Situation and programmatic monitoring with RapidPro and Big Data: UNICEF Indonesia's experience in COVID-19

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for every child

Witma Wirawan supports his 12 year old daughter Andra Maharani while she continues to study at home during the COVID-19 pandemic.

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Abstract

UNICEF collaborated closely with the Ministry of Education Ministry of Education, Culture, Research and Technology of the Republic of Indonesia (MoECRT)[1] to generate, process and visualize data to support programme and policy decisions to keep children safe and learning despite school closures. UNICEF supported the MoECRT to collect feedback from students, family members and teachers on the quality of remote learning and willingness to return to in-person schooling through U-Report surveys and polls using SMS and WhatsApp. Data was systematically analyzed data by sex, age and location (urban or 3T[2]) to identify specific needs.

UNICEF constructed a machine learning algorithm using big data to classify schools as having good, average, poor, no internet connectivity to support planning and ensure accountability for improvements over time. UNICEF amplified MoECRT data collection on preparedness to return to school and school operation status using RapidPro (WhatsApp and SMS). This enabled data collection from remote areas.

UNICEF's longstanding partnership with the MoECRT, internal capacity in Data & Analytics, and creation of partnerships to use innovative tools contributed to policy and programming to support children in Indonesia learn safely during the pan-

Lessons learned for consideration

Standing capacity for data and analytics in an office alongside data savvy teams can deliver responsive solutions. UNICEF had standing capacity in digital platforms, remote monitoring and collaboration around big data prior to the pandemic. The team sat under Social Policy, which had the funding and appetite to support the initiative. Standing capacity was pivoted and expanded to address the specific needs related to COVID-19. The standing capacity was responsive to evolving needs and provided an important foundation for augmentation with additional expertise when needed.

Be clear on what questions the data solution needs to answer and build from what is available. In each digital solution, UNICEF and stakeholders identified a limited and clear number of questions to answer to inform specific policy or programming actions. Those parameters also defined data users and informed how data was organized and processed.

Create close feedback loops between technical, programme, and data expertise to visualize the end product and address limitations during development. Data solutions involved iterative development.

Build interfaces that can be integrated into other applications or processes to ensure data gets in front of people who make decisions. Interoperability is a standard principle and condition for any collaborative project between UNICEF data team and the Government.

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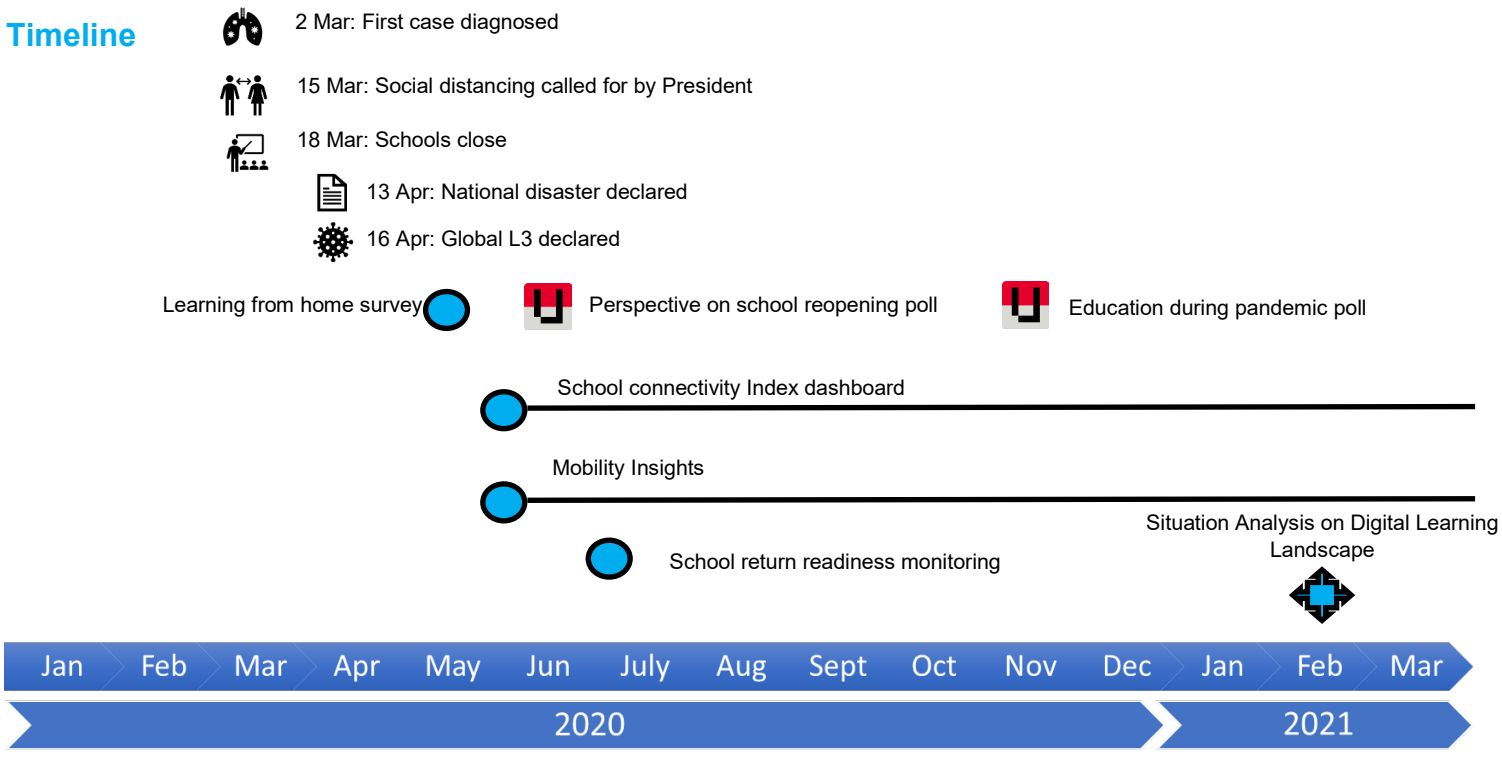
Know your trusted influential messengers and involve them in the process. Trusted messengers drive decision-making by conveying information effectively to those that take action. In some cases this will be UNICEF, or another UN agency, or a partner in a government ministry and focus on servicing the needs of that partner.

Create space for experimentation and an environment for safe failure. There will be a small number of projects that will have massively outsized of impact while others will fail to deliver on even on their most minimum objectives. Providing both a funding environment and management environment where people feel safe to undertake experimentation is important.

Timeline



Context

The first case of COVID-19 was confirmed on 2 March 2020. Travel restrictions and social distancing were in place by the end of March across the thousands of islands in the Indonesian archipelago which spans three time zones. More 60 million children were impacted by the closure of over 500,000 schools.[3]

Indonesia faced the challenges of how to keep children safe and how to support continued learning despite school closures. UNICEF collaborated closely with the MoECRT[4] to generate, process and visualize data to support programme and policy decisions to address these two challenges.

Leveraging existing resources

UNICEF's Data & Analytics (D&A) Team had an existing portfolio of digital monitoring capacity[5] and experience in understanding, collecting, and analyzing government data and generating data through RapidPro. The D&A Team's workplans were refocused to support emerging data needs for decision-making across programmes in the context of COVID-19. Data needs were identified and communicated on an ongoing basis to the D&A team through focal points in each programme that acted as liaisons between D&A and programme sections.

The Education Management Information System (EMIS) was the core dataset used to track the number of students and operational status of schools over time.[6] UNICEF tracked school closures with EMIS data to gauge the number of school children impacted by school closures. The data was used to adapt UNICEF's programming support, public campaigns and advocacy with national and subnational leaders throughout the pandemic.

End user monitoring and feedback on quality on remote learning

The digital education infrastructure in Indonesia was not adequately developed at the onset of COVID-19 to enable a seamless transition to remote learning by children in all areas. Digital connectivity, internet access and even electricity were not equally available or reliable. It was likely that even with a digital solution in place, teachers and students would need some support to navigate the online learning platforms. There was also a chance that the remote learning modality might deepen pre-existing disparities in learning outcomes. Understanding the quality of and access to remote learning was essential.

The EMIS data could not capture the quality of remote learning. The MoECRT requested UNICEF's support in April 2020 to find out whether the remote learning programme was effective for students, parents and teachers. UNICEF and the MoECRT collected data through several tools, and included analysis of results by sex, age, and zone (urban or 3T[7]).

- a "Learning from Home" survey in May 2020 gathered information from **students, parents and teachers** to gauge their experience of distance learning to adapt programming support.[8] Findings showed that more than 95% of schools caried out distance learning. However, only 13% of teachers reported that they had been trained on distance learning tools and methodologies and most children spent only around 1-2 hours per day studying.
- A poll of **U-Reporters** on young people's perspectives on school reopening was shared in June via Facebook Messenger, WhatsApp Messenger and SMS.[9] The lack of teachers' guidance and internet access were the top two challenges identified in remote learning. 56% of respondents highlighted the need for clear COVID-19 protocols to be prepared by schools before they reopen.
- UNICEF also supported the MoECRT to monitor TV learning sessions among **teachers, parents and students** on a weekly basis. The MoECRT developed the survey which UNICEF shared through WhatsApp and SMS using the RapidPro system.

While data using this type of convenience sampling cannot be expected to be representative of the entire population, they do provide some indication of what support students need to learn through remote modalities. The data also helped address a gap in information on how policy decisions were being implemented at local level, critical in the context of Indonesia with decentralized government oversight.

Mapping digital school connectivity to guide remote learning programming

UNICEF had collaborated with UN Global Pulse on data for humanitarian decision-making prior to the pandemic. UNICEF reached out to colleagues from that collaboration to explore how big data might augment situation and programmatic monitoring. The use of big data seemed promising, and the Social Policy team hired two consultants, a Data Scientist & Artificial Intelligence Researcher and a Full-Stack Developer[10] in May 2020 to support this emerging area of work.

The UNICEF Education team wanted to understand the geographic distribution of digital access for students because digital connectivity would dramatically impact student ability to access remote learning. This information was essential to support advocacy with the Government and partners to increase digital access. A model of a school connectivity index has been developed using big data to visualize geographic connectivity access (Figure 1).

The MoECRT georeferenced data on government-managed school locations.[11] UNICEF had access to Facebook's global connectivity data set through a data sharing agreement with Facebook from 150 million Indonesians, representing more than 50% of the population. Anonymized data, aggregated at village level by Facebook, reported the average connectivity within 200x200m^2 blocks. Connectivity data reflected on average how people accessed Facebook and the type of connection, e.g. either 2G, 3G or 4G cellular networks or Wi-Fi. In the case of Wi-Fi access, internet stability was also tagged as low, medium or high.

UNICEF constructed a machine learning algorithm using this

data to classify schools as having good, average, poor or no connectivity. The model was trained using a small sample of school internet connections that had been surveyed in 2020 by the MoECRT. After validation, the model was applied to date across the country to categorize school connectivity based on these two data sets. Facebook connectivity data was used as a proxy to reflect digital access at household level, regardless of the age of the Facebook user. The sum of connectivity around the geographic location of the school was used as a proxy for overall connectivity of the school which was graded into 4 categories:

- No action needed- School connectivity was good and surrounding connectivity was good (dark green),
- Easy solutions- school connectivity was poor but surrounding connectivity was good (peach),
- Medium effort solutions- school and surrounding area not well services (orange),
- High effort solutions- school connectivity was poor and surrounding connectivity was poor (green).

Maps reflected the connectivity data during that period. The geographic distribution of school connectivity tended to reflect the geographic disparities and the pattern of overlapping deprivations noted in assessments prior to COVID-19.

The maps were shared with the MoECRT and with the Ministry of Information and Communication (KomInfo) that is responsible for providing in all government schools, hospitals and health centers with reliable internet connectivity. The mapping was positioned as a tool that could support advocacy, action and accountability for improvements in digital connectivity at school level. UNICEF used the information for internal analysis and planning and it is hoped that the tool may become more useful as school continue to reopen and as the Government of Indonesia addresses shortfalls in access in 3T areas.

Monitoring safe reopening of schools[12]

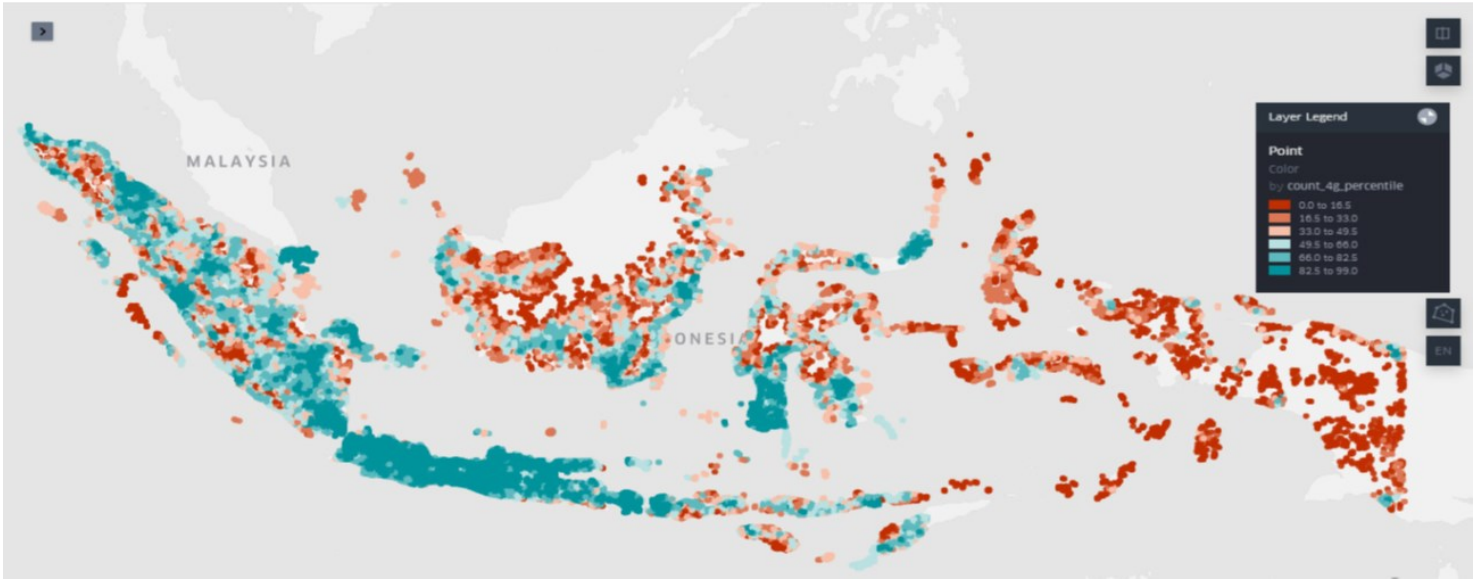
Local adaptation of global guidance on school reopening supported national efforts to reopen schools. The MoECRT Data Center managed dashboards that tracked data in relation to:

School preparedness: whether schools fulfilled requirements of the health protocol to reduce the spread of COVID-19 before reopening, and

School reopening status: status of school operation and form of instruction was being used (remote, hybrid, in-person).

The MoECRT collected data from school principals through paper-based and online methods, including and application. The initial response rate was low, especially in remote 3T areas. By September 2020, only 30% of schools had responded. UNICEF supported the MoECRT to increase response rate and coverage of the data to enable action to

Figure 1: School connectivity dashboard



support school reopening through boosting data collection via RapidPro (WhatsApp and SMS), disseminating and circulating the data collection tools through the UNICEF office and network to make awareness, and developing tools, questions, checklists.

UNICEF translated the data collection tool into an interactive RapidPro chatbot that operated with WhatsApp and SMS to support data collection in areas without internet access. UNICEF also supported an SMS blast inviting headmasters to report and linking them to options for data reporting. The MoECRT also promoted the link to the RapidPro survey on television, which lead to a significant increase of response rates. Approximately 50% of schools responded by the first quarter of 2021, with a small proportion of schools in low-risk zones offering face-to-face instruction.

Translation of the survey tools into the chatbot took three days in the D&A Team given the workload for Education and other programmes. Templates that linked school ID numbers and the application programming interface (API) had already been established during earlier UNICEF MoECRT data collection efforts. Creating the API, the database, the connection between systems from NPSN and RapidPro would otherwise have taken several weeks. UNICEF hosted the RapidPro data, and shared data analysis and raw data in Excel with the MoECRT who then upload the data into their database and visualized the data. Automation of the process would have taken additional time in setting up the data collection and could be built with time. During the process, UNICEF built the capacity of MoECRT staff to use RapidPro tools more independently in future. The MoECRT data collection expanded over time, including teacher and student vaccination status to reflect the most-relevant information for supporting safe learning for children.

Results

The MoECRT used the data on user feedback, school connectivity, preparedness and reopening status to inform decision-making around remote learning materials, actions to address the digital divide, and support continued learning. For example, gaps in reporting on school preparedness and reopening status were followed up by the MoECRT through the line or province, district and city to create actions plans to support them in reporting or the school reopening process. UNICEF also reached out to other agencies to support schools in provinces and districts where the data or lack of reporting indicated gaps in coverage of capacity. The use of

Required resources

UNICEF contribution

- Staff time: Education Cluster and the Data & Analytics team (3)
- Individual Consultants: Data Scientist/Big Data Researcher (1) and Full Stack Developer (1)
- Technical support from UNICEF Regional Office and Headquarters (Innovations Team and MagicBox)

Government contribution

Staff time from MoECRT

Partner contribution

- Pro-bono data from Facebook and Cuebiq through partnerships with UNICEF

Enabling factors

- Strong partnership between UNICEF Indonesia and MOECRT including disaster preparedness and response through the National Safe School Secretariat since 2014
- UNICEF's internal capacity in data innovation, institutionalized D&A Team and digital portfolio
- UNICEF's enabling environment in terms of structure, processes and funding model (Box 1)
- Previous collaboration around big data for humanitarian decision-making with UN Global Pulse which created space to explore the use of big data in COVID-19
- The RapidPro templates, databases and APIs in place
- The ability to organically negotiate global partnerships with Facebook and Cuebiq

Challenges

RapidPro and SMS enabled data collection from more remote areas, yet the majority of remote data collection reflected more urban contexts. In some surveys, respondents varied by sex and age.

Next steps

UNICEF commissioned a digital learning landscape analysis to shape further investments by UNICEF and the MoECRT. The Social Policy and Education Cluster will collaborate in the analysis of learning loss through conventional survey. Further data analysis to estimate intergenerational learning loss is an area to be explored.

Box 1: Creating an enabling environment for data

UNICEF Indonesia's structure, processes and funding model created an enabling environment for responsive data collection throughout the pandemic.

- **Structure:** Data & Analytics team (total of 4 staff) sits under Social Policy. The Data & Analytics Team has a cross-cluster role, and each cluster has a designated focal person to liaise with the D&A team for respective intervention.
- **Process**: Data needs are identified within Programmes and communicated to D&A. Structured user interviewing is also conducted quarterly by D&A to gauge upcoming data needs.
- **Funding model:** The D&A Team is funded as a cross-cutting area of work through a set percentage added into all funding proposals, or as a standalone component of funding proposal, providing funding stability

Endnotes

1 UNICEF co-lead the Education Cluster, and coordinated partners in support of the Government of Indonesia's response.
2 3T areas ("daerah **3T** (Terdepan, Terluar, dan Tertinggal)" refer to areas that can be classified as frontier, outermost and underdeveloped areas.
3 The total covers both government-managed schools (primary to higher education levels) and religious schools.
4 UNICEF co-lead the Education Cluster, and coordinated partners in support of the Government of Indonesia's response.
5 Pre-COVID-19, digital innovations included digital monitoring of village health posts (e-posyandu), real-time immunization monitoring (2017-2018 nationwide measles Rubella campaign), SDG dashboard for the Government, vulnerable children monitoring in orphanages, and a pilot of out-of-school children monitoring.
6 In Indonesia, The MoE provided oversight for government-managed schools while the Ministry of Religious Affairs (MoRA) managed religious schools. Each Ministry had its own EMIS system and efforts to understand the situation of school children in Indonesia required negotiation and collaboration with both Ministries.
7 3T areas ("daerah **3T** (Terdepan, Terluar, dan Tertinggal)" refer to areas that can be classified as frontier, outermost and underdeveloped areas.
8 The majority of students were girls (62%), in senior/vocational secondary schools, and very few from remote areas (7%). The majority of children of parents who responded were boys (53%), less than half in senior/Vocational secondary school, with greater representation from remote areas (20%).
9 The majority of respondents were between 15-19 years of age (63%) and from Java (46%).
10 A full-stack developer can work at the front end (user interface software) and backend (server software) of a website or an application.
11 UNICEF did attempt to secure and generate similar maps for religious schools but this was not possible.
12 "UNICEF support also included nationwide monitoring of out-of-school children, with a special focus on disadvantaged families with school-age children in rural, remote areas. To follow up the results of the monitoring, capacity-building activities have been provided to selected district and village governments to equip them with necessary knowledge and skills on how to address the monitoring findings and prevent increases in the number of out-of-school children with their own resources."

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