Alex Lebedev
2022 – Hotjar

# Data mining:// from a bomb shelter

How to use data extraction and statistics to find the best time to work, sleep, and live during the war in Ukraine.

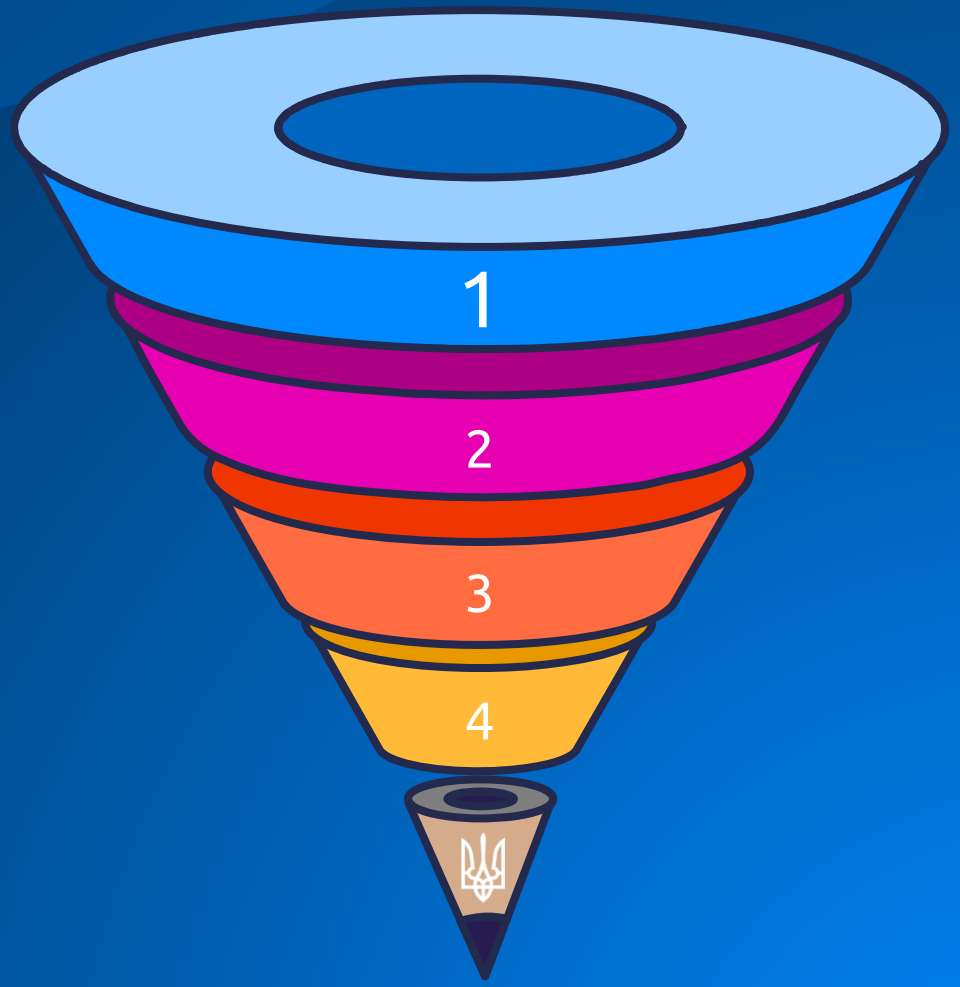
# What you could learn from this talk (if you don't know it yet)

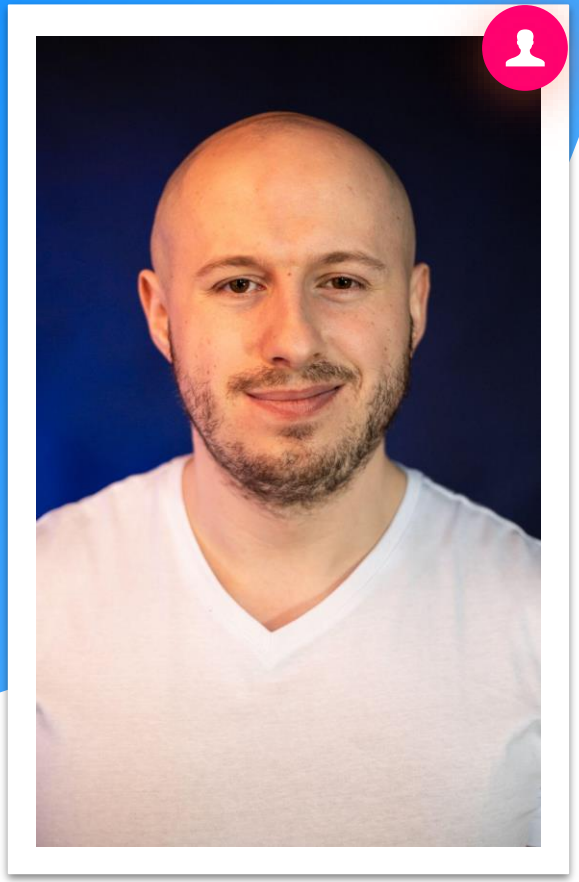
01. How to parse Telegram channels.

02. How to organize parsed messages into data.

03. How to get insights from this data.

04. What's happening in Ukraine in general.





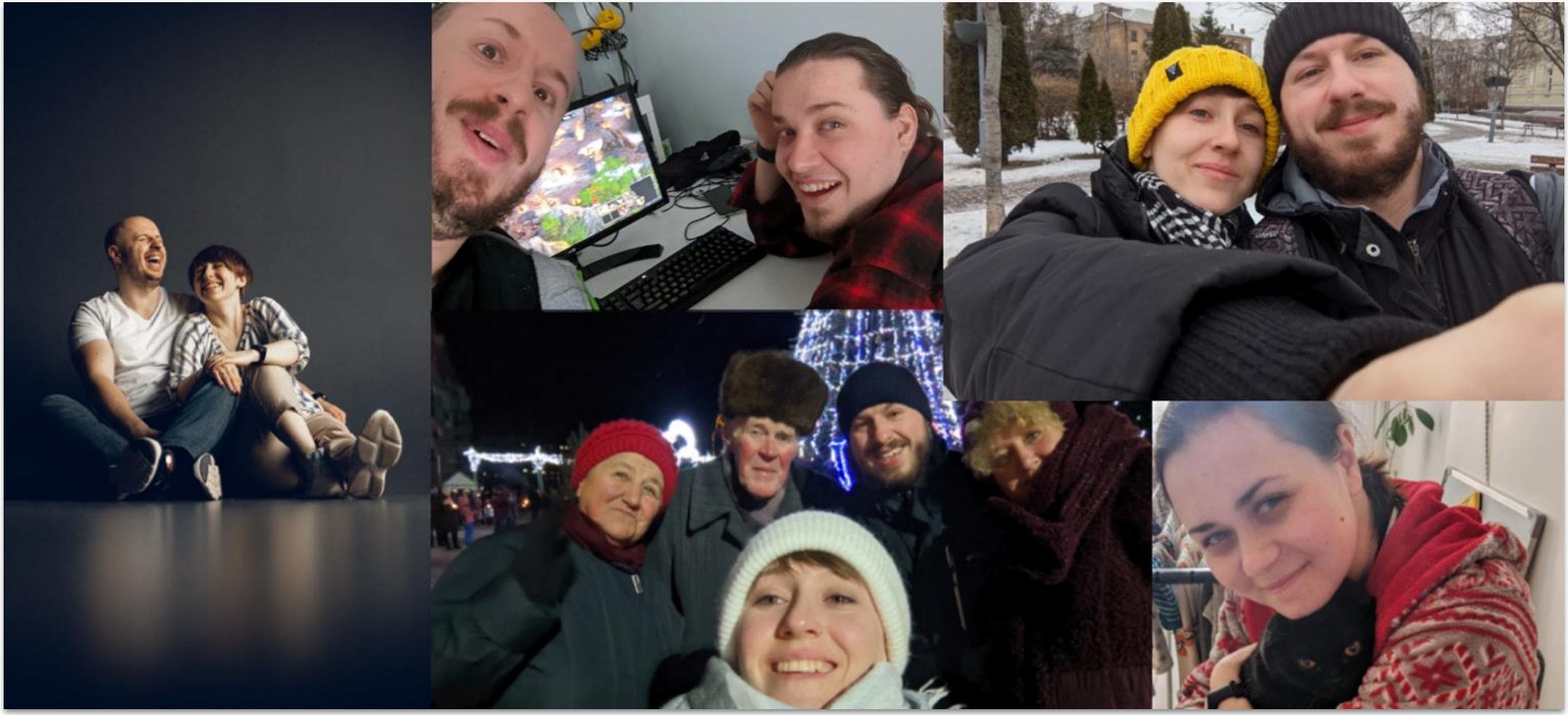
youtube.com/**AlexLebedev**

linkedin.com/in/**nightowlcoder**

# Hi, I'm Alex Lebedev

- Software Engineer in Hotjar.
- 7+ years as full-time programmer.
- 7+ years in Digital Marketing as Analyst/Manager.
- 7+ months of fundraising and volunteering in Ukraine.

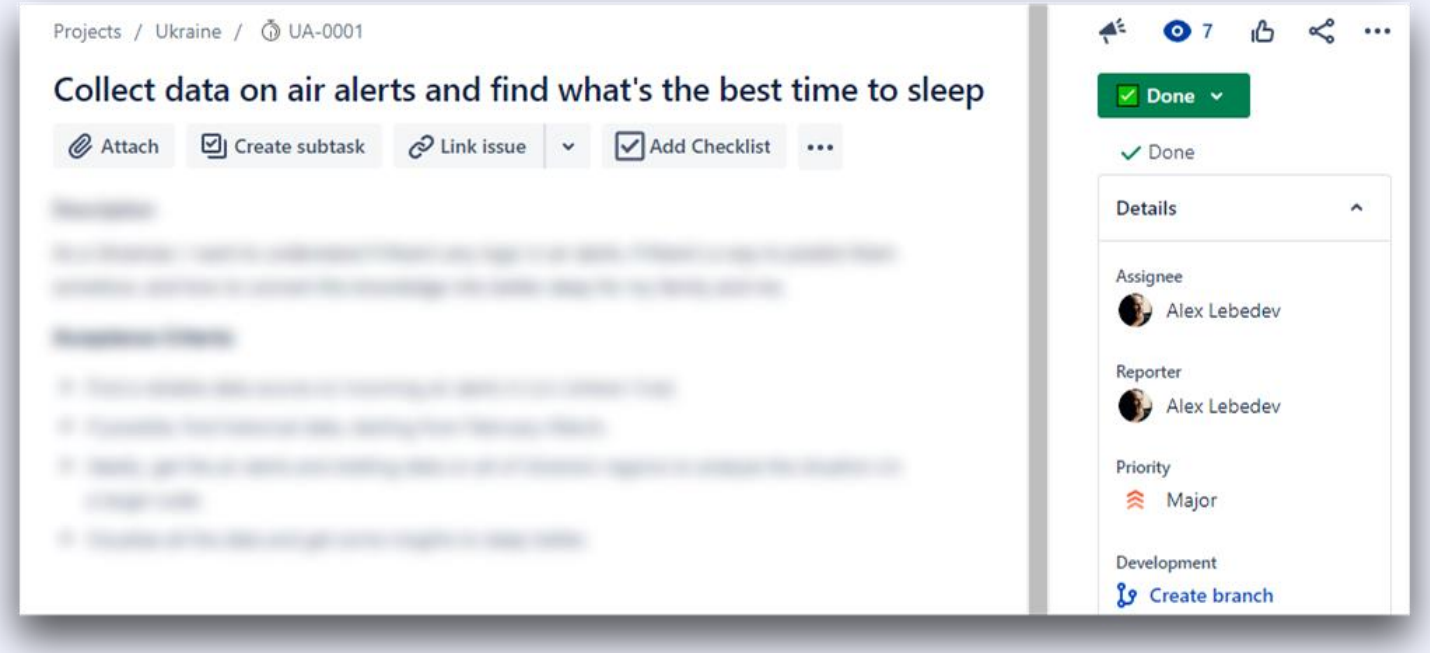
# Today, I will tell you how we went from this



# To this, in just a couple of days, and how it's going

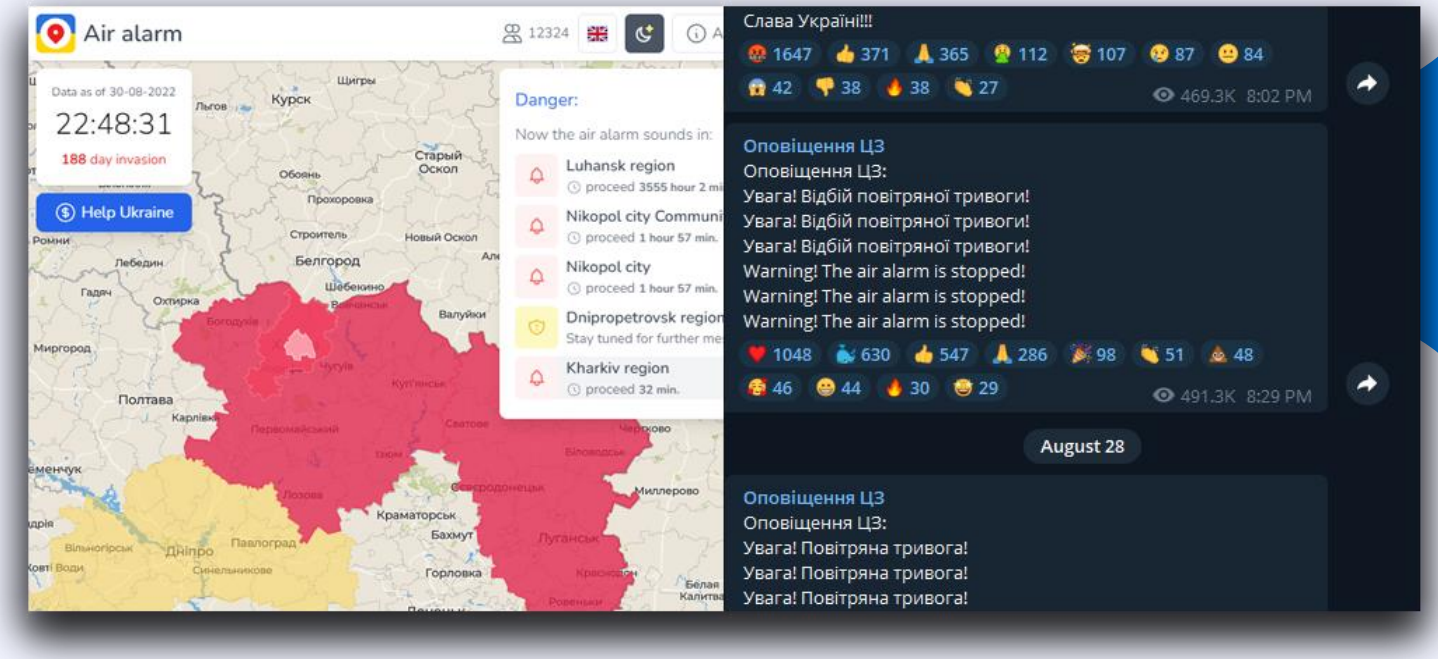
# **Step 1:** Calm down and define the task

1



# **Step 2:** Collect all the required data

2

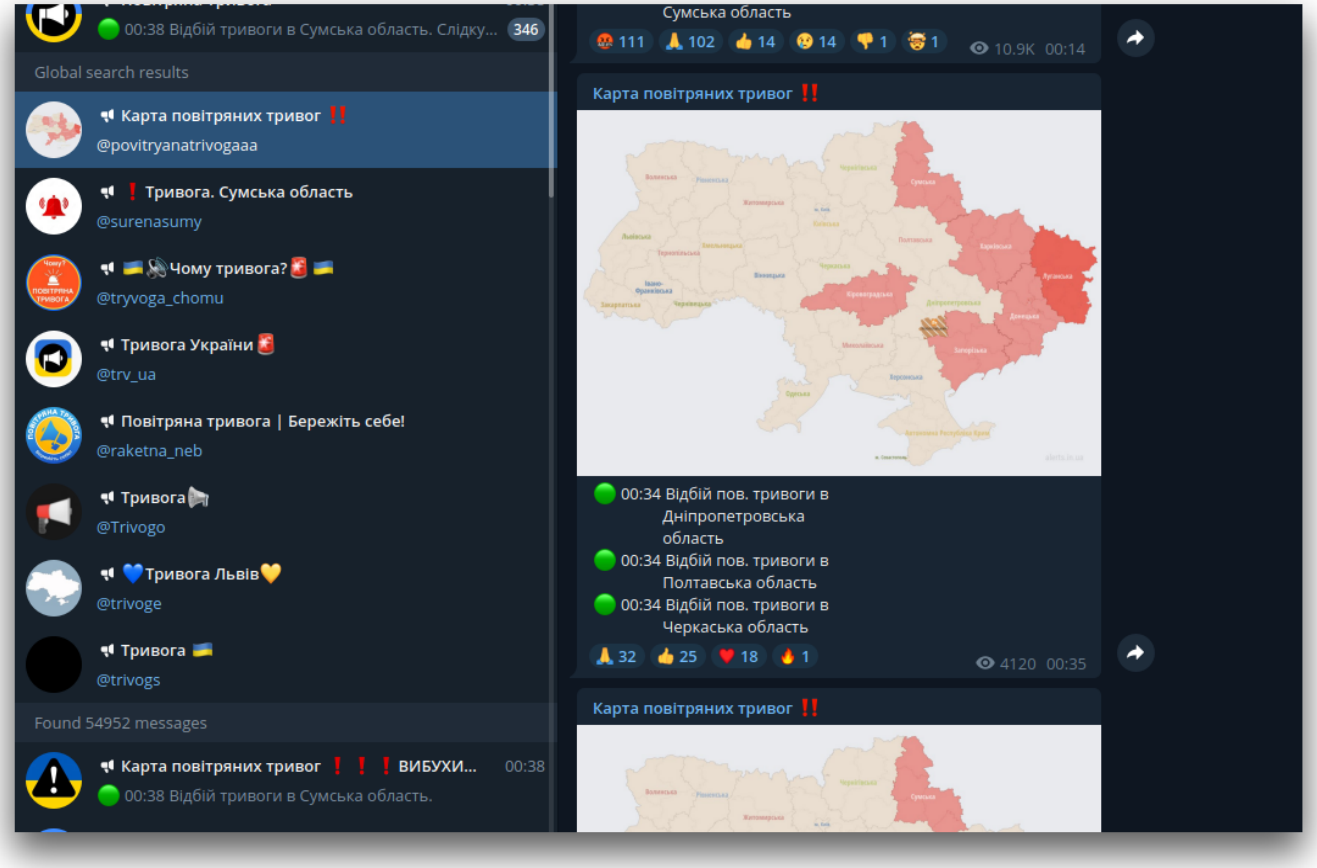


# **Step 3:** Visualize and analyze the data

#opensource
Want to get a closer look at the code?
https://github.com/sortafreel/dmbm

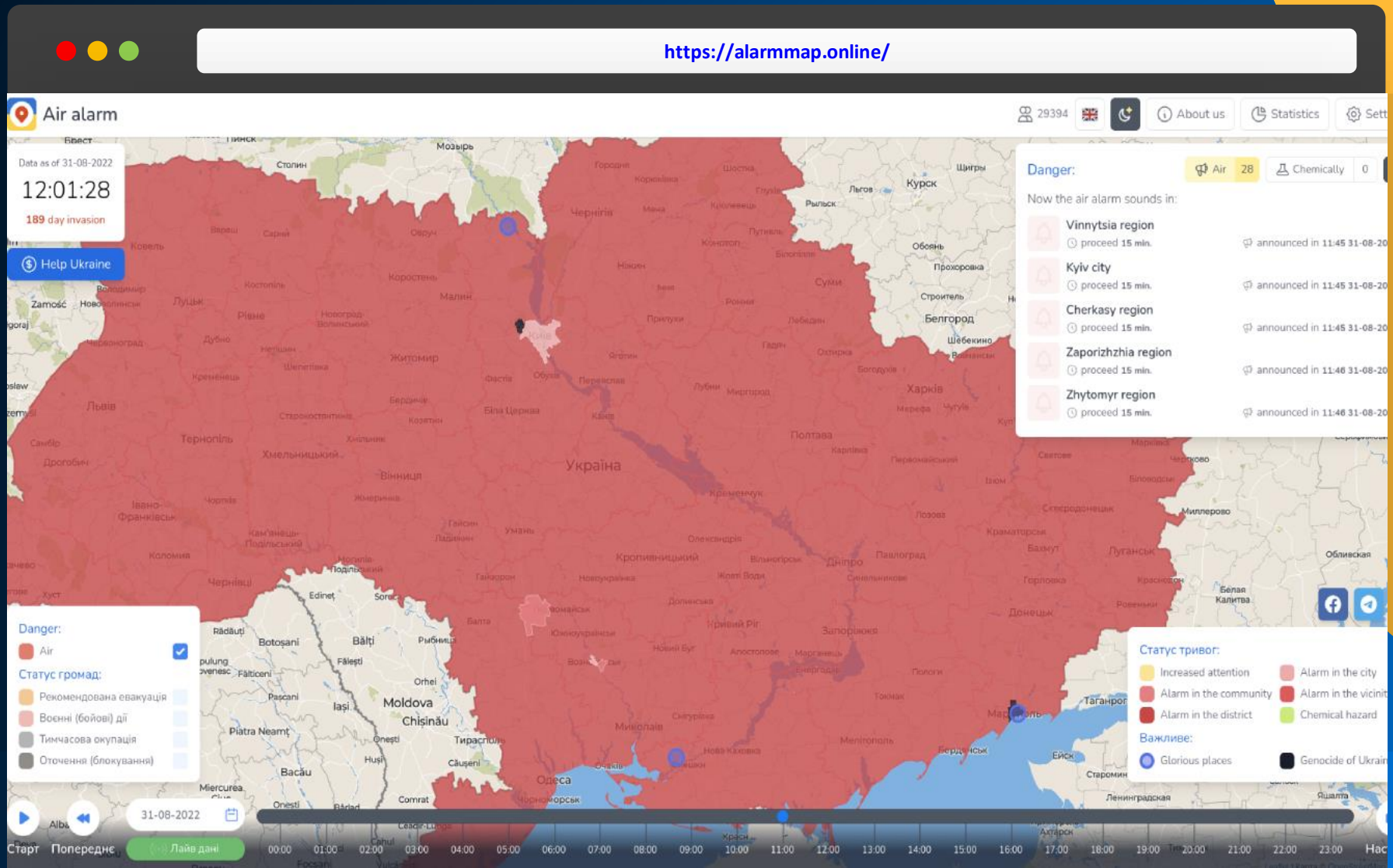
# How air alerts and shelling are announced?

- Most cities have **powerful sirens** installed.
- Towns have own **Telegram channels**.
- **Android/iOS apps** with loud notifications.
- **Alarm maps** that show alerts in real-time.



# Alarm maps

The fastest way to understand what's happening in Ukraine right now.



# Where all of them get the data?

## Ukrainian army

They monitor the rockets and bomb carrier plane launches.

- I'm not in the army, so I don't have access to the data.

## Reposting

Local Telegram channels repost from official apps.

- The way to go, historical data, but it could be a bit chaotic.

## API

Created after months, by the top home security company.

- The easiest way, but my access request was denied.

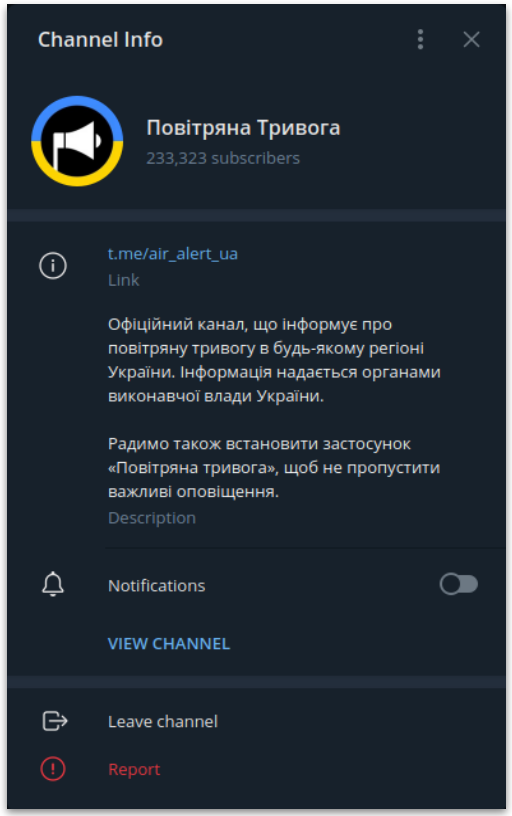
# Where I get the data?

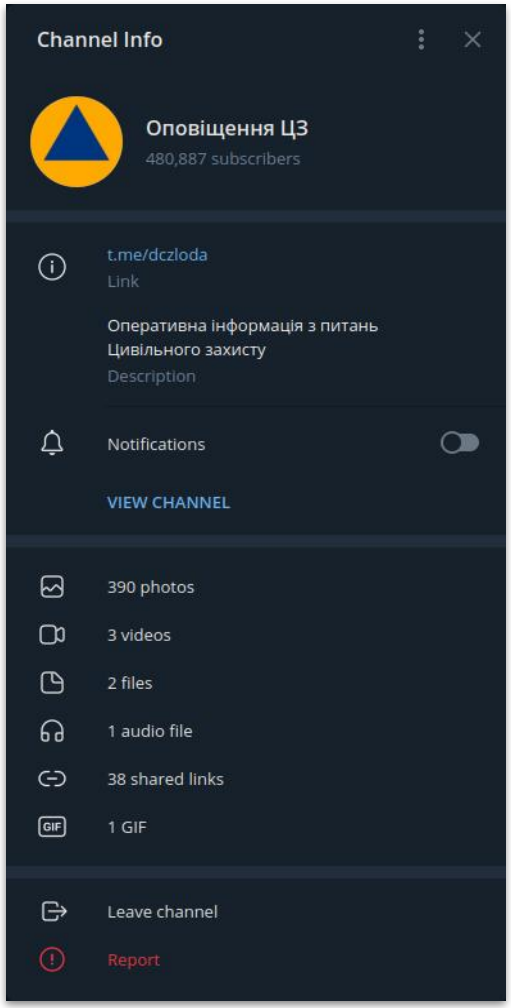
## Air Alert

Includes data on **all the regions**.

Stable format of messages.

Historical data from **March 13th**.




## Civil Protection Notifications

Includes data on the **Lviv region**.

Stable enough format of messages.

Historical data from **February 25th** (the second day of the war).

# How I get the data?

## Python library

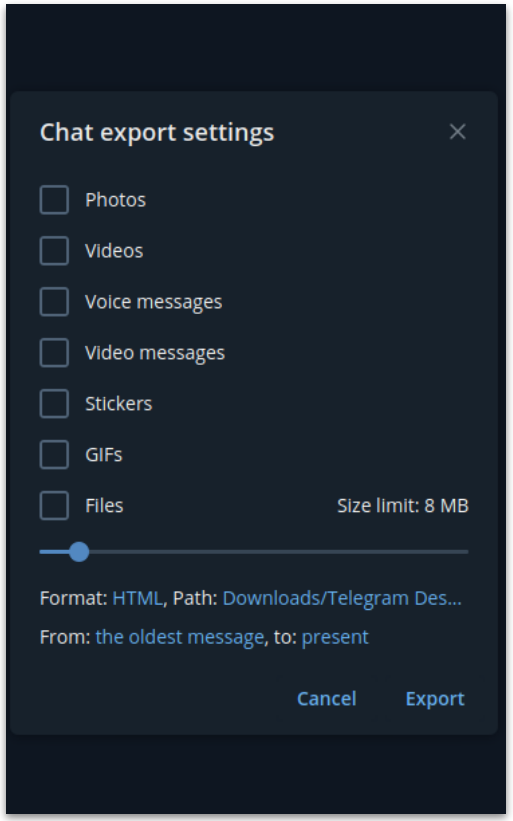
I used the **Telethon** library as it allows to extract any data (users, messages, etc.) from any amount of channels.

```
from telethon import TelegramClient
from telethon.tl.types import Message

WAR_START = datetime(2022, 2, 24, 0,


async def collect_messages(channel_id
    # Fill Telegram cache
    await client.get_dialogs()
    # Get the required channel data
    alerts_channel = await client.get
    async for post in client.iter_mes
        if isinstance(post.message, l
            continue
        if post.date < WAR_START:
            break
        MESSAGES.append(prepare_messa


client = TelegramClient("name", int(C
with client:
    client.loop.run_until_complete(co
```

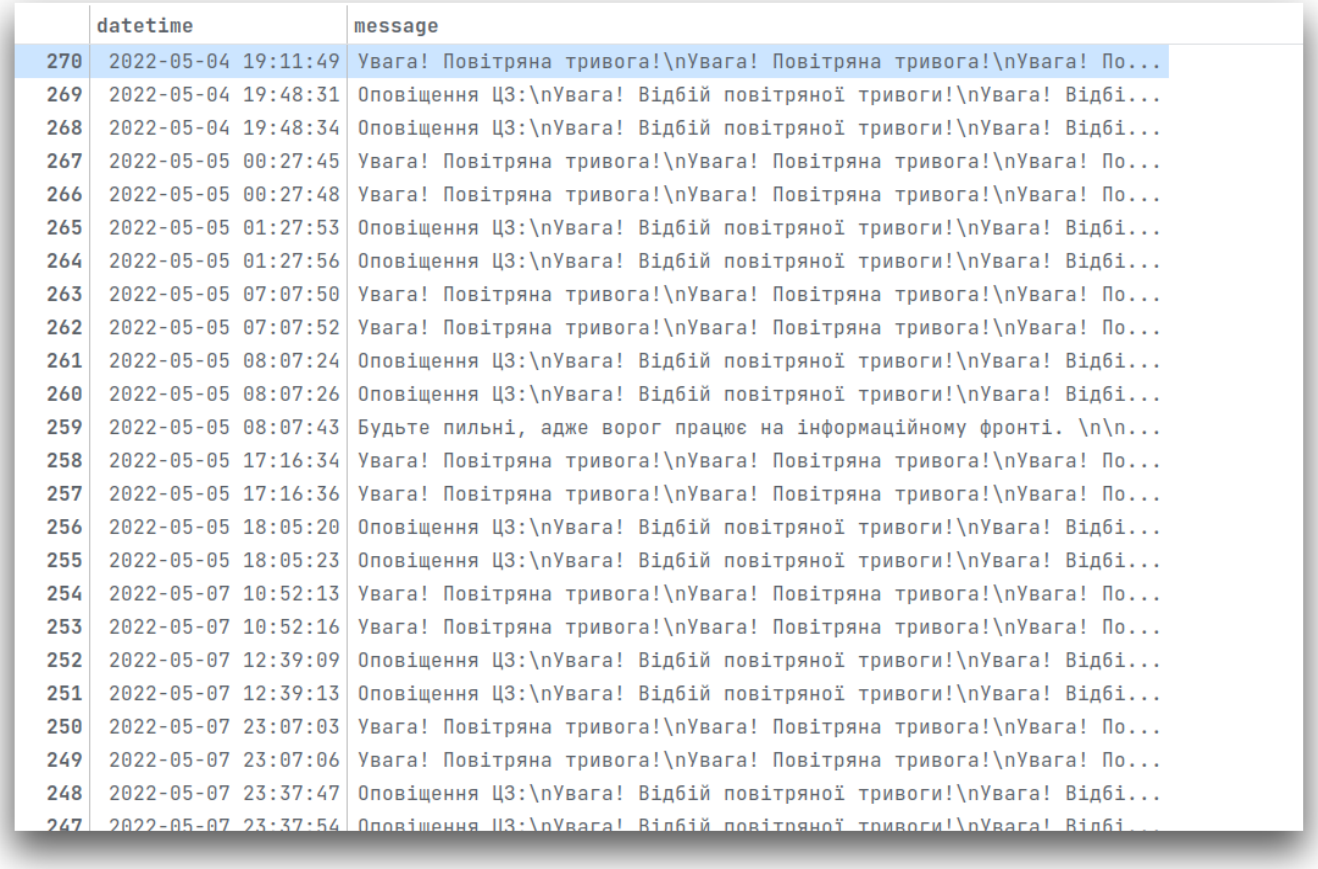



## Manual export

Built-in export tool (right top corner, "Export chat history" on desktop). Allows to extract chat history of any channel.

# We got the data, what's next?

- We need to **filter messages** (news, local authorities, etc).
- Then, organize them into **actual alarms** (start, end, duration).
- Next, **assign a region** to each alarm (to avoid overlap and to get local stats).
- After that, we're **ready to go** (to build charts and get insights).



| | datetime | message |
|---|---|---|
| 270 | 2022-05-04 19:11:49 | Увага! Повітряна тривога!\nУвага! Повітряна тривога!\nУвага! По... |
| 269 | 2022-05-04 19:48:31 | Оповіщення ЦЗ:\nУвага! Відбій повітряної тривоги!\nУвага! Відбі... |
| 268 | 2022-05-04 19:48:34 | Оповіщення ЦЗ:\nУвага! Відбій повітряної тривоги!\nУвага! Відбі... |
| 267 | 2022-05-05 00:27:45 | Увага! Повітряна тривога!\nУвага! Повітряна тривога!\nУвага! По... |
| 266 | 2022-05-05 00:27:48 | Увага! Повітряна тривога!\nУвага! Повітряна тривога!\nУвага! По... |
| 265 | 2022-05-05 01:27:53 | Оповіщення ЦЗ:\nУвага! Відбій повітряної тривоги!\nУвага! Відбі... |
| 264 | 2022-05-05 01:27:56 | Оповіщення ЦЗ:\nУвага! Відбій повітряної тривоги!\nУвага! Відбі... |
| 263 | 2022-05-05 07:07:50 | Увага! Повітряна тривога!\nУвага! Повітряна тривога!\nУвага! По... |
| 262 | 2022-05-05 07:07:52 | Увага! Повітряна тривога!\nУвага! Повітряна тривога!\nУвага! По... |
| 261 | 2022-05-05 08:07:24 | Оповіщення ЦЗ:\nУвага! Відбій повітряної тривоги!\nУвага! Відбі... |
| 260 | 2022-05-05 08:07:26 | Оповіщення ЦЗ:\nУвага! Відбій повітряної тривоги!\nУвага! Відбі... |
| 259 | 2022-05-05 08:07:43 | Будьте пильні, адже ворог працює на інформаційному фронті. \n\n... |
| 258 | 2022-05-05 17:16:34 | Увага! Повітряна тривога!\nУвага! Повітряна тривога!\nУвага! По... |
| 257 | 2022-05-05 17:16:36 | Увага! Повітряна тривога!\nУвага! Повітряна тривога!\nУвага! По... |
| 256 | 2022-05-05 18:05:20 | Оповіщення ЦЗ:\nУвага! Відбій повітряної тривоги!\nУвага! Відбі... |
| 255 | 2022-05-05 18:05:23 | Оповіщення ЦЗ:\nУвага! Відбій повітряної тривоги!\nУвага! Відбі... |
| 254 | 2022-05-07 10:52:13 | Увага! Повітряна тривога!\nУвага! Повітряна тривога!\nУвага! По... |
| 253 | 2022-05-07 10:52:16 | Увага! Повітряна тривога!\nУвага! Повітряна тривога!\nУвага! По... |
| 252 | 2022-05-07 12:39:09 | Оповіщення ЦЗ:\nУвага! Відбій повітряної тривоги!\nУвага! Відбі... |
| 251 | 2022-05-07 12:39:13 | Оповіщення ЦЗ:\nУвага! Відбій повітряної тривоги!\nУвага! Відбі... |
| 250 | 2022-05-07 23:07:03 | Увага! Повітряна тривога!\nУвага! Повітряна тривога!\nУвага! По... |
| 249 | 2022-05-07 23:07:06 | Увага! Повітряна тривога!\nУвага! Повітряна тривога!\nУвага! По... |
| 248 | 2022-05-07 23:37:47 | Оповіщення ЦЗ:\nУвага! Відбій повітряної тривоги!\nУвага! Відбі... |
| 247 | 2022-05-07 23:37:54 | Оповіщення ЦЗ:\nУвага! Відбій повітряної тривоги!\nУвага! Відбі... |

# Let's start with Lviv, the city where I live

The capital of one of the calmest regions. That's why I can continue my work and participate in the Digital Analytics Summit.

- 800+ km to the border with Russia.
- 50+ km to the border with Poland.
- Up to 1 million current population.
- The most touristic city of Ukraine (highly recommend to visit after Ukrainian victory).

# What does "alert" actually mean?

Here's some data on the morning alert we got just this Monday (October 10th).

- It started at 7:30 AM and finished at 12:21 PM (~**5 hours**).
- Out of 84 Russian rockets launched, **at least 4-5 rockets** landed in Lviv.
- 90% of the city (~900 000 people, including me) **lost power supply**.
- Because of no power, **80% of traffic lights** and **all electric public transport** stopped working. Same for water, mobile network and internet.

# How the process looks for me?

1. **An air alert starts**, with loud sirens and mobile app notifications.
2. We pick up emergency backpacks and **run to the shelter.**
3. At the same time, my remote Ubuntu server **checks channels every 5 minutes**.
4. All the alerts that are not collected yet – are **added to the remote DB**.
5. An air alert ends, I get back home, **export data and analyze it**.

# How often are air alerts in Lviv?

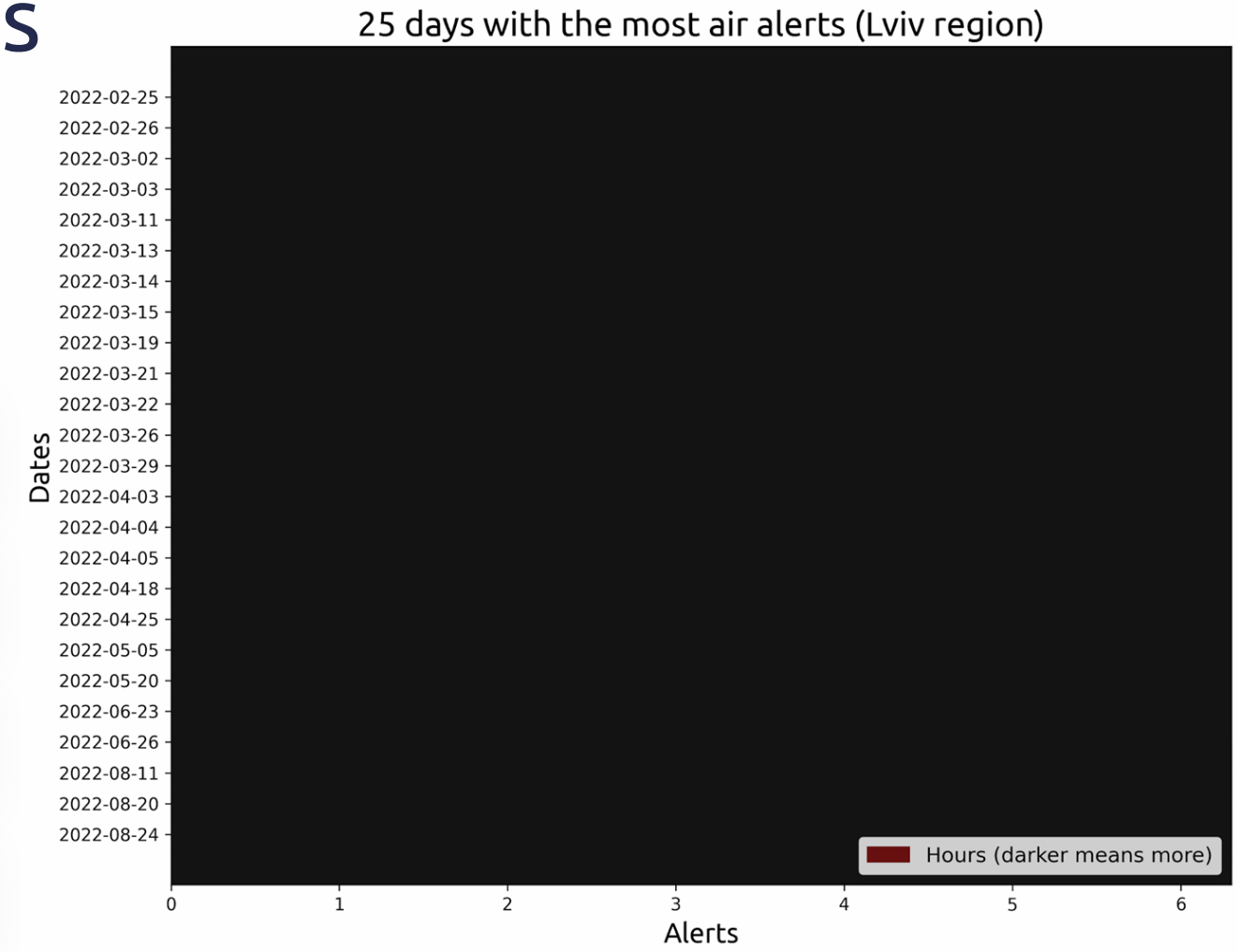
Often enough. But we're far from the frontline, and bombed only with expensive long-range rockets.

**0.99** **Average alerts per day**

**0.95** **Hours per day in bomb shelters**

**199** **Alerts from 25.02.2022 to 01.10.2022**

**191** **Hours spent in bomb shelters**



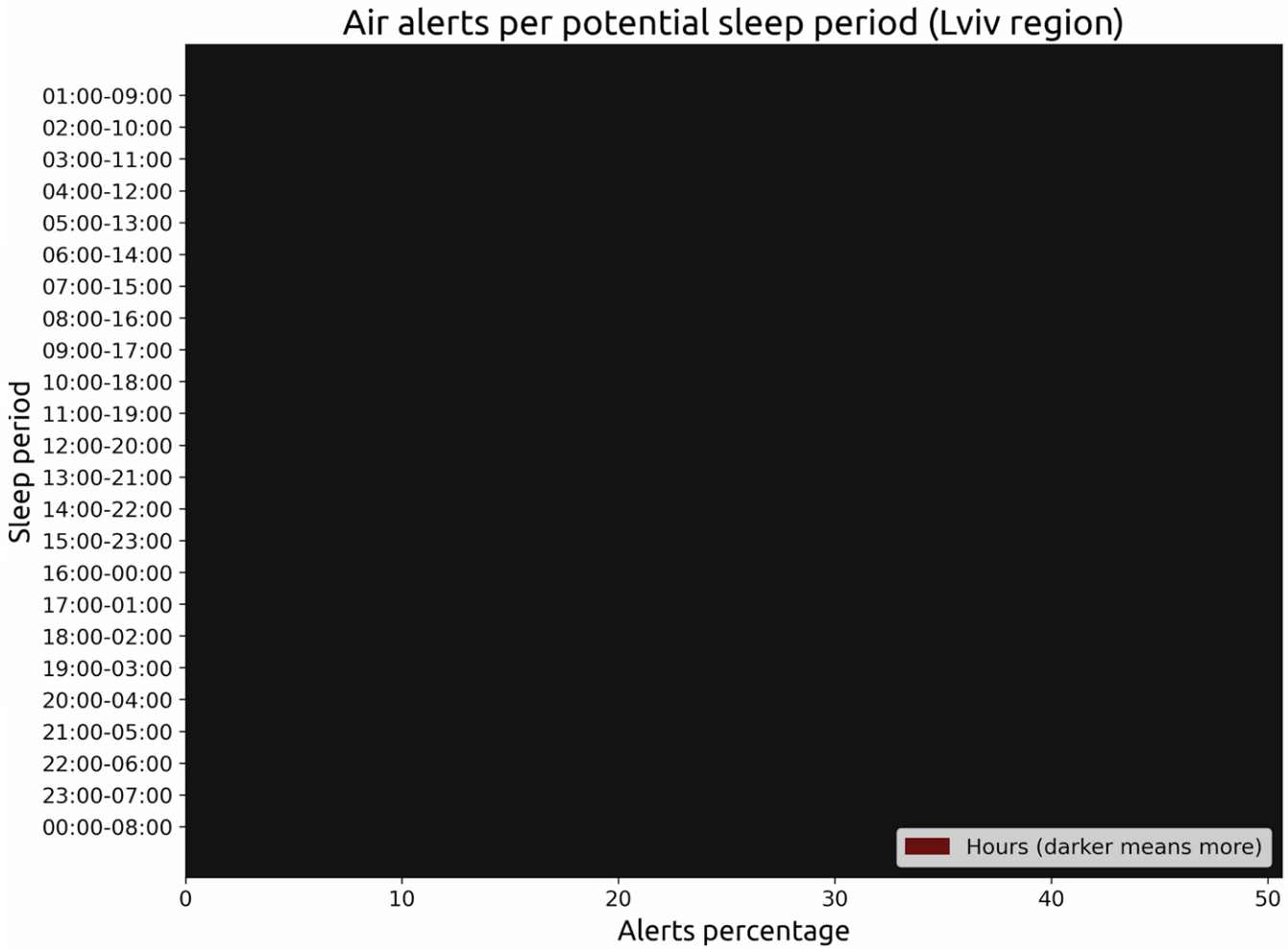
# What about sleep?

If we group hours into 8-hour segments, it's clear enough what periods to pick to get the most sleep.

**23:00-10:00** **The least amount of alerts.**

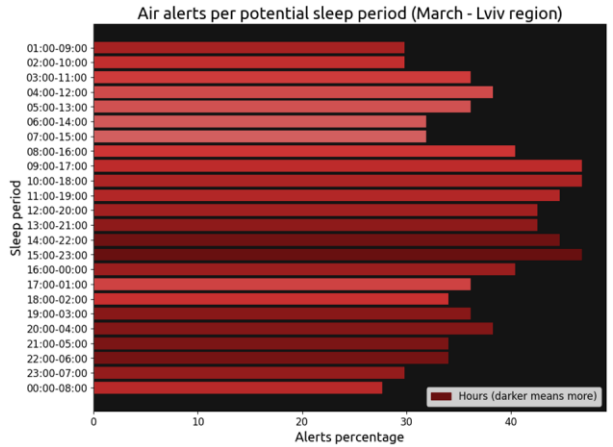
**04:00-15:00** **A bit more alerts, but they're shorter**

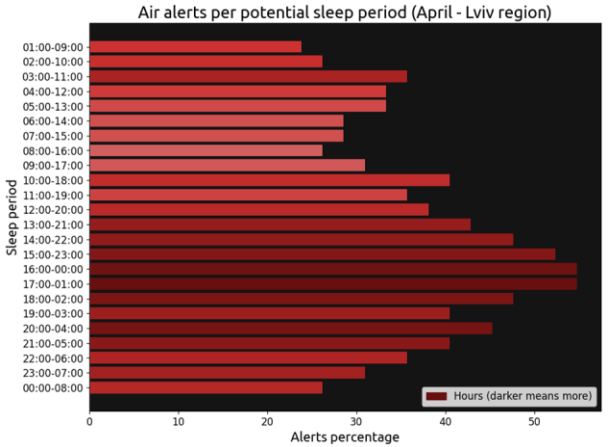
**14:00-01:00** **The worst possible time to sleep**

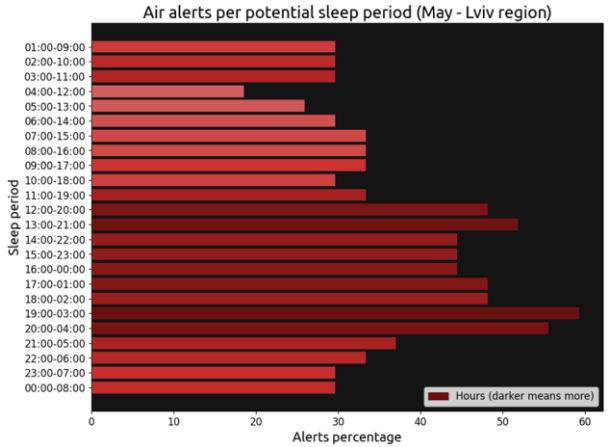


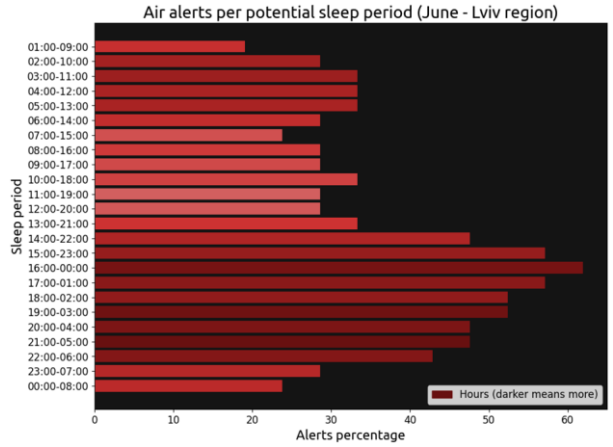
# Are there any patterns?

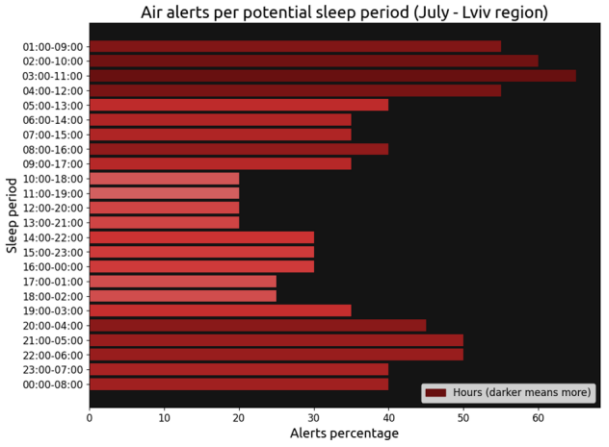
If we monitor the last 6 months, the pattern is similar enough. It's mainly affected by the **Russian ability to use long-range rockets** and the **night/day schedule of artillery teams**.

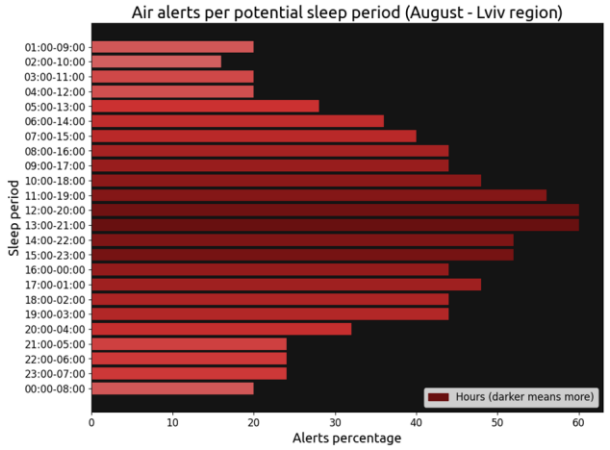


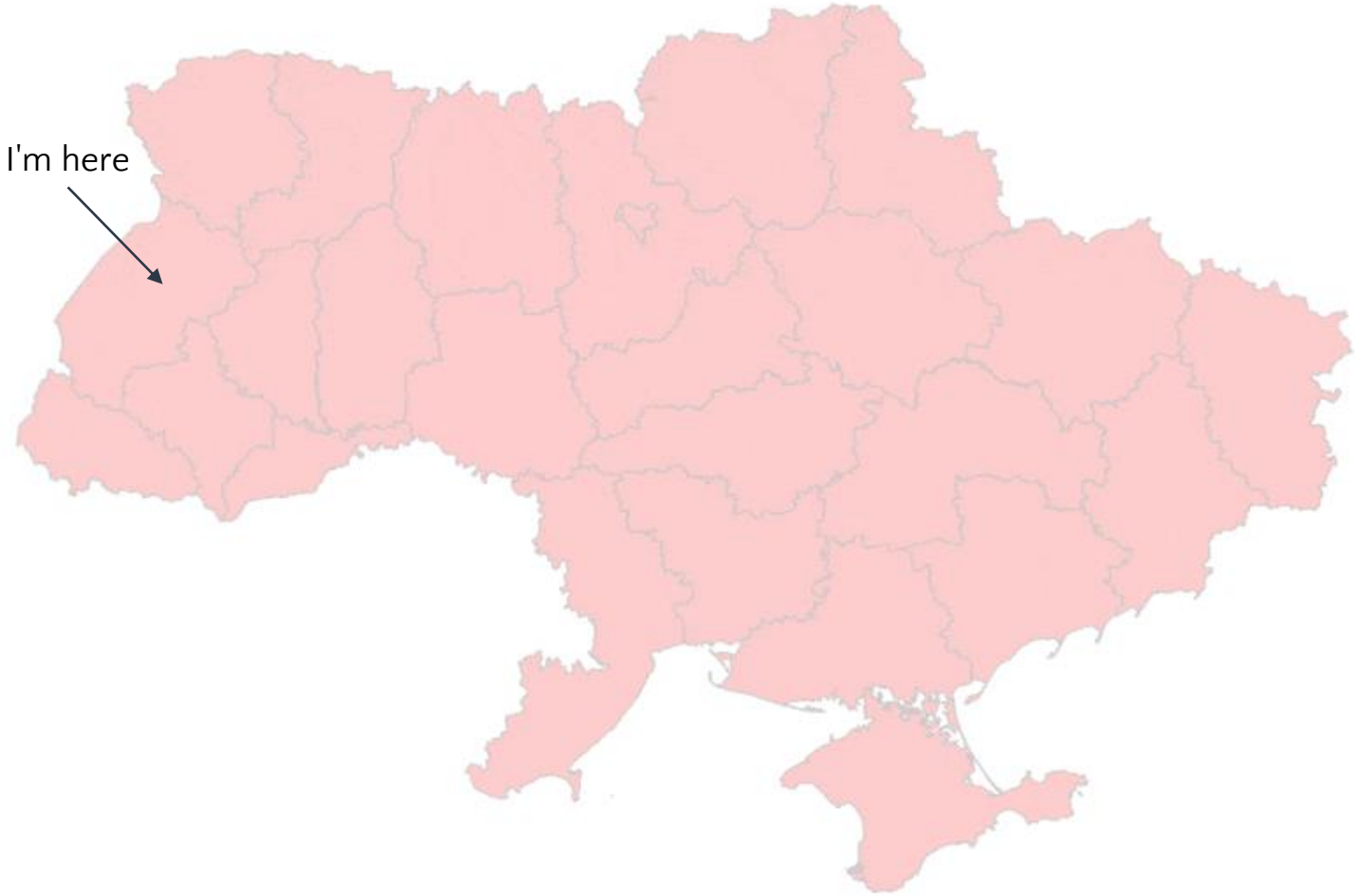



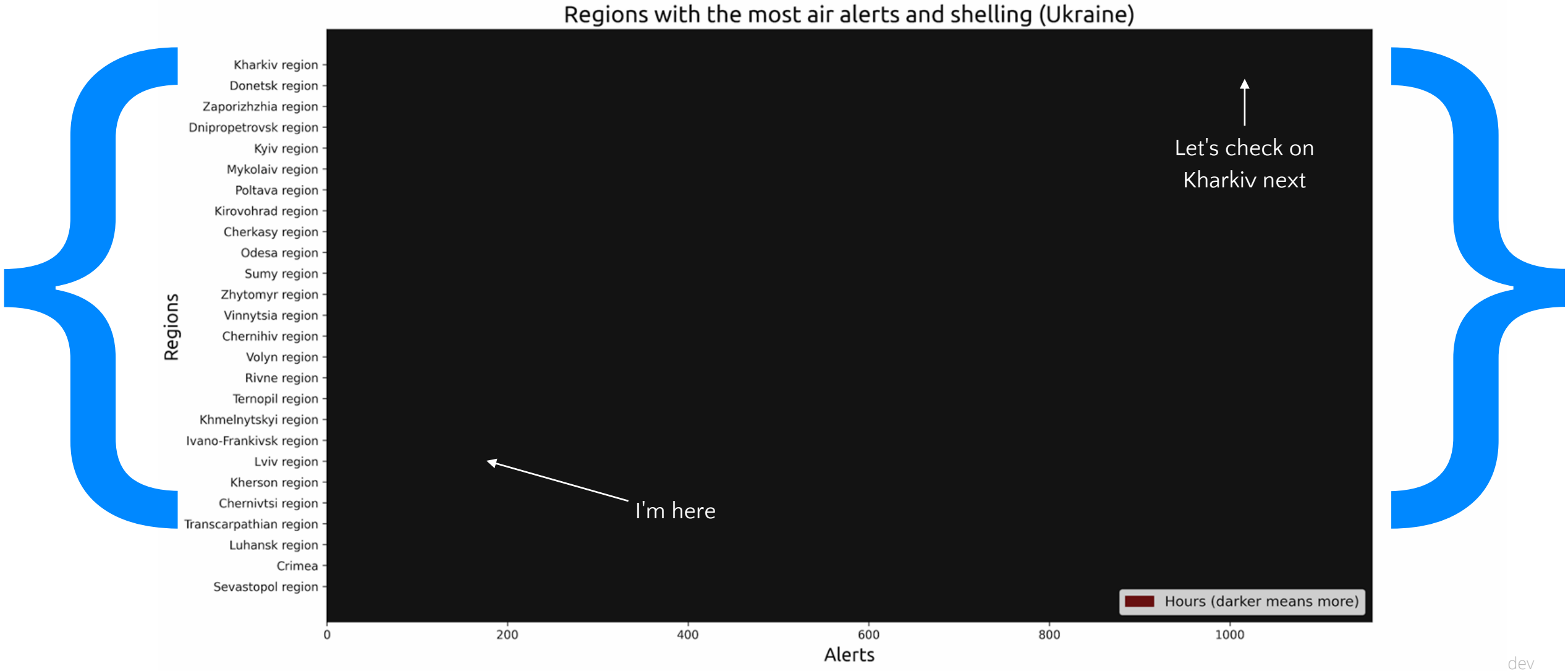



# But what's happening in other regions?

Dynamic from day 1. The darker the color – the more alerts.



# But what's happening in other regions?



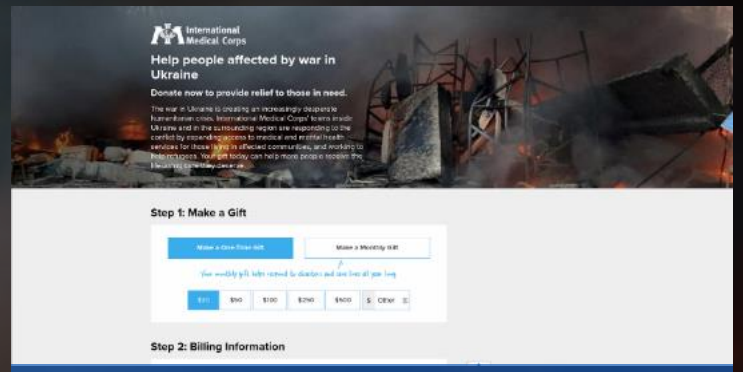
# Donations

## Humanitarian and Military aid, if you want to help to stop the war

https://prytulafoundation.org/en

### Charity foundation of Serhiy Prytula

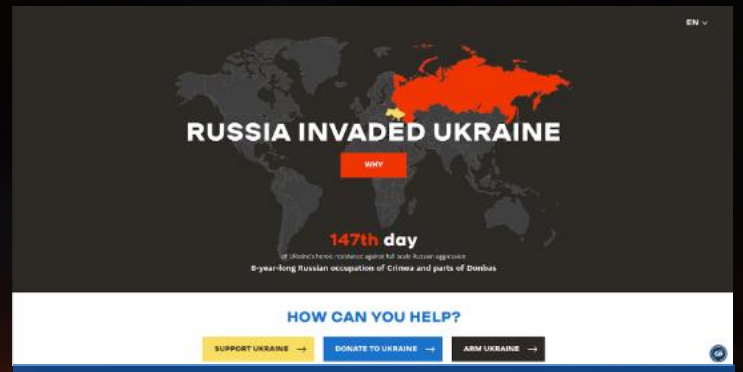
- **The foundation I donate to the most.**
- Regular reports on Twitter and Facebook.




https://give.internationalmedicalcorps.org/page/99837

### International Medical Corps

- Confirmed and measurable presence in “hot” parts of Ukraine.

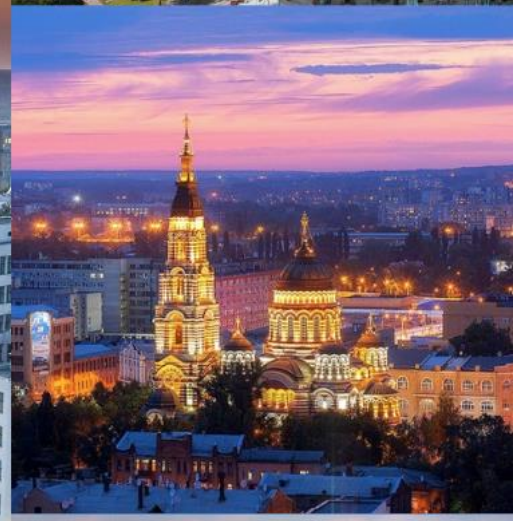



https://war.ukraine.ua/

### MFA of Ukraine

- Repository of charity foundations.
- Ukrainian news in English.

**Since the start of the war, my wife and I donated €7500+ out of our own pocket and participated in fundraising €80000+ for Ukrainian needs.**



# Let's continue with Kharkiv, the borderline city

The capital of one of the largest regions. Close to the border, heavily bombed daily, but stands and was never occupied.

- 30+ km to the border with Russia.
- 1.5 million population before the war.
- The current population is unknown, as the large part of the city is destroyed.
- One of the most IT-focused cities in Ukraine, but, potentially, not anymore.

# How often are air alerts in Kharkiv?

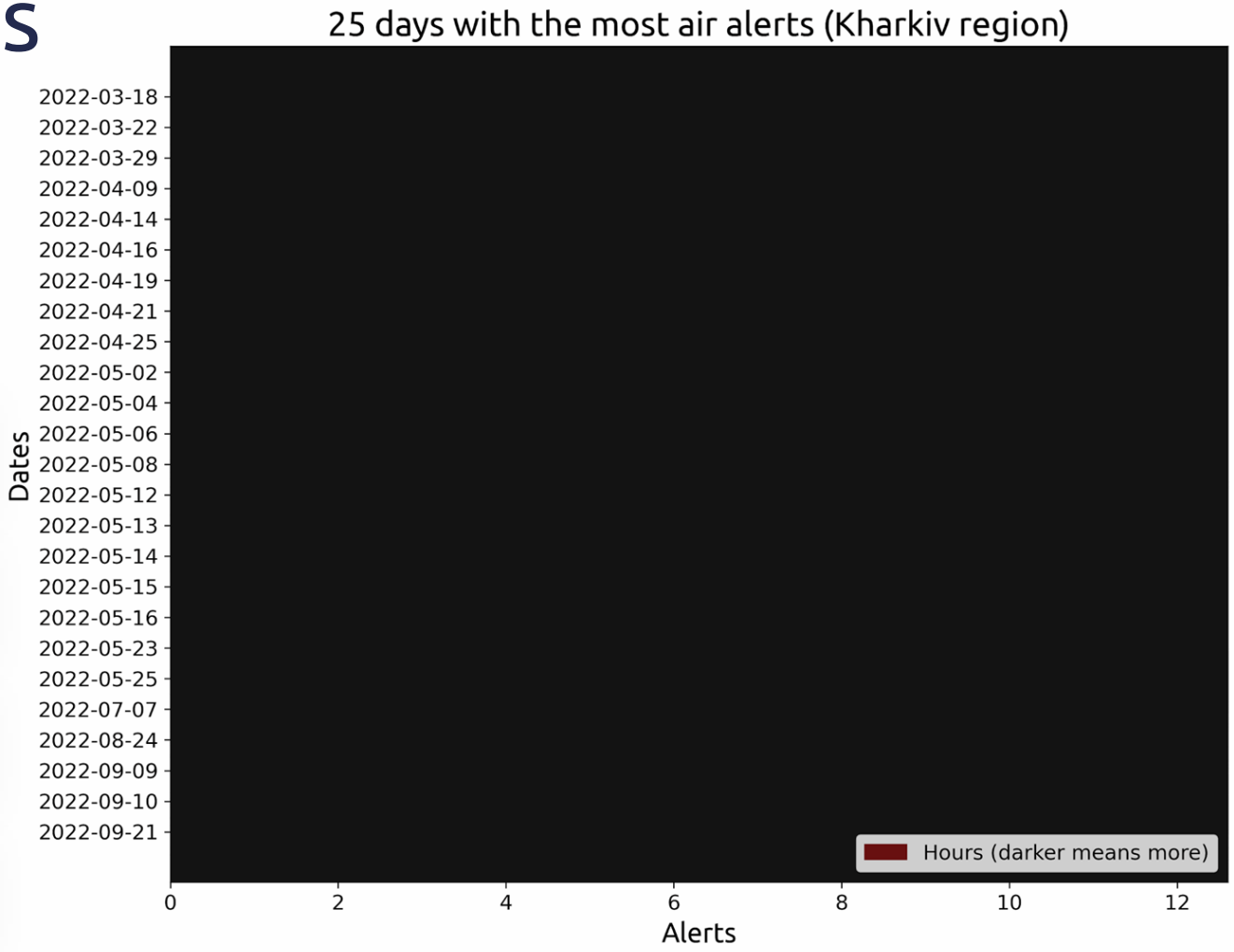
Every couple of hours.

**5.96** **Average alerts per day**

**5.21** **Hours per day in bomb shelters**

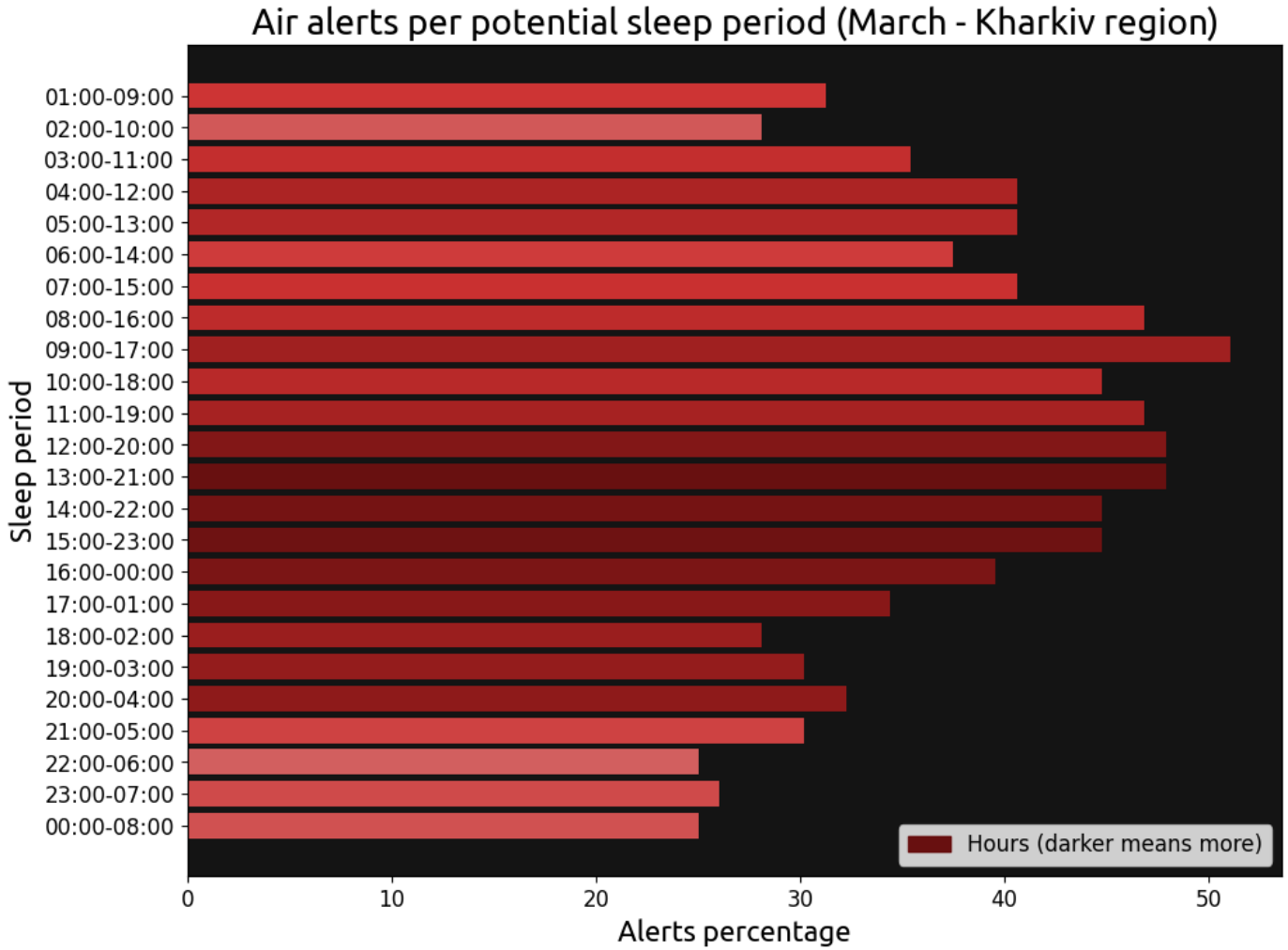
**1102** **Alerts from 13.03.2022 to 01.10.2022**

**964** **Hours spent in bomb shelters**



# What about sleep?

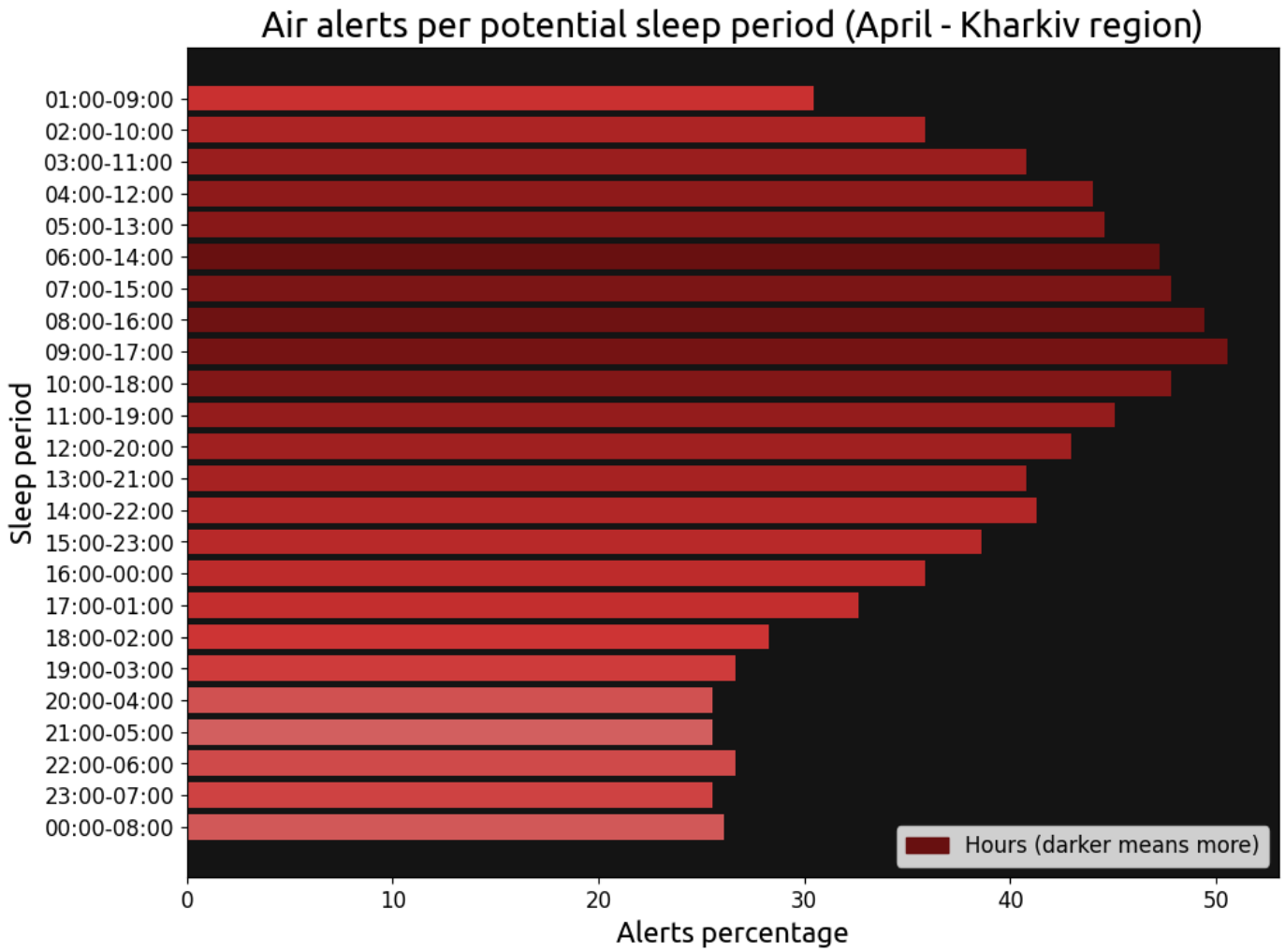
With 6 alarms per day, you won't guess when to sleep – **every hour is pretty bad**. Still, the dynamic tells the story.




**March 2022**

**160** air alerts
in Kharkiv region

# What about sleep?

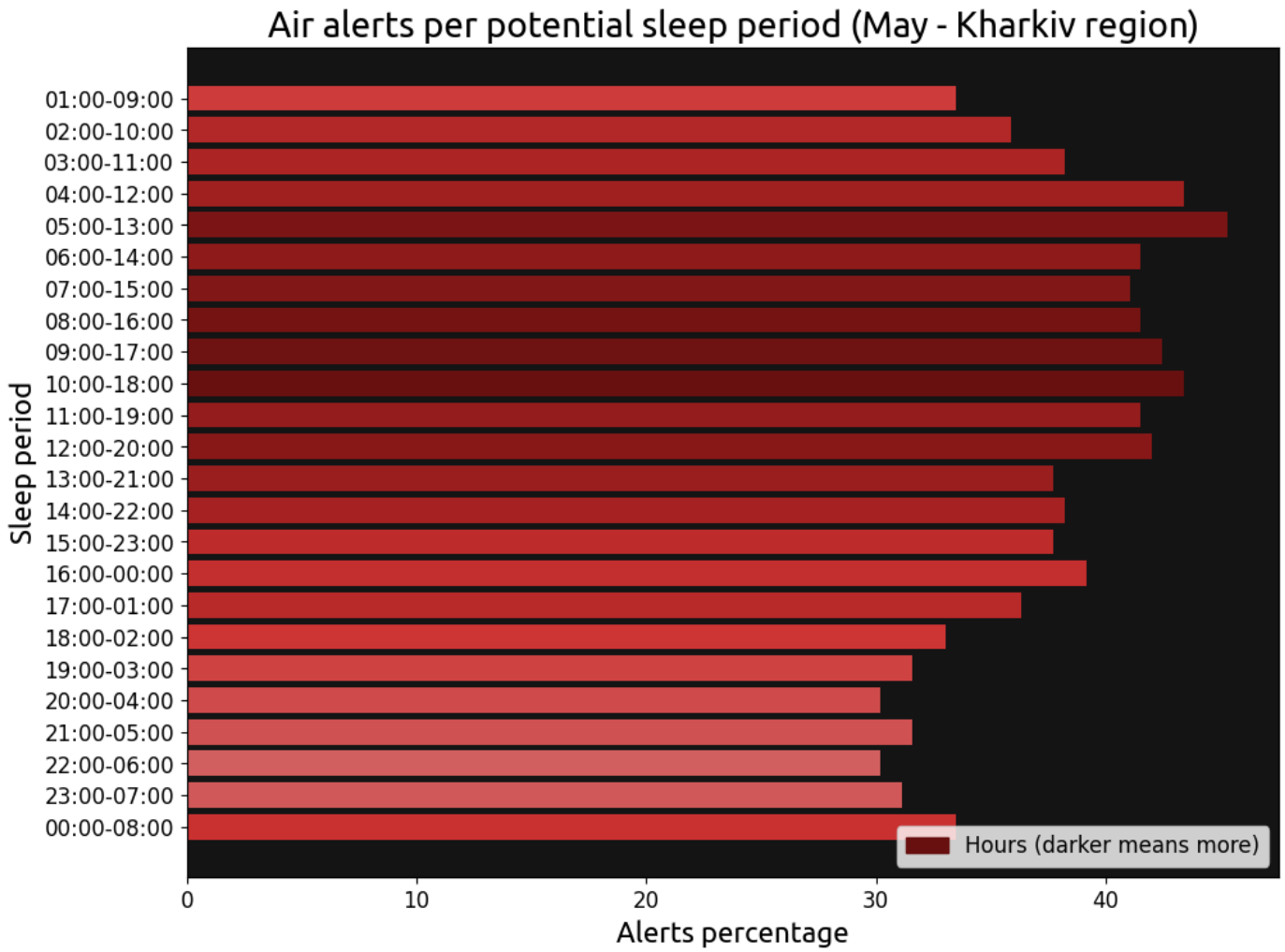



**April 2022**

**184**↑ air alerts

in Kharkiv region

# What about sleep?



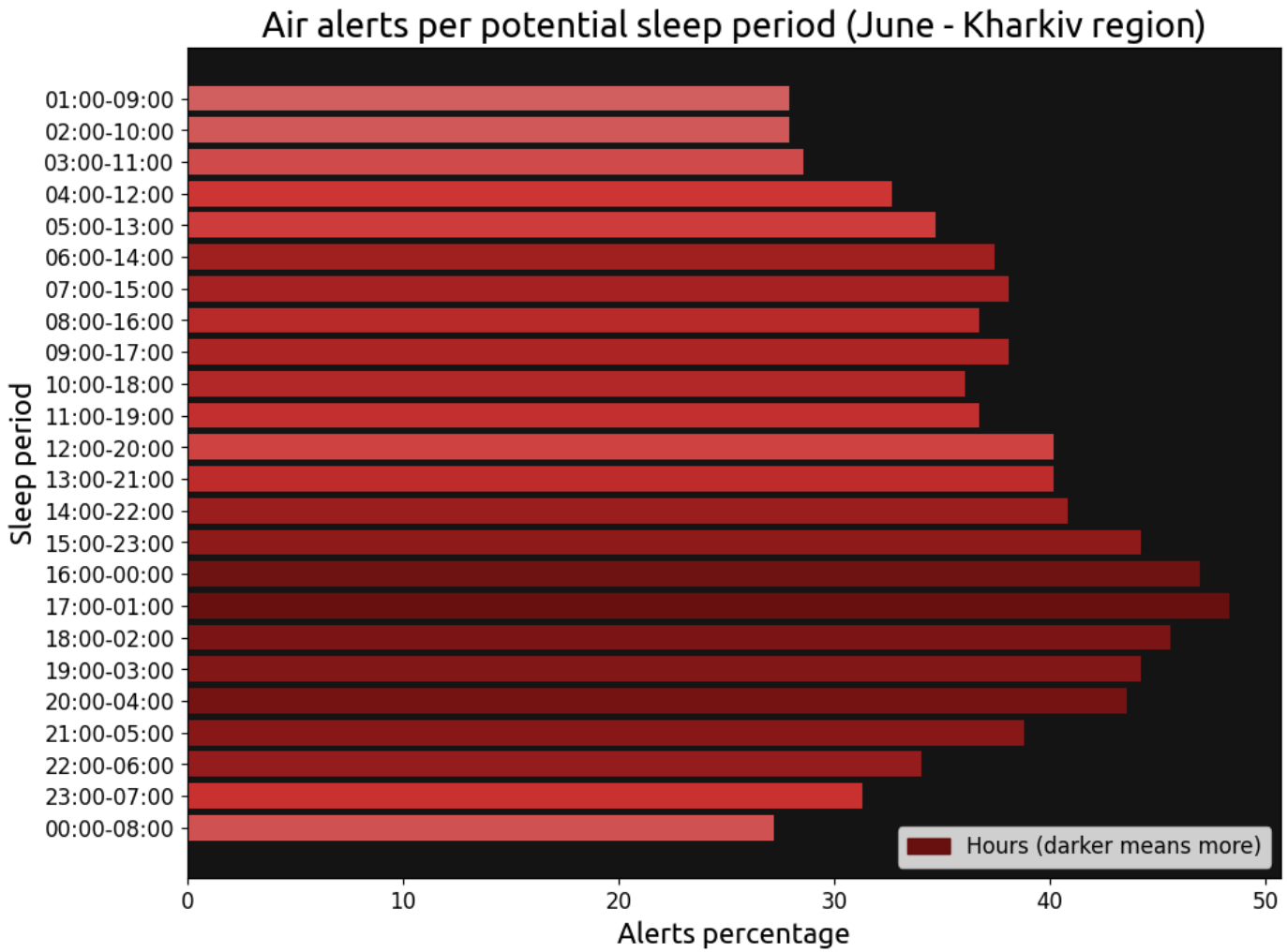

**April 2022**

**212**↑ air alerts

in Kharkiv region

# What about sleep?

The **start of the Ukrainian counter-offensive** drops the number of alerts significantly and moves the focus from morning to evening.

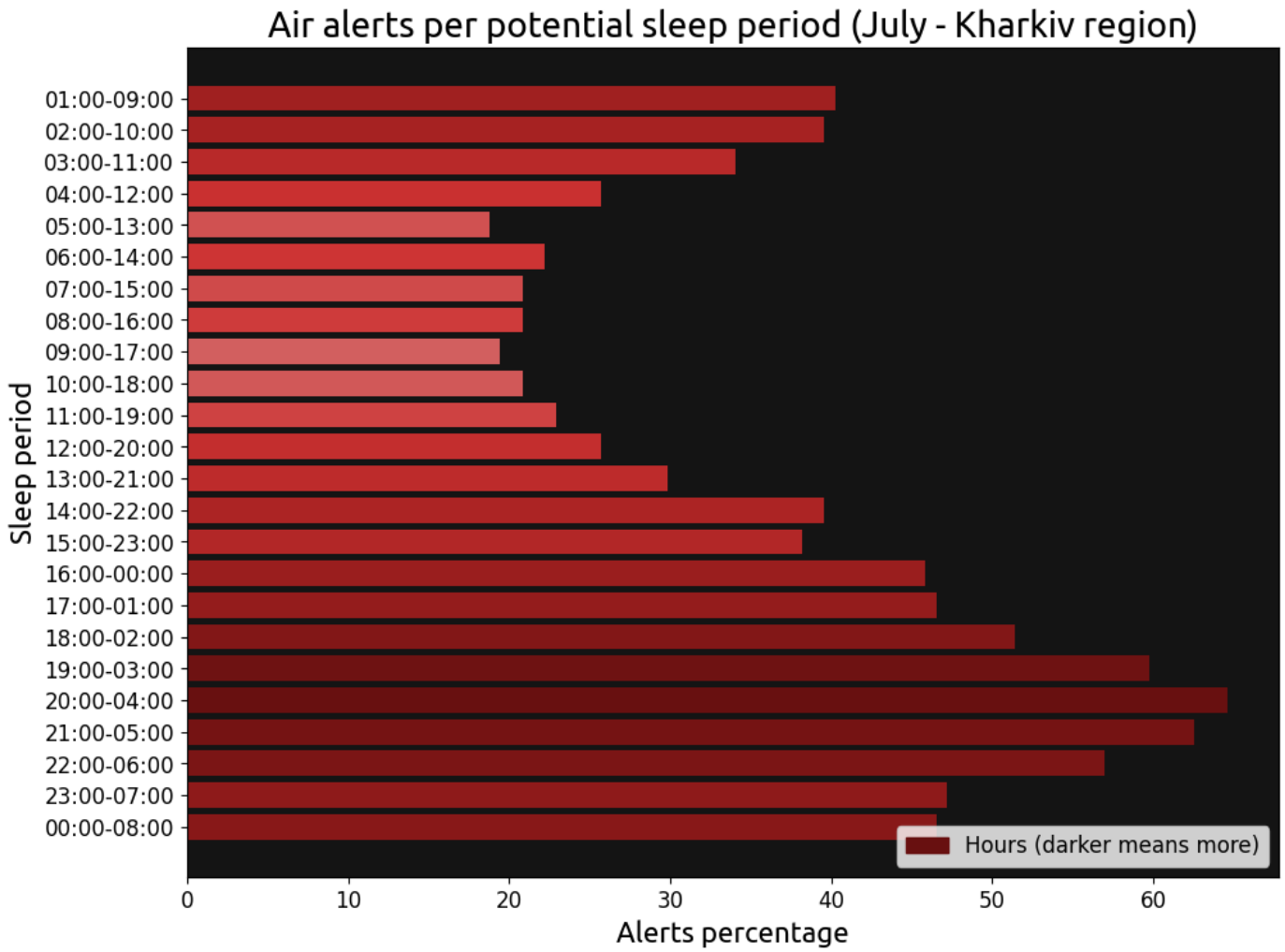



**June 2022**

**147**↓ air alerts

in Kharkiv region

# What about sleep?

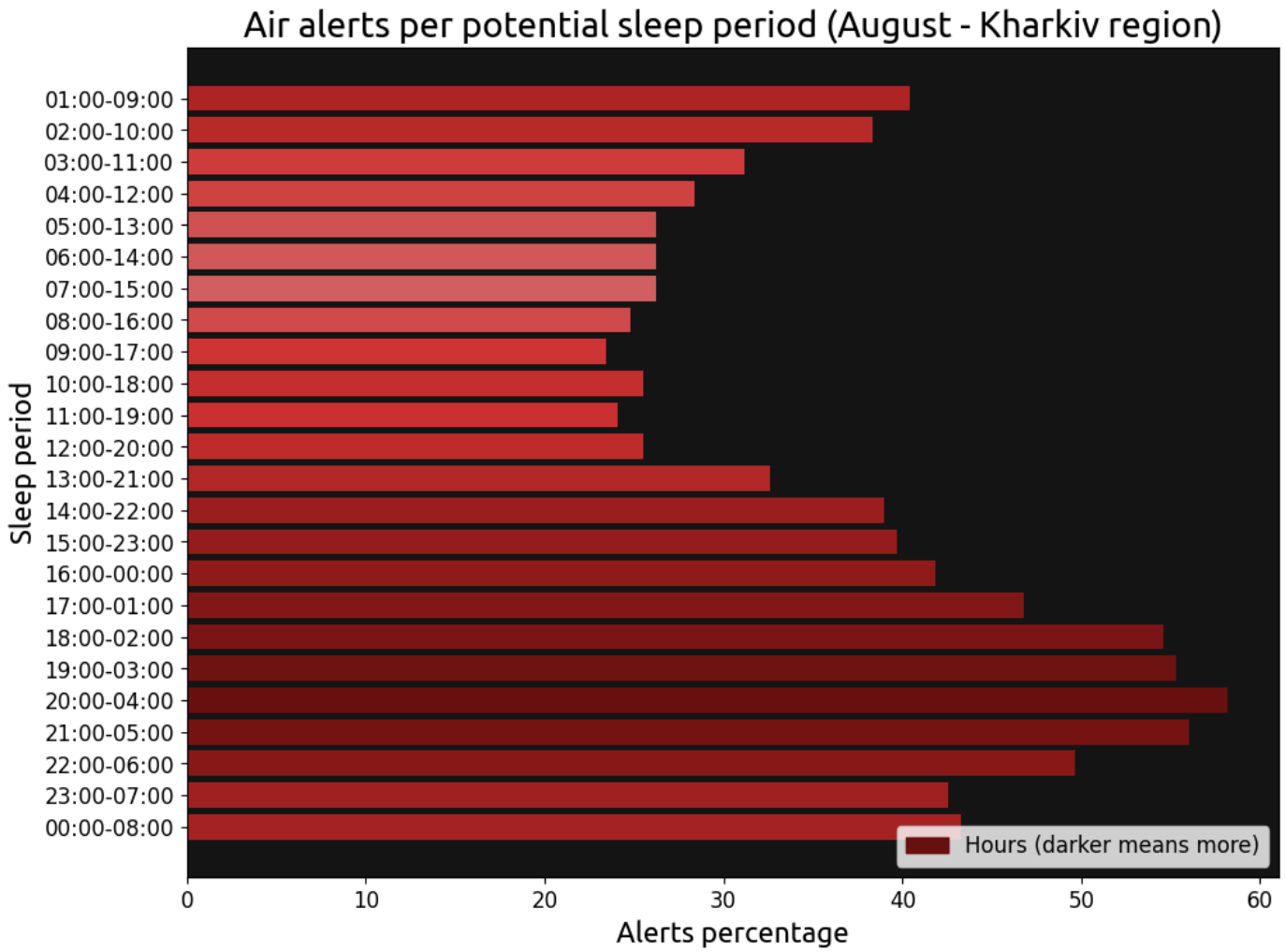



**July 2022**

**144**↓ air alerts

in Kharkiv region

# What about sleep?

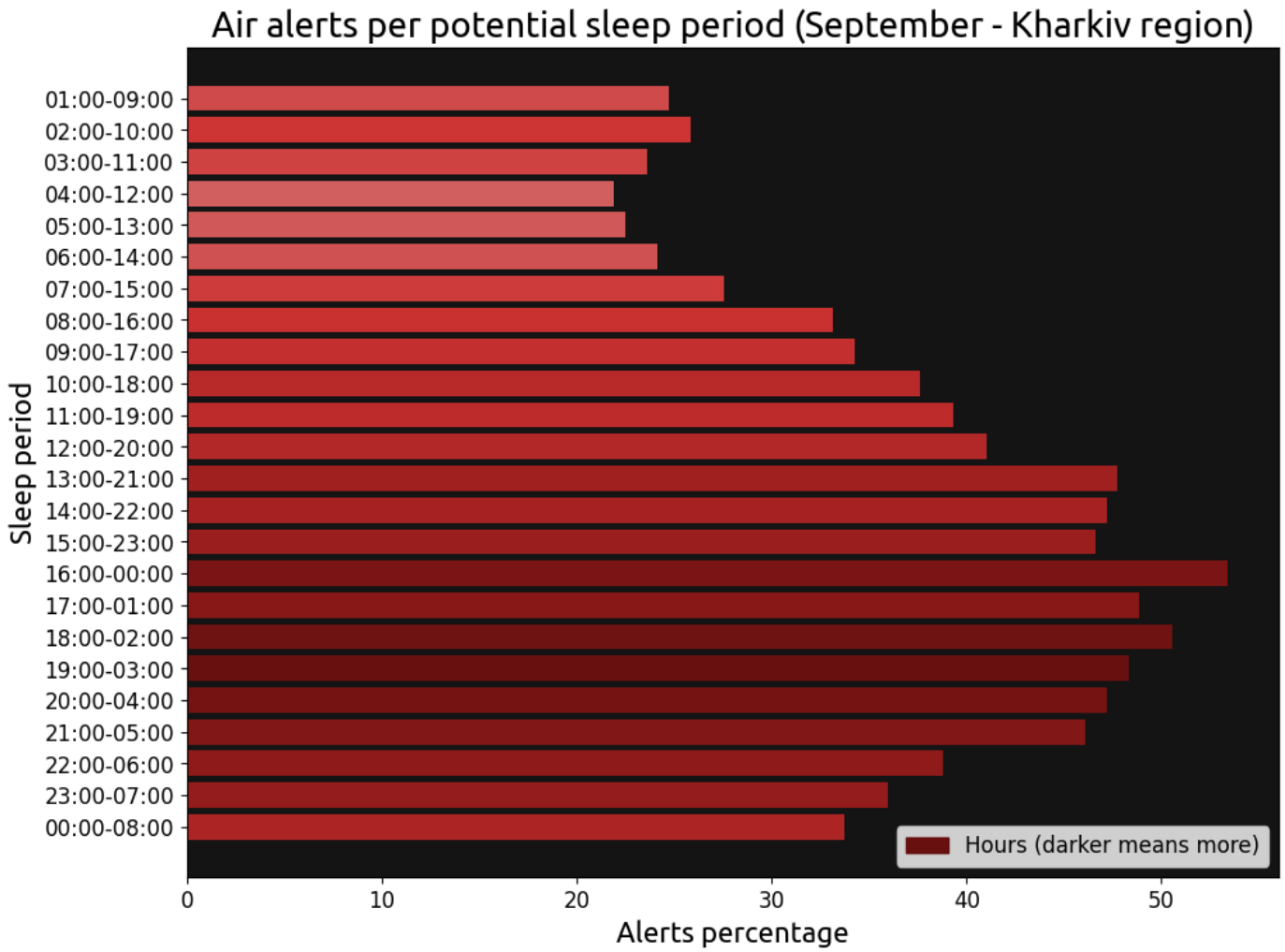



**August 2022**

**141**↓ air alerts

in Kharkiv region

# What about sleep?




**September 2022**

**178**↑ air alerts

in Kharkiv region

What's left?

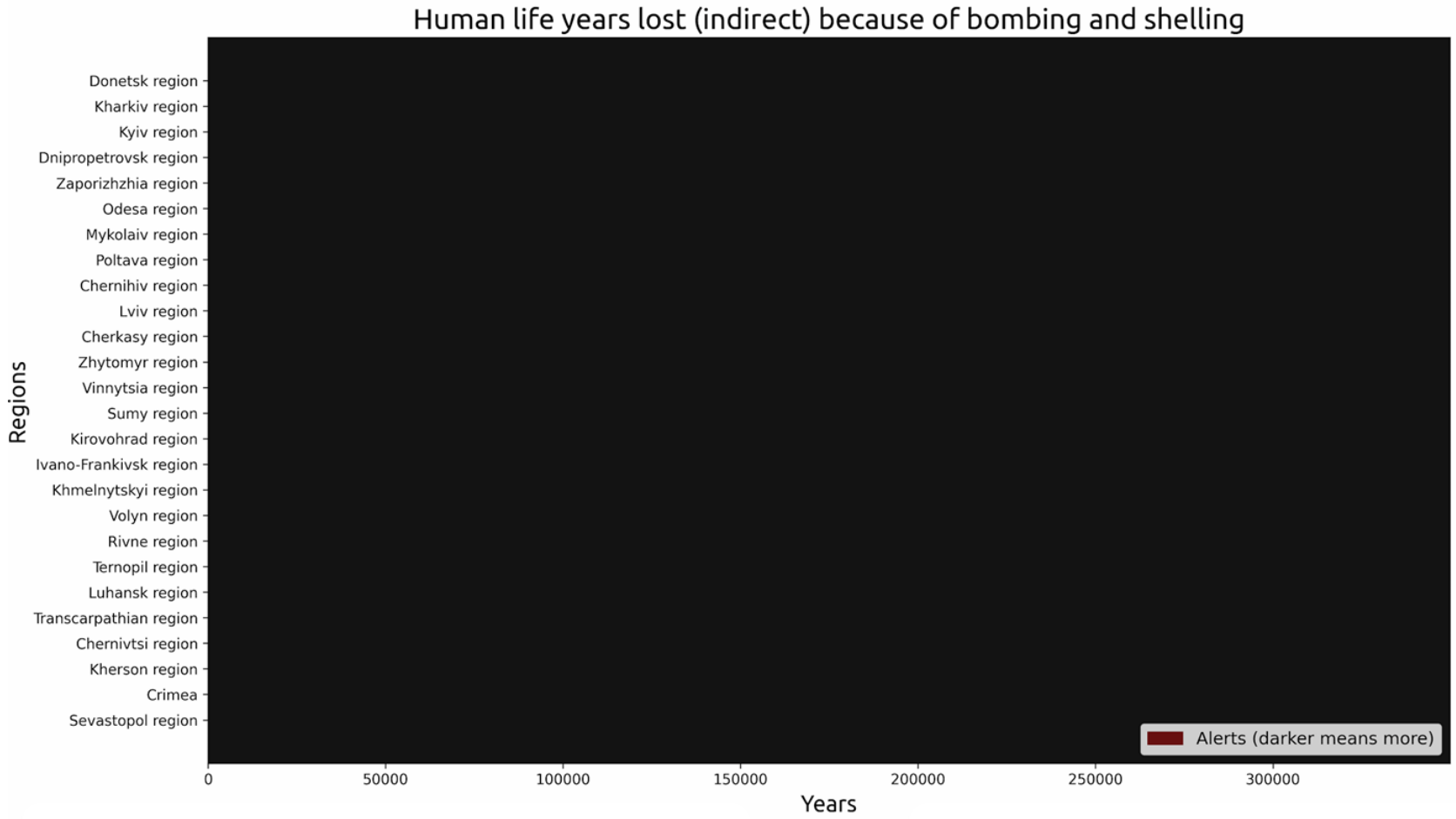
The most important bar chart.

# Let's do some simple math

The grim reality of the war is that rockets don't just kill people. They also kill the time of the ones who survived.

| | | |
|---|---|---|
| **1 million people in shelters for 1 hour** | = | **1 million hours or 114 years lost** |
| **Average life expectancy** | = | **~73 years** |
| **Population of Ukraine** | = | **~44 million people** |

# The most important bar chart




**> 2 million years spent in bomb shelters** = **27000 lifetimes that never happened**

THANK YOU