

Study Mitigation Disaster for Early Childhood in Indonesia: A Systematic Literature Review

Windi Wulandari Iman Utama¹, Wardani Rahayu², Hapidin³

1.Universitas PGRI Yogyakarta, Indonesia. E-mail: Windi@upy.ac.id

2,3.Universitas Negeri Jakarta, Jakarta, Indonesia

Abstract

Indonesia is highly susceptible to natural disasters, posing significant risks to its population, particularly early childhood. Effective disaster mitigation strategies tailored for young children are crucial to enhance their safety and resilience. This study systematically reviews the literature on disaster mitigation practices and policies for early childhood in Indonesia. This review aims to synthesize the current state of research on disaster mitigation for early childhood in Indonesia, identify gaps in the literature, and provide recommendations for future research and policy development. A systematic literature review was conducted following PRISMA guidelines. Databases, including PubMed, Scopus, Web of Science, and Google Scholar, were searched for peer-reviewed articles published between 2011 and 2024. Keywords used in the search included "mitigation," "early childhood," "disaster mitigation," and "early childhood disasters." Studies were selected based on predefined inclusion and exclusion criteria, focusing on those that addressed disaster preparedness, training, community, and technology in early childhood contexts within Indonesia. The review identified 107 relevant studies. Key findings highlight that while several programs and initiatives exist, there is a lack of cohesive and comprehensive disaster mitigation strategies specifically designed for early childhood. Most studies emphasize the importance of integrating disaster education into early childhood curricula, training educators, and involving parents and communities in disaster preparedness. Future research should focus on developing and evaluating comprehensive, culturally sensitive disaster mitigation strategies for young children. Policymakers and practitioners must collaborate to create robust frameworks that ensure the safety and well-being of early childhood during disasters.

Keywords: disaster mitigation, early childhood, systematic literature review, disaster preparedness, child-centered approaches.

T Indonesia, located in a region prone to natural disasters such as earthquakes, volcanic eruptions, floods, and tsunamis, faces significant challenges in safeguarding its population, particularly vulnerable groups like young

children (Danarta, 2022). These disasters present immediate physical threats and have long-term psychological impacts that can hinder children's development (Yoshikawa et al., 2020). The susceptibility of Indonesia to such calamities is

further heightened by its geographical location, with cities like Palu being particularly vulnerable due to their proximity to active fault lines (Wirawan et al., 2024). Given these circumstances, effective disaster mitigation strategies are crucial to protect young children in Indonesia.

In disaster mitigation, it is essential to consider the holistic well-being of children, encompassing both their physical safety and psychological resilience (Levickis et al., 2023). The impact of natural disasters on children's mental health, exacerbated by factors like extended lockdowns, disrupted routines, and financial hardships, underscores the need for comprehensive mitigation efforts (Levickis et al., 2023). Furthermore, the link between early childhood vulnerability to disasters and long-term adverse outcomes in cognitive development underscores the importance of proactively addressing these risks (Robinson & Dinh, 2023). The detrimental effects of such events on children's development can be mitigated by implementing robust disaster preparedness and response measures.

Apart from the immediate risks posed by natural disasters, children in Indonesia also encounter challenges related to environmental factors, such as air pollution, which can adversely affect their health and well-being (Sharma & Kumar, 2018). Strategies like establishing clean air zones around children's breathing areas can provide immediate solutions to mitigate the impact of air pollution on their health (Williams et al., 2020). Additionally, the association between exposure to environmental risks in early life and the development of mental disorders in childhood highlights the need for proactive measures to address such risks (O'Hare et al., 2023). By understanding and mitigating these environmental hazards, the overall resilience of children in the face of disasters can be enhanced.

The COVID-19 pandemic has further emphasized the importance of disaster preparedness and mitigation, especially

concerning the impact on young children (Sharma & Kumar, 2020). Lessons learned from the pandemic, such as maintaining access to early childhood education and care, underscore the need for continuity in essential services during crises (Koirala et al., 2021). The pandemic has also highlighted the significance of social support systems and parental involvement in mitigating the adverse effects of crises on children's well-being (Tracy et al., 2018). By leveraging such protective factors, the resilience of children in the face of disasters can be strengthened.

Moreover, the role of education in disaster mitigation is crucial, as it plays a significant part in raising awareness, preparedness, and resilience among children and communities (Eriksen, 2013). Integrating disaster risk reduction education into early childhood education can instil lifelong skills and behaviours that enhance children's ability to cope with emergencies (Thygesen et al., 2020). By incorporating sustainable development principles into educational curricula, countries like Indonesia can foster a culture of resilience and preparedness from a young age (Akhtar et al., 2022). This proactive approach to education can significantly contribute to mitigating the impact of natural disasters on children and communities. Safeguarding young children in Indonesia from the multifaceted risks of natural disasters necessitates a comprehensive and proactive approach to disaster mitigation. Effective mitigation strategies can be developed by addressing the immediate physical threats, long-term psychological impacts, and environmental risks. Leveraging lessons from past crises like the COVID-19 pandemic, integrating disaster risk reduction into education, and promoting social support systems are essential to mitigating disasters' impact on young children in Indonesia.

Disaster mitigation involves a series of actions to reduce disaster risks and negative impacts. For young children, mitigation strategies should include preparedness

education, training for teachers and parents, and community-based interventions to help them understand and manage emergencies. However, while the importance of disaster mitigation for young children is recognized, research focusing on effective strategies in Indonesia is limited. Therefore, this systematic literature review was conducted to identify and analyze previous research on disaster mitigation for early childhood in Indonesia.

This research aims to identify and analyze implemented disaster mitigation strategies for early childhood in Indonesia. By collecting and evaluating existing literature, it is expected to find approaches that are effective and relevant in the Indonesian context. In addition, this research also aims to identify gaps in the existing literature and provide recommendations for future research. This research seeks to answer the question: What are the effective disaster mitigation strategies for early childhood in Indonesia based on the existing literature?

METHODOLOGY

Research Design

This research uses the systematic literature review (SLR) method to identify, evaluate, and synthesize research results relevant to disaster mitigation for early childhood in Indonesia. This method was chosen because it allows researchers to collect and analyze information from various sources systematically and comprehensively to provide a comprehensive overview of the topic under study. Literature studies are carried out by reviewing the literature, notes, and multiple reports related to the problem studied (Chinmoy et al., 2019). Data was collected from the content analysis results of early childhood education articles. Thirty-two articles were used to collect research data. Articles published from 2011 to 2024. All articles used reviews of disaster mitigation. The instrument used in this research is an analysis guide that contains aspects of disaster mitigation content. The data analysis used in this research is content analysis. Analysis

fulfills the objective of obtaining valid conclusions and possibly being re-examined based on the context (Disasmitowati & Utami, 2017).

Most research uses qualitative research methods based on data obtained from existing research publications. Most treatment involves conducting interviews, making observations, or even distributing questionnaires. There were only three studies that provided treatment. The first research was conducted (Putri, 2019) by providing treatment, namely the storytelling method using audio-visual media. This lesson carries out a pre-test and post-test regarding children's understanding of the nature of disasters. The second research was conducted by (Azmi et al., 2020) conducting tests on groups of children via disaster management knowledge tests through interviews. The treatment is a book story containing pictures from several disaster topics such as earthquakes, tsunamis, floods, landslides, and land and forest fires. Furthermore, research was conducted by (Artha et al., 2020; Fang et al., 2020), who conducted a pre-test and post-test regarding flood disaster preparedness for children aged 5-6 years. The treatment carried out is in the form of graphic media.

Inclusion and Exclusion Criteria

The inclusion criteria in this study were:

- Articles published in highly reputable international journals
- Research focusing on disaster mitigation for early childhood (0-6 years old).
- Studies conducted in Indonesia or have direct relevance to the Indonesian context.
- Publications within the period of 2011 to 2024.
- Articles written in English

The exclusion criteria in this study were:

- Articles that have full-text access and those that do not.
- Research is irrelevant to disaster mitigation and does not focus on early childhood.

- Studies conducted outside Indonesia are not directly relevant to the Indonesian context.

Data Sources

Data sources used in this research include academic databases such as PubMed, Scopus, Google Scholar, and other international journal portals.

Search Procedure

The search procedure was carried out using the keywords "mitigation" and "early childhood disaster". There were 2 Indonesian documents, the keywords "mitigation" and "early childhood". There were 64 documents with the selection of subject areas: social science, environmental science, psychology, medical, and biochemistry. Using the keyword "disaster mitigation", there are 41 documents, totalling 101 papers.

Selection and Analysis Procedure

The study selection process was conducted in several stages:

- Initial keyword search to identify relevant articles.
- Title and abstract screening to remove irrelevant articles.
- Full-text evaluation of articles to ensure compliance with inclusion criteria.
- Data from the selected articles will be compiled, including information on disaster types, mitigation strategies, research methods, and main results.

Data Analysis

Data analysis was conducted using the thematic analysis method, where information from the selected articles was categorized based on themes relevant to disaster mitigation for early childhood. Key findings from each article will be compared and synthesized to provide a comprehensive picture of effective mitigation strategies in Indonesia.

RESULTS

With collaborative efforts and seriousness about protecting young children in the face of natural disasters, we hope this research's findings

can become a strong foundation for building a better, safer, and more sustainable future for future generations. Figure 1 shows the findings of research conducted in Indonesia.

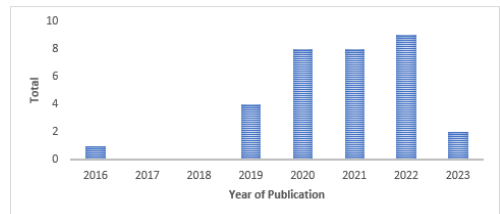


Figure 1. Findings Study related to Mitigation Disaster in children from early 2016 until 2024

The problem often found in this research is the lack of understanding of disaster mitigation. The number of published articles shows how frequently mitigation talks have occurred. Based on the graph in Figure 1, one review article on disaster mitigation was found in 2016. In the following years, namely 2017 and 2018, there was no research on disaster mitigation in early childhood. However, starting in 2019, 4 articles with disaster mitigation studies were found, and the number of publications on disaster mitigation increased in the following year. In 2020, eight articles were published related to disaster mitigation for early childhood. In 2021, eight published articles will be related to disaster mitigation for early childhood. In 2022, there will be 9 article publications indexed by Sinta articles related to disaster mitigation for early childhood. In 2023, two article publications will be indexed by Sinta articles related to disaster mitigation for early childhood. In 2024, there will be one published article indexed by Sinta related to disaster mitigation for early childhood.

The increasing trend in the number of publications regarding disaster mitigation shows a significant increase in researchers researching disaster mitigation. The more studies there are about disaster mitigation, the more positive influence it will have on understanding disaster mitigation, especially in early childhood education. From the literature search results, 28

articles met the inclusion criteria. The articles covered various types of disasters frequently occurring in Indonesia, such as earthquakes, tsunamis, floods, and volcanic eruptions. The studies used different research methods, including surveys, case studies, and program evaluations. These studies were conducted in various regions in Indonesia, such as Aceh, West Sumatra, Java, Bali, and Nusa Tenggara.

Key Findings

1. Preparedness Education in Schools

- Many studies show that school disaster preparedness education programmes can improve early childhood knowledge and skills in dealing with disasters. These programs include evacuation training, recognition of disaster signs, and simulation activities.

- Studies in Aceh show that children involved in disaster preparedness programs in schools are more prepared and responsive during earthquakes compared to children who do not participate in such programs.

2. Training for Teachers and Parents

- Training provided to teachers and parents on how to handle children during and after a disaster is essential. The Yogyakarta study showed that this training improved teachers' and parents' ability to provide psychological first aid and support children's emotional needs after a disaster.

- Training also covers making home and school environments safer and more disaster-ready.

3. Community-based interventions

- Studies in East Nusa Tenggara show that community-based approaches, such as forming disaster preparedness groups involving children, parents, and local stakeholders, are highly effective. These groups play a role in education, information dissemination, and evacuation coordination.

- A community program in Bali involving local rituals and culture in disaster preparedness activities also improved children's awareness and preparedness.

4. Use of Technology and Media

- Technology such as mobile applications and social media for disaster preparedness education is also being introduced. A study in Jakarta showed that mobile applications designed specifically for children can help them learn about disasters in an interactive and fun way.

Findings from the reviewed studies suggest that a multidimensional approach that includes preparedness education in schools, training for teachers and parents, community-based interventions, and the use of technology are effective disaster mitigation strategies for early childhood in Indonesia. These strategies not only improve children's knowledge and skills in dealing with disasters but also strengthen the support system of their environment, including family, school, and community.

DISCUSSION

The main findings of this study show that a multidimensional approach to disaster mitigation for early childhood in Indonesia is highly effective. Preparedness education in schools, training for teachers and parents, community-based interventions, and the use of technology all have essential roles in improving children's emergency preparedness and response.

Preparedness Education in Schools

Disaster preparedness education equips children with the knowledge and skills to respond to emergencies effectively. Studies conducted in various regions, including Aceh, have emphasized integrating disaster preparedness education into school curricula. Activities such as evacuation simulations, familiarization with disaster signs, and the inclusion of disaster risk reduction programs in education have been shown to enhance children's preparedness for disasters (Boon & Pagliano, 2015; Jannah et al., 2021; Novita et al., 2022; Safriani & Wibowo, 2022; White-Lewis et al., 2021).

By integrating disaster preparedness education in schools, students acquire essential

knowledge and develop a proactive approach to planning and responding to disasters (Jasper et al., 2013; Lee et al., 2023). This education is vital in raising awareness among students and their communities, encouraging preparedness actions, and instilling values and attitudes towards disaster risk reduction (Rahmawati et al., 2020; Winarni & Purwandari, 2018). Furthermore, school disaster education interventions serve as effective catalysts to influence community preparedness and decrease inequity in disaster preparedness (Hidayat, 2023).

The effectiveness of disaster preparedness education is evident in various contexts, such as improving students' knowledge and preparedness levels for disasters (Dewi et al., 2024; Hermansyah et al., 2023). Additionally, integrating disaster education into school subjects from an early age has been recognized as a critical factor in implementing disaster risk reduction and ensuring that preparedness becomes a structured and sustainable part of education programs (Asif et al., 2020; Buzási et al., 2021). Integrating disaster preparedness education in schools is essential for building children's resilience and readiness to face emergencies. By providing students with the necessary knowledge, skills, and attitudes toward disaster risk reduction, schools play a critical role in fostering a culture of preparedness and ensuring the safety and well-being of children in the face of disasters.

Training for Teachers and Parents

Training for teachers and parents is crucial in enhancing disaster preparedness among children. Studies have shown that trained teachers and parents are better equipped to provide physical and psychological support to children during and after disasters (Kawasaki et al., 2022; Uhm et al., 2019). The Yogyakarta study emphasized that such training significantly improved overall family and school preparedness, strengthening the social support networks essential for children's well-being (Wijaya & Putri, 2024). Teachers play a vital role in children's lives, educating students and managing evacuation

centres at schools that serve as shelters during disasters (Schling & Winters, 2018). Therefore, providing teachers with field-based disaster preparedness education and training ensures they can respond effectively to various disaster scenarios (Samuelsson et al., 2020). Additionally, involving parents in disaster preparedness training further enhances the overall resilience of families and communities (Karanci et al., 2005).

The significance of training for teachers and parents is highlighted because individuals tend to take disaster preparedness more seriously after receiving such education or training (Koeffler et al., 2019). Strategies to enhance disaster preparedness education include focusing on teachers' performance in disaster prevention education, planning professional teacher-training programs, and assessing educational methods to improve children's awareness of natural disasters (Pranoto et al., 2023). Training for teachers and parents is a critical component of disaster preparedness efforts. It equips them with the necessary skills to support children effectively and strengthens the overall resilience of families and communities. By investing in training programs for teachers and parents, societies can enhance their capacity to respond to disasters and ensure the well-being of children in times of crisis.

Community-based interventions

Community-based interventions are crucial for enhancing disaster preparedness by involving all community members, including children. Studies conducted in East Nusa Tenggara and Bali have shown that these approaches not only increase awareness and preparedness but also foster a sense of community and solidarity in the face of disasters (James et al., 2019; Levac et al., 2012; Pike et al., 2024; Tang & Feng, 2018). Integrating local cultural elements in preparedness activities has been demonstrated to enhance the acceptability and effectiveness of such programs.

The active participation of community members, including children, in disaster preparedness initiatives contributes to building a

resilient community that can effectively respond to and recover from disasters. Involving the community in preparedness activities creates a sense of shared responsibility and mutual support, strengthening social cohesion and solidarity (Kenney et al., 2015). Moreover, integrating local cultural elements in preparedness programs ensures that the initiatives are culturally relevant and resonate with the community, increasing their effectiveness and sustainability (Hites et al., 2014).

Community-based disaster preparedness interventions have successfully increased disaster awareness, resilience, social cohesion, and support networks within communities (James et al., 2019; Jasper et al., 2013; Pike et al., 2024). By empowering communities to take ownership of their preparedness efforts and leveraging local knowledge and resources, these interventions have proven effective in enhancing overall community resilience and response capabilities (Glik et al., 2014; Sofyana et al., 2024; Tam et al., 2019). Community-based interventions that actively engage all community members, including children, are essential for building disaster-resilient communities. By integrating local cultural elements and fostering a sense of community and solidarity, these initiatives increase awareness and preparedness and strengthen social cohesion, ultimately enhancing the community's ability to withstand and recover from disasters.

The Use of Technology and Media

Integrating technology and media in disaster preparedness education has demonstrated positive outcomes, especially in engaging children. Mobile applications, educational films, crossword puzzles, and disaster e-books have proven to be practical tools for enhancing disaster preparedness among students (Sholihah et al., 2020). However, addressing access and digital literacy challenges is essential to ensure these technologies widespread and effective utilization (Ghiassi et al., 2024).

Incorporating digital tools like educational films, crossword puzzles, and e-books into disaster preparedness education can improve student engagement and knowledge retention. These interactive and innovative approaches have the potential to make learning about disaster preparedness more engaging and effective (Koeffler et al., 2019; Levac et al., 2012). Furthermore, enhancing digital literacy capabilities, as emphasized in the study on Babinsa Kodim, is critical for improving community preparedness for natural disasters (Syam et al., 2023). Leveraging technology and media in disaster preparedness education can be a valuable strategy to enhance learning outcomes and increase student awareness. By utilizing tools such as mobile applications, educational films, crossword puzzles, and e-books, educators can create engaging and interactive learning experiences that build a culture of preparedness in schools and communities.

Study Limitations

Although this review provides a comprehensive overview, some limitations must be recognized. Firstly, most studies reviewed had different research designs, making direct comparisons difficult. Secondly, there is still a limited number of studies that focus specifically on early childhood. Many studies were more generalized or focused on school-aged children without a clear separation of age groups.

Implications for Practice

The findings from this study have significant practical implications. Firstly, there is a need for policies that encourage integrating disaster preparedness education into the primary school curriculum. Second, training programmes for teachers and parents should be expanded and facilitated continuously. Third, community-based approaches should be strengthened with support from government and non-government organizations. Finally, the use of technology and media in disaster education should be optimized with attention to accessibility and sustainability.

Suggestions for Future Research

Based on the gaps found in the literature, future research needs to focus on several essential areas. Firstly, more empirical research using consistent methods is required to evaluate disaster mitigation strategies' effectiveness. Secondly, more specific research on early childhood (0-6 years) is needed to gain a deeper understanding. Thirdly, further exploration of the use of technology and media in disaster preparedness education should be undertaken to develop innovative and inclusive solutions.

As such, this research provides a solid foundation for developing more effective and comprehensive disaster mitigation strategies for early childhood in Indonesia and paves the way for further study.

CONCLUSION

This research concludes that disaster mitigation for early childhood in Indonesia requires a multidimensional and integrated approach. The systematic literature review found that preparedness education in schools, training for teachers and parents, community-based interventions and the use of technology are effective strategies for improving children's emergency preparedness and response.

Summary of Key Findings:

- Preparedness Education in Schools: In-school education programmes that include evacuation simulations and recognizing disaster signs improve early childhood preparedness.
- Training for Teachers and Parents: Training provided to teachers and parents improves their ability to provide physical and psychological support to children during and after disasters.
- Community-based Interventions: Community approaches involving children, parents and local stakeholders effectively improve disaster awareness and preparedness.

- Use of Technology and Media: Using mobile apps and social media as disaster education tools can help children learn in an interactive and fun way.

Effective disaster mitigation is essential to protect young children in Indonesia, who are the most vulnerable when disasters occur. The strategies found to be effective in this research should be integrated into national policies and local programs to ensure better preparedness across Indonesia. With a comprehensive and inclusive approach, it is hoped that young children can be better prepared and responsive in the face of disasters and minimize the negative impacts that can affect their development.

To improve the effectiveness of disaster mitigation for early childhood in Indonesia, several essential recommendations are proposed:

- Integration of Preparedness Education in the Curriculum: Policies promoting disaster preparedness education integration in primary schools should be developed and widely implemented.
- Continuous Training Programmes: Training programs for teachers and parents must be expanded and facilitated continuously, focusing on physical and psychological support for children.
- Strengthening Community Approaches: Community-based approaches should be strengthened with support from government and non-government organizations, ensuring the active involvement of all community members.
- Utilization of Technology: The use of technology and media in disaster education should be optimized with attention to accessibility and sustainability.

This research provides a strong foundation for developing more effective disaster mitigation strategies for early childhood in Indonesia and paves the way for further study.

WORKS CITED

- Akhtar, N., Khan, N., Qayyum, S., Qureshi, M. I., & Hishan, S. S. (2022). Efficacy and pitfalls of digital technologies in healthcare services: A systematic review of two decades. *Frontiers in Public Health*, 10(3389), 1-13. <https://doi.org/10.3389/fpubh.2022.869793> COPYRIGHT
- Artha, R. S., Suryana, D., & Mayar, F. (2020). E-Comic: Media for Understanding Flood Disaster Mitigation in Early Childhood Education. *JPUUD - Jurnal Pendidikan Usia Dini*, 14(2), 341-351. <https://doi.org/10.21009/jpud.142.12>
- Asif, M., Edirisingha, P., Ali, R., & Shehzad, S. (2020). Teachers' practices in blended learning environment: Perception of students at secondary education level. *Journal of Education and Educational Development*, 7(2), 286-306. <https://doi.org/10.22555/joeed.v7i2.19>
- Azmi, E. S., Rahman, H. A., & How, V. (2020). A two-way interactive teaching-learning process to implement flood disaster education in an early age: The role of learning materials. *Malaysian Journal of Medicine and Health Sciences*, 16, 166-174. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-85099376006&partnerID=40&md5=154c376972ce101122efc0303e3356a0>
- Boon, H. J., & Pagliano, P. J. (2015). Disaster education in Australian schools. *Australian Journal of Environmental Education*, 30(2), 187-197. <https://doi.org/10.1017/ae.2015.8>
- Buzási, A., Pálvölgyi, T., & Esses, D. (2021). Drought-related vulnerability and its policy implications in Hungary. *Mitigation and Adaptation Strategies for Global Change*, 26(3). <https://doi.org/10.1007/s11027-021-09943-8>
- Chinmoy, L., Iniyar, S., & Goic, R. (2019). Modeling wind power investments, policies and social benefits for deregulated electricity market - A review. *Applied Energy*, 242, 364-377. <https://doi.org/10.1016/j.apenergy.2019.03.088>
- Danarta, A. (2022). The Implementation of Disaster Mitigation based on Qur'anic Interpretation: Muhammadiyah Case Study. *Jurnal Studi Ilmu-Ilmu Al-Qur'an Dan Hadis*, 23(1), 125-144. <https://doi.org/10.14421/qh.2022.2301-07>
- Dewi, N. K. I. K., Rasdini, I. G. A. A., Yasa, I. D. P. G. P., & Wedri, N. M. (2024). AKSINA Education with Crossword Puzzle on Knowledge of Earthquake Disaster Preparedness in Elementary School Students. *Nursing and Health Sciences Journal (NHSJ)*, 4(1), 91-95. <https://doi.org/10.53713/nhsj.v4i1.332>
- Disasmitowati, C. E., & Utami, A. S. (2017). Analysis of Students' Mathematical Communication Skill for Algebraic Factorization Using Algebra Block. *International Conference on Research in Education*, 20(2), 72-84. https://usd.ac.id/seminar/icre/wp-content/uploads/2018/07/72-84_Disasmitowati_ICRE2017.pdf
- Eriksen, K. G. (2013). Why education for sustainable development needs early childhood education: The case of Norway. *Journal of Teacher Education for Sustainability*, 15(1), 107-120. <https://doi.org/10.2478/jtes-2013-0007>
- Fang, Y. M., Chou, T. Y., Hoang, T. Van, Bui, Q. T., Nguyen, D. B., & Nguyen, Q. H. (2020). New landslide disaster monitoring system: Case study of pingding village. *Applied Sciences (Switzerland)*, 10(19), 1-24. <https://doi.org/10.3390/app10196718>
- Ghiasi, R., Khan, M. A., Sorrentino, D., Diaine, C., & Malekjarfarian, A. (2024). An unsupervised anomaly detection framework for onboard monitoring of railway track geometrical defects using one-class support vector machine. *Engineering Applications of Artificial Intelligence*, 133(PB), 108167. <https://doi.org/10.1016/j.engappai.2024.108167>
- Glik, D. C., Eisenman, D. P., Zhou, Q., Tseng, C. H., & Asch, S. M. (2014). Using the Precaution Adoption Process model to describe a disaster preparedness intervention among low-income Latinos. *Health Education Research*, 29(2), 272-283. <https://doi.org/10.1093/her/cyt109>
- Hermansyah, H., Muhammad, M., Nurhayati, N., & Masyudi, M. (2023). Effectiveness of School-Based Disaster Management Education on Knowledge and Preparedness of D-III Nursing Study Program Students. *Jurnal Penelitian Pendidikan IPA*, 9(SpecialIssue), 945-952. <https://doi.org/10.29303/jppipa.v9ispecialissue.5933>
- Hidayat, Z. (2023). Environmental disaster education and communication in Indonesia: A survey among generation Z near Mount Krakatoa. *Kasetsart Journal of Social Sciences*, 44(1), 231-242. <https://doi.org/10.34044/j.kjss.2023.44.1.26>

- Hites, L. S., Sass, M. M., D'Ambrosio, L., Brown, L. M., Wendelboe, A. M., Peters, K. E., & Sobelson, R. K. (2014). The Preparedness and Emergency Response Learning Centers: Advancing standardized evaluation of public health preparedness and response trainings. *Journal of Public Health Management and Practice*, 20(SUPPL. 5), S17-S23. <https://doi.org/10.1097/PHH.0000000000000066>
- James, L. E., Welton-Mitchell, C., Noel, J. R., & James, A. S. (2019). Integrating mental health and disaster preparedness in intervention: A randomized controlled trial with earthquake and flood-affected communities in Haiti. *Psychological Medicine*, 50(2), 342-352. <https://doi.org/10.1017/S0033291719000163>
- Jannah, M. M., Jumadi, & Herawati. (2021). Integration of Volcanic Eruption Disaster Education with Physics Learning Process to Improve Students' Disaster Preparedness in Magelang Regency. *Proceedings of the 6th International Seminar on Science Education (ISSE 2020)*, 541(Isse 2020), 388-393. <https://doi.org/10.2991/assehr.k.210326.055>
- Jasper, E., Berg, K., Reid, M., Gomella, P., Weber, D., Schaeffer, A., Crawford, A., Mealey, K., & Berg, D. (2013). Disaster Preparedness: What Training Do Our Interns Receive During Medical School? *American Journal of Medical Quality*, 28(5), 407-413. <https://doi.org/10.1177/1062860612471843>
- Karanci, A. N., Aksit, B., & Dirik, G. (2005). Impact of a community disaster awareness training program in Turkey: Does it influence hazard-related cognitions and preparedness behaviors. *Social Behavior and Personality*, 33(3), 243-258. <https://doi.org/10.2224/sbp.2005.33.3.243>
- Kawasaki, H., Yamasaki, S., Kurokawa, M., Tamura, H., & Sonai, K. (2022). Relationship between Teachers' Awareness of Disaster Prevention and Concerns about Disaster Preparedness. *Sustainability (Switzerland)*, 14(13), 1-11. <https://doi.org/10.3390/su14138211>
- Kenney, C. M., Phibbs, S. R., Paton, D., Reid, J., & Johnston, D. M. (2015). Community-led disaster risk management: A māori response to Ōtautahi (Christchurch) earthquakes. *Australasian Journal of Disaster and Trauma Studies*, 19(SpecialIssue), 9-20. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-84929247376&partnerID=40&md5=548ff630c5245ca7583256b11616c1fc>
- Koeffler, T. J., Demeter, N. E., Kysh, L., Reeb, J., Stayton, A., Spears, R., & Burke, R. V. (2019). Evaluation and Gap Analysis of Pediatric Disaster Preparedness Resources. *Disaster Medicine and Public Health Preparedness*, 13(2), 330-337. <https://doi.org/10.1017/dmp.2018.23>
- Koirala, A., Goldfeld, S., Bowen, A. C., Choong, C., Ryan, K., Wood, N., Winkler, N., Danchin, M., Macartney, K., & Russell, F. M. (2021). Lessons learnt during the COVID-19 pandemic: Why Australian schools should be prioritised to stay open. *Journal of Paediatrics and Child Health*, 57(9), 1362-1369. <https://doi.org/10.1111/jpc.15588>
- Lee, Y. R., Park, S. N., Lee, M. R., & Nam, E. (2023). Influencing factors of early childhood teachers' disaster preparedness. *Frontiers in Public Health*, 11(November), 1-8. <https://doi.org/10.3389/fpubh.2023.1249736>
- Levac, J., Toal-Sullivan, D., & O'Sullivan, T. L. (2012). Household emergency preparedness: A literature review. *Journal of Community Health*, 37(3), 725-733. <https://doi.org/10.1007/s10900-011-9488-x>
- Levickis, P., Murray, L., Niklas, F., Lee-Pang, L., Vogt, M., Page, J., Eadie, P., & Lehl, S. (2023). Exploring Environmental Factors Associated with Child Wellbeing during COVID-19 in Australia and Germany. *Education Sciences*, 13(7). <https://doi.org/10.3390/educsci13070641>
- Novita, M., Nurohmah, A., Ma'arif, S., Anh Huynh Nguyen, T., Kusumo, H., Marlina, D., & Taufik Anwar, M. (2022). Analysis of Disaster Mitigation in IPAS Subject of High School Phases under Merdeka Belajar Concepts. *KnE Social Sciences*, 2022, 432-443. <https://doi.org/10.18502/kss.v7i19.12463>
- O'Hare, K., Watkeys, O., Whitten, T., Dean, K., Laurens, K. R., Harris, F., Carr, V. J., & Green, M. J. (2023). Cumulative environmental risk in early life is associated with mental disorders in childhood. *Psychological Medicine*, 53(10), 4762-4771. <https://doi.org/10.1017/S0033291722001702>
- Pike, C. E., Dohnt, H. C., Tully, P. J., Bartik, W., Welton-Mitchell, C., Murray, C. V., Kylie, R., Cosh, S. M., & Lykins, A. D. (2024). A Community Mental Health Integrated Disaster Preparedness Intervention for Bushfire Recovery in Rural Australian Communities: Protocol for a Multimethods Feasibility and Acceptability Pilot Study. *JMIR Research Protocols*, 13, 1-9. <https://doi.org/10.2196/53454>
- Pranoto, N. W., Sibomana, A., Ndayisenga, J., Chaeroni, A., Fauziah, V., Susanto, N., Pavlovic, R., & Rayendra, R. (2023). Development of a disaster mitigation learning program for kindergarten students through physical fun games. *Journal of Physical Education and Sport*, 23(12), 3228-3234. <https://doi.org/10.7752/jpes.2023.12369>

- Rahmawati, D., Saryono, Purnama, D. S., & Nopembri, S. (2020). Organization Collaboration for Disaster Preparedness in School. *Proceedings of the 2nd International Seminar on Guidance and Counseling 2019 (ISGC 2019) School*, 462(Isgc 2019), 150-155. <https://doi.org/10.2991/assehr.k.200814.033>
- Robinson, J. A., & Dinh, P. T. T. (2023). High doses of a national preschool program are associated with the long-term mitigation of adverse outcomes in cognitive development and life satisfaction among children who experience early stunting: a multi-site longitudinal study in Vietnam. *Frontiers in Public Health*, 11(December), 1-18. <https://doi.org/10.3389/fpubh.2023.1087349>
- Safriani, E. W., & Wibowo, Y. A. (2022). Preparedness and Adaptive Capacity of Students for Landslide Disasters in Karangobar, Central Java, Indonesia. *KnE Social Sciences*, 2022(2), 1-19. <https://doi.org/10.18502/kss.v7i5.10536>
- Samuelsson, I. P., Wagner, J. T., & Eriksen Ødegaard, E. (2020). The Coronavirus Pandemic and Lessons Learned in Preschools in Norway, Sweden and the United States: OMEP Policy Forum. *International Journal of Early Childhood*, 52(2), 129-144. <https://doi.org/10.1007/s13158-020-00267-3>
- Schling, M., & Winters, P. (2018). Computer-Assisted Instruction for Child Development: Evidence from an Educational Programme in Rural Zambia. *Journal of Development Studies*, 54(7), 1121-1136. <https://doi.org/10.1080/00220388.2017.1366454>
- Sharma, A., & Kumar, P. (2018). A review of factors surrounding the air pollution exposure to in-pram babies and mitigation strategies. *Environment International*, 120, 262-278. <https://doi.org/10.1016/j.envint.2018.07.038>
- Sharma, A., & Kumar, P. (2020). Quantification of air pollution exposure to in-pram babies and mitigation strategies. *Environment International*, 139. <https://doi.org/10.1016/j.envint.2020.105671>
- Sholihah, I., Rahayu, M., & Suryanto. (2020). Comparison of Tabletop Disaster Exercise (Tde) and Educational Film on Disaster Preparedness Among Indonesian Vocational High School Student: a Quasi-Experimental Study. *Malaysian Journal of Nursing*, 12(2), 51-57. <https://doi.org/10.31674/mjn.2020.v12i02.008>
- Sofyana, H., Ibrahim, K., Afriandi, I., & Herawati, E. (2024). The implementation of disaster preparedness training integration model based on Public Health Nursing (ILATGANA-PHN) to increase community capacity in natural disaster-prone areas. *BMC Nursing*, 23(1), 1-18. <https://doi.org/10.1186/s12912-024-01755-w>
- Syam, B. M., Sutisna, S., Kurniadi, A., & Kusuma. (2023). The role of digital literacy capability of Babinsa Kodim 0705/Magelang to improve community preparedness for natural disasters. *E3S Web of Conferences*, 464, 1-7. <https://doi.org/10.1051/e3sconf/20234640001>
- Tam, G., Chan, E. Y. Y., & Liu, S. (2019). Planning of a health emergency disaster risk management programme for a chinese ethnic minority community. *International Journal of Environmental Research and Public Health*, 16(6), 1-12. <https://doi.org/10.3390/ijerph16061046>
- Tang, J. S., & Feng, J. Y. (2018). Residents' disaster preparedness after the meinong taiwan earthquake: A test of protection motivation theory. *International Journal of Environmental Research and Public Health*, 15(7), 1-12. <https://doi.org/10.3390/ijerph15071434>
- Thygesen, M., Engemann, K., Holst, G. J., Hansen, B., Geels, C., Brandt, J., Pedersen, C. B., & Dalsgaard, S. (2020). The association between residential green space in childhood and development of attention deficit hyperactivity disorder: A population-based cohort study. *Environmental Health Perspectives*, 128(12), 1-9. <https://doi.org/10.1289/EHP6729>
- Tracy, M., Salo, M., & Appleton, A. A. (2018). The mitigating effects of maternal social support and paternal involvement on the intergenerational transmission of violence. *Child Abuse and Neglect*, 78, 46-59. <https://doi.org/10.1016/j.chiabu.2017.09.023>
- Uhm, D., Jung, G., Yun, Y., Lee, Y., & Lim, C. (2019). Factors Affecting the Disaster Response Competency of Emergency Medical Technicians in South Korea. *Asian Nursing Research*, 13(4), 264-269. <https://doi.org/10.1016/j.anr.2019.09.005>
- White-Lewis, S., Beach, E., & Zegers, C. (2021). Improved Knowledge of Disaster Preparedness in Underrepresented Secondary Students: A Quasi-Experimental Study. *Journal of School Health*, 91(6), 490-498. <https://doi.org/10.1111/josh.13023>
- Wijaya, O., & Putri, W. G. B. (2024). Disaster preparedness for tourist village organizers in disaster prone area of Merapi Yogyakarta. *Periodicals of Occupational Safety and Health*, 2(2), 130-137. <https://doi.org/10.12928/posh.v2i2.9569>

- Williams, S. N., Armitage, C. J., Tampe, T., & Dienes, K. (2020). Public perceptions and experiences of social distancing and social isolation during the COVID-19 pandemic: A UK-based focus group study. *BMJ Open*, 10(7), 1-8. <https://doi.org/10.1136/bmjopen-2020-039334>
- Winarni, E. W., & Purwandari, E. P. (2018). Disaster Risk Reduction for Earthquake Using Mobile Learning Application to Improve the Students Understanding in Elementary School. *Mediterranean Journal of Social Sciences*, 9(2), 205-214. <https://doi.org/10.2478/mjss-2018-0040>
- Wirawan, R. R., Hasibuan, H. S., Tambunan, R. P., & Lautetu, L. M. (2024). Assessing Vulnerability and Social Capital for Disaster Mitigation and Recovery in Palu City, Indonesia. *International Journal of Sustainable Development and Planning*, 19(4), 1559-1567. <https://doi.org/10.18280/ijstdp.190432>
- Yoshikawa, H., Wuermli, A. J., Britto, P. R., Dreyer, B., Leckman, J. F., Lye, S. J., Ponguta, L. A., Richter, L. M., & Stein, A. (2020). Effects of the Global COVID-19 Pandemic on Early Childhood Development: Short- and Long-Term Risks and Mitigating Program and Policy Actions. *The Journal of Pediatrics*. <https://doi.org/10.1016/j.jpeds.2020.05.020>