The state of practice of COVID-19 tracking systems:
An inventory study

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Abstract
In this poster, we report the preliminary results of an inventory of 149 publicly accessible active COVID-19 tracking systems. Key findings include the frequency distribution of the systems' web domain names, the countries where the systems were created, the languages they support, the visual display format, the map platforms, and the data sources. These findings help to advance the knowledge of the data characteristics and design of pandemic surveillance/tracking systems.

KEYWORDS
countries and languages, COVID-19 tracking system inventory, data sources, URL domain names, visual display formats and map platforms

1 | INTRODUCTION

During the current COVID-19 pandemic, numerous COVID-19 tracking systems and dashboards (e.g., “COVID-19 Map” by Johns Hopkins University, “COVID-View” by The CDC, “Coronavirus [COVID-19]” by WHO) have been developed, and used readily by public health professionals, researchers, and the general public. According to The World Health Organization (WHO), the objectives of COVID-19 surveillance systems include: “(a) monitor trends in the disease where human-to-human transmission occurs; (b) rapidly detect new cases in countries where the virus is not circulating; (c) provide epidemiological information to conduct risk assessments at the national, regional and global levels; (d) provide epidemiological information to guide preparedness and response measures” (WHO, 2020). Shah (2020) also indicated that “Covid-19 has shown the importance of dashboards and visualization for everyone. Various countries and even states/regions have created their own COVID-19 dashboards to educate people on the pandemic.” However, to date, there has been no in-depth examination of the functions and features of these tools, and no sufficient empirical evidence about the accessibility and usability of these tools for the general public, whose daily lives have been threatened by the virus.

The main goal of this study is to investigate the primary functions, features, and data display characteristics of COVID-19 tracking systems. The research questions for the study are as follows:

RQ1. What is the frequency distribution of web domain names of COVID-19 tracking systems?
RQ2. Which countries created COVID-19 tracking systems?
RQ3. Which languages do COVID-19 tracking systems support?
RQ4. What visual display format do COVID-19 tracking systems support?
RQ5. What map platforms were used in COVID-19 tracking systems?
RQ6. What are the data sources for COVID-19 tracking systems?
2  |  PROCEDURE

The COVID-19 tracking system inventory was developed from April 6 to May 21, 2020 by our research team. There is a total of 149 publicly accessible systems documented in the inventory. Among them, 112 (75.17%) were found through using Google as the search engine. Twenty (13.42%) were found using YouTube, 10 (6.71%) were found on news websites. Other search tools used to source tracking systems include Baidu (n = 2, 1.34%), Bing (n = 1, 0.67%), Weibo (n = 1, 0.67%), articles (n = 1, 0.67%), newsletters (n = 1, 0.67%), and more. Search terms used include “COVID 19,” “Coronavirus,” “COVID 19 map,” “新 冠 疫 情” “疫情地图” or other variations. All but three systems were retrieved using English, and three using Chinese search terms. We also used search terms that included individual states in the US, for example, “COVID 19 and California,” “COVID 19 and Washington DC.”

3  |  RESULTS

3.1  |  URL domains

The most frequently occurred URL domain extension was .gov (n = 52, 35%), followed by .com (n = 42, 28.2%), .org (n = 13, 8.7%), then by .edu (n = 4, 2.7%), .live (n = 3, 2.0%). Other generic domain extensions that had only one occurrence include .us, Info, Io, App and Tech. The .cn has six instances (n = 6, 4%). The remaining 24 sites included one instance from EU and 23 individual countries’ URL extensions.

3.2  |  Tracking systems by countries

There were 37 originating countries. Ninety-seven (64.67%) systems were from the US, eight systems were from China (5.33%), three were from the UK (2%), two each were from Australia, Germany, Hong Kong, India, Japan, Korea, and Switzerland. Our sample was biased towards tools in the U.S., as we performed U.S. state related searches. Table 1 includes all the countries where tracking systems were created.

3.3  |  Languages

Twenty-four languages were used in the 149 systems, with several systems having multilingual versions. The most common language was English (n = 127, 85.23%), followed at a distant second by Chinese (n = 13, 8.72%), Spanish (n = 8, 5.37%), Korean (n = 5, 3.36%), German (n = 3, 2.01%), Japanese (n = 3, 2.01%), Russian (n = 3, 2.01%), Vietnamese (n = 3, 2.01%), and Haitian Creole (n = 2, 1.34%). The remaining 14 other languages were used by one system.

3.4  |  Visual display format

Data visualization features and display format were documented in terms of the presence or absence of maps, tables, various chart formats including line charts, column charts, bar graphs, area charts, and pie charts. More than 80% (n = 120) of the systems contained a map, mostly interactive maps, and over 76% (n = 114) of the systems had tables. The types of charts in the order of frequency, were line charts (n = 86, 57.72%), column charts (n = 84, 56.38%), bar graph (n = 45, 30.20%), area charts (n = 34, 22.82%), and pie charts (n = 28, 18.79%). Figure 1 shows the proportion of the systems’ visual display capabilities.

3.5  |  Platforms

Twenty-six kinds of platforms were used for tracking systems’ map displays. The most popular platform was ArcGIS by ESRI (n = 30, 20.13%), followed by HERE (n = 22, 14.77%), and OpenStreetMap (n = 22, 14.77%). Figure 2 displays all the platforms used by the 149 tracking systems.

3.6  |  Data source

A total of 71 data sources were used by the 149 systems. Among them, 19 were repeated sources, 52 were single
sources. The most frequent data source was local state governments in the U.S. (n = 63, 42.28%). The second most frequent data source was Johns Hopkins Center for Systems Science and Engineering (CSSE) (n = 35, 23.49%). Government-provided data sources were utilized for 31 systems (20.81%). Beyond that, sources such as
WHO (n = 21, 14.09%), The CDC (n = 14, 9.40%), The National Health Commission of China (n = 10, 6.71%), and European Centre for Disease Prevention and Control (ECDC) (n = 9, 6.04%) were used by multiple tracking systems. Examples for data sources that were used for one system only included Lancet, стопкоронавирус, Helsingin Sanomat, and BBC. Table 2 lists data sources that were used by more than one system.

### Table 2 Data sources used by more than one COVID-19 tracking systems

| Data source                                      | Frequency/percentage |
|-------------------------------------------------|----------------------|
| State Government                                | 63 (42.28%)          |
| Johns Hopkins University Center for Systems Science and Engineering | 35 (23.49%)          |
| Government of Various Countries                 | 31 (20.81%)          |
| WHO                                             | 21 (14.09%)          |
| CDC                                             | 14 (9.40%)           |
| National Health Commission of People's Republic of China | 10 (6.71%)           |
| ECDC                                            | 9 (6.04%)            |
| News Media, The COVID Tracking Project          | 6 (4.03%)            |
| Wikipedia, Worldometer, DXY                      | 5 (3.36%)            |
| 1point3acres (for USA), The New York Times      | 4 (2.68%)            |
| BNO News                                        | 3 (2.01%)            |
| USAfacts, China CDC, NBC News, Baidu            | 2 (1.34%)            |

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### 4 Conclusion

According to French and Monahan (2020), it is necessary to establish a broader understanding of COVID-19 surveillance systems as “[t]his understanding could productively contemplate ‘any tracking and monitoring, whether systematic or not, of health-related information,’ as well as any tracking and monitoring that could be enrolled into the work of determining the health status of people and populations” (pp. 4–5). With the current status of the COVID-19 pandemic, it is essential that COVID-19 tracking systems provide accurate, reliable, and timely data. With reports (e.g., Madrigal & Meyer, 2020) on how various tracking systems including The CDC and state governments in the U.S. mixing data about tests, and thereby producing an inaccurate picture of the outbreak status, our inventory study presents an overall understanding the state of practice of such systems. Note that our inventory at this stage is heavily biased towards the U.S. dashboards, systems originating from countries with more than 10,000 coronavirus cases will be searched and included. Our next steps will involve the heuristic evaluation and usability testing of selected systems. It is hoped that our findings will advance the knowledge of the data characteristics and design of pandemic surveillance/tracking systems.

### References

French, M., & Monahan, T. (2020). Dis-ease surveillance: How might surveillance studies address COVID-19? Surveillance & Society, 18(1), 1–11.

Madrigal, A. C., & Meyer, R. (2020, May 21). How could the CDC make that mistake? The Atlantic. Retrieved from https://www.theatlantic.com/health/archive/2020/05/cdc-and-states-are-misreporting-covid-19-test-data-pennsylvania-georgia-texas/611935/

Shah, N. (2020, April 8). Data visualization and dashboards in the era of Covid-19. Retrieved from https://opendatascience.com/data-visualization-and-dashboards-in-the-era-of-covid-19/

World Health Organization (WHO). (2020). Global surveillance for human infection with Coronavirus disease (COVID-19). Geneva, Switzerland: WHO. Retrieved from https://apps.who.int/iris/bitstream/handle/10665/330857/WHO-2019-nCoV-Surveillance Guidance-2020.3-eng.pdf?sequence=1&isAllowed=y

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