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Examining Individual and Environmental Factors Associated with Emergency Preparedness Among People with Disabilities in China

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Abstract: *Background*: People with disabilities, particularly those from developing countries, often fare worse during disasters, pandemics, and other emergencies. China is located in the most disaster-prone region in the world. However, no study has examined emergency evacuation planning among people with disabilities in China. The latest literature on emergency preparedness tends to focus on individual-level factors such as demographic characteristics, self-efficacy, and disability status. A focus on individual-level factors overlooks the importance of environmental influences on disaster preparation. *Objective*: This paper explores how individual and environmental factors are associated with emergency preparedness among people with disabilities in China. *Methods*: Two hundred and forty-eight people with various disabilities filled out an online cross-sectional survey on the level of emergency preparedness among people with disabilities in China. We conducted a hierarchical logistic regression to examine which environmental-level factors are associated with emergency preparedness after controlling for individual-level factors. *Results*: The results show that when entering only individual-level factors, self-efficacy in evacuation and previous emergency experiences are significant factors associated with being prepared. After including the environmental-level factors, self-efficacy remains significant. People with a physical disability and those from Hubei province, when compared with respondents from the rest of China, are less likely to be prepared. Another protective factor other than self-efficacy is being part of an online disability peer-support group. *Conclusions*: When designing risk management interventions, public health officials should consider both individual- and environmental-level factors. Using an online peer-support community may be considered an innovative component when designing these interventions.

Keywords: emergency preparedness; disasters; disability; China

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1. Introduction

Although China ratified the Convention on the Rights of Persons with Disabilities (CRPD) in 2008, the most recent state party compliance review in 2022 by the United Nations (UN) Committee on the Rights of Persons with Disabilities highlighted the urgent need to address the specific needs of persons with disabilities in disaster risk reduction plans and strategies. The review also urged China to include people with disabilities in the decision-making process involved in developing these plans and strategies [1].

The COVID-19 pandemic triggered global attention toward the health inequity facing people with disabilities during disasters, highlighting systemic flaws in public health and

emergency preparedness policies [2]. Specifically, in China, the disabled community was frequently overlooked, excluded, and subjected to discrimination during the pandemic [3–5]. With the end of the global pandemic, public health officials and civil society must reflect on how to address the glaring inequities that people with disabilities face to reduce similar disparities in future crises. Household emergency planning is one of the most efficient ways to mediate the consequences of disasters. Emergencies refer to situations that pose immediate risks to health, life, and property, including natural disasters, pandemics, and other crises requiring urgent responses and preparedness. Emergency preparedness, in turn, is defined as proactive actions taken to mitigate the impact of emergencies, such as planning for an evacuation, maintaining emergency supplies, and establishing communication plans. A good understanding of household emergency planning can help inform the development and implementation of public health interventions. Yet little is known about whether or not people with disabilities have these plans in place and what factors shape their preparedness. To examine the factors influencing emergency preparedness among people with disabilities in China, we conducted an online survey to explore both individual and environmental factors shaping preparedness behaviors, including, but not limited to, evacuation planning.

1.1. Context of Emergency Planning and Disaster Risk Reduction in China

Preparing for emergencies has become increasingly critical due to the growing frequency and intensity of natural disasters, which pose significant risks to public health and safety [6–8]. Effective emergency preparation can mitigate the severe consequences of disasters [9,10]. Common emergency preparation activities include improving readiness by planning various activities and preparing resources for an effective response [11,12]. Evidence from a systematic review and other studies highlight that individual factors such as age, education, income, trust in the government, and prior exposure to disasters are associated with higher preparedness levels [13–16].

However, preparedness initiatives often fail to account for the specific needs of people with disabilities, leaving them more vulnerable during disasters due to their systemic neglect and exclusion from planning, design, and implementation processes [17,18]. Recognizing these disparities, international organizations such as the UN have published important guidelines to ensure that humanitarian actors take action to identify and respond to the needs and rights of people with disabilities [19]. These efforts are grounded in international legal standards, such as the UN CRPD, which establishes the obligation to protect and promote the rights of persons with disabilities in all aspects of disaster planning and response [20].

In China, the primary legislative framework for emergency management is the Emergency Response Law of the People's Republic of China, which is complemented by other laws, such as the Law on Prevention and Control of Desertification, the Meteorology Law, and the Law on Earthquake Disaster Prevention and Mitigation. While these laws provide guidance on managing various natural disasters, they largely exclude provisions explicitly addressing the needs of people with disabilities in emergencies. Disability-related content in these laws is mostly limited to compensation for workers who become disabled during rescue operations, with no clear guidelines on ensuring the safe evacuation and protection of people with disabilities in emergencies. Similarly, a search of the Ministry of Emergency Management of China's website, which serves as the executive branch responsible for disaster management, reveals minimal focus on disability, with the content primarily centered on welfare policies for disabled firefighters and rescue personnel.

The COVID-19 pandemic highlighted the disproportionate impact on people with disabilities in China. In response, the China Disabled Persons' Federation (CDPF) issued

the Guidelines for the Protection of Persons with Disabilities During Major Infectious Disease Outbreaks (Trial) in September 2020, nine months after the start of the pandemic. Subsequently, on 30 October 2020, the CDPF, in collaboration with multiple national ministries, released the Guidelines for Social Support Services for the Protection of Persons with Disabilities During Major Infectious Disease Outbreaks (Trial). The former categorizes protective measures into "home quarantine", "community protection and prevention", and "prevention provided by disability service organizations". The latter emphasizes services related to "accessibility", "assistive device provision", "home-based care services", "psychological intervention and support", and "rehabilitation services". Despite these efforts, the guidelines were implemented in a top–down manner and ed input from people with disabilities and legal enforceability, serving more as recommendations than enforceable policies.

In the absence of adequate governmental action, civil society organizations have emerged as critical players in addressing the needs of people with disabilities during emergencies. For instance, during the COVID-19 pandemic, the tragic death of Yan Cheng, a teenage boy with cerebral palsy, after his sole caregiver was quarantined, spurred collective action within the disabled community. Deaf leaders, online disability-support group leaders, and other advocates formed the Disability Volunteer Network, which provided care and disseminated vital information. Beyond direct support, the network also advocated for policies such as rent subsidies for disabled business owners [4,20]. This grassroots response underscores the pivotal role of civil society in filling the gaps left by governmental policies and actions, highlighting the need for a more inclusive and participatory approach to emergency preparedness.

Although these legal and policy frameworks represent progress, many institutions continue to fail to adequately address the specific needs of people with disabilities in the planning, design, and implementation of emergency preparedness initiatives. This oversight has deepened their vulnerability, particularly in countries like China, where barriers to education, accessible infrastructure, and economic stability persist [4,5,21]. The COVID-19 pandemic starkly illustrated these inequities, as the disabled community in China was overlooked, excluded, and even discriminated against during the crisis [3,20].

Addressing these systemic gaps requires a deeper understanding of how people with disabilities navigate emergency preparedness on an individual level. This study focuses on identifying the barriers and facilitators shaping their preparedness, particularly in the context of China, where disability-related disparities are pronounced. By examining these factors, the study aims to contribute to developing interventions and policies that prioritize accessibility and inclusivity, ultimately enhancing disaster preparedness for individuals with disabilities.

1.2. Theoretical Framework: The Ecological Enactive Model of Disability

The ecological enactive model of disability offers a nuanced perspective on how individuals' bodily experiences interact with their lived environments, including the social, physical, and cultural dimensions. This model shifts away from static views of disability, positing that disability is not solely a characteristic of an individual or a limitation imposed by the environment. Instead, it emerges dynamically through the interplay between a person and their surroundings [22].

This perspective aligns with the principles of the CRPD, which emphasize the inclusion of persons with disabilities in all aspects of decision-making and planning. The ecological enactive model broadens this understanding by highlighting how barriers and facilitators in the environment shape the experiences of individuals with disabilities, particularly in contexts of crisis or disaster. For example, emergency preparedness, an inherently

interactive process, can be hindered or supported by the accessibility of physical infrastructure, the inclusiveness of policy frameworks, and cultural attitudes of the surrounding communities.

By employing this model, the present study explores emergency preparedness as a co-constructed phenomenon shaped by both individual characteristics (e.g., disability type, self-efficacy) and environmental factors (e.g., accessibility, policy frameworks, community support). Environmental factors refer to both physical and social elements that influence an individual's ability to prepare for emergencies. Physical environmental factors may include the accessibility of infrastructure and evacuation routes, while social environmental factors encompass social and community networks and policy frameworks. This theoretical lens underscores the importance of considering both personal and systemic factors when evaluating emergency preparedness, offering a holistic view of the challenges faced by people with disabilities in China.

1.3. Literature Review

Factors Associated with Emergency Preparedness

People with disabilities have a higher risk of being adversely affected by disasters than people without disabilities [23,24]. Despite the consequences people with disabilities face, they are less prepared compared with those without disabilities [23]. A failure to include people with disabilities in the assessment, design, and implementation of emergency plan leads to series consequences, one of which is that people with disabilities are not as prepared compared with the non-disabled population [23]. Like the general population, demographic factors often affect people with disabilities' level of emergency preparedness. A study using national data suggests that being female and nonwhite, having less education and less income, and living in urban areas increase the likelihood of unpreparedness among people with disabilities in the US [25]. The intersectionality of race, gender, disability, and lower socioeconomic status further exacerbates the vulnerability of people with disabilities from diverse backgrounds.

Within the disability population, disability type, level of impairment severity, and health status are closely associated with variations in emergency preparedness [11,23]. Individuals with more support needs may have additional barriers to increasing their emergency preparedness compared with those with fewer support needs [25]. Different types of impairments may result in different challenges. For example, persons with activity limitations are less likely to be prepared for an emergency [23], while people who are visually impaired may avoid help-seeking during emergencies or accidents due to fear or shame that they are not independent enough [26]. Even those with the same type of disability may present different needs during emergencies, since their needs in daily lives and under crisis may differ from those of other people [11].

Self-efficacy of people with disabilities in emergency preparedness has also attracted scholarly attention in recent years. Research indicates that self-efficacy and the perception of threat motivate people with physical impairments to improve their preparedness [15]. Another study posits that although people with poor health are less likely to be prepared for disasters, self-efficacy significantly mediates the relationship between health and emergency preparedness [27].

Despite the importance of environmental-level factors in emergency preparedness [28], few studies take environmental-level factors into consideration. Adams et al. included community factors in their analysis of emergency preparedness [27]. Nevertheless, they operationalized community advantage using a general public-health index, which does not directly address issues pertinent to people with disabilities, such as the level of accessibility of their living environment.

Another social-environmental aspect is social media use during disasters [29]. A study conducted in the US shows that social media use among people with disabilities is high; however, trust in the information's validity on social media during emergencies is lower than that on televisions [30]. Despite the distrust of social media during emergencies among people with disabilities, emerging literature has documented the critical role of online communities in empowering people with disabilities [31–35]. Additionally, more attention has been paid to how social media serves as a tool during emergencies [36]. Discussions focusing on how the use of social media affects emergency preparedness among people with disabilities are needed.

1.4. Lack of Knowledge of Emergency Preparedness Among People with Disabilities in China

What are largely absent in the literature are studies on the emergency preparedness of people with disabilities in developing countries, especially since these countries often suffer greater acute consequences from natural disasters compared with more developed countries [37–39]. China is located in the most disaster-prone region globally [40]. Despite its disaster-prone location, China's household preparedness is generally low due to negative attitudes toward preparedness as well as a lack of motivation and knowledge [41]. However, to the best of our knowledge, there are no empirical studies on emergency preparedness among people with disabilities in China, which has the largest population of people with disabilities (about 85 million) among all the countries and regions in the world [42]. In China, three-quarters of people with disabilities live in rural areas, where buildings are often inaccessible. As Campbell and Uren found in their ethnography, despite the positive legislative changes for people with disabilities, there have been few changes in the built environment, and people with disabilities are still largely invisible in public spaces [42]. Furthermore, 43.29% of the disability population of age of 15 and above are illiterate, and most people with disabilities live in poverty [43]. Despite these disadvantages that may complicate their level of preparedness, people with disabilities in China are often excluded from discussions on emergency preparedness and response [5].

Improving personal emergency preparedness knowledge among people with disabilities in China can strengthen efforts to reduce the elevated risk this population may face during emergencies due to systemic and environmental barriers. Therefore, this study sought to (1) examine the associations of the individual-level factors (demographic, disability and health, and self-efficacy) with personal preparedness among people with disabilities in China, and to (2) determine what environmental-level factors are associated with personal emergency preparedness after controlling for the individual-level factors.

2. Methods

2.1. Design and Content of the Survey

We collected online cross-sectional survey data to investigate emergency preparedness among people with disabilities in China. An online survey method was chosen to ensure participants' safety, compliance with public-health guidelines, and broader accessibility during the COVID-19 pandemic. Survey questions were developed with input from a grassroots disability organization, Minority Voice, led by people with various types of disabilities. The survey contained questions on individual-level and environmental-level factors that may influence emergency preparedness among people with disabilities. These independent variables (DVs) include individual-level factors (i.e., demographics, health and disability, self-efficacy) and environmental-level factors (i.e., social and environmental factors). A detailed list of variables is provided under the "measures" section. We uploaded the survey (Supplementary File S1) onto the Wenjuanxing platform (www.wjx.cn (accessed on 3 November 2020)), one of China's largest online survey platforms. We then pilot-tested

the questionnaire with five people with various types of disabilities. The average time to complete the survey among the five pilot-testers was two minutes. We further modified the questions after these pilot tests to ensure accessibility.

2.2. Positionality Statements

The first author identifies as a Chinese woman with an invisible neurodevelopmental disorder. Holding a PhD in disability studies, she brings both personal and professional insights into the lived experiences of individuals with disabilities in China. As the co-founder of one of the largest online peer-support groups for people with disabilities in China, she was the primary point of contact for data collection. Her positionality informed the study's design and ensured cultural and contextual relevance throughout the research process. The second author, a law professor in China, identifies as a Chinese man. His professional expertise provided critical insights into the legal and policy frameworks relevant to disability rights and emergency preparedness in China. His contributions enhanced the study's contextual grounding, particularly in examining systemic barriers and institutional dynamics affecting people with disabilities. The third author, a disability studies professor in the United States, identifies as a Taiwanese able-bodied woman. Her academic expertise provided a global perspective on disability studies, enriching the theoretical framing and analysis of the findings. Although not directly involved in data collection, her background ensured a nuanced understanding of disability issues and contributed to a broader comparative interpretation of the study's implications.

2.3. Data Collection

The survey was promoted on Chinese social media and disability-related online groups using a snowball sampling strategy for this hard-to-reach and largely invisible population [44]. The online survey was activated from 3 March 2020 through to 31 March 2020. The inclusion criteria were as follows: (1) being an adult with a disability or an adult caregiver of children with disabilities; (2) residing in mainland China. We evaluated participants' eligibility based on their residence and disability status as reported in the survey. After data cleaning, the study's final sample included 248 people with various disabilities. The study was deemed non-human subject research and was exempted by the University of Illinois Chicago's Institutional Review Board.

It is important to acknowledge that persons with disabilities represent a diverse group, encompassing a wide range of experiences. This study aggregated persons with disabilities into a single group, a methodological approach commonly employed in previous research to identify overarching patterns and shared barriers across diverse disability groups. While this method provides a broad understanding of systemic issues, it does not allow for the exploration of subgroup-specific differences, which could be addressed in future studies.

2.4. Measures

2.4.1. Outcome Variable

Emergency preparedness. One of the key elements in emergency preparedness is the evacuation plan [45]. For the purposes of this study, emergency preparedness was operationalized as having an emergency evacuation plan, which is one of several important components of preparedness. This definition, while narrower than broader conceptualizations that encompass multifactorial elements such as emergency supplies, communication strategies, and shelter planning, was chosen for two key reasons. First, it reflects a specific and actionable aspect of preparedness that is directly relevant to personal safety during emergencies. Second, among all potential variables related to emergency preparedness, data on emergency evacuation plans was the most complete and intact, making it the most reliable measure for analysis in this study.

In the survey, we asked, "Do you have an emergency evacuation plan?" with four possible responses: (1) No, I have never given this prior thought; (2) No, I have thought about making an evacuation plan but do not have one; (3) Yes, I have a general plan; and (4) Yes, I have a detailed plan. We then recoded the variable into a dichotomous variable. Responses "3" and "4" were recoded as "1", and responses "1" and "2" were recoded as "0".

2.4.2. Independent Variables

The selection of independent variables was informed by the ecological enactive model of disability, which emphasizes the dynamic interaction between individuals and their environments. In line with the ecological enactive model, we approach emergency planning as being shaped by both individual characteristics (such as disability type, health status, and self-efficacy) and environmental factors (e.g., accessibility of living spaces and social context).

2.4.3. Individual-Level Factors

Demographic characteristics. Demographic characteristics included gender, age, education, and employment status. The education variable had five responses: (1) elementary, (2) middle school, (3) high school, (4) college and above, and (5) other. Education beyond middle school is not part of China's nine-year compulsory education. The 15 participants who selected "other" did not specify the details about their education level and were excluded from the analysis. Education levels were treated as a continuous variable and were coded from 1 = "elementary" to 4 = "college and above". The original employment status variable had five categories: (1) not interested; (2) looking for a job; (3) employed part-time; (4) employed full time; and (5) I am a student. Those who indicated that they are "a student", "not interested", or "looking for a job" were recoded as "0" = "not employed". Meanwhile, those who answered "part-time employed" and "full-time employed" were recoded as "1" = "employed".

Disability and Health. Perceived health status, disability type, level of independent living, disability's impact on daily living, and the use of assistive technology were included in our survey. Perceived health was measured using a five-point Likert scale ranging from "1" = "very unhealthy" to "5" = "very healthy". For disability type, we provided multiple options in addition to an open-ended "other" option. These options included physical disability, mental illness, visual impairment or blindness, hearing impairment or deafness, rare diseases, chronic conditions, and developmental disabilities. We acknowledge that disability experiences are complex, encompassing both individual- and environmental-level variables. For the current study, we operationalized disability type as an individual-level factor. The level of independent living was measured using a four-point Likert scale ranging from "1" = "I need assistance in all activities of daily living" to "4" = "I am completely independent". Disability's impact on daily living was measured using a five-point Likert scale ranging from "1" = "no impact" to "5" = "very much impacted".

Self-efficacy in emergency preparedness. Two variables on self-efficacy in emergency preparedness included having prior experience of facing an emergency and having confidence that one could evacuate during an emergency.

2.4.4. Environmental-Level Factors

For the environmental-level factors, we assessed both the physical environment and the social environment. To assess the physical environment, we asked, "How would you describe accessibility in the city or the region you live in?" Participants could choose from the following responses: (1) completely accessible to me; (2) there are some accessible infrastructures, but I still need assistance accessing places; (3) there are rarely any accessible

places, I need help almost anywhere I go; and (4) there are no accessible places; I do not leave my home. Additionally, we categorized the city that the participant came from into a first-tier city (coded as "1") and a non-first-tier city (coded as "0") based on a recent evaluation of China's city development [46]. The media group evaluated cities based on a few criteria, such as economic development and infrastructure. First-tier cities include Beijing, Shanghai, and 17 other cities. First-tier cities tend to have newer, accessible infrastructure such as elevators, tactile pavements, and ramps. We added this variable to provide objective measures of accessibility in addition to the self-reported accessibility.

To assess the social environment, we included "being part of an online disability community" and "being from Hubei province". First, we asked whether the individual is part of an online disability peer-support group to determine whether the participant was socially connected to an online peer-support disability community. We collected data after the COVID-19 pandemic hit the hardest in Wuhan, Hubei province, in China. Therefore, we included a variable on whether the participant is from Hubei province to adjust for the potential social–emotional influence of the pandemic.

2.5. Data Analysis

The raw data collected were first exported as an Excel file. Data analysis was performed using IBM SPSS Statistics for Windows, version 25 [47].To identify potential confounders, we performed chi-square tests to compare group differences between those who had an evacuation plan and those who did not. Using a *p*-value cut-off point of 0.25, significant variables were selected for the hierarchical logistic regression model [48,49]. As a result, both the education and the first-tier city variables failed to meet the cut-off criteria. Based on our literature review, since education plays a significant role in emergency preparedness both in the general population and among people with disabilities, we included "education" in the model. To examine collinearity, we conducted Pearson correlation tests among independent variables. Correlation coefficients among independent variables of $|r| > 0.7$ were used as a threshold [50]. None of the correlation coefficients exceeded this cut-off.

To examine the associated factors for whether or not a person has an emergency evacuation plan, we conducted a hierarchical logistic regression using the block-entry method [51]. All individual-level factors were entered into Block One as Model I. Model II consisted of both individual-level and environmental-level factors. For Model II, the independent variables included demographic characteristics (age, gender, education, and employment), disability and health (perceived health status, having a physical disability, level of independent living, disability's impact on daily living, and use of assistive technology), and self-efficacy (previous emergency experiences and confidence in evacuating during emergencies) as the individual-level factors. The perceived accessibility of their physical environment, being part of an online disability peer-support group and being from Hubei province were included as the environmental-level factors. We used a *p* value of 0.05 as the significance level for the logistic regression analyses.

3. Results

3.1. Demographics

We collected 342 surveys. All the respondents reported residing in mainland China and having a disability. Figure 1 shows the number of individuals at each stage of data cleaning. Our final sample consisted of 248 participants. There were no missing data points for the variables of interest. Detailed demographic characteristics of the sample participants are presented in Table 1. Overall, the majority of the sample were male (56%), had a high school degree or above (66.7%), resided in a non-first-tier city (66.9%), and had a physical disability (63.3%). Over one-third (35.9%) of the participants had full-time jobs,

while over half (52.4%) were not employed. Among the sample participants, only 8.1% of the participants reported having a detailed evacuation plan. In comparison, nearly half (49.6%) indicated that they have thought about having an emergency evacuation plan but do not actually have any actionable plan.

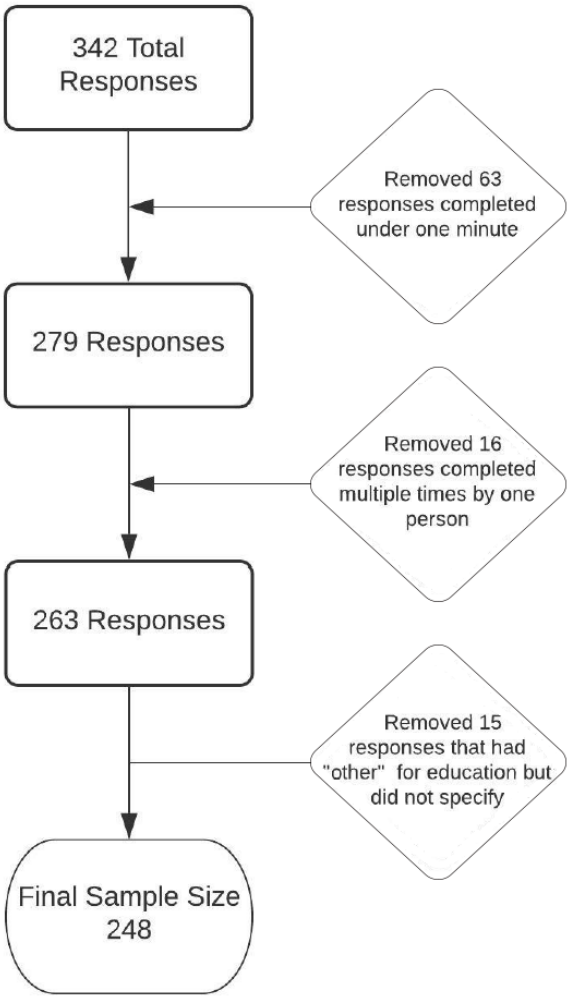

Figure 1. Process of data cleaning.

Table 1. Demographics (*N* = 248).

Variable Name	***N* (%)**
Gender	
Male	139 (56%)
Female	109 (44%)
Age	31.6 (MIN 6, MAX 63)
Education	
Elementary school	33 (13.3%)
Middle school	57 (23%)
High school	55 (22.2%)
College or above	103 (41.5%)
Employment	
Student	29 (11.7%)
Full time	89 (35.9%)
Part time	29 (11.7%)
Looking for jobs	66 (26.6%)
Not interested	35 (14.1%)

Table 1. *Cont.*

Variable Name	*N* (%)
Disability Type	
Physical disability	157 (63.3%)
Mental illness	15 (6%)
Visual impairment or blind	37 (14.9%)
Hearing impairment or deaf	45 (18.1%)
Rare disease	31 (12.5%)
Chronic condition	20 (8.1%)
Developmental disabilities	32 (12.8%)
Emergency Evacuation Plan	
Yes, have a detailed plan	20 (8.1%)
Yes, have a draft plan	49 (19.8%)
No, thought about it, no plan	123 (49.6%)
No, never thought about this	56 (22.6%)

The characteristics of participants who had an emergency evacuation plan versus those who did not have one are shown in Table 2. Compared with those without an emergency evacuation plan, those with a plan were more likely to be male, younger, healthier, and employed, have a disability other than a physical disability, need less support for daily living, use some sort of assistive technology, not be from Hubei province, and be part of an online disability peer-support group. Compared with those who reported that their city was inaccessible to them, those who reported that their city was accessible to them were more likely to have an evacuation plan. However, this difference was only marginally significant ($p = 0.085$).

Table 2. Participant characteristics based on whether they had an evacuation plan or not.

	Without Evac Plan	With Evac Plan	
	(*n* = 180)	(*n* = 68)	
	% (*n*) or Mean (SD)		χ^2 or *t* Test
INDIVIDUAL-LEVEL FACTORS			
Demographic Factors			
Gender			3.90 *
Male	52.2 (94)	66.18 (45)	
Female	47.8 (86)	33.8 (23)	
Age	32.6 (11.30)	28.8 (9.72)	−2.64 *
Employed	43.8 (79)	57.4 (39)	3.59 †
Education	2.9 (1.1)	3.1 (1)	1.65
Disability and Health			
Perceived health	3.18 (1.78)	3.9 (1)	4.65 †
Physical disability	71.1 (128)	42.6 (29)	17.21 ***
Disability impact on daily living	3.8 (1.2)	3.3 (1.35)	−2.90 †
Use assistive technology	35.6 (64)	60.3 (41)	12.37 ***
Independent living	2.8 (1)	3.2 (0.78)	3.22 ***
Self-Efficacy			
Past emergency experiences	17.8 (32)	42.6 (29)	16.46 ***
Confident can evacuate	27.2 (49)	79.4 (54)	55.36 ***

Table 2. *Cont.*

	Without Evac Plan	With Evac Plan	
	(*n* = 180)	(*n* = 68)	
	% (*n*) or Mean (SD)		χ^2 or *t* Test
ENVIRONMENTAL FACTORS			
My city is accessible	66.7 (120)	29.4 (53)	2.97 †
From first-tier city	34.4 (62)	29.4 (20)	0.57
From Hubei	22.2 (40)	5.8 (4)	9.03 **
Online disability peer support	60.6 (109)	79.4 (54)	7.79 **

† $p < 0.25$; * $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$. Note: age, education, perceived health, disability impact on daily living, and independent living were treated as continuous variables, while the rest were categorical variables.

3.2. Factors Associated with Personal Emergency Preparedness

Table 3 displays the summary of the hierarchical logistic regression analysis. Model I only included the individual-level factors (demographic, disability and health, and self-efficacy). Only self-efficacy factors were significantly associated with having an emergency evacuation plan. Individuals with disabilities who had experienced an emergency were almost three times (OR = 2.76; 95% CI 1.27–5.98) more likely to have an evacuation plan than those who did not have prior experience of an emergency. Individuals with disabilities that felt confident that they could evacuate during an emergency were five times (OR = 5.62; 95% CI 2.51–12.58) more likely to have an evacuation plan than those who did not feel confident about evacuating during an emergency. The omnibus test of the model coefficients indicates that Model I is significant ($\chi^2 = 74.11$; $p < 0.001$; −2 log likelihood = 209.37).

Table 3. Summary of the hierarchical logistic regression analysis: factors associated with having an emergency evacuation plan.

Variable Name	Emergency Evacuation Plan			
	OR	95% CI	OR	95% CI
INDIVIDUAL FACTORS				
Demographic				
Gender (male v.s. female)	1.61	(0.80–3.25)	1.62	(0.78–3.34)
Age	0.97	(0.93–1.01)	0.98	(0.94–1.02)
Employed	0.89	(0.43–1.83)	0.82	(0.39–1.72)
Education	0.89	(0.62–1.31)	0.86	(0.58–1.28)
Disability and Health				
Perceived health	1.18	(0.83–1.69)	1.18	(0.82–1.70)
Physical disability	0.50	(0.25–1.02)	0.43	(0.21–0.91 *)
Disability impact on daily living	0.86	(0.64–1.15)	0.83	(0.61–1.12)
Use assistive technology	0.96	(0.47–1.96)	0.97	(0.47–2.02)
Independent living	1.22	(0.78–1.91)	1.28	(0.79–2.05)
Self-Efficacy				
Past emergency experiences	2.76	(1.27–5.98) **	2.37	(0.98–5.09)
Confident I can evacuate	5.62	(2.51–12.58) ***	5.28	(2.29–12.19) ***

Table 3. *Cont.*

Variable Name	Emergency Evacuation Plan			
	OR	**95% CI**	**OR**	**95% CI**
ENVIRONMENTAL FACTORS				
My city is accessible			1.00	(0.60–1.67)
From Hubei			0.21	(0.06–0.79) *
Online disability peer support			2.37	(1.0–5.62) *
−2 log likelihood	209.37		199.38	
Nagelkerke R square	0.38		0.42	

* $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$.

After entering the environmental-level factors into Model II, the association between self-efficacy and the DVs remain (OR = 5.28, 95% CI 2.29–12.19). However, the association between past experiences and the DVs is no longer significant ($p = 0.055$). Two environmental-level factors, being part of an online peer-support group (OR = 2.37; 95% CI 1–5.62) and being from Hubei (OR = 0.22; 95% CI 0.06–0.79), were significantly associated with having an emergency evacuation plan. Having a physical disability was negatively associated with emergency preparedness (OR = 0.43; 95% CI 0.21–0.91). The omnibus test of the model coefficients indicates that the block of environmental-level factors is significant ($\chi^2 = 10$, $p < 0.05$). Overall, Model II, which includes both individual-level and environmental-level factors, is significant ($\chi^2 = 84.1$; $p < 0.001$; −2 log likelihood = 199.38). The likelihood ratio test also demonstrates that Model II is better than Model I (Δ−2 log likelihood = 9.99; $p < 0.01$).

4. Discussion

The current study examines factors associated with emergency preparedness among people with disabilities in China.

Only 8% of our sample of people with disabilities reported having a detailed plan.

People with disabilities are generally excluded from the planning and implementation of emergency evacuation and quarantine measures [5]. The lack of people with disabilities having an emergency plan reflects the broader issue of systemic barriers, including inadequate representation in policy-making, inaccessible communication systems, and insufficient resource allocation, which undermine the confidence of people with disabilities to engage in disaster planning. Without assurance that their needs will be prioritized, this mistrust can push them even further away from engaging in future planning efforts.

We performed hierarchical logistic regression to tease out how individual-level and environmental-level factors are associated with emergency preparedness. After controlling for individual-level and environmental-level confounders, we found that being from Hubei province while having a physical disability is significantly associated with a lack of emergency preparedness. Meanwhile, being part of an online peer-support group and self-efficacy are significantly associated with being prepared for an emergency among people with disabilities in China.

When we entered only the individual-level factors, the findings indicate that having past experiences with emergencies and feeling confident that one is able to evacuate are significantly associated with having an emergency evacuation plan. This finding is consistent with previous findings that self-efficacy plays a positive role in emergency preparedness [15,27]. It is unclear whether self-efficacy motivates people to be more prepared or whether having an emergency evacuation plan makes one feel more confident

about one's preparedness. Future studies may explore the potential causal relationship between self-efficacy and emergency preparedness. Having prior experience dealing with an emergency may lead to a higher level of perceived threat, therefore motivating people with disabilities to be more prepared. This aligns with Marceron and Rohrbeck's finding that perceived threat, along with self-efficacy, motivates people to take greater precautions in order to minimize an emergency's consequences [15]. Within Model I, demographic, disability, and health factors were not significantly associated with emergency preparedness.

We found that the environmental-level factors contributed significantly to Model II, where both individual-level and environmental-level factors were entered. The individual-level factors that remained significantly associated with emergency preparedness were "having a physical disability" and "confidence in evacuation". Those with physical disabilities were significantly less likely to have a plan, highlighting systemic negligence in addressing accessibility needs. This finding aligns with previous studies that identify mobility limitations as barriers, which are compounded by a lack of accessible infrastructure, poorly designed evacuation routes, and limited enforcement of accessibility standards, even in urban areas [42].

Two environmental-level factors emerged in Model II as being significantly associated with the outcome variable. People from Hubei province are less likely to have an evacuation plan. Participants who are part of a disability online peer-support group are more likely to have an evacuation plan. At the time of our data collection, Hubei province had no additional COVID-19 cases. However, many people from Hubei province were discriminated against, especially migrant workers from Hubei working in other regions of China [52]. The lack of emergency preparedness among people with disabilities from Hubei highlights systemic failures in addressing both the immediate and long-term impacts of discrimination and stress. These experiences underscore the need for inclusive policies that prioritize equitable support and address the psychological impacts of exclusion during crises. Although few research studies have explored the relationship between stress and emergency preparedness, the literature on future orientation may shed light on this connection. Studies have documented how perceived discrimination [53] and acute stress [54] negatively impact future orientation. As preparing for emergencies is in line with future orientation, it is possible that people with disabilities who are stressed and discriminated against do not have emergency planning as one of their priorities. More studies are needed on how stress and future orientation are related to emergency preparedness.

Another significant environmental-level factor is being part of an online disability peer-support group. Online peer-support groups provide a source of information, a space for socialization, and, importantly, a sense of belonging for people with disabilities [29]. The use of social media for people with disabilities in China may provide unique support when faced with an inaccessible physical environment and social isolation [33,34]. Over the past decade, a growing body of research has examined how social media has shaped the lives of people with disabilities in China. For example, one survey study revealed that social media messenger platforms such as WeChat and QQ were the most favorable tools for exchanging and receiving information among people with disabilities [55]. Another recent study highlighted how social media platforms are being used to help develop a positive disability identity among women with disabilities in China [3].

Our finding of the association between online peer-support group participation further highlights the potential of disseminating emergency preparation information through such platforms. However, it is unclear whether being part of an online group makes one more informed about emergency preparedness or whether specific characteristics of people who actively join a peer-support group lead to increased preparedness. Future studies should

further explore the causal relationship between being part of an online peer-support group and emergency preparedness.

Our findings on the significant association between environmental-level factors and emergency preparedness among people with disabilities in China affirm the importance of considering social-environmental influences on emergency preparedness. Looking at social-environmental barriers helps to shift the traditional medical view of disability to one that recognizes the disabling impact of systemic shortcomings, such as inaccessible infrastructure and insufficient social support. Policy-makers must prioritize these barriers in disaster planning to ensure equitable and inclusive preparedness for all. Future studies on emergency preparedness among people with disabilities may consider adopting environmental-level factors to further expand our knowledge of how physical and social environmental factors influence or mediate emergency preparedness.

4.1. Limitations

Some limitations should be taken into consideration. First, our sample could be biased and not representative, since the participants were solely recruited online. Recruiting online tends to preclude those who do not have internet access from participating [56]. Additionally, online surveys pose challenges related to socio-educational factors such as basic literacy, familiarity with survey forms, and question formats [57]. Physical requirements of computer usage, along with disability-related stigma and trust issues, may have further restricted participation [58].

Second, our sample may not represent the population of people with disabilities in China. In our sample, over 40% of the participants had at least a college degree. In 2018, only 11,154 students with disabilities entered college, while in the general population, almost eight million students were enrolled in college [59]. Although we do not know exactly how many people with disabilities in China have a college degree or above, based on the 2018 data, we can assume that the percentage of those with a college degree is significantly lower than that in our sample. The literature indicates that a higher educational level is associated with better emergency preparedness [25]. Therefore, the reality of emergency preparedness among people with disabilities may be bleaker than what is shown in this sample.

Third, we operationalized emergency preparedness with whether or not the person has an evacuation plan. This narrow scope limits the ability to capture other aspects of readiness, such as maintaining emergency supply items, establishing emergency contacts, and emergency shelter planning. Additionally, although we asked participants about their city's accessibility level, we did not have an objective measure of environmental accessibility. The study is cross-sectional. Therefore, one should not draw causal conclusions based on our findings.

Furthermore, this study aggregated individuals with disabilities into a single group, which limits the ability to examine potential differences in emergency preparedness across various disability subgroups. It is important to recognize that emergency preparedness needs and experiences may vary significantly depending on factors such as the type of disability, level of functional support required, and individual or group-specific barriers. Future research should disaggregate the data by disability type to better understand these nuanced differences and to tailor interventions accordingly.

4.2. Recommendations for Future Research

There is a pressing need to further evaluate the emergency planning needs of people with disabilities in China. Future studies should focus on connecting with the Disabled Persons' Federation, the official semi-governmental service entity for people with disabil-

ities in China. Connecting with a formal system may enhance the chance of recruiting a more representative sample of people with disabilities. Additionally, studies should aim to triangulate the data by incorporating focus groups and interviews with individuals with disabilities and other stakeholders. These qualitative approaches can complement survey data and provide richer insights into the diverse experiences and needs of this population.

Future studies should also prioritize collecting data on a wider range of emergency preparation activities, such as maintaining emergency supplies, establishing emergency contacts, and planning for shelter and evacuation, to name a few. To evaluate the accessibility of participants' residences, future research teams could incorporate Geographic Information System(GIS) data to provide objective measures of accessibility [60].

Although physical disability is a common risk factor for decreased emergency preparedness among people with disabilities in China and in the existing literature on samples in the US, more in-depth qualitative studies are needed to tease out contributing factors. Similarly, exploratory qualitative studies with people with disabilities who are part of online peer-support groups may shed light on what makes those who are connected online more likely to be prepared. The next steps for developing community-informed public-health interventions to improve emergency preparedness among people with disabilities in China should also include investigating how fairly people with different types of disabilities are treated in terms of preparedness to help inform intervention design and implementation.

5. Conclusions

This study contributes to the growing understanding of emergency preparedness among people with disabilities in China, offering valuable insights through an empirical cross-sectional survey. The findings reveal that individuals with physical disabilities are less likely to have an emergency evacuation plan. Moreover, confidence in one's ability to evacuate and participation in online peer-support disability communities emerge as potential protective factors. Despite recent legislative advancements aimed at protecting the rights of people with disabilities, this population remains insufficiently engaged in emergency planning efforts [5].

There is an urgent need for governments, non-governmental organizations, and disability service providers to raise awareness about emergency preparedness and to support this population through proactive outreach and inclusive public-health interventions. Effective interventions should consider both environmental and social barriers, moving beyond an exclusive focus on individual-level preparedness. By highlighting key factors influencing emergency readiness, this study lays the groundwork for future research and intervention developments aimed at enhancing the resilience of people with disabilities in the face of emergencies.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/disabilities5020046/s1, File S1: Emergency Preparedness Survey.

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