

Title: Open Science Practices of the UP Pandemic Response Team

Author/s: Peter Julian Cayton and the UP Pandemic Response Team

Abstract:

In this work, we highlight the open science practices of the UP Pandemic Response Team. The concepts of open data and open science are discussed, especially on how these empower citizens in participating in national development and public information. It outlines the opportunities and challenges for open data and open science presented by the COVID-19 pandemic. These were the setting for the formation of the UP Pandemic Response Team and guided its activities. In this work, we focus on the team's open science activities and tools that delivered public information about the pandemic. We outline current challenges to open data and science and some recommendations moving forward to support COVID-19 response and beyond to other aspects of the country.

I. Introduction

In responding to crises, it is best to have all available data and information to make clear, scientific, and evidence-based decisions. In a democratic form of government, accountability and transparency are important virtues to build trust and compliance from citizens. Public information of current conditions in emerging crisis situations guides citizens in making informed decisions about the hazards.

In these cases, open science and open data principles and practices are relevant to facilitate decision-making, accountability, transparency, and public information. Open science is “science that is open to scrutiny and challenge, and to the knowledge need and interests of the wider publics” (International Science Council 2020). In having open science as part of disaster and crisis risk management and mitigation, people are given information to act accordingly to the prevailing risk and are made confident on the soundness of decisions made. The public is also made to engage with the open science by participating in the collection of data, the data analysis, and the generation of insights by the growing availability of data, increasing accessibility of computing technology, and growing skills in data analytics.

As part of open science, open data principles to participate and engage with the science. As defined by Open Knowledge Foundation (2022) defines open data as data that is “freely accessed, used, modified, and shared by anyone by any purpose – subject only, at most, to requirements to provide attribution and/or share-like”. With open and accessible data, the public can engage with data to make decision and scientists of many disciplines can engage in open dialogue with common ground from freely accessible open data and peer review facilitated by open science discussion.

With these ideas, government and scientific institutions in the Philippines push on with open science and open data policies. These policies are grounded with legal bases from the Constitution concerning the government's transactions and other laws and orders such as the Data Privacy Act and the executive order on the Freedom of Information (Pacis 2017). Currently available data access portals are Open Data Philippines (<https://data.gov.ph/>), Philippine Statistics Authority OpenSTAT (<https://openstat.psa.gov.ph/>), and eFOI Request Portal (<https://www.foi.gov.ph/>). With the COVID-19 pandemic, open data on different healthcare facility and case information are available through the Data Drop link (<https://bit.ly/DataDropPH>), which are also added into the Open Data Philippines portal.

With the need for public information on the COVID-19 pandemic, the UP Pandemic Response Team was formed to conduct research and analytics for public information and policy guidance. The team is made up of faculty, researchers, and volunteers from multiple disciplines and campuses of the University of the Philippines System. They have produced and compiled materials concerning statistics, recommendations, and information sources concerning the COVID-19 pandemic and its impacts to Philippine society. These works were carried out with open science principles in mind for accessibility of the public.

In this paper, we will discuss about the open data and science practices of the UP Pandemic Response Team. In the second section, we give a short discussion about open science and open data. We follow it with open data policies in the Philippine context in the third section. We describe the UP Pandemic Response Team in the fourth section while we give a non-exhaustive list of its open science activities in the fifth. Based on the experience of the team, we express some challenges and give recommendations for open data in the Philippines in the sixth section. Lastly, the references for the paper are in the seventh section.

II. Open Science and Open Data

As defined by the International Science Council (2020), open science is “science that is open to scrutiny and challenge, and to the knowledge needs and interests of wider publics”. The definition includes the archiving of science as it evolves with ideas, knowledge, and possibilities easily and freely accessible, from whatever geographic location, gender, ethnicity, or financial capability. Even if data and science are open, replicable, and reproducible, privacy, safety, and security are still protected. Members of society are open to engage in the science in pursuit of knowledge and in supporting humanity to achieve sustainable and equitable living.

The vital elements of open science are:

- Open access to the record of science: that science should be accessible without exorbitant burden such as subscription fees; best if there free and comprehensive access to high-quality scientific research and educational materials,
- Open Data: that free but anonymized data that facilitate open science should be easily accessible and machine-readable, meaning easily useful for data analysis by other scientists and capable citizens; that data are FAIR – Findable-Accessible-Interoperable-Reusable (Wilkinson, Dumontier, & Aalbersberg 2016),
- Engagement with society: that citizens are participant to the development of science, so called citizen science, such as with data collection and subject-matter experts, scientists, and research institutions aiding or supporting in the development of insights from locally-gathered data,
- Digital Enablement: that infrastructure and support is available to facilitate an open science system; this includes hard infrastructure such as wide network connectivity systems, soft infrastructure such as freely accessible information and data portals for open scientific activities, and human capital such as training of and provision for research and support staff.

As earlier discussed, one of the important elements of open science is open data. As defined by the Open Knowledge Foundation (2022), open data is data that is “freely accessed, used,

modified, and shared by anyone for any purpose – subject only, at most, to requirements to attribution and/or share-alike.

There are two important requirements for open data:

- Legally Open: that is, there is an open data license to freely access, reuse, and redistribute, and
- Technically Open: that data is available for no more than the cost of reproduction and can be easily available as machine-readable and in bulk.

In the aspect of open data, governments and their agencies are the largest repositories of data with their use for government policy and decision-making. It is also important that governments are accountable to their citizens as they design policies, deliver services, and execute decisions based on evidence and science. To facilitate this openness by governments, the Open Government Partnership (2022) was established. Member countries adhere to open and transparent government, of which the Philippines is a member.

III. Open Data Policies in the Philippines

For the commitment in open data, the legal bases of the policies for the Philippine government are as follows (Department of Health 2022; Pacis 2017; Ponio 2018):

- 1) Section 28, Article II of the 1987 Philippine Constitution, which states: “subject to reasonable conditions prescribed by law, the State adopts and implements a policy of full public disclosure of all its transactions involving public interest”,
- 2) Section 7, Article III of the same Constitution, which states: “the right of the people to information on matters of public concern shall be recognized; access to official records, and to documents and papers pertaining to official acts, transactions, or decisions, as well as to government research data used as basis for policy development, shall be afforded the citizen, subject to such limitations as may be provided by law”,
- 3) Republic Act No. 10173, or the Data Privacy Act of 2012
- 4) Executive Order 43, s. 2011, titled “Pursuing our Social Contract with the Filipino People through the Reorganization of the Cabinet Clusters”,
- 5) Commitments in the Open Government Partnership Organization, and
- 6) Executive Order 2, s. 2016, which is the Freedom of Information Program of the government.

For the specific case of the COVID-19 pandemic, Republic Act No. 11332, or the Mandatory Reporting of Notifiable Diseases and Health Events of Public Health Concern Act of 2018, requires mandatory reporting of reportable diseases and health events of public health concern.

Given these legal bases, the Philippine government makes data available through the following portals, the list below being non-exhaustive:

1. Open Data Philippines (ODP) Portal (<https://data.gov.ph/>), the online data repository of the Philippine government agencies, currently servicing data from the Department of

Foreign Affairs, Department of Health (DOH), Department of Information and Communication Technology, Department of Interior and Local Government, and Mines and Geosciences Bureau; it is currently in beta release since concluding its maintenance last August 15, 2022,

2. OpenSTAT (<https://openstat.psa.gov.ph/>), the online data portal of the Philippine Statistics Authority (PSA), which contains summary socio-economic statistics and other multi-domain statistics, in addition to the existing database that PSA has in its main website at [https:// psa.gov.ph/](https://psa.gov.ph/),
3. The PhilGEPS Open Data page (https://www.philgeps.gov.ph/CmsHomePages/open_data_grid), which contains procurement data of the Department of Budget and Management – Procurement Service,
4. The Freedom of Information portal (<https://www.foi.gov.ph/>), also known as eFOI Request portal, and
5. The DOH Data Drop (<https://bit.ly/DataDropPH>), for the specific case of the COVID-19 pandemic where open data on anonymized case information, hospital baselines and occupancy aggregates, testing laboratory aggregates, weekly hospital supplies inventory, and quarantine facility aggregates datasets are available.

Given these principles and available data portals, independent scientist groups, research institutions, and capable citizens are able to mine and analyze through the wealth of data especially to bring information to the public, with larger institutions making policy recommendation for government institutions. Among these are the UP Pandemic Response Team.

IV. The UP Pandemic Response Team

The UP COVID-19 Pandemic Response Team, now named the UP Pandemic Response Team, was created by Administrative Order No. TJH 2020-15, with Dr Teodoro J Herbosa, then Executive Vice President of the UP System, and Dr Alfredo Mahar Francisco Lagmay, Executive Director of the UP Resilience Institute, as Team Leaders.

From an initial composition of 11 faculty members, the UP Pandemic Response has at least 200 members, which are made up of faculty, students, and researchers from different campuses of the UP System. The UP Resilience Institute provides Secretariat support to the team.

The Team is involved with the following research projects as per the Order:

1. Development of a Web-based Decision Support System for Policymakers and the Public,
2. Geospatial Analysis and Visualization of COVID-19 Outbreak in the Philippines,
3. Modeling/Simulation of the Effect of Different Interventions on the Spread of SARS-COV-2 virus in Different Demographic Scales,
4. Assessment of the Socioeconomic Impacts of the COVID-19 Outbreak in Selected Communities,
5. Development of Knowledge Products on COVID-19 for Risk and Crisis Communication,

6. Determining our Capacity Threshold for COVID-19 through Analysis and Projection of Needs and Resources,
7. Development of National Policies for Emerging and Re-emerging Diseases, and
8. Queuing Study on Selected Checkpoints in and around Metro Manila.

Besides their work on these research projects, the Team has also given presentations to then-President Duterte and the Inter-Agency Task Force on Emerging Diseases (IATF). Given their highly specialized competencies, members have been called to join the IATF Technical Working Group on Anticipatory and Forward Planning.

The Team coordinated with local government units across the nation thru DILG Memorandum dated April 28, 2020, for COVID-19 information for real-time modeling and analytics.

Aside from working with national and local government units, the UP Pandemic Response Team has been collaborating with academics from the National University of Singapore, University of California Davis and University College London as well as local academic institutions. On the international front, the team has joined the Forecast-based Warning, Analysis and Response Network (FOREWARN), an organization of academics, scientists, and humanitarian workers.

For brevity of discussion of the paper and the scope of the involvement of the first author, we will discuss projects and products that heavily involved the use of open data and the practice of open science done by the UP Pandemic Team.

V. Open Science Activities of the UP Pandemic Response Team

In the research activities of the UP Pandemic Response Team, data portals were utilized to produce outputs for public information and policy recommendations. The list of activities below is not exhaustive as different projects are still being conducted as of writing. Open data that the team have used in these projects involve the DOH Data Drop and resources coming from the Philippine Statistics Authority (PSA), especially for geographic data matching through the Philippine Standard Geographic Code, then available as of the year 2020.

a. Policy Notes

Among the outputs of the UP Pandemic Response Team were policy notes written and designed by its team. It features data analysis and policy recommendations using metrics researched from existing interdisciplinary literature on epidemics. An example is the figure below from Policy Note No. 2: Modified Community Quarantine beyond April 30: Analysis and Recommendations (UP COVID-19 Pandemic Response Team 2020A). It features epidemiological metrics and outbreak risk measures that are also mapped by provinces in the Philippines.

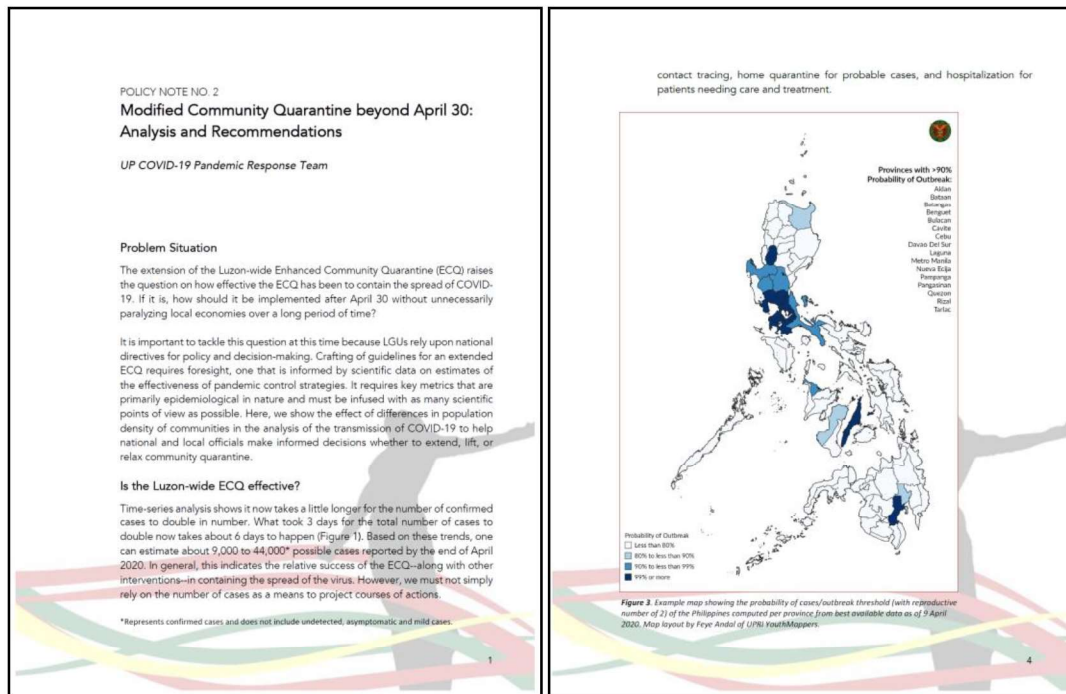


Figure 1: Pages 1 and 4 of the Policy Note No. 2; Modified Community Quarantine beyond April 30: Analysis and Recommendations.

When explanations about the methodologies are necessary, supplementary technical papers are issued alongside the policy notes. An example is the work by Cayton (2020) shown in the figure below, which features the technical discussion of the epidemiological statistics used in Policy Note No. 2.

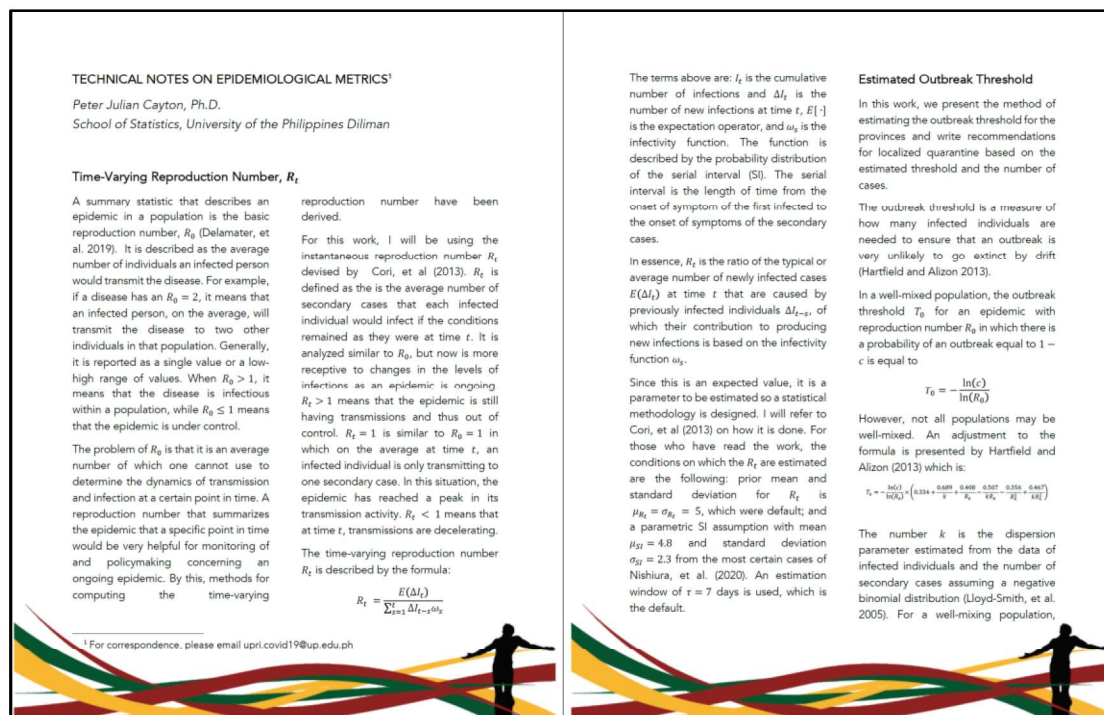


Figure 2: Pages 1 and 2 of the Technical Notes on Epidemiological Metrics.

The policy notes are also available in multiple languages written by linguistic experts in the Team. An example policy flashcard below is written in Meranaw and Waray (Leyte). Other languages are Tagalog, Ilokano, Bikol Sentral, Cebuano, Hiligaynon, Aklanon, Kapampangan, Itawis, Chavacano de Zamboanga, Meranaw, and Bahasa Sug.

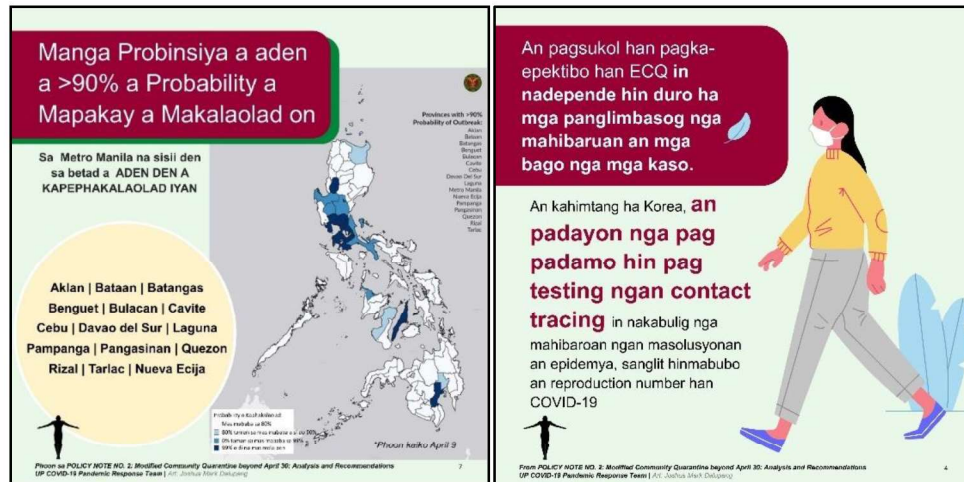


Figure 3: Flashcards of Policy Note No. 2 in Meranaw (L) and Waray Leyte (R).

b. Compendium of COVID-19 Statistics

A compilation of COVID-19 epidemiological metrics for regions, provinces, cities, and municipalities were also compiled by the team. The compendium of these statistics include: 1) case tallies, reproduction numbers, fatality rates, and recovery rates, 2) hospital bed occupancy rates, and 3) regional and provincial testing aggregates and rates. An example below is the first page and a sample results page of the Compendium as of Dec 28, 2021 (Cayton, et al. 2021).

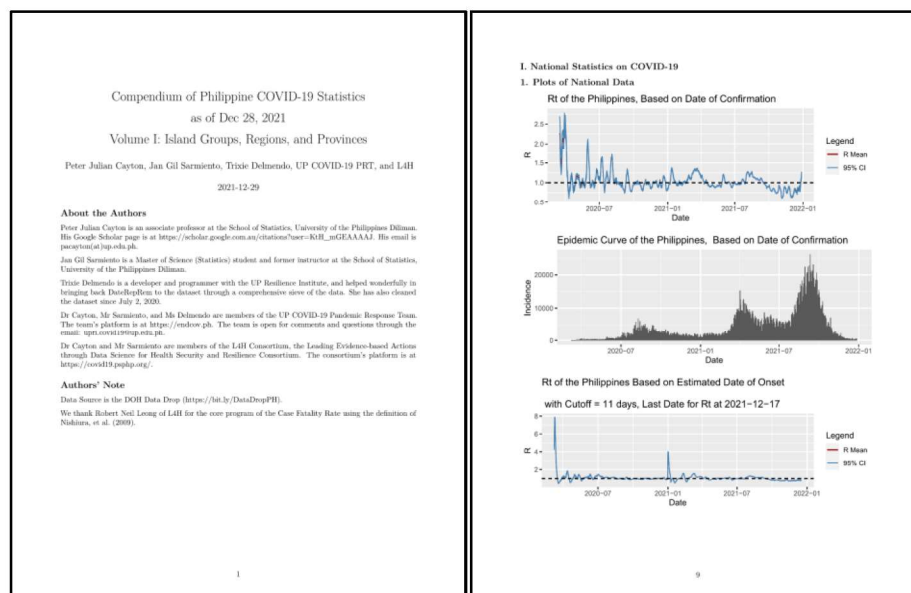


Figure 4: The First Page and Example Results Page of the Compendium of Philippine COVID-19 Statistics as of Dec 28, 2021, Volume I: Island Groups, Regions, and Provinces.

c. COVID-19 Projections

The UPLB Bioinformatics Initiative and the UP COVID-19 Pandemic Response Team (2022), the former being a team led by Dr Jomar Rabajante, the Dean of the UPLB Graduate School as of writing, devised a COVID-19 projection model, with the last work shown as a figure below.

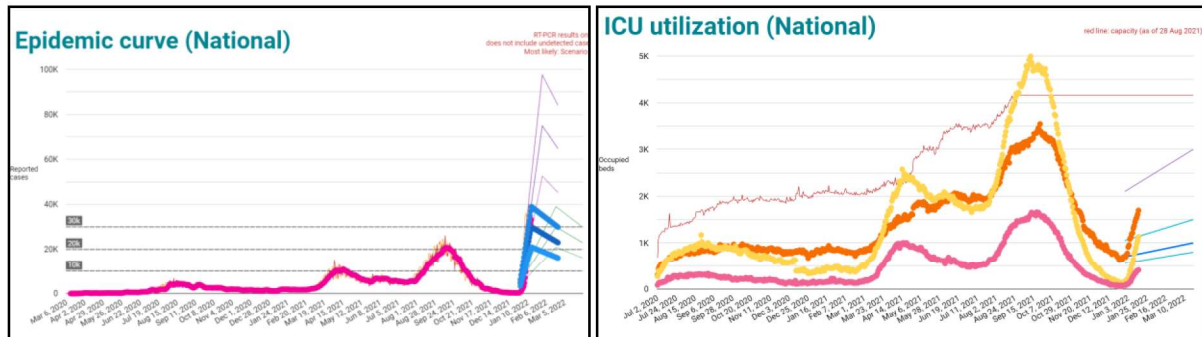


Figure 5: COVID-19 Epidemic Curve and ICU Utilization Projections.

The epidemic compartmental model that was used as a basis for projections are publicly available and accessible thru the work by the UPLB Bioinformatics Initiative (Marasigan, et al. 2020). The model illustration is shown below:

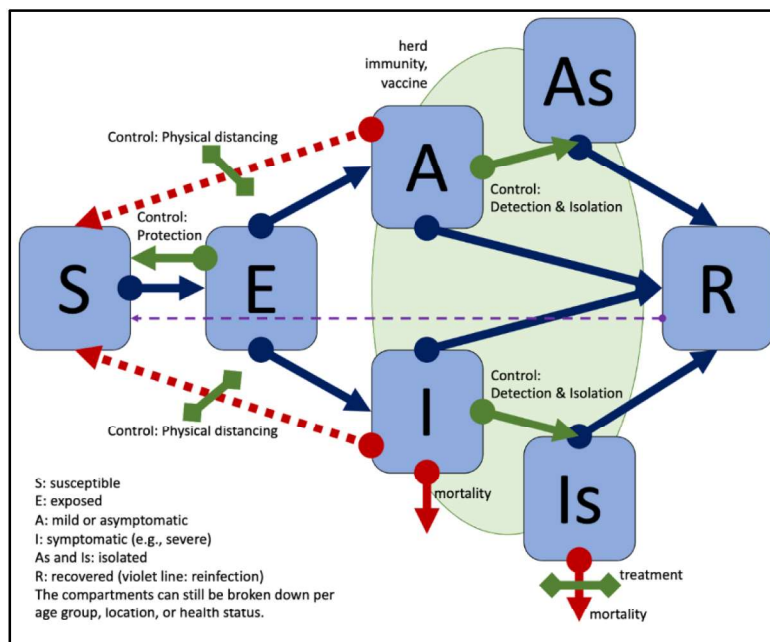


Figure 6: Epidemic Compartmental Model for COVID-19 Projection (Marasigan, et al. 2020)

d. Data Maps

As COVID-19 infections have spread in a wider geographic scope, mapping the prevalence of cases and outbreak risks is important as a public information. The wealth of information these maps were dense for different purposes. They had information on important healthcare facilities for the pandemic with available bed capacity as reported by the Department of Health Data Drop. They also had case aggregates by province and city/municipality based on data from the

Data Drop as well. They also feature the probability of outbreak statistic based on research done by the Team. The figure below shows the data map available from the ENDCOV website.

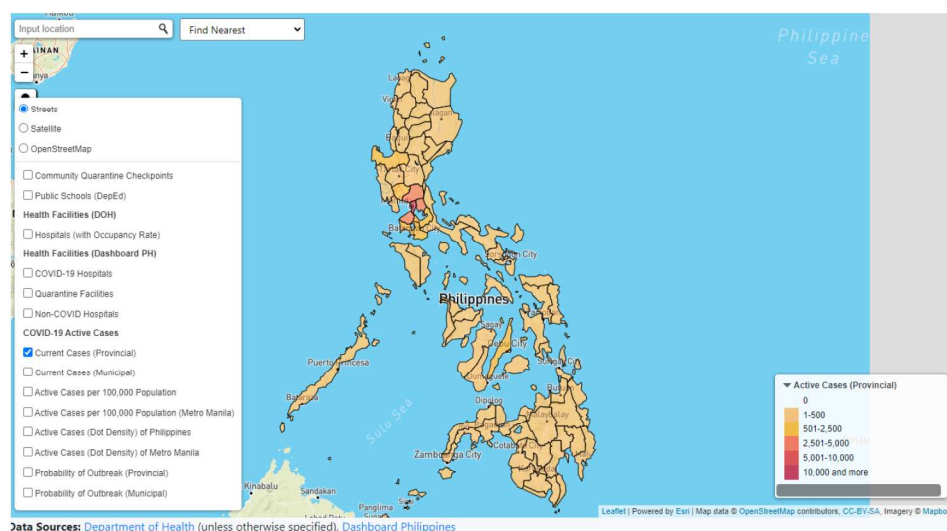


Figure 7: Data map available on the ENDCOV Website; Displayed Data as of January 9, 2022.

Among the outputs of the team are also active cases distribution maps and active cases per 100,000 maps colored by barangay. Examples below are as of July 30, 2022.

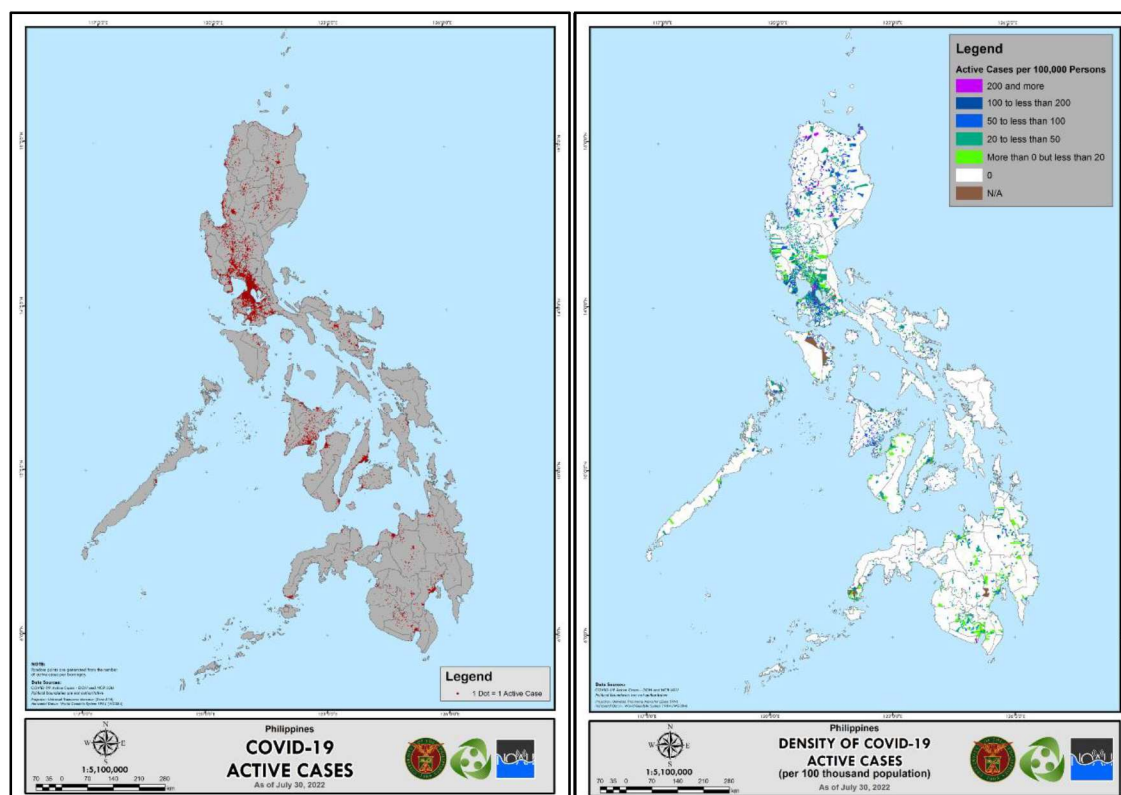


Figure 8: COVID 19 Active Case Distribution Map (L) and Density of COVID-19 Active Cases per 100,000 Population (R) as of July 30, 2022.

e. Job Risk Profiling and Event R Risk Calculator

The UP Pandemic Response Team and UPLB Bioinformatics Initiative also designed the Job Risk Profiling page (Arapoc, et al. 2020). The page compiles work COVID-19 infection risks per occupation and industry, depending on the exposure through social contact and amount of protection. For the second Job Risk Calculator, the reference of the work is from Dy and Rabajante (2020)

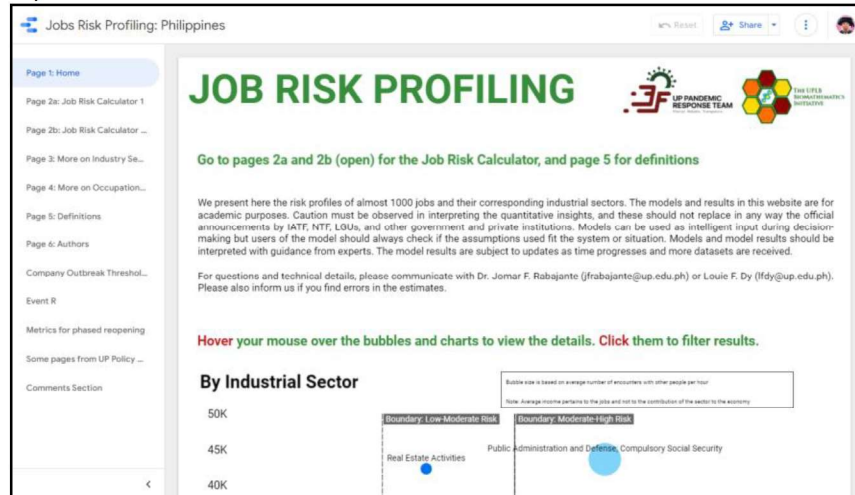


Figure 9: Screenshot of the Job Risk Profiling Webpage (Arapoc, et al. 2020)

Included in the Job Risk Profiling page is the Workplace COVID-19 Outbreak Threshold and Transmission Microsimulation (Cuaresma, et al. 2020), which simulates the possible spread of COVID-19 in workplace settings given inputs in workplace dimensions, interaction frequency, and employee counts. How to use the simulation tool is available at <https://github.com/frabajante/COVID19-Company-Simulator> which outlines the science behind the product.

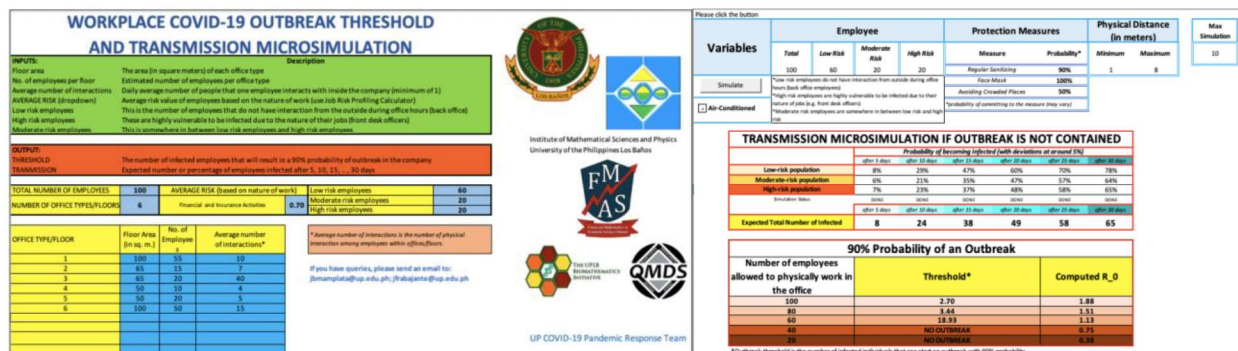


Figure 10: Workplace COVID-19 Outbreak Threshold and Transmission Microsimulation (Cuaresma, et al. 2020)

Another product included in the Job Risk Profiling page is the Event R data product, based on Tupper, et al. (2020). It computes for the risk of spread of COVID-19 based on the features of a gathering or event. Its inputs are: 1) event duration, 2) average interactions of unique individuals per hour, mean crowd density, variance of crowd density, and transmission probability.

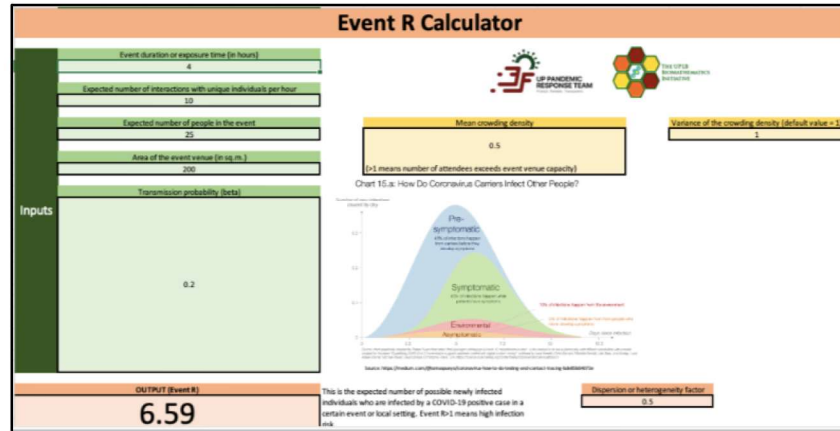


Figure 11: Event R Calculator

f. ENDCOV Website

The online information portal of the UP Pandemic Response Team is the ENDCOV website (<https://endcov.up.edu.ph/>), which features data maps, projections, city-level statistics, COVID-19 policies by government, advisories, and policy notes produced by the UP Pandemic Response Team from accessing open data from DOH, PSA and other sources.

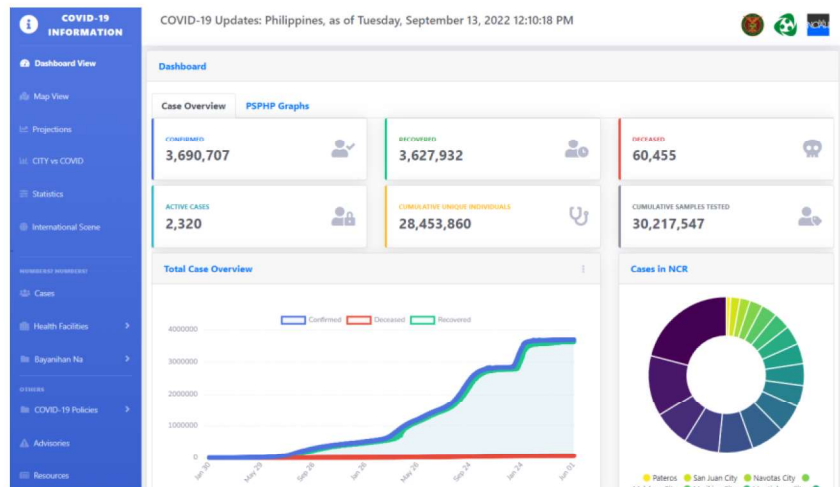


Figure 12: Dashboard Header of the ENDCOV Website.

g. UPTake

In the period of April-November 2021, the UP Resilience Institute and UP Pandemic Response Team produces a short communication note titled "UPTake", which highlight important developments of the pandemic in bite-size information chunks, generally highlighting about COVID case counts, testing positivity rates, and vaccination rates. It always featured "What happened in the <month>?" and "What should we do?" sections as public health information for the public. The figure below is a example of a image posted on Facebook® (UP Resilience Institute 2021). These UPTake notes were also published in Filipino.

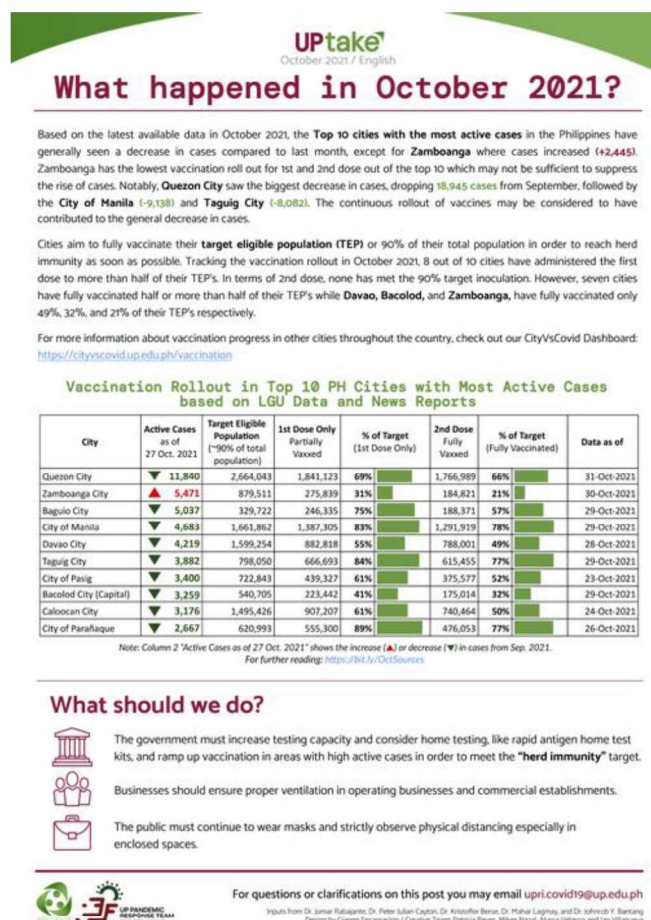


Figure 13: UPTake October 2021, in English.

VI. Challenges and Recommendations with Open Data in the Philippines

Some of the challenges faced with doing the data work involved the data management being done by government agencies responsible for the open data (UP COVID-19 Pandemic Response Team 2020B). For example, inconsistencies in dates, case count ID coding, and data access changed in the first months of the pandemic crisis. Errors in sex, age, and residence of cases were also noted. In addition, date of recovery data in the case information dataset has a large missing data fraction since July 9, 2021, ranging from 60-80% of the recovered cases with missing date of recovery.

More recently, the DOH has released data in less than timely fashion. Before January 15, 2022, comprehensive COVID-19 data would be available daily. By January 22, 2022, data has only been released every Saturday, with the reference date of the data being a week before, e.g., data that was available on August 6, 2022 for download would be data from July 30, 2022. Timeliness of data has been lost and has discouraged some of the activities of the UP Pandemic Team that depend on prompt and as-close-to-now data.

Coming from the Policy Note No. 6 (UP COVID-19 Pandemic Response Team 2020B), it is understood that, for the sake of data privacy and other national security concerns, some data cannot be fully open to the public. It is of highest recommendation to call on other government agencies to share relevant data that can help make scientific assessments of evolving crises

and to also come up with better peer-reviewed and actionable science. In line with the openness of data, it is recommended that data should be standardized and regularized for machine-readability and accessibility of the general population in keeping with data privacy principles.

Making all data sources open empowers stakeholders, such as independent and commissioned scientists and researchers, local government officials, and national policy decision-makers, in the prevailing and future emerging risks and hazards.

Calling for open data is in line with the call for open science and scientific cooperation and the call for evidence-based, accountable, and transparent decision-making.

The COVID-19 pandemic has unlocked the potential that open data can do to inform the public and make them contribute in the policy-making process in mitigating health hazards or any natural hazard. Keeping data in inaccessible silos narrows our nation's ability to respond to crises and issues of natural peace and security actively and scientifically. Resolving data issues immediately will secure public trust in science and governance as evidence and data are used as guiding principles in planning for the public good and participation of citizens in an evolving and active democracy.

VII. References

Arapoc, JA, et al. (2020), "Job Risk Profiling: Philippines". Accessible online last August 1, 2022, at https://datastudio.google.com/u/0/reporting/1uGMQnM_ky_NQ_mnA7tiQ118wYIxQ_wMR/page/k4rNB.

Cayton, PJ (2020), "Technical Notes on Epidemiological Metrics", UP COVID-19 Pandemic Response Team, Accessible online last August 1, 2022, at <https://endcov.up.edu.ph/advisories/>.

Cayton, PJ, Sarmiento, JG, Delmendo, T, UP COVID-19 PRT, and L4H (2021), "Compendium of Philippine COVID-19 Statistics as of Dec 28, 2021, Volume I: Island Groups, Regions, and Provinces".

Cuaresma, DCN, et al. (2020), "WORKPLACE COVID-19 OUTBREAK THRESHOLD CALCULATOR AND TRANSMISSION MICROSIMULATOR", Accessible online last August 1, 2022, at https://datastudio.google.com/u/0/reporting/1uGMQnM_ky_NQ_mnA7tiQ118wYIxQ_wMR/page/AZDRB.

Department of Health (2022), DOH Data Drop, Accessed online last August 1, 2022, at <https://bit.ly/DataDropPH>.

Department of Interior and Local Government (2020) Memorandum dated April 28, 2020.

Dy, L., & Rabajante, J. (2020), "A COVID-19 Infection Risk Model for Frontline Health Care Workers". doi: 10.1101/2020.03.27.20045336. In press: Network Modeling Analysis in Health Informatics and Bioinformatics (a Springer journal).

eFOI Request Portal (2022), Accessed online last August 1, 2022, at <https://www.foi.gov.ph/>.

- International Science Council (2020), "Open Science for the 21st Century", Draft ISC Working Paper, 4 June 2020. Accessed online last August 1, 2022, at https://en.unesco.org/sites/default/files/isc_paper_for_unesco_open_science_consultation_2020.pdf.
- Marasigan, A, et al. (2020), "Initial COVID-19 PH Provincial Estimates", Accessed online last August 1, 2022, at <https://sites.google.com/up.edu.ph/initialcovid19phestimates/>.
- Open Data Philippines (2022), Accessed online last August 15, 2022, at <https://data.gov.ph/>.
- Open Government Partnership (2022), "About Open Government Partnership", Accessed online last August 1, 2022, at <https://www.opengovpartnership.org/about/>.
- Open Knowledge Foundation (2022), "Open Data", Accessed online last August 1, 2022, at <http://opendatahandbook.org/glossary/en/terms/open-data/>.
- Pacis, J (2017), "Open Data in the Philippines: An Issue of Access and Awareness", IT for Change. Accessed online last August 1, 2022, at <https://opendocs.ids.ac.uk/opendocs/bitstream/handle/20.500.12413/13008/Research-Brief-Philippines.pdf>.
- Philippine Statistics Authority OpenSTAT (2022), Accessed online last August 1, 2022, at <https://openstat.psa.gov.ph/>.
- Ponio, G (2018), "Open Data", A Presentation Accessible Online last August 1, 2022, at <https://psa.gov.ph/sites/default/files/attachments/BS3%20-%203%20-%20Mr.%20Gideon%20Ponio.pdf>.
- Procurement Service – PhilGEPS (2021). "PS PhilGEPS: Open Data", Accessed online last August 1, 2022, at https://www.philgeps.gov.ph/CmsHomePages/open_data_grid.
- Tupper, P, Boury, H, Yerlanov, M, and Colijn, C (2020), "Event-specific interventions to minimize COVID-19 transmission", in PNAS Vol. 117, No. 50, pp 32038-32045, <https://doi.org/10.1073/pnas.2019324117>.
- University of the Philippines (2020), Administrative Order No. TJH 2020-15: "Creation of the UP COVID-19 Pandemic Response Team".
- UP COVID-19 Pandemic Response Team (2020A), "Policy Note No. 2; Modified Community Quarantine beyond April 30: Analysis and Recommendations", Accessible online last August 1, 2022, at <https://endcov.up.edu.ph/advisories/>.
- UP COVID-19 Pandemic Response Team (2020B), "Policy Note No. 6; Prevailing Data Issues in the Time of COVID-19 and the Need for Open Data", Accessible online last August 1, 2022, at <https://endcov.up.edu.ph/advisories/>.
- UPLB Bioinformatics Initiative & UP COVID-19 Pandemic Response Team (2022), "INITIAL PROJECTIONS 2022", Accessible online last August 1, 2022, at <https://endcov.up.edu.ph/projections/>.

UP Resilience Institute (2021), “#UPtake: WHAT HAPPENED IN OCTOBER 2021?”, Accessible online last August 1, 2022, at <https://www.facebook.com/UPResilienceInstitute/posts/660057835400710>.

Wilkinson, M., Dumontier, M., Aalbersberg, I. (2016), “The FAIR Guiding Principles for scientific data management and stewardship”, Sci Data 3, 160018. <https://doi.org/10.1038/sdata.2016.18>.