The experience of studying spatio-temporal patterns of Ukrainian refugees in Estonia based on mobile phone data

Siiri Silm
Ago Tominga, Tiit Tammaru
Mobility Lab, University of Tartu
Motivation

- Around seven million refugees have left Ukraine since Russia started invasion to Ukraine in February 2022.
- Estonia is one important destination country for Ukrainian refugees.
- The receiving countries have no clear overview of the residential distribution of refugees and its changes in the receiving country.
- The ministries in Estonia were in spring 2022 interested in finding out where the children of Ukrainian refugees are likely to go to school, that is, where the Ukrainian refugees have settled permanently.
Objective

• How has the visits from Ukraine-origin people in Estonia changed?
• Which is the spatial distribution and mobility of Ukraine-origin people and how it has changed?

Studied periods:

1) pre-COVID period (2017-2018)
2) COVID period (2020-2022)
3) period of Russian invasion to Ukraine (1.02.-30.06.2022)

• Which are the advantages and challenges in using mobile positioning data in studying refugees?
Passive mobile positioning data

- One mobile network operator
- Inbound roaming data in Estonia (DDR)
  - Time
  - Location
- Joint methodology development with positium
Methodology

• **Visit** - the period from the first call activity until the last call activity in Estonia (Saluveer et.al 2020).

• **Place of residence** - the municipality, where the person has spent the most nights in a 2-week period.

• **Ukrainian refugees** - visitors whose visit to Estonia began after February 1, 2022, and the same visitor had not previously been in Estonia (since February 1, 2020).
Arrival of people from Ukraine

Data source
- Mobile positioning data
- Board Control data
Number of people from Ukraine

Number of people

Date

Feb
Mar
Apr
May
Jun
Jul

Beginning of the 2022 invasion
Number of people from Ukraine

06.04.2023

Siiri Silm  siiri.silm@ut.ee
# Duration of the visits

<table>
<thead>
<tr>
<th>Period</th>
<th>25th percentile</th>
<th>median</th>
<th>75th percentile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-COVID period</td>
<td>2.0 hours</td>
<td>1 day</td>
<td>4 days, 5 hours</td>
</tr>
<tr>
<td>COVID period</td>
<td>0.6 hours</td>
<td>23 hours</td>
<td>6 days, 11 hours</td>
</tr>
<tr>
<td>Period of Russian invasion to Ukraine</td>
<td>3.4 hours</td>
<td>1 day, 18 hours</td>
<td>8 days, 16 hours</td>
</tr>
</tbody>
</table>
Preliminary home municipality

Preliminary home municipalities for Ukrainians after the 2022 invasion (%)
- 0 to 0.5
- 0.6 to 1
- 1 to 2
- 2 to 4
- 4 to 8
- 42

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Changes of home municipalities

- 80% of the refugees stayed in the same settlement unit where they arrived.
- 90% stayed same municipality
- 95% stayed same county.
20% of refugees changed settlement unit.
5% of refugees changed county.
Home municipalities before and after the invasion

Before period of Russian invasion to Ukraine

During the period of Russian invasion to Ukraine

Siiri Silm  siiri.silm@ut.ee
UNIVERSITY OF TARTU Mobility Lab
06.04.2023
Visited municipalities before and after the invasion

**Before** period of Russian invasion to Ukraine

% of Ukrainians having visited municipalities before the 2022 Russian invasion

- Up to 2
- 2 to 5
- 6 to 10
- 11 to 20
- Over 20

**Changes** on the period of Russian invasion to Ukraine

Change of Ukrainians visiting Estonian municipalities after the 2022 invasion

- Increase (in %)
  - More than 4
  - 1 to 4
  - Unchanged
  - -1 to -4
  - -4 to -6
- Decrease (in %)

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Discussion

Advantages
• Monitoring of spatial locations and its persistence, within destination country.

Challenges
• Unusual behaviour from mobile operators side (free calls for refugees, changes in roaming network selection, …)
• Using local SIM cards instead of roaming
• Not the usual tourism or migration behavior
Thank you!

siiri.silm@ut.ee