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## LOGISTICS PREPAREDNESS DURING HEALTH EMERGENCIES IN GHANA

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### ABSTRACT

This paper sought to investigate logistics preparedness of Ghanaian institutions during health emergencies. Two hundred and fifty-seven (257) respondents drawn from the security and other agencies within the Effutu Municipality in the Central region of Ghana constituted the sample size. The authors used structural equation modelling (SEM) to test the study's model and hypotheses. The study revealed that, the availability of logistical support during emergencies is inadequate for efficient emergency management. Regarding logistical preparedness of health professionals and security agencies, there is much needs to be done to attain the minimum acceptable standards. The study further discovered that logistical resources are critical to the collaborative effort of health workers and security agencies. However, it was evident that collaboration among institutions does not necessarily enhance the success of emergency management. The study is significant because the steady rise in Ghana's population coupled with urbanization has brought in its wake challenges that successive governments have struggled to surmount. The occurrence of frequent disasters meant that a study of this nature is important to bring to the fore the human and material costs, thus awakening the sensitivities of policy makers and authorities mandated to ensure the safety and wellbeing of the citizenry.

### KEYWORDS

logistics preparedness; health emergencies; disaster; humanitarian logistics; Ghana.



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## 1. Introduction

Logistics deployment and response are critical during emergencies because the survival of victims of disasters depend on first time respondents. These first-time respondents such as the ambulance service, the fire service, the police service, the health service staff among others should have the requisite logistics to respond effectively and efficiently to emergencies. Studies have established that health care management is a complex activity that goes beyond health centers and hospitals but extends to multi-state hospital systems, ancillary care agencies, and external stakeholders who invariably influence health care operations. It is therefore imperative to create a collaborative environment where actors in emergency response strategically plan the logistics network systems to effectively help in their operations during disasters and emergency situations (VanVactor, 2012). According to Norman *et al.*, (2012), many hospitals in Ghana are ill-prepared and ill-equipped to handle emergencies. The object of providing an efficient and effective emergency response depends on the flexible flow of logistics support necessary for timely emergency response (Wang, 2018). The first point of call in an emergency is the security and health care providers. These agencies are responsible for overseeing emergency operations and are charged to take appropriate steps to save the lives of victims (Valecha, et.al., 2019). Delays on the part of security agencies and health services providers during emergency relief operations in most cases is as a result of inadequate and delays in the deployment of the requisite logistics to mitigate the effect of disasters (Boye & Abubakar, 2019). According to the World Health Organization (WHO), about 80 percent of deaths in low to middle income countries during emergencies is said to occur at the pre-hospital settings. Indeed, research has shown that most of these deaths could be avoided with timely and adequate logistical support to frontline or first respondents (Sam, et, al., 2019). It is estimated that on the average 218 million lives are affected yearly due to inadequate preparedness during world emergencies. The increasing numbers of emergencies and catastrophic events across the globe makes it imperative for security and health services in Ghana to prepare towards handling these uncertainties. These situations require that logistical supplies and support are given critical attention (Rahman et al., 2020). The motivation for the urgent need of designing a relief network systems in preparing for potential emergencies to cope with the main logistical challenges in both pre- and post-disaster phases on humanitarian logistics network design under mixed uncertainty was researched by Tofighi, Torabi and Mansouri (2016). Boonmee, Arimura and Asada (2017), examined the significance of the location of health facilities in dealing with emergency situations. It is worth mentioning that there have been numerous research outputs on emergency rescue operations across the globe. However, there is still paucity of information in the literature in logistics preparedness during emergencies in Ghana. The objective of this paper is to investigate the level of logistical preparedness during disasters and emergencies in Ghana by the various stakeholders.

## 2. The Incidence of Disasters in Ghana

In Ghana, fire outbreaks, road accidents, perennial floods, the collapse of physical structures (buildings) among others have become routine occurrences that cause loss of lives and property (Boye & Abubakar, 2019). For instance, in 2019, the Motor Traffic and Transport Department (MTTD) of Ghana reported over 13,800 road accidents resulting in about 17,380 injuries and 2,284 deaths. Again, between January and October 2022, a total of 1,985 persons lost their lives through road accidents (MTTD, 2022). The Ghana National Fire Service (GNFS) reported about 4,287 fire outbreaks in the same year (Graphic online 17<sup>th</sup> January 2020). In the first half of 2020, the GNFS recorded a total of 4,467 fire outbreaks across the country (GNFS, 2022). Data from the National Disaster Management Organization (NADMO) revealed that at least 174 persons died through flooding between 2014 and 2020 (NADMO, 2020). The common understanding of what constitute logistics preparedness and how

it is essential during disasters and emergency relief operations of victims has been a challenge to successive governments (Jahre et al., 2016). The availability, adequacy and appropriateness of logistics support systems are necessary for efficient healthcare delivery, reliable ambulance and security interventions during disasters and emergencies (Boye & Abubakar, 2019). The planning of activities necessary for obtaining logistics to fight disasters and emergencies require critical attention. This is important because the success of relief operations during disasters and emergencies are dependent on the availability of appropriate and requisite logistical supplies (Rodríguez-Espíndola et al., 2018).

In responding to emergencies, authorities responsible for decision making must play a major role by managing the available logistical resources while the emergency is still in progress. Boonmee, Arimura and Asada (2017), argue that the most important considerations during disasters and emergencies are shelters and medical centers. These facilities respond to demand and ensure the wounded are transferred to medical facilities during emergencies, and the ability to evacuate victims as quickly as possible. Speer (2018) posits that it is necessary to increase emergency preparedness to ensure safety for all during and after critical incidents of emergency. Baidoo (2018) researching into a study on humanitarian and relief organizations operating in Ghana revealed that, availability of logistical support is an important factor for effective and efficient emergency relief operations. Prompt delivery of logistics during disasters is the most important element in any emergency relief effort, and thus makes the difference between a successful and a failed emergency relief operations (Wang, 2018).

### 3. Humanitarian Logistics

Humanitarian logistics aims at the mobilization of resources to aid in alleviating the suffering of victims during disasters and emergencies. Humanitarian logistics coordinates the demand and supply of materials needed for relief operations in emergency events (Tomasini and Wassenhove, 2009). Humanitarian logistics looks at efficiency and cost effectiveness of activities related to the planning, implementation, and control of material and information flow from suppliers to end-customers. Thomas and Kopzack (2005) recognize logistics preparedness as one of the activities of humanitarian logistics. Van Wassenhove (2006) explained that humanitarian logistics are required resources essential for relief operations and involves the process and systems of mobilizing people and resources, skills, and knowledge to help victims during emergencies. In emergency management, logistics management facilitate the flow of materials needed to rescue lives of victims. Effective and efficient emergency response management calls for proactive material planning. There should be a streamlined process of making materials that are needed for emergency relief operation readily available and deployed without delay (Tarigan, 2018). Tarigan (2018) posits that the management of relief items during disasters should be agile, timely as well as cost effective. The uncertainty of events and rapid change of logistics requirements during disasters make agility of humanitarian logistics very important. Nahleh et al. (2013), explain that the limited supply of humanitarian logistics, technology, human capital, and financial resources justify the need to streamline logistics systems in a cost-effective manner to support the delivery of emergency services during disasters. Van Wassenhove (2006) identified five elements of logistics preparedness - human resource, knowledge management, operational and process management, financial resources, and community. Kunz et al. (2014) incorporated the five elements of preparedness into logistics preparedness by adding inventory management and infrastructural planning as key components of logistical preparedness. Planning and stock management are suggested by Doughty and Rackham (2019), as tools that support preparedness for emergencies. These tools are seen as elements that are important in emergency preparedness.

#### 4. Disaster Management

The rapid urbanization in Ghana has brought in its wake developmental challenges needing emergency management strategies. Sharpe *et al.* (2019), suggest that emergencies are situations that call for immediate interventions to rescue lives and protect properties. According to Pascapurnama *et al.* (2018), emergencies are seen as situations born from catastrophic events such as hurricane, terrorism, human induced disasters and natural disasters. Haddow, Bullock and Coppola (2017) agree with Sharpe *et al.* (2019) when they posit that emergencies become disasters when the capacity of respondents fail to meet the requirements of the event. Blanchard (2007), explain emergencies as incidents which occurrence causes temporal or permanent threat to lives and properties. The occurrence of these events is unannounced with little or no warning signs. Salamati, *et al.*, (2017), affirm that emergencies are unpredictable events that are inevitable. The likelihood of the reoccurrence of emergencies makes it imperative to put in place sustainable measures to reduce its effect on society. Effective planning by security and health services assist in preventing and mitigating the effect of emergencies (Salamati, *et al.*, 2017). Guarnieri and Travadel (2014), indicated that the inevitable nature of emergencies have led to the development of strategies to reduce its occurrence. Demiroz and Haase (2019), argue that resilience has become an important concept in the fields of emergency and disaster management. Policy makers and academics have increasingly use resilience to relate to the management of emergencies. In relation to effort of managing emergencies, resilience should be conceptualized, promoted, measured, and assessed (Cutter, 2016).

#### 5. Emergency Management in Hospitals

Hospitals provide essential care during emergencies. The degree of disturbances borne out of emergencies has increased significantly because of the capacity of hospitals and health-care systems to handle these phenomena. The response checklist developed by the WHO's regional office for Europe to manage hospitals' emergency response is to assist hospital administrators in the effective management of emergencies and surges within societies. Any event with the tendency of causing harm to lives and properties, such as natural disasters, terrorism, or chemical, biological, radiological, nuclear, or explosive hazards, RTAs, fire outbreaks, floods, often require a multi-jurisdictional and multi-functional response and recovery effort, which must include the provision of health care. There is a significant barrier to the delivery of emergency health care because of increases in demand for medical services and supplies. The readiness of the health system to handle such emergencies is dependent on their level of preparedness (Norman *et al.*, 2012). The United Nations International Strategy for Disaster Reduction (UNISDR, 2008) recognized hospitals as an important part of disaster and emergency management. In line with previous arguments, Persoff, Orloff and Little (2018) argue that the preparedness of hospitals against emergencies is necessary as the hospital acts as the primary care provider during emergencies.

The insufficient numbers of health workers and the shortage of critical equipment and other logistical supplies at hospitals can reduce the effort of hospitals in the management of emergencies. It is very challenging managing emergencies as health facilities are overwhelmed. Emergency preparedness involves the resourcing of hospitals and health facilities by building a system that create synergy and resilient healthcare for the management of emergencies. According to the WHO's standards and best practices, there is the need for the provision of efficient and effective management of all emergency situations by hospitals and other related agencies. The training of human resource for the management of emergencies and the provision of funds to better build capacity in responding to emergencies become essential (Norman *et al.*, 2012). Hospitals across countries increasingly understand their role in emergency preparedness to improve the capability and capacity before a

major incident. Hospitals are increasingly understanding their roles in emergency management. There are efforts to improve the preparedness of hospitals to manage emergency situations. The failure of a health system to withstand disasters and its related emergencies create huge effect on victims because of limited capacity (Rezaei et al., 2018). According to Ncube and Chimanya (2016), preparing for emergencies in the hospitals involves a systematic process with sequence of activities such as policy development, vulnerability assessment, emergency plan, training and education and monitoring and evaluation. The checklist developed by WHO's Regional Office for Europe outlined nine tools for hospital emergency response namely Command and control, communication, safety and security, triage, surge capacity, continuity of essential services, human resources, logistics and supply management and post disaster recovery. Salamati and Kulatunga (2017), also argue for the implementation of a formal plan by hospitals to manage emergencies.

## 6. The Role of Security Agencies during Emergencies

Security agencies play a major role in emergency management. They are the first respondents in times of emergencies. As emergencies are unpredictable and inevitable, there is the need for the security services to adopt management functions to manage the occurrence of this unpredicted events. The availability of logistics and human capital is essential in rescue operations by security services in providing support to victims of disasters. The security services are the primary point of contact by communities in the occurrence of most emergency incidents like fire outbreaks, riots, floods among others. Security services are organizations or institutions that provide lifesaving support to victims in an emergency (Pascal & Waard, 2017). The security services are expected to supervise the safe and proper evacuation of victims during emergencies and also investigate the cause of such incidents (Levinson & Domb, 2016). The security services also have the responsibility of educating citizens on preventive measures and ways of mitigating or responding to an emergency event. The security services are to ensure the adoption of proactive measures by making available the needed resources for preventive, mitigation and rescue operations (City, 2012). The work of security services is not the same as health care providers. Security services are to provide support and also aid in the evacuation of victims in the midst of emergencies (Etkin, et al., 2015).

The security service is responsible for coordinating the evacuation of victims during emergencies. In the event of emergencies, the security services have the overall operational responsibility during search and rescue, and evacuation of victims (Sommer et al., 2017). The protection of lives and properties are the main functions of security services. In emergency situations the police service are tasked to prevent damages to individuals and the environment at large (Schweickhardt, 2019). Emergencies are life threatening events that affect the lives of people. The threat of emergencies makes the provision for its management if it occurs very important. The effort of preparing for emergency incidents is to provide for positive outcomes. Learning from the lessons of previous emergency operations are essential in preparing for similar future events (Sommer et al., 2017). Logistical preparedness is a continuous process of planning and coordinating the flow of materials and information for the purpose of meeting the urgent needs of institutions. The fulfillment of the institutional responsibility in a timely and efficient manner is critical in the delivery of desired services (Speer, 2018). Coordinating the flow of logistics is critical to relief operations, the fulfillment of responsibilities by security services during relief operations cannot be executed without the required logistics. The collaboration among the fire and police services is crucial in the management of emergencies. Collaboration has been identified as a useful resource aimed at preventing, preparing, responding and restoring societies after an emergency (Menya & K'Akumu, 2016). McConnell *et al.*, (2019) argue that humanitarian support requires proactive planning of logistics and support tools like

the enterprise resource planning to provide solution to logistical challenges. Speer, (2018) is of the view that the flow of tools, information and equipment needed for relief operations are critical to agencies and institutions assigned with the responsibility of managing emergencies.

## 7. Logistics Preparedness

Various agencies and organizations have varied opinions on what constituent logistics preparedness. The lack of a common understanding regarding the meaning of logistics preparedness has the tendency of impeding coordinated efforts aimed at addressing issues pertaining to humanitarian logistics. Having a common understanding of what constitute logistics preparedness will provide effective means of communicating the importance to various agencies to better position them logistically (Jahre et al., 2016). The establishment of networks has been recognized as a strategic move which is also relevant for emergency preparedness management and enhance the effectiveness and efficiency of emergency response (Kaneberg, 2018). Human resource is essential in the management of emergencies. It is necessary to have a pull of highly skilled personnel with varied specialities to assist in the management of emergencies (DiLeva & Sulis, 2017). DiLeva and Sulis, (2017) further posit that logistical resources like the blood bank, modern diagnostic equipment, allocation of space, among others are determinants of a successful emergency operation. Due to the scarcity of logistical resources, it is advised that Business Process Methodology (BP-M) be used to assist in the management of emergencies. There is a higher level of awareness of professionals on their roles in the management of emergencies. However, there is low level of professionals awareness on their institutional strategies for dealing with emergencies (Alzahrani & Kyratsis, 2017). Knowledge and skills of emergency management professionals needs a continuous enhancement to better position the preparedness level of institutions. De Leeuw, Vis and Jonkman (2012), outlined four key challenges in emergency logistics preparedness framework as demand management, supply management, inventory management and resource management. It is imperative that adequate attention is given to the various logistics requirements necessary to handle emergencies. The consideration of logistics requirements and the management of the available logistical resources is central to the management of emergencies. The deployment of resilient supply chain that is able to mitigate and overcome disruptions during emergencies do not only constitute preparedness but also strengthen standards, innovation and collaborative effort of stakeholder agencies to efficiently respond to emergencies (Ongyi et al., 2021).

## 8. Theoretical Foundation

### *Resource-Based Theory*

The origination of resource-based view is dated back from the work of Penrose (1959), where Penrose classified an institution as a pull of resources and capabilities. The argument of Penrose is that the success of an institution is ensured by available resources. Barney (1991) further included physical logistics, capabilities, processes, attributes, knowledge, and professional know-how as important requirements for the formulation of institutional strategies. The foundation of the resource-based view according to Barney (1995) is based on immobility and heterogeneity of resources. Tatham, et al., (2012), define the resource-based view as all tangible and intangible resources and capabilities of an institution including institutional processes, managerial capabilities, information, knowledge among others. The resource-based view explains the internal strengths of an institutions with emphasis on the institution's resources (Barney, 2002). These resources are valuable, rare, inimitable, and non-substitutable. Institutions that exploit its resources and capabilities to meet its strategies are more likely to be successful in their operations. Logistical resources have great

influence on institutions that seek to rescue victims during emergencies. The logistical resource profile and the capability of an institution determines how fast they can respond to emergencies.

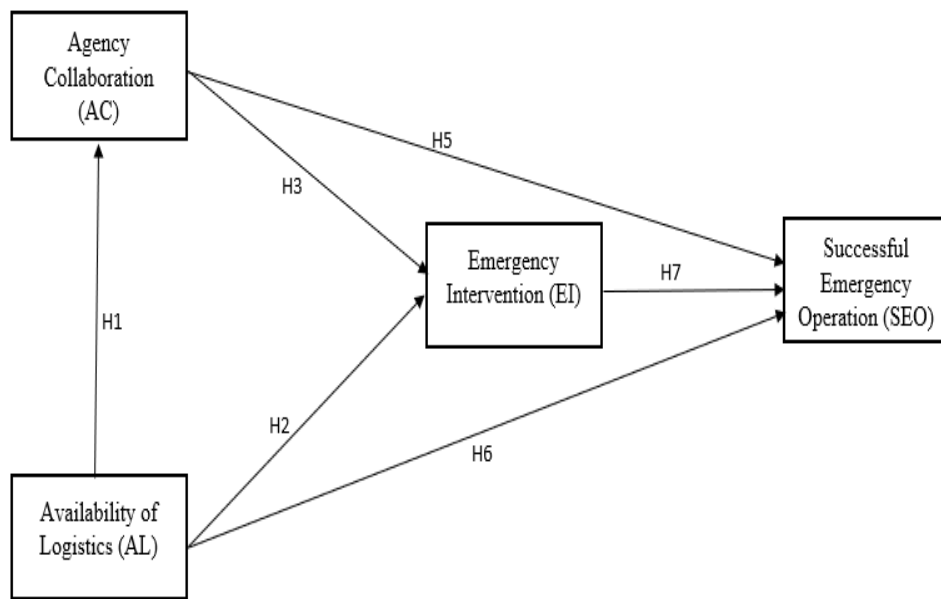
The emergence of the RBV theory represents a disagreement with the five forces analysis model or what is known as Porter's Theory (Dyer & Singh, 1998). The RBV argues that firms consist of a collection of heterogeneous resources and that these resources are the source of competitive advantage (Barney, 1991). The RBV posits that effective logistical processes within institutions ensure successful relief operations (Teo & King, 1997). The RBV explains how important each component of an institution is and the role it plays in the strategic implementation of ideas. The theory brings together bundles of physical and logistical resources that aids in successful operation of an organization (Wowak et al. 2016). The resource-based theory further explains the relevance of developing internal strengths of institutions to respond to societal resource requirements. The analysis of the resource capacity of institutions play a major role in rescue operations (Rivard, et al., 2006). Cohen (2017) opines that the RBV depicts access to resources and capabilities in humanitarian supply chains. Resources and capabilities are the core competency of the health and security services during rescue operations (Cohen, 2017). The RBV places health and security institutions at a level of strategic resources desirable for successful execution of rescue operations (Dubey et al., 2018). Porter explains that the success of institutions performance does not necessarily depend only on its resources but rather how these resources match into the institutions structure and strategy. The RBV provides better understanding of those resources and capabilities needed to improve the performance of institutions (Rivard, et al., 2006). Collaboration among institutions help in the management of emergencies. Collaboration enables institutions to harness each other's strategic resources for effective and efficient disaster operations (Rodríguez-Espíndola, 2018). The resource-based theory stresses that it is the internal resources of institutions that are converted into capabilities for a successful operation (Ashrafi & Mueller 2015).

### *Contingency Theory*

Haavisto (2014), from the point of view of humanitarian logistics argues that contingency theory provides for the alignment of resources and capabilities to match the societal demands of people. A study by Larson and Foropon (2018), on the relevance of contingency theory on humanitarian operations revealed that, the scope and size of institutions is connected to the use of standards in its operations. Contingency theory focuses on three dimensions, the contingency factors which are societal or environmental factors that goes beyond the control of institutions, the institutional response, which is in the context of internal structures and capabilities and the assessment of the alignment between the contingency factors and the institutional response (Sousa & Voss 2008). The match between these variables provides for successful relief operations. Contingency theory provides management of institutions with better understanding of how to position their supply chains to appropriately react to emergencies. The humanitarian supply chain is faced with uncertainties and disruptions, the mismatch of resources to deal with such disruptions necessitate the theory of contingency (Smith, 2013).

## **9. Conceptual Framework**

The conceptual framework is connected to the concept, theories and empirical knowledge that are important to the research (Camp, 2001). The framework explains how the issues identified will be solved. The conceptual framework shows the connection between the concepts of the research. It is the visual representation of how concepts are connected to each other (Grant & Osanloo, 2014).



## 10. Availability of Logistics and Agency Collaboration

The availability of logistics provides relief to victims of emergencies. Different agencies collaborate to rescue victims during emergencies. (Rodríguez-Espíndola et al., 2018). In the mist of large-scale emergencies, joint participation activities are needed to pool logistical resources from different agencies (Nolte, et al., 2012). The non-availability of logistics is likely to impede the collaboration effort of agencies during emergencies. According to Holguín-Veras et al., (2012), the lack of logistical resources affected the ability of governments and other agencies who came together with a coordinated effort to provide rescue to victims during the 2010 Haiti disaster in a timely manner. Whilst individual agencies have the responsibility of making available logistical resources for its operations, the magnitude of the disaster calls for collaborative effort by different agencies. Furthermore, the low rate of morbidity and mortality of victims in disasters require a multi-agency approach which is strongly equipped with logistical resources. Individual agencies specialize in a certain area of logistics to better the coordinated effort of all agencies (VanVactor, 2017). From the above discussions it can be said that the availability of logistics affects collaboration effort by agencies during emergencies. Therefore, the study proposed hypothesis 1 as:

*Hypothesis 1 (H1): Availability of logistics has a positive influence on agency collaboration.*

## 11. Availability of Logistics and Emergency Interventions

The range of interventions provided by health and security agencies during emergencies is essential to their capacity. However, the success of these interventions is driven by the availability of logistical resources (Kyei-Onanjiri et al., 2018). During the novel coronavirus pandemic, hospitals redesigned their logistical strategies to support the implementation of interventions. Nations and institutions deploy various strategic interventions to support their fight against the pandemic. The deployed interventions are supported by the provision of logistics (Gagliano et al., 2020). According to Vail et al., (2018), the availability of logistics is one of the barriers to giving emergency care to victims. Focusing on the required logistics can help in improving emergency care. Availability of skilled personnel, medical equipment, medicines, and non-medicine consumables directly affects rescue operations. The



provision of logistical resources promote the interventions of health and security agencies to better position themselves during emergencies (Kyei-Onanjiri et al., 2018). According to DiLeva and Sulis (2017), the addition of human resource increases the performance of an emergency department whilst reduction in human resource causes a major blockage in the intervention given by emergency departments. Chan *et al.*, (2017), further argue that the limitation of logistical resources has negative implications on the interventions deployed by agencies during emergencies. The discussion suggests that availability of logistics has significant influence on the intervention of emergency rescue operators. Hence the study postulate hypothesis 2 as:

*Hypothesis 2 (H2): Availability of logistics has a positive influence on emergency interventions.*

## **12. Agency Collaboration and Emergency Intervention**

Working together for the purpose of alleviating the suffering of victims during emergency is arguably a form of emergency intervention. Collaborative teamwork among agencies has been adopted to increasingly improve interventions of rescue operators. A study conducted by Watson, et al., (2017), showed how the Crisis Intervention Team (CIT) model can be used as a strategy to identify various components to improve response systems. Indeed, collaboration among institutions is recognized as a central component of emergency interventions. Inter-agency collaboration improves the competitive advantage of collaborating institutions. Collaboration among agencies brings about positive changes in outcomes. Inter-agency collaboration is one intervention which needs critical attention during emergencies. The unique strength of individual agencies is drawn to better manage emergencies when there is coordination and collaboration among agencies (Li *et al.*, 2017). The discussions indicate that individual agencies have unique logistical strengths that are needed during emergencies. For this reason, merging efforts will better the various strategic interventions that will be drawn to alleviate the suffering of victims during emergencies. Therefore, the study hypothesized that:

*Hypothesis (H3): Agency collaboration has a positive influence on emergency intervention.*

## **13. Agency Collaboration and Successful Emergency Operation**

Due to the uncertain nature of emergencies, collaboration among agencies is very critical for rescue teams before and during emergencies. The effects of inter-agency collaboration on the success of emergencies response management were illustrated during the May/June 2010 floods across the Czech Republic, Slovakia, Poland, Hungary, Ukraine, Austria, Germany, and Serbia. The capacity drawn from different agencies played critical roles in the success of rescue missions. The effort of different agencies like the Fire Service, Police Services and medical teams are needed to complement each other during emergency response operations (Kozuch, et al., 2016). Accordingly, inter-agency collaboration aids in improving the success of emergency operations. Emergencies call for combination of effort from stakeholder agencies. The collaboration of effort among agencies has a great deal of impact on the success of emergency operations (Kapucu et al., 2010). From the argument, the study proposes the fourth hypothesis:

*Hypothesis 4 (H4): Agency Collaboration has a positive influence on successful emergency operations.*

## **14. Availability of Logistics and Successful Emergency Operations**

Logistics is very essential in the management of emergencies. The availability of materials, equipment, labour among others drive the success of relief operations. Supplies of medicines, machines, equipment and other consumables are the basic needs of health and security agencies

during rescue operations (Skender, et al., 2019)The mobilization of supplies by health and security agencies are very important in their preparation towards emergencies. In the aftermath of an emergency, the security and health agencies need specialized equipment to undertake its rescue operations. The RBV suggests that the competency of institutions is dependent on its available resources(Cohen, 2017). This further makes logistics preparedness a very important part of the health and security service as they seek to execute their mandate of rescuing victims during disasters in Ghana. From the argument, the study is of the view that availability of logistical resources has great effect on the success of emergency operations. From this logic the study proposes hypothesis 5 as:

*Hypothesis 5 (H5): Availability of logistics has a positive influence on successful emergency operations*

## **15. Emergency Interventions and Successful Emergency Operations**

Emergency interventions help in the identification of essential logistical resources that are necessary for the management of disasters. Simulation activities is an intervention that helps in significant increase in the knowledge of rescue operators. It helps place rescue operators on how to better operate and utilize the logistical resources available to achieve successful emergency operations(Chan et al., 2017). Furthermore, Razeghi *et al.*, (2019) posit that, interventions regarding emergency management are effective towards improving the success of emergency operations and also has positive influence on relief operations during emergencies.According to Chan *et. al.*, (2017), interventions have the ability of enhancing the effectiveness of emergency operations, it helps to build the knowledge and skills of personnel and agencies. Rasheed *et al.*, (2019), also highlighted the usefulness of using Logistics Support Systems (LSS) as an intervention to help in the timely supply and management of logistical supplies during emergencies. The LSS as an intervention aid in the success of emergency operation by efficiently making available the required logistical resources needed for a particular emergency. From the argument, the study hypothesizes that:

*Hypothesis 6 (H6): Emergency intervention has a positive influence on successful emergency operation.*

## **16. Method**

### ***Sample and Sampling Technique***

Sharma, (2017), suggests that the method of sampling should be considerate of the population size, the population variance, the expected accuracy, the nature, and objective of the study. Two hundred and fifty-seven (257) respondents drawn from the Accident and Emergency departments, the Police service, the Fire service, the Ambulance service, Maternity and Theatre units within the Effutu Municipality in the Central region of Ghana constitutes the sample size. For the purposes of this study, the authors adopted the purposive and simple random sampling techniques. The justification for the use of these sampling techniques is premised on the fact that, generally staff of the emergency departments, maternity and the theatre units are mostly deployed in the mist of emergencies. This makes it appropriate for the authors to purposively access the sample size from these unit in the case of the hospital (Yunus, 2022). The use of simple random sampling technique to access respondents from the various units afforded every element in the accessible population equal opportunity of responding to the data collection instrument. Quotas were assigned to the various agencies selected for the research. This helped the authors to select an accurate proportion of respondents to represent each agency (Adekeye& Apeh, 2019).

## Data Collection

Good research requires data which is of high quality. It is sometimes difficult to fall on data from relief operations since the priority of such operations is not to produce data. This makes it important for the collection of primary data by researchers (Kunz et al., 2017). The analytical basis of a research in the bid to arriving at conclusions to a research phenomenon is anchored on data collection instrument which is the fundamental component of a research approach (Moyo, 2017). The data collection instrument used to carry out this study was structured questionnaires. Structured questionnaires with closed-ended questions were used because they limit respondents to a set of alternatives being offered (Foddy, 1993).

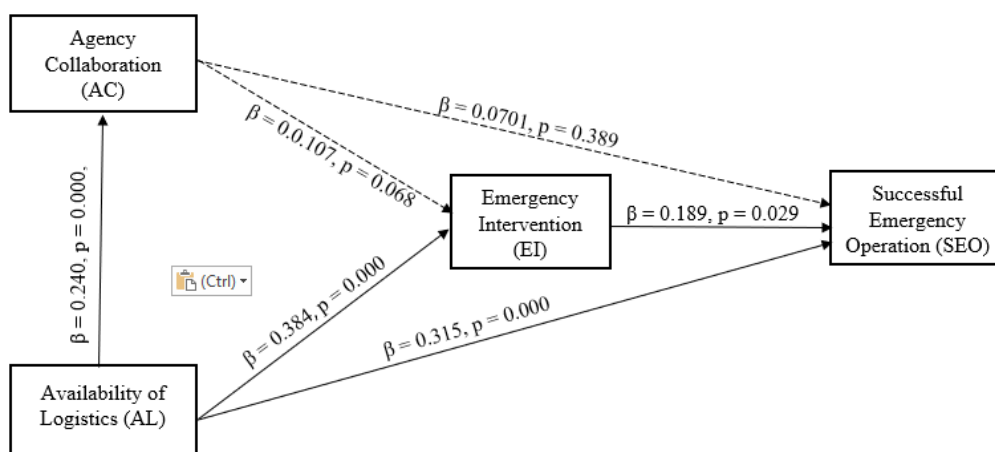
## Data analysis

Data analysis provides the procedures that assist in the logical determination and evaluation of data collected (Dhall, 2019). The study used the SPSS software to assist in analysing the level of logistical preparedness of health and security services in Ghana. The study also made use of structural equation modelling (SEM) to test the study's model and hypotheses. Cronbach Alpha benchmarks of (0.70) were used to test internal consistencies of questions on the structured questionnaire. Cronbach Alpha (0.70) is more widely an adopted objective measure of reliability. It is a standard for determining strong or weak consistencies between questions and whether they are related (Tavakol, 2011).

## Hypotheses Testing

The results of structural equation modelling show that hypotheses H1, H2 and H4 were supported. Thus, Availability of Logistics has a positive influence on Agency Collaborations ( $\beta = 0.240, p = 0.000$ ), Emergency Interventions ( $\beta = 0.384, p = 0.000$ ), and Successful Emergency Operations ( $\beta = 0.315, p = 0.000$ ). This suggests that Availability of Logistics has more influence on Emergency Interventions followed by the Successful Emergency Operations. Again, Emergency interventions have a positive influence on Successful Emergency Operations ( $\beta = 0.189, p = 0.029$ ). However, H3 and H5 were not supported. That is, Agency Collaborations has no significant influence on Emergency Interventions ( $\beta = 0.107, p = 0.068$ ) and Successful Emergency Operations ( $\beta = 0.070, p = 0.389$ ). Meaning, Emergency Interventions ( $\beta = 0.107, p = 0.068$ ) and Successful Emergency Operations are not influenced by Agency Collaborations. The summary of results is shown below:

## Path Analysis Results



**Research Model****Exploration Factor Analysis**

## Summary Results of Exploration Factor Analysis (EFA)

<b>Construct</b>	<b>Measurement</b>	<b>F L (<math>\rho</math>)</b>	<b>S</b>	<b>K</b>
<b>Availability of Logistics</b>	AVE = 0.787, CR = 0.917, E = 3.890, CVE = 21.394 and $\alpha = 0.900$			
<b>AL1</b>	My institution has logisticalresources necessary to manage emergencies	0.888	-1.428	2.199
<b>AL2</b>	I have acquired adequate training on the usage of logistics	0.899	-0.872	0.359
<b>AL3</b>	It is easy to get access to logistics during emergencies	0.874	-0.816	0.871
<b>Agency Collaboration</b>	AVE = 0.773, CR = 0.911, E = 1.937, CVE = 62.117 and $\alpha = 0.860$			
<b>AC1</b>	Stakeholders engage in joint participation activities to handle emergencies	0.903	-1.492	2.336
<b>AC2</b>	There is joint participation activities to assist other institutions during emergencies	0.850	-0.625	-0.089
<b>AC3</b>	There is joint educational activities related to emergency response among stakeholders institutions	0.883	-1.113	1.065
<b>Emergency Intervention</b>	AVE = 0.731, CR = 0.894, E = 1.403, CVE = 81.546 and $\alpha = 0.865$			
<b>EI1</b>	I have received professional training on how to take care of emergency victims	0.911	-1.413	2.111
<b>EI2</b>	There are laid down system to share information on victims of emergency by stakeholder institutions	0.748	-0.835	0.504
<b>EI3</b>	There is a designated line of communicating emergencies	0.910	-1.542	2.798
<b>Successful Emergency Operation</b>	AVE = 0.828, CR = 0.935, E = 2.506, CVE = 42.127 and $\alpha = 0.896$			
<b>SEO1</b>	Emergency operations are successful in my institution	0.896	-1.120	0.580
<b>SEO2</b>	I have confidence in the emergency	0.912	-1.341	1.050

<b>SEO3</b>	operations of my institution Implementation of Emergency operations in my institution is always successful	0.921	-1.280	0.939
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FL: Factor Loading, S: Skewness, K: Kurtosis,  $\alpha$ : Cronbach Alpha, AVE: Average Variance Extracted =  $\sum \rho^2/n$ , CR: Composite Reliability =  $(\sum \rho)^2/(\sum \rho)^2 + (\sum b)$ ,  $b = 1 - \rho^2$ , Factor Loadings < .400 are omitted Varimax with Kaiser Normalization

### Internal Consistency

The study used Cronbach's alpha ( $\alpha$ ) to test the internal consistency of the multi-item construct used in the study. Cronbach's alpha score of 0.70 and above is recognised as the generally accepted reliability or internal consistency of each item construct (Wu & Chen, 2017). The values recorded show a high Cronbach's alpha ( $\alpha$ ) values between 0.860 and 0.900. This indicates a higher reliability or higher internal consistency within the model construct. The results also indicated a component extract eigenvalue ranging from 1.403 to 3.890 and a percentage of total variance also ranging from 21.394% to 81.546%. To ascertain the normality of the data, skewness and kurtosis indices were analysed. According to Brown (2006), the skewness and kurtosis indices recorded from a data should be |3| or less to show data normality. From the study, the kurtosis and skewness indices recorded for all the questions is within the normality range. This indicate that the data for the study is appropriate, and the authors could proceed with factor analysis. The study further measured the sampling adequacy using Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity. A substantial statistic of  $\chi^2 (66) = 1843.075$ , ( $p = 0.0000 < 0.05$ ) and KMO measure =  $0.759 > 0.500$  was recorded.

### Convergent Validity

The study measured the convergent validity to test the factor loadings ( $\lambda$ ), the composite reliability (CR) and the average variance extracted (AVE) as indicated by Hair et al., (2010), the recommended values for each model construct should be above 0.50 and 0.70 for AVE and CR respectively for acceptable convergent validity. The result indicates factor loadings ( $\lambda$ ) above 0.50 for all the model constructs which show a substantial level of approval (Chen & Phou, 2013).

### Availability of Logistical Resources of Health and Security Agencies

The study assessed the perception of respondents on the availability of logistical resources at their various agencies. A scale of 5 point was used to assess respondent's perception on the availability of the required logistics in their institutions. The measure of 1 and 2 shows poor performance of the institutions with regards to available logistics, whilst the score of 3 shows a fair performance of institutions in relation to their available logistics. Points 4 and 5 show very good and excellent performance of institutions respectively. The authors used a list of questions labelled AV1 to AV3 to respond to the availability of logistic in various institutions to manage emergencies. These questions were adopted:

**Availability of Logistics in Institutions**

	N	Min	Max	Mean	SD
<b>AV1. My institution has logistical resources necessary for managing emergencies</b>	257	1	5	3.63	0.901
<b>AV2. I have acquired adequate training on the usage of logistics</b>	257	1	5	3.49	0.902
<b>AV3. It is easy to get access to logistics during emergencies</b>	257	1	5	3.43	0.966
<b>Overall</b>	257			3.5162	0.843

Next is the availability of required logistics for respondents in their institutions. The mean recorded were 3.5162. The result indicates a good performance which shows that the various agencies have some level of logistics to manage emergencies but those logistics are inadequate to support efficient emergency management. From the various questions that were responded to, the responses show an average performance of health and security agencies in the Effutu municipality regarding the availability of logistical resources needed to support emergency management. Question AV1 which sought to elicit responses on the availability of logistical supplies needed for the management of emergencies, recorded the highest mean scores under logistics requirement (M=3.63; S=0.901; N=257). Question AV2 and AV3 recorded a mean (M=3.49; S=0.902; N=257) and (M=3.43; S=0.966; N=257) respectively. The results from the study indicate that agencies mandated with emergency rescue operations require relevant and adequate logistical support to be able to successfully manage emergencies. The importance of logistics in the management of emergencies is supported by Tarigan (2018), when he indicated that the availability of equipment, machines, medicine and other medical consumables are resources that are required to undertake a successful rescue operations. From a theoretical point of view, the resource-based view suggests that the competency of institutions is dependent on its available logistical resources (Cohen, 2017).

**Correlation Matrix**

Correlation Matrix of the Constructs

Construct	AL	AC	EI	SEO
AL	<b>(0.887)</b>			
AC	0.251	<b>(0.879)</b>		
EI	0.426	0.206	<b>(0.854)</b>	
SEO	0.180	-0.21	-0.050	<b>(0.910)</b>

Note: Diagonal elements (in bracket) are square roots of AVE

**Confirmatory Factor Analysis of the research model**

Fit index	Threshold value	Model Value
Chi square/ degree of Freedom (X <sup>2</sup> /d.f.)	≤ 3.00	1.856
P-value	< 0.050	0.040
Goodness of Fit Index (GFI)	≥ 0.900	0.978
Adjusted Goodness of Fit Index (AGFI)	≥ 0.900	0.944
Root Mean Square Error of Approximation (RMSEA)	≤ 0.080	0.058

Comparative Fit Index (CFI)	$\geq 0.900$	0.915
Standardized Root Mean Square Residual (SRMR)	$\leq 0.080$	0.051
Root Mean Square Residual (RMR)	$\leq 0.05$	0.040
Increment Fit Index (IFI)	$\geq 0.900$	0.922

The table indicates the threshold of chi square/degree of freedom, Goodness of Fit Index (GFI), Adjusted Goodness of Fit Index (AGFI), Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), Standardized Root Mean Square Residual (SRMR), Root Mean Square Residual (RMR), Increment Fit Index (IFI). The fit index of the model falls within the acceptable threshold indicating that the model for the study is fit for structural equation modelling.

### Summary of the Hypotheses Testing

Significant at  $p^* < 0.05$

Hypothesis	Path coefficient	T-value	P-value	Decision
H1: AL → AC	0.240	4.137	0.000	Supported
H2: AL → EI	0.384	6.866	0.000	Supported
H3: AC → EI	0.107	1.827	0.068	Not Supported
H4: AL → SEO	0.315	3.751	0.000	Supported
H5: AC → SEO	0.070	0.862	0.389	Not Supported
H6: EI → SEO	0.189	2.188	0.029	Supported

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## 17. Discussion of Results

### *The Availability of Logistics Influence the Success of Emergency Operation Positively*

Logistics play critical role in the management of relief operations. The result of the study indicates the importance of making logistics available for the management of emergencies. Adequate logistical preparedness improves response activities of institutions significantly. Indeed, availability of logistics have the potential to enhance response activities and also improve the management of emergency operations (Rodríguez-Espíndola, et al., 2018). Agyekum, et al., (2016) posit that improving the capacity of institutions is critical to the success of emergency operations. This shows the necessity of logistical resource capacity in the management of emergencies in these institutions. The importance of improving institutional logistical capacity to manage emergencies is supported by Agyekum, et al., (2016). In their study, they argued for the planning of logistical activities, equipping and training personnel to sustain the capacity of effective response to emergencies. The coordination of effective and efficient management of logistical activities are critical to the success of emergency operations (Alavi, 2018). The recognition of required logistical resources needed for the management of emergencies was described by Caunhye, et al., (2012), as a critical factor for institutions before, during, and after the occurrence of an emergency. The availability of equipment, machines, medicines and other medical consumables are critical resources that are needed by security and health services to undertake a successful emergency operations (Tarigan 2018).

The health and security services in Ghana needs to pay critical attention to the mobilization of logistical supplies when preparing towards emergencies. The significance of the availability of logistics to the management of emergencies call for critical attention of government and management of emergency relief agencies to put systems in place that will facilitate the availability of the needed logistics during emergencies. The preparedness of institutions includes the availability of human resources, from doctors to generic operators in hospitals as well as trained Emergency Medical Technicians (EMT) and experienced security professionals and the functionality of the required equipment and tools (DiLevaand Sulis, 2017). Efficient management of logistics is essential to ensure that there is no interruption in the supply of equipment to help in the management of victims by health professionals and security agencies during emergencies(Rasheed et al., 2019). According to Tayfur and Benjamin, (2007), the management of logistics during emergencies has been challenged by the hype in demand and short time circle needed to make logistics available. This suggestion by Tayfur and Benjamin, (2007), indicate the importance of designing logistical management systems that is agile to help in the successful management of emergencies by the health and security agencies. From the discussion, the importance of making logistics available to facilitate the success of emergency operations cannot be under rated and calls for critical attention of government and management of health professionals and security agencies.

### *The Availability of Logistics Influences Agency Collaboration Positively*

The effectiveness of collaboration between agencies during rescue operations rely on the availability of logistical resources. From the research modeland hypothesis, logistical resources are the engine of relief operations. What this mean is that not ensuring the availability of logistics will negatively affect the collaborative effort of agencies during emergencies. The non-availability of logistics is likely to impede the collaboration effort of agencies during emergencies. As argued by VanVactor, (2017), the collaboration of agencies does not necessarily lead to successful operation during emergencies but it is the coordination of available logistical resources among these agencies that largely support the success of emergency operations. Rodríguez-Espíndola, et al.,(2018), suggest that the success of an emergency operation rely largely on the collaborative effort of agencies and not necessarily the availability of logistical resources. This does not support the result of the study as the study suggests that enough logistical resources will aid the success of emergency operations without the collaboration of agencies. The study's findings is contraryto the opinion of Rodríguez-Espíndola, et al.,(2018). The research model shows that, the availability of logistics enhances collaborative effort of agencies during emergencies, and the absence of the required logistics will negatively affect the collaborative effort by agencies. Emergency management require effective and efficient use of logistical resources. The combination of the efforts with efficient and effective use of logistical resources will enhance collaboration among all stakeholders during emergencies (Kapucu, et al., 2010).

### *The Availability of Logistics Influence Emergency Intervention Positively*

Emergency interventions are as good as the availability of logistical resources. The logistical resources available for the implementation of emergency interventions are critical to the success of emergency operations.According to Gagliano *et al.*, (2020), the effectiveness and efficiency of emergency interventions is supported by the availability of logistical resources. The provision of logistical resources promote the intervention of health professionals and security agencies to better position themselves during emergencies (Kyei-Onanjiri et al., 2018). The study shows that the availability of logistical resources has positive effect on emergency interventions deployed by health professionals and security agencies during emergencies. The result of the study supports the above



literature that shows the importance of logistics during emergency operations. The importance of available logistical resources to emergency interventions has been highlighted by DiLeva and Sulis (2017), where they show the positive and negative effect of the addition and reduction of logistical resources respectively on the performance of emergencies.

### ***Emergency Intervention Influences Successful Emergency Operation Positively***

The study indicates that emergency interventions have a positive effect on the success of emergency operations. The results indicate that the strategies used by health professionals and security agencies during emergencies are critical to the success of their operations. Previous studies posit that the deployment of emergency interventions positively affect the success of emergency operations through systems which help in the effective and efficient utilization of available logical resources (Rasheed *et al.*, 2019). Furthermore, Razeghi *et al.*, (2019) posit that, interventions regarding emergency management are effective towards improving the success of emergency operation and also has positive effect on relief operations during emergencies.

## **18. Conclusion**

The research sought to conceptualize logistical preparedness of health workers and security agencies in the management of emergencies in Ghana. The study argues for the importance of making logistical resources available for the management of emergencies. The study revealed that regarding logistical preparedness of health professionals and security agencies in Ghana, there is still much to be done to attain the acceptable standards. Logistics is the central point of any rescue operation; the pliability of emergency interventions is enhanced by the availability of logistical resources. The inadequacy of logistics negatively affects the effort of rescue operations during emergencies. The limited supplies negatively affect rescue operations. The study revealed the effect of available logistical resources on the collaborative effort of health workers and security agencies. The findings of the study shows that logistical resources are critical to the collaborative effort of health workers and security agencies. The study further revealed that, collaboration among institutions do not necessarily enhance the success of emergency operations but it is the availability of logistics which enhance the effort of agencies to manage emergencies successfully. Even though the study did not find a positive significant association between agency collaboration and the success of emergency operations among health workers and security agencies, the positive and significant findings in relation to agency collaboration and successful emergency operations link generally aligned with conventional knowledge identified from existing research that was reviewed.

### **Implication of the Study**

The findings of the study have some implications for research and practitioners. By way of implications for research, it provides a foundational guide for other researchers to broaden the knowledge base of humanitarian logistics and supply chain in Ghana. The importance of logistics and how it affects the delivery of emergency services in Ghana could be explored. The lack of widely available research should drive others to broaden this study to many other frontiers and carry out comparisons that will bring greater understanding of humanitarian logistics and supply chain. The knowledge gained through this further research can aid in the improvements to humanitarian logistics and supply chain management practices for diverse agencies in Ghana. By way of implications for practice, health and security agencies understand the positive association between availability of logistics and successful emergency operations. The availability of logistics is very critical to the management of emergencies. Agencies will have to adopt systems that will make supplies reliable for the management of emergencies in Ghana. Health and security agencies should develop interventions

that fit into the available logistics for successful management of emergencies. As well, beyond health and security agencies, government and other agencies should also help in strengthening the logistics aspect of agencies whose services are needed in times of emergencies.

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