TERROR
Strengthened preparedness and response to biological and chemical terror attacks

Co-funded by the Health Programme of the European Union

D 7.3: Assessment of the role of community preparedness and engagement in risk and crisis communication

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Abbreviations

European Union (EU)

European Economic Area (EEA)

Disaster Risk Reduction (DRR)

European Climate Adaptation Platform (Climate-ADAPT)

European Flood Awareness System (EFAS)

Local Resilience Fora (LRFs)

European Forest Fire Information System (EFFIS)

The European Fire Safety Alliance (EuroFSA)

World Health Organisation (WHO)

RESIST (Resilient Smart Ecosystems for Smart City Resilience)

Law Enforcement Agency (LEA)

Crisis Communication System (CCS)

National Public Health Organization (EODY)

Executive summary

The objective of WP7 of JA TERROR is to promote the implementation of Risk and Crisis Communication at all stages of risk management, on both national and EU level. The purpose of this deliverable is to provide advice regarding the assessment of the role of community preparedness and engagement in risk and crisis communication in the case of a biological or chemical terror attack in Europe, under the framework of the EU-funded project "Joint Action to Strengthen Health Preparedness and Response to biological and chemical terror attacks" (JA TERROR).

To that aim, the paper initially refers to the numerous existing community engagement strategies and community resilience plans on other-but CB-Health Threats, in the EU / EEA and elaborates on the work done through the EU funded programs PROACTIVE and RESIST. Following this, the findings of the survey contacted to identify and analyze how already implemented community engagement plans can be modified to include terrorist attacks without inducing a feeling of an impending threat to the public and to identify common challenges and barriers that impede community engagement and resiliency, as well as to understand the current state of inter-sectoral collaboration and identify gaps in risk communication procedures at all levels of crisis management, from command posts to decision-makers.

Having presented the already existing projects and respective actions taken, as well as the survey and conference findings, the paper proceeds in presenting more specifically, the role of community preparedness and engagement in the occasion of deliberate release of CBRNe agents, while the nature of biological / chemical terror attacks, along with respective guidance are included in the respective annex of the paper.

Following the above the issues of building trust and how this trust is fortified through community engagement are discussed, as well as the importance of community engagement during health crisis and community engagement approaches are presented, along with proposed ways to encourage such engagement. Additionally, the role of two-way communication is stressed. The community engagement role in behavioral change is discussed, and its vital role for controlling disease outbreaks and mitigating disasters, and specific guidance is given, as well as past events' stories that highlight preparedness benefits can activate behavior attitudes, along with respective challenges in achieving positive behavioral change during a health crisis. Challenges in terms of funding are also elaborated in this document.

Moreover, the document refers to resilience and how Involving community members in crisis response increases resilience and helps communities recover more quickly. Finally, the role of health care units – Hospitals and HCW (health care workers) is stressed in terms of facilitating and encouraging community engagement in case of emergency.

Key Findings:

- **Cross-sectoral collaboration is crucial:** Effective communication requires seamless information flow between healthcare, law enforcement, emergency response, and community leaders. This ensures coordinated messaging and avoids confusion during crises.

- **Community engagement is essential:** Prepared and engaged communities are more resilient and recover faster. This includes proactive communication, trust-building, and two-way dialogue to address concerns and promote informed decision-making.
- **Challenges exist:** Barriers include funding limitations, potential for public anxiety, and the need for clear, accessible information across diverse communities.

Recommendations:

- **Develop integrated communication plans:** These plans should include protocols for cross-sectoral information sharing, designated communication channels, and strategies for reaching diverse audiences.
- **Invest in community engagement:** Establish ongoing communication channels with community leaders and organizations. Provide accessible information on preparedness, including risk mitigation and response strategies.
- **Prioritize trust-building:** Transparency, empathy, and consistent messaging are vital for establishing public trust and encouraging community cooperation during crises.
- **Utilize diverse communication channels:** Employ traditional and social media, community forums, and multilingual resources to ensure broad reach and accessibility.
- **Evaluate and adapt:** Regularly assess communication strategies and community engagement efforts to identify areas for improvement and ensure ongoing effectiveness.

This deliverable emphasizes the critical role of community engagement and cross-sectoral communication in strengthening preparedness and response to biological and chemical terror threats. By addressing challenges and implementing these recommendations, Europe can enhance its resilience and mitigate the impact of such attacks.

1. Introduction

The purpose of this guideline is to provide advice regarding the assessment of the role of community preparedness and engagement in risk and crisis communication in the case of a biological or chemical terror attack in Europe, under the framework of the EU-funded project "Joint Action to Strengthen Health Preparedness and Response to biological and chemical terror attacks" (JA TERROR).

Community preparedness and engagement in crisis communication involve proactive efforts to ensure that communities are ready to respond effectively to emergencies and disasters, in the specific case in the emergency of a biological or chemical terror attack. This includes educating the public about potential risks, developing clear communication strategies, and fostering strong partnerships between community members, organizations, and emergency responders. Crucially, this also necessitates effective cross-sectoral communication between diverse stakeholders such as healthcare providers, law enforcement agencies, and government bodies to ensure a coordinated and unified response.

By involving the community in planning and preparedness activities, authorities can build trust, improve the effectiveness of communication during crises, and ensure that messages are culturally relevant and accessible. Engaging the community also empowers individuals to take an active role in their safety and resilience, leading to more coordinated and efficient responses when crises occur.

In the following pages several community engagement strategies and community resilience plans that focus on threats other than chemical and biological health threats and have been implemented by the European Union (EU) and European Economic Area (EEA) will be presented, along with the findings of the sampled public survey that has been implemented to identify and test suggestions provided by the joint workshop of community resilience experts and CBRN experts, that took place in Thessaloniki, that provides significant feedback and assessment on national policies regarding the community preparedness and engagement.

Additionally, to this assessment of current policies, this paper provides a significant complete guide for community preparedness and engagement, by presenting initially useful general information on chemical and biological agents, and proceeding with specific guidance and examples regarding building trust, the role of communities' engagement, how this engagement can be encouraged, the role of behavior change in controlling disease outbreaks and mitigating disasters and the challenges in achieving such positive behavioural change.

2. Existing Community Engagement Strategies and Community Resilience Plans on other-but CB-Health Threats, in the EU / EEA

In the European Union (EU) and European Economic Area (EEA), there are several community engagement strategies and community resilience plans that focus on threats other than chemical and biological health threats. These plans are aimed at enhancing the capacity of communities to respond to various types of crises, including natural disasters, terrorism, and technological hazards. Here are some of these projects:

EU Strategy on Disaster Risk Reduction: This strategy emphasizes the importance of community engagement and resilience in preparing for and mitigating the impact of natural disasters, such as floods, earthquakes, and wildfires. It encourages member states to involve local communities in risk assessment, preparedness planning, and disaster response. (https://civil-protection-humanitarian-aid.ec.europa.eu/what/civil-protection/disaster-risk-reduction_en)

The EU Civil Protection Mechanism: This mechanism aims to strengthen cooperation among EU member states and enhance disaster response capabilities. It includes provisions for engaging communities in preparedness activities and building local resilience through training, public awareness campaigns, and community-based disaster risk management initiatives. (https://civil-protection-humanitarian-aid.ec.europa.eu/what/civil-protection/eu-civil-protection-mechanism_en)

National Platforms for Disaster Risk Reduction (DRR): Several EU/EEA countries have established national platforms for DRR, which often include community engagement components. These platforms facilitate collaboration between government agencies, local authorities, NGOs, and community groups to develop and implement resilience-building activities. (https://www.undrr.org/terminology/national-platform-disaster-risk-reduction)

The European Climate Adaptation Platform (Climate-ADAPT): This platform provides information and tools for enhancing climate resilience at the community level. It supports local adaptation strategies, which involve community stakeholders in assessing vulnerabilities, planning adaptation measures, and increasing public awareness of climate-related risks. (https://climate-adapt.eea.europa.eu/en)

European Flood Awareness System (EFAS): In countries like Germany and the Netherlands, there are well-established community engagement strategies focused on flood risk management. These plans involve local residents in decision-making processes, encourage the development of community flood response teams, and promote the use of traditional knowledge and practices to enhance resilience. (https://european-flood.emergency.copernicus.eu/en)

Urban Resilience Strategies: Several European cities, such as Copenhagen and Paris, have developed comprehensive urban resilience strategies that address a wide range of threats, including terrorism, cyber-attacks, and infrastructural failures. These strategies often prioritize community engagement by involving citizens in planning and response activities and fostering a culture of preparedness and resilience. (Link to Paris Resilience Strategy: https://www.100resilientcities.org/strategies/paris/ , link to Copenhagen Resilience Strategy: https://urbandevelopmentcph.kk.dk/artikel/resilience)

Local Resilience Fora: In the UK, Local Resilience Fora (LRFs) are multi-agency partnerships that bring together emergency services, local authorities, health bodies, and community groups to plan

and prepare for emergencies. These fora focus on a range of threats, from natural disasters to terrorism, and involve community engagement in emergency planning and response activities. (https://www.gov.uk/government/publications/local-resilience-forums-contact-details)

The European Forest Fire Information System (EFFIS): EFFIS provides a platform for monitoring forest fires and supporting wildfire management across Europe. It involves communities in fire prevention and response strategies, promoting awareness and preparedness to reduce the risk and impact of wildfires. (https://effis.jrc.ec.europa.eu/)

The European Fire Safety Alliance (EuroFSA): This alliance works to improve fire safety across Europe by promoting community awareness and education on fire risks. It encourages the involvement of local communities in fire prevention initiatives and safety practices, particularly in residential settings. (https://www.europeanfiresafetyalliance.org/)

Additional to these examples, that highlight the diverse strategies and plans across the EU/EEA focused on engaging communities and building resilience against various threats, ensuring a comprehensive approach to crisis management and disaster preparedness, the EU-funded programs PROACTIVE and RESIST, also focus on enhancing community engagement and resilience against specific types of threats, and are presented below, in a more detailed way.

PROACTIVE is an EU-funded project aimed at improving preparedness and response to Chemical, Biological, Radiological, Nuclear, and Explosive (CBRNe) threats, with a strong emphasis on engaging vulnerable communities and civil society. The project focuses on enhancing cooperation between security practitioners (such as law enforcement and emergency services) and the general public, particularly vulnerable groups, to ensure effective crisis communication and response in the event of a CBRNe incident. (https://proactive-h2020.eu/)

The community engagement is one of the main key aspects that PROACTIVE project builds upon. The project involves communities, especially vulnerable groups like people with disabilities, the elderly, and children, in preparedness activities. It aims to develop inclusive communication strategies and training that cater to these groups.

Among the projects products, it is considered significant to highlight the PROACTIVE CBRNe Crisis Communication System (CCS), as relative to our project. The CCS has been designed as an innovative response tool which improves two-way communication between civil society and first responders. It also increases preparedness through its CBRNe Library. It is composed of three tools: the Web Collaborative Platform for LEAs, the Modular App for Practitioners, and the Mobile App for the public. The Mobile App for Practitioners and the Mobile App for Vulnerable Citizens are available as one single app, with the target end-user (practitioner or vulnerable citizen) being differentiated by access rights, available on Google Play and App store. All three tools are powered by the dedicated PROACTIVE CBRNe back-end.

RESIST is also an EU-funded project, that focuses on enhancing the resilience of critical infrastructure and urban ecosystems to a wide range of threats, including natural disasters, cyber-attacks, and other technological hazards. The project aims to create smart, resilient ecosystems that can withstand and recover from disruptions, ensuring the safety and security of urban populations. (https://resist-project.eu/). The project aims through its collaborative platform and the communication outreach and the citizens' engagement to reach 22 million European citizens.

These programs, PROACTIVE and RESIST, demonstrate the EU's commitment to enhancing community engagement and resilience through innovative projects that address specific threats and vulnerabilities. By involving communities and leveraging technology, these projects aim to create safer, more resilient societies across Europe, and have been an excellent example, among others, on how community engagement can add value to addressing threats and risks.

3. Conference and Survey

The increasing threat of biological and chemical terrorism poses significant challenges to public health and safety. In response to these threats, the European Union has established a framework to improve preparedness and strengthen response capacities through initiatives like Decision 1082/2013/EU on serious cross-border threats to health. To support these efforts, Joint Action TERROR (JA TERROR) has been launched with the primary objective of addressing gaps in health preparedness and enhancing responses to biological and chemical terror attacks through cross sectoral collaboration among security, civil protection, and health sectors.

Within this framework, Work Package 7 (WP7) plays a pivotal role. Its specific objective is to promote the implementation of Risk and Crisis Communication across all stages of risk management, at both national and EU levels. WP7 aims to develop tools and strategies that facilitate robust communication channels between relevant sectors and the public. These tools are intended to establish legally and technically sound solutions for unified platforms that enable rapid information exchange between diverse sectors, including the handling of potentially classified data. Member States and partners will be able to leverage the experiences gained from community resiliency plans already applied to other health threats, adapting them to the context of biological and chemical terrorist attacks.

In alignment with WP7's objectives, on July 4th in Thessaloniki, the 4th International Workshop of the EU JA TERROR project was held under the auspices of the National Public Health Organization (EODY). The event gathered a diverse group of experts and stakeholders from both Greece as a host country and other European countries. A common theme was the topic of targeting to enhance cooperation, communication and preparedness to address the growing threats of deliberate release of chemical and biological agents. The workshop marked a crucial step in strengthening crisis management capabilities within the EU and Member States, underlining the importance of collective action to safeguard public health and safety.

The event brought together a wide range of participants, including health authorities from the EU and EEA, together with key Greek crisis management actors such as Civil Protection, the Fire Service, the Greek National Emergency Medical Service (EKAB) and the Ministry of Health. Also present were representatives of the General State Chemistry Department, the Hellenic Atomic Energy Commission, the Police Anti-Terrorism Service and the CBRNE (Chemical, Biological, Radiological, Nuclear and Explosives) Department of the Fire Brigade and the Military. The participation of local government agencies, media representatives and voluntary groups further highlighted the wide range of cooperation necessary to deal effectively with such threats.

A highlight of the workshop was the presentation of the results of the public survey. The development of this part, as part of the wider project is a vital product to ensure that information is accurately filtered and disseminated appropriately to the public, thereby preventing misinformation and managing the public's response during a bioterrorism incident. The development and inclusion of such tools reflects a proactive approach to crisis communication, which is essential to minimize the impact of such threats to public health and safety.

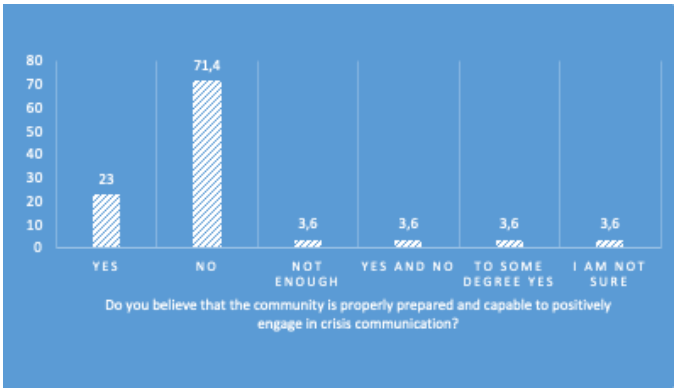
In conclusion, the 4th International Workshop in Thessaloniki was part of the European Union's efforts to make progress in the fight against bioterrorism. By fostering cooperation between a diverse group of stakeholders, discussing on community engagement and related plans, developing new

communication tools and emphasising the importance of education and training, it has been a significant contribution to the progress of the deliverable.

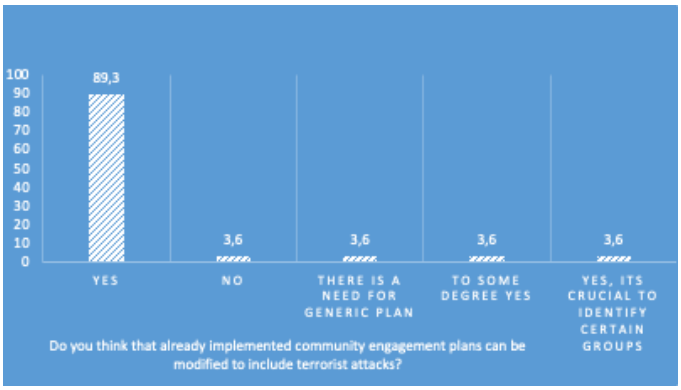
Regarding the survey, its objective has been communication experts, health professionals, law enforcement, and civil protection sectors to identify and analyse how already implemented community engagement plans can be modified to include terrorist attacks without inducing a feeling of an impending threat to the public and to identify common challenges and barriers that impede community engagement and resiliency, as well as to understand the current state of inter-sectoral collaboration and identify gaps in risk communication procedures at all levels of crisis management, from command posts to decision-makers. The results of the survey were presented at the Hybrid Workshop on Community Resilience at Major CB Health Threats on the 4th of July in Thessaloniki. The sample, it was 31 people who are all originating structures and institutions related to security, civil protection, and health.

The aforementioned sample is characterized by diversity in its structure in terms of both specialization within its services and hierarchy. However, we can say that a basic demographic map is filled by people higher up in the hierarchical ranks of the structures where they serve, there is a clear group of people who work in positions of responsibility for communication and another group for management.

The subjects in a percentage of 72.4% stated that they had received Graduate and Professional education while 20.7% Post- Secondary Education (Undergraduate Education- Bachelor's Degree). Finally, only 6.9% stated that they have received exclusively secondary education.



Regarding the Community Engagement, to the question: "Do you believe that the community is properly prepared and capable of positively engaging in crisis communication?", the distribution of the answers was: "Yes": 4 respondents (14.3%), "No": 20 respondents (71.4%), "Not enough": 2 respondents (7.1%) and "Yes and No. Depends on the crisis": 1 respondent (3.6%), "To some degree yes, civil protection is locally very efficiently organized and coordinated": 1 respondent (3.6%), and "I am not sure": 0 respondents (0%). According to these answers, **a significant majority (71.4%) believe that the community is not properly prepared for crisis communication.** Only 14.3% believe the community is properly prepared, indicating a strong perception of inadequacy in current preparedness levels. The responses suggest a need for improved community engagement and preparedness strategies, with only a small fraction recognizing existing efforts as adequate.



Moving on to the next question, Do you think that already implemented community engagement plans can be modified to include terrorist attacks?" The responses were: "Yes": 25 respondents (89.3%), "No": 1 respondent (3.6%), "There is a need for Generic Plans": 1 respondent (3.6%) and "Yes. In my view, it is crucial to continually identify and monitor the different target audiences and their specific characteristics.": 1 respondent (3.6%). So, **an overwhelming majority (89.3%) agree that current community engagement plans can and should be modified to address terrorist attacks.** This indicates a strong consensus on the adaptability and necessity of existing plans to include specific measures for terrorism-related incidents. The minimal disagreement suggests a unified perspective on the need for comprehensive and inclusive crisis communication strategies.

Asked to "Identify common **challenges and barriers** that impede community engagement and resiliency. Please name them in one word each if possible.", a number of different opinions have been presented and several common challenges and barriers to community engagement and resiliency have been identified, summarized as follows:Lack of common exercises between stakeholders, political willingness and understanding, limited experience in managing CBRNE incidents, need for more communication experts, lack of trust in official channels, knowledge of community features and behavior, lack of community training, misinformation – disinformation, diverse population challenges, poor intersectoral collaboration, lack of clear responsibilities, lack of communication and detailed plans, misconceptions, bias, and mob mentality, fear, lack of information and preparation and political polarization

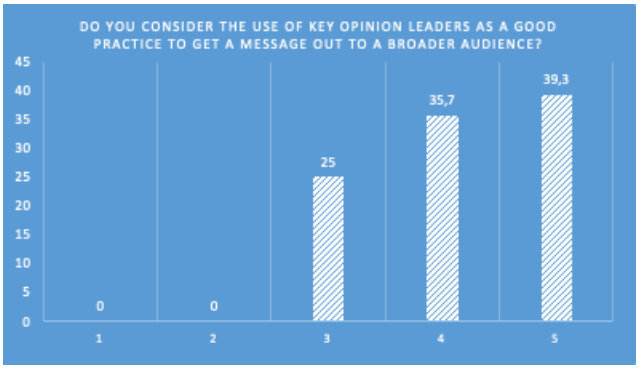
The survey **responses reveal numerous challenges** and barriers to community engagement and resiliency. A significant issue is the lack of coordination, exemplified by the absence of common exercises among stakeholders and inadequate multisectoral collaboration. Political willingness and understanding of the necessity for community engagement are also limited, undermining efforts to build resilience.

There's a clear need for more experience in managing CBRNE incidents and training more communication experts. Trust and credibility emerge as crucial factors. Many respondents highlighted the **lack of trust** in official channels, exacerbated by widespread misinformation, disinformation, and fake news. This distrust is further compounded by insufficient knowledge of community features and behavior, as well as technology illiteracy, which hampers effective communication.

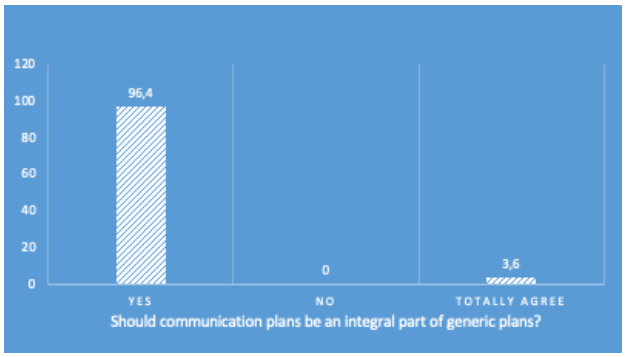
Cultural and social factors also pose significant barriers. The diversity of populations, political polarization, and societal unity issues make engagement efforts more complex. Additionally, operational challenges such as poor intersectoral collaboration, unclear responsibilities, and inadequate coverage by NGOs further complicate community engagement.

Preparation and planning are critically lacking. The absence of detailed communication plans and community training weakens overall resilience. Fear, misconceptions, bias, and mob mentality also

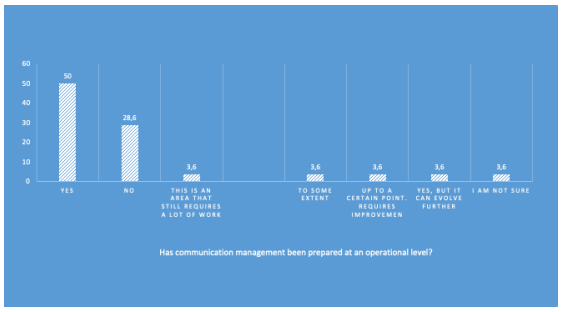
hinder effective community engagement. Addressing these challenges requires a comprehensive approach, involving improved coordination, enhanced training, better information dissemination, and stronger political and societal support.



In the thematic of Crisis Communication and Risk Strategic Planning, asking about the Key opinion leaders "Do you consider the use of key opinion leaders as a good practice to get a message out to a broader audience?", the answers were distributed as high endorsement, with the majority of respondents rating the practice highly, with 11 rating it with a 5 out of 5 and 10 with a 4 out of 5. This indicates strong support, with 21 out of 28 respondents (75%) leaning towards the high end of the spectrum. Additionally, a smaller segment of the respondents rated it a 3, which suggests a moderate level of endorsement. This group (7 out of 28, or 25%) likely sees value in the use of key opinion leaders but may have reservations or believe there are limitations or potential drawbacks. There were no responses for 1 or 2, suggesting that no respondents viewed the practice as ineffective or detrimental. This is a positive indication that there is no significant opposition to the practice among the surveyed group. The data suggests that **the use of Key Opinion Leaders (KOLs) is largely viewed positively** by the surveyed group. The absence of low scores (1 or 2) and the concentration of responses at the higher end of the spectrum (4 and 5) indicate a strong consensus that KOLs are effective in reaching broader audiences. Several factors contribute to these high ratings. KOLs are often seen as trustworthy and knowledgeable, which enhances the credibility of the message they convey. They typically have large followings, allowing them to disseminate information to wide and diverse audiences effectively. Additionally, audiences are more likely to engage with content shared by KOLs due to their established influence and authority in their respective fields.

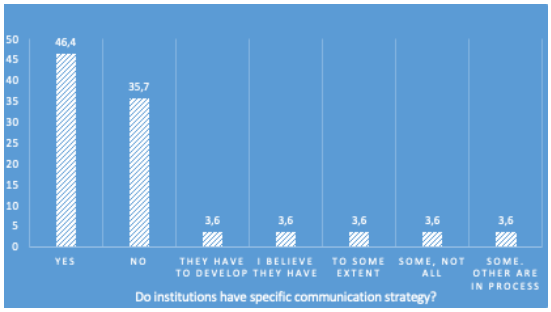


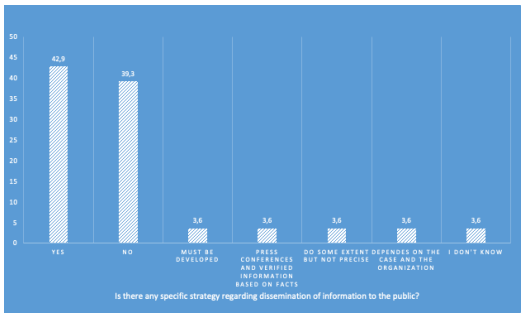
The survey also regarding the "Crisis Communication and Risk Strategic Planning" showed that the subjects answered that the communication plans have to be an integral part of generic plans with 96,4%. As for the last one, the subjects also answered that at a high percentage (89.3%) "yes" to the question, "Should communication plans be an integral part of generic plans?" indicates a strong consensus on the importance of incorporating communication strategies into broader planning efforts. The **overwhelming agreement suggests** that most respondents believe **that communication plans should not be treated as separate or secondary considerations. Instead, they should be embedded within the overall strategic planning process.**



Also, the responses to the question "Has communication management been prepared at an operational level?" show a clear divide: 50% answered "No," indicating a lack of operational-level communication management, while 28.6% confirmed its presence. The remaining responses fall in between, suggesting varying levels of preparedness. This indicates **a significant gap, with many organizations potentially facing challenges due to insufficient operational communication strategies.**

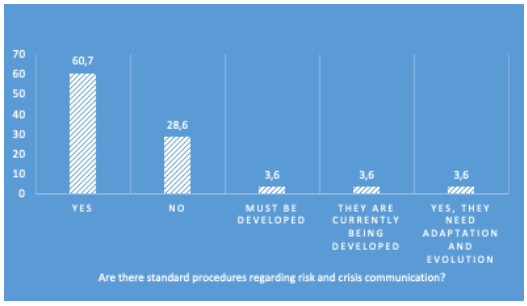
According to the data especially from the question "Do institutions have a specific communication strategy?", 46.4% of institutions have a specific communication strategy in place, while 35.7% do not. The remaining responses are distributed among intermediate options. This indicates that **nearly half of the institutions have formalized their communication approaches, but a significant portion still lacks a defined strategy,** suggesting variability in the strategic management of communication across institutions.



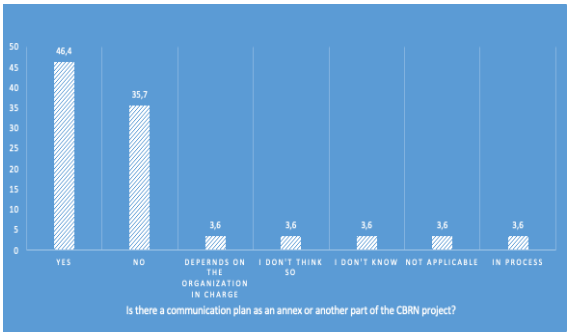


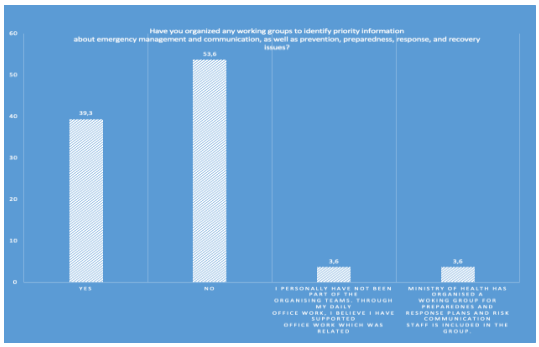
The responses to the question, "Is there any specific strategy regarding the dissemination of information to the public?" indicate that 42.9% of respondents have established such a strategy, whereas 39.3% do not. This distribution suggests that while **a significant proportion of organizations have developed specific strategies for communicating with the public, a considerable number have not,** pointing to a potential area for enhancement in strategic communication practices.

The respondents regarding protocols of risk and crisis communication were divided. The analysis of the results from the question "Are there standard procedures regarding risk and crisis communication?", shows that **the majority of respondents (60.7%) have standard procedures** for risk and crisis communication, while a smaller portion (28.6%) do not. The remaining responses once more fall somewhere in between. It might be useful to explore what specific procedures are considered standard and how they are applied across different contexts or organizations.

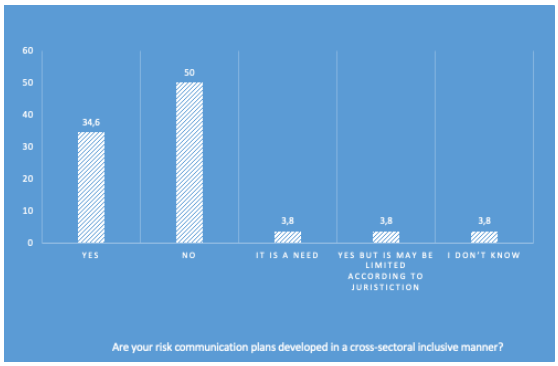


On protocols, the results regarding **the inclusion of a communication plan in CBRN projects reveal a notable division**. Approximately 46.4% of respondents affirm that such a plan is part of the project, whereas 35.7% report its absence. The remaining responses are mixed, showing varying tendencies towards either inclusion or exclusion. This distribution suggests a lack of uniformity in the implementation of communication plans across CBRN projects, indicating a potential need for standardized guidelines to ensure consistency and effectiveness in project management.



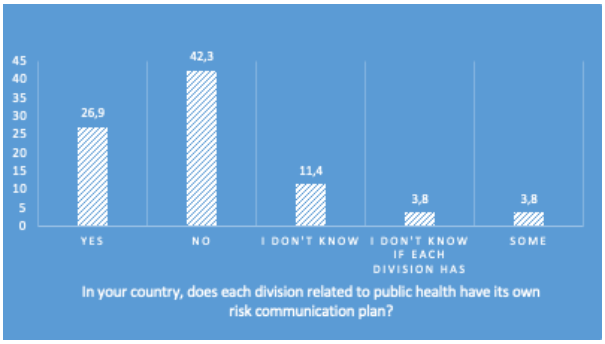


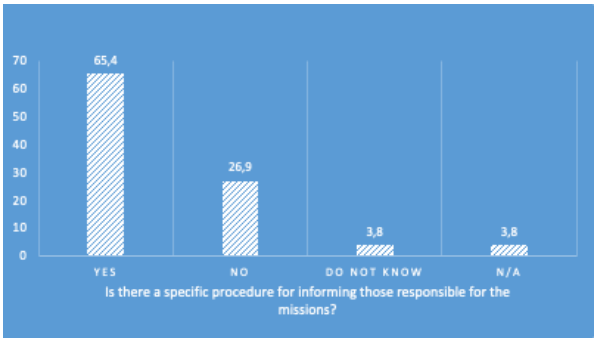
The survey also, reveals that **the majority (53.6%) of respondents have not organized working groups to address emergency management and communication**, with only 39.3% indicating they have taken such steps. This suggests a significant gap in structured preparedness efforts within many organizations. The lack of organized groups dedicated to prioritizing information on prevention, preparedness, response, and recovery could hinder effective crisis management, indicating a need for more proactive measures to ensure comprehensive emergency preparedness.



Half of the respondents (50%) report that their risk communication plans are not developed in a cross-sectoral inclusive manner, while only 34.6% have achieved such inclusiveness. This indicates **a critical shortfall in collaboration across sectors,** which is essential for a cohesive and effective response to crises. The lack of cross-sectoral inclusiveness suggests that risk communication efforts may be fragmented, potentially leading to inconsistent messaging and response strategies across different sectors and jurisdictions.

In response to whether each organisations has its risk communication plan, 42.3% of participants answered "No," while only 26.9% confirmed the existence of such plans. This highlights a considerable inconsistency in the development and implementation of risk communication strategies within organizations. The absence of standardized communication plans across different sectors can lead to a disjointed public health response during emergencies, emphasizing the need for more uniform and comprehensive planning at all levels.





Regarding **internal communication and national plans,** the survey question, "Is there any specific way or channel through which you will be informed?" reveals that **the majority (56%) of respondents have a specific communication channel in place.** In contrast, 32% of respondents lack a designated channel for receiving information. A minority (4%) depend on an ad hoc working group under Civil Protection supervision or personal relationships with colleagues from other agencies for information dissemination. An additional 4% of respondents are uncertain about the communication channels available to them. These findings highlight the importance of structured communication channels within organizations to ensure effective information flow.

In continuing to the same frame, the question, "Are there any classified communication channels?" reveals that a slight majority (53.8%) of **respondents affirm the existence of such classified channels**. Meanwhile, 42.3% of respondents need to be made aware of any classified communication channels. A small percentage (3.8%) are uncertain about their existence. These results underscore the need for clear communication and awareness within organizations regarding the availability and use of classified channels.

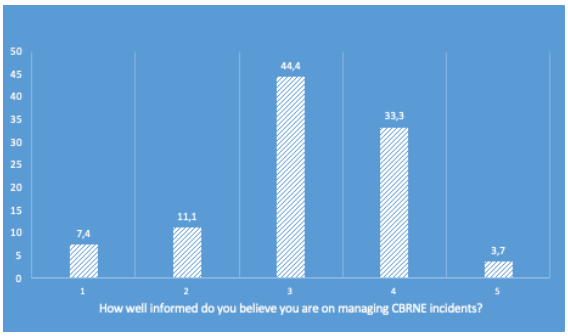
However, the activation of secure communication channels presents a concern. Less than half (47.6%) of respondents confirm that these channels are activated, highlighting a potential weakness in operational security preparedness. In addition, 28.6% of respondents report that secure channels are not activated and 19% are unsure of their status. These inconsistencies indicate significant gaps in ensuring consistent operational readiness, which could undermine the effectiveness of critical communications. The final question related to the communication channels and revealing the names of these channels is pretty much unanswered since most of these are classified.

In addition, there are concerns about transnational communication. A large majority (76%) of respondents expect problems at the transnational level due to the current state of information, indicating concerns about the adequacy and effectiveness of existing communication strategies across national borders. This suggests that while communication protocols may be adequate in national contexts, they may not be as effective when extended to a transnational context.

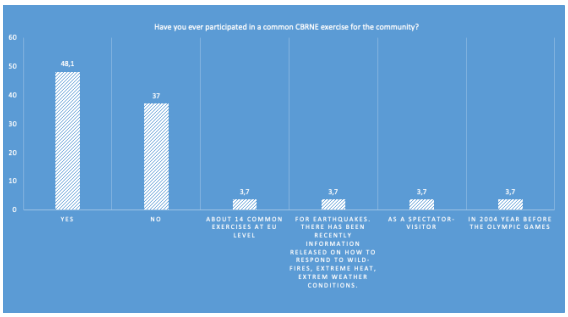
Overall, these findings highlight the need for greater clarity, consistency, and activation of secure communication channels for effective risk mitigation, particularly in a transnational counter-terrorism context. The research highlights both strengths and areas for improvement in the communication strategies currently used by organizations tasked with managing terrorism-related risks.

The survey on the **perceived likelihood of a CBRNe** (Chemical, Biological, Radiological, Nuclear, and explosive) incident reveals that 81.4% of respondents rate the possibility as moderate to high, with 40.7% assigning a likelihood of 3 and another 40.7% assigning a rating of 4 or 5. This **high level of perceived risk** indicates a strong awareness among respondents of the potential for such incidents. The relatively few respondents who rate the likelihood as low (1 or 2) further underscore the prevalent recognition of the threat. These findings suggest that the awareness of CBRNE risks should drive efforts to enhance preparedness and communication strategies within relevant organizations.

The opinion of the subjects regarding preparedness shows that 33.3% of respondents rated their preparedness at a level of 3, indicating a **moderate sense of readiness.** Close numbers of respondents rated themselves lower at 2 (29.6%) and higher at 4 (25.9%). The largest group's rating of 3 reflects uncertainty, suggesting that while there is some level of preparedness, many respondents recognize significant gaps. The substantial portion who state inadequately prepared (rating of 2) highlights the need for targeted training and preparedness exercises to enhance overall readiness



The survey question regarding participation in common CBRNE exercises reveals that **nearly half (48.1%) of respondents have taken part in such exercises.** However, 37% have not participated, indicating a gap in practical experience for a significant portion of respondents. The remaining 14.8% of respondents have engaged in specific contexts, such as EU-level exercises, earthquake-related exercises, as spectators, or before the 2004 Olympics, each accounting for 3.7%. These results highlight the need for broader participation in CBRNE exercises to ensure comprehensive preparedness across the community.



Regarding the self-assessment of information and managing CBRNE incidents shows that most respondents (44.4%) rated themselves at a 3, indicating moderate confidence in their knowledge. A significant portion (33.3%) rated themselves higher at 4, while ratings at the extremes of 1 and 5 were less common. This distribution suggests that while many respondents feel moderately informed, they may lack the in-depth knowledge required for a more advanced understanding of CBRNE management. The presence of lower ratings highlights a segment of the population that feels underinformed, pointing to a need for further education and training to bolster overall preparedness. The data underscores a critical need for focused training and readiness exercises to bridge these gaps and bolster overall preparedness.

Having presented the already existing projects and respective actions taken, as well as the survey and conference findings, we will proceed discussing more specifically, on the role of community preparedness and engagement in the occasion of deliberate release of CBRNe agents. To this context, specific guidance and recommendation is presented below, where the already discussed findings are in many cases already present.

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4. Deliberate release of agents and community

4.1 Basic notions and definitions of what a deliberate release of an agent is

The deliberate release of a chemical or biological agent refers to the intentional dissemination of harmful substances into the environment with the aim of causing damage or harm. This act is typically associated with malicious intent, such as terrorism, warfare, or sabotage. Chemical agents are toxic substances that can harm living organisms or the environment. They can exist in gaseous, liquid, or solid forms and can cause immediate or delayed harmful effects. Examples of these agents include nerve agents like sarin and VX, which disrupt the nervous system; blister agents such as mustard gas, which cause severe skin, eye, and mucosal pain and irritation; blood agents like hydrogen cyanide, which interfere with the body's ability to use oxygen; and choking agents such as chlorine gas and phosgene, which cause respiratory distress (Sidell et al., 1997).

Biological agents, on the other hand, are microorganisms or toxins derived from living organisms that can cause diseases in humans, animals, or plants. These include bacterial agents like Bacillus anthracis (anthrax) and Yersinia pestis (plague), viral agents such as the smallpox virus and the Ebola virus, and biotoxins like ricin or botulinum toxin (Riedel, 2004). The release of these agents can occur through various methods, including aerosolization, which involves dispersing agents into the air for inhalation exposure; contamination of food or water supplies; and physical dissemination using explosive devices or other means to spread agents over a wide area (Carus, 2001).

The intent behind a deliberate release can vary. However, it generally aims to cause mass casualties by targeting large populations to inflict death or serious injury, create economic disruption by damaging crops, livestock, or infrastructure, instill psychological impact by spreading fear, panic, and confusion, or cause environmental damage by contaminating natural resources and ecosystems (Kosal, 2007). The deliberate release of chemical or biological agents is a severe crime and a violation of international laws, including the Chemical Weapons Convention (CWC) and the Biological Weapons Convention (BWC), which prohibit the development, production, acquisition, stockpiling, and use of such weapons (United Nations, 1997).

Preparedness involves developing strategies and capabilities to detect, prevent, and respond to such attacks. This includes establishing surveillance systems to monitor for signs of chemical or biological agent release, creating emergency response plans to coordinate medical and public health responses, implementing decontamination procedures to remove or neutralize hazardous substances, and ensuring effective public communication to inform and educate the public on protective measures (Centers for Disease Control and Prevention (CDC), 2018). Understanding these concepts is crucial for recognizing the risks associated with the deliberate release of chemical and biological agents and implementing effective preventive and response strategies.

4.2 Ways and Extent the community can be affected

The deliberate release of chemical or biological agents can have profound and far-reaching impacts on a community, affecting public health, the environment, the economy, and social stability. The extent and ways in which a community is affected depend on several factors, including the type of agent used, the method and scale of dissemination, the population density, and the effectiveness of emergency response measures.

The most immediate and severe impact of a deliberate release of chemical or biological agents is on **public health**. The consequences can range from acute health effects, such as respiratory distress, skin burns, and systemic toxicity, to chronic conditions, including cancers and neurological damage. Biological agents can cause outbreaks of infectious diseases, potentially leading to epidemics or pandemics. The mortality and morbidity rates can be high, especially if the release is undetected or if effective medical treatments are unavailable (Centers for Disease Control and Prevention, 2021).

The **psychological impact** on the community can be substantial. The fear and uncertainty associated with exposure to hazardous agents can lead to widespread panic, anxiety, and trauma. The stigma associated with contamination can lead to social isolation of affected individuals or groups, exacerbating mental health issues. Moreover, the community's trust in public institutions may erode, particularly if the response is perceived as inadequate or delayed (World Health Organization, 2022).

The **economic impact** of such an event can be devastating. Businesses may suffer due to contamination, loss of workforce, or damage to infrastructure. The costs associated with decontamination, medical treatment, and compensation can strain local and national economies. Additionally, tourism, trade, and investment in the affected area may decline, leading to long-term economic downturns (FEMA, 2021).

Chemical and biological agents can cause significant **environmental damage**, contaminating air, water, and soil. The long-term effects may include loss of biodiversity, disruption of ecosystems, and the contamination of food and water supplies. The environmental cleanup can be costly and time-consuming, and some areas may remain uninhabitable or unsuitable for agriculture for extended periods (United States Department of Health and Human Services, 2021).

The release of harmful agents can **disrupt essential public services**, including healthcare, transportation, and utilities. Hospitals and emergency services may become overwhelmed with casualties, while quarantine measures and movement restrictions can disrupt daily life and economic activities. Critical infrastructure, such as water treatment facilities, may be targeted or affected, leading to further public health risks (Organisation for the Prohibition of Chemical Weapons, 2022).

Such events pose significant **challenges to national and local governance**. Authorities must coordinate complex response efforts, including evacuation, decontamination, and public communication. The potential for civil unrest or criminal exploitation of the situation can further complicate the response. In severe cases, martial law or other extraordinary measures may be required to maintain order and ensure public safety (Organisation for the Prohibition of Chemical Weapons, 2022).

The long-term **societal impact** can include changes in community dynamics, with increased surveillance, security measures, and potential restrictions on civil liberties. There may also be long-term health monitoring and support needs for affected populations, as well as ongoing economic and environmental rehabilitation efforts (World Health Organization, 2022).

The extent of the impact largely depends on the preparedness and resilience of the community, the effectiveness of the emergency response, and the nature of the agent used. In a worst-case scenario, the effects can be catastrophic, with long-lasting repercussions on all aspects of society. However, with timely and effective intervention, the damage can be mitigated, and the community can recover more quickly.

In conclusion, the deliberate release of chemical or biological agents can have severe, multifaceted impacts on a community. These effects can be immediate and long-term, spanning public health, psychological, economic, environmental, and societal domains. Comprehensive preparedness and response strategies are essential to minimize the harm and facilitate recovery.

4.3 The importance of the community resilience

Community resilience plays a critical role in coping with the deliberate release of chemical or biological agents. Resilience refers to the capacity of individuals, communities, institutions, and systems to survive, adapt, and grow in the face of adverse events. The importance of community resilience in these scenarios can be understood through several key aspects:

4.3.1. Preparedness and Response

A resilient community is better prepared to respond effectively to emergencies. This includes having well-developed emergency plans, trained personnel, and resources in place to manage and mitigate the impact of chemical or biological threats. Effective communication channels and public education are crucial for ensuring that individuals understand the risks and know how to protect themselves (Cutter et al., 2008). Preparedness activities, such as regular drills and community training, enhance the ability to respond quickly and efficiently, thereby reducing casualties and limiting the spread of harmful agents.

4.3.2. Social Cohesion and Support Networks

Social cohesion and strong community networks are vital for resilience. During crises, these networks provide essential support, such as sharing information, resources, and emotional support. Communities with high levels of social capital can mobilize quickly to help vulnerable members, ensuring that assistance reaches those in need. This collective action is crucial for maintaining order and ensuring a coordinated response to crises (Aldrich & Meyer, 2015).

4.3.3. Recovery and Adaptation

Community resilience also involves the capacity for recovery and adaptation after an incident (Norris, Stevens, Pfefferbaum, Wyche, & Pfefferbaum, 2008). A resilient community can rebuild infrastructure, restore services, and support the mental and physical health of its members. This includes providing access to healthcare, counseling, and other support services that are critical for recovery. Moreover, resilient communities are more likely to learn from experiences and adapt by implementing changes that reduce vulnerability to future incidents.

4.3.4. Economic Stability

Economic resilience is a component of community resilience that ensures businesses and local economies can withstand and recover from shocks. This includes having diverse economic activities, insurance coverage, and financial reserves. Economically resilient communities are better equipped to manage the costs associated with response and recovery efforts, such as medical treatment, decontamination, and infrastructure repair. They are also more likely to attract investments and recover more quickly, minimizing long-term economic disruption (Rose, 2009).

4.3.5. Trust in Institutions

Trust in government and public institutions is a critical aspect of resilience. Communities that trust their leaders and institutions are more likely to follow public health directives and cooperate with emergency response efforts (Pfefferbaum, Pfefferbaum, & Van Horn, 2011). This trust is built through transparent communication, consistent and fair actions, and community involvement in decision-making processes. Trustworthy institutions can manage the dissemination of information and resources, reducing misinformation and panic.

Community resilience is essential for effectively coping with the deliberate release of chemical or biological agents. It enables communities to prepare for, respond to, and recover from these events, minimizing their impact on public health, social cohesion, the economy, and trust in institutions. Building resilience requires ongoing efforts to strengthen social networks, enhance preparedness, and foster economic and institutional stability. By investing in resilience, communities can better protect themselves against future threats and ensure a quicker and more comprehensive recovery.

4.4 The nessecity of cross-secttoral communication

The devastating potential of a deliberate release of chemical or biological agents and its multifaceted impact on public health, the environment, the economy, and societal well-being, underscores the critical need for robust community resilience and, within that, effective cross-sectoral communication and collaboration. The complexities inherent in responding to a CBRNe event necessitate a coordinated approach involving a diverse array of stakeholders. Healthcare providers must diagnose and treat casualties, law enforcement agencies secure the affected area and investigate the incident, environmental agencies assess and mitigate contamination, and government bodies disseminate vital information and coordinate resource allocation. This intricate interplay necessitates the establishment of clear communication channels and the implementation of collaborative decision-making processes to ensure a unified and effective response.

The timely and accurate sharing of information is paramount. Healthcare facilities must alert public health agencies of suspected cases, enabling the swift identification of the agent and the implementation of appropriate public health measures. Similarly, law enforcement agencies require access to scientific data to comprehend the nature of the threat and its potential criminal implications. Cross-sectoral communication facilitates this vital exchange of information.

Effective communication with the public is crucial to prevent panic and foster informed decision-making. This requires collaboration between healthcare professionals, government officials, and communication experts to ensure that messages are accurate, accessible, and culturally appropriate. Effective communication fosters trust, encourages compliance with public health directives, and ultimately strengthens community resilience.

CBRNe events can rapidly overwhelm local resources. Cross-sectoral collaboration ensures the efficient allocation of resources, coordinating the distribution of medical supplies, personnel, and logistical support. This collaborative approach optimizes resource utilization and maximizes the effectiveness of the response.

Recovering from a CBRNe incident also needs sustained cross-sectoral collaboration. Healthcare providers must address long-term health consequences, environmental agencies oversee decontamination efforts, and economic institutions support businesses and community rebuilding.

Effective communication and collaboration across sectors are essential for navigating the complex recovery process and building long-term community resilience.

In essence, the multifaceted challenges posed by a deliberate release of CBRNe agents demand a coordinated and collaborative response. This response should be primarily organized at the state level, providing a framework for effective action and ensuring a unified approach to the crisis. Cross-sectoral communication is the linchpin of this response, ensuring efficient information sharing, resource management, and public communication. By fostering strong partnerships and communication channels between diverse stakeholders, communities can enhance their resilience and mitigate the devastating impact of such events.

Organizing the response at the state level allows for:

- **Centralized Coordination:** A central state authority can effectively coordinate the efforts of various agencies and organizations, preventing duplication of efforts and ensuring a cohesive strategy.
- **Resource Allocation:** State-level oversight facilitates the efficient allocation of resources, ensuring that critical supplies, personnel, and equipment are distributed where they are most needed.
- **Standardized Protocols:** Establishing standardized protocols for communication, information sharing, and decision-making streamlines the response process and reduces confusion during a crisis.
- **Legal and Regulatory Framework:** The state can provide the necessary legal and regulatory framework for managing the crisis, including public health orders, emergency powers, and access to essential resources.

While state-level organization is essential, it should be complemented by strong community-level engagement. Local authorities, community organizations, and individual citizens play a vital role in preparedness, response, and recovery efforts. This localized knowledge and engagement are crucial for tailoring the response to specific community needs and ensuring that messages are culturally relevant and accessible.

By fostering strong partnerships between state-level agencies, local authorities, and community stakeholders, a comprehensive and multi-layered response can be established. This collaborative approach, with cross-sectoral communication at its core, enhances community resilience and optimizes the management of CBRNe events, ultimately minimizing their devastating impact.

Fortunately, CBRNe attacks are rare, making it difficult to find well-documented cases of cross-sectoral collaboration in response to such events. However, we can draw on examples from incidents and near-misses to illustrate the importance of this collaboration.

The 2001 anthrax attacks in the USA, where letters containing anthrax spores were mailed to various targets, underscored the critical need for interagency collaboration. The FBI, CDC, and USPS worked tirelessly together to investigate the attacks, trace the source of the anthrax, and provide vital public health guidance. Local and state health departments played a crucial role in conducting surveillance, providing prophylactic antibiotics, and managing public communication. Hospitals and healthcare providers were essential in diagnosing and treating anthrax cases, implementing infection control measures, and collaborating with public health officials. This event highlighted the

interconnectedness of law enforcement, public health, and healthcare in responding to bioterrorism.

The 2013 Boston Marathon bombing, while not a CBRNe event, provided a powerful example of coordinated response in a crisis. Law enforcement agencies, including the FBI and Boston Police, conducted a massive investigation, identified the suspects, and ultimately apprehended them. Emergency medical services were vital in providing immediate medical care and transporting victims to hospitals. Hospitals, in turn, activated mass casualty protocols and treated a large influx of patients with various injuries. Public officials played a crucial role in communicating with the public, providing updates on the investigation, and reassuring the community. This event demonstrated the importance of a unified response involving law enforcement, healthcare, and public communication.

The 2018 Salisbury poisoning, where a former Russian spy and his daughter were poisoned with a Novichok nerve agent, showcased the complexities of responding to a chemical attack. Public Health England investigated the poisoning, identified the substance, and provided critical public health advice. Law enforcement conducted a thorough criminal investigation, identified suspects, and issued international arrest warrants. Hospitals provided specialized medical care to the victims and implemented decontamination procedures. Even the military was involved, assisting with the investigation and providing expertise in chemical weapons. This incident highlighted the need for collaboration between public health, law enforcement, healthcare, and even military sectors in such events.

Finally, the Fukushima Daiichi nuclear disaster in Japan, though primarily a radiological incident, demonstrated the necessity of national and international collaboration in managing large-scale crises. The Japanese government evacuated residents, established a no-go zone, and coordinated the international response. Nuclear experts worked tirelessly to contain the damage, monitor radiation levels, and advise on decontamination efforts. Healthcare providers monitored the health of residents, provided medical treatment, and addressed long-term health concerns. International organizations like the IAEA and WHO provided technical assistance, monitored the situation, and offered humanitarian aid. This disaster emphasized the importance of coordinated action between governments, scientific experts, healthcare providers, and international organizations in managing crises with potential long-term consequences.

5. Trust

Trust between communities and authorities is crucial for social cohesion, effective governance, and community safety. To build and maintain this trust, authorities should prioritize procedural justice and reconciliation. Procedural justice involves fair and respectful treatment during daily interactions, ensuring that authorities' actions are transparent and accountable (O'Brien & Tyler,2019). Reconciliation focuses on acknowledging past injustices and committing to positive change, fostering an environment where communities feel heard and valued. In crisis situations, like the 2014-16 Ebola epidemic in Liberia, trust can be eroded by fear and misinformation. However, consistent communication and actions that align with community interests can gradually rebuild trust (Arthur et al., 2022). Moreover, the perception of fairness in decision-making processes, such as those involved in environmental projects, significantly influences community trust. Transparent procedures and equitable distribution of benefits can foster a sense of justice and shared responsibility (Miletić et al., 2022). Authorities must demonstrate responsiveness to community needs, transparency in operations, and a commitment to improving citizens' well-being. This approach not only helps mitigate skepticism but also promotes a positive future outlook, essential for sustaining public confidence (Ilicheva & Lapin, 2022).

5.1 Building Trust

Building trust between the community and authorities is paramount in effective risk and crisis communication, particularly in the context of health crises. This trust forms the foundation for a cohesive response, promotes public cooperation, and enhances the overall effectiveness of health interventions. The significance of this relationship can be explored through several key dimensions:

5.1.1. Facilitating Accurate Information Dissemination

In a health crisis, such as a pandemic or an outbreak of a contagious disease, the rapid dissemination of accurate information is crucial. Trustworthy communication from authorities ensures that the public receives clear, accurate, and timely information (Reynolds, B., & Quinn, S. C.,2008). This can prevent misinformation and rumors, which often spread faster than factual information, especially in the age of social media. When authorities are trusted, the public is more likely to believe and act on the information provided, thereby facilitating appropriate responses such as vaccination uptake, quarantine compliance, and adherence to public health guidelines.

5.1.2. Encouraging Compliance with Public Health Measures

Trust in authorities significantly affects public compliance with health directives. During crises, governments and health organizations may implement measures such as lockdowns, social distancing, or mandatory vaccinations. These measures, often seen as restrictive, require a high degree of public cooperation to be effective. (Van der Weerd et al., 2011).. If the community trusts that these measures are necessary, based on scientific evidence and the authorities' commitment to public welfare, they are more likely to comply. Conversely, a lack of trust can lead to resistance, non-compliance, and even public protests, which can exacerbate the crisis.

5.1.3. Mitigating Fear and Anxiety

Health crises often generate widespread fear and anxiety, which can be as detrimental as the physical health threat itself. Trusted authorities can play a crucial role in managing these emotions by providing reliable information, debunking myths, and offering guidance on coping strategies. A calm, consistent, and empathetic communication approach can reassure the public, reduce panic, and promote mental well-being. When people trust that authorities are managing the situation competently and transparently, they are less likely to succumb to fear and more likely to maintain a rational and measured response (Covello, 2003).

5.1.4. Ensuring Equitable Access to Resources and Support

In a health crisis, the distribution of resources such as medical supplies, vaccines, and financial aid is critical. Trust in authorities is essential for ensuring that these resources are allocated fairly and reach those in need. Transparency in decision-making processes, clear communication about resource availability, and efforts to address inequalities can build trust and ensure that vulnerable populations receive adequate support (Krieger, 2012). When people believe that authorities are acting justly and without favoritism, it fosters social cohesion and reduces the risk of conflict and tension within the community.

5.1.5. Long-Term Benefits for Public Health Infrastructure

Beyond the immediate crisis, building trust has long-term benefits for public health infrastructure. Trust established during a crisis can extend to routine health services, improving overall public health outcomes. Gilson exploration the long-term impact of trust on public health systems, discussing how trust can enhance system legitimacy and effectiveness, in the American Journal of Public Health (Gilson, 2006), provides significant insights. It can lead to sustained engagement with health programs, higher vaccination rates, and better health literacy among the population. Furthermore, a track record of trustworthy communication can strengthen the legitimacy and credibility of health authorities, making it easier to mobilize the community in future crises.

5.1.6. Enhancing Public Engagement and Participation

Trust encourages public engagement and participation in health initiatives. This is particularly important in health crises where community involvement can significantly impact the outcome, such as in vaccination campaigns or public health education programs. When authorities engage with communities transparently and respectfully, they can foster a collaborative environment where community members feel their voices are heard and valued. This is evident in Fischhoff's article, where he explores the relationship between risk communication and public engagement, highlighting how trust plays a crucial role in encouraging public participation (Fischhoff ,1995).
This two-way communication can lead to better-informed policies that consider the specific needs and concerns of different demographic groups, ultimately leading to more effective interventions.

5.1.7. Challenges and Considerations

Building and maintaining trust is not without challenges. Slovic discusses the challenges of building trust in democratic societies and the complex interplay between perceived risk and trust (Slovic, 1993). Authorities must navigate issues such as historical mistrust, cultural differences, and potential conflicts of interest. A transparent and honest approach is essential, even when delivering difficult messages or acknowledging mistakes. Openness about uncertainties and the limitations of current knowledge can paradoxically build trust, as it demonstrates integrity and respect for the public's

intelligence. Moreover, engaging with community leaders and influencers who are trusted by the public can help bridge gaps and reinforce official messages.

In summary, trust between the community and authorities is a critical component of effective risk and crisis communication during health crises. It enhances the dissemination of accurate information, encourages compliance with health measures, fosters public engagement, mitigates fear, ensures equitable access to resources, and has long-term benefits for public health infrastructure. Building and maintaining this trust requires transparency, empathy, and a commitment to serving the public's best interests. Without trust, even the most well-intentioned and scientifically sound interventions may fail to achieve their desired outcomes.

5.2 Engaging communities helps build trust in local authorities and health providers, which is essential during a crisis

Engaging communities plays a pivotal role in building trust in local authorities and health providers. This engagement fosters a sense of partnership, transparency, and responsiveness, which are key elements in establishing and maintaining trust. Here are several ways in which community engagement contributes to this process:

5.2.1. Fostering Two-Way Communication

Community engagement facilitates two-way communication, where both the authorities and the community members actively participate in the dialogue. This approach allows community members to express their concerns, ask questions, and provide feedback. In their paper Nilsen, P., & Olander, E. discuss the importance of two-way communication in public health campaigns, emphasizing how it fosters mutual understanding and trust between authorities and the community(Nilsen, et al. 2020). Authorities and health providers, in turn, can listen and respond to these inputs. This mutual exchange helps to clarify intentions, dispel misconceptions, and provide accurate information, creating a more informed public. It also demonstrates that authorities value the opinions and experiences of the community, which enhances credibility and trust.

5.2.2. Incorporating Local Knowledge and Needs

When authorities engage with communities, they gain valuable insights into local customs, traditions, and specific needs. Campbell, C., & Cornish, F. (2010) explore how incorporating local knowledge and cultural context in health interventions can lead to more effective community engagement and build trust (Campbell et al. 2010), studying approaches to HIV/AIDS management. This understanding allows them to tailor their approaches and interventions in ways that are culturally sensitive and contextually relevant. For example, incorporating local languages, respecting cultural practices, and addressing specific health concerns can make public health messages more relatable and acceptable. By showing respect for the community's unique identity, authorities build trust and foster a sense of ownership over health initiatives.

5.2.3. Empowering Community Members

Engagement efforts often include involving community members in decision-making processes and the implementation of health initiatives. This empowerment can take many forms, such as forming

advisory boards, including community leaders in planning committees, or training local health workers. When community members play an active role in these processes, they are more likely to trust the authorities and health providers, as they see themselves as partners rather than passive recipients of services (Zakus & Lysack, 1998). This sense of involvement can increase the community's investment in the success of health programs and interventions.

5.2.4. Enhancing Transparency and Accountability

Active community engagement promotes transparency and accountability in the actions of authorities and health providers. By openly sharing information about decisions, policies, and the rationale behind them, authorities demonstrate their commitment to honesty and integrity. This openness can reduce suspicions and mitigate fears of hidden agendas or corruption (Gilson, L. 2003). Additionally, when authorities solicit and incorporate community feedback, they are held accountable for their actions, which can help to build and maintain public trust over time.

5.2.5. Building Relationships and Social Capital

Regular and genuine engagement helps build strong relationships between authorities and the community. While not strictly a journal article, Putnam in his book provides comprehensive insights into social capital, including how relationships and community engagement contribute to trust in institutions (Putnam, 2000). These relationships are foundational to creating social capital, which refers to the networks, norms, and trust that enable collective action. In times of crisis, such as a health emergency, strong social capital facilitates cooperation and coordination, making it easier to implement public health measures effectively. The relationships built through consistent engagement can also provide a platform for mobilizing resources and support in response to emerging needs.

5.2.6. Addressing Misinformation and Building Health Literacy

Community engagement provides a direct channel for authorities to address misinformation and promote health literacy. By engaging with community leaders, influencers, and trusted local figures, authorities can disseminate accurate information more effectively and counteract rumors or falsehoods. This direct engagement helps build a well-informed community that can make better decisions regarding their health. As people feel more confident in their understanding of health issues, their trust in the authorities providing that information grows (Southwell & Thorson, 2015).

5.2.7. Demonstrating Responsiveness and Adaptability

Engagement allows authorities to demonstrate their responsiveness to community concerns and their willingness to adapt policies and programs based on feedback. In their book Laverack, G., & Manoncourt discuss the importance of responsiveness and adaptability in community engagement during the Ebola outbreak, highlighting how these qualities build trust (Laverack, & Manoncourt, 2016). When authorities show that they can listen and make changes, they earn respect and trust. For example, if a community voices concerns about vaccine accessibility and the authorities respond by adjusting the distribution plan, it shows that the authorities are attentive and committed to meeting the community's needs.

5.2.8. Creating a Sense of Community Ownership

Engagement efforts that involve the community in designing and implementing health initiatives can foster a sense of ownership. When people feel that they have a stake in a program's success, they are more likely to support and promote it. This shared ownership can lead to higher participation rates in public health campaigns, such as vaccination drives or health screenings, and a greater willingness to adhere to public health guidelines (Bracht & Tsouros, 1990).

In summary, community engagement is a crucial strategy for building trust in local authorities and health providers. It facilitates open communication, respects local knowledge, empowers individuals, promotes transparency, strengthens relationships, combats misinformation, demonstrates responsiveness, and fosters a sense of ownership. These elements work together to create a trusting and cooperative environment, which is essential for effective public health interventions and the overall well-being of the community.

6. Community Engagement During Health Crises

Encouraging community engagement during health crises, particularly in the aftermath of a biological or chemical terrorist attack, requires multifaceted strategies that go beyond conventional risk communication approaches. One effective approach is relational community engagement, which fosters trust and collaboration across micro, meso, and macro levels. At the micro level, it enhances individual empowerment and knowledge; at the meso level, it strengthens group cohesion and community ownership; and at the macro level, it influences policy and governance (Redvers et al., 2024). Ensuring ethical preparedness and meaningful involvement in research is critical, as highlighted by the COVID-19 pandemic and previous outbreaks like Ebola. This involves establishing a genuine partnership with the community, respecting their concerns and inputs (Ravinetto et al., 2024). Moreover, effective communication strategies, particularly in marginalized communities, must be carefully crafted. Research indicates that messages conveying anger or strong emotions tend to have higher engagement, suggesting a need for emotionally resonant messaging to overcome distrust and misinformation (Kim & Oh, 2024). The utilization of platforms like the WHO Hive exemplifies the importance of a community-centered approach, providing a space for credible information exchange and collaborative problem-solving (Briand et al., 2023). Ultimately, fostering community engagement requires a blend of ethical research practices, emotionally intelligent communication, and platforms that facilitate active participation and shared decision-making.

6.1 Community engagement approaches

In a health crisis, such as an accident, attack, or other emergencies, community engagement is crucial for effective response and recovery. Here are key approaches, supported by scientific literature, along with practical examples:

6.1.1. Voluntary Participation and Collaboration

- Organize Volunteer Groups and Peer-to-Peer Support Networks: Community members can form or join volunteer groups to assist in various capacities, such as providing first aid, distributing supplies, or helping with evacuation efforts. Additionally, through established Peer-to-Peer Support Networks individuals can offer and receive support, whether emotional, logistical, or financial, from their neighbors and community members. For example, during Hurricane Katrina, community members organized volunteer groups to rescue stranded individuals and distribute food and water.

The need for voluntary participation and collaboration is described thoroughly in yhe work of Norris et Al. (2008), who emphasize the importance of social networks and collective action in community resilience.

6.1.2. Community-Led Initiatives

- Neighborhood Committees and Crowdsourcing Solutions could provide significant added value in a case of emergency. Local committees can be formed to coordinate efforts at a grassroots level, including gathering and distributing resources, identifying vulnerable individuals, and organizing neighborhood watches. Additionally, community members can be encouraged to propose and implement solutions, such as setting up makeshift clinics, organizing transportation, or creating information hubs. Quarantelli (2003) in his work discusses the critical role of community-based

organizations and informal networks in managing health emergencies. An example of such community-led initiatives can be displayed in the aftermath of the 2010 Haiti earthquake, when neighborhood committees helped distribute aid and coordinate relief efforts.

6.1.3. Sharing Knowledge and Skills

- Local Expertise and Public Education can provide guidance and training to others, by Utilizing the expertise of community members, such as healthcare professionals, engineers, and educators. Community members can organize workshops and information sessions to educate others on safety measures, first aid, and emergency protocols. An example of such community engagement has been the utilization of local healthcare workers during the Ebola outbreak in West Africa, who played a key role in educating the public and implementing control measures. The need and importance for collaboration and trust-building in public health initiatives is highlighted by the Centers for Disease Control and Prevention (CDC) (2011)

6.1.4. Resource Mobilization

- Donations and Fundraising encourage community-driven fundraising efforts to gather financial resources, medical supplies, food, and other essentials. At the same time local businesses and services can contribute by offering discounts, free services, or converting their facilities into shelters or resource centers. The case of the COVID-19 pandemic has been such an example , where in response to that, communities worldwide raised funds to support local hospitals and vulnerable populations.

6.1.5. Communication and Coordination

Set up of local communication channels, such as WhatsApp groups, community radios, or bulletin boards, can assist in sharing real-time updates and coordinate efforts. Moreover, storytelling can be used to highlight the needs and experiences of affected individuals, which can inspire others to participate and contribute. There are numerous such exapmles, for the records, we could mention the example of the California wildfires, local communities used social media and messaging apps to share evacuation information and offer help. Kaniasty and Norris (2000) describe the importance of effective communication and social support in disaster response.

6.1.6. Emotional and Psychological Support

Community members can create support groups to provide emotional and psychological support to those affected by the crisis, while at the same time, engagement in cultural and religious practices can offer comfort and a sense of unity, such as prayer groups, communal meals, or traditional healing methods. Norris et al. (2008) discuss the psychological processes involved in community response, including support networks. The Manchester Arena bombing, community support groups provided counseling and emotional support to survivors and families, constitutes a typical example of such practices.

6.1.7. Recognizing Efforts and Celebrating Contributions

Publicly recognize and celebrate the contributions of volunteers through social media, community newsletters, or local events and in some cases provide small incentives or tokens of appreciation to volunteers and active participants, fostering a sense of accomplishment and encouraging continued involvement. In New York City for example, volunteers who assisted during the COVID-19 pandemic were publicly recognized through various media outlets and ceremonies.

6.1.8. Utilizing Technology

Use apps, websites and other digital platforms for coordinating volunteer efforts, sharing information, and connecting those in need with those who can help. Additionally, Crowdsourcing Data provides a significant added value in case of emergency, as community members can contribute to data collection efforts by reporting issues, needs, and available resources in their areas. The use of apps like "Nextdoor" facilitated neighborhood-level coordination during lockdowns, enabling neighbors to assist each other with groceries and other needs.

6.1.9. Long-term Community Building

The crisis can be used as an opportunity to strengthen community bonds, building trust and cooperation that can last beyond the immediate emergency. Moreover, through Post-Crisis Reflection and Learning the community can be engaged in reflecting on the crisis response to learn from the experience and improve preparedness for future events. Norris et al. (2008) emphasizes building community resilience through stronger social bonds.

By empowering and mobilizing themselves, community members can play a pivotal role in managing and mitigating the impacts of a health crisis. This bottom-up approach ensures that the community's needs and strengths are at the forefront of the response efforts.

6.2 Encouraging Community engagement

Engaging community members in crisis response efforts, especially during a health crisis, is crucial for effective and comprehensive outcomes. But the community members are not always willing to engage, for several reasons. A comprehensive response that includes strategies for encouraging community participation in crisis response initiatives, could include the following:

6.2.1. Foster a Sense of Ownership and Responsibility (Empowerment)

Involve community members in decision-making processes to foster a sense of ownership. This can be achieved through public forums, advisory boards, or community surveys. Norris et al. (2008) discuss the importance of collective action and community ownership in building resilience. An example of such approach is in New Orleans post-Hurricane Katrina, where local residents were involved in rebuilding efforts, leading to a greater sense of ownership and responsibility in community recovery.

6.2.2. Effective Communication and Information Sharing (Clear Messaging)

Communicate the importance of participation through clear, consistent, and relatable messages. Use multiple channels to reach different demographics. The example of the COVID-19 pandemic, is the first anyone can think of, where the "Stay Home, Save Lives" campaign effectively communicated the importance of public health measures through clear and consistent messaging. Kaniasty and Norris (2000) emphasize the role of effective communication in mobilizing community support.

6.2.3. Accessibility and Convenience (Flexible Opportunities)

Offer various ways for people to participate, such as online volunteering, local task forces, or resource distribution. In response to the Australian bushfires, for example, virtual volunteering opportunities allowed people to assist with fundraising and information dissemination from their homes.

6.2.4. Recognition and Appreciation (Public Recognition)

Acknowledge and celebrate the contributions of community members through social media, local news, or public ceremonies. The New York City's "Hometown Heroes" parade, that has been mentioned also before, honored essential workers and volunteers who contributed during the COVID-19 crisis.

6.2.5. Build a Community Spirit and Collective Identity (Shared Goals)

Highlight common goals and the shared benefits of participating in response efforts, fostering a sense of unity. The community clean-up drives after natural disasters, such as the 2011 Japan earthquake for example, helped unify residents and foster a strong sense of community spirit.

6.2.6. Education and Awareness (Training and Workshops)

Provide training on relevant skills, such as first aid, crisis management, or emergency preparedness, to empower individuals to participate confidently. For example, the "Community Emergency Response Team (CERT)" program in the United States provides training to prepare individuals for disaster response (https://community.fema.gov/PreparednessCommunity/s/cert-trainings?language=en_US).

6.2.7. Collaboration with Community Organizations (Partnerships)

Collaborate with local organizations, NGOs, and religious or cultural groups that have established trust within the community. Quarantelli (2003) discusses the significance of partnering with community-based organizations during emergencies, mentioning also how faith-based organizations played a crucial role in providing shelter and support during Hurricane Harvey in Houston.

6.2.8. Leverage Technology and Social Media

Utilize social media and digital platforms to coordinate efforts, share updates, and provide information. The use of apps like "Nextdoor", mentioned before, and "Zello" during the Houston floods allowed residents to coordinate rescue efforts and share real-time information.

6.2.9. Address Concerns and Barriers

Provide channels for community members to express concerns and offer suggestions, addressing any fears or misconceptions. It is of most importance to listen to the public's concerns. This is also highlighted by Kaniasty and Norris (2000) who elaborate on the importance of addressing community concerns to facilitate engagement. The Public forums and virtual town halls implemented during the Flint water crisis provided a platform for residents to voice their concerns and receive updates, has been such an example.

7. The Role of Two-Way Communication

Two-way communication between authorities and the community is crucial during emergencies as it ensures the efficient flow of information and enhances the overall response. This bidirectional exchange allows authorities to disseminate timely updates, safety instructions, and resources to the public, while simultaneously receiving real-time feedback, concerns, and situational reports from the community. Such interaction helps identify urgent needs, address misinformation, and adjust strategies to meet the evolving circumstances of the crisis. Ultimately, fostering a transparent and responsive communication loop not only builds trust but also empowers communities to participate actively in their own safety and recovery, leading to more resilient and cohesive responses to emergencies. Below a number of strategies to foster such communication are presented with real life examples:

7.1. Establish Multiple Communication Channels

- Social Media Platforms: During Hurricane Harvey, the City of Houston used Twitter and Facebook for real-time updates and to receive reports of stranded residents (City of Houston, 2017).

- Community Meetings: In the aftermath of the 2011 Joplin tornado, local officials held town hall meetings to discuss recovery efforts and listen to community concerns (Joplin Globe, 2011).

- Email Newsletters: FEMA sends regular email updates during major disasters, including instructions on how to seek help (FEMA, 2020).

- SMS/Text Messaging: The Wireless Emergency Alerts (WEA) system sends emergency messages to mobile devices, such as evacuation orders during wildfires (FCC, 2019).

7.2. Utilize Technology and Digital Tools

- Mobile Apps: The Red Cross app provides emergency alerts and allows users to report their status and seek help (American Red Cross, 2018).

- Online Surveys and Polls: After the 2010 Haiti earthquake, the Ushahidi platform was used to collect and map crisis information from text messages and social media (Heinzelman & Waters, 2010).

- Live Streaming and Webinars: During the COVID-19 pandemic, governments used live streaming to update citizens and answer questions about safety measures (World Health Organization, 2020).

7.3. Create Feedback Mechanisms

- Suggestion Boxes: In emergency shelters, suggestion boxes can be placed for evacuees to share their needs and concerns (National Center for Disaster Preparedness, 2017).

- Feedback Forms: The FEMA website includes forms for disaster survivors to request assistance and provide feedback on services received (FEMA, 2020).

- Hotlines and Help Desks: The National Suicide Prevention Lifeline provides immediate support for individuals in crisis, demonstrating the importance of hotlines in emergencies (National Suicide Prevention Lifeline, 2020).

7.4. Engage Community Representatives

- Focus Groups: After Hurricane Katrina, various community organizations formed focus groups to discuss rebuilding efforts with local officials (Institute of Medicine, 2015).

- Community Liaisons: The CERT (Community Emergency Response Team) program trains volunteers to assist in emergencies and communicate community needs to authorities (FEMA, 2018).

7.5. Foster a Culture of Openness and Transparency

- Regular Updates: New York City's Office of Emergency Management provides daily updates during crises, including press releases and situation reports (NYC Emergency Management, 2019).

- Transparency Reports: After major disasters, the National Transportation Safety Board (NTSB) publishes detailed reports on causes and responses, promoting transparency (NTSB, 2020).

- Responsive Communication: During the 2018 California wildfires, local authorities provided rapid responses to social media inquiries about evacuation routes and safety (California Department of Forestry and Fire Protection, 2018).

7.6. Education and Training

- Workshops and Training Sessions: FEMA conducts regular training sessions for community leaders on emergency preparedness and response (FEMA, 2019).

- Information Campaigns: The "Ready" campaign by the U.S. Department of Homeland Security educates the public on how to prepare for emergencies and communicate effectively (DHS, 2018).

7.7. Monitor and Evaluate Communication Efforts

- Feedback Analysis: After the 2004 Indian Ocean tsunami, NGOs analyzed feedback from affected communities to improve future disaster response strategies (UN Office for the Coordination of Humanitarian Affairs, 2005).

- Surveys and Audits: Post-disaster surveys by the Red Cross gather data on community satisfaction and the effectiveness of their response (American Red Cross, 2017).

- Community Satisfaction Metrics: During the COVID-19 pandemic, many health departments used surveys to measure public satisfaction with communication efforts about vaccination (Centers for Disease Control and Prevention, 2021).

These strategies and examples illustrate how two-way communication can be effectively managed during emergencies, with lessons drawn from real-life scenarios and authoritative sources.

8. Behavioural Change:

Behavior change is crucial in addressing health crises, as it directly impacts the spread and management of diseases. Health crises often arise from behaviors that contribute to disease transmission, such as poor hygiene, unprotected sexual activity, or neglecting vaccinations. Therefore, altering these behaviors can mitigate the impact of the crisis. Effective risk and crisis communication play a pivotal role in promoting these necessary changes. It involves delivering accurate, timely, and clear information to the public, enabling individuals to understand the risks and adopt preventive measures. Such communication should address both the cognitive and emotional aspects of behavior change, offering practical advice and support while also considering the psychological impact of the crisis. For example, during the COVID-19 pandemic, communication strategies emphasized the importance of handwashing, mask-wearing, and social distancing, all of which required significant behavior adjustments. The success of these strategies relied on transparency, empathy, and consistent messaging from credible sources, which helped build public trust and compliance. Additionally, communication should consider cultural, social, and economic contexts to ensure that the recommended behaviors are feasible and acceptable to the target audience. Ultimately, effective risk and crisis communication fosters a cooperative environment where individuals feel informed and empowered to take appropriate actions, thereby reducing the severity and spread of health crises.

Behavior change during a health crisis can be either temporary or permanent, depending on various factors. The permanence of these changes largely depends on the nature of the behavior, the context in which it occurs, and the strategies used to reinforce and sustain it. Here's an exploration of the factors influencing the longevity of behavior change and ways to maintain positive changes:

8.1 Temporary vs. Permanent Behavior Change

8.1.1. Temporary Behavior Change

- Crisis-Driven: Many behaviors adopted during a health crisis are reactive and driven by immediate threats, such as wearing masks or social distancing during a pandemic. Once the perceived threat diminishes, people may revert to their previous behaviors.

- Situational: Some changes are specific to certain circumstances, like increased hygiene practices during flu season, which may not be maintained year-round.

8.1.2. Permanent Behavior Change

- Habit Formation: Behaviors can become permanent if they turn into habits. For instance, regular hand washing might persist if it becomes a routine part of an individual's daily activities.

- Value Alignment: If the behavior aligns with a person's values or is seen as beneficial beyond the crisis, it may continue. For example, increased awareness of health and wellness might lead to lasting dietary and exercise changes.

8.2 Community Engagement's Role in Encouraging Behavior Change During Health Crises

Community engagement is a vital strategy in promoting behavior change during health crises, as it fosters trust, collaboration, and a shared sense of responsibility. It involves actively involving community members in the planning and implementation of health interventions, ensuring that their voices and concerns are heard. This participatory approach helps tailor health messages and interventions to the community's specific needs, making them more relevant and acceptable. For instance, during the Ebola outbreak in West Africa, engaging local leaders and community members in public health efforts significantly improved adherence to safety protocols like quarantine and safe burial practices. Community engagement also facilitates the dissemination of accurate information and counters misinformation, as trusted community figures can effectively communicate health messages. Additionally, it empowers individuals by providing them with the knowledge and tools needed to protect themselves and their families, fostering a proactive attitude toward health. This collective action is crucial in building resilience and solidarity, which are essential for sustained behavior change. By involving the community, health authorities can also identify and address potential barriers to behavior change, such as cultural norms or economic constraints, thus designing more effective interventions. Ultimately, community engagement not only enhances the efficacy of health interventions but also strengthens the community's capacity to manage future health challenges.

Community engagement can play a crucial role in encouraging behavior change during a health crisis by leveraging local knowledge, building trust, and fostering a sense of ownership and responsibility among community members. **Building trust and credibility** is one of the many key ways community engagement can facilitate behavior change. Engaging trusted community leaders, influencers, and organizations can help disseminate accurate information and counter misinformation. When messages come from trusted sources, people are more likely to listen and act on them.cLarson et al. (2018). In their study regarding COVID 19 vaccination highlight the role of trust in public health authorities in influencing vaccine uptake.

Another way that the community engagement can facilitate behaviour change is through **localized messaging.** Community engagement allows for tailoring messages to the specific cultural, social, and linguistic context of the community. This increases the relevance and effectiveness of the communication, making it more likely that individuals will understand and adopt recommended behaviours. The importance of tailoring health interventions to specific cultural and social contexts is discussed in the article of Nguyen et al. (2020).

Participatory approaches may also assist in behavior change. Involving community members in the decision-making process creates a sense of ownership and empowerment. When people feel that they have a say in the measures being implemented, they are more likely to comply and encourage others to do the same.

Communities can also use **social networks** to spread positive behavior changes. When influential community members adopt new behaviors, others are likely to follow, creating new social norms that support the desired changes. Paluck & Shepherd (2012). In their journal "The Salience of Social Referents: A Field Experiment on Collective Norms and Harassment Behavior in a School Social

Network. Journal of Personality and Social Psychology" show how influential individuals can shift social norms and behaviors within a community.

Additionally, communities can **identify and mobilize local resources to support behavior change**. This might include organizing transportation to health facilities, providing supplies like masks or sanitizers, or setting up support systems for vulnerable individuals. Kalyango et al. (2012). On their article about the Community Health Workers' Role in TB Care in Sub-Saharan Africa and the Potential of Using mHealth Solutions, discuss how community health workers mobilize resources to support health interventions.

A significant added value of continuous community engagement is that it allows for **real-time feedback on interventions and strategies.** This helps in adapting messages and approaches to better fit the community's needs and address any barriers to behavior change (Nutbeam, 2000).

Understanding **cultural norms and values** is essential in framing health messages in a way that resonates with the community. Engaging with the community helps in identifying culturally acceptable ways to communicate and implement health guidelines. Kreuter & (2004) on their paper on the role of culture in health communication discuss the impact of cultural factors on health communication and behavior.

Finally, Community engagement can help **address stigma** associated with a health crisis, such as infectious diseases. By promoting empathy and understanding, communities can create a more supportive environment for those affected (Link & Phelan, 2001).

In summary, community engagement is a powerful tool in promoting behavior change during a health crisis. It ensures that interventions are relevant, trusted, and supported by the community, leading to more effective and sustainable health outcomes.

8.3 Behavior Change as Vital for controlling disease outbreaks and mitigating disasters

Behavior change is crucial for controlling disease outbreaks and mitigating disasters due to several key reasons:

8.3.1. Prevention and Control of Disease Spread

-Adherence to Preventive Measures: Behavior changes such as hand washing, mask-wearing, and social distancing can significantly reduce the transmission of infectious diseases. During the COVID-19 pandemic, for instance, widespread adoption of these behaviors was essential to controlling the virus spread (Ahmed, Zviedrite, & Uzicanin, 2018).

- Vaccination Uptake: Willingness to get vaccinated is a critical behavior that can lead to herd immunity, reducing the spread of diseases and preventing outbreaks (Larson, et al. 2018).

8.3.2. Improving Health Outcomes

- Early Detection and Treatment: Behaviours such as seeking early medical attention and complying with treatment regimens can improve health outcomes and reduce the severity of diseases (Thorne, Paterson, & Russell, 2003).

- Adopting Healthy Lifestyles: Long-term behavior changes like maintaining a healthy diet and exercising regularly can strengthen immune systems and reduce susceptibility to diseases (Kearns, O'Brien, & Bond, 2012).

8.3.3. Enhancing Community Resilience

- Preparedness and Response: Communities that adopt behaviors geared towards preparedness, such as creating emergency plans and stockpiling necessary supplies, are better equipped to respond to disasters .

- Supporting Vulnerable Populations: Behavior changes that promote community support and solidarity can ensure that vulnerable populations receive the help they need during crises (Campbell, 2020).

8.3.4. Reducing Economic Impact

- Minimizing Disruption: By adopting behaviors that reduce the spread of disease, such as remote working and avoiding large gatherings, communities can minimize economic disruptions caused by widespread illness and lockdowns (McKee, Stuckler, & Zeegers, 2020).

- Sustaining Healthcare Systems: Behavior changes that reduce disease transmission can prevent healthcare systems from becoming overwhelmed, ensuring that resources are available for those who need them most (Ranney, Griffeth, & Jha, 2020).

8.3.5. Combating Misinformation and Promoting Accurate Information

- Informed Decision-Making: Behavior changes that include critically evaluating information sources and relying on credible health guidance help combat misinformation, leading to better public health decisions (Southwell & Thorson, 2015).

- Trust in Health Authorities: Building trust in health authorities through transparent communication and consistent messaging can encourage communities to adopt recommended behaviors (Quinn, & Kumar,2014).

8.3.6. Environmental Protection

- Sustainable Practices: Behaviors that protect the environment, such as reducing waste and conserving resources, can mitigate the impact of natural disasters and reduce the risk of diseases related to environmental degradation (Markandya & Wilkinson, 2007).

8.3.7. Social and Psychological Well-being

- Stress Reduction: Promoting mental health behaviors, such as seeking social support and practicing stress-relief techniques, can help individuals and communities cope better with the psychological impacts of disasters and disease outbreaks (Hobfoll, et al. 2007).

- Community Cohesion: Encouraging behaviors that foster community engagement and support can strengthen social bonds, enhancing collective resilience in the face of crises

In summary, behavior change is a fundamental component in the strategy to control disease outbreaks and mitigate disasters. It not only reduces the immediate risk of transmission and impact but also builds a foundation for long-term resilience and health improvement.

8.4 Examples – past events: Stories that highlight preparedness benefits can activate behaviour attitudes

Here are some examples from past events where preparedness and risk communication efforts have demonstrated benefits in activating behavior and attitudes, particularly concerning health threats from chemical and biological agents:

8.4.1. The 2001 Anthrax Attacks (Amerithrax)

- Context: Following the anthrax attacks in the U.S. in 2001, which involved letters containing anthrax spores sent to media outlets and government offices, there was a significant public and governmental response to improve preparedness for biological threats.

- Preparedness Benefits: The attacks prompted the development and implementation of comprehensive biodefense strategies, including enhanced surveillance systems, improved laboratory capacities, and public awareness campaigns.

- Activation of Behavior: The crisis led to increased public awareness about the importance of preparedness for biological threats. Federal agencies like the CDC and the Department of Homeland Security (DHS) developed educational materials and training programs for first responders and the public, which improved community readiness and response capabilities.

- **Source**: Inglesby, T. V., et al. (2002). Anthrax as a Biological Weapon, 2002: Clinical and Epidemiologic Features. Journal of the American Medical Association, 287(17), 2236-2252.

8.4.2. The 2014 Ebola Outbreak in West Africa

- Context: The Ebola outbreak in West Africa highlighted the need for improved risk communication and community engagement in managing viral outbreaks.

- Preparedness Benefits: In response, organizations like the World Health Organization (WHO) and local health authorities implemented strategies that included community meetings, involvement of local leaders, and culturally sensitive messaging.

- Activation of Behavior: These efforts helped control the outbreak by improving community understanding of Ebola transmission and prevention. Local leaders played a crucial role in disseminating accurate information, addressing myths, and encouraging safe practices, which were critical in reducing the spread of the virus.

- Source: Shuaib, F., et al. (2017). Ebola Virus Disease Outbreak – Nigeria, July-September 2014. Morbidity and Mortality Weekly Report, 63(39), 826-829.

8.4.3. The 2015 Zika Virus Outbreak in the Americas

- Context: The Zika virus outbreak raised concerns about its link to birth defects and prompted a global health response.

- Preparedness Benefits: Public health agencies and community organizations engaged in widespread risk communication efforts, including educational campaigns and community outreach programs.

- Activation of Behavior: The outreach led to increased public awareness about the importance of mosquito control, personal protective measures, and seeking medical care for symptoms. This

resulted in better community practices to prevent Zika virus transmission, such as reducing standing water and using insect repellent.

- Source: CDC. (2016). Zika Virus: Clinical Guidance for Health Care Providers. Centers for Disease Control and Prevention. Retrieved from [CDC Zika Virus Guidance](https://www.cdc.gov/zika/hc-providers.html).

8.4.4. The 2009 H1N1 Influenza Pandemic

- Context: The H1N1 influenza pandemic required a rapid response to manage the spread of the virus and mitigate its impact.

- Preparedness Benefits: Health authorities implemented mass vaccination campaigns, public education efforts, and community engagement strategies to promote preventive measures.

- Activation of Behavior: Effective risk communication led to high vaccination rates and adherence to public health recommendations. Community meetings and outreach programs helped educate the public about the importance of vaccination and hygiene practices, contributing to the control of the outbreak.

- Source: World Health Organization (WHO). (2010). Pandemic (H1N1) 2009 – Update 112. Retrieved from [WHO H1N1 Updates](https://www.who.int/influenza/pandemic-influenza/en/).

8.4.5. The 2016 Flint Water Crisis

- Context: The Flint, Michigan water crisis, where lead contamination in the drinking water led to a public health emergency, highlighted the importance of risk communication and community involvement.

- Preparedness Benefits: The crisis prompted local and national responses to address water safety, provide health screenings, and improve infrastructure.

- Activation of Behavior: Community engagement efforts included town hall meetings, informational campaigns, and collaborations with local leaders to address the crisis. These efforts helped in mobilizing community action, securing funding for infrastructure improvements, and ensuring access to clean water.

- Source: Hanna-Attisha, M., et al. (2016). Elevated Blood Lead Levels in Children Associated with the Flint Drinking Water Crisis: A Spatial Analysis of Risk and Resilience. Environmental Health Perspectives, 124(12), 1948-1953.

Conclusion

These examples illustrate how effective risk communication and preparedness efforts can lead to significant behavioral changes and improvements in community resilience. By engaging with the public through targeted communication, community meetings, and collaborations with local leaders, these past events demonstrate how communities can be better prepared for and respond to health threats from various agents.

8.5 Challenges in Achieving Positive Community Behavioral Change During a Health Crisis

Achieving positive community behavioral change during a health crisis and effectively communicating risks and crisis information face several challenges. These challenges can be complex, interrelated, and context specific. Below are presented some key challenges in both areas, of achieving behavioral change and communication effort.

8.5.1. Misinformation and Disinformation

The spread of false information can lead to confusion, fear, and resistance to adopting recommended behaviors. Misinformation can be particularly damaging if it comes from seemingly credible sources or is widely shared on social media (Lewandowsky, et Al. 2017).

8.5.2. Cultural and Social Norms

Cultural beliefs, traditions, and social norms can sometimes conflict with recommended health behaviors. For example, certain practices or rituals may hinder the adoption of new hygiene or social distancing measures (Airhihenbuwa, & Webster, 2004).

8.5.3. Trust Issues

Lack of trust in authorities, healthcare providers, or the media can significantly hinder the acceptance of health recommendations. This distrust may stem from historical abuses, perceived biases, or inconsistent messagin (Quinn & Kumar, 2014).

8.5.4. Economic and Resource Constraints

- Financial limitations and lack of access to necessary resources, such as clean water, healthcare, or protective equipment, can prevent individuals from adopting recommended behaviors (Marmot, & Wilkinson, 2005).

8.5.5. Complacency and Perceived Invulnerability

- People may underestimate the severity of a crisis or believe they are not personally at risk, leading to complacency and disregard for recommended precautions (Weinstein, 1989).

8.5.6. Psychological and Emotional Factors

Fear, anxiety, and denial can prevent people from taking appropriate actions. Psychological stress can also lead to fatigue and reduce compliance with ongoing behavioral changes (Lazarus & Folkman, 1984).

8.5.7. Complexity and Inconsistency of Information

Conflicting guidelines and complex information can overwhelm individuals, making it difficult for them to understand and follow recommended behavior (Fischhoff, & Kadvany, 2011).

8.5.8. Behavioral Fatigue

Sustained compliance with behavioral measures, such as lockdowns or mask-wearing, can lead to fatigue, reducing adherence over time (Michie, & West 2020).

8.5.9. Accessibility and Reach

Ensuring that risk communication reaches all segments of the population, including vulnerable and marginalized groups, is challenging. Not everyone has equal access to digital or traditional media channels (Wakefield, & Hornik, 2010).

8.5.10. Political and Social Factors

Political agendas and social dynamics can influence the dissemination and reception of crisis communication. Misinformation campaigns and political interference can undermine public health messages (Jamieson & Albarracin, 2020).

Both achieving behavioral change and effective risk communication require a nuanced understanding of the target audience, transparent and consistent messaging, and efforts to build and maintain trust. Addressing these challenges is crucial for successful crisis management and public health outcomes.

9. Financial Capacity impact on Community Preparedness & Engagement

Financial challenges play a crucial role in the effectiveness of community preparedness and engagement in health risk and crisis communication. These challenges can significantly impede the ability to plan, respond, and recover from health crises such as pandemics, outbreaks, or other public health emergencies.

Many communities for example, particularly those in low-income or under-resourced areas, struggle with limited financial resources and **insufficient budgets**. This lack of funding often results in inadequate health preparedness programs, insufficient training for healthcare and emergency responders, and a shortage of critical medical supplies and communication tools (Landesman, 2012). Having to achieve their goals with an insufficient budget, they have to prioritise competing sectors. Financial resources must be allocated across various essential services, including healthcare, education, and infrastructure. This competition can lead to underfunding in health risk communication and preparedness initiatives, leaving communities vulnerable during health crises.

Moreover, the **training** healthcare workers and first responders comes with a certain cost. Effective preparedness requires substantial investment in training healthcare workers, first responders, and community leaders. The costs associated with developing comprehensive training programs, conducting simulations, and certifying personnel can be prohibitive, particularly for smaller or resource-strapped communities.

Additionally, to that cost, **engaging and educating the public** about health risks and preparedness measures involves significant costs. This includes expenses related to creating and disseminating educational materials, running media campaigns, and conducting outreach efforts, which are essential for raising awareness and promoting protective behaviours (Veenema, Losinski & Hilmi, 2020).

Another issue concerns the **medical supplies and protective equipment**. Ensuring an adequate stockpile of medical supplies, such as vaccines, medications, and personal protective equipment, requires significant financial investment. The costs of acquiring, storing, and maintaining these resources can strain community budgets.

Even further, modern health risk communication relies heavily on **technology**, including emergency alert systems, telehealth services, and digital communication platforms. Investing in and maintaining these technologies can be financially challenging, especially for smaller communities with limited resources (Garrett, 2000).

One more thing that we should have in mind in terms of financial planning is the **short-term vs. long-term funding**. Many health preparedness and communication initiatives rely on short-term funding sources, such as grants or emergency funds. Once this funding is depleted, maintaining these initiatives becomes challenging without a stable and continuous financial base. Moreover, many communities depend on grants from government agencies, non-profits, or private entities to fund their health preparedness efforts. However, these grants are often limited and competitive, which can result in gaps in funding and hinder the continuity of vital programs (Glandon, Paina & Bennett, 2017).

Another issue that should be considered is the **impact of economic inequality**. Economic disparities can lead to unequal access to health information and resources. Vulnerable populations, such as low-

income families, elderly individuals, and people with disabilities, may face additional barriers in accessing health risk information and participating in preparedness activities (Marmot, & Wilkinson, 2006). Furthermore, engaging the community in preparedness and communication activities may require individuals to attend meetings, participate in drills, or access educational resources. For economically disadvantaged individuals, these activities may represent a financial burden, leading to lower levels of participation and engagement.

Finally, there is significant **cost in response and recovery after a crisis**. The financial burden of responding to a health crisis, including deploying healthcare services, conducting testing and treatment, and managing public health measures, can be substantial. These immediate response costs can quickly deplete community resources (Wexler & Plough, 2021). Additionally, the financial implications of long-term recovery efforts, such as rebuilding healthcare infrastructure, providing mental health support, and ensuring ongoing public health education, can be extensive. Securing adequate funding for these efforts is essential for building resilience and ensuring a robust recovery.

Closing, financial challenges in health risk and crisis communication can significantly affect a community's ability to prepare for, respond to, and recover from health emergencies. Addressing these challenges requires innovative funding mechanisms, strong public-private partnerships, and policies that prioritize sustainable investment in health preparedness and communication. By overcoming these financial barriers, communities can enhance their resilience and better protect public health during crises.

10. Resilience

The role of the community in fostering social resilience towards health risks and terrorist attacks is pivotal, as it involves collective action, support, and resource mobilization to withstand and recover from crises. Communities enhance resilience by providing social support networks that offer emotional and practical assistance, facilitating accurate information dissemination to counteract misinformation, and promoting adherence to public health measures. Moreover, community engagement in preparedness activities, such as local emergency planning and resource sharing, strengthens collective capacity to respond effectively. By fostering a culture of solidarity and cooperation, communities not only mitigate the immediate impact of health risks and attacks but also build a foundation for long-term recovery and adaptation, ultimately enhancing overall societal resilience.

10.1 Involving community members in crisis response increases resilience and helps communities recover more quickly

Involving community members in crisis response enhances resilience and accelerates recovery in several keyways. **Leveraging local knowledge and resources** is a significant such example. Community members possess intimate knowledge of local conditions, needs, and resources. This insight enables a more targeted and efficient response, ensuring that aid and interventions are appropriately tailored to the unique circumstances of the community. By utilizing local networks, resources, and skills, communities can mobilize quickly and effectively during crises. Palttala, Boano, Lund & Vos (2012) in their paper "Communication Gaps in Disaster Management: Perceptions by Experts from Governmental and Non-Governmental Organizations discuss the importance of utilizing local knowledge and resources in disaster management and the communication gaps that can arise without it.

Active participation in crisis response fosters a sense of shared responsibility and solidarity. This collective engagement **strengthens social bonds and cohesion**, promotes mutual support, and reduces feelings of isolation, which are crucial for emotional and psychological well-being during crises. Strong social networks provide practical support and facilitate communication, making it easier to coordinate efforts and share critical information (Aldrich, 2012).

Enhanced trust and cooperation is another way that assists community recover faster. When community members are involved in decision-making and implementation processes, it increases transparency and accountability. This involvement builds trust in local authorities and organizations, encouraging greater cooperation and compliance with public health measures and emergency directives. Trust is essential for effective communication and the successful implementation of response strategies. (Covello et Al, 2001).

Moreover, involving community members in crisis response provides opportunities for **skill development and capacity building**. Training and engaging locals in preparedness and response activities enhance the community's ability to handle future crises independently. Empowering individuals and groups within the community fosters resilience by developing a sense of agency and confidence in their ability to manage challenges. Norris et Al. (2008) on their article titled "Community Resilience as a Metaphor, Theory, Set of Capacities, and Strategy for Disaster Readiness" outline the

components of community resilience, including the role of capacity building and empowerment in disaster readiness and response.

Another significant added value of community engagement is that community involvement allows for a **more agile and adaptive response to evolving situations**. Local actors can quickly identify emerging needs and adjust strategies in real-time, providing a dynamic and flexible approach to crisis management. This adaptability is crucial in rapidly changing scenarios, such as disease outbreaks or natural disasters (Paton & Johnston, 2001).

Finally, community involvement in the recovery process ensures that rebuilding efforts align with the community's needs and priorities and **facilitates long-term recovery**. Engaged communities are more likely to support and sustain recovery initiatives, leading to more durable and effective outcomes. The sense of ownership and involvement in the recovery process also fosters a commitment to maintaining resilience and preparedness for future crises. (Berke, et Al, 1993).

10.2 The role of health care units – Hospitals and HCW (health care workers) in terms of facilitating and encouraging community engagement in case of emergency

Healthcare units, including hospitals and healthcare workers (HCWs), play a pivotal role in facilitating and encouraging community engagement during emergencies. Their responsibilities encompass several critical areas:

10.2.1. Providing Accurate Information

- Education and Awareness: Hospitals and HCWs can disseminate accurate, up-to-date information regarding the nature of the emergency, preventive measures, and available resources. This helps combat misinformation and panic. During the COVID-19 pandemic, the Mayo Clinic provided extensive online resources and virtual Q&A sessions to educate the public about the virus and safety measures (Mayo Clinic, 2020).

- Communication Channels: Utilizing various platforms such as social media, community meetings, and hotlines to reach a broad audience ensures that information is accessible to all community members. The Johns Hopkins Medicine website became a central hub for COVID-19 information, offering updates and guidelines through various channels (Johns Hopkins Medicine, 2020).

10.2.2. Health Surveillance and Reporting

- Monitoring and Reporting: HCWs are often the first to detect emerging health threats. They can report cases and trends to public health authorities, aiding in the swift identification and management of outbreaks. During the Ebola outbreak in West Africa, HCWs played a critical role in reporting cases and tracking the spread of the virus, which helped coordinate international response efforts (World Health Organization, 2015).

- Community Feedback: Gathering data from patients about their symptoms, concerns, and needs provides valuable insights for tailoring public health responses.

10.2.3. Providing Direct Support and Services

- Medical Care: Hospitals offer immediate care to those affected, helping to manage injuries and illnesses that arise during emergencies. In the aftermath of natural disasters like Hurricane Katrina,

hospitals such as Ochsner Health System provided critical care and support to the affected population (Rudowitz, Rowland, & Shartzer, 2006).

- Mental Health Support: HCWs can provide psychological support and counseling to help the community cope with stress and trauma related to the emergency. After the 2011 Christchurch earthquake, New Zealand's healthcare system provided extensive mental health services to support the affected community (Ministry of Health, 2012).

10.2.4. Community Outreach and Engagement

- Building Trust: Regular interaction with the community through health education programs and outreach initiatives builds trust, which is crucial during crises. The Cleveland Clinic conducts regular community health fairs and outreach programs, building strong community relations that are vital during emergencies (Cleveland Clinic, 2020).

- Volunteer Training: Hospitals can organize and train community members as volunteers, enhancing local capacity to respond effectively to emergencies. During the COVID-19 pandemic, Mount Sinai Health System trained volunteers to assist with testing and vaccination efforts in New York City (Mount Sinai Health System, 2020).

10.2.5. Coordination with Other Agencies

- Collaborative Planning: Working with public health departments, emergency services, and other organizations ensures a coordinated response, aligning efforts to maximize efficiency and resource utilization. During the 2017 Grenfell Tower fire in London, NHS trusts worked closely with emergency services and local authorities to provide medical care and support to survivors (NHS England, 2017).

- Resource Sharing: Hospitals can help coordinate the distribution of medical supplies and resources to areas of greatest need. In the response to Hurricane Maria, hospitals in Puerto Rico collaborated with FEMA and other agencies to distribute essential medical supplies (Centers for Disease Control and Prevention, 2018).

10.2.6. Emergency Preparedness Training

- Community Drills and Simulations: Conducting regular emergency drills with community participation helps prepare residents for real-life scenarios. The University of California, San Francisco (UCSF) Medical Center regularly conducts earthquake drills with community involvement to ensure preparedness (UCSF Health, 2019).

- Education Programs: Offering courses on first aid, CPR, and basic emergency response equips community members with the skills needed to assist during emergencies. The American Red Cross offers a variety of emergency preparedness courses to the public, enhancing community readiness (American Red Cross, 2020).

10.2.7. Advocacy and Policy Development

- Policy Input: HCWs can advocate for policies that enhance emergency preparedness and community resilience, ensuring that the needs of vulnerable populations are addressed. After the 2004 Indian Ocean tsunami, HCWs advocated for better disaster preparedness policies in affected countries (World Health Organization, 2005).

- Research and Best Practices: Hospitals can contribute to research on effective emergency response strategies and share best practices with the community and other stakeholders. Research conducted by the CDC on emergency response strategies has informed best practices globally, improving community resilience (Centers for Disease Control and Prevention, 2019).

By fulfilling these roles, healthcare units and HCWs not only provide essential medical services but also act as leaders and collaborators in fostering a well-prepared, engaged, and resilient community.

Conclusions

In conclusion, community engagement remains a critical factor in effectively addressing health crises and CBRN threats. Local populations are often the first to experience the impacts of these crises, and their participation in response efforts is vital for ensuring that interventions are both culturally appropriate and responsive to the unique needs of the affected communities. Empowering residents to actively participate in decision-making fosters trust, enhances the dissemination of accurate information, and ultimately strengthens crisis management strategies. A well-engaged community can help reduce the spread of misinformation, increase compliance with health guidelines, and contribute to more resilient outcomes in the face of such threats.

However, the survey conducted reveals that there is still a long way to go in achieving meaningful community engagement. The data highlights gaps in communication between communities and health or emergency authorities. Moreover, misinformation, limited access to reliable health information, and unequal access to resources are significant barriers to effective community-driven responses. Particularly in low-resource settings, engagement efforts often fall short due to a lack of infrastructure, coordination, and outreach strategies that address the specific concerns and needs of the population. In the case of CBRN threats, the complexity of the technical information involved can further distance communities from fully understanding the risks, making public education a critical yet underdeveloped area.

To bridge these gaps, a concerted effort is needed to build stronger relationships between communities and emergency response agencies. This involves not only improving communication strategies but also investing in long-term trust-building initiatives. More inclusive decision-making processes that actively incorporate community voices are essential to fostering genuine collaboration. As the survey results suggest, achieving this level of engagement will require greater investment in public education, transparency, and community involvement—ensuring that people are not only recipients of aid but also active partners in the response to health and CBRN crises.

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ANNEX A: Main CBRNe Agents

Main Chemical – C – Agents

Before moving forward, it is essential to provide an overview of mitigation guidance to increase understanding and preparedness against chemical agents. The main source used for the extraction of the below findings is the Centers for Disease Control and Prevention (CDC, 2018). This guidance aims to help individuals and communities protect themselves and respond effectively in the event of exposure to such agents.

Nerve Agents

Highly toxic compounds that disrupt the nervous system, leading to overstimulation of muscles and glands. Examples include sarin, VX, and tabun.

Mitigation Guidance:
- Detection: Be aware of signs of exposure such as sudden difficulty breathing, convulsions, and pinpoint pupils.
- Protection: Use gas masks and protective clothing to prevent skin and respiratory exposure. Ensure proper fit and maintenance of equipment.
- Decontamination: Quickly remove contaminated clothing and wash skin with soap and water. Use absorbent materials to blot off any liquid agents.
- Medical Response: Administer antidotes like atropine and pralidoxime as soon as possible. Seek immediate medical attention.

Blister Agents (Vesicants)

Cause severe blistering of the skin and mucous membranes upon contact. Mustard gas is a well-known example.

Mitigation Guidance:
- Detection: Look out for symptoms like skin redness and blistering, and eye irritation.
- Protection: Wear protective gear, including gloves, gas masks, and full-body suits. Avoid areas known to be contaminated.
- Decontamination: Remove and dispose of contaminated clothing. Wash affected areas with soap and water; avoid breaking blisters.
- Medical Response: Seek medical care for burns and respiratory issues. Use cool, wet dressings on blisters and burns.

Blood Agents

Interfere with the body's ability to use oxygen, causing asphyxiation. Notable agents include hydrogen cyanide and cyanogen chloride.

Mitigation Guidance:

- Detection: Recognize symptoms such as headache, dizziness, difficulty breathing, and cherry-red skin.
- Protection: Use proper respiratory protection like gas masks. Avoid inhaling potentially contaminated air.
- Decontamination: Move to fresh air immediately. For skin exposure, remove contaminated clothing and wash thoroughly.
- Medical Response: Administer antidotes if available, such as hydroxocobalamin or sodium thiosulfate. Provide oxygen therapy and seek emergency medical help.

Choking Agents (Pulmonary Agents)

Cause severe irritation of the respiratory system, leading to fluid buildup in the lungs. Common examples are chlorine gas and phosgene.

Mitigation Guidance:
- Detection: Be aware of coughing, chest tightness, and difficulty breathing as early symptoms.
- Protection: Use gas masks to filter out harmful gases. Stay away from low-lying areas where heavier-than-air gases may accumulate.
- Decontamination: Leave the contaminated area immediately. Rinse eyes and skin with water if exposed.
- Medical Response: Provide fresh air and administer oxygen. Seek medical care for respiratory distress.

Riot Control Agents (Tear Gas)

Chemicals used to temporarily incapacitate people by causing severe eye irritation, tearing, and respiratory distress. Common examples include CS (causing intense eye irritation and pain), CN (causing burning and irritation), and OC (pepper spray, causing intense burning and inflammation). They are used primarily for crowd control and are designed to be non-lethal.

Mitigation Guidance:
- Detection: Symptoms include eye irritation, burning sensation, coughing, and skin irritation.
- Protection: Use goggles, masks, and protective clothing. Avoid touching the face and eyes.
- Decontamination: Leave the area, flush eyes with clean water, and wash skin with soap and water. Remove contaminated clothing.
- Medical Response: Move to fresh air and rinse affected areas. Seek medical attention if symptoms persist.

Incapacitating Agents

Temporarily disable individuals by affecting physiological or mental functions without causing permanent harm. Examples include BZ and other hallucinogens.

Mitigation Guidance:
- Detection: Watch for confusion, disorientation, and loss of motor skills.

- Protection: Use protective gear and avoid inhaling or ingesting substances. Be cautious in unfamiliar environments.
- Decontamination: Move to a safe area and avoid further exposure. Provide supportive care until the agent wears off.
- Medical Response: Seek medical evaluation and supportive care, including fluids and rest.

By following mitigation strategies, communities can enhance their resilience and reduce the impact of potential chemical threats.

Basics on treatment and Mitigation

Given the low probability but potentially severe impact of chemical agent incidents, it is essential for citizens to have basic knowledge and preparedness for treatment. This awareness can enhance individual and community resilience and ensure a more effective response in the unlikely event of exposure. Here's a summary of basic treatment principles:

Immediate Actions[1]

Recognition of Symptoms: Be aware of common symptoms associated with chemical agents, such as difficulty breathing, eye irritation, skin blistering, and sudden confusion. Recognizing these signs early can prompt timely action.

Evacuation and Sheltering: If safe to do so, quickly leave the area of exposure. Moving upwind and uphill can reduce further exposure, especially with heavier-than-air agents. If evacuation is not possible, seek shelter indoors. Close and seal windows, doors, and ventilation systems to prevent the entry of contaminants.

Decontamination[2]

Personal Decontamination:
- Removal of Clothing: Immediately remove contaminated clothing, cutting it off rather than pulling it over the head to avoid further exposure.
- Washing: Rinse exposed skin with copious amounts of water and mild soap. For eye exposure, rinse eyes with clean water or saline solution for at least 15 minutes.
- Avoid Contaminant Spread: Avoid touching contaminated surfaces or items and prevent cross-contamination by isolating contaminated clothing.

[1] Centers for Disease Control and Prevention (CDC). (2018). Chemical Emergency Preparedness and Response. Retrieved from https://www.cdc.gov/nceh/hsb/chemicals/emergencies.htm

[2] U.S. Department of Homeland Security (DHS). (2018). Chemical Attack Fact Sheet: Warfare Agents, Industrial Chemicals, and Toxins. Retrieved from https://www.dhs.gov/publication/chemical-attack-fact-sheet

First Aid[3]

General Measures:
- Respiratory Support: Assist individuals having difficulty breathing by positioning them upright and ensuring access to fresh air. If trained, provide CPR if necessary.
- Fluid Intake: Encourage drinking water if the person is conscious and able to swallow, particularly if vomiting or diarrhea occurs (to prevent dehydration).

Specific Interventions:
- Nerve Agents: Administer auto-injectors containing atropine and pralidoxime if available, as these are standard antidotes for nerve agent poisoning.
- Blister Agents: Apply cool, wet dressings to blisters and avoid puncturing them. Use sterile gauze to cover burns.
- Riot Control Agents: Remove contact lenses and rinse eyes thoroughly. Use cool compresses on skin and eyes to alleviate pain and irritation.

Medical Attention[4]

- Seek Professional Help: Always seek immediate medical evaluation following suspected exposure, even if symptoms are mild or delayed. Medical professionals can provide specific treatments, such as oxygen therapy, antidotes, or supportive care.
- Reporting and Communication: Inform local authorities and emergency services about the exposure incident to facilitate a coordinated response and help prevent further exposures.

Preparedness Measures[5]

Emergency Supplies:
- Basic Kits: Include items like gloves, masks, bottled water, soap, first aid supplies, and plastic sheeting for sealing rooms.
- Medical Supplies: Keep medications for specific needs and over-the-counter remedies, along with personal protective equipment like masks and goggles.

Education and Training:

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[3] Agency for Toxic Substances and Disease Registry (ATSDR). (2007). *Medical Management Guidelines for Chemical Exposures*. Retrieved from https://www.atsdr.cdc.gov/mmg/index.asp
[4] World Health Organization (WHO). (2004). Guidelines for the public health management of chemical incidents. Retrieved from https://www.who.int/publications/i/item/9241546158
[5] Federal Emergency Management Agency (FEMA). (2009). Are You Ready? An In-depth Guide to Citizen Preparedness. Retrieved from https://www.fema.gov/media-library-data/20130726-1549-20490-5753/areyouready_full.pdf

- Public Awareness: Participate in community drills and educational programs to understand emergency protocols and first aid techniques.
- Information Access: Stay informed about local emergency services and communication channels, and understand the specific risks associated with the area.

Conclusion

While the likelihood of a chemical agent incident is low, the potential impact on public health and safety can be significant. Therefore, having basic knowledge of symptoms, decontamination procedures, first aid, and when to seek medical attention can greatly enhance personal and community preparedness. Being equipped with the right information and supplies, and staying informed through reliable sources, can make a critical difference in the response to such an event.

Main Biological – C – Agents

Understanding the main biological agents that could potentially be used against personnel or civilians is crucial for enhancing community preparedness and response. Biological agents are microorganisms or toxins derived from living organisms that can cause diseases. Here, we will outline key biological agents, the basics of their effects, and mitigation guidance to help communities better understand and prepare for such threats.

Bacteria

- *Anthrax* (Bacillus anthracis)[6]
  - Symptoms: Skin ulcers, fever, cough, chest pain, and severe respiratory distress in inhalational cases.
  - Transmission: Inhalation, ingestion, or cutaneous contact.
  - Mitigation: Avoid contact with suspicious powders or substances. Use masks and protective clothing. Seek immediate medical treatment with antibiotics like ciprofloxacin or doxycycline.

- *Plague* (Yersinia pestis)[7]
  - Symptoms: Fever, chills, headache, muscle aches, and swollen lymph nodes (buboes). Pneumonic plague causes severe pneumonia.
  - Transmission: Flea bites, direct contact with infected tissue, or inhalation of respiratory droplets.
  - Mitigation: Use insect repellents, rodent control, and respiratory protection. Prompt antibiotic treatment with streptomycin or gentamicin.

- *Tularemia* (Francisella tularensis)[8]

[6] Centers for Disease Control and Prevention (CDC). (2021). Anthrax. Retrieved from [https://www.cdc.gov/plague/](https://www.cdc.gov/αnthrax/)
[7] Centers for Disease Control and Prevention (CDC). (2020). Plague. Retrieved from https://www.cdc.gov/plague/
[8] Centers for Disease Control and Prevention (CDC). (2020). Tularemia. Retrieved from https://www.cdc.gov/tularemia/

- Symptoms: Fever, skin ulcers, swollen lymph glands, and respiratory symptoms.
- Transmission: Insect bites, direct contact, inhalation, or ingestion of contaminated water or food.
- Mitigation: Avoid exposure to potentially infected animals, use protective gear, and consume safe food and water. Antibiotic treatment includes streptomycin or doxycycline.

Viruses

- *Smallpox* (Variola virus)[9]
  - Symptoms: High fever, fatigue, severe headache, rash that progresses to pus-filled sores.
  - Transmission: Person-to-person via respiratory droplets.
  - Mitigation: Vaccination for prevention, isolation of infected individuals, and supportive care. In case of exposure, vaccinate within 3 days to prevent onset or mitigate severity.

- *Viral Hemorrhagic Fevers (VHFs)* (e.g., Ebola, Marburg)[10]
  - Symptoms: Fever, bleeding, bruising, organ failure, and shock.
  - Transmission: Contact with infected bodily fluids, contaminated objects, or infected animals.
  - Mitigation: Use personal protective equipment (PPE), implement strict infection control measures, and quarantine affected individuals. No specific treatment, but supportive care is crucial.

Toxins

- *Botulinum Toxin*[11]
  - Symptoms: Muscle paralysis, difficulty swallowing, respiratory failure.
  - Transmission: Ingestion, inhalation, or wound contamination.
  - Mitigation: Avoid consumption of improperly canned or preserved foods. In the event of exposure, administer antitoxins and provide supportive care, including mechanical ventilation if necessary.

- *Ricin*[12]
  - Symptoms: Fever, cough, chest tightness, difficulty breathing, nausea, and organ failure.
  - Transmission: Inhalation, ingestion, or injection.
  - Mitigation: Avoid contact with suspicious powders or substances. There is no specific antidote; treatment focuses on supportive care, including respiratory support.

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[9] Centers for Disease Control and Prevention (CDC). (2016). Smallpox. Retrieved from https://www.cdc.gov/smallpox/

[10] World Health Organization (WHO). (2021). Viral haemorrhagic fevers (VHFs). Retrieved from https://www.who.int/health-topics/viral-haemorrhagic-fevers

[11] Centers for Disease Control and Prevention (CDC). (2020). Botulism. Retrieved from https://www.cdc.gov/botulism/

[12] Centers for Disease Control and Prevention (CDC). (2018). Ricin. Retrieved from https://emergency.cdc.gov/agent/ricin/

Basics on treatment and Mitigation

As with in the case of the chemical agents, given the low probability but potentially severe impact of chemical agent incidents, it is essential for citizens to have basic knowledge and preparedness for treatment. We have come with a summary of principles, based on specific respective literature[13][14].

Awareness and Education

- Educate the community about the signs and symptoms of exposure to biological agents. Understanding the nature and transmission of these agents is critical for early detection and response.

Protective Measures

- Personal Protective Equipment (PPE): Use masks, gloves, protective clothing, and eye protection to prevent exposure.
- Hygiene Practices: Regular hand washing, use of hand sanitizers, and disinfection of surfaces can reduce the risk of transmission.
- Food and Water Safety: Ensure proper food handling and storage. Only consume water from safe sources.

Vaccination and Prophylaxis

- Vaccination is available for certain agents, such as smallpox and anthrax. People in high-risk areas or professions should consider vaccination.

Emergency Preparedness

- Stockpiling Supplies: Keep emergency kits with essentials like first aid supplies, masks, gloves, disinfectants, and personal medications.
- Communication Plans: Establish clear communication channels for alerts and instructions from health authorities.

Isolation and Quarantine

- In the event of an outbreak, quick isolation of affected individuals and quarantine of those exposed can help contain the spread.

[13] World Health Organization (WHO). (2004). Guidelines for the public health management of chemical incidents. Retrieved from https://www.who.int/publications/i/item/9241546158
[14] Federal Emergency Management Agency (FEMA). (2009). Are You Ready? An In-depth Guide to Citizen Preparedness. Retrieved from https://www.fema.gov/media-library-data/20130726-1549-20490-5753/areyouready_full.pdf

Medical Response

- Early Treatment: Seek immediate medical attention if exposure is suspected. Early use of antibiotics, antivirals, or antitoxins can be life-saving.
- Supportive Care: In many cases, supportive care, such as hydration, oxygen therapy, and pain management, is crucial.

Conclusion

While the use of biological agents is highly unlikely due to international regulations and the difficulty of deploying them effectively, understanding the basics of these agents and the appropriate mitigation strategies can significantly reduce the impact of an incident. Public education, preparedness, and collaboration with health authorities are key components in enhancing community resilience against biological threats.

ANNEX B: Encouraging Community Engagement Check List

1. Foster a Sense of Ownership and Responsibility (Empowerment)	
2. Effective Communication and Information Sharing (Clear Messaging)	
3. Accessibility and Convenience (Flexible Opportunities)	
4. Recognition and Appreciation (Public Recognition)	
5. Build a Community Spirit and Collective Identity (Shared Goals)	
6. Education and Awareness (Training and Workshops)	
7. Collaboration with Community Organizations (Partnerships)	
8. Leverage Technology and Social Media	
9. Address Concerns and Barriers	

ANNEX C: Enhancing Two Way Communication Check List

1. Establish Multiple Communication Channels	
Social Media Platforms	
Community Meetings	
Email Newsletters	
SMS/Text Messaging	
Incorporate the team into the organization processes.	
2. Utilize Technology and Digital Tools	
Mobile Apps	
Online Surveys and Polls	
Live Streaming and Webinars	
3. Create Feedback Mechanisms	
Suggestion Boxes	
Feedback Forms	
Hotlines and Help Desks	
4. Engage Community Representatives	
Focus Groups	
Community Liaisons	
5. Foster a Culture of Openness and Transparency	
Regular Updates	
Transparency Reports	
Responsive Communication	
6. Education and Training	

Workshops and Training Sessions	
Information Campaigns	
7. Monitor and Evaluate Communication Efforts	
Feedback Analysis	
Surveys and Audits	
Community Satisfaction Metrics	