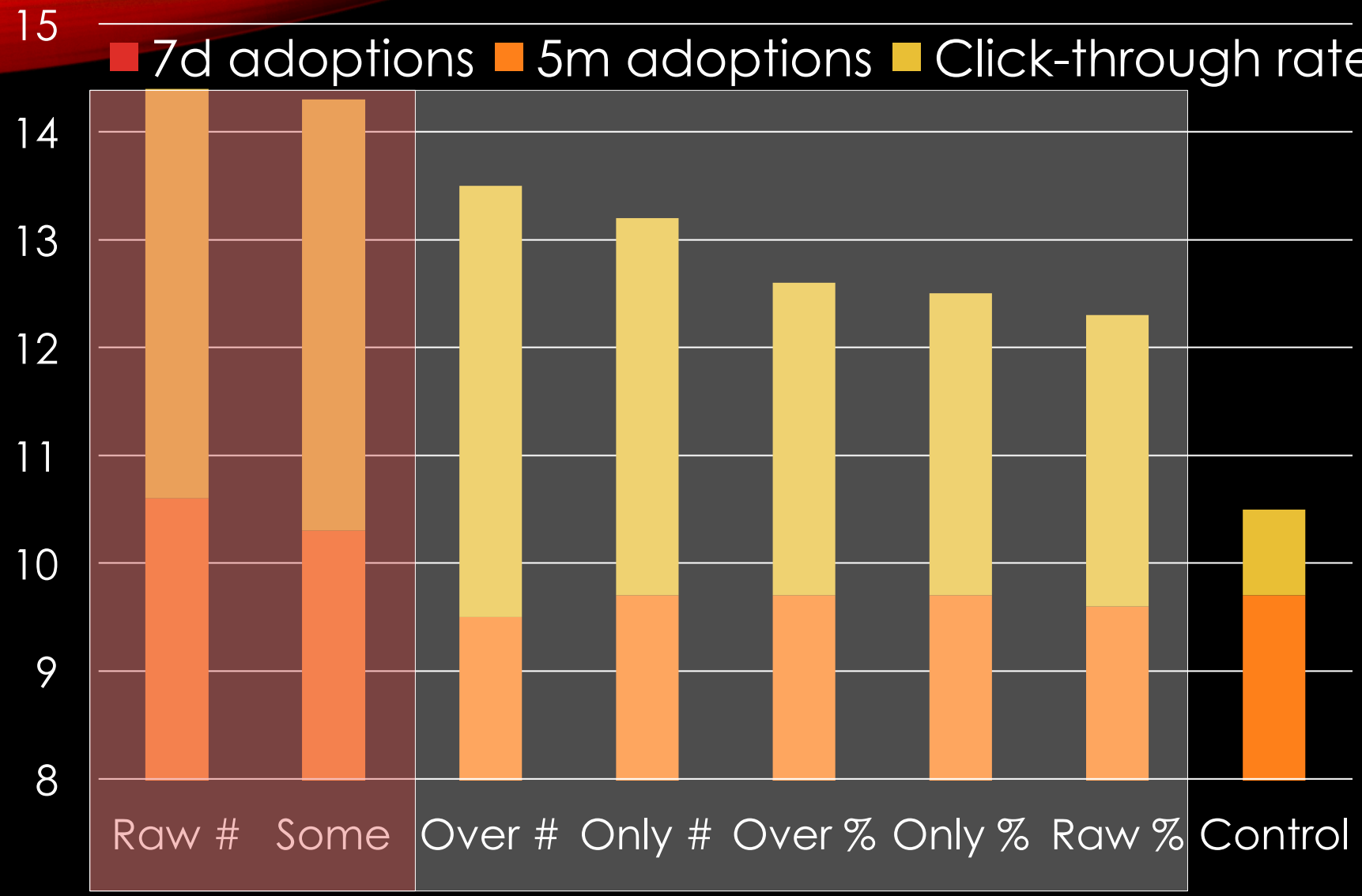
CTR
(click through rate)

7d
adoptions

5mo
adoptions

DESCRIPTIVE STATS

46,235 (93%)	logged in and saw announcement
5,971 (13%)	clicked on an announcement
1,873 (4%)	adopted one of the promoted tools within 7 days
4,555 (10%)	adopted one of the promoted tools within 5 months



Raw # vs Control

1.36x improvement in CTR

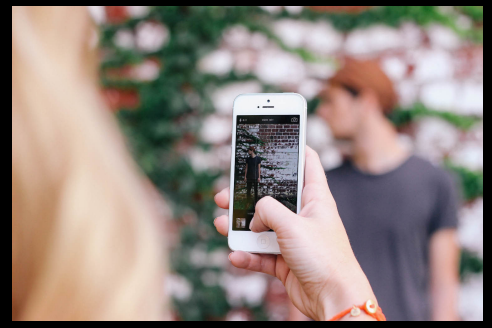
1.10x improvement in adoptions

Social influence strongly affects security behaviors, and this effect is contingent upon the design of a security tool affects its potential for social spread.

Making cybersecurity systems more social can encourage better security behaviors.

How can we design systems that encourage better cybersecurity behaviors?

There is a fruitful but largely untapped opportunity to improve cybersecurity behaviors by making social systems that are more:



Observable

Cooperative

Stewarded

OBSERVABLE

How can we make it easier for people to observe and emulate good security behaviors?


COOPERATIVE
How can we design additive security systems that make group security a sum instead of a min function?


STEWARDED
How can we design systems that allow people to act on their concern for the security of their loved ones?

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