

Co-Creating Crisis Preparedness: Inclusive Field Exercises with Persons with Disabilities for Enhanced Risk Management

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Effective risk management in crisis situations requires not only robust planning but also inclusive and realistic training scenarios. Yet, vulnerable populations, particularly persons with disabilities, are often excluded from practical crisis exercises. This study presents the development and implementation of a novel methodology for inclusive crisis preparedness, aiming to integrate individuals with functional impairments as active participants in scenario-based training. The methodology was developed through action research and co-creation involving researchers, municipal crisis managers, disability organizations, and individuals with lived experience of impairment. Drawing on human factors principles and universal design, the method was tailored to support inclusive planning, execution, and evaluation of role-based exercises. A full-scale field exercise was conducted in an urban setting, simulating a crisis scenario involving contaminated water, extended power outages, and suspected sabotage. Participants included crisis professionals from three municipalities, individuals with visual, cognitive, and mobility impairments, and researchers in observational and facilitative roles. The exercise revealed significant insights for risk management and inclusive emergency planning. Crisis professionals gained a deeper understanding of the specific needs and vulnerabilities of persons with disabilities, such as reliance on electricity for mobility aids, access to medication and special diets, and the need for clear, single-message communication. Participants with disabilities demonstrated resilience and mutual support, contributing valuable perspectives on barriers, coping strategies, and systemic shortcomings. The exercise also exposed a lack of existing methods, institutional readiness, and training among crisis professionals for engaging these groups effectively. In conclusion, inclusive crisis exercises offer a powerful tool for improving societal resilience and advancing risk management practices. By involving persons with disabilities as co-creators and contributors, preparedness efforts become more representative, actionable, and ethically grounded. The developed methodology provides a replicable framework for inclusive crisis training and should be further disseminated across emergency preparedness domains and policy development.

Keywords: disability, crisis preparedness, action research, crisis exercise, crisis scenario, communication

1. Introduction

Effective crisis management depends not only on robust plans and formal procedures but also on training environments that realistically reflect the complexity and diversity of real-world emergencies. Yet global evidence shows that persons with disabilities face disproportionately higher risks during disasters, including mortality rates two to four times higher than those of non-disabled populations (GDPC, 2023). Analyses of recent wildfire evacuations in California found that individuals with cognitive, hearing,

and mobility impairments were significantly overrepresented among those displaced or severely affected, largely due to breakdowns in accessible communication, mobility support, and evacuation logistics (ICDR Toolkit, 2021). A similar pattern was documented in one of the most widely studied disasters of the past decades, the Hurricane Katrina in 2005. In the aftermath, investigations revealed that older adults and persons with disabilities accounted for a disproportionately high share of fatalities and rescues. Many were unable to evacuate

because of inaccessible transportation, reliance on powered medical equipment, or lack of tailored public warnings. Shelters frequently lacked appropriate accommodations, mobility aids could not be transported, and emergency communication channels were not adapted for individuals with sensory or cognitive impairments. These systemic failures made clear that traditional, one-size-fits-all preparedness and response structures do not meet the needs of diverse populations, particularly those with functional impairments (ICDR Toolkit, 2021).

Despite this evidence, persons with disabilities remain largely absent from crisis exercises, planning forums, and preparedness initiatives. This exclusion persists even as research in disability-inclusive disaster risk reduction (DIDRR) highlights the importance of accessible communication, universal design, and cross-sector collaboration, along with the critical need to integrate lived experience into practical preparedness work (Collaborating4Inclusion, 2023; AIDR, 2023). International policy frameworks such as the Sendai Framework for Disaster Risk Reduction 2015-2030 call for the full inclusion and empowerment of persons with disabilities in all phases of disaster management, recognizing them as key stakeholders rather than passive recipients of assistance (GDPC, 2023).

Emerging evidence from smaller disaster risk reduction (DRR) initiatives demonstrates that disability-inclusive exercises can strengthen community resilience, improve communication pathways, and generate more realistic preparedness insights (CBM, 2018). Nevertheless, such initiatives remain rare, and few validated methodologies exist for systematically involving individuals with functional impairments in full-scale crisis exercises or scenario-based training.

Previous work by the authors on inclusive crisis preparedness in Sweden (Stark et al., 2024; Osvalder, 2025) identifies persistent structural barriers and a lack of practical tools for exercise planners. The problem is also highlighted in an international systematic literature review by the authors, which synthesizes methods for disability-inclusive preparedness (Stjernholm et al., 2025).

Further, inclusive design strategies are lacking when it comes to presenting crisis information also useful for people with special communication needs, which has been highlighted in a multi-case study by the authors (Aryana et al., 2024).

Against this background, the present study develops and tests a structured approach aimed at addressing the lack of validated, practical methods for disability-inclusive crisis preparedness. The aim of this paper is therefore to (1) outline the co-creation and overall design principles of the approach, (2) present key empirical findings from the field exercise, and (3) discuss implications for risk management, preparedness planning, and future inclusive crisis training.

2. Method

This study employed an action research approach to develop, refine, and test a methodology for inclusive crisis preparedness. Action research is well-suited for complex societal challenges because it enables iterative collaboration between researchers, practitioners, and affected communities. In alignment with recommendations from disability-inclusive disaster risk reduction research (Collaborating4Inclusion, 2023), the study was grounded in co-creation, emphasizing equal participation of Swedish municipal crisis managers, disability organizations, and individuals with functional impairments. The work was co-created with crisis managers, disability organizations, researchers, and individuals with lived experience of disability, and was examined through a full-scale urban field exercise involving participants with visual, cognitive, and mobility impairments. This enabled the identification of vulnerabilities, adaptive strategies, communication challenges, and systemic shortcomings that traditional exercises often fail to reveal.

2.1. Method development

The methodology was developed in several structured steps, supported by human factors principles (Wickens et al., 2021) and universal design considerations (Steinfeld & Maisel, 2012; Raja & Narasimhan, 2013).

Review of existing crisis exercise models and DIDRR literature. An analysis was conducted of existing preparedness models, identifying gaps in

inclusion, accessibility, and communication (AIDR, 2023)

Identification of participant roles and contextual constraints. This included selecting crisis professionals, individuals with visual, cognitive, or mobility impairments, and organizing roles within the exercise scenario.

Scenario design and development of injects. Scenarios were crafted to simulate realistic cascading crises (e.g., contaminated water, power outages) and designed to expose communication bottlenecks and support needs, building on earlier observations of disproportionate impacts in real-world crises (ICDR Toolkit, 2021).

Accessibility and support planning. Preparations included accessible venues, transportation arrangements, simplified written materials, and optional support persons. These steps align with best practices in inclusive emergency management as described in international guidelines (Global Disaster Preparedness Center, 2023).

Design of evaluation protocol. Evaluation questions and data collection instruments were co-developed with disability representatives, following recommendations for inclusive monitoring and evaluation frameworks (Collaboratin4Inclusion, 2023).

2.2. Field Exercise Implementation

A full-scale field exercise was conducted in an urban environment, simulating a crisis involving contaminated drinking water, extensive power outages, and suspected sabotage. The exercise structure followed four phases:

- Initial briefing with introductory crisis preparedness information
- Self-directed relocation to a designated safe point
- Scenario progression with escalating injects via SMS and web-based communication
- Debriefing and group reflection

The participants included municipal crisis professionals and individuals with visual,

cognitive, and mobility impairments. The researchers acted as observers, facilitators, and scenario controllers. This design mirrors recommendations in disaster risk management literature that emphasize realistic, participatory, community-based exercises (CBM, 2018).

2.3. Data collection and analysis

Data were collected through:

- Participant observations,
- Field notes
- Structured group interviews
- Reflective discussions
- documentation of communication flows and decision-making patterns

A thematic analysis was conducted to identify cross-cutting themes related to communication challenges, system bottlenecks, adaptive strategies, and learning outcomes.

3. Results

The full-scale field exercise generated a rich set of empirical observations regarding communication, decision-making, coordination, and the lived experience of crisis among participants with disabilities and municipal crisis professionals. The analysis revealed three overarching result domains: (1) Insights for crisis professionals, (2) insights from participants with disabilities, and (3) exercise performance and methodological validation.

3.1. Insights for crisis professionals

The crisis professionals gained an increased awareness of functional dependencies and vulnerabilities. They reported developing a deeper understanding of how everyday dependencies, such as access to electricity, mobility aids, medication, special diets, and digital communication, shape the ability of individuals with disabilities to respond during a crisis. Several participants expressed surprise at the extent to which even short-term power outages compromised independence, mobility, and personal safety for wheelchair users and individuals reliant on assistive devices. They also recognized significant communication challenges and the need for simplicity. They realized that crisis information must be delivered clearly, sequentially, and without unnecessary

complexity. During the exercise, several participants struggled to interpret layered or ambiguous messages, confirming that single message, directive communication was more effective for maintaining engagement and reducing anxiety among participants with cognitive or sensory impairments. In addition, the professionals reported gaining new insights into the fact that some individuals with disabilities cannot perform expected citizen behaviors during emergencies. Examples include relocating independently, carrying supplies, or navigating unfamiliar environments. Understanding variations in individual capabilities and forming realistic role expectations emerged as essential for planning, decision-making, and designing inclusive crisis responses.

3.2. Insights from Participants with Disabilities

The participants with disabilities demonstrated strong social cohesion, supporting each other in formulating questions, interpreting information, and navigating the scenario. They reported that the group context reduced stress and enabled them to articulate their needs more confidently, contributing to a sense of agency within the exercise. Mutual support and collaborative problem-solving not only enhanced participants' engagement but also illustrated the need for structured methods that actively foster such dynamics, an issue the present study seeks to address by developing and testing a practical approach for disability-inclusive crisis preparedness. The scenario enabled participants to confront, in a controlled environment, how a compounded crisis—loss of power, unsafe water, mobility barriers—could affect them personally. Several participants reported that the exercise gave them a “tangible understanding” of how quickly a situation could become unmanageable without external support, mirroring vulnerabilities documented in international studies on emergency preparedness for persons with disabilities. This kind of realistic, embodied understanding of crisis impact underscored the value of exercises that allow participants to experience, rather than merely imagine, the cascading effects of disruption. Some participants had trouble expressing concerns in ways that crisis professionals were prepared to interpret. This mismatch confirmed known gaps in cross-group communication under time pressure

and reinforced the need for training in accessible dialogue. These communication and interaction challenges highlight the importance of developing preparedness methods that explicitly support mutual understanding between professionals and individuals with disabilities.

3.3. Exercise Performance and Insights

The exercise successfully simulated a plausible, escalating crisis involving contaminated water, a widespread power outage, and suspected sabotage. The injects delivered via SMS and a web interface created a dynamic flow that prompted active decision-making among all participants. Both crisis professionals and participants with disabilities remained engaged throughout the exercise, confirming that the scenario was neither overly taxing nor too simplistic. This high level of scenario realism and participant engagement underscores the robustness of the exercise design and its suitability for inclusive preparedness training.

Recruiting participants with disabilities and organizing accessible transportation, facilities, and materials required substantial preparation efforts. These logistical burdens reflect well-documented barriers in implementing inclusive preparedness activities. Despite these challenges, the exercise proceeded smoothly and produced valuable insights, demonstrating that even resource-intensive arrangements can yield meaningful outcomes when accessibility is prioritized. At the start of the exercise, professionals tended to revert to traditional, hierarchical staff roles. However, as the scenario progressed and the complexity of participant needs became apparent, they adopted more flexible, creative, and collaborative problem-solving approaches. This adaptive shift aligns with human-factors literature emphasizing the need for flexibility and user-oriented responses in dynamic, uncertain environments, highlighting the value of immersive training for supporting such behavioral transitions.

The exercise confirmed that the co-created methodology offered an effective structure for inclusive crisis training. It supported realistic, ethically grounded engagement and generated insights unattainable through conventional exercises lacking participation from vulnerable groups. These outcomes align with evidence from global Disability-Inclusive Disaster Risk

Reduction practices showing that inclusive exercises strengthen both preparedness and societal resilience, reinforcing the methodological value of co-designed approaches.

4. Discussion

The purpose of this study was to develop and test a co-created methodology for inclusive crisis preparedness and to examine the insights emerging from a full-scale field exercise involving municipal crisis professionals and individuals with functional impairments. The findings demonstrate that inclusive exercises not only reveal neglected vulnerabilities but also generate concrete learning outcomes for both groups. This discussion situates these findings in the broader literature on disability-inclusive disaster risk reduction.

The exercise confirmed that involving persons with disabilities reveals crucial aspects of crisis dynamics that are otherwise overlooked in traditional preparedness efforts. Crisis professionals reported gaining a more nuanced understanding of how functional dependencies, such as reliance on electricity, mobility aids, communication devices, and medication, shape risk exposure and response capacity during emergencies. These observations directly mirror findings from international research showing that disruptions to essential services disproportionately affect individuals with disabilities and amplify their vulnerability in crisis situations (ICDR Toolkit, 2021; GDPC 2023).

This enhanced realism strengthens the ecological validity of crisis exercises. Traditional exercises often assume an average citizen, thereby omitting the heterogeneity of needs present in real populations. This methodological bias has been highlighted as a major gap in DIDRR literature (Collaborating4Inclusion, 2023; AIDR, 2023). The results of this study demonstrate that inclusive exercises correct this bias by confronting practitioners with real-world constraints and forcing adaptive problem-solving, a shift also observed in global case studies on inclusive DRR (CBM, 2018).

The exercise highlighted significant communication challenges, particularly in conveying crisis information clearly, sequentially, and in ways accessible to individuals with cognitive or sensory impairments. Participants frequently struggled when messages

were complex or multi-layered, supporting findings from DIDRR research that emphasize the need for simplified, multimodal communication approaches (Collaborating4Inclusion, 2023; AIDR, 2023).

These results underscore the persistent gap between policy intentions, such as the Sendai Framework's call for inclusive communication, and the operational practices of local emergency managers (GDPC, 2023). The exercise further demonstrated that accessible communication requires more than producing "easy-to-read" materials; it demands continuous, responsive, and dialogical interaction adapted to participants' needs, a human factors-driven insight also emphasized by Raja and Narasimhan (2013).

Participants with disabilities showed strong collaborative behavior, supporting one another in interpreting messages, navigating tasks, and articulating concerns. This mutual support not only improved exercise flow but also strengthened participants' sense of agency, confirming that inclusive crisis exercises can empower individuals rather than treat them as passive recipients of care. Similar empowerment effects appear in international DRR case studies where community-based approaches improve resilience and confidence (CBM, 2018).

These findings also align with results from systematic review (Stjernholm et al., 2025), which concludes that meaningful participation fosters both individual preparedness and organizational learning. The field exercise suggests that empowerment emerges not only through information but through participation itself, like global policy recommendations that emphasize the importance of treating persons with disabilities as active stakeholders (GDPC, 2023).

Although the methodology proved effective, the exercise also illuminated substantial logistical challenges. Recruiting participants with disabilities, ensuring accessible facilities, coordinating transportation, and providing individualized support required significant time and resources. These challenges reflect systemic barriers identified in DIDRR research, including insufficient organizational capacity, a lack of inclusive planning tools, and fragmented collaboration (Collaborating4Inclusion 2023; ICDR Toolkit, 2021).

These barriers suggest that successful inclusive exercises depend on long-term institutional commitment and cross-organizational networks. The results indicate that municipal crisis managers currently lack both training and established guidelines for involving vulnerable groups—another pattern consistent with the international scoping studies reviewed above (AIDR, 2023).

The results collectively suggest that inclusive exercises offer a powerful tool for enhancing crisis preparedness and risk governance. They provide actionable insights into system vulnerabilities, build professional competence, and strengthen community resilience. However, scaling up such exercises requires: (1) robust administrative support, (2) investments in accessible communication systems, (3) participatory planning frameworks, and (4) stronger collaborations with disability organizations.

These recommendations align with international DRR guidance and evidence from global programs advocating for mainstreaming disability inclusion in preparedness, response, and recovery (CBM, 2018; GDPC, 2023).

Overall, the discussion highlights that inclusive crisis exercises should be seen not as special initiatives but as standard components of professional preparedness, essential for creating equitable and resilient crisis management systems. These observations align with prior research documenting disproportionate impacts of disrupted infrastructure among persons with disabilities.

5. Implications for Practice and Policy

The findings from this study offer actionable implications for municipalities, emergency services, and policymakers seeking to strengthen disability-inclusive crisis preparedness. First, the results clearly demonstrate that inclusive exercises uncover critical system vulnerabilities that remain invisible in traditional crisis training. This aligns with international DRR analyses showing that disruptions in communication, transportation, power supply, and assistive technologies disproportionately affect persons with disabilities and should therefore be central components of preparedness planning. Municipalities should therefore integrate functional assessments and dependency mapping into early

stages of preparedness work to better anticipate cascading effects.

Second, the exercise highlighted the urgent need for accessible, multimodal crisis communication. Participants' difficulties in understanding complex or layered messages mirror longstanding gaps identified in international scoping studies, which emphasize that emergency information must be tailored to different cognitive, sensory, and linguistic capacities. Local emergency services should develop communication protocols using multiple parallel channels (e.g., SMS, visual signs, audio messages, simplified web pages) and ensure that crisis personnel receive training in accessible communication.

Third, the results underscore the importance of formalized partnerships between municipal crisis managers and disability organizations. International case studies show that such partnerships are key enablers of disability-inclusive DRR, facilitating knowledge exchange, participant recruitment, and ethical implementation. Municipalities should therefore establish long-term collaboration agreements with disability advocacy groups and include representatives with lived experience in preparedness planning, scenario development, and evaluation processes.

Fourth, the study suggests the need for policy-level support and resource allocation. The logistical complexity experienced in preparing and executing the exercise, such as transport arrangements, facility accessibility, support persons, reflects structural barriers. National crisis authorities should consider issuing guidelines, funding programs, and standardized tools to support inclusive exercises and reduce the burden on individual municipalities.

Finally, the results indicate that inclusive exercises serve as powerful learning and capacity-building tools. Professionals shifted from rigid, hierarchical thinking to adaptive and collaborative problem-solving as the scenario unfolded; a transformation consistent with human factors research highlighting the value of user-centered, scenario-based learning. Integrating inclusive exercises into regular training cycles would thus strengthen resilience and readiness across emergency management systems.

6. Conclusion

This study contributes with new empirical evidence and methodological guidance to the growing field of disability-inclusive crisis preparedness. By co-creating and testing a full-scale field exercise with persons with visual, cognitive, and mobility impairments, as well as municipal crisis professionals, the research demonstrates that inclusive exercises are both feasible and highly valuable.

The findings show that such exercises reveal overlooked vulnerabilities linked to functional dependencies, uncover communication barriers, and highlight systemic gaps in preparedness, insights echoed in international studies documenting disproportionate risks faced by persons with disabilities. Importantly, the exercise also highlighted the strengths, adaptability, and mutual support demonstrated by participants with disabilities, reinforcing global evidence that meaningful participation enhances both individual and organizational resilience.

The co-created methodology proved effective in supporting realistic, ethically grounded, and participatory crisis training. It enabled richer learning for crisis professionals, empowered participants with disabilities, and validated the usefulness of inclusive, human-centered approaches recommended by DIDRR research and international policy frameworks.

Overall, inclusive crisis exercises should not be viewed as exceptional or optional; rather, they represent a necessary evolution in crisis preparedness, one that acknowledges the diverse abilities of the population and strengthens the robustness, fairness, and societal relevance of crisis management systems. Expanding the use of such methodologies will require sustained cross-sector collaboration, organizational commitment, and policy support, but the benefits for resilience, equity, and operational effectiveness are clear.

References

- Aryana, B., Stark, E. & Osvalder, A-L. (2024). Universal Crisis Information Design: A Multi-Case Study. Int Conf on Universal Design Nov 2024, Oslo, Norway. *Studies in Health Technology and Informatics*, Vol. 320 s. 74-81, 0926-9630 (ISSN).
- CBM (2018). Disability inclusive disaster risk management: Voices from the field & good practices. Christian Blind Mission (CBM) International, Inc. (USA). <https://www.cbm.org/dam/jcr:a6f938b5-cff9-4d93-8dc6-40bc3d17d2d4/disability-inclusive-disaster-risk-management-cbm.pdf>
- Collaborating4Inclusion (2023). Emergency management capabilities for disability inclusive disaster risk reduction (DIDRR): Scoping study findings. https://collaborating4inclusion.org/wp-content/uploads/2023/11/EM_DIDRR_ScopingStudy_Findings_FINAL.pdf
- GDPIC (2023). Disability inclusive disaster preparedness. *Global Disaster Preparedness Center*. Copyright 2017-2025 The American Red Cross.
- ICDR Toolkit (2021). Disability and emergency preparedness: Resources and research for inclusive emergency preparedness planning https://pfs2.acl.gov/strapib/assets/ICDR_Emerg_Prep_Toolkit_7_22_21_508_0_45abcbf01a.pdf
- Osvalder, A-L (2025). From Passive Recipient to Active Resource in the Crisis Management System: Including the Knowledge and Experiences of Persons with Disabilities in Crisis Prevention and Management. Research Report to Swedish Civil Contingencies Agency. *Published at Chalmers University of Technology, Sweden*.
- Stark, E., Osvalder, AL. & Borell, J. (2024). Civil Preparedness, Crisis Management, and Resource Allocation: A Knowledge Review on Inclusion and Diversity. Swedish Civil Cont. Agency https://research.chalmers.se/publication/541702/file/541702_Fulltext.pdf
- Stjernholm, L., Borell, J. & Osvalder, AL (2025). Active Participation of People with Disabilities in Disaster Preparedness and Contingency Work: A Systematic Literature Review on Methods, Outcomes, and Challenges. *Progress in Disaster Science*, Vol 29, No 100502.
- Raja, D. S., & Narasimhan, N. (2013). Inclusive disaster and emergency management for persons with disabilities. *Centre for Internet & Society*.
- Steinfeld, E., & Maisel, J. (2012). *Universal Design: Creating Inclusive Environments*. Wiley.
- AIDR (2023). Disability inclusion and disasters: Emergency management and disability-inclusive disaster risk reduction. *Australian Disaster Resilience Knowledge Hub*.
- Wickens, C. D., Lee, J. D., Liu, Y., & Gordon-Becker, S. (2021). *An introduction to human factors engineering* (3rd ed.). Pearson.