

## The COVID-19 pandemic through the lens of humanitarian logistics

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**Abstract** *An integrative literature review (ILR) was conducted to identify the relationship between humanitarian logistics and the development of the COVID-19 pandemic based on research in the SCOPUS, MEDLINE and ENEGEP databases in April and May 2022. In all, 61 articles were evaluated according to the following criteria: original article or review of literature published in a scientific journal; abstract and full text available; article on humanitarian logistics in relation to the COVID-19 pandemic. The resulting sample comprised eleven publications organized and analyzed through a synthesis matrix, where 72% were published in international journals and mostly in 2021 (56%). The presence of the supply chain defines the course of action of economic and social sectors, which in turn determine, by means of an interdisciplinary approach, humanitarian operations in the face of the COVID-19 pandemic. The lack of studies narrows down humanitarian logistics to mitigate the impacts caused by these disasters, both in the context of the current pandemic and in future events of the same nature. However, as a global emergency, it suggests the need to increase scientific knowledge on the subject of humanitarian logistics related to disaster events.*

**Key words** *Humanitarian logistics, COVID-19, disasters*

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## Introduction

Humanitarian logistics (HL) is a branch of logistics that emerged as a branch of knowledge and scientific research in the mid-2002 to provide support to places in need of humanitarian aid in situations of war, political crises, natural disasters and other events involving a disaster context. Thus, HL is defined as a set of plans and actions aimed at saving lives and developing strategies to meet human and material requirements by spreading information and acquisition, storage, transport and distribution of inputs in disaster situations<sup>1</sup>.

According to the Terminology of the United Nations Strategy for Disaster Reduction<sup>2</sup> (p.11), disaster is the *Disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources*.

Disasters are major public health challenges. They may be classified either as Technological (related to work accidents, transport...) or Natural (climatic, meteorological, geophysical, biological, hydrological); they are further classified according to their intensity, development and origin<sup>1,2</sup>.

Emergency crises with significant impacts on public health are included, such as the COVID-19 pandemic, which requires us to think about humanitarian crises and the complexity of local, organic and participatory responses<sup>3</sup>.

One notices that the current sociopolitical course of action puts the discussions on that topic to a high level of concern given the consequences and damages caused by natural disasters. In addition, the massive publicity caused by that type of event requires measures to mitigate resulting damages.

Especially in Brazil, the highest incidence of disasters is related to climatic actions and anthropogenic reflexes that are directly or indirectly caused by man. However, although they are less common, pandemics and epidemics are more complex to monitor due to uncertainties, instability and gaps, which makes it more difficult to elaborate a precise and effective response in advance.

The World Health Organization (WHO) highlighted the occurrence of pneumonia events in Wuhan, China, in December 2019<sup>4</sup>. The SARS-CoV-2 virus they identified causes a significant viral infection which is transmitted by

respiratory droplets. Due to its high incidence and a high rate of cases, the WHO declared a pandemic situation on March 11, 2020<sup>5,6</sup>. The spread of the virus on a global scale resulted in 496 million confirmed cases and 6 million deaths by April 2022<sup>5</sup>.

Identified and verified disease symptoms range from asymptomatic cases to others that are characterized by mild, moderate or critical respiratory failure<sup>7</sup>. In this sense, the occurrence of a health crisis is defined by the development of the disease and consequently by its geographical spread. The impact of infectious diseases, more precisely the fact that the world is still fighting the COVID-19 pandemic and that studies are incomplete, in progress and not yet fully developed in terms of medium and long-term reflections increases the degree of uncertainty regarding measures of prognosis, prevention, prophylaxis and possibilities that have been adopted to treat the disease. This combination of aspects results in a massive and sustained mobilization of resources at global level and strongly impacts people's lives<sup>8,9</sup>.

Studies<sup>10</sup> show that HL has become more important during the COVID-19 pandemic, as it helps tackle supply disruptions of global supply chain flows and 'interfaces' with higher quality with the supply chain.

Disaster classification is made according to a variety of features and presented in different ways, which has global consequences such as shortage of supplies and humanitarian assistance<sup>11</sup>, highlighting the need to expand concepts and the discussion about humanitarian operations and logistics in public health crisis scenarios in the context of pandemics<sup>12</sup>.

Additionally, in natural disasters, HL is significant due to its substantial impact on people, goods and services to solve an emergency or crisis, both in the humanitarian area and during interruptions of the global supply chain<sup>13</sup>. Regardless of the type of disaster or crisis, humanitarian logistics organizations cannot fail to operate in either local or global networks.

In this sense, studies focusing on pandemic contexts have gained greater visibility since 2015 and increased considerably after 2020. New outbreaks of previously unknown diseases are reported every day, resulting in devastating and hidden effects on our social and economic way of living and health<sup>14</sup>.

The increasing intensity of disasters around the world in recent decades impacts urbanization, political stances and environmental concerns, affecting people's vulnerability and result-

ing risks<sup>15</sup>. Thus, not only disaster probability, but also the possibility of their occurrence requires developing a system that helps not only to detect an event but also to address its impacts. Given that situation, the following question arises: how does international literature relate HL to the context of the COVID-19 pandemic?

In Brazil, this topic is recent and its discussion is rather limited<sup>16</sup>, especially in the northern region of the country, where no related studies were found. Therefore, the present article aims to contribute to the field of HL research by focusing on health to find answers to questions regarding 'present' and future impacts and minimize them during the COVID-19 pandemic and others that may occur in the future. This study further aimed to identify the relationship between HL and the development of the COVID-19 pandemic in international literature.

## Methodology

According to Vosgerau and Romanowski<sup>17</sup> (p. 167), *literature reviews consist of organizing, clarifying and summarizing the most important existing works, as well as providing complete citations covering the spectrum of relevant literature in the field*. This type of review analyses and summarizes knowledge produced on a given topic based on a key research question and seeks to identify studies that answer the question defined by researchers using primary sources<sup>17,18</sup>.

To perform a literature review, specific protocols need to be followed to organize a range of documents and analyze them in the studied context, requiring defined steps such as: 1) identifying the topic and defining the research question, 2) establishing inclusion and exclusion criteria, 3) identifying pre-selected studies, 4) categorizing selected studies and 5) creating a summarized presentation of current knowledge<sup>19</sup>.

Our literature review was based on articles located in databases such as PUBMED and SCOPUS – given the representativeness of the database of abstracts and citations of the peer-reviewed literature via the CAPES portal (CAFe access) and the relevance of the portal regarding Brazilian research, through an advanced search form – and ENEGEP, due to its expressiveness in the surveyed area. Web of Science and LILACS portals were also searched, but no articles on that topic were found.

This research was based on the intersection between HL and the COVID-19 pandemic us-

ing controlled and uncontrolled descriptors (free terms) in Portuguese and English. The exact descriptors were located in the controlled vocabulary systems: Medical Subject Headings (MeSH), terms in English, and Health Sciences Descriptors (HSD). In this sense, our search strategy included defining thematic filters in Portuguese and English: 1) “Humanitarian Logistics” and “Covid 19”. 2) “Humanitarian Logistics” and “Covid-19” or “SARS CoV 2 Infection”. Data collection by means of reference searches took place between March and April 2022. Regarding data production, the following inclusion criteria were used to select articles: 1) original article or literature review published by a scientific journal; 2) available abstract and full text; 3) discusses humanitarian logistics in relation to the COVID-19 pandemic. The following exclusion criteria were applied: 1) articles that did not consider the relationship of the topic; 2) articles written in the form of editorials, reviews, experience reports and text analyses that did not describe the method applied in detail.

## Results

Initially, we found 61 articles but retained only 41 after reading their title and abstract. Four were excluded due to repetition and six for not meeting the other inclusion criteria. A double-blind peer review reduced the final sample to 11 scientific articles (Figure 1).

A Microsoft Excel spreadsheet (version 2019) was used to organize the literature review and create the database, as suggested by the Synthesis Matrix<sup>18</sup>.

The selected articles we read in detail to identify the data required and establish a bibliometric profile of the sample, as summarized in Chart 1.

Three journals were retained as a result of this review. SCOPUS provided the largest number of articles 63.63% (n = 7), followed by ENEGEP, 27.27% (n = 3) and PUBMED, 9.09% (n = 1). Of these, 72.72% (n = 8) were published by international journals (36.36% by the Journal of Humanitarian Logistics and Supply Chain Management, 27.27% by the Annals of Operations Research and 9.09% by Frontiers in Public Health), whereas 27.27% (n = 3) were published by Brazilian journals.

Review findings show that 54.54% (n = 6) of the sample were published in 2021, followed by 27.27% (n = 3) and 18.18% (n = 2) in 2022. Regarding study methodology, 66.63% (n = 6) of

the articles were in some kind of review category, 18.18% (n = 2) were case studies and 9.09% (n = 1) were field studies and exploratory researches. Qualitative studies are most often performed to investigate areas that have been less often studied to date, whereas the quantity of literature reviews has been the result of the second stage of the COVID-19 pandemic.

## Discussion

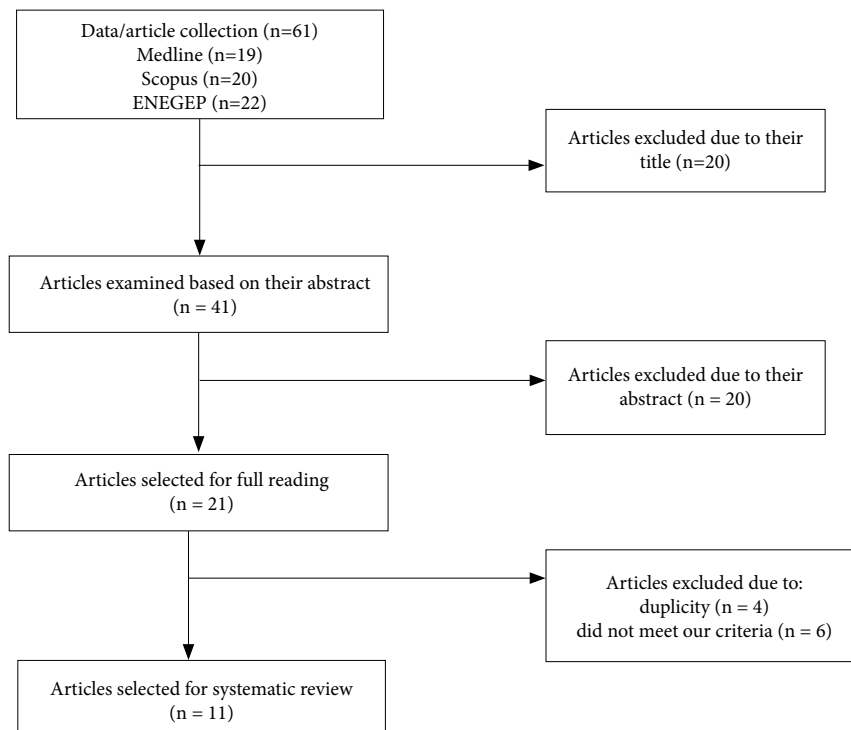
Humanitarian Logistics is considered a “new” discipline due to lack of research before the year 2000 and it has only recently been highlighted and documented by several academic studies. Constant disasters draw the attention to improving acclimatization and response infrastructure in affected areas, as well as to assisting affected populations<sup>20</sup>.

The following two decades should contribute to the expansion of this field of study, stimulate

scientific production and expand the field of logistics due to the COVID-19 pandemic. Some proposals have already analyzed the impacts or risk of disaster development but the scope and intentionality of research on the relationship between disasters and humanitarian logistics have greatly increased, especially in the last three years.

Chart 2 summarizes the goals, study limitations and conclusion of previously published articles. Studies were conducted as part of projects that develop a relationship with the current supply chains that support the social and economic sectors. The present literature review explores the various aspects of humanitarian logistics and supply chain management, such as concepts, management, contributions and resilient perspectives of humanitarian operations regarding decision-making, political possibilities and inter-organizational relationships.

Challenges in the field of logistics processes still need to be overcome to implement effective



**Figure 1.** Information flowchart showing the several stages of the integrative literature review. PRISMA, 2022.

**Chart 1.** Data found in the selected articles according to database, year, title, journal and authors.

Identification	Year	Title	Journal	Authors
A1	2021	The COVID-19 response: considerations for future humanitarian supply chain and logistics management research	<i>Journal of Humanitarian Logistics and Supply Chain Management</i>	Thompson and Anderson.
A2	2021	A collaborative approach to maintaining optimal inventory and mitigating stockout risks during a pandemic: capabilities for enabling health-care supply chain resilience	<i>Journal of Humanitarian Logistics and Supply Chain Management</i>	Sagave et al.
A3	2021	Serving vulnerable populations under the threat of epidemics and pandemics	<i>Journal of Humanitarian Logistics and Supply Chain Management</i>	Sokat and Altay
A4	2021	The evolution of humanitarian logistics as a discipline through a crystal ball	<i>Journal of Humanitarian Logistics and Supply Chain Management</i>	Altay, Kovács and Spens.
A5	2020	Impacts of epidemic outbreaks on supply chains: mapping a research agenda amid the COVID-19 pandemic through a structured literature review	<i>Annals of Operations Research</i>	Queiroz et al.
A6	2021	Social media effectiveness as humanitarian a response to mitigate influenza epidemic and COVID-19 pandemic.	<i>Annals of Operations Research</i>	Kumar et al.
A7	2021	Analysis of WHO publications on COVID-19 in the context of the Humanitarian Supply Chain	<i>ENEGEPE</i>	Lima and Samed et al.
A8	2020	Humanitarian supply chains: survey of key logistical operations carried out by humanitarian organizations during the COVID-19 pandemic	<i>ENEGEPE</i>	Sá et al.
A9	2020	Humanitarian Logistics in Natural Disaster Management: A Systematic Review of Literature (RSL) oriented to COVID-19	<i>ENEGEPE</i>	Santos and Lopes
A10	2022	Serving the Vulnerable: the world health organization's scaled support to countries during the first year of the covid-19 pandemic.	<i>Frontiers in Public Health</i>	<i>Bajarda et al.</i>
A11	2022	Mapping research on healthcare operations and supply chain management: a topic modeling-based literature review	<i>Annals of Operations Research</i>	Ali and Kannan.

Source: Authors.

humanitarian logistics associated with infrastructure, assistance centers, resource distribution and coordination of human and logistical processes related to the supply chain.

As a natural disaster based on a biological factor, spreading of the disease and increase in deaths, associated with the precariousness of public health, social and economic aspects, have affected several segments worldwide, requiring

the intervention and operationalization of humanitarian logistics to minimize damages in supplies, basic services, and hospital services<sup>21</sup>.

The research sample shows first of all a lack of studies correlated to humanitarian logistics, supply chain and the COVID-19 pandemic, especially of studies involving practical application methods and damage analysis tools or the need to establish research agendas for future projects.

**Chart 2.** Data from articles selected according to goal, method, study limitations and conclusion.

Identification	Goal	Study limitations	Conclusion
A1	Contextualize articles included in the research on pandemics and epidemics that provide short- and medium-term contributions on the effects of the humanitarian supply chain (HSC) and logistics in complex disasters.	The article was written during the Covid-19 pandemic.	There is significant focus on how vulnerable populations bear the impact of humanitarian supply chain (HSC) failures.
A2	Provide a thematic analysis of the concepts of Inventory Management Systems in Healthcare Supply Chains (HCSCs) and propose a research agenda based on the knowledge gaps on the role of HCSCs in maintaining optimal stock levels and boost resilience against disruptions during the pandemic.	Might neglect other studies due to search variation in language control.	The question is not whether there will be another pandemic, but when. Therefore, it aligns with the HCSC, and suggests models aimed at a more collaborative approach and a more resilient management of the supply chain.
A3	Make researchers in the field of HL and supply chain (SC) aware of the particularities of different vulnerable groups and how their specific needs may affect planning and execution of humanitarian operations.	Books, conference proceedings, group reports and reflections by NGOs were not included, despite the fact that the authors acknowledge these materials.	There are no studies on humanitarian logistics and supply chain management (HLSCM) with vulnerable populations by means of multidisciplinary research at the intersection of public health and supply chain management.
A4	Understand the development and trend of HL in the last decade.	The article suggests increasing the number of collaborative and co-engineered research to enhance the relevance and impact of HL.	Much of the research in HL has redirected its focus to the pandemic and, not surprisingly, to health care. This is a challenge for the humanitarian sector and the authors question how logistics and health care will be affected.
A5	Unravel and shed light on the discussion and the provision of intuitions to support decision-making and public policies regarding the supply chain.	Keywords used to search the databases, as they hamper exploring other topics related to the supply chain and limit research related to supply chain effects.	Proposes a framework for supply chain operations and management during the COVID-19 pandemic, which is divided into the following stages: adaptation, digitization, preparation, recovery, ripple effect and sustainability.
A6	Study and quantify the efficacy of using social media as a humanitarian response to mitigate influenza epidemics and the current COVID-19 pandemic.	Data sample is based on quantity rather than on content of COVID-19 related 'tweets'.	Social media is an integral part of HL to address pandemics and emergency situations and contributes to literature by informing best practices to tackle similar disasters.

it continues

Chart 3 shows the scope of study of the selected articles and the insights mentioned by the authors in their research agenda proposals.

It becomes clear that public health needs to move from a reactive health management sector to developing service logistics management so as to provide not only care support to patients, but also to address elements that result (before,

during and after) from disaster episodes in order to meet the global needs of the population<sup>22</sup>.

Primary care (PC) is essential in this context and is established as a strategic element in the first stages of response in disaster risk management, hence the relevance of the sector for health care, as there is a complexity in Primary Care in disaster scenarios caused by reflexes of factors

**Chart 2.** Data from articles selected according to goal, method, study limitations and conclusion.

Identification	Goal	Study limitations	Conclusion
A7	Conduct an exploratory study on World Health Organization (WHO) protocols defining the provisions that apply to humanitarian supply chain management and relate them to the five flows defined by Tomasini and Van Wassenhove.	The disease is still ongoing and has manifested itself in different ways and forms, according to management practices adopted by every country.	The WHO publications were issued as a result of the Covid-19 pandemic. Although insufficient, they mainly address knowledge information, which justifies the need for protocols and references to prepare for and tackle the COVID-19 crisis.
A8	Describe the main features and operations of HL performed by the U.N. and other partner institutions during the response phase to the COVID-19 pandemic.	The study does not mention any limitations.	The efficacy of HL actions is essential for the provision of assistance services in disaster situations, such as the one currently experienced.
A9	Propose a conceptual approach to the application of humanitarian and supply chain logistics to management of natural disasters / biological disasters.	The study does not mention any limitations.	Lack of studies related to COVID-19 and HL and/or to health care as a tool to help reduce damages caused by the disease. Its application to manage natural disasters may reduce the suffering of victims.
A10	Describe WHO contributions to countries during the first year of the COVID-19 pandemic.	WHO contributions based on self-reports did not capture the perspective of the public health impact of WHO inputs and actions. No conclusions could be reached regarding the impact of investments or whether there was assistance to vulnerable populations in different countries through WHO inputs.	The analysis showed that WHO supported all 194 countries, regardless of humanitarian vulnerability. Studies are needed to assess the impact of WHO contributions on health outcomes during the COVID-19 pandemic as a support for future crises.
A11	Unravel latent topics regarding Operations and Supply Chain Management (OSCM), how it has evolved in the last 20 years and its future projections.	Articles relevant to the topic may have been ignored during data collection. Presents limited research in public health.	Contributes with new methods regarding the literature review and proposes a change in operations management research patterns by more emerging topics.

Source: Authors.

that define and condition people's health<sup>23,24</sup>. However, the study<sup>24</sup> related the impact of disasters in the field of public health worldwide and denounced – before the COVID-19 pandemic – the poor performance and response capacity of Primary Care in dealing with these events.

In another segment of public health, a study highlights the importance of field hospitals as an emergency response<sup>21</sup>. It underlines the need for investments in the hospital/health context,

which ranges from elaborating targeted diagnoses, training schedules and permanent education of professionals to care protocols and service flows, evaluation of human, material and technological resources, psychological support for professionals and the development of advanced skills through the context of disasters and risk management<sup>25</sup>.

The Sustainable Health Agenda for the Americas (2018-2030) develops a commitment to work

**Chart 3.** Data listing the main topics discussed by selected articles as insights for future research.

Main topics	Related articles
<b>Supply chain</b> Humanitarian logistics and supply chain management; Relationship Global Humanitarian Logistics Continuity Working Group, Logistics Cluster and humanitarian assistance programs; Humanitarian supply chain and logistical response in the coming years; Humanitarian supply chain and disaster logistics operations in the context of pandemics and epidemics; Supply chain resilience in disaster scenarios; Application of humanitarian logistics and supply chain assistance in real cases of biological disasters; Current knowledge and knowledge gaps about the role of collaboration in HCSCs in maintaining optimal stock levels and building resilience against stock outages during pandemics; Analyzes of supply chain behavior during and after the pandemic in the vein of logistical feasibility.	Altay, Kovács, Spens, 2021; Sá <i>et al.</i> , 2020; Savege <i>et al.</i> , 2021; Thompson, Anderson, 2022; Ali <i>et al.</i> , 2022
<b>Vulnerable Populations</b> Operational and logistical response to serve vulnerable populations through multidisciplinary research.	Sokat e Altay, 2021; Lima e Samed, 2021; Saveg <i>et al.</i> , 2021; Queiroz <i>et al.</i> , 2020
<b>Miscellaneous</b> Relationship between ethics and operations management and research on cross-sector partnerships.	Queiroz <i>et al.</i> , 2020
<b>Public health</b> Intersection of public health and supply chain management; Health perspective in the management of humanitarian logistics operations.	Sokat e Altay, 2021; Lima e Samed, 2021;

Source: Authors.

with emerging public health challenges connected to the Sustainable Development Goals (SDGs) by means of strategic plans and policies for access to health services.

Study<sup>26</sup> highlights the need to adopt specific measures to characterize different disasters based on studies that show that epidemiological disasters of natural origin have done more harm than wars. In this sense, generalized reproduction of logistics loses its efficiency. For example, more vulnerable populations are more affected, which means that they need a better standard of response<sup>22,27</sup>. After all, acknowledging the “beneficiary” emerges as a tool and subterfuge to deal with diversity, given that one of the aim of SDGs is to provide equal access to populations that require health services. Researchers emphasize in their studies that social inequality is a potential factor for the occurrence and/or worsening of disasters<sup>28</sup>.

Points of interest were identified that reassert the need for interdisciplinarity as a key component for good management of human resources

and results. Thus, the shared collaboration of sectors and areas of knowledge is a strategy that has played an essential role in the development of humanitarian logistics, guided by aspects of multiple areas of knowledge. In addition, resources, supplies, materials and financing need not be supplied by states alone, but may also be provided by NGOs, private institutions and international institutions<sup>21</sup>.

Sectors involved do not respond in an isolated manner, but rather based on their involvement and relationship with cross studies and discussions on concepts that adopt a rather transversal look to contribute to the process of operations management, mobilization of institutions, public authorities, policies, resources and provision of services<sup>21,22</sup>.

Scientific literature on humanitarian logistics is limited and shows a wide range of gaps, as research has only just started in this field of study. Despite the growing and notorious internationalization of data collected, insertion of Brazilian



researchers in this field was evident. The lack of a more cohesive sharing network that might favor production of knowledge may result in a certain fragilization<sup>26,29</sup>.

Concerning research sample, study limitations were often related to the prevalence of the methodology of articles and their timeframes, since most of the data (samples) were based on secondary data collected during the COVID-19 pandemic. Limitations were also due to failure to account for the direct impact on public health and its connections with vulnerable populations.

However, systematic reviews have emerged as a start to guide future research by recognizing the main theoretical implications and proposals of research agendas created by grouping of data found in the studies produced so far.

## Conclusion

A systematic literature review was conducted to evaluate and synthesize information, as well as to analyze future prospects. In this sense, this article surveys and presents what the scientific community has been working on in the field of HL to minimize natural disaster impacts, especially COVID-19, to solidify an accumulation of scientific capital and help fill research gaps by connecting emerging research agendas and those

proposed by the literature by considering the development of the pandemic and its impacts on human life.

In a context of disasters, it is essential to know the model of humanitarian structure used to support strategies that address epidemic periods, based on the support that the structure of humanitarian logistics may provide to public health. Therefore, the scenario of the COVID-19 pandemic, as a global emergency, has shown its relevance and surveying scientific production facilitates or instructs taking efficient and more assertive measures in humanitarian logistics.

Therefore, among the contributions of the present work are the suggestion of research for future investigations and systematization of the literature related to the interaction between humanitarian logistics and COVID-19, not only in Brazil, but on a global scale through its challenges and opportunities, observing the development, impact and contribution of HL in these crisis and disaster scenarios, especially in Brazil.

Study limitations are due to a lack of research on the effects of the pandemic on health/humanitarian logistics and few possibilities for research comparisons. In addition, the query used to perform the research and the choice of keywords are related, as they may have been an obstacle to exploring other topics, as well as the fact that the pandemic occurred at the same time as the study.

## Collaborations

SCT Silveira worked on the design, formal data analysis, investigation, methodology, project administration, writing the original draft, writing and revising. HRF Filho worked on validation, visualization, writing the original draft, proof-reading and editing. AN Pontes worked on validation, visualization, review and editing. HS Lopes Pontes worked on validation, visualization, review and editing. GC Marfrini worked on validation, visualization, review and editing.

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Article submitted 20/07/2022

Approved 28/09/2022

Final version submitted 30/09/2022

Chief editors: Romeu Gomes, Antônio Augusto Moura da Silva

