DEPtH Lab

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Digital Dashboards for
DECISION-MAKING

Ethically using citizen big data for public health rapid responses

A DEPTH LAB REPORT

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ACKNOWLEDGEMENTS

KEY MESSAGES

01 Development of digital health dashboards is feasible, replicable, and scalable by integrating cloud computing with digital epidemiology and data science.

02 Digital health dashboards can revolutionize our responses to public health crises.

03 Digital health dashboards can ethically obtain and utilize big data to provide critical support to not only citizens in need, but also enhance policy making by decision-makers.

04 Digital health dashboards can enable integration of systems by going beyond healthcare in response to public health crises.

05 Digital health dashboards can be built and maintained with minimal resources to ensure sustainability.

GAPS AND OPPORTUNITIES IN DECISION-MAKING

Decision-making in healthcare systems, specifically when health crises arise, can be challenging. The Corona Virus Disease (COVID-19) pandemic highlighted significant gaps and inefficiencies in decision-making processes during public health crises. The pandemic emphasized the need for more cohesive and collaborative societal efforts to address weaknesses within our health systems. In particular, it demonstrated the need for timely, appropriate, and precise evidence to overcome decision-making gaps during public health emergencies. Moreover, it has highlighted the importance of having access to timely and accurate information in making informed decisions while addressing and mitigating public health emergencies.

It is evident that we need to change how we handle health crises in the future. One of the biggest challenges during outbreaks is coordinating decisions between different levels of authority, including local, regional, national, and even international groups. Information is often not relayed from high-level authorities to specific jurisdictions quickly enough to be implemented. This lack of coordination results in disparities where local decision-makers lack timely access to evidence specific to their own communities. Thus, the development of digital tools and dashboards that can facilitate evidence-based real-time decision-making grounded in real-world big data from communities is essential. This will help to minimize delays and inconsistencies, optimizing responses at a local level.

Despite its challenges, the pandemic also showed us opportunities to give more power to local decision-makers. Moving forward, it is critical that during future health emergencies, we have improved methods for gathering community specific big data and assessing precise, up-to-date information to support local decision-makers during public health crises. This can be done by leveraging existing technologies and decentralized web applications.
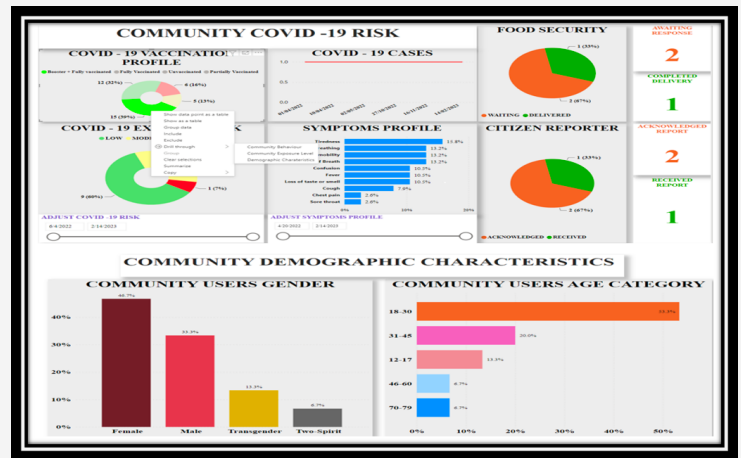

Figure 1: Data visualization depicting demographic information and community risks.

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ROLE OF DIGITAL HEALTH DASHBOARDS

Retrieving, handling, and displaying real-time big data from residents in an ethical way is important for making rapid local decisions. To do this, decision-makers need access to secure digital platforms focused on health, which ethically engage people from the community, gather big data, analyze it quickly, and display it in a way that is easy to understand to expedite decision-making. This helps fill gaps in coordination and information-sharing between different levels of governance and community partners.

One way to show this data is by using digital health dashboards, which are tools that help decision-makers make quick and informed decisions. Digital health dashboards present an opportunity to transform how decisions are made during public health emergencies. By providing access to real-time, community-level data streams sourced directly from citizens, dashboards allow evidence-based responses tailored to the local situation. This study discusses the development of digital health dashboards that can be adapted and used in different places. These dashboards help monitor public health issues and promote decisions that are ethical, rapid, and address more than just healthcare systems.

Dashboards also offer a reusable framework that could be adapted and scaled. Their digital structure can be reconfigured as needs change, such as for future health events. This maximizes the utility of dashboards in the long-term to continuously enhance evidence-based local policymaking and management of public health issues.

COLLABORATIVE DEVELOPMENT OF THE DIGITAL HEALTH DASHBOARD

The first step in the development process was to establish a Citizen Scientist Advisory Council using Digital Epidemiology and Population Health Laboratory's (DEPtH Lab) community partnerships. The diverse and inclusive 8-member council had representation from across varied groups that included gender, ethnicity, and socioeconomic diversity. More importantly, the council consisted of both community members and decision-makers, a key component in the development of local digital health dashboards for decision-making.

The digital health platform was built in conjunction with the research and development teams. Extensive user-testing of prototypes with the council provided feedback to refine the dashboard and PWA interface, ensuring it was intuitive for decision-makers and residents alike. To integrate the two teams, health systems training was provided to computer programmers. Engaging computer programmers in the research process enabled them to understand the rationale behind specific decisions regarding platform development. This approach resulted in a digital infrastructure that addressed user needs, while balancing technological possibilities in computer programming.

Figure 2: Screenshots of progressive web application.

Based on the consultation with the council, three critical needs of citizens were prioritized: (1) management of household risk of COVID-19, (2) facilitation of food security, and (3) understanding citizen accessibility of public services. Hence, a progressive web application (PWA) was developed to provide daily services that address these citizens' needs.
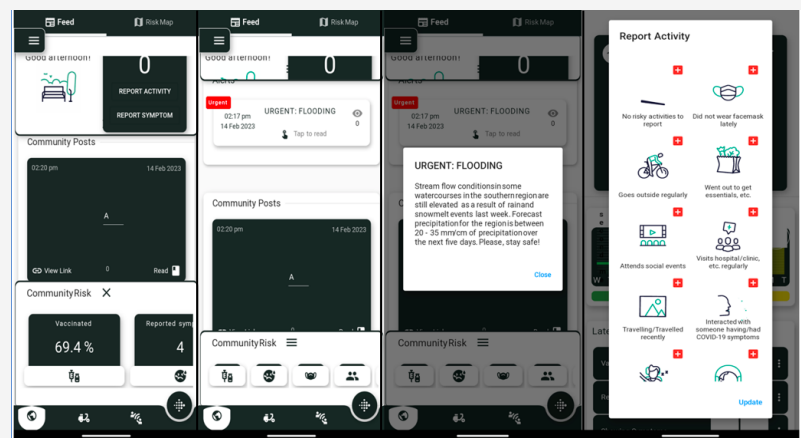
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INSIGHTS FROM A DYNAMIC DIGITAL HEALTH DASHBOARD

A digital dashboard was created that can be used in different places and adjusted to local needs and priorities. This dashboard displays de-identified and aggregated real-time data generated from people and collected through an app to manage their COVID-19 risk, request food, and report issues with public services. The dashboard has three main components: (1) the visualization of the community's COVID-19 risks, (2) the status of food security, and (3) the statistics of reported issues from community members. The dashboard also includes additional features such as the ability to send alerts from the community leader to the community, a system for direct communication between decision-makers and the people, and a way to control access to features of the dashboard.

The data displayed on dashboards comes from a cloud server and is turned into useful information and visuals that provide value in using the dashboard. The dashboard is interactive, meaning decision-makers can explore different parts of the data through slicing and filtering to understand specific details.
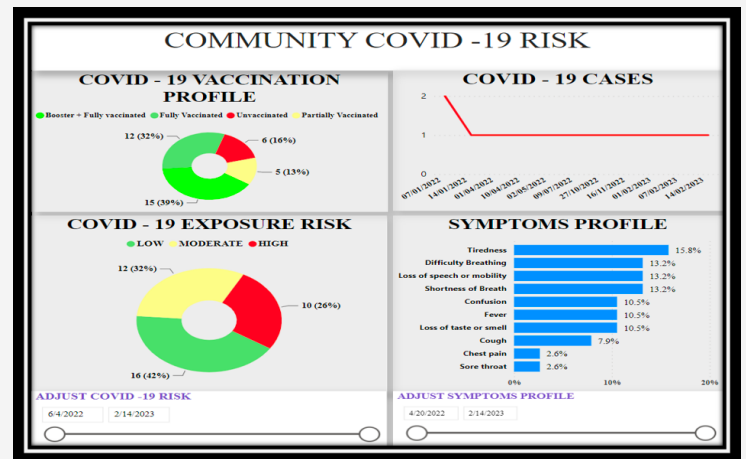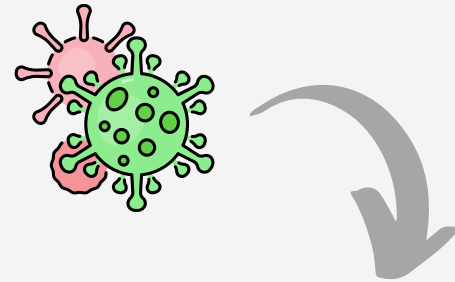

Figure 3: Dashboard home page displaying community risk profile.

REAL-TIME DATA AS A CATALYST FOR HEALTH SYSTEMS INTEGRATION

The COVID-19 pandemic clearly underscores the need for more holistic and data-driven approaches to decision-making during public health crises. Traditionally, responses have focused narrowly on healthcare. However, crises like pandemics require coordinating efforts across multiple sectors that impact community well-being.
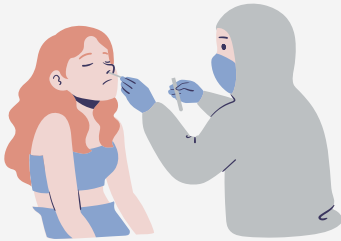
Creating a dashboard design that is replicable and scalable ensures its adaptability across different jurisdictions, allowing customizability to meet their unique needs and public health priorities. This enables decision-makers to make rapid decisions to manage public health crises in a way that includes various systems such as healthcare, food and nutrition, and social services.

During public health crises, decisions must go beyond healthcare. They also involve ensuring citizens have enough food, maintaining safety and order, and supporting vulnerable groups.

The COVID-19 pandemic has shown us just how challenging it is for decision-makers to effectively manage the complexities of infectious illnesses when they lack access to real-time, locally relevant information. As the situation evolved rapidly, inconsistencies arose due to a lack of coordinated evidence sharing between different levels of government. Local authorities were sometimes left without guidance tailored to the unique circumstances in their own communities.

To address this, leveraging real-time big data directly from community members living in specific jurisdictions in insightful ways through digital platforms can help equip local decision-makers with the evidence they need to make rapid decisions. Once citizen data is collected, monitored, analyzed and visualized through a local digital health dashboard, it provides decision-makers insights into the evolving situation within their communities. These insights can enable them to make choices informed by the realities in their area to best support residents through an integrated, evidence-based response.

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DEPtH Lab ———————————————

This reported was collated based on original research:
Katapally T, Ibrahim S
Digital Health Dashboards for Decision-Making to Enable Rapid Responses
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