

**PARTICIPATORY CYBER EXTENSION IMPLEMENTATION TO BUILD COMMUNITY HEALTH RESILIENCE IN FACING DISEASE OUTBREAK DISASTERS****Metha Madonna<sup>1</sup>, Sumardjo<sup>2</sup>, Siti Amanah<sup>3</sup>, E. Oos M. Anwas<sup>4</sup>**<sup>1</sup>Student of Doctoral Study Program in Agricultural and Rural Development Communication IPB University, Bogor, Indonesia & University of Bhayangkara Jakarta Raya, Jakarta, Indonesia<sup>2,3</sup>IPB University, Bogor, Indonesia<sup>4</sup>Badan Riset dan Inovasi Nasional (BRIN), Jakarta, Indonesia<sup>1</sup>metha.madonna@dsn.ubharajaya.ac.id**ABSTRACT**

Indonesia has experienced a series of infectious disease outbreaks, including outbreaks of the plague (1910), dengue fever (1968), malaria (2016), diphtheria (2012), and the latest being the Covid-19 pandemic (2020). These infectious disease outbreaks have claimed hundreds of thousands of lives. In addition to the limitations of medical facilities, there are constraints in public awareness and health literacy due to the suboptimal implementation of health education and communication. The selection of health education methods is challenging due to the limited number of functional health educators in the central or regional health ministries, especially considering Indonesia's archipelagic geography and scattered population. Cyber extension, managed by volunteer health educators, becomes one option to enhance the availability of better public health services. Objective: This research aims to analyze the importance of implementing participatory cyber extension for the prevention of infectious disease outbreaks. Method: A case study was conducted in three different neighborhoods in the Jagakarsa sub-district, South Jakarta. Interviews and observations were carried out to gather data and information from health volunteers, health stakeholders, and healthcare workers. Eighteen informants were involved in the study. Cybernetics theory and mobilization theory were used to analyze the concept of participatory cyber extension. Results: (1) The urgency of cyber extension is rooted in a large internet user base, clustered and closed demographic characteristics of settlements, urban community dynamics, and the opening of opportunities for feedback and interaction in the form of information exchange and consultations. (2) Community participation in implementation is essential for disseminating information, socialization, and consultation regarding the most current or scheduled health programs from stakeholders. The novelty of this research lies in participatory cyber extension efforts to build collective health resilience.

*Keywords: Cyber Extension, Participatory, Community Involvement.*

**INTRODUCTION**

Indonesia has faced crises due to the spread of infectious disease outbreaks. Many people have been exposed to viruses or bacteria, resulting in deaths during outbreaks such as the plague (1910), diphtheria (2010), malaria (1852), and the latest, the Covid-19 pandemic (2020), which has caused 1,051,795 deaths as of January 2021 [1]. The Ministry of Health of the Republic of Indonesia (Kemenkes RI) reported that by the end of 2020, the spread of infectious diseases, such as Dengue Hemorrhagic Fever (DHF), had the highest number of casualties in West Java, reaching 22,613 deaths. Malaria had the highest casualties in Papua, with 685,382 deaths. Tuberculosis had the highest casualties in West Java, with 79,423 deaths, and the highest cases of diarrhea were in West Java, with 1,348,268 casualties [2].

Several factors contribute to the challenges in handling infectious disease outbreaks, including the limited medical facilities in hospitals, clinics, and Community Health Centers (PKM). The underdevelopment of the pharmaceutical industry has led to a shortage of supplies such as medicines, vaccines, and other medical equipment. Additionally, the lack of healthcare professionals, including doctors, nurses, pharmacists, and others, hampers the effective management of outbreaks [3]. On the other hand, the implementation of health education and communication during outbreaks faces challenges, resulting in a lack of knowledge, awareness, and insight among the public to improve their health and the health of their families and communities [4].

During the early years of independence and the New Order government period (1966-1986), health education primarily focused on the development of healthcare services and support personnel, emphasizing information on healthy living behaviors such as environmental cleanliness, nutrition, and Family Planning (KB) programs. However, after the Ottawa Declaration in Canada in 1986, which emphasized the importance of health promotion in building global public health resilience, the World Health Organization (WHO) urged countries to prioritize promotive measures – activities that focus on health promotion and prevention rather than curative or treatment actions after the spread of diseases [5].

The concept of health education, now more commonly known as health promotion, involves the dissemination of information and communication. Before the shift in terminology to health promotion, health education, from the early years of independence until 1965, focused on the development of health services and support personnel. The health development focus then shifted to the behavior and knowledge of the population regarding health, known as Health Educational Service (HES) from 1965 to 1975. However, after 1975-1985, the term health education became familiar to the public before the introduction of the term health promotion (Health Promotion) in 1986 during the first International Conference on Health Promotion in Ottawa, Canada, which launched "The Ottawa Charter," addressing the basic principles of Health Promotion [6].

Health promotion through health education is a process that aims to empower communities to defend themselves against health threats. Empowerment is achieved through collaborative learning involving medical practitioners, healthcare workers, bureaucrats, and the community itself [7]. However, in practice, health education targeting the community faces challenges due to Indonesia's extreme geographical and demographic conditions, with many settlements located on remote islands, in rural areas, or densely populated areas such as the capital, Jakarta. Therefore, the approach and methods of health education are adapted to these situations [8].

The selection of approaches and methods for health education has evolved with the digital transformation of information systems and healthcare services in Indonesia, including the National Health Information System (Siknas) for data collection and administration, as well as the concept of telemedicine for medical services [9]. The digitalization of health education concepts through announcements or messages delivered through videotron, banners, Short Message Service (SMS), or public service advertisements has extended to the internet through websites and social media platforms, facilitating health education in the virtual health concept [10].

Simultaneously, the government recognized the limitation in the number of medical practitioners, healthcare workers, and functional educators to disseminate information, socialize programs, and provide health education to the public. The recorded number of healthcare professionals by the Central Statistics Agency (BPS) in 2021 was 2,287,142 people. This condition led to Indonesia's healthcare human resources (SDMK) falling below the WHO-set standards, where Indonesia has a ratio of 4 healthcare professionals (doctors, nurses, and midwives) per 1,000 population, while the WHO standard is 4.4 per 1,000 population [11].

Effective healthcare services depend on the quantity and quality of healthcare personnel, the Human Resources for Health (HRH) themselves. Healthcare professionals are crucial for ensuring the proper functioning of healthcare services, contributing approximately 80% to the success of health development [12]. These limitations prompted the Ministry of Health in Indonesia to recruit health volunteers from the community.

Various challenges in organizing health education, related to methods and limitations of educators, have become the focus of research that raises questions such as: (1) Why is the implementation of cyber extension crucial as an effort to prevent infectious diseases? (2) How does community participation contribute to implementing cyber extension for preventing infectious disease outbreaks? The objective of this research is to analyze the implementation of cyber extension and community participation in building public health resilience. The urgency of this research lies in providing an alternative solution for internet-based health education or cyber extension organized by the community.

Digital media and internet-based health education have been developed in agriculture under the concept of cyber extension [13]. The internet and virtual space connecting computers and other digital communication devices serve as extensive data storage (Big Data). Internet connectivity serves as a mechanism for exchanging information among users, educators, and beneficiaries, leading to increased agricultural production and quality through the facilitation of communication [14]. Cyber extension also contributes to building food resilience in society by encouraging community participation in productive planting on limited land [15].

In reality, cyber extension for building public health resilience has been implemented, as demonstrated by Sik Sumaedi's (2021) research on the use of digital health communication media as a healthy food education strategy [16]. Similarly, I Gede Mahatma Yuda Bakti's (2022) study on health education communication models to improve healthy living behaviors emphasizes the role of equity in health education [17]. Elizabeth Morrow et al.'s (2023) research on the learning process of healthcare professionals using evolving technology aims to enhance self-quality [18]. Sheikh Aziz et al.'s (2021) study on health information technology development focuses on improving health quality, safety, and efficiency, aligning with Ilona Kickbusch's (2021) research on the urgency of digital transformation for creating public equality and supporting sustainable health development [19, 20].

The use of digital media for health purposes has also been explored, such as Kim's (2020) research on the vital role of social media in educating and motivating parents to participate in preventing measles outbreaks [21]. Salem's (2020) research underscores the importance of digitization in health and education as pivotal sectors influencing society [22].

The key difference in this research lies in involving community participation in cyber extension, aligning with efforts to improve health quality through the digitalization of health education. This approach provides services to citizens indirectly, saving on limited state budgets, time, and energy, especially for health and well-being, in line with the third and seventeenth goals of the United Nations Sustainable Development Goals (SDGs).

The implementation of community-involved cyber extension refers to research on empowering coastal communities in building participatory communication, as demonstrated by Amanah's (2010) study where the role of voluntary educators represents community empowerment in delivering development messages [23]. Cyber extension implementation by health educators can be classified based on the actor or manager of education, such as cyber extension by health professionals (government or private educators), as discussed in Ting's (2020) study on how digital technology can improve health education and knowledge in society. For instance, Singapore utilizes WhatsApp to provide accurate information to the public regarding the development of infectious diseases like Covid-19. The Indonesian Coalition to Prevent Cervical Cancer (KICKS) as a health volunteer network forms strategies by maximizing the use of opinion leaders, mass media, new media, and interpersonal communication as communication channels. Messages are crafted considering the characteristics of the innovation, as discussed by Sutjipto (2019) [24]. Raine's (2014) research proves the significant influence of influencers as voluntary educators on the government's health policy socialization related to preventing obesity in society [25]. Similarly, Kongats' (2019) study confirms the contribution of influencers used by the government to succeed in socializing or educating about healthy eating habits [26]. Byrne's (2017) foundational research emphasizes the importance of influencers in health education. Influencers, particularly those promoting healthy and nutritious food, have been proven to significantly influence behavioral changes in society. Hence, there is a strong rationale for empowering the community, including volunteers, and community leaders as influencers through digital media [27].

Based on the above reviews, several previous studies show both differences and innovations in this research, involving community participation in cyber extension for public health resilience. The main theory supporting this research is the cybernetics learning theory, which helps explain the communication and learning process in cyber extension [28]. Additionally, the theory of resource mobilization is used to present the concept of community-based education, utilizing and encouraging resources to initiate social change [15].

**METHODS**

The research is designed with a qualitative approach using a case study method. Primary data is obtained through observation and interviews, supplemented by confirmation through conducting Focus Group Discussions (FGD). Secondary data is collected through literature reviews, scientific and popular publications, as well as documentation from relevant authorities. The locations are intentionally chosen, specifically three neighborhoods: Jagakarsa, Lenteng Agung, and Srengseng Sawah in the Jagakarsa sub-district, South Jakarta, Indonesia. These areas were selected due to their distinctive geographical, demographic, and historical characteristics, having experienced disease outbreaks.

The research analysis unit is the community of health volunteers, identified as research subjects using the snowball sampling technique or based on recommendations from initial informants. This technique involves obtaining samples by the process of rolling from one respondent to another, used to explain the social patterns or communication in a particular community [29]. Informants in this research are categorized into bureaucrat clusters, observer or beneficiary clusters, and participant clusters in health education. Based on this clustering and the search for informants using the snowball sampling technique, 3 informants were obtained for the bureaucrat cluster, 3 informants for the observer cluster, and 12 informants for the participant cluster in health education, totaling 18 informants for this study. To ensure the validity and reliability of the research, data collection emphasizes triangulation in determining informants and forming informant clusters.

Next, the data analysis stage is carried out through the classification of gathered information based on topics, concepts, or keywords. The reduction stage follows, based on interpretation or meaning of the topic, then data condensation to obtain a comprehensive interpretation or meaning. Based on the collected data, the analysis of reduced and condensed data is carried out in discussions to formulate conclusions overall. The discussion is examined with the theories of cybernetics and resource mobilization. The data analysis process refers to the interactive model by Miles and Huberman, where data analysis is conducted during data collection and continues until completion [30].

**RESULTS AND DISCUSSION**

The observation results in the three neighborhoods indicate significant differences in terms of geographical location, the history of disease outbreaks, and distinctive demographic characteristics. Locus (1) Jagakarsa Sub-district with an area of 4.85 square kilometers and a population of 350,000 people still has green open spaces due to the establishment of housing complexes in some areas. In its history, Jagakarsa experienced infectious disease outbreaks, including COVID-19 from 2019 to 2022 and an outbreak of tuberculosis (TBC) with around 30 cases in 2022. Locus (2) Lenteng Agung Sub-district is the smallest area among the six sub-districts in Jagakarsa with an area of 2.28 square kilometers and a population of 120,000 people. The area is divided by the Jakarta-Bogor railway line and a provincial highway connecting Jakarta to Depok. Historically, this area has faced various infectious diseases, including Dengue Fever (DBD) in 1984, 2010, and 2019, COVID-19 from 2019 to 2022, and TBC with 52 cases in 2022. Demographically, the settlement in this area appears dense and crowded, with limited open spaces except along a small river in the Lenteng Agung Barat region due to restrictions on building in flood-prone areas. The presence of seasonal residents in boarding houses or rental houses makes the residential areas always busy and noisy throughout the day. Locus (3) Srengseng Sawah Sub-district with an area of 6.75 square kilometers still has many open spaces and features the Setu Babakan cultural site, a small lake surrounded by lush trees with traditional houses preserved. Various infectious diseases have affected this area, such as DBD in 2019, COVID-19 from 2019 to 2022, and TBC with 67 cases in 2022. Demographically, there are still many green and vacant areas. The buildings are not well-maintained. The characteristics of the Srengseng Sawah community are more dynamic and are considered less concerned about the environment and health, including not welcoming health education initiatives.

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**Table 1:** Characteristics of the Area and Demographics of the Locality

No.	Information	Jagakarsa	Lenteng Agung Village	Srengseng Sawah Village
1.	Land Area	4, 85 square kilometers	2, 28 square kilometers	6, 75 square kilometers
2.	Population	350.000 people	25.000 to 3.000.000 people spread across 10 RW and 114 RT area	73,493 people spread across RW 19 and RT 156 area.
3.	Characteristics	It is noted that there are numerous residential areas or complexes with settled populations. The characteristics appear to be more individualistic due to living in residential areas, and residents are busy with their respective activities. Despite this, there seems to be a generally good level of awareness.	The settlement is densely populated, with many seasonal or urban residents. The characteristics are more familial and cooperative, but tend to be primordial or prioritize indigenous people, thus neglecting seasonal or migrant residents. This is particularly evident in flood-affected areas.	There are still many green and vacant lands, and the buildings are not well-maintained. The characteristics of the Srengseng Sawah community are more dynamic, and they are generally not very concerned about the environment and health, including not welcoming health education initiatives.
4.	History of Disease Outbreaks	Covid 2019 to 2022 TBC 30 cases (In 2022)	DBD 1984, 2010 and 2019 Covid 2019 to 2022 TBC 52 cases (In 2022)	DBD 2019 Covid 2019 to 2022 TBC 67 cases (In 2022)
5.	Penyuluh swadaya (Health Volunteer)	200 Health Volunteers	175 Health Volunteers	201 Health Volunteers
6.	Utilization of the Internet and Digital Media	They have utilized the internet by creating an Instagram account (IG) with the username "pkk_kel_jagakarsa." However, its nature is limited to disseminating information, and no educational outreach has been conducted (last active posting on October 27, 2021). Although there is a WhatsApp group, it is currently only used by the PKK volunteers management.	They have utilized the internet by creating an Instagram account (IG) with the username "pkk_lentengagung." However, its nature is limited to disseminating information, and no educational outreach has been conducted (last active posting on July 26, 2023). Although there is a WhatsApp group, it is currently only used by the PKK volunteers management.	They have utilized the internet by creating an Instagram account (IG) with the username "pkk.srengsengsawah." However, its nature is limited to disseminating information, and no educational outreach has been conducted (last active posting on October 27, 2021). There is also a WhatsApp group, but it is currently only used by the PKK volunteers management.

Analysis of the situation regarding approaches and education methods applied in each neighborhood, upon analyzing the situation and the education methods employed in each neighborhood, several facts were discovered.



In Jagakarsa Sub-district, where there are high-class and exclusive clustered settlements like housing complexes, real estate, and the like, conducting face-to-face health education on an individual basis is not feasible. The solution is to designate local environmental officials as messengers or information bearers, utilizing digital telecommunication media. On the contrary, in Lenteng Agung Sub-district, with dense settlements and the dynamics of seasonal (urban) population movements, education is carried out door-to-door, and there is potential for repeated message delivery since the target audience may change residence frequently. Meanwhile, in Srengseng Sawah Sub-district, which has the widest area and a varied distribution of settlements, direct education is possible but is also strengthened by the use of digital media to reach some residents who work outside and are difficult to locate. In conclusion, the use of digital media and the implementation of cyber extension are relevant when conducted in clustered or complex housing settlements, among working residents with high outdoor activities, and with mutual agreement between educators and local environmental officials.

### **Implementation of Cyber Extension in Preventing Infectious Diseases**

The primary data analysis, derived from interviews with health bureaucrats, indicates that the Ministry of Health of the Republic of Indonesia (Kemenkes RI) is acutely aware of the importance and urgency of utilizing internet-based digital media as a cyber extension concept. The World Health Organization (WHO) even recommends that every country intensify health education or promotion through internet-based digital communication channels [31]. This recommendation is not unfounded, especially in Indonesia, where the use of internet-based digital media is very high. From 2019 to 2020, internet access via mobile phones was at 96.95 percent, increasing to 98.31 percent in 2020. Access through laptops was 15.78 percent in 2019, decreasing to 13.61 percent in 2020. Additionally, internet access through desktop computers (PC) declined from 5.47 percent in 2019 to 4.52 percent in 2020 [32].

Given the large number of internet users, the Ministry of Health utilizes digital communication channels such as Facebook (FB), Instagram (IG), Youtube, TikTok, and Flickr, aligning with its responsibilities in public service and communication. Digital media is employed to socialize health development policies and counteract issues, including informing the public about infectious disease policies.

The demographic characteristics of metropolitan communities, where residents spend more time working outside their homes and live in clustered locations, make direct health education and communication challenging. Therefore, the preferred option is to utilize telecommunication tools. Health educators frequently encounter difficulties in carrying out their tasks among residents in housing complexes or those with high outdoor activities. Hence, the choice is to conduct cyber extension through platforms like WhatsApp Group (WAG), Telegram, and similar applications.

The implementation of cyber extension allows for faster information exchange directed towards individuals, yet it remains open for scrutiny by other individuals who are part of groups, communities, or targeted organizations for education. Health education and communication in the cyber domain facilitate mutual relationships or interpersonal communication between health educators and the audience. Crucially, cyber extension involves feedback on informative and educational messages, as well as interactions for consultation purposes.

Supplementing the primary data analysis, secondary data indicates the urgency of digital transformation in creating public equality and fostering hope for sustainable health development in the future. The development of health information technology aims to enhance the quality, safety, and efficiency of health and healthcare services. Digitalization in health and education is crucial, as these two sectors significantly influence society. Providing quality health through digitalization means delivering exceptional services to citizens, saving on limited national budgets.

Based on the analysis of both primary and secondary data, propositions can be formulated regarding the urgency of implementing cyber extension in building community health resilience, driven by: (1) a large population of internet-based digital media users, (2) the need to disseminate information on health policies, programs, and health issue studies to the wider community, (3) the demographic characteristics of clustered and closed

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residential areas, (4) the dynamics of urban communities or seasonal residents with numerous activities that hinder direct contact, and (5) the opening of opportunities for feedback or interactions in the form of information exchange and consultations.

The mechanisms in the implementation of health-related cyber extension begin with information sources such as messages, appeals, programs, regulations, including countering issues provided by the Ministry of Health through websites like <https://sehatnegeriku.kemkes.go.id/> and <https://radiokesehatan.kemkes.go.id/>. Information from the vast virtual space can also be produced by other institutions, healthcare service providers like hospitals, clinics, or laboratories, pharmaceutical industries, publishing companies, or individuals. Information from individuals includes not only written articles but also video content on social media covering health topics, often produced by celebrity influencers [33]. This information is not only adopted but also utilized by functional and voluntary health educators through applications like YouTube, TikTok, Podcasts, and similar online or social media platforms such as WhatsApp, Facebook, Instagram, among others.

The absorbed information is processed into knowledge (cognitive process) and then delivered as messages to the targeted audience for education or beneficiaries through digital communication media devices. Subsequently, the messages received by the beneficiaries from health educators or acquired from information sources are adopted and processed as knowledge in a cognitive process [34]. The endpoint of the cognitive process in both the communicator and the audience is a change in attitude (affective) and action (behavior), forming feedback in the cybernetic-based learning communication process [28].

The cyber extension mechanism in the health sector represents education with a mass communication approach, following Laswell's model that involves health educators and stakeholders as communicators, health information sources as messages, digital telecommunication devices as channels, and beneficiaries as the audience or communicants. This leads to the addition of knowledge accompanied by actions as feedback [35]. However, cyber extension goes beyond being a communication process, placing users as learners. As explained in the Cybernetic Learning Theory, an individual's knowledge and attitude changes are determined by the information processing system or how information is managed by the human brain. This theory assesses that there is no singular and primary learning method, focusing on making information systematic and easily understandable to facilitate recall. The cognitive process in this theory occurs when information received in Short Term Memory is transformed into Long Term Memory through repeated or even permanent delivery [36].

In conclusion, the proposition is built that cyber extension, in the effort to prevent infectious diseases and build community health resilience, is a mechanism for providing, disseminating, and exchanging programs, knowledge, regulations, and health issues via the internet. The communication process in cyber extension lies in the delivery of messages conducted by health educators or the Ministry of Health to the audience through the internet. Interpersonal communication occurs when the messages conveyed by health educators utilize social media networks, responded to by the audience as communicants, resulting in feedback. Referring to the Cybernetic Learning Theory, feedback is the learning process within the audience, involving the absorption of information, the adoption of knowledge, and decision-making. Through repeated information delivery and summarization, it is expected to transform short-term memory into long-term memory, representing knowledge.

### **Participation of the Community in Cyber Extension Implementation**

Community-based health educators involved in health socialization and education activities come from individuals or groups with non-medical educational backgrounds and skills. Individual voluntary health educators may include celebrities, influential figures, or content creators known as influencers. Health influencers are required to meet certain criteria such as popularity, competence, and behavior [33]. Meanwhile, voluntary health educators also include volunteers, individuals who voluntarily participate in health services in their community. Some volunteers are appointed or mandated by community organizations such as the Family Welfare Movement Team (TP PKK), Dharma Wanita, Bhayangkari, and others collaborating with the government as health volunteers. Health volunteers act as an extension of healthcare professionals to improve community health. These

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volunteers, originating from various community organizations, study groups, or Non-Governmental Organizations (NGOs), may also be selected to represent a specific community.

The role of health volunteers includes (1) identifying or observing health problems, barriers, and community health needs, (2) promoting or mobilizing the community to adopt Clean and Healthy Living Behavior (PHBS) [37].

Health volunteers affiliated with Community Health Centers (Puskesmas) at the sub-district level undergo training and coaching to provide health services independently. Their roles are divided into health motivators, education providers, and health service providers. This involves activities such as socialization, education, and health services, encouraging community participation in Integrated Service Posts (Posyandu), participating in Family Medicinal Plant cultivation (Toga), improving nutrition for toddlers, promoting PHBS, maintaining cleanliness and environmental sanitation, and other activities related to public health services [38].

Significantly, health volunteers have responsibilities for health services, recording, and education. Field observations show that the services provided by volunteers to the community include measuring height and weight, blood pressure monitoring, and distributing supplements or nutritious food for Child and Elderly Integrated Service Posts (Posyandu). However, diagnostic actions, medication recommendations, and injections are performed by medical professionals dispatched by the Community Health Center during health monitoring events. Cadre services related to larvae monitoring involve routine inspections of the environment and residents' homes, conducting cleaning activities, and destroying potential mosquito breeding grounds.

The role of volunteers in providing education is primarily through face-to-face meetings conducted during routine Posyandu activities. Education is also provided through home visits within the neighborhood or community units (RT/RW). The RW 05 Lenteng Agung Cadre Coordinator, along with the team, regularly visits residents when instructed by the Community Health Center or local government to provide education on the spread of specific diseases or special programs.

Based on observations in the research location from October 2022 to September 2023, supported by interviews with 18 informants, it is evident that cyber extension efforts to build community health resilience have been conducted by health volunteers and all relevant stakeholders. Although the term "cyber extension" is not widely known or understood, the majority interpret it as health program socialization through digital media and the internet. The use of digital communication technology for coordination and socialization has been recommended by the head of Jagakarsa Sub-district to stakeholders, health facility managers, and volunteers. When faced with obstacles such as severe traffic congestion in Jakarta, the spread of dangerous diseases like Covid-19, or air pollution posing a risk of Acute Respiratory Infections (ISPA), education is conducted online or in a hybrid format.

The cyber extension mechanism to build community health resilience in Jagakarsa Sub-district, South Jakarta, has been implemented, involving all stakeholders. Educational and counseling materials in the virtual space (Big Data) are provided by the Ministry of Health of the Republic of Indonesia through websites such as <https://sehatnegeriku.kemkes.go.id/> and <https://radiokesehatan.kemkes.go.id/>. These websites serve as communication and information management for public services, issue management, and public complaints.

Health information sources are not limited to official ministry websites; they can come from anywhere, such as influencers, cadre posts, or materials recommended by Community Health Centers (PKM). Data source users are not only health professionals or educators but also the general public with health needs or those seeking additional insights. In a cyber extension mechanism involving community participation, especially health volunteers, the availability of education material-related data needs to be continuous and in line with the evolving situation. This requirement necessitates the Directorate General of Disease Prevention and Control of the Ministry of Health to continuously produce educational materials in audio and video formats, delivered to the Directorate of Health Promotion for dissemination through multi-platform and social media.



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In the implementation of cyber extension, information or health education materials obtained through searches or instructions from stakeholders are disseminated through groups or directly to the target audience. To ensure that the message reaches the audience, volunteers have previously collected data on every resident within their working area, ensuring that contact numbers are available for beneficiaries or those closest to them. Thus, volunteer health volunteers as participant members of health education play a crucial role in delivering information, programs, and health regulations to residents in the smallest communities.

The cyber extension practiced by health volunteers is a manifestation of the Community-Based Extension concept in efforts to build community health resilience together. Empowering the community to participate in health education has helped expedite the dissemination of information, programs, and regulations aimed at improving health quality, managing outbreaks, and planning to build a healthy and resilient generation.

### CONCLUSION

The urgency of implementing cyber extension in building community health resilience is based on: (1) a large population of internet-based digital media users, (2) the need to disseminate information on health policies, programs, and health issue studies to the wider community, (3) the demographic characteristics of clustered and closed residential areas, (4) the dynamics of urban communities or seasonal residents with numerous activities that hinder direct contact, and (5) the opening of opportunities for feedback or interactions in the form of information exchange and consultations.

Community participation in the implementation of cyber extension is tangible and factual when individuals use digital telecommunication devices such as smartphones to spread information, socialize, and consult on current or scheduled health programs from stakeholders. Information or health education materials obtained from searches or intentionally distributed by stakeholders are then delivered through groups or directly to the target audience. To ensure that the message reaches the audience, health volunteers have previously collected data on every resident within their working area, ensuring that contact numbers are available for beneficiaries or those closest to them. Thus, volunteer health volunteers play a crucial role in delivering information, programs, and health regulations to residents in the smallest communities.

The cyber extension practiced by health volunteers is a manifestation of the Community-Based Extension concept in efforts to build community health resilience. Empowering the community to participate in health education has helped expedite the dissemination of information, programs, and regulations aimed at improving health quality, managing outbreaks, and planning to build a healthy and resilient generation.

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