Influence of the environment on password choice

➢ **Country** *(Grobler et al., 2020)*

➢ **Level of literacy in their country** *(Bergeron, 2022)*

➢ **Data breaches exposure** *(Bergeron, 2022)*

➢ **Sexe** *(Juozapavičius et al., 2022)*

➢ **Age** *(Juozapavičius et al., 2022)*

➢ **Religion** *(He et al., 2021)*

➢ **Web services** *(Wei et al., 2018)*

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Objective

➢ Observe if the criminal nature of a network influences password characteristics and strength

Hypotheses

➢ Characteristics of the passwords of both networks will be different from one another

➢ Criminal network of online offenders will be more likely to choose stronger password than a non-offenders' network

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Method

➢Open-source data
- *Leaked databases found online*
- *Databases were illegally hacked by individuals and put online*

What is a hash?

Objective: attributing unique value

Irreversible

Example:

andrea = 1c42f9c1ca2f65441465b43cd9339d6c

Andrea = 28f719c89ef7f33ce2e178490676b5ab

Hashed passwords
9c898fc91987d3a07e92efdb22f0a533:2fnKDAsf
b2bd18b0081c0ddfb4abd5996ac62916:OE2SuGcP
1d61f91492b6c2144adf33bbad7c9918:7FcslRvM
fae2dff15bd864fdf13a9f71dddd35d4:PTYPYK6M
207ea21eaa47b28728bc298a786fb101:JoRrEUV7
d9bf6bb63cdc61ead6e288557973bc54:aCy54uQC

Tables to compare hash values

Popular passwords

Dictionnary words

Names

Word in clear text	Hash value
123456	e10adc3949ba59abbe56e057f20883e
123456789	25f9e794323b453885f5181f16624d0b
Password	5f4dcc3b5aa765d61d8327deb882cf99
Adobe123	7558af202997483d3afef3bb265a709d
12345678	25d55ad283a400af464c76d713c07ad
Qwerty	d8578edf8458ce06fbc5bb76a585ca4
1234567	fcea920f7412b5da7be0cf42b8c93759
111111	96e79218965eb72c92a549dd5a330112
Photoshop	c7c9cfbb7ed7d1cebb7a4442de308776
123123	4297f44139552352452462497399d7a93

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Brute force attacks

Trying everything

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Time to crack a password according to its characteristics

Number of Characters	Numbers Only	Lowercase Letters	Upper and Lowercase Letters	Numbers, Upper and Lowercase Letters	Numbers, Upper and Lowercase Letters, Symbols
4	Instantly	Instantly	Instantly	Instantly	Instantly
5	Instantly	Instantly	Instantly	Instantly	Instantly
6	Instantly	Instantly	Instantly	1 sec	5 secs
7	Instantly	Instantly	25 secs	1 min	6 mins
8	Instantly	5 secs	22 mins	1 hour	8 hours
9	Instantly	2 mins	19 hours	3 days	3 weeks
10	Instantly	58 mins	1 month	7 months	5 years
11	2 secs	1 day	5 years	41 years	400 years
12	25 secs	3 weeks	300 years	2k years	34k years
13	4 mins	1 year	16k years	100k years	2m years
14	41 mins	51 years	800k years	9m years	200m years
15	6 hours	1k years	43m years	600m years	15 bn years
16	2 days	34k years	2bn years	37bn years	1tn years
17	4 weeks	800k years	100bn years	2tn years	93tn years
18	9 months	23m years	6tn years	100 tn years	7qd years

HIVE SYSTEMS

-Data sourced from HowSecureismyPassword.net

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Characteristics of strong passwords

Length

Contains letter and number (not one or the other alone)

Contains symbols

Does not contain dictionary words

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Samples: two networks to compare

OGUsers
Offenders

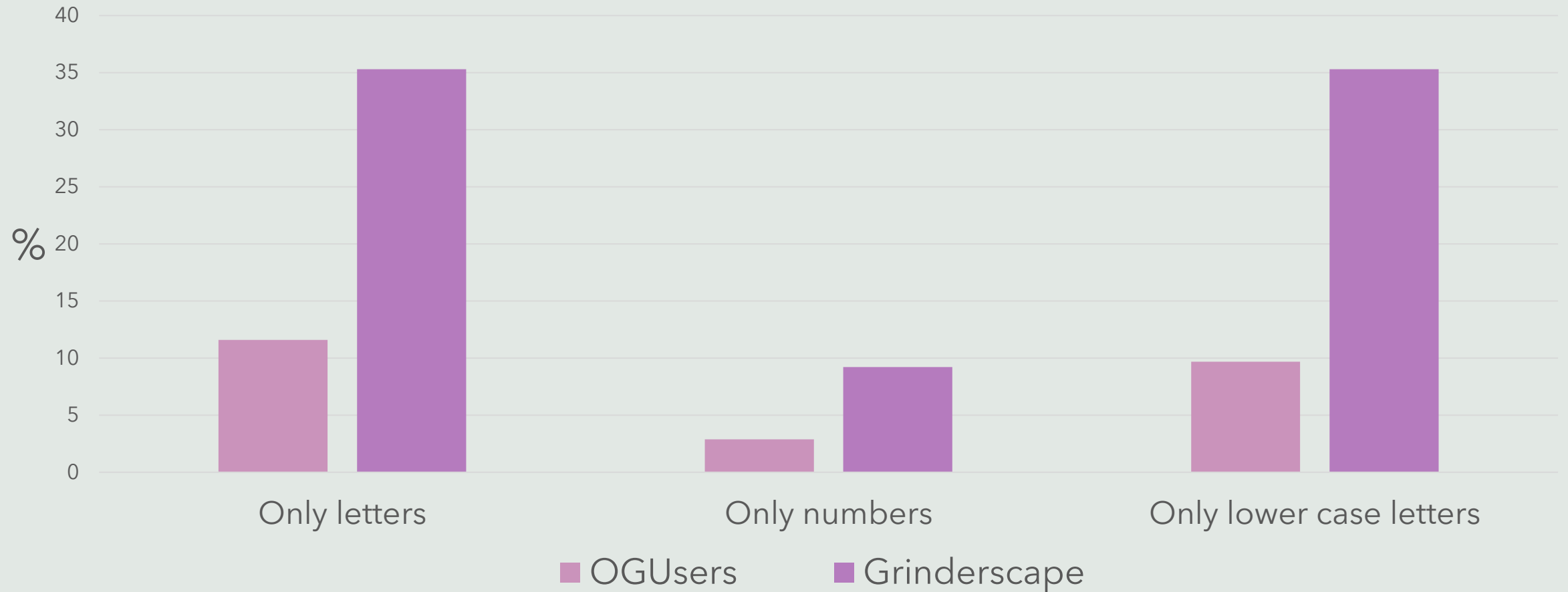125,560 passwords

GrinderScape
Non-offenders

1,358,535 passwords

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Offenders vs non-offenders network

Characteristics of stronger passwords
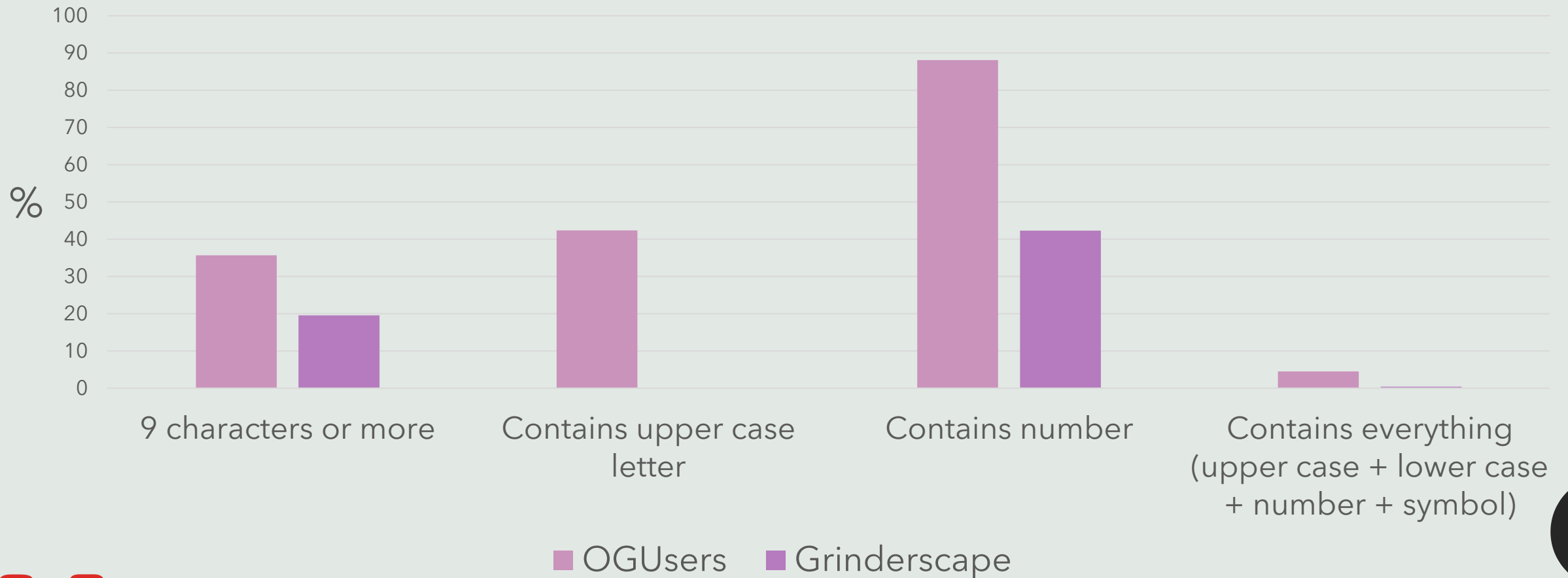
Legend: ▩ OGUsers ▩ Grinderscape

Categories: 9 characters or more | Contains upper case letter | Contains number | Contains everything (upper case + lower case + number + symbol)
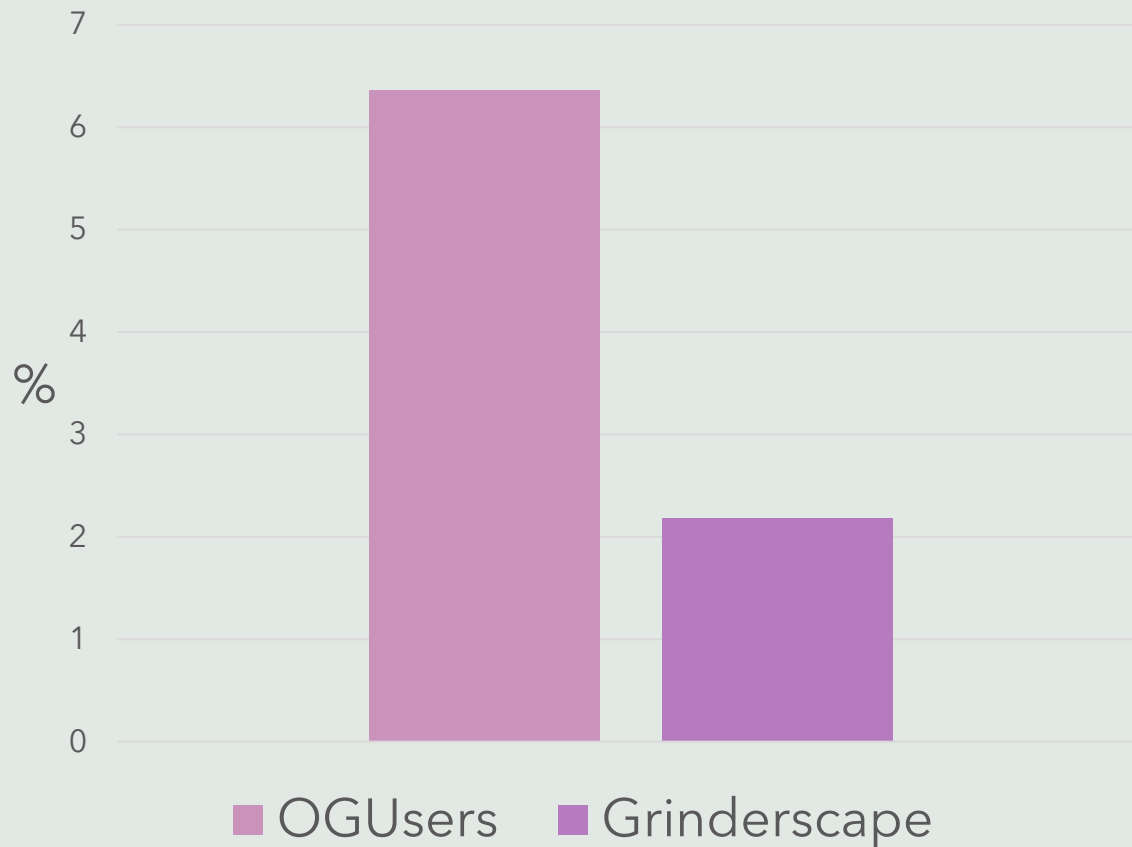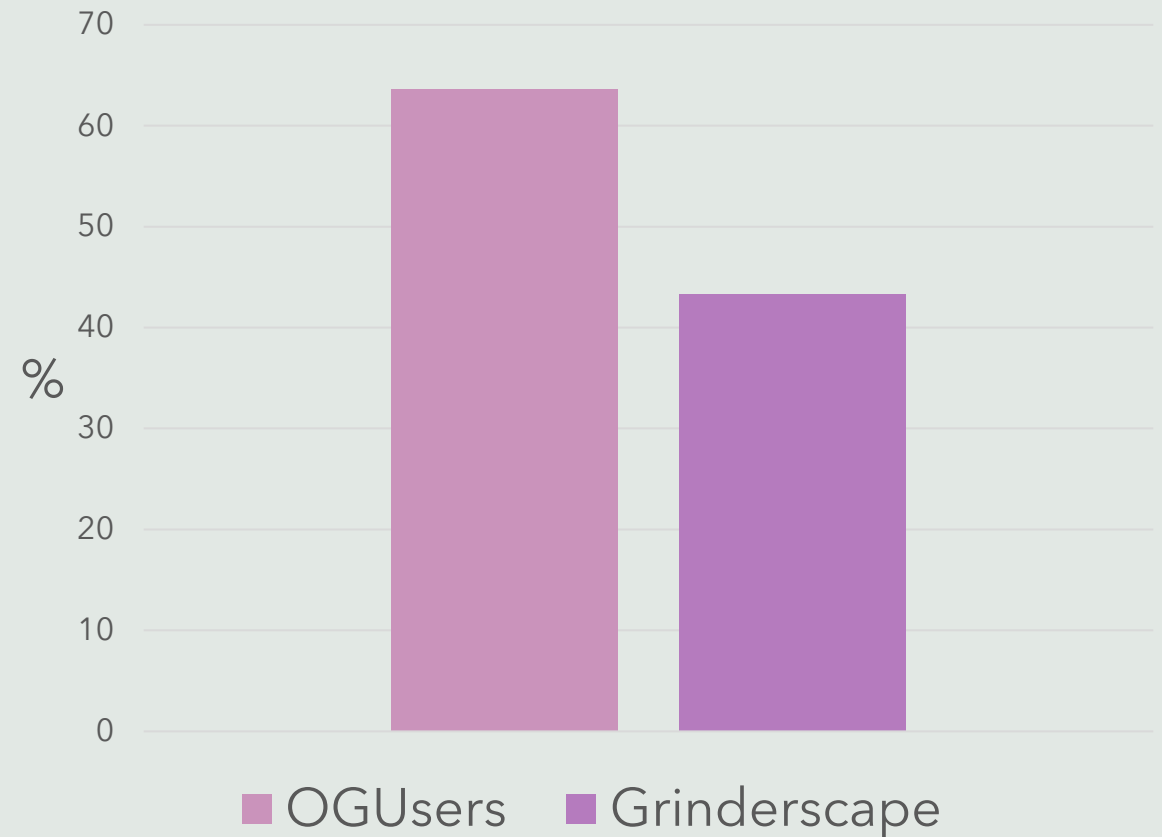
Analysis – Logistic regression

|	
COMPARISON BETWEEN OFFENDERS AND NON-OFFENDERS' PASSWORDS CHARACTERISTICS	
Length of password	0.012411***
Password is only lowercase letters	-0.12354***
Password contains all the elements (letter, number, symbol)	0.294831***
Password is only numbers	-0.09376***
Password contains a dictionary word	0.033848***
Password contains a profanity word	0.110573***

N=1,484,095
***p<0.001

Comparison between offenders and non-offenders' passwords characteristics (Logistic Regression)
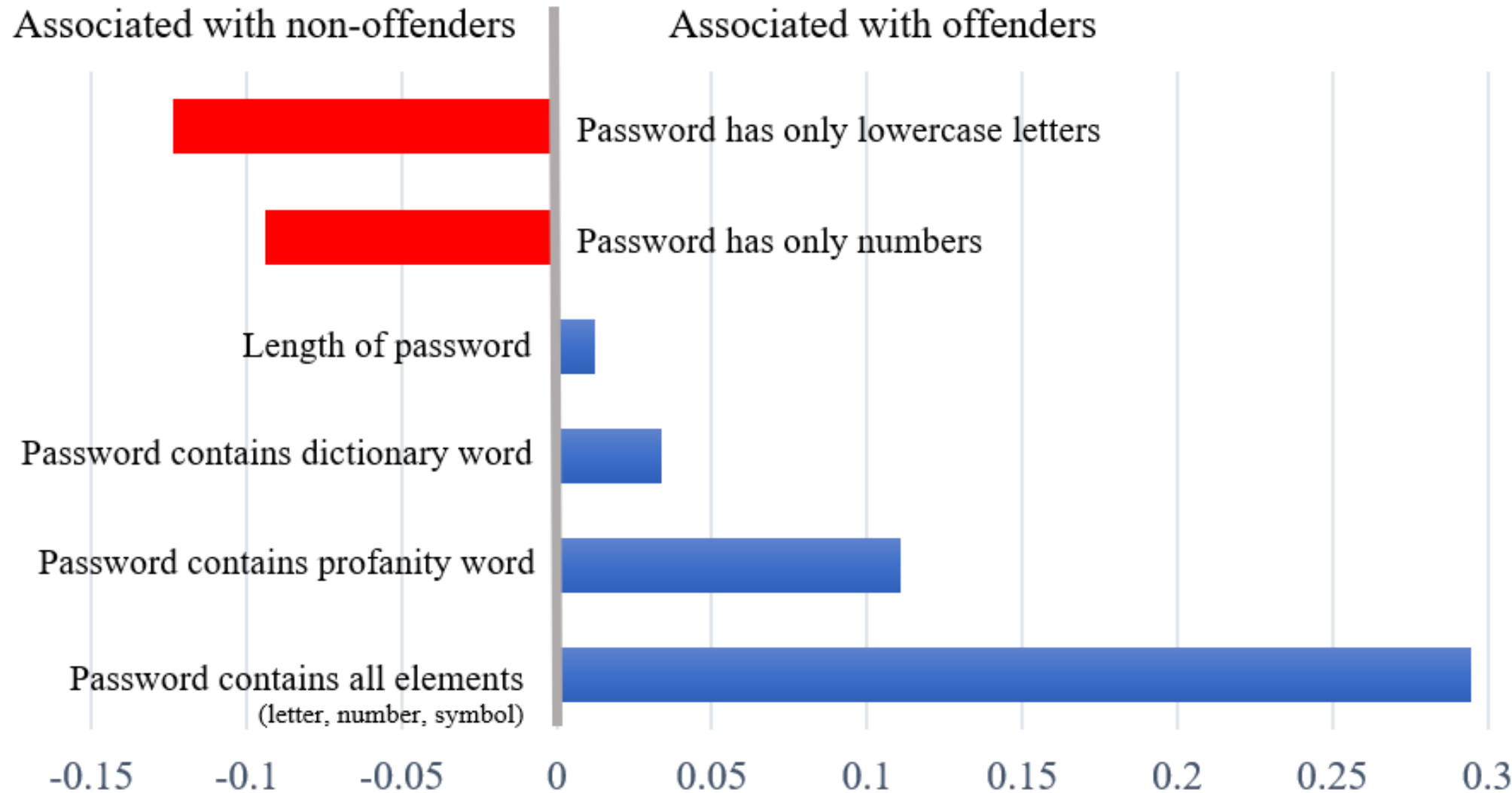
What does it mean?

Password choice is influenced by your network

Online offenders have stronger passwords

Practical implication : Identification of different networks in databreaches

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Questions?

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