Coverage challenges to overcome with MPD

Presentation at International Meeting on Measuring Human Mobility

28 March 2019
Undercoverage Issues
<table>
<thead>
<tr>
<th>Country</th>
<th>Visitors</th>
<th>MNO subscriber</th>
<th>Single MNO %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe 1</td>
<td></td>
<td></td>
<td>23.0%</td>
</tr>
<tr>
<td>Europe 2</td>
<td></td>
<td></td>
<td>17.9%</td>
</tr>
<tr>
<td>Europe 3</td>
<td></td>
<td></td>
<td>13.2%</td>
</tr>
<tr>
<td>Europe 4</td>
<td></td>
<td></td>
<td>7.8%</td>
</tr>
<tr>
<td>Europe 5</td>
<td></td>
<td></td>
<td>15.1%</td>
</tr>
<tr>
<td>United States</td>
<td></td>
<td></td>
<td>3.4%</td>
</tr>
<tr>
<td>Europe 6</td>
<td></td>
<td></td>
<td>38.5%</td>
</tr>
<tr>
<td>Europe 7</td>
<td></td>
<td></td>
<td>23.1%</td>
</tr>
<tr>
<td>Asia 1</td>
<td></td>
<td></td>
<td>0.4%</td>
</tr>
<tr>
<td>Europe 8</td>
<td></td>
<td></td>
<td>28.1%</td>
</tr>
<tr>
<td>Europe 9</td>
<td></td>
<td></td>
<td>9.1%</td>
</tr>
<tr>
<td>Europe 10</td>
<td></td>
<td></td>
<td>15.2%</td>
</tr>
<tr>
<td>Europe 11</td>
<td></td>
<td></td>
<td>33.9%</td>
</tr>
<tr>
<td>Europe 12</td>
<td></td>
<td></td>
<td>33.0%</td>
</tr>
<tr>
<td>Europe 13</td>
<td></td>
<td></td>
<td>23.7%</td>
</tr>
<tr>
<td>Europe 14</td>
<td></td>
<td></td>
<td>19.2%</td>
</tr>
<tr>
<td>Asia 2</td>
<td></td>
<td></td>
<td>0.4%</td>
</tr>
<tr>
<td>Europe 15</td>
<td></td>
<td></td>
<td>19.0%</td>
</tr>
</tbody>
</table>

CDR: Roaming subscriber numbers are well below the visitor estimation.
Signaling:
Roaming subscriber numbers are well above immigration data
Method
Data = Reality

Data must reflect reality as closely as possible
Consultancy

Processing 2018

Inbound data extraction → Data formatting → Data forwarding

Data validation → Filters → Extrapolation to whole

Output validation → Disclosure control → Publication

Consultancy + Formula
Each process is designed carefully to bring data closer to the definition of tourism.
Country of Residence

12 month sliding window
>50% of time in ID
Usual Environment

- Less strict than COR
- Not based on trip duration
- Based on weekly regularity

1. Look back 12 months
2. Province level
3. Comes weekly
   1. Present in more than 75% of the weeks
   2. Minimum number of trips 52
Cascading of MPD data across error classes, one year

All trips in MPD → Tourism trips in MPD

- Trip <80s: 2,626,060
- Land Border Accidental: 642,981
- Sea Border Accidental: 662,252
- Seamen Transit: 364,142
- Fishermen: 1,549
- COR: 42,387
- UE: 150,379
- MPD tourism: 2,985,615

TOTAL for 23 kabupatens
Calibration
Cross-Roaming Check

• Individual subscriber data combined from two operators
• Check what is the cross-roaming ratio
• State-of-the-art encryption software & hardware – secure multi-party computation

Market share ratio based on **actual roaming market share**
Share of Cross-Roaming Subscribers

~0% overlap

~90% overlap
Calibration Formula

\[
AT = \left( \frac{MPD}{X_{roam}} \times \frac{1}{1 - P_{nr}} \times \frac{1}{MS} \right) - WCI
\]
Methodology challenges to overcome

Large questions:
• How to bring the detail of official definitions (even COR and UE) down to data level?
• How do we measure the quality of the data when we aim to produce new indicators (no immediate ground truth)?

Specific questions:
• Methods of overcoming all the cases of overcoverage (non-tourism)
• Overcoming the cross-roaming overlap (through secure multi-party computation)
• Overcoming SIM card change (through IMEI?)
• Etc…

Not to be taken lightly! Official statistics development requires clear deliberation
Terima Kasih!