An Evaluation of COVID-19 Dashboards from Cartographic and Epidemiological Perspectives

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Outline

1. Motivation

2. Analysis of Covid-19 dashboards
   - Epidemiological Variables
   - Cartographic Symbolization
   - Animation and Interactivity
   - Speed and Underlying Technologies

3. The Coviz project
Motivation

Early dashboards dominated by symbol maps

Questionable cartographic choices

John Hopkins University (https://systems.jhu.edu/research/public-health/ncov/)
Cumulative vs. Recent Cases

Total Cases

Jul 25, 2020

Weekly Cases

Jul 25, 2020

Cases Per Million

1,000 10,000

New Cases Per Million

1 10 100 1,000
Case Counts vs. Rates

Weekly Cases

Sep 25, 2020

New Cases Per Million

100 1,000 10,000
Why Dashboards?

To determine:

• **Current risk of activity**
• **Rate of increase/spread**
• **Effects of policy**

For historical documentation
Analysis of Existing Dashboards
An Evaluation of COVID-19 Dashboards from Cartographic and Epidemiological Perspectives
39 Dashboards

- Asia
  - (China, Hong Kong, Japan, S.Korea)
- U.S.
  - (GOV, NGO, Volunteers, Educational Entities)
1. Are data variables properly selected, well defined?

2. Are visual variables appropriately symbolized?

3. Is map animation and/or interactivity used effectively?

4. Is the dashboard fast and responsive?
Dashboard Follows General Cartographic Principles

COVID-19 Data by ZIP Code

New York City (https://www1.nyc.gov/site/doh/covid/covid-19-data.page)
Dashboards without Proper Data Variables

- 11 out of 39 (28%) were not well defined or difficult to interpret
- 3 out of 39 (7.7%) did not have a legend or label

Comparing Cumulative and Recent Cases

<table>
<thead>
<tr>
<th></th>
<th>Case Rate per Population</th>
<th>Raw Case Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recent</td>
<td>8 (21%)</td>
<td>8 (21%)</td>
</tr>
<tr>
<td>Cumulative</td>
<td>14 (36%)</td>
<td>30 (77%)</td>
</tr>
</tbody>
</table>
Comparing Population Map and Raw Cases

Examples of improper symbolization

- 14 out of 39 (36%) followed basic cartographic principles
- 16 out of 39 (41%) did not follow basic cartographic principles
- 9 out of 39 (23%) had two or more map themes and followed basic cartographic principles in one map theme but did not follow in other themes.
Examples of Unsuitable Symbols

• 3 out of 39 (8%) were making confusion with unsuitable symbols

Healthmap (https://www.healthmap.org/covid-19/)
Inconsistent Use of Color

Importance of Animation

- 5 out of 39 (13%) have animation and only one dashboard provide interactivity
Importance of Linking and brushing

• 18 out of 39 (46%) have linking and brushing
• 2 (5%) dashboards worked one way
• 21 out of 39 (54%) took more than 5 seconds

• 17 out of 39 (44%) recorded as “slow” by user experience

• 14 dashboards took more than 5 seconds with speed measure and also recorded as slow by UX

• 8 out of 11 (73%) ESRI products took more than 7 seconds

• 5 out of 6 (83%) Mapbox products took more than 5 seconds
Key Takeaways

- Label and Explain
- Visualize the recent data to show current risk
- Choropleth map work best to visualize rates (cases per population)
- Choose suitable symbols and make it clear and simple
- Provide useful function such as animation or interactivity
- Make the dashboard faster and provide good user experiences
Logan, CO vs Denver, CO

Raw count vs Rate
Coviz Highlights:

Begun in March 2020
Completely open source, built on D3
Recent cases shown by default
Focus is always on rates per population
Cartograms provide population context for symbols
Smooth animation with controls
The Covid-19 Open Visualization Project (Coviz)

EIU.EDU/GISCI/COVIZ