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# EFFECT OF USING ASEAN REGIONAL CAPACITY ON DISASTER HEALTH MANAGEMENT (ARCH PROJECT)'S HEALTH NEEDS ASSESSMENT TOOLKIT TO ASSESS THE DAMAGE OF STORM LINFA AFFECTED IN THE CENTRAL PROVINCES OF VIETNAM IN OCTOBER 2020

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## List of Abbreviations

| | |
|---|---|
| ARCH Project | : Project for Strengthening the ASEAN Regional Capacity on Disaster Health Management |
| ASEAN | : Association of Southeast Asian Nations |
| DHM | : Disaster Health Management |
| EMT | : Emergency Medical Team |
| HNA | : Health Needs Assessment |
| JICA | : Japan International Cooperation Agency |
| MOH | : Ministry of Health |
| WASH | : Water, Sanitation, and Hygiene |
| WHO | : World Health Organization |

## ABSTRACT

**Introduction**: A Health Needs Assessment (HNA) after a disaster is essential to inform health care planning and delivery. In 2018, the ARCH project developed the Standard Operating Procedures for disaster health management in ASEAN countries, which included the HNA

toolkit. This study aims to assess the impacts of Storm Linfa in October 2020 in the central provinces of Vietnam and the applicability of the ARCH project's HNA toolkit. **Methods**: The ARCH project's HNA toolkit was used to assess the damage severity in 5 provinces in central Vietnam. The data was collected by secondary data, in-depth interviews, and direct observation at the scene by independent survey teams in two weeks, processed by Microsoft Excel and thematic analysis. **Results**: For the severity damages of the storm, a total of 710,076 people were affected by Storm Linfa with 20 missing and 72 deaths. Main sources of drinking water were bottled water (45.5%), piped water (25.6%), and rainwater, water stored in tanks (16.6%); 100% of households had unsafe sanitation and hygiene conditions; 100% of households lacked fresh food in the first two days; 100% of district hospitals were only partially functioning while the commune health stations had 20% functioning, five preventive medical centers had 3/5 (60%) partially functioning. For the applicability of HNA form, the ARCH project's HNA toolkit was helpful and easy to apply for the assessment of disaster damage and was feasible and covered all events at the scene. **Conclusions**: Storm Linfa caused serious damage to people and health care facilities in five provinces of the middle part of Vietnam. The ARCH project's HNA toolkit was helpful and comprehensive for the assessment of the severity of damage. It can be applied effectively with some modifications in real situations of natural disasters in Vietnam.

**Keywords**: Storm Linfa; Health Needs Assessment; Central provinces of Vietnam; ARCH project, Disaster.

## INTRODUCTION

Disasters can be natural or man-made, which always have enormous impacts on public health. The main goal of responding to any disaster is to save lives and reduce disability and disease. Rapid Health Needs Assessment is one of the first steps in the medical response process to a disaster and is essential to inform commissioning and service planning (1).

Vietnam has a coastline stretching 3,440 km, combined with diverse and complex terrain, so it is subject to many different types of natural disasters. In the period from 2013 to 2023, Vietnam has suffered many prolonged heavy rains, storms, floods, flash floods, and inundation, leading to more than 2,000 deaths, over 500 missing people, nearly 4,000 injured people, 7 trillion VND in damages (2–4).

Storm Linfa was the sixth Storm to form in the East Sea and made landfall over central provinces in Vietnam on 11 October 2020, causing many provinces in central Vietnam to be flooded and landslides on a large scale. It posed a risk to public health, increased communicable

diseases, risk outbreaks, and longer-term public health. The Government of Vietnam, the United Nations, Non-Governmental Organizations, and local authorities conducted damage assessments and took action to respond to the consequences of floods. However, information mainly focused on urgent food, necessities, and shelter needs. Information on the damage and medical needs in the affected provinces is still limited (5–7).

To proactively respond to the impact of the flood on public health, the disaster response group of the Standing Committee of Natural Disaster Prevention Department, Ministry of Health (MOH) with the support of the World Health Organization (WHO) in Viet Nam, requested rapid health needs assessment in the 5 provinces most affected by the flood, including Ha Tinh, Quang Binh, Thua Thien Hue, Da Nang and Quang Nam province.

In recent years, ASEAN countries have had many similarities in disaster situations. Therefore, within the framework of the ARCH project, in 2018, the project developed the Standard Operating Procedure for Emergency Medical Teams of ASEAN countries, including the HNA toolkit (8). This study aims to assess the impact of Storm Linfa in the central provinces of Vietnam and the applicability of the ARCH project's HNA toolkit in the context of Vietnam.

### ***ARCH Project and HNA Toolkit***

At the Japan-ASEAN Summit in December 2013, Japan introduced the "ASEAN-Japan Cooperation Package for Enhancement Disaster Management", which includes cooperation on disaster medicine and support for establishing a disaster medicine network between ASEAN and Japan. In 2014 and 2015, JICA (Japan International Cooperation Agency) also conducted a baseline survey on disaster medicine and emergency medicine in all ASEAN member countries. Based on the survey results, the ARCH project was officially approved for implementation in January 2016. The project was formulated as a technical cooperation project with JICA in close collaboration with the National Institute for Emergency Medicine (NIEM) and the Ministry of Public Health of Thailand. One of the roles of this project is to develop a draft regional standard operating procedure. Therefore, the HNA toolkit was also developed by the ARCH project in 2018.

## METHODS

### ***Subjects***

The ARCH project's HNA toolkit (8) was translated into Vietnamese and approved by Vietnam MOH.

***Time and Research Location:***

HNA was carried out on the 3rd day after the Storm and lasted 2 days in the 10 most severely affected communes in the five most affected districts of five central provinces (Ha Tinh, Quang Binh, Thua Thien Hue, Da Nang and Quang Nam - Table 1).

*Table 1: The localities were surveyed*

| | Province | | | | |
|---|---|---|---|---|---|
| | Ha Tinh | Quang Binh | Hue | Da Nang | Quang Nam |
| District | Cam Xuyen | Quang Ninh | Quang Dien | Hoa Vang | Thang Binh |
| Commune/ ward | Cam Quang<br>Cam My | Ham Ninh<br>Vo Ninh | Quang Thanh<br>Quang Phuoc | Hoa Phong<br>Hoa Nhon | Binh Duong<br>Binh Sa |

*Source: Dung et al., 2025*

***The Variables To Be Collected Are Represented in the HNA Toolkit***

The HNA toolkit has been created for the Emergency Medical Team (EMT), which has 29 variables (8) including:

1. The disaster situation on population and health needs: 9 variables for mortality and morbidity information focus on exploiting information such as total population, number of deaths, main causes of death, number of injuries/ill, number of pregnant women, number of patients suffering from chronic diseases, any unusual increased illness or rumors of outbreaks, number of people with mental health and psychosocial problems and main health concerns.
2. The public health of the site: 15 variables related to the water (the main water sources and the amount of water a person uses daily), sanitation and hygiene (the situation the garbage/waste, and stagnant water in people's living areas as well as vector issues (e.g. mosquitoes, dogs, snakes), food security, and nutrition (the total number of households lacking food, the types of food were lacking, and when it was re-supplied).
3. Health facilities and services: 5 variables reflecting the current situation and operational capacity of medical facilities include: impact and accessibility on health facilities, status related to electricity, communication, transportation, essential drugs, vaccines, medical equipment, medical supplies, and medical staff.

***Data Collecting Process***

Immediately after Storm Linfa 24h, Vietnam MOH deployed a team including 9 researchers for one mission to assess health needs in 5 mentioned central provinces. The team members had experience responding to disasters and were trained in the knowledge and skills of Disaster Health Management (DHM) and the HNA toolkit. Before conducting the survey, the HNA toolkit was sent to district health departments to test and evaluate its suitability. Based on feedback from medical facilities on the feasibility of the HNA toolkit, experts from the MOH adjusted it.

Data were collected by fifteen in-depth interviews with the heads of the commune, ward and district authorities, the medical staff in charge of the commune, ward, district health stations, and the local people. Data were also collected by direct observation of disaster area, direct recording to assess the losses of locality. The secondary data collection (Report every 12 hours from the Provincial Department of Health on damage to medical facilities and people's health situation) was also exploited to supplement the data in the hard copy of the HNA toolkit.

***To Assess the Applicability of the HNA Toolkit***

When filling out the form, the surveyors asked questions to determine the clarity, ease of use, usefulness, and comprehensiveness. The responses of health workers and local government representatives in the five provinces were recorded to determine the feasibility of the HNA toolkit. Further, we met regularly during testing to reflect on our experiences.

***Ethics Statement and Funding***

This survey was conducted after receiving permission from the MOH of Vietnam and funding from WHO). Oral consent to participate in the assessment was obtained from all participants.

***Statistical Analysis***

Quantitative data were analyzed using Microsoft Excel. Descriptive statistics were used. For qualitative data, thematic analysis was used.

## RESULTS

### ***Impacts of Tropical Storm Linfa.***

1. Mortality and morbidity

A total of 710,076 people were affected after Storm Linfa. There were 27 pregnant women and 285 patients with chronic diseases. Among 106 people with mental health and psychosocial problems, 79 developed mental health and psychosocial conditions after the Storm event (depression and obsessive-compulsive symptoms) (Table 2). There were 20 missing and 72 deaths. The details are shown in Table 3.

*Table 2. Disaster situation on population and health needs after Storm Linfa in the central provinces*

| Variables | Location | | | | | | | | | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ha Tinh | | Quang Binh | | Hue | | Da nang | | Quang Nam | | | |
| | N | % | N | % | N | % | N | % | N | % | N | % |
| Number of total population (person) | 153,518 | 21.6 | 89,462 | 12.6 | 92,750 | 13.1 | 201,070 | 28.3 | 173, 276 | 24.4 | 710,076 | 100 |
| Number of pregnant women (persons) | 4 | 14.8 | 4 | 14.8 | 6 | 22.2 | 5 | 18.5 | 8 | 29.6 | 27 | 100 |
| Number of patients suffering from chronic disease (persons) | 63 | 22.1 | 60 | 21.1 | 48 | 16.8 | 45 | 15.8 | 69 | 24.2 | 285 | 100 |
| - Cardiovascular disease | 25 | 25 | 19 | 19 | 15 | 15.0 | 24 | 24 | 17 | 17 | 100 | 35.2 |
| - Lung disease | 12 | 21.1 | 10 | 17.5 | 12 | 21.1 | 7 | 12.3 | 16 | 28.1 | 57 | 20 |
| - Kidney disease | 7 | 17.5 | 8 | 20 | 3 | 7.5 | 6 | 15 | 16 | 40 | 40 | 14 |
| - Diabetes | 11 | 25.6 | 12 | 27.9 | 6 | 14 | 6 | 14 | 8 | 18.6 | 43 | 15.1 |
| - Dermatitis | 5 | 22.7 | 6 | 27.3 | 4 | 18.2 | 3 | 13.6 | 4 | 18.2 | 22 | 7.7 |
| - Other | 3 | 10.3 | 5 | 17.2 | 8 | 27.6 | 5 | 17.2 | 8 | 27.6 | 29 | 10.2 |
| Number of people with mental health and psychosocial problems (persons) | 28 | 26.4 | 16 | 15.1 | 20 | 18.9 | 25 | 23.6 | 17 | 16 | 106 | 100 |
| | 6 | 22.2 | 5 | 18.5 | 3 | 11.1 | 8 | 29.6 | 5 | 18.5 | 27 | 25.5 |
| | 10 | 12.7 | 17 | 21.5 | 28 | 35.4 | 10 | 12.7 | 14 | 17.7 | 79 | 74.5 |

| Variables | Location | | | | | | | | | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ha Tinh | | Quang Binh | | Hue | | Da nang | | Quang Nam | | | |
| | N | % | N | % | N | % | N | % | N | % | N | % |
| - Before the disaster happened<br>- After the disaster happened | | | | | | | | | | | | |
| Number of deaths (persons) | 6 | 8.3 | 25 | 34.7 | 31 | 43.1 | 4 | 5.6 | 6 | 8.3 | 72 | 100 |
| Number of missing people (persons) | 3 | 15 | 6 | 30 | 8 | 40 | 1 | 5 | 2 | 10 | 20 | 100 |
| Number of injured people (persons) | 18 | 14.1 | 26 | 20.3 | 32 | 25 | 22 | 17.2 | 30 | 23.4 | 128 | 100 |

*Source: Dung et al., 2025*

*Table 3. Causes of death after Storm Linfa in the central provinces (n=72 persons)*

| Cause of death | Frequency | Percentage |
|---|---|---|
| Direct death | 10 | 13.9 |
| Indirect death | 62 | 86.1 |
| - Heart attacks | 12 | 16.7 |
| - Vehicle accidents | 31 | 43.1 |
| - Falls from a roof or ladder | 19 | 26.4 |
| Total | 72 | 100 |

*Source: Dung et al., 2025*

Three hundred and eighty-four people were hospitalized within 3 days due to trauma/injuries, also by acute diseases such as acute diarrhea, dermatitis, eye conjunctivitis, appendicitis and chronic diseases pneumonia, cardiovascular disease, diabetes accounted for 19.3% and 16.9% respectively (Table 4).

*Table 4. Cause of hospitalization after Storm Linfa (n= 384 person)*

| Cause of hospitalization | Frequency | Percentage |
|---|---|---|
| Injuries | 245 | 63.8 |
| - Traumatic brain injuries | 34 | 8.9 |
| - Fracture | 82 | 21.4 |
| - Open/ Closed chest trauma | 43 | 11.2 |

| Cause of hospitalization | Frequency | Percentage |
|---|---|---|
| - Abdominal trauma | 39 | 10.2 |
| - Burn injury | 35 | 9.1 |
| - Animal and insect bites | 12 | 3.1 |
| Acute diseases (acute diarrhea, dermatitis, eye conjunctivitis, appendicitis) | 74 | 19.3 |
| Chronic diseases (pneumonia, cardiovascular disease, diabetes) | 65 | 16.9 |
| Total | 384 | 100 |

*Source: Dung et al., 2025*

2. Public health issues

Water source, Sanitation and Hygiene (WASH refers to the provision of safe water for drinking, washing and domestic activities, the safe removal and final disposal of waste (faecal and solid waste disposal)):

a. The main sources of drinking water were bottled water (45.5%), piped water (25.6%), and rainwater, water stored in tanks (16.6%) (Figure 1).

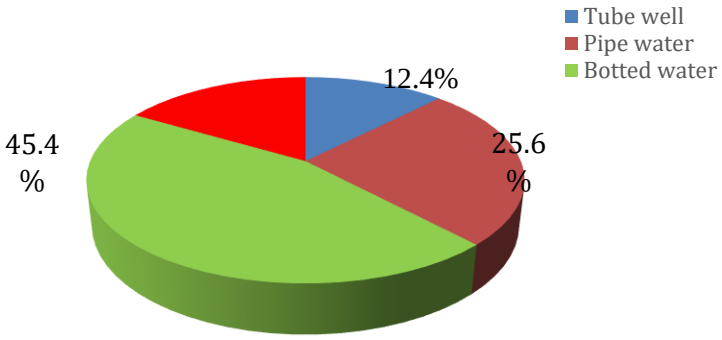


*Figure 1. Main sources of water for drinking*
*Source: Dung et al., 2025*

b. The main sources of water for basic hygiene practices were mainly spring water (33.4%), rainwater (29.1%), bottled water (22.1%), and pipe water (10.2%) (Figure 2).

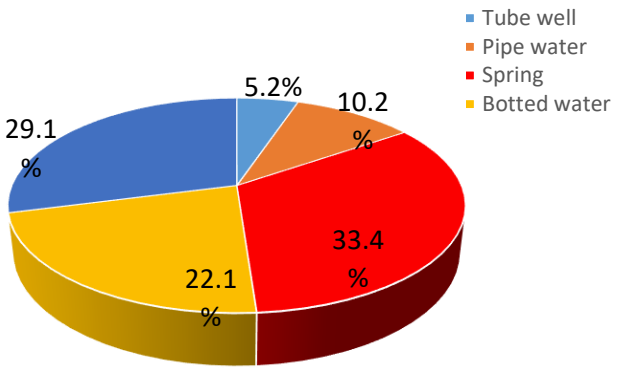


*Figure 2. Main sources of water for basis hygiene practices*
*Source: Dung et al., 2025*

The average amount of safe water for drinking and safe water for basic hygiene practices was low (1.8±0.3 and 2.0±0.3 liter/person/day). There were many potential risks of water contamination such as household waste, waste from animal husbandry areas, seawater, and animal carcasses (Table 5). 100% of households had unsafe sanitation and hygiene conditions. The toilets were flooded, and garbage was floating everywhere. Many areas had been flooded unceasingly. Vector problems (e.g. mosquitoes, dogs, snakes) existed everywhere.

*Table 5. Water source and potential risks of water contamination*

| Variables | M ± SD | Range |
|---|---|---|
| Safe water for drinking (liter/person/day) | 1.8±0.3 | 1.2– 2.6 |
| Safe water for basic hygiene practices | 2.0±0.3 | 1.2 - 3 |
| | Potential risks | |
| Potential risks of water contamination (Yes) | - Household waste | |
| | - Waste from animal husbandry areas | |
| | - Seawater | |
| | - Animal carcasses | |

*Source: Dung et al., 2025*

***Health Facilities and Services (Places That Provide Health Care)***

100% of district hospitals were only partially functioning. Commune health stations had 2/10 (20%) functioning, 5/10 (50%) partially functioning and 3/10 (30%) not functioning facilities. Five preventive medical centers had 3/5 (60%) partially functioning and 2/5 (40%) not functioning facilities. 75% of health facilities did not have adequate electricity, water, medical gas, communication, and transportation. 65% of health facilities also do not have adequate essential drugs, vaccines, medical equipment, and medical supplies (Table 6).

*Table 6. Health facilities and services*

| Variables | | Frequency | Percentage |
|---|---|---|---|
| Health facilities affected by disaster | | | |
| - District hospital (n=5) | Partially functioning | 5 | 100 |
| | Functioning | 2 | 20 |
| - Commune medical station (n=10) | Partially functioning | 5 | 50 |
| | Not functioning | 3 | 30 |
| - Preventive medical center (n=5) | Partially functioning | 3 | 60 |
| | Not functioning | 2 | 40 |

| Variables | | Frequency | Percentage |
|---|---|---|---|
| Current situation of health facilities (n=20) | | | |
| - Availability of electricity, water, medical gas, communication, transportation (n=20) | Yes | 5 | 25 |
| | No | 15 | 75 |
| - Availability of essential drugs, vaccines, medical equipment, medical supplies (n=20) | Yes | 7 | 35 |
| | No | 13 | 65 |
| - Health facilities with more than 50% of medical staffs working | | 12 | 60 |
| - Health facilities with less than 50% of medical staffs working | | 8 | 40 |
| Transportation to health facilities (n=20) | | | |
| - Ambulance | | 5 | 25 |
| - Car | | 7 | 35 |
| - Motorbike | | 14 | 70 |
| - Small boat | | 6 | 30 |
| - Inaccessible | | 1 | 0.5 |

*Source: Dung et al., 2025*

***The Applicability of the HNA Toolkit***

Two hundred residents (76.9%), 40 healthcare workers (15.4%), and 20 local government representatives (7.7%) in five provinces participated in providing the information. 60 persons including 40 health workers (66.7%) and 20 local government representatives (33.3%) participated in the evaluation of the HNA toolkit (Table 7). They have had no comments so far for the HNA forms, and all agreed that they are helpful for the assessment of disaster damage. 100% of HNA forms (2 forms/province) were completed. 29 variables in the HNA toolkit were collected in full without any problems. The variables were feasible and covered all events at the scene.

*Table 7. The applicability of the HNA toolkit*

| Features | Frequency | Percentage |
|---|---|---|
| Providing the information (n=260) | | |
| - Resident | 200 | 76.9 |
| - Healthcare worker | 40 | 15.4 |
| - Local government representative | 20 | 7.7 |
| Evaluation of HNA toolkit (n=60) | | |
| - Healthcare worker | 40 | 66.7 |
| - Local government representative | 20 | 33.3 |

| Features | Frequency | Percentage |
|---|---|---|
| Applicability of HNA toolkit (n=60) | | |
| - Easy application and Helpful | 60 | 100 |
| - Feasible and covered all events at the scene | 60 | 100 |
| - Other | - | - |

*Source: Dung et al., 2025*

## DISCUSSION

### ***Impacts of the Tropical Storm Linfa***

Due to its long coastline, Vietnam is one of the countries that faces hydro-meteorological disasters such as storms, floods, landslides, drought, water intrusion, and coastal erosion. In the past 20 years alone, natural disasters have left 500 people dead or missing, causing economic damage to GDP (Gross Domestic Product) of about 1-1.5%/year (2,6).

The survey results in 5 central provinces of Vietnam after Storm Linfa showed that there were many causes of injuries and deaths, such as vehicle accidents and falls from a roof or ladder (Table 3). These causes are also common and have been statistically reported after natural disasters (9–12).

Public health condition after a disaster is expressed in three aspects: Water source; Sanitation and Hygiene; Food security and nutrition. Inadequate water, sanitation, and hygiene (WASH) provision can lead to the risk of several diseases including diarrhea, hepatitis A, cholera, typhoid, dysentery, intestinal worms, malaria, and trachoma (9). Natural disasters have repeatedly been shown to have a negative impact on households' access to safe and affordable drinking water. Water sources such as rivers and streams can serve as essential alternative sources for households during disasters. However, it is important to note that these open water sources are often considered unsafe for consumption and pose potential health risks (13). The lack of inadequate drainage facilities, the dysfunctional state of toilets, and insufficient drinking water had resulted in unhygienic conditions (14,15). Our survey has shown that the drinking water sources, and basic hygiene practices (bathing, etc.) were often not up to hygienic standards. The average amount of safe water for drinking and safe water for basic hygiene practices was low (1.8±0.3 and 2.0±0.3 liter/person/day, respectively - Table 5) when compared to the standards set out in the HNA toolkit (2.5-3 and 2-6 liter/person/day, respectively) (8).

After natural disasters, ensuring food security is a top priority (16). In recent years, the Vietnamese government has proposed many policies to ensure food security for areas frequently

affected by natural disasters (17). The effectiveness of this strategy has been clearly shown in our survey results on food security and nutrition. In the first two days after the disaster, people living in the survey area lacked fresh food (chicken, other meat, fish, eggs), food (rice, corn, noodles, sesame, beans, cassava, potatoes, and flour), and other (cooking oil, fruits, vegetables). By the third day after the disaster, 100% of households were supported and fully provided with necessities by the local government.

Healthcare services play an essential role in saving lives in times of disaster impact. However, after the disaster, health facilities also suffered heavy damage (18). Our survey results have shown that 75% of health facilities did not have adequate electricity, water, medical gas, communication, or transportation. 65% of health facilities also do not have adequate essential drugs, vaccines, medical equipment, and medical supplies.

In case of a severe disaster, it is necessary to evaluate and implement disease prevention; coordinate to ensure clean water, establish sanitation facilities and implement sanitation work during and after disasters; deploy mental and psychosocial support for communities affected by disasters; coordinate planning and implementation to ensure nutrition; coordinate planning and implementation of sexual and reproductive health counseling in disaster-hit communities; Deploying treatment of non-communicable diseases in the community (19,20). Therefore, the results obtained from this HNA survey will be very useful for deploying emergency medical support after Storm Linfa in 2020.

***The Applicability of the ARCH Project's HNA Toolkit***

Currently, many tools exist to assess medical needs in disasters and emergencies (21). The International Federation of Red Cross and Red Crescent Societies (2021) reported that there are currently four HNA tool models. The first tool was rapid secondary data review, which was used before the deployment of the assessment team to the field, at the regional/headquarters office level. Surveyors with a public health or clinical background often use this toolkit to collect information such as general information about the population's health status (including mental health) and the health system before disaster strikes. The toolkit also collects data related to the impacts of disasters on people, groups in need of humanitarian assistance, basic health needs and local response capacity. The second tool is the Rapid Health Assessment Form. This tool collects information related to Demographics, Health status (mortality, morbidity, malnutrition), and Health Services: availability and accessibility. The third tool is the health facility assessment form. This is a comprehensive assessment tool for the performance of healthcare systems and the health status of people after an emergency. It includes the

demographics of the disaster area, the state of infrastructure (structures and transportation systems), medical personnel, available medical services, information related to mortality, morbidity, surveillance, drugs, and medical supplies. The fourth tool is Reference values for health needs assessments. This tool contains reference standards for key health indicators in emergencies and is applied in analyzing the data collected during the HNA process (1,7).

Things to do in case of a disaster such as evaluating and implementing disease prevention; coordinating to ensure clean water, establishing sanitation facilities and implementing sanitation work during and after disasters; deploying mental and psychosocial support for communities affected by disasters; coordinating planning and implementation to ensure nutrition; coordinating planning and implementation of sexual and reproductive health counseling in disaster-hit communities; Deploying treatment of non-communicable diseases in the community to identify unique regional, cultural, and other unanticipated needs, as well as to recognizing the needs of specific sub-populations (20,22,23). Therefore, the results obtained from this HNA survey will be beneficial for deploying emergency medical support after Storm Linfa in 2020.

Our survey aimed to collect information related to the "Overall situation of the site or shelter". In particular, the three major contents were surveyed: The disaster situation on population and health needs, the public health of the site, and health facilities and services. During the survey, we found that the ARCH project's toolkit comprehensively covered most of the effects of the disaster on people at the scene. During the survey, we found that the ARCH project's toolkit comprehensively covered most of the effects of the disaster on people at the scene. This toolkit also summarizes the contents of all four HNA toolkit models offered by the International Federation of Red Cross and Red Crescent Societies in 2021, as presented above. Kết quả nghiên cứu của chúng tôi cũng phù hợp với nhận định của tác giả Wuthisuthimethawee P và cs (2022), khi sử dung bộ công cụ HNA của dự án ARCH đã nhận định rằng: This HNA toolkit was complete and updated information, and easy to implement (24).

## LIMITATION

We missed some information during the survey process due to a lack of experience in practicing HNA. Some flooded areas were inaccessible and we could not identify safe drinking water and safe water for basic hygiene practices. Besides, the authenticity of the results obtained in this research also depends on the interviewer's information exploitation skills and the interviewee's ability to express and understand.

## CONCLUSION

Storm Linfa in October 2020 caused severe environmental and health damage to 5 provinces in Central Vietnam. The ARCH project's HNA toolkit was helpful and easy to apply to assess disaster damage. This toolkit covered all events at the scene to collect information on health activities and the impact of the environment in the disaster-affected area.

## ACKNOWLEDGMENTS

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## CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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