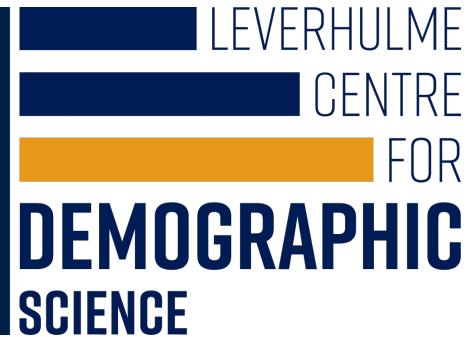


Ukraine Crisis: Monitoring population displacement through social media activity

Doug Leasure
Leverhulme Centre for Demographic Science
University of Oxford

SICSS-Oxford
6 July 2022



Facebook Marketing API

A tool for advertisers to measure audience sizes and demographics for targeted advertisements



Home In draft Edit Review

New Reach Campaign New Reach Ad Set advert advertisment Create ad set

Nigeria

Nigeria

Include Search locations Browse

Nigerian Drop pin

BURKINA FASO BENIN N'Djamena Niamey Abéché Kano Togo Tamale Accra Lagos Port Harcourt Sarh CAMEROON Bandouli Add locations in bulk

Age

18 ▼ 65+ ▼

Gender

All Men Women

Detailed targeting

Close ✓ All edits saved

Audience definition

Your audience selection is fairly broad.

Specific Broad

Estimated audience size: 18,200,000 - 21,400,000 i

Estimates may vary significantly over time based on your targeting selections and available data.

Estimated daily results

Reach i 42K - 120K

The accuracy of estimates is based on factors like past campaign data, the budget you entered, market data, targeting criteria and ad placements. Numbers are provided to give you an idea of performance for your budget, but are only estimates and don't guarantee results.

Back Next

Home In draft Edit Review

New Reach Campaign ...

New Reach Ad Set ...

advert ... !

+ Create ad set

Nigeria

Nigeria

Include Search locations Browse

Drop pin

Map of West Africa showing Nigeria, Burkina Faso, Benin, Togo, Ghana, and Cameroon. A blue checkmark is placed on the map of Nigeria.

Add locations in bulk

Age

18 ▼ 65+ ▼

Gender

All Men Women

Detailed targeting

Close ✓ All edits saved

Audience definition

Your audience selection is fairly broad.

Specific Broad

Estimated audience size: 12,100,000 - 14,300,000 i

Estimates may vary significantly over time based on your targeting selections and available data.

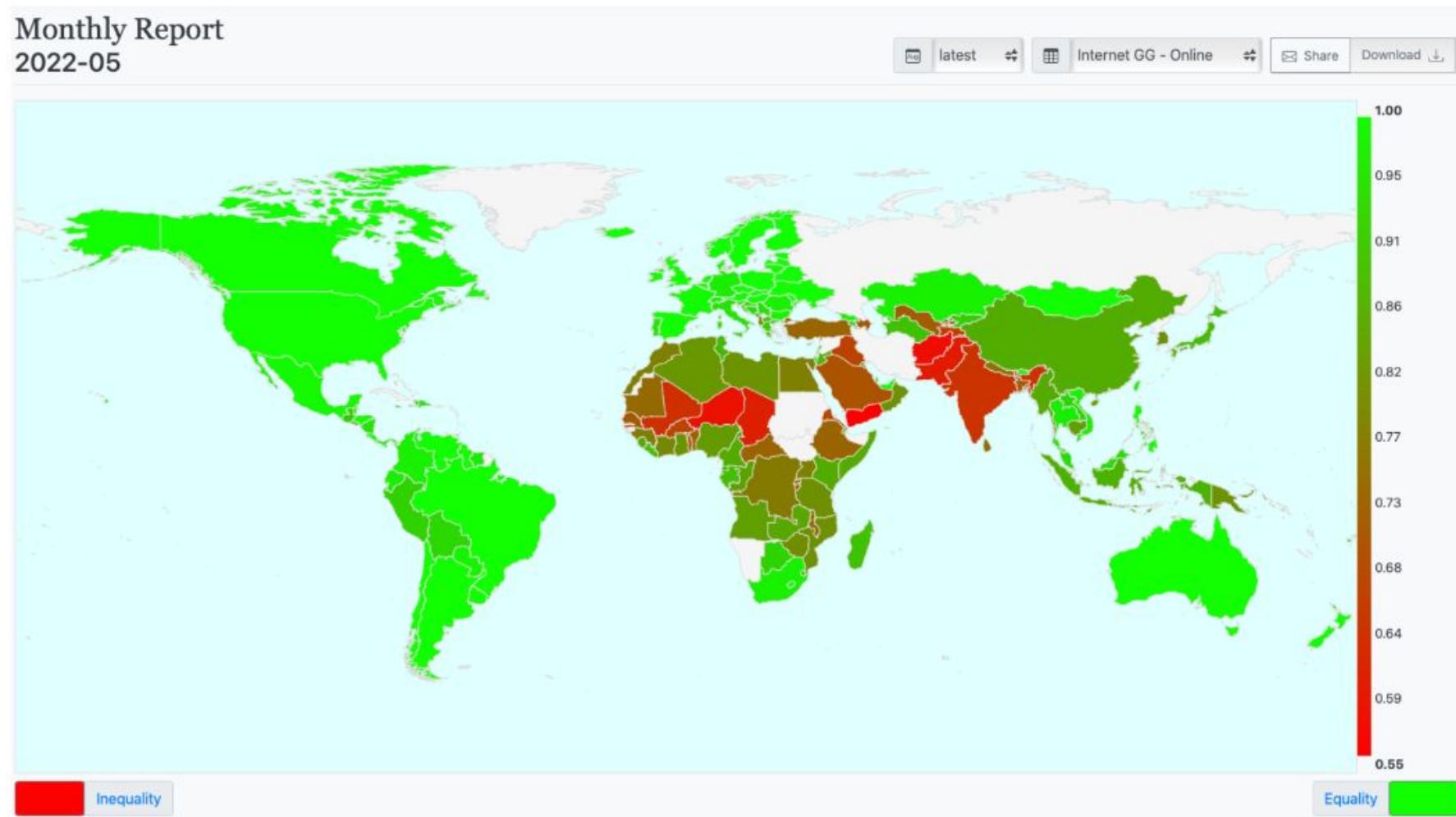
Estimated daily results

Reach i
40K - 114K

The accuracy of estimates is based on factors like past campaign data, the budget you entered, market data, targeting criteria and ad placements. Numbers are provided to give you an idea of performance for your budget, but are only estimates and don't guarantee results.

Back Next

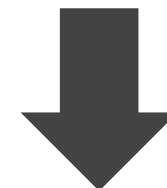
Nowcasting Digital Gender Gaps



www.digitalgendergaps.org

Fatehkia M, Kashyap R, Weber I. 2018. Using Facebook ad data to track the global digital gender gap. *World Development* 107: 189-209.

Facebook Marketing API



Request

- Location (*e.g. Kyiv, Ukraine*)
- Sex
- Age
- Language

Response

- Counts of daily active users
- Counts of monthly active users

http requests

- Request-response protocol between a client computer (e.g. you) and a server (e.g. Facebook)
- Methods
 - GET or POST requests
- Implementation
 - R package: *httr*
 - Python package: *requests*
 - Command line: *curl*

Example **http GET** request from your browser:

<https://www.google.com/search?q=puppies>

Facebook Marketing API

You need:

1. Facebook account
2. Marketing app with a ***token*** and an ***ad account number***

[https://github.com/ridhi-kashyap/SICSS_Digital_Trace_2022/blob/main/
Steps for creating FB Access Token.pdf](https://github.com/ridhi-kashyap/SICSS_Digital_Trace_2022/blob/main/Steps_for_creating_FB_Access_Token.pdf)

Additional Resources:

<https://developers.facebook.com/docs/marketing-api/audiences/reference/basic-targeting>
<https://developers.facebook.com/docs/marketing-api/audiences/reference/targeting-search>

API Query from R

```
#Loading required packages
library(readr)
library(dplyr)
library(jsonlite)
library(httr)

#Specify version of the API
version <- "v13.0"

#Specify your authentication/credentials,
#these should be saved separately in a private file

credential<-read.csv("credentials.csv",header = FALSE)

token <- credential$V1
act <- credential$V2

#We specify the basic URL as a string
Credentials <- paste0('https://graph.facebook.com/',version,'/act_',act,'/delivery_estimate?acces
s_token=',token)
```

API Query from R

```
targeting_spec_simple <- '{"geo_locations":{"countries":["GB"]}}'

query_char <- list(
  include_headers="false",
  method="get",
  optimization_goal="REACH",
  suppress_http_code=1,
  targeting_spec = targeting_spec_simple)
```

Targeting: Total audience size in Great Britain (country="GB")

API Query from R

```
query_val1 <- GET(url = Credentials, query = query_char) %>% content(as="text",encoding = "UTF-8") %>% fromJSON  
query_val1<-query_val1$data  
query_val1
```

```
##   daily_outcomes_curve estimate_dau estimate_mau_lower_bound  
## 1          0, 0, 0      46394479        45500000  
##   estimate_mau_upper_bound estimate_ready  
## 1            53600000       TRUE
```

```
#The query provides three counts -  1. estimated daily active users (dau)  
#                                two monthly active user  
#                                2. mau_upper_bound  
#                                3. mau_lower_bound
```

```
query_val1$estimate_dau
```

```
## [1] 46394479
```

```
query_val1$estimate_mau_lower_bound
```

```
## [1] 45500000
```

```
query_val1$estimate_mau_upper_bound
```

```
## [1] 53600000
```

API Query from R

```
{  
  "data": [  
    {  
      "daily_outcomes_curve": [  
        {  
          "spend": 0,  
          "reach": 0,  
          "impressions": 0,  
          "actions": 0  
        }  
      ],  
      "estimate_dau": 46394479,  
      "estimate_mau_lower_bound": 45500000,  
      "estimate_mau_upper_bound": 53600000,  
      "estimate_ready": true  
    }  
  ]  
}
```

API Query from R

```
target_query <- paste0('{"age_min":',age_min,
                      ', "age_max":',age_max,
                      ', "genders":[' ,genders, ']' ,
                      ', "geo_locations": {"countries":[' ,countries,''],
                      "location_types": ["home", "recent
                     "]}}')}
```

Let's put it into practice...

Ukraine Crisis: February 24, 2022



BBC NEWS | WORLD SERVICE

Objectives

Can we quantify internally displaced populations in Ukraine using daily Facebook marketing data?

Produce daily sub-national population estimates inside Ukraine disaggregated by age and sex.

Help fill critical data gaps to inform humanitarian response efforts.

Methods

SocArXiv Pre-print

Executive Summary
Introduction
Methods
Results
Discussion
Acknowledgements
License
References
Supplementary Material

Ukraine Crisis: Monitoring population displacement through social media activity

2022-05-30

Douglas R. Leasure^{1,3,6,*}, Ridhi Kashyap^{1,3}, Francesco Rampazzo^{2,1,3}, Benjamin Elbers^{3,1}, Claire Dooley^{4,6}, Ingmar Weber⁵, Masoomali Fatehkia⁵, Maksym Bondarenko⁶, Mark Verhagen¹, Arun Frey¹, Jiani Yan¹, Evelina T. Akimova¹, Robert Trigwell⁷, Brian McDonald⁷, Mohamed Bakr⁷, Alessandro Sorichetta⁶, Andrew J. Tatem⁶, Melinda C. Mills^{1,3}

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³ Nuffield College, University of Oxford

⁴ Department of Population Health, London School of Hygiene and Tropical Medicine

⁵ Qatar Computing Research Institute, Hamad bin Khalifa University

⁶ WorldPop, University of Southampton

⁷ International Organization for Migration, United Nations

* douglas.leasure@sociology.ox.ac.uk



Note: This analysis is a rapid-response effort that has not yet undergone peer-review. All results are provisional and should be interpreted with caution. Version updates will be provided as potential issues are identified, methods are improved, or new data become available.

<https://doi.org/10.31235/osf.io/6j9wq>

Source Data

1. Baseline population sizes (Bondarenko et al 2022)
2. Daily refugee counts (UNHCR 2022)
3. Daily Facebook user counts

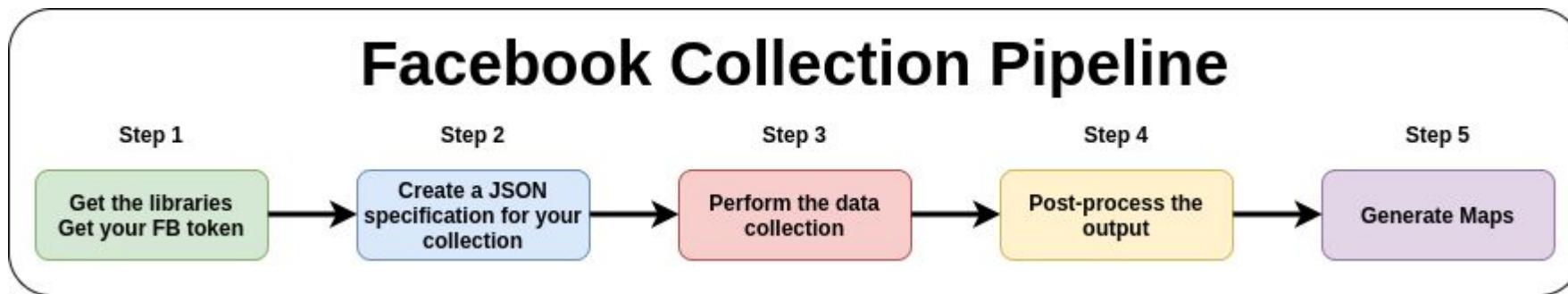
Bondarenko et al. 2022 Gridded population estimates for Ukraine using UN COD-PS estimates 2020, version 2.0. WorldPop and DLR, University of Southampton. [http://doi.org/10.5258/SOTON/WP00735](https://doi.org/10.5258/SOTON/WP00735)

UNHCR. Operational Data Portal. <https://data2.unhcr.org/en/situations/ukraine>

Daily Facebook user counts



THE WORLD BANK



https://worldbank.github.io/connectivity_mapping/facebook_nbs/pipeline.htm

pySocialWatcher software

(Araujo, Mejova, Weber, Benevenuto 2017)

Open-source Python package to help automate data collections from the Facebook marketing API.

<https://github.com/joaopalotti/pySocialWatcher>

Specify Facebook users to query

Demographics:

- **Sex:** Females, males, and all
- **Age:** 5- and 10-year age groups from 20 years old to 65+
- **Language:** All, Ukrainian, and Russian

Specify Facebook users to query

Locations

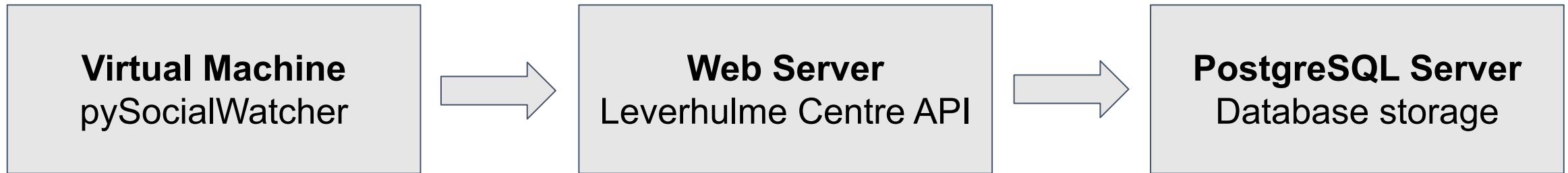
- **Countries:** Ukraine, neighbors, and European Union
- **Sub-national:** Administrative units within Ukraine and neighbors
- **Cities:** Selection within Ukraine and neighbors

Specify Facebook users to query

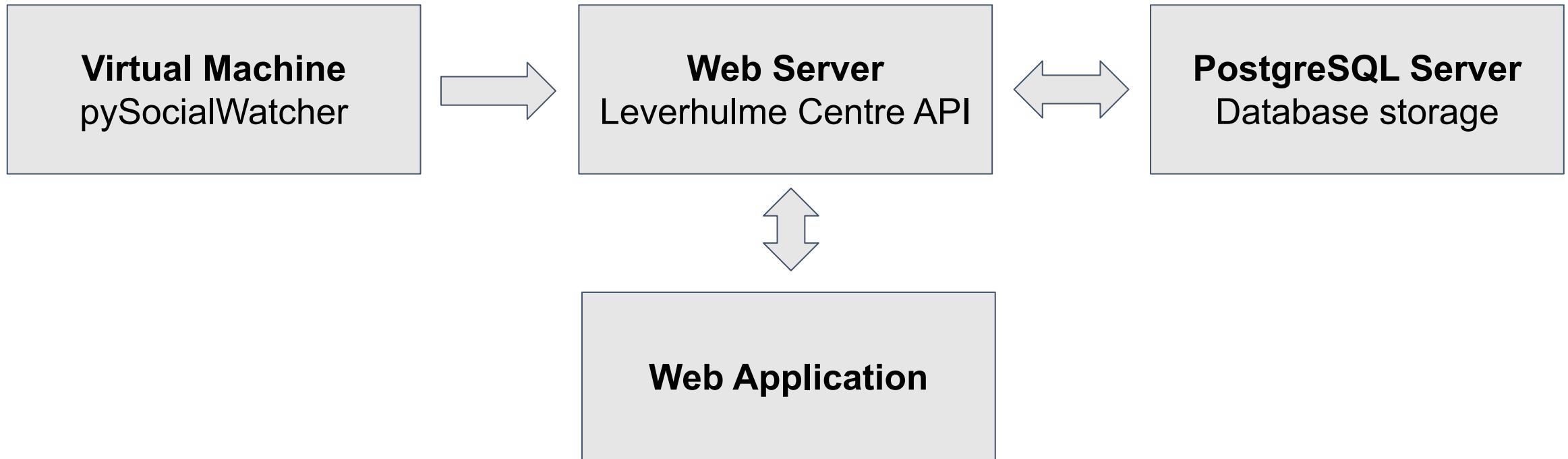
Location types:

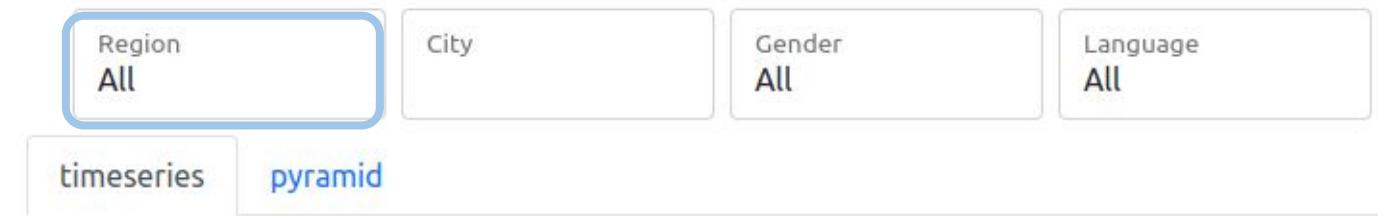
- ***Recent:** Location determined by Meta from users' device data such as GPS, IP address, etc.
- **Home:** “Current city” from Facebook profile
- **Travel_in:** Users whose recent location is more than 100 miles from their home location.

Continuous daily data collections

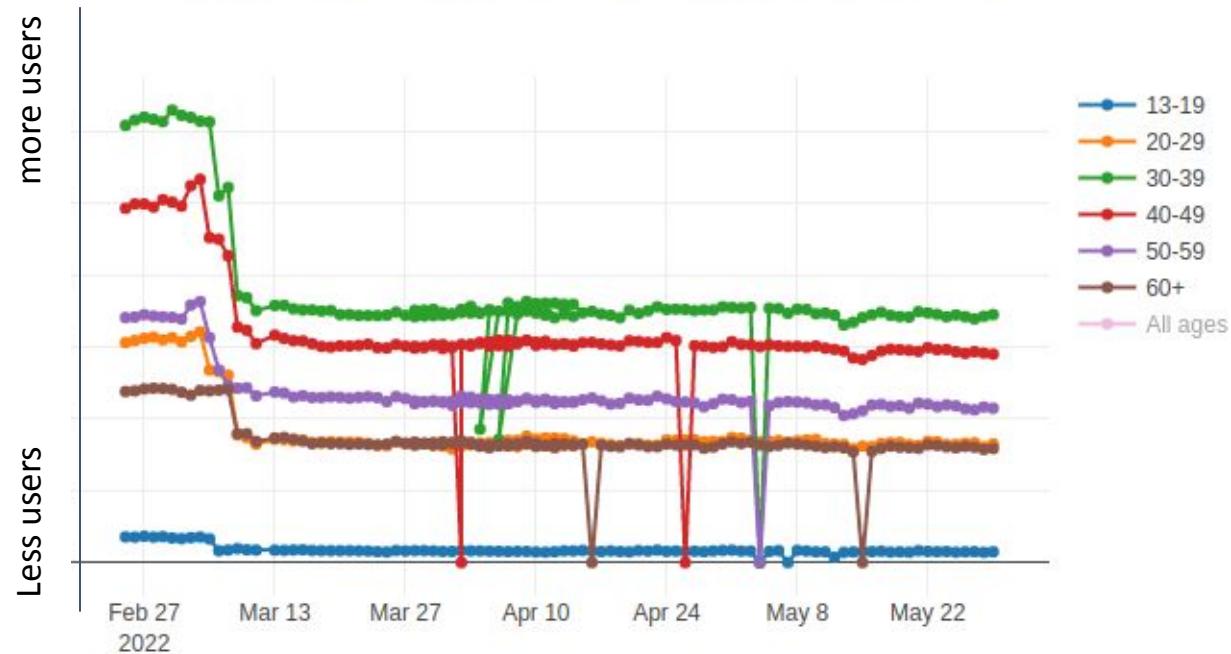


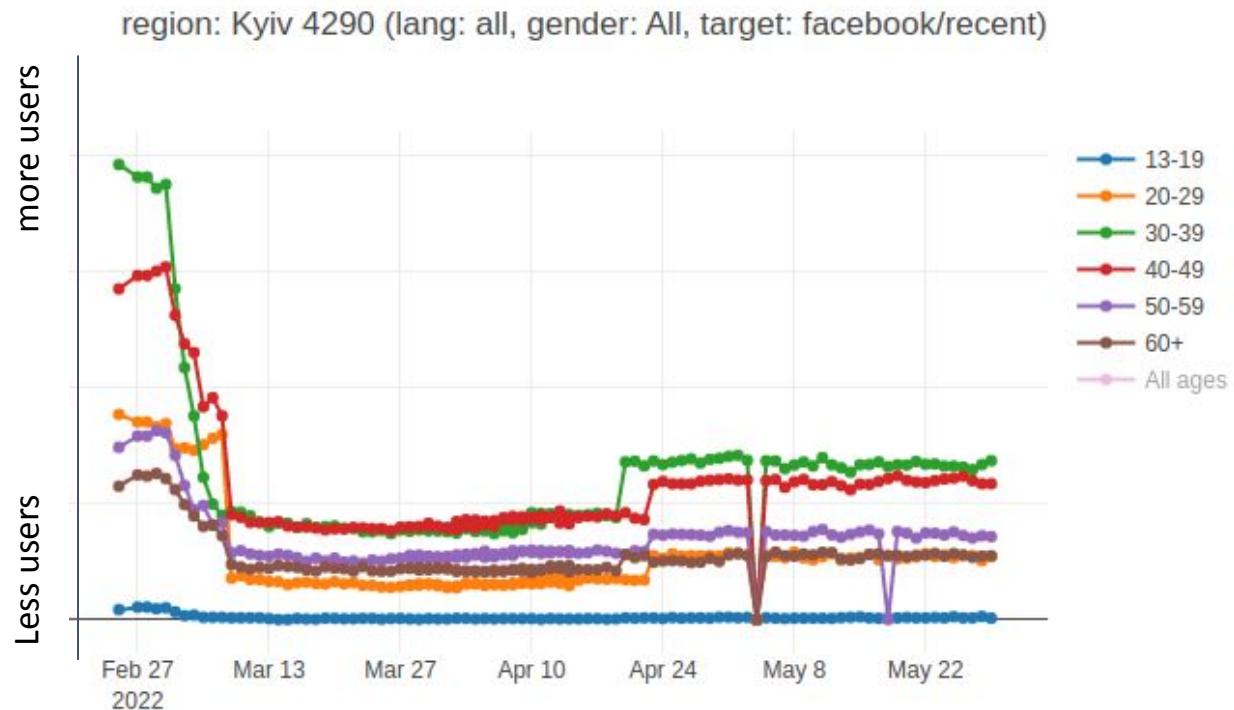
Visualize data in near real-time





country: UA (lang: all, gender: All, target: facebook/recent)





Region
Donetsk Oblast

City
Mariupol

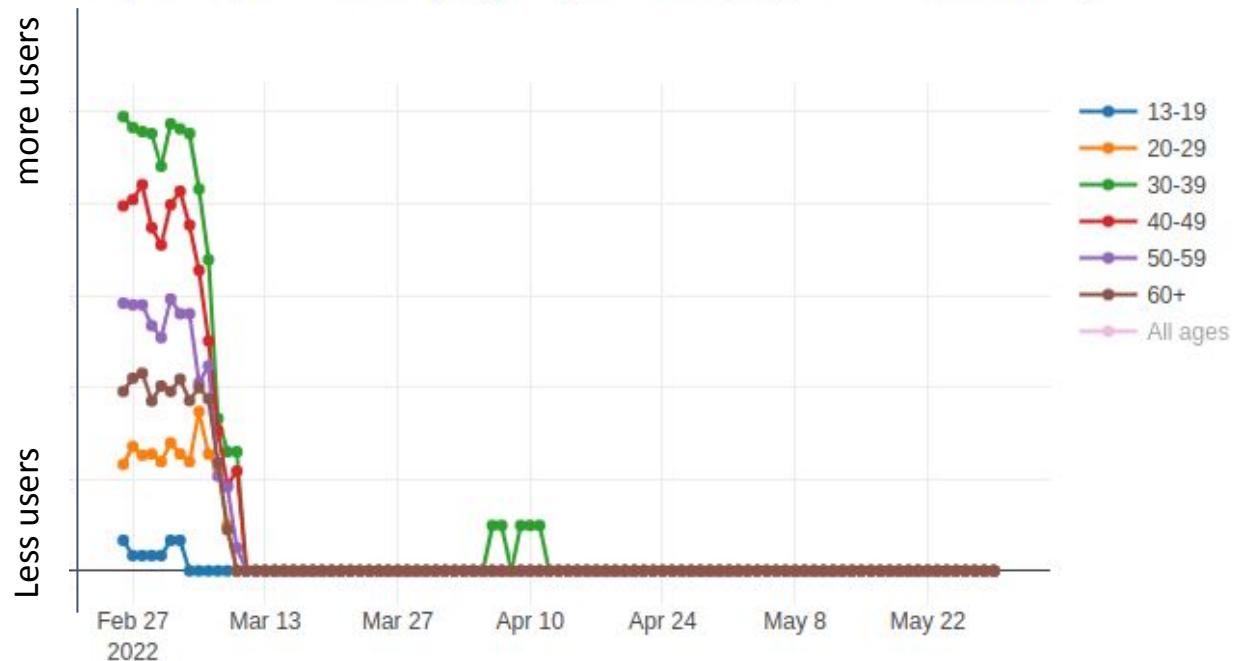
Gender
All

Language
All

timeseries

pyramid

city: Mariupol 2400701 (lang: all, gender: All, target: facebook/recent)



Region
Kyiv

City
All

Gender
All

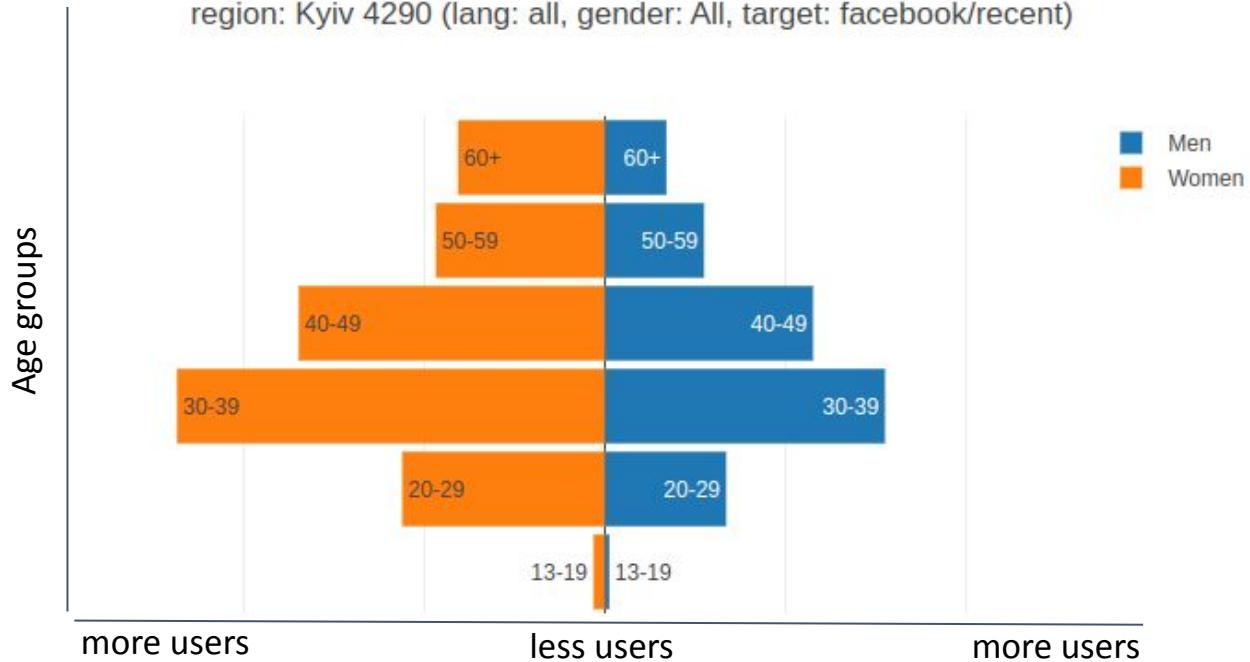
Language
All

timeseries

pyramid

Date:2022-02-25

region: Kyiv 4290 (lang: all, gender: All, target: facebook/recent)



Region
Kyiv

City
All

Gender
All

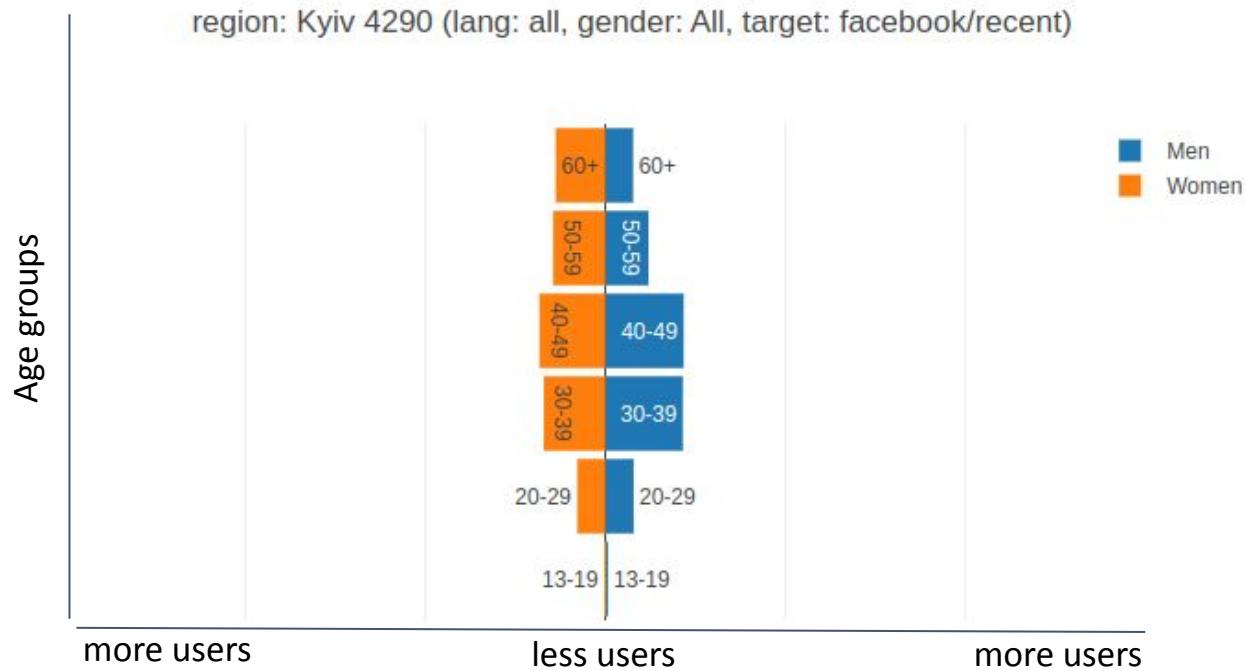
Language
All

timeseries

pyramid

Date:2022-04-01

region: Kyiv 4290 (lang: all, gender: All, target: facebook/recent)



Region
Kyiv

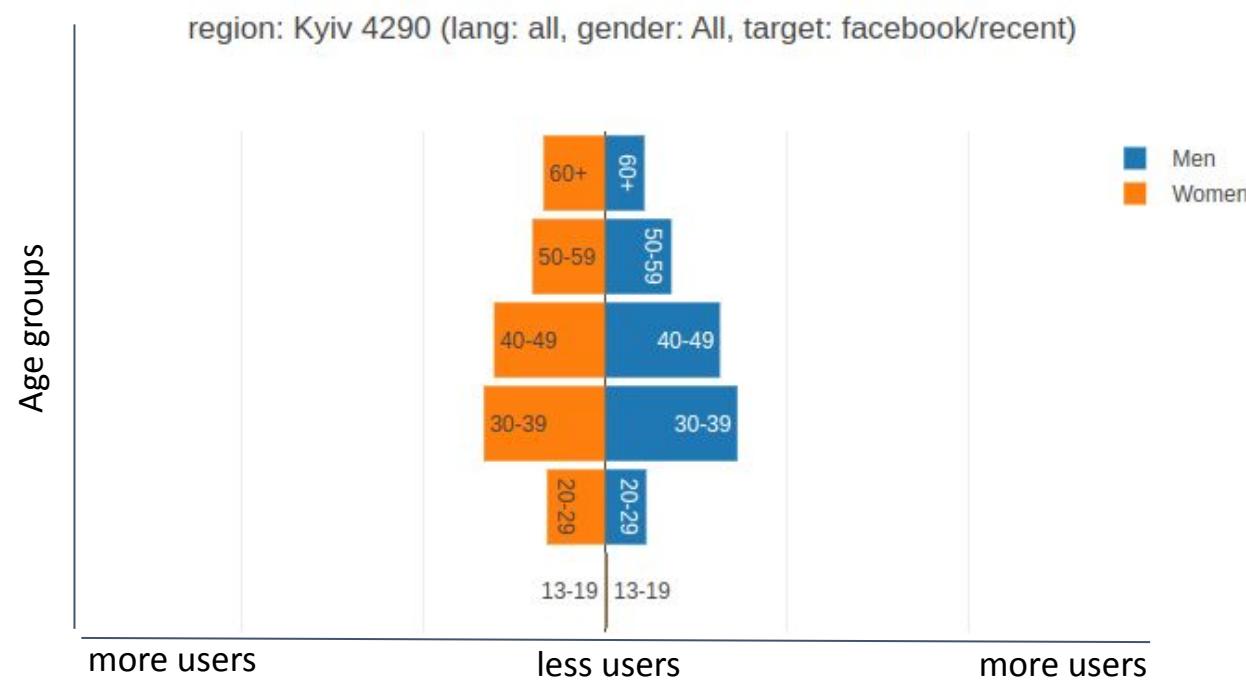
City
All

Gender
All

Language
All

timeseries pyramid

Date:2022-05-29



Population Estimation

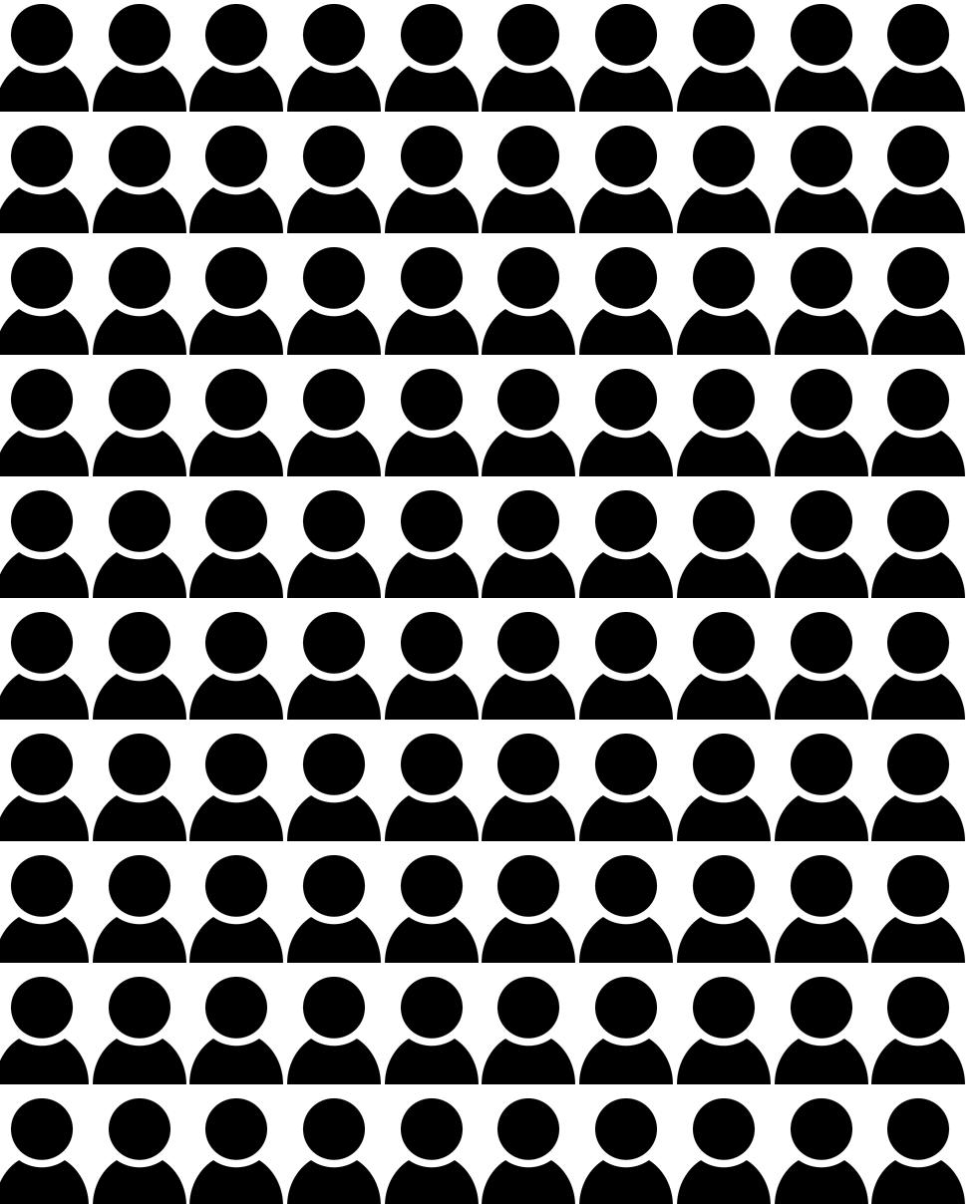
Population Estimation

*30-34 year old women
in Kyiv before the conflict*

Population Estimation

*30-34 year old women
in Kyiv before the conflict*

Baseline population = 100



Population Estimation

*30-34 year old women
in Kyiv before the conflict*

Baseline population = 100

Baseline Facebook users = 25



Population Estimation

*30-34 year old women
in Kyiv before the conflict*

Baseline population = 100

Baseline Facebook users = 25

Baseline Facebook penetration = 25%



Population Estimation

*How many 30-34 year old women
are in Kyiv **today**?*

POPULATION = USERS / PENETRATION

Population Estimation

*How many 30-34 year old women
are in Kyiv **today**?*



Current Facebook users = 15

POPULATION = USERS / PENETRATION

Population Estimation

*How many 30-34 year old women
are in Kyiv **today**?*



Current Facebook users = 15

Baseline Facebook penetration = 25%

POPULATION = USERS / PENETRATION

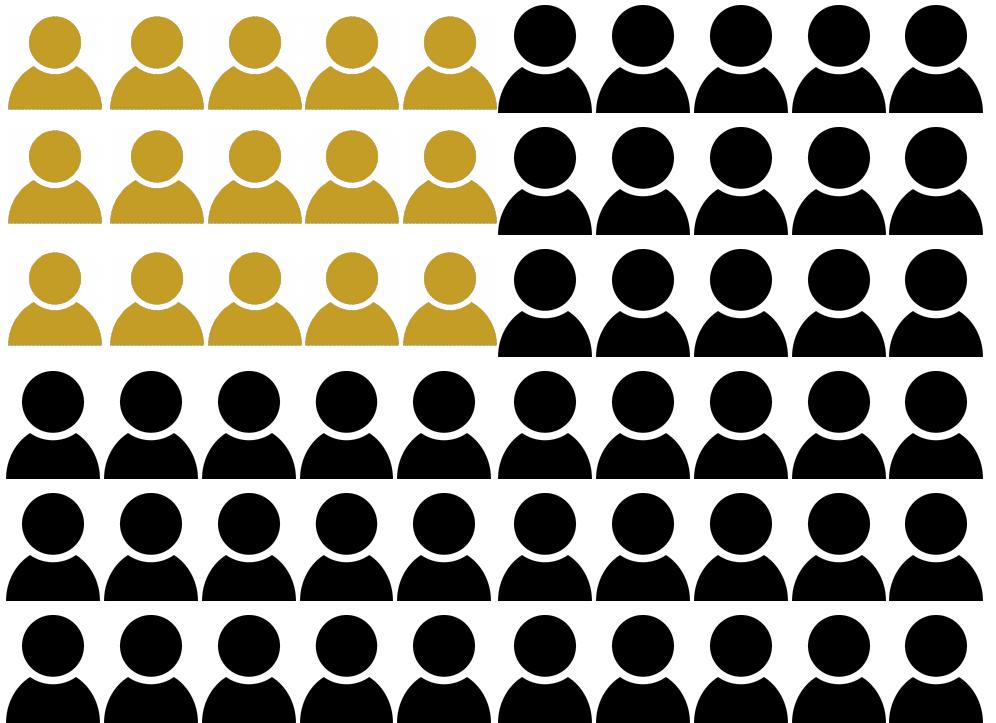
Population Estimation

*How many 30-34 year old women
are in Kyiv **today**?*

Current Facebook users = 15

Baseline Facebook penetration = 25%

Current population = $15 / 0.25 = 60$



POPULATION = USERS / PENETRATION

Non-stationary Facebook penetration rates

Facebook penetration rates have changed due to the conflict.

This would cause under- or over-estimates of *total national population*.

Non-stationary Facebook penetration rates

The sum of our population estimates nationally should equal the baseline population minus refugees.

We apply a daily scaling factor X to ensure population estimates sum to the correct national total:

POPULATION ESTIMATE * X = BASELINE POPULATION - REFUGEES

Under-20 Populations

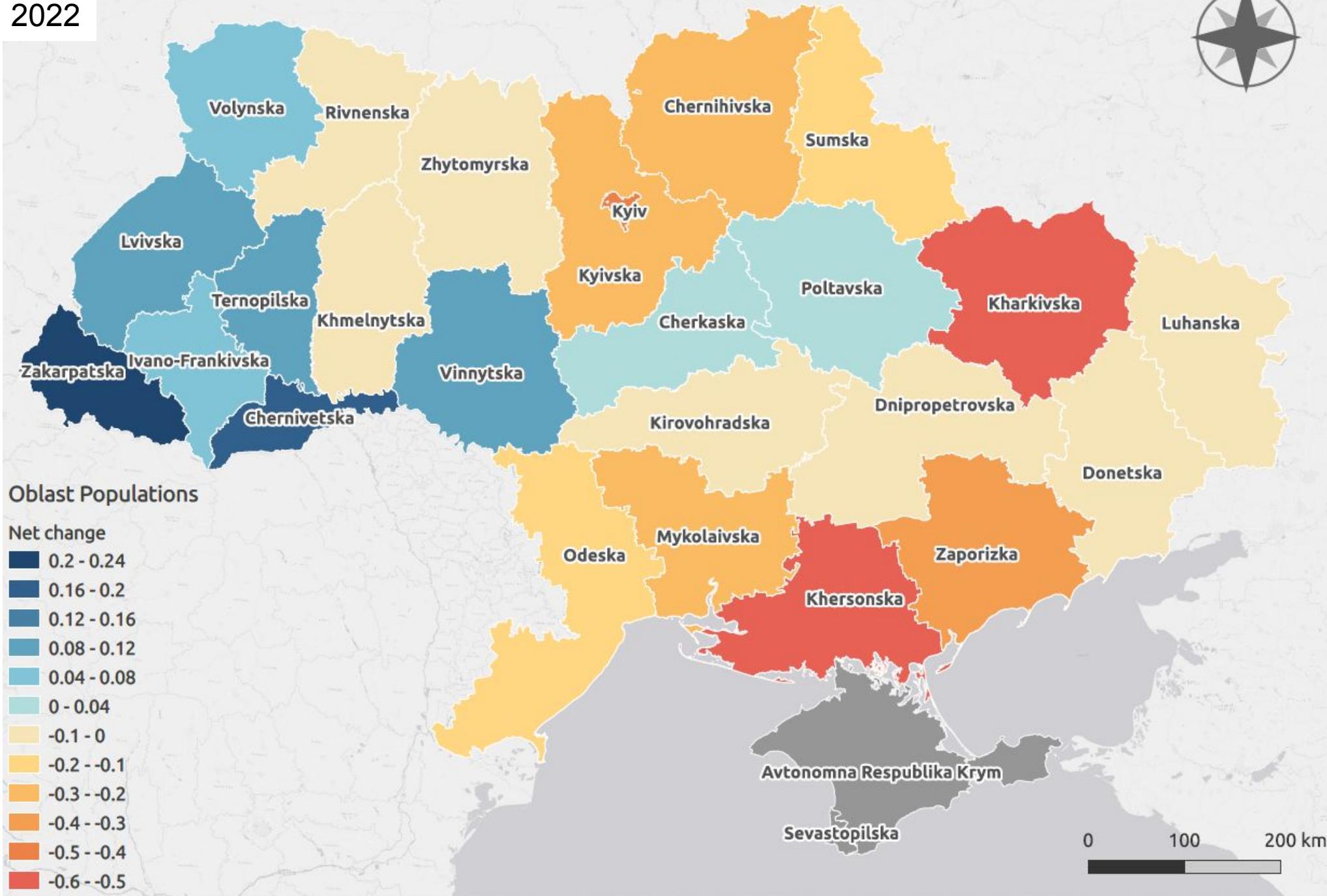
- Ukraine has very few Facebook users under 20 years old
- Facebook has no users under 13 years old

We infer under-20's using baseline age-sex proportions, assuming:

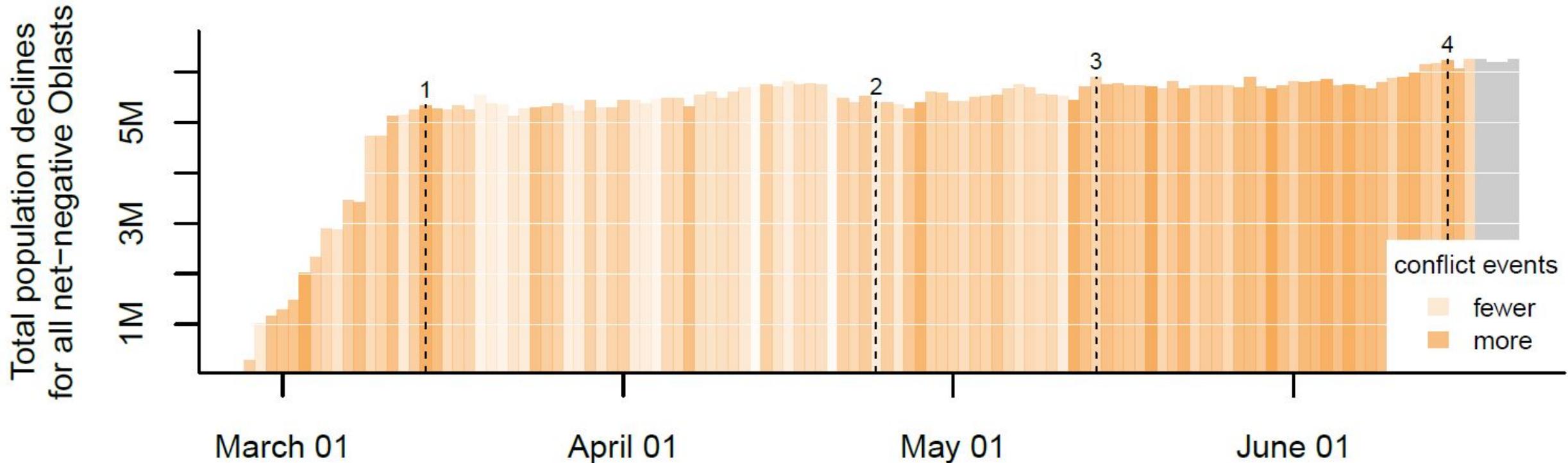
child populations are proportional to women of reproductive age

Results

June 21, 2022



Internal displacement away from home Oblast



1. **Initial evacuation**
Internally displaced
5.3m by March 14th
6.2m by June 21st

2. **Easter Sunday**
- 480k people went home
- Displacement declined across 80% of Oblast

3. **Kherson Evacuations**
- 500k people left but returned a few days later

4. **Kherson Evacuations**
- 500 k people left again

April 22, 2022
6:41 PM GMT+1
Last Updated 2 months ago

World

Ukrainians return home from Poland for special Easter

By Joanna Plucinska and Kuba Stezycki

4 minute read



CNN World Africa Americas Asia Australia More

Ukrainians celebrate Easter in the shadow of war



By Lauren Said-Moorhouse, Isa Soares, Madalena Araujo, Sofiya Harbuziuk, Oleksandra Ochman and Marc Seeman, CNN

① Updated 0628 GMT (1428 HKT) April 24, 2022



Ukrainians gather for Easter in the shadow of war 03:00

May 28, 2022
6:01 PM GMT+1
Last Updated a month ago

Europe

Pro-Moscow Kherson official sees decision 'towards next year' on joining Russia

By Felix Light

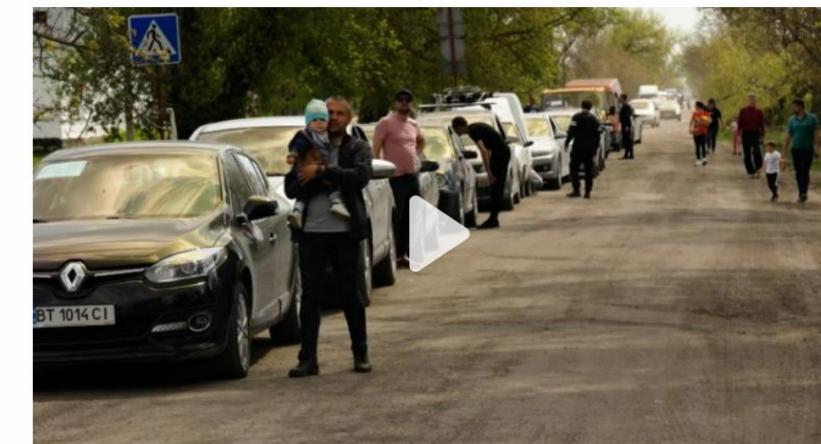
CNN World Africa Americas Asia Australia More

Audio Live

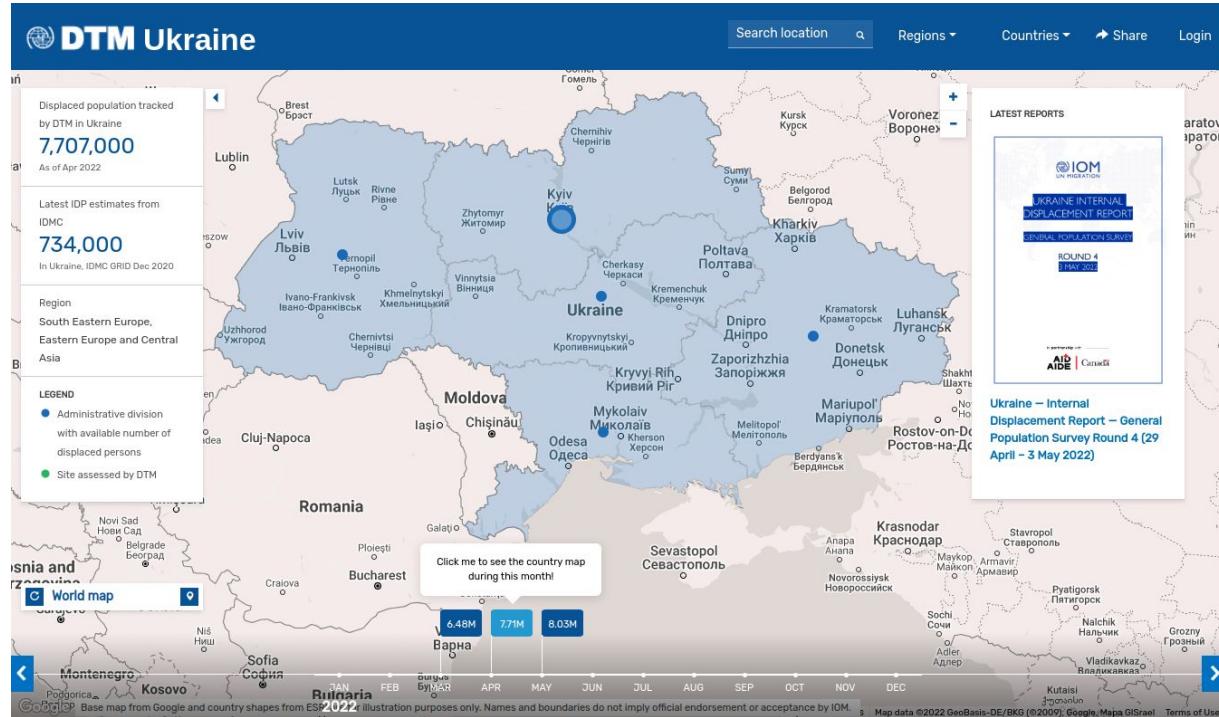
Days-long roadblocks, missiles and 'lots of blood.' Civilians recall terrifying attempts to escape Ukraine's cities as Russian forces tighten grip

By Tim Lister and Sanyo Fylyppov, CNN

① Updated 0755 GMT (1555 HKT) May 21, 2022

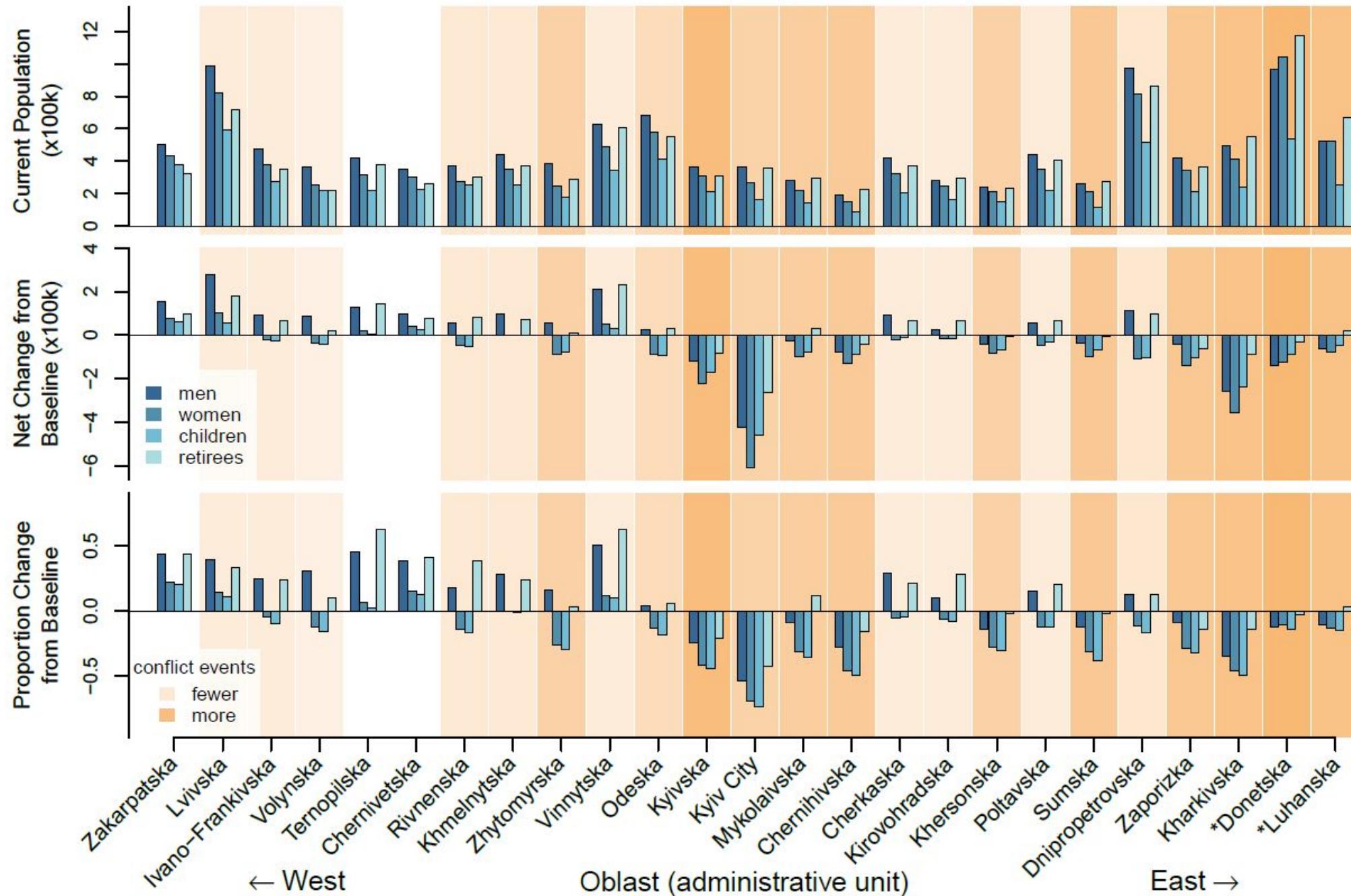


- Estimate IDPs using telephone surveys with 2,000 respondents per survey round.
- Used our population estimates as “triangulation data”.
- Helped revise official IDP estimate in early March from 1.5 million to 6.5 million.

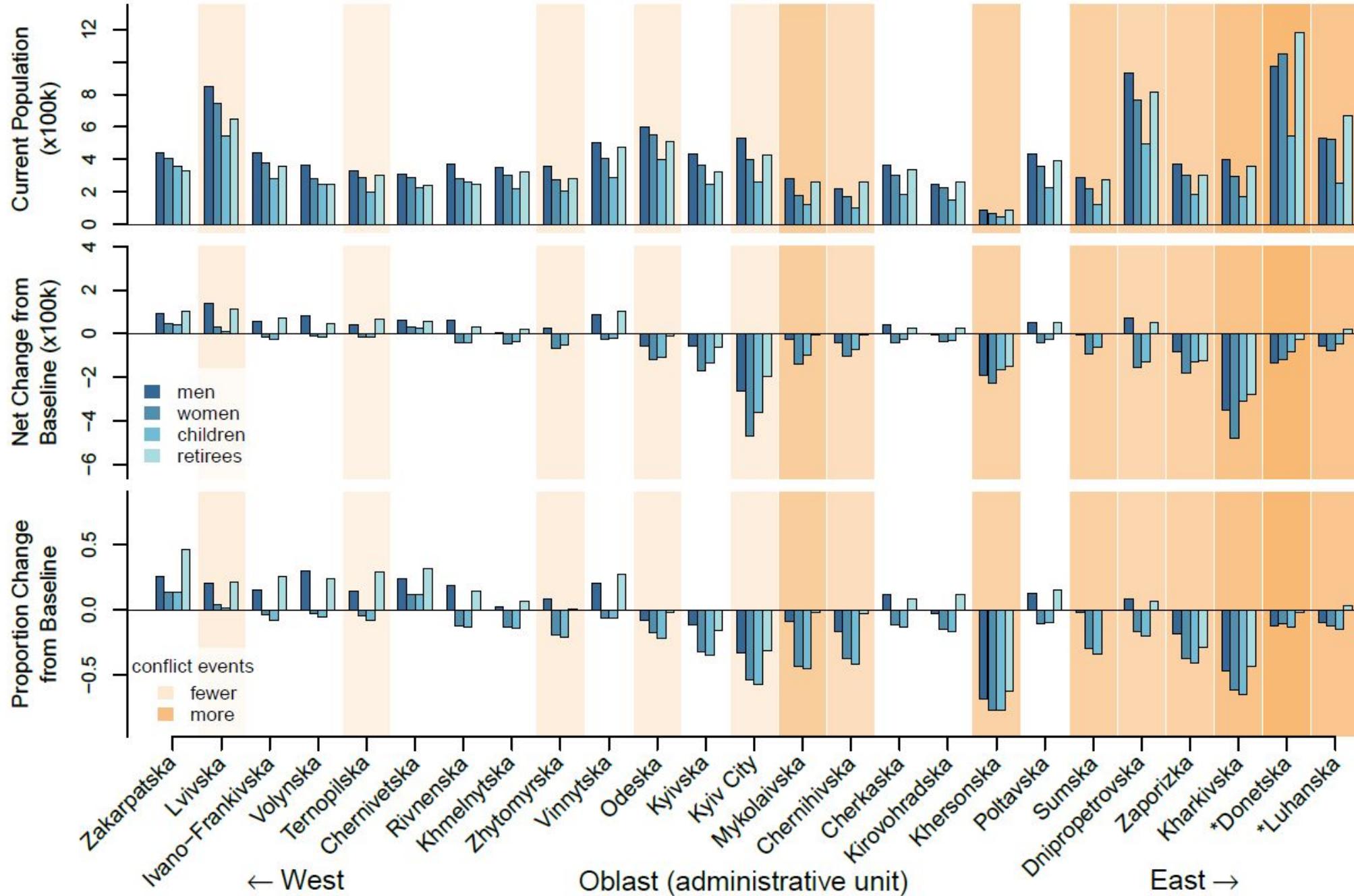


<https://displacement.iom.int/ukraine>

Oblast populations and net changes (March 14, 2022)

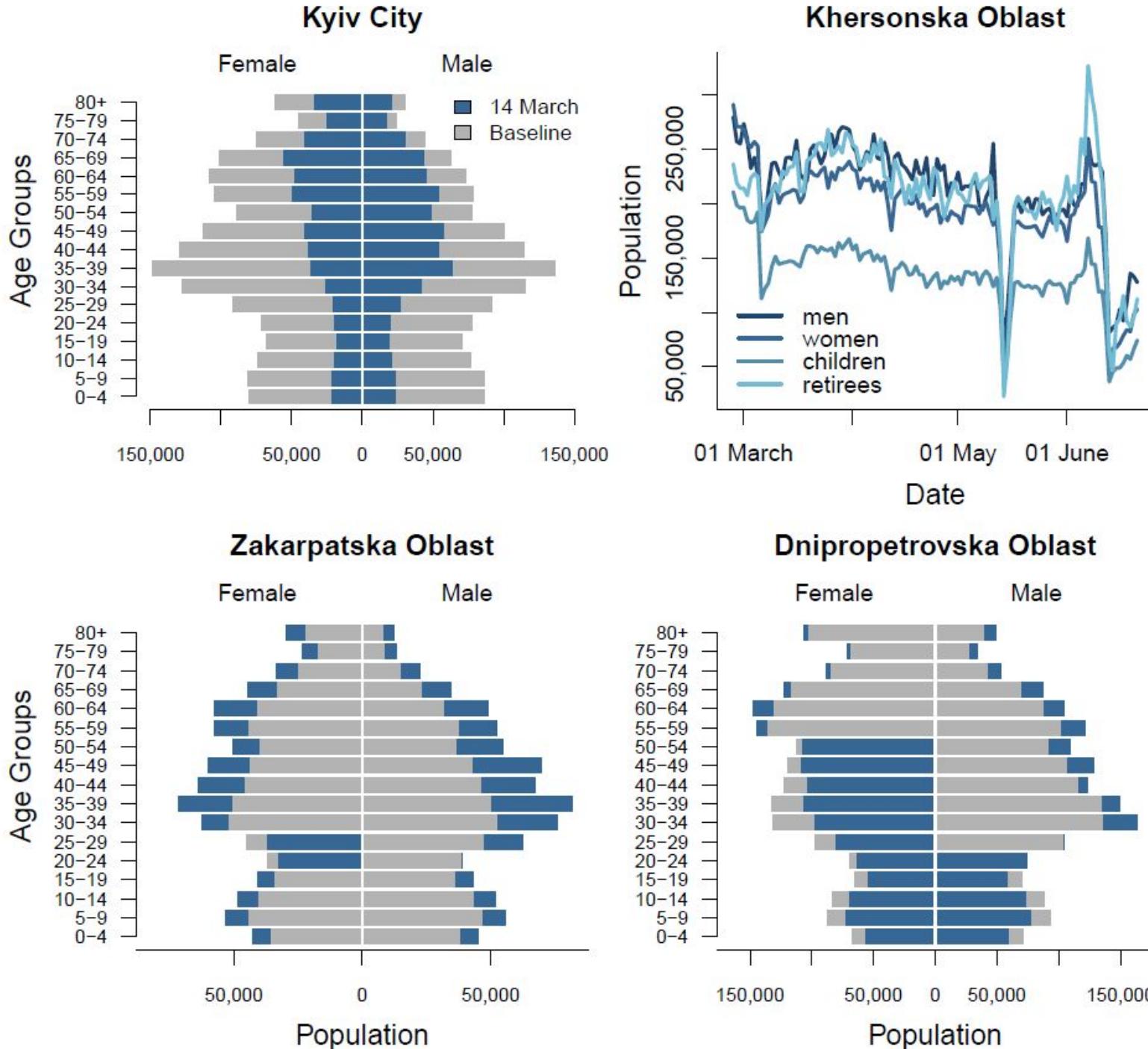


Oblast populations and net changes (June 15, 2022)



Demographics of internal displacement

1. *Top-left:* Large scale evacuations
2. *Bottom-left:* Refugee staging locations
3. *Bottom-right:* Internal safe-haven
4. *Top-right:* Irregular population dynamics



Conclusions

Facebook marketing API (and others) are opening up new possibilities:

- Real-time data
- Census of the Facebook user community

There are also challenges:

- Data quality (e.g. not a representative sample of the population)
- Data licensing
- Research ethics

Thank you!

Questions? Suggestions? Want to get involved?

Contact me: douglas.leasure@sociology.ox.ac.uk

