

MANUAL

Dashboards for data visualization

COVID-19 GLOBAL RESPONSE

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With support of



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Introduction

Since March 2020, the 510 Data Team of the Netherlands Red Cross (NLRC) has aided various National Societies (NS) with the visualization of a range of different datasets with the use of dashboards. This manual provides the information that one needs to know when planning on building and using dashboards.

Product in a nutshell

A dashboard is a tool for visualizing vast amounts of data in one place. The 510 Data Team creates dashboards using different platforms, to portray various datasets. Dashboards are used by decision-makers to help them identify priority target areas, groups etc.

What is a dashboard and what can you do with it?

A dashboard is a data visualization tool which makes information easily accessible by providing at-a-glance views of multiple datasets. Some examples of the data the NLRC 510 Data Team has visualized are:

- The COVID-19 Risk Index^{1,2}, see manual “Framework for COVID-19 Risk Index”
- Twitter data about vaccination rumors, see manual “Rumor tracking tools”
- Forecasting of COVID-19 cases in Occupied Palestinian Territory (OPT), see manual “COVID-19 Forecast Tool”
- Beneficiaries reached with COVID-19 information campaign, see section “Example Dashboards” of this manual.

The data is usually -but not always- projected on a geographical area and so dashboards often contain a geographical map, see section “Example dashboards” of this manual.

Who is a dashboard for?

A dashboard can be used by any organisation looking to incorporate data in internal decision-making processes such as governments, intergovernmental organisations or non-

¹ Poljansek, K., Vernaccini, L. and Marin Ferrer, M., INFORM Covid-19 Risk Index, EUR 30240 EN, Publications Office of the European Union, Luxembourg, 2020, ISBN 978-92-76-19203-9, doi:10.2760/596184, JRC120799.

² Marin-Ferrer, M., Vernaccini, L. and Poljansek, K., Index for Risk Management INFORM Concept and Methodology Report — Version 2017, EUR 28655 EN, doi:10.2760/094023

governmental organisations. Examples of Red Cross or Red Crescent National Societies that have used dashboards until now are:

- The Philippine Red Cross
- The Mali Red Cross
- The Yemen Red Crescent Society

Why use a dashboard?

A dashboard offers the user a clear view of data which accelerates decision-making processes. For example, a geo-based dashboard showing risk assessment, allows the user to quickly identify the regions at risk and which major factors are contributing to that risk.

Another example is a dashboard which shows rumour spreading on Twitter regarding vaccines. The dashboard allows the user to identify trends in misinformed opinions of a country's population and organise targeted campaigns to spread scientifically correct information. Thus, by using dashboards, the user can make informed decisions by using data that is available at a glance.

Choosing the right platform to build a dashboard

There are several platforms which support building a dashboard. The choice to use one platform over the other can depend on the type and amount of data you want to visualize, if the specific computer program is available etc. Here we have compiled a table offering a clear comparison between the most-used platforms by the 510 Data Team. It includes the following software:

1. Excel (Microsoft)
2. PowerBI (Microsoft)
3. Google Data Studio (Google)
4. ArcGIS

| | Excel | PowerBI | Google Data Studio | ArcGIS |
|-----------------------|---------|--------------|-------------------------|---------|
| Data visualization | ✓ | ✓ | ✓ | ✓ |
| Geospatial data | | 3 | 4 | ✓ |
| Interactive interface | | ✓ | ✓ | ✓ |
| GIS skills needed | | | | ✓ |
| Allows collaboration | 5 | ✓ | ✓ | |
| Offline use | ✓ | Partly | | ✓ |
| Mobile view | ✓ | ✓ | ✓ | ✓ |
| Windows compatible | ✓ | ✓ | ✓ | ✓ |
| MacOS compatible | ✓ | | ✓ | 6 |
| Open-source | | | ✓ | |
| Trial | 30 days | 60 days | Unnecessary | 21 days |
| Data limit | | 1 GB/dataset | 5x10 ⁶ cells | |

³ Limited resolution interactive maps for PowerBI are only available through plugins such as Mapbox Visual. Alternatively, ArcGIS can be integrated into PowerBI (paid).

⁴ Limited resolution interactive maps for Google Data Studio are available through Geocharts or Google maps

⁵ Only for Office 365 Business

⁶ Requires running ArcGIS on a Windows partition or in a virtual environment

Case study

Dashboards have been widely used in different projects as a means of visualizing and managing large amounts of data and information in one location. In essence, a dashboard is a data visualization tool that allows the end user to easily access and see information from multiple datasets. The data will be visualized in a clear and concise way, making it easy to use by decision makers whilst identifying priority areas. The advantage of such a tool is its ability to visualize different types of data, such as number of beneficiaries reached in an awareness campaign or a geographical vulnerability assessment.

Additionally, developing a dashboard is not limited to one platform; there are several platforms that can provide that support. Choosing the platform will depend on the amount and type of data that will be used, as well as the available budget for acquiring commercial programs versus open-source software. The COVID-19 Risk Index, an index that was implemented and used by multiple countries, was visualized differently depending on the NS' access to certain programs. The following are examples of what dashboard program NS used to visualize the COVID-19 Risk Index, see manual "Framework for COVID-19 Risk Index".

| National Society | Platform Used |
|-----------------------------------|---------------|
| Central African Red Cross Society | ArcGIS |
| Malawi Red Cross Society | PowerBI |
| Mali Red Cross | ArcGIS |
| Uganda Red Cross Society | ArcGIS |
| Yemen Red Crescent | PowerBI |

Data responsibility

Datasets

Dashboards can be used to visualize different types of data. The types of data that can be found in a dashboard include, but are not limited to, COVID-19 Risk Index data, geographical boundaries data, data collected using Kobo forms, number of beneficiaries reached and tweets. The data can be obtained directly from the NS but could also be acquired from third parties in a situation where there is a lack of publicly available data.

Data processing

The data that is inputted into the dashboard have been, for the most part, processed prior to input. Depending on the software used for the dashboard, different visualization options and tools can be used. Some platforms will require processing the inputted data to produce a visual output. The information, in some cases, is projected on a geographical area, resulting in the dashboard showcasing a map of the country of interest. Additionally, data on the COVID-19 cases can be automatically updated through programming scripts that source the data from the John Hopkins website (<https://coronavirus.jhu.edu/map.html>).

Non-discrimination

A dashboard is a tool for visualizing metrics for the purpose of managing vast amounts of information in one place. If, for any reason, discrimination could result from this product, for example due to regional differences in data availability within a certain country, it would need to be addressed in the data collection and processing phase.

Human oversight

The data used for the dashboard needs to be collected, cleaned and processed by one or more staff members. The staff member will need to have the adequate skills, based on the platform and software being used, in order to produce reliable and valid visualizations. Depending on the type of data available and the monetary capacity of the NS to purchase licences, a decision will have to be made on the type of program and platform to use. The dashboard can ultimately be used by any organisation looking to incorporate data in internal decision-making processes such as governments, intergovernmental organisations or non-governmental organisations.

Risks

The risk depends on the platform and its respective software that the user will choose for creating their dashboard. For instance, when using the open platform of Google Data Studio, the data is not as protected when compared with other available platforms. Limitations tied to the use of either of the dashboard platforms mentioned could be found in the section of this manual “Choosing the right platform to build a dashboard”.

Requirements

User knowledge

In this section we describe the skills that someone would need to build a dashboard such as the ones presented in this manual. In addition to the skills mentioned below, it is crucial the user has the following skills:

- Analytical thought
- Problem solving attitude
- Data responsibility, see section “Data responsibility” of this manual
- Visualization skills

To collect, process and subsequently visualize the data with a dashboard, the user will need the following skills:

- **Internet browser:** intermediate level
- **Excel (or other spreadsheet-based program):** intermediate to advanced level
- **Programming skills (Optional):** intermediate to advanced level Python or other programming language
- **Data visualization skills:** Several programs or platforms can be used for visualization of the data. For each program or platform, different user knowledge requirements apply.
 - For **PowerBI** and **Google Data Studio** essential skills are:
 - Good computer and internet knowledge
 - Good skills in a spreadsheet-based program (e.g., Microsoft Excel)
 - Experience or training in PowerBI or Google Data Studio
 - For **ArcGIS** or **QGIS**, all of the abovementioned skills are needed as well as:
 - GIS skills (e.g., ArcGIS experience or training)
 - Intermediate to advanced programming skills in R, Python or other programming language (optional)

Hardware

Below you can find the hardware requirements to collect, process and subsequently visualize the data with a dashboard. Broadly speaking you need a computer with an internet connection. Below you can find the hardware requirements for each program.

- **Microsoft Excel (2019):**
 - Processor: Windows OS: 1.6 GHz, 2-core / macOS: Intel processor
 - RAM: Windows OS: 4 GB; 2 GB (32-bit) / macOS: 4 GB
 - Disk space: Windows OS: 4 GB / macOS: 10 GB of available disk space
 - Screen resolution: Windows OS: 1280 x 768 (32-bit requires hardware acceleration for 4K and higher) / macOS: 1280 x 800
 - Graphics Windows OS: DirectX 9 or later, with WDDM 2.0 or higher for Windows 10 (or WDDM 1.3 or higher for Windows 10 Fall Creators Update) / macOS: No graphics requirements
- **Python (versions: 2.7.X, 3.6.X):**
 - Processor: Intel Atom® processor or Intel® Core™ i3 processor
 - Disk space: 1 GB
 - Operating systems: Windows* 7 or later, macOS, or Linux
- **PowerBI:**
 - Processor: 1 GHz 64-bit (x64) processor
 - RAM: 1 GB available
 - Screen resolution: 1440x900 or 1600x900 (16:9)
- **Google Data Studio:**
 - A computer with an internet connection (program online)
- **ArcGIS:**
 - Processor: 2 cores hyperthreaded
 - RAM: 8 GB
 - Disk space: 32 GB
 - Platform x64 with SSE2 extensions
 - Screen resolution :1024x768 or higher at normal size

- Display: 24-bit colour depth
- Visualization cache: the temporary visualization cache for ArcGIS Pro can consume up to 32 GB of space

Software

Below we list the software required for data visualization with a dashboard. Depending on the platform, one or more of the following software is required:

- Mozilla Firefox or another internet browser
www.mozilla.org/en-US/firefox/new/
- Excel (Microsoft Office) or other spreadsheet-based program
www.microsoft.com/en-us/microsoft-365/excel
- Installed Python (optional)
www.python.org/downloads/
- Installed R (optional)
www.cran.r-project.org/mirrors.html and optionally
www.rstudio.com/products/rstudio/download/) or
- PowerBI Desktop by Microsoft (Windows 8 or later)
First install .NET Framework (Microsoft)
<https://dotnet.microsoft.com/download/dotnet-framework/net48>
Then install PowerBI Desktop
<https://www.microsoft.com/en-us/download/details.aspx?id=58494>
- ArcGIS pro
First install .NET Framework (Microsoft)
<https://dotnet.microsoft.com/download/dotnet-framework/net48>
Then install ArcGIS pro
<https://pro.arcgis.com/en/pro-app/latest/get-started/download-arcgis-pro.htm>
- Google Data Studio
 - Internet browser (see above)
 - Google account
 - Country needs to be supported. Unsupported countries (can only view dashboards):
 - People's Republic of China
 - Sudan

- Iran
- Iraq
- Crimea
- North Korea
- Syria
- Cuba

Time

Time needed to build a dashboard is the sum of time needed to proceed through the steps listed below. The duration of each step depends on a number of factors.

- **Collection of the data:** The duration of this depends on user skills, IT infrastructure, data availability, the amount of data that needs to be collected and if the data collection is automated.
- **Cleaning and processing the data:** For example, normalizing the data (e.g., for the COVID-19 Risk Index calculation) and/or cleaning the data (e.g., in the case of survey data). The duration of this depends on user skills and the complexity and amount of data.
- **Building the dashboard:** The duration of this depends heavily on user skills, the amount and complexity of data that needs to be visualised.

For reference, the 510 Data Team of the NLRC needed about 14 hrs to build the COVID-19 Risk Index dashboard for Uganda Red Cross (excluding the calculation of the index).

The product

What does a dashboard consist of?

A dashboard can be found in the form of

- A non-interactive report with infographics made with a spreadsheet-based program such as Excel or Google Sheets
- An interactive report with infographics made in PowerBI or Google Data Studio
- An interactive report with infographics and geospatial information made in ArcGIS

Locations to view example dashboards

Here we provide the links and locations to find example dashboards made by the 510 Data Team of the NLRC.

- Dashboard visualizing the COVID-19 Risk Index in Syria, made with ArcGIS Online: <https://nlrc.maps.arcgis.com/apps/opsdashboard/index.html#/3fd5737dcec54073975c46ecc8417f6c>
- Dashboard visualizing the Twitter data collected for the tracking of COVID-19 vaccine-related Tweets in the Philippines, visualized with PowerBI (external link): <https://app.powerbi.com/reportEmbed?reportId=cb62aa1b-7ae5-4f71-83df-3861ed955df3&autoAuth=true&ctid=d3ab9790-6ae2-4bd8-aa5e-02864483e7c7&config=eyJjbHVzdGVyVXJsIjoiaHR0cHM6Ly93YWJpLW5vcnRoLWV1cm9wZS1jLXByaW1hcnktcmVkaXJlY3QuYW5hbHlzaXMud2luZG93cy5uZXQvIn0%3D>

Advantages & Limitations

There are several advantages and limitations linked to using dashboards for the visualization of data. Here we briefly discuss these.

- Whereas the creation of a dashboard requires certain skills as listed in this manual, the user of the dashboard does not need to have the same skillset in order to use it.
- The user is dependent on the availability of certain programs. Programs such as PowerBI or ArcGIS are not openly available. Limitations tied to the use of either of the dashboard platforms mentioned in this manual can be found in the overview table in section “Choosing the right platform to build a dashboard” of this manual.

sheet. The dashboard is non-interactive for the end user. District-specific dashboards were also made, which are linked to the national dashboard shown here, and which are updated whenever the national dashboard shown is updated. Input data in csv format. The data have been collected through KoBo Collect. For more information, refer to “[Manual ZRCS dashboard](#)” [internal link].

Example of a dashboard in Google Data Studio

This dashboard displays COVID-19 Risk communication and community engagement activities for the Uganda Red Cross Society (**Figure 2**). New data are loaded automatically into the dashboard from the input data sheet. The dashboard is interactive for the end user, who can select the displayed district, date range etc. Input data in csv format. The data have been collected with a KoBo form.

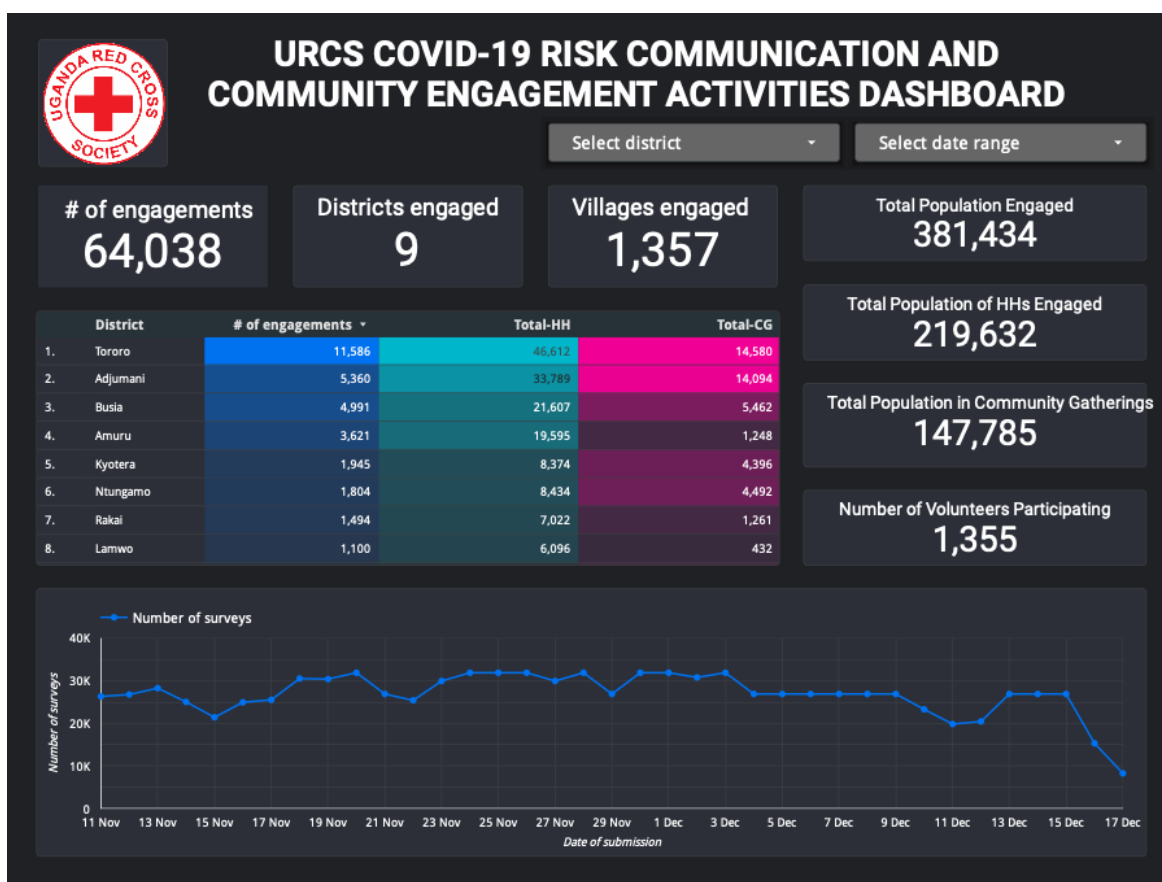


Figure 2 • Example of a dashboard made in Google Data Studio for the Uganda Red Cross Society. The dashboard shows a dynamic report of common rumors, beneficiaries reached, and other data nation-wide.

Example of a dashboard in PowerBI (1)

This dashboard displays Twitter rumour tracking data for the Philippine Red Cross (Figure 3). New data are loaded automatically into the dashboard from the input data sheet. The dashboard is interactive for the end user, who can select the navigation page, district, tweet topics etc. Geodata are displayed by means of a Mapbox plugin. Input rumour data in csv format, input geodata in shapefile format. The rumour data have been collected from Twitter, and included geolocation.

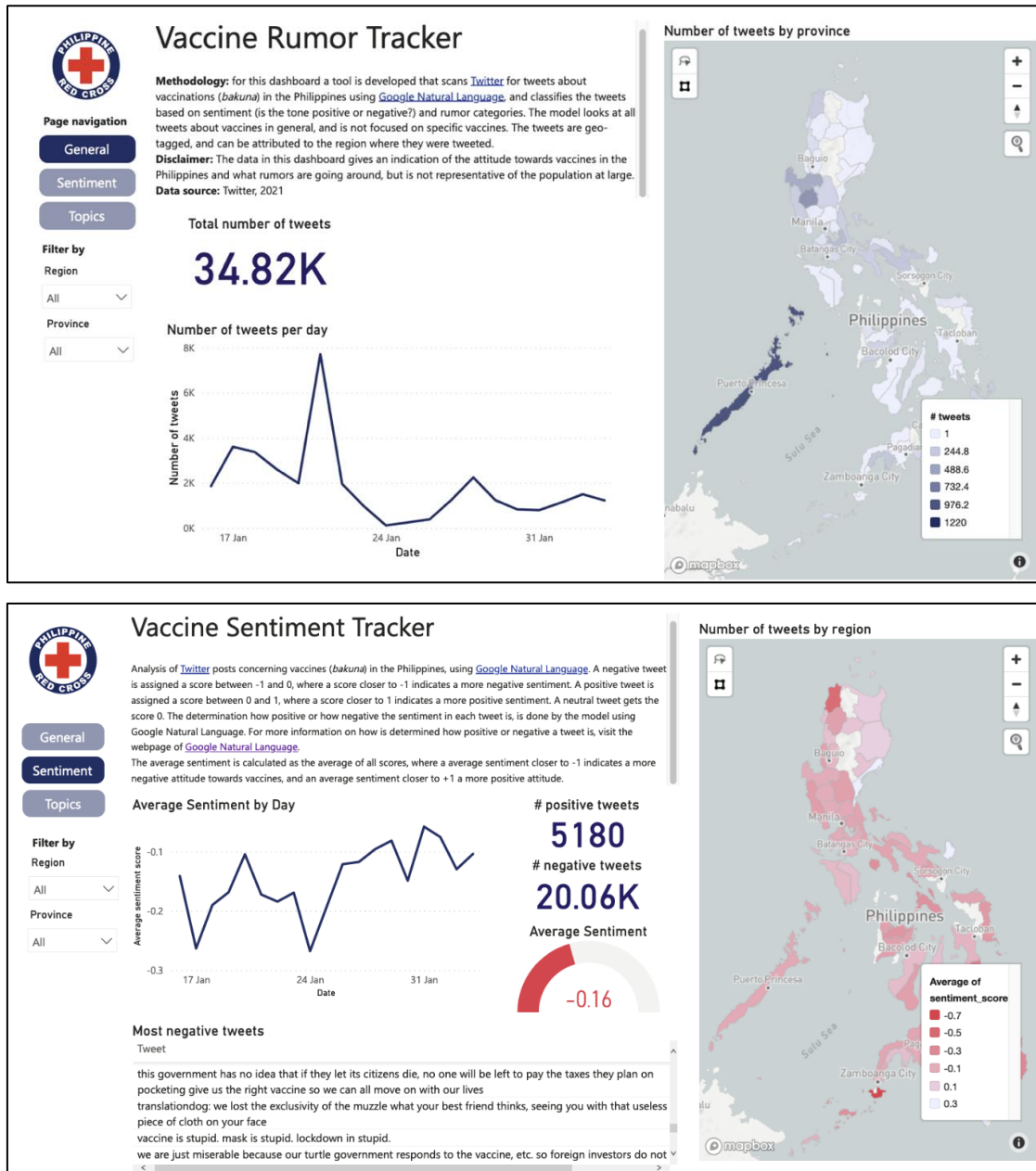


Figure 3 • Example of a dashboard made in PowerBI for the Philippine Red Cross. The upper and lower panels show the “General” and “Sentiment” pages of the dashboard, respectively. The dashboard shows a dynamic report of vaccine-related rumors that can be viewed both at a nation-wide and regional level.

Example of a dashboard in PowerBI (2)

This dashboard displays beneficiaries reached by a COVID-19 awareness campaign for the South Sudan Red Cross (**Figure 4**). New data are loaded automatically into the dashboard from the input data sheet. The dashboard is interactive for the end user, who can select the displayed district, shown month, week etc. Input data in csv format. Geodata are displayed by means of a Mapbox plugin. Input rumour data in csv format, input geodata in shapefile format.

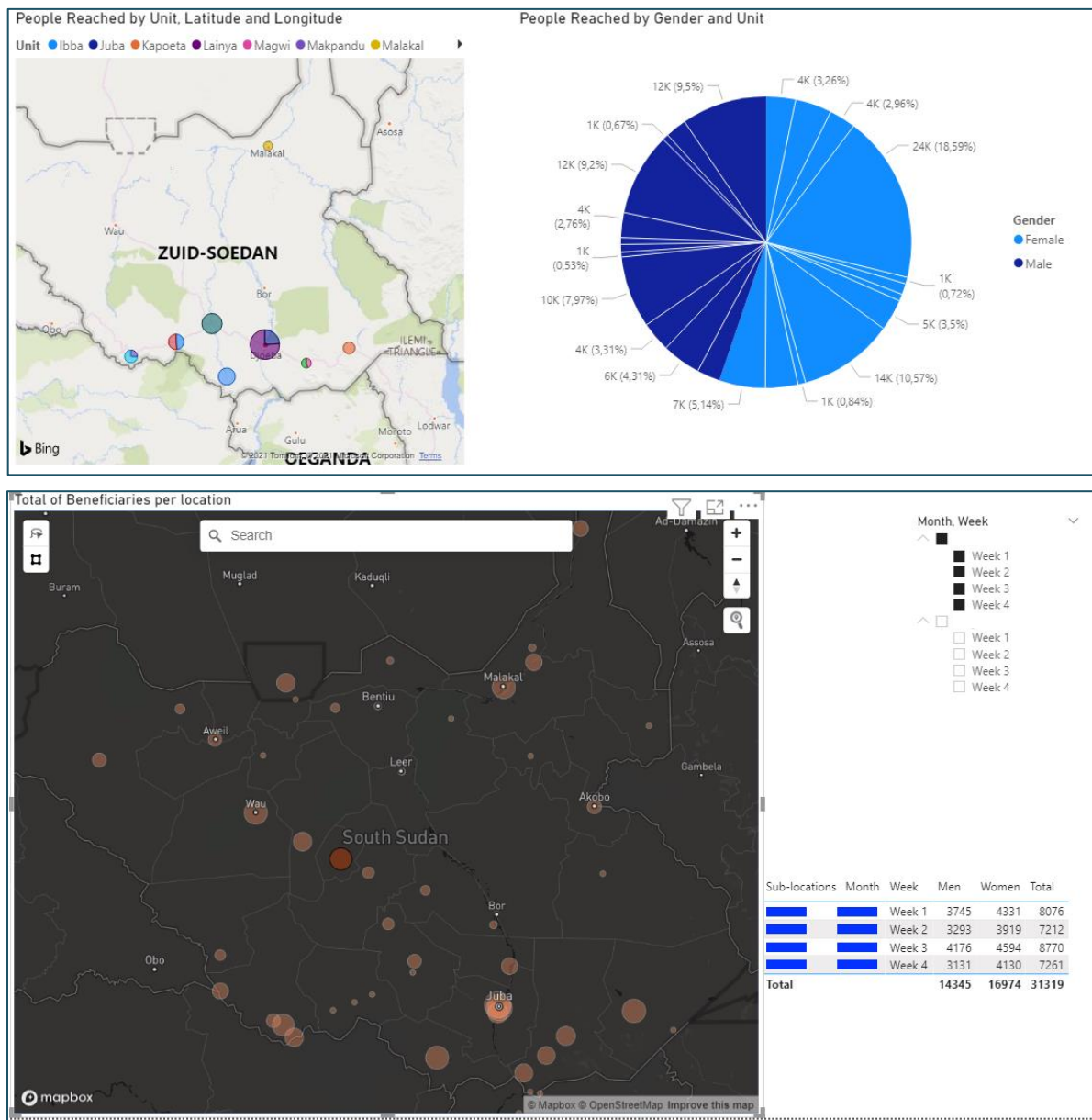


Figure 4 • Example of a dashboard made in PowerBI for the South Sudan Red Cross. The upper and lower panels show different pages of the dashboard. The dashboard shows a dynamic report of beneficiaries reached by a COVID-19 awareness campaign that can be viewed at a regional level.

Example of a dashboard in PowerBI (3)

This dashboard displays COVID-19 related data in Lebanon for forecasted COVID-19 cases and ICU entries (**Figure 5**). The dashboard was made by the Lebanese Red Crescent in PowerBI and its data are loaded automatically into the dashboard from the input data sheet. The dashboard is interactive for the end user, who can select the shown governorate. Geodata are displayed by means of an ArcGIS plugin. Input forecasted data in csv format, input geodata in shapefile format.

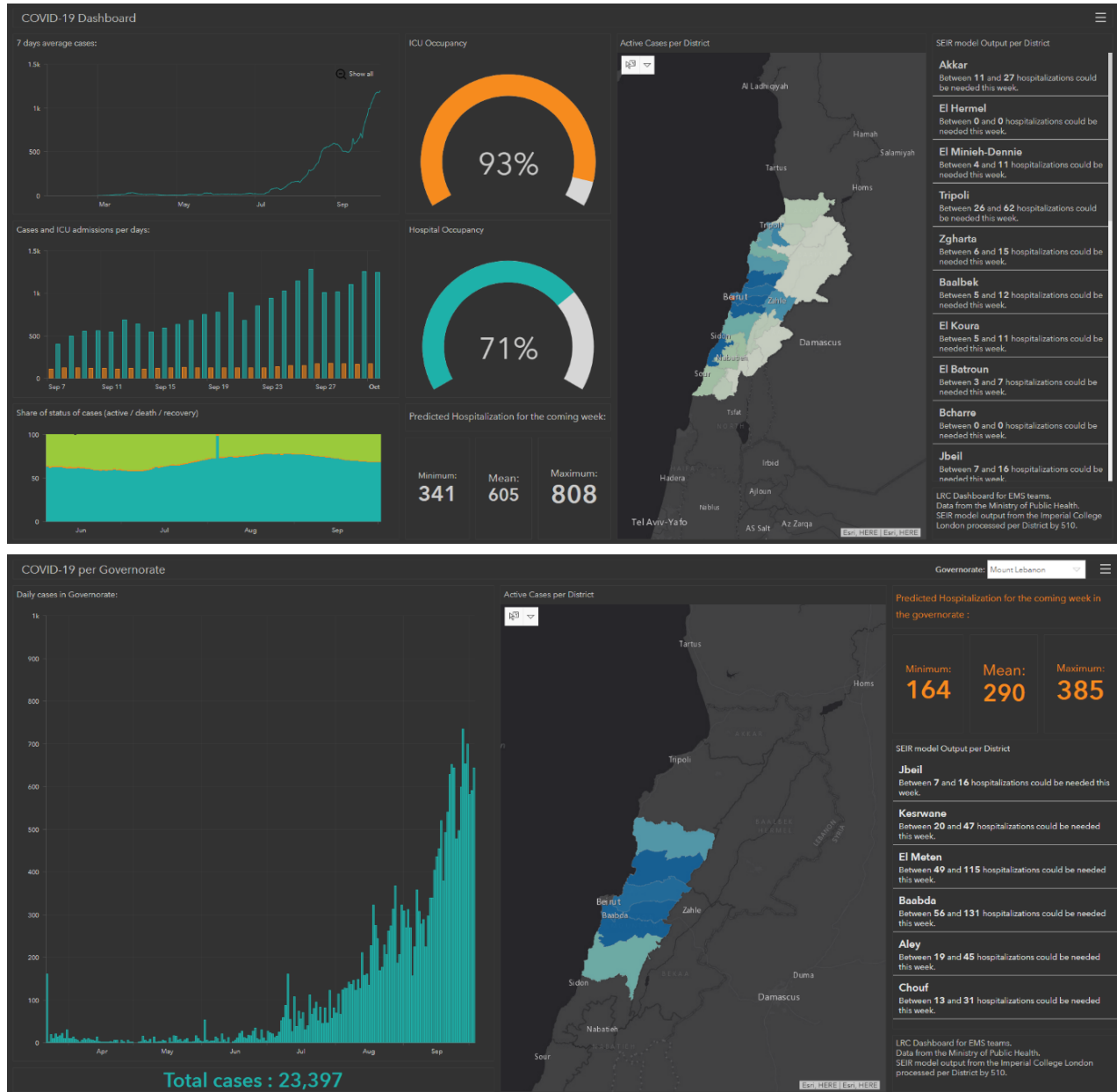


Figure 5 • Example of a dashboard made in PowerBI by the Lebanese Red Crescent. The upper panel and lower panels show COVID-19 forecasts for the national and subnational level, respectively.

Example of a dashboard in ArcGIS

This dashboard COVID-19 Risk Index data for the Syrian Arab Red Crescent (**Figure 6**). The input data are csv files containing the COVID-19 Risk Index data and shapefiles to create the map in ArcGIS online. The data are not updated automatically unless the COVID-19 Risk Index is calculated again and the input datasheet changed. The dashboard is interactive for the end user, who can select the shown dimension and district. For more information on the COVID-19 Risk Index, please refer to the manual “Framework for COVID-19 Risk Index”.

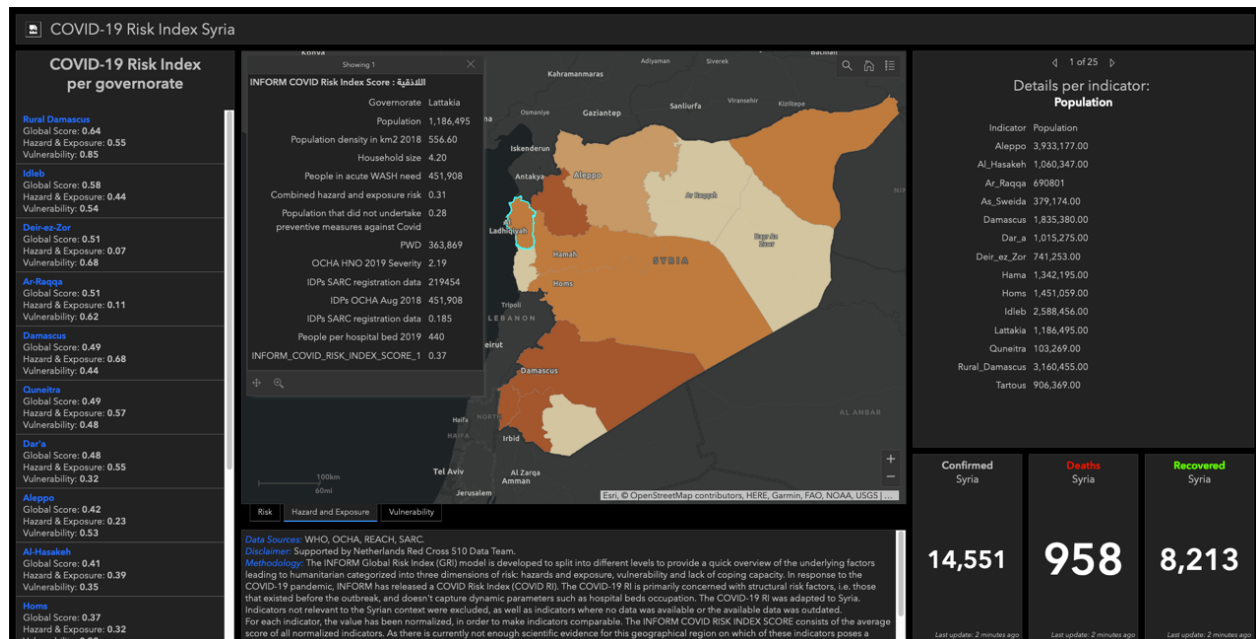
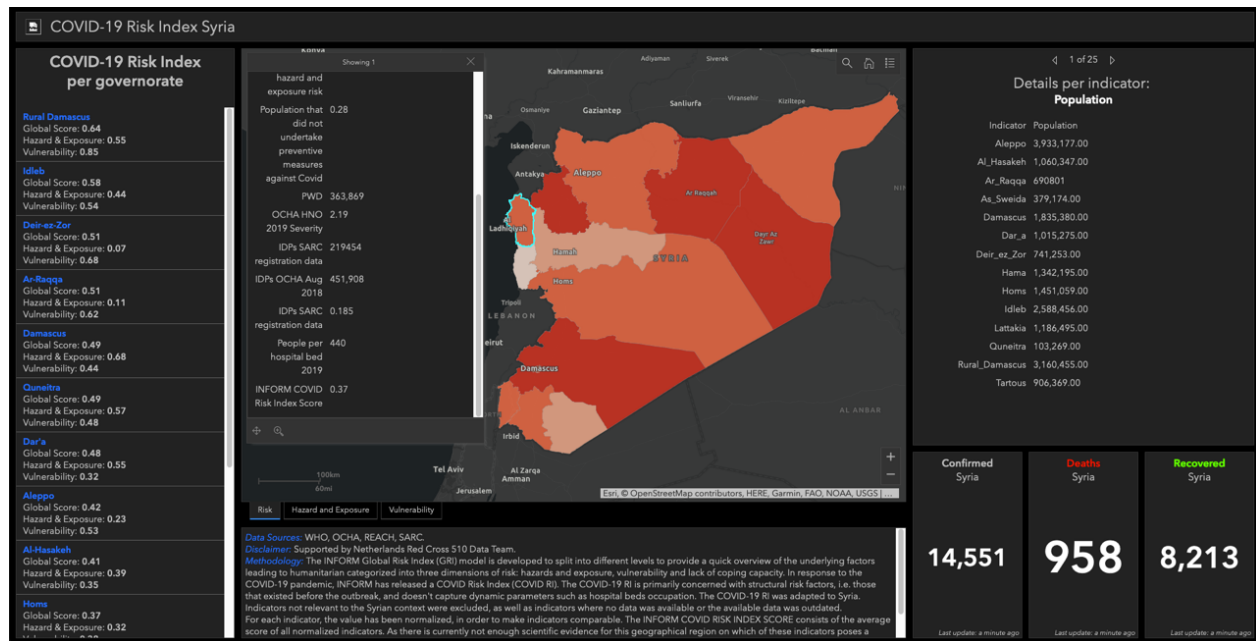


Figure 6 • Example of a dashboard made in ArcGIS online for the Syrian Arab Red Crescent. The upper panel and lower panels show the COVID-19 Risk Index and the Hazard & Exposure, respectively.

Table of abbreviations

| | |
|------------|---|
| NLRC | Netherlands Red Cross |
| NS | National Society/Societies |
| SARS-CoV-2 | Severe Acute Respiratory Syndrome coronavirus 2 |
| COVID-19 | The disease caused by the SARS-CoV-2 virus |
| OPT | Occupied Palestinian Territory |
| GIS | Geographical Information System |
| PowerBI | Power Business Intelligence |

Resources

- The dashboards made by 510 in ArcGIS for the COVID-19 response:
<https://nlrc.maps.arcgis.com/home/index.html>
- A quick guide to choosing the right graph to visualize data:
www.chartguide/topics/chartguide-poster-4-0/
- PowerBI training (internal link):
https://rodekruis.sharepoint.com/:p:/r/sites/510-CRAVK-510/_layouts/15/Doc.aspx?sourcedoc=%7B57A25F0D-3012-4716-8891-201E7FC75931%7D&file=POWERBI_TRAINING_ZRCS.pptx&action=edit&mobileredirect=true
- Doc on how to connect KoboToolbox to Google Data Studio (internal link):
https://rodekruis.sharepoint.com/:w:/r/sites/team-Data-Teams-COVID-19-Africa-510/_layouts/15/Doc.aspx?sourcedoc=%7BF7826814-35CA-4A41-8A6E-9B8EEDCF9149%7D&file=Connect%20KoboToolbox%20to%20Google%20Data%20Studio.docx&action=edit&mobileredirect=true&wdPreviousSession=ea907a15-a070-46c5-8604-b29bd640179b&wdOrigin=TEAMS-WEB.teams.undefined
- Introduction to GIS (internal link):
https://rodekruis.sharepoint.com/sites/team-Data-Teams-COVID-19-Africa-510/_layouts/15/guestaccess.aspx?guestaccesstoken=8hc7xuhNLRBT%2FPLzrDKIL5XFM

[fj3GpCkSq3wEYJ1aGM%3D&docid=2_0f581eaf790474215bf0e9a82aa5cdc3e&rev=1&e=rUtayd](https://www.510.nl/fj3GpCkSq3wEYJ1aGM%3D&docid=2_0f581eaf790474215bf0e9a82aa5cdc3e&rev=1&e=rUtayd)