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Review

College Students and Environmental Disasters: A Review of the Literature

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Abstract: College students are a unique population occupying a distinct life-course and transition period between adolescence and adulthood. Although not monolithic in experiences, knowledge, and demographics, this diverse population is particularly susceptible to immediate, short-term, mid-term, and long-term disaster impacts. Recently, disaster research focusing on college students has rightly focused on the ongoing COVID-19 pandemic. Although the pandemic was a public health disaster interrupting social, developmental, and educational processes for students on a global scale, the climate crisis and related environmental disasters continuously threaten college students' individual development, health, and well-being. Thus, it is critical to understand current knowledge focusing on environmental disasters and college students in order to determine future research needs. This article used the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) approach to examine research on college students and disasters over the past ten years (2014–2023). We identified 67 articles, which we analyzed through a mixed methods approach, including descriptive statistics and thematic analysis. Results indicate that disaster impacts on college students are an understudied topic in the social sciences, especially in an era of more-frequent and -intense environmental hazards. Our findings demonstrate a need to engage college students in disaster research worldwide so that trade schools, colleges, and universities can collaborate with policymakers to build this unique and disproportionately impacted population's capacity to mitigate against, respond to, and recover from environmental hazards in an ever-changing climate.

Keywords: disasters; college students; disaster impacts; disaster education; mitigation; well-being; literature review

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1. Introduction

Climate change and climate-induced disasters severely impact all areas of society (Breen et al. 2023; Hamideh et al. 2023; Lai et al. 2019; Lowe et al. 2021; Peek et al. 2020; Wu and Etienne 2021; Wu et al. 2023). The changing climate and associated disasters disproportionately impact populations like racial and ethnic minorities (Breen 2022; Fitzpatrick and Spialek 2021), gender and sexual minorities (Goldsmith et al. 2022; Whitley and Bowers 2023), older adults (Wu 2020), children and young people (Gordon-Hollingsworth et al. 2016; Lai et al. 2018), among other populations who have historically been marginalized. Yet, college students are often overlooked as a disproportionately impacted group (Wu et al. 2021). College students, including any students enrolled in a 2- or 4-year college or university worldwide, are often considered to hold great privilege and agency. This may be true, but it is also true that due to their life course position between childhood and traditional adulthood, college students are in a uniquely vulnerable position when disasters strike.

Recent research in the field of disaster studies has centered on the ongoing COVID-19 pandemic. College students have been adversely impacted by the pandemic, experiencing mental health problems, academic disruption, and socioeconomic issues (Wu 2022). While

research on college students during the global public health disaster of COVID-19 has been clear and abundant, the state of research on college students and the short-term, mid-term, and long-term impacts associated with environmental disasters (e.g., hurricanes and wildfires) remains cloudy. In this context, environmental disasters are defined as disasters that result from natural hazards such as hurricanes, storms, fires, and earthquakes. This definition stems from the increasing call from disaster social scientists to refrain from using "natural" to describe disasters (Chmutina et al. 2017; Chmutina and von Meding 2019). Indeed, disasters are social processes that result from hazards—natural, technological, or willful—interacting with pre-existing systemic and institutional factors (Peek et al. 2021).

Studying disasters and their diverse impacts on college students is not a new venture (Breen and Meyer 2021; Lai et al. 2022). Scholars worldwide have contributed to the nuanced understanding of student-oriented efforts, including disaster preparedness, displacement, and academic impacts (Lovekamp and McMahon 2011; Tanner and Doberstein 2015; Peek et al. 2016; Marris 2019). However, these studies need to be updated to account for new experiences as the college population is continuously becoming more diverse due to the full spectrum of their demographic variables, and the entire disaster and emergency management cycle (Wu et al. 2021). Hence, it is necessary to systematically review what research has been conducted on this disproportionately impacted population through a full disaster and emergency management cycle, including disaster mitigation, preparedness, response, and recovery.

Over the past 10 years, the world has experienced a swiftly elaborated climate change process and dramatically increasing climate-induced disasters (NOAA 2023a), establishing the basic timeframe for this literature review. Integrating the college student component into the context of climate change and disaster, our literature review was guided by two distinct research questions: (1) What is the current state of research knowledge concerning college students and acute environmental disasters beyond COVID-19?; (2) Based on the findings and analysis of the identified and reviewed publications, what recommendations can be made regarding practice, policies, and research in higher education?

To answer these questions, we used a mixed methods approach to analyze the results of the publications included in the review. The Results section is divided into quantitative and qualitative analyses. Finally, the Discussion section lays out the implications of the results for higher education in practice and policy and we make recommendations for future research based on the gaps identified through the review.

2. Methods

We used the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guideline (Page et al. 2021) to conduct a review of the literature on college students and environmental disasters. The PRISMA approach is a widely used method of conducting literature reviews and analyses of data within the existing research literature (Page et al. 2021). The PRISMA guideline includes three distinct phases that cover the entirety of the literature collection, screening, and analysis process. The first phase consisted of data collection and curation where the authors used keywords and database searching to collect the associated literature. The second phase involved data management in which the authors conducted two screens of the identified literature and extracted the data from the agreed-upon articles. The third and final phase was analysis. It was during this stage that the first two authors conducted both quantitative and qualitative analyses of the articles selected for the review. In the sections below, we describe each of the three phases in detail to demonstrate the decision-making process of data collection, curation, inclusion, exclusion, and analysis.

2.1. Phase One: Data Collection and Curation

As mentioned prior, much of the recent research on college students and disasters focuses on the COVID-19 pandemic. The pandemic caused widespread educational impacts and college students uniquely experienced these impacts because, in many instances, both

their educational and living environments were affected by mandated closures (Wu 2022). Meanwhile, each year college students are exposed to acute environmental disasters like floods, wildfires, and hurricanes, but the consequences of this exposure are understudied. Therefore, it was imperative to conduct a comprehensive literature review to provide the current landscape of knowledge and research focused on college students across the disaster cycle.

We selected four academic databases including Embase, Proquest, Scopus, and Web of Science (Table 1) to identify publications related to college students and disasters. After identifying the databases, we developed three groups of keywords within overarching thematic categories including "college student", "disaster", and "impacts" (Table 2). Each of the keywords *within* the specified thematic category was separated by the operator "OR", while the operator "AND" separated *between* categories. Asterisks were included to broaden the search to include words that began with the same letters. In Proquest, Scopus, and Web of Science, we used "Title, Abstract, and Keywords" as our search parameters. In Embase, we used the "broad search" function to ensure an adequate number of articles remained within the search functionality. Finally, we included two additional filters in our search: language (English) and timeframe (10 years; 2014–2023).

Table 1. Databases Searched and Final Article Counts.

Database	Identified Publications	Duplicates Removed	Total Publications
Embase	433	86	347
ProQuest Central	1208	247	961
Scopus	218	143	75
Web of Science	341	1	340
Google Scholar	20	0	20
Total	2220	477	1743

Table 2. Keywords Used for Database Search.

Keyword Groups	Keywords
College Student	"college student" OR "college students" OR "university student" or "university students" OR higher education OR tertiary education
Disaster	disaster* OR "disaster response" OR "disaster preparedness" OR "disaster recovery" OR "disaster relief" OR "disaster reconstruction" OR "disaster mitigation" OR flood* OR wildfire* OR bushfire* OR hurricane* OR earthquake* OR storm* OR heatwave* OR tornado*
Impacts	"mental health" OR well-being OR disrupt* OR relocate* OR displace* OR grade* OR "education impacts"

The search of the four databases returned a total of 2200 publications. We then exported these publications to Covidence, an online platform that manages literature reviews (Covidence n.d.). Covidence automatically removed 477 duplicates, resulting in 1723 total articles. Furthermore, we wanted to additionally allow for the collection of recent and relevant articles that may have been missed in the initial search. We conducted a supplemental Google Scholar search that provided 20 additional articles, which gave the initial publication dataset a total of 1743 publications to move to initial screening.

2.2. Phase Two: Screening and Extraction

The initial dataset of 1743 publications underwent two steps of screening before extracting the final data. Figure 1 depicts a visualization of the PRISMA flowchart guideline that maps the data collection, screening, and extraction. First, the first two authors independently conducted title and abstract screening, eliminating any articles that were not relevant to college students and disaster. Disagreements were resolved with a conversation between the first two authors. The title and abstract screening removed 1506 publications,

moving 237 publications to the second review stage—a full-text review. Covidence also calculated the two authors' inter-rater reliability for the title and abstract screening. The proportionate agreement for the two raters was 0.933 and Cohen's kappa was 0.644. Cohen's kappa is a statistic that indicates the reliability of the level of agreement between two raters. According to McHugh (2012), Cohen's kappa described the statistic as indicating little to no agreement at the 0.01–0.20 level, substantial agreement at the 0.61–0.80 level, and near-perfect agreement at the 0.81–1.00 level.

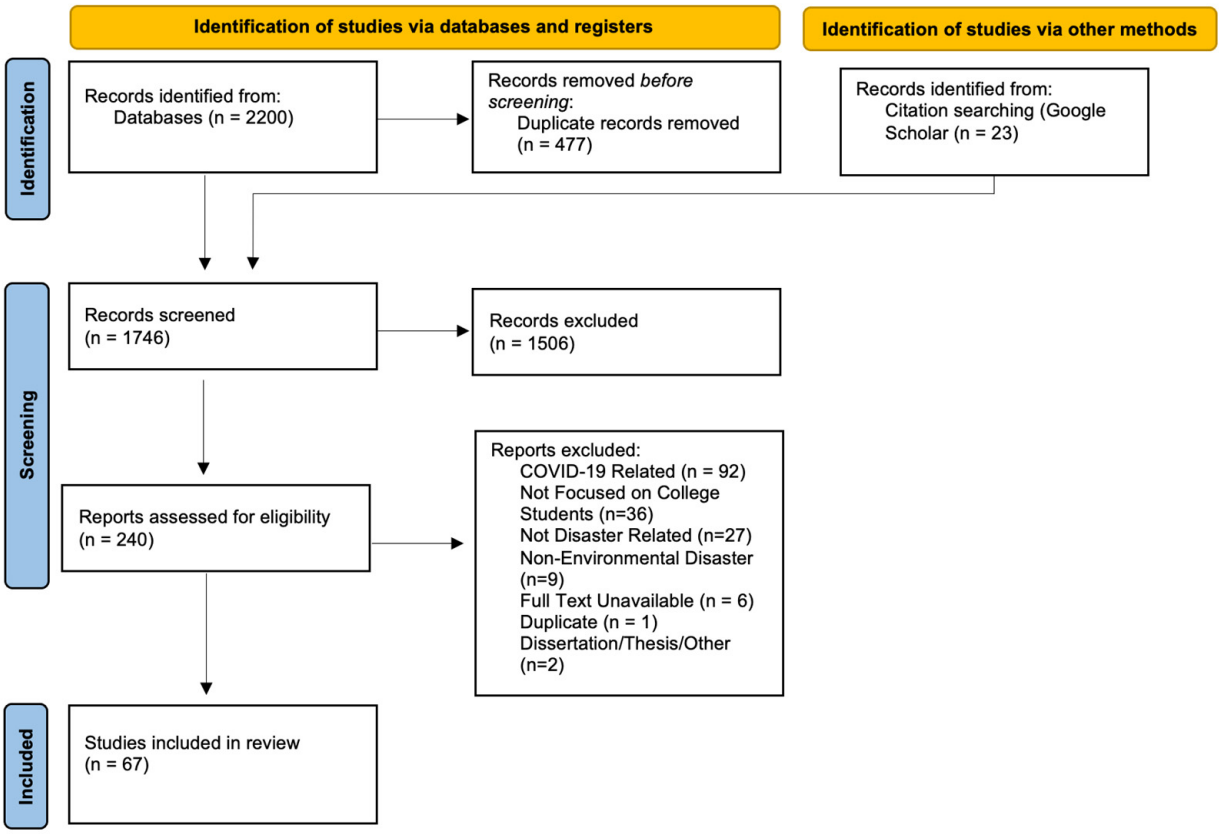


Figure 1. PRISMA Flowchart. Adapted From: Page et al. (2021). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews.

For the full-text review, the first two authors independently read through the full texts to determine whether the publications met the inclusion or exclusion criteria (Table 3). One of the key exclusion criteria for this review was any mention of COVID-19. We excluded COVID-19 studies in order to gain an understanding of the current scope of environmental disaster research specifically focused on college students. Any disagreements were discussed between the first two authors until a final decision was made on the publication's validity. The proportionate agreement for the full-text review was 0.895 and the Cohen's kappa statistic was 0.732. The full-text review process removed a total of 170 publications leaving a total of 67 publications for extraction. Extraction was carried out in the Covidence system, where metadata about each of the articles (e.g., title, DOI, disaster type discussed, etc.) was collected by the first and second authors independently. After reaching a consensus on the metadata, the data were exported into a CSV for quantitative analysis.

Table 3. Inclusion and Exclusion Criteria.

Inclusion Criteria	Exclusion Criteria
The population of interest must include college students, including those enrolled at community colleges and in post-graduate programs such as graduate schools and professional schools (e.g., JD, MD, DDS, etc.).	Studies focused on university staff or faculty. Studies examining students who are not in college including elementary school or high school.
Selected articles will be situated in the context of environmental disasters and/or hazards impacting college students, including floods, hurricanes, wildfires, etc.	Studies focused on public health disasters such as COVID-19 or influenza will be excluded as the focus is on the effect of environmental disasters on college students. Studies examining technological disasters or willful/intentional disasters such as shootings, oil spills, war, and explosions

2.3. Phase Three: Data Analysis

We used a mixed methods analytic approach for the dataset of reviewed publications. For the quantitative analysis, we gathered descriptive statistics from the extracted data to show a broad overview of the scope and content of the research that has been conducted on college students and environmental disasters. For qualitative analysis, the first two authors independently conducted a thematic analysis based on the overarching themes that emerged while reviewing each of the publications via an inductive approach (Neal et al. 2015). They discussed and built the final code and theme structure to present the qualitative findings. The integration of both quantitative and qualitative outcomes resulted in the final recommendations for future research orientations.

3. Results

The following sections detail the quantitative and qualitative results derived from the data analysis phase of the PRISMA guideline. The results indicate that little is currently known about this disproportionately impacted population regarding environmental disasters.

3.1. Quantitative Analysis

For the quantitative analysis, we analyzed the descriptive statistics compiled during the extraction of the metadata in the 67 publications. For each of the articles, we collected the geographic locations of each of the studies to determine if there were geographic location gaps in the research. We found that the United States has the most publications with 28, followed by New Zealand (7), China (6), Turkey (4), and Indonesia (4). Figure 2 shows the fully mapped distribution of the articles. This distribution indicates the vast disparity between research on college students and environmental disasters. In our review, South American, Australian, and African research was non-existent. Even taking into account that the United States had the most articles on college students and disasters with 28 in the past ten years, the number of billion-dollar environmental disasters is rising (NOAA 2023b) and there were 92 articles excluded in the full-text review for being COVID-19-related. This means there were more than three times as many articles written about COVID-19 and college students in half the time frame. This justifies the need to conduct further research on environmental disasters and college students.

In addition to the geographic location of the articles, we were also interested in what types of environmental disasters were the focus when examining them in the context of college students (Figure 3). Our data showed that articles referred to disasters in the most general sense nearly a third of the time (31%). Hurricanes were the second most commonly discussed disaster (30%), with earthquakes as the third most common (24%). On the other hand, tornadoes, floods, and wildfires only made up 9% of the studies reviewed—there was one study on tornadoes (Mok et al. 2016), two studies examining wildfires (Kornbluh

et al. 2022; Ritchie et al. 2021), and three focused on floods (Breen and Meyer 2021; Ekuase-Anwansedo et al. 2017; Lemieux et al. 2020). Finally, three studies focused on a combination of disaster types (Anderson et al. 2016; Carales and Lopez 2022; Carlton et al. 2022). For example, Anderson et al. (2016) examined medical student involvement and psychological impacts following the typhoon and earthquake in Fukushima, Japan, in 2011 finding those who had volunteered experienced higher post-traumatic growth. In addition, Carales and Lopez (2022) interviewed community college students who experienced Hurricane Harvey and the subsequent flooding in 2017, and found that students relied heavily on advisers and institution members to assist with navigating their post-Harvey academics. As compounding and cascading disasters become more common in the future, these studies will serve as the precursor to research regarding college students facing numerous disasters while in school.

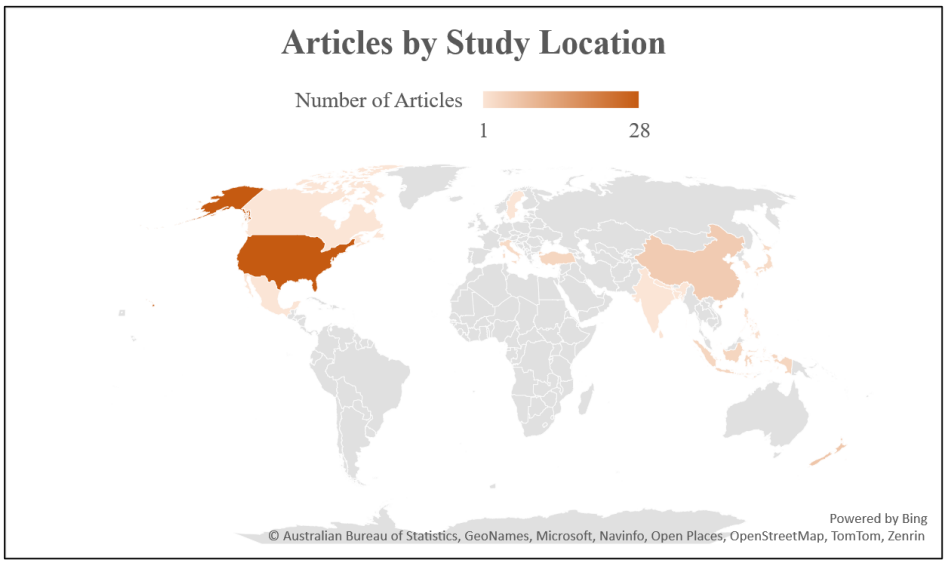


Figure 2. Articles by Study Location.

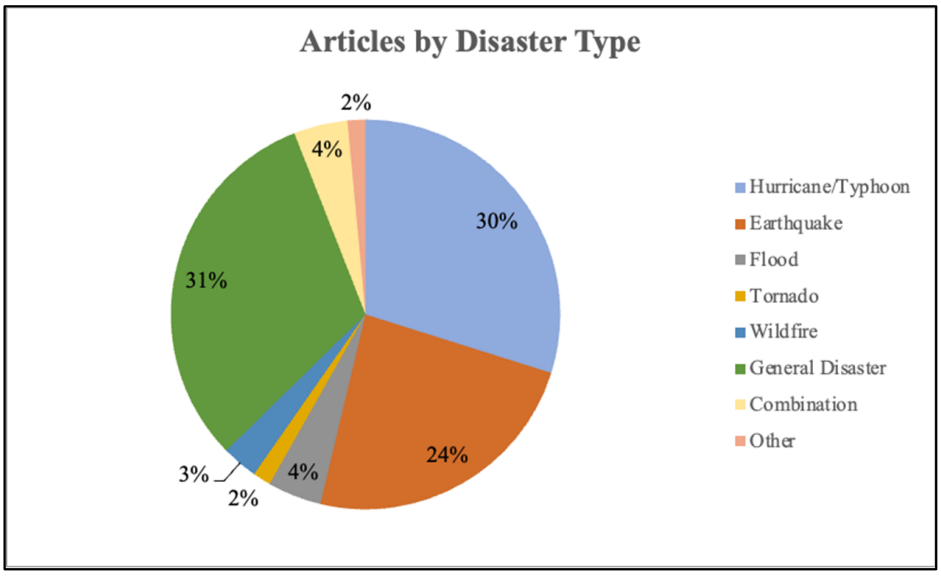


Figure 3. Articles by Disaster Type.

Since nearly half of the publications examined environmental disasters and college students in North America—specifically the United States, Canada, and Mexico—we also viewed the disaster type within a North American context compared to the rest of the

world. North American hurricane studies made up 70% of the total hurricane or typhoon research. All the wildfire, tornado, and flood studies in our review occurred in North America. However, it should be noted that a total of only six studies were conducted on this disaster type, while wildfires have impacted over 500,000 acres in the U.S. as of June 2023 (Congressional Research Service 2023) and flooding remains among the most commonly experienced disasters (Tompkins and Watts 2022). This indicates a severe need for further research on how these disasters impact college students in North America and on a global scale.

In terms of what disaster stage publications examined, the recovery stage was discussed the most often in articles (Figure 4). This was due, in part, because we coded post-disaster impacts as part of the recovery stage. Forty-four of the sixty-seven total articles discussed recovery or post-disaster impacts. Comparatively, preparedness was the second most common stage discussed in the articles but with half the total compared with the recovery stage. We coded for mitigation in 10 articles. However, mitigation was often closely aligned with disaster preparedness. For example, several studies tested students on their preparedness knowledge outside of the context of a specific disaster event (Gouramanis and Morales Ramirez 2021; Thorup-Binger and Charania 2019; Zhang et al. 2021). These studies not only addressed students' personal preparedness knowledge but also provided crucial information to the universities on how to better mitigate against negative impacts on students and their families. Finally, the least examined disaster stage is the response stage. The lack of research focused on disaster response might be expected—especially in a population as specific as college students—because of the sheer difficulty and rapid nature of conducting research within the context of an acute environmental disaster (Pfefferbaum et al. 2013).

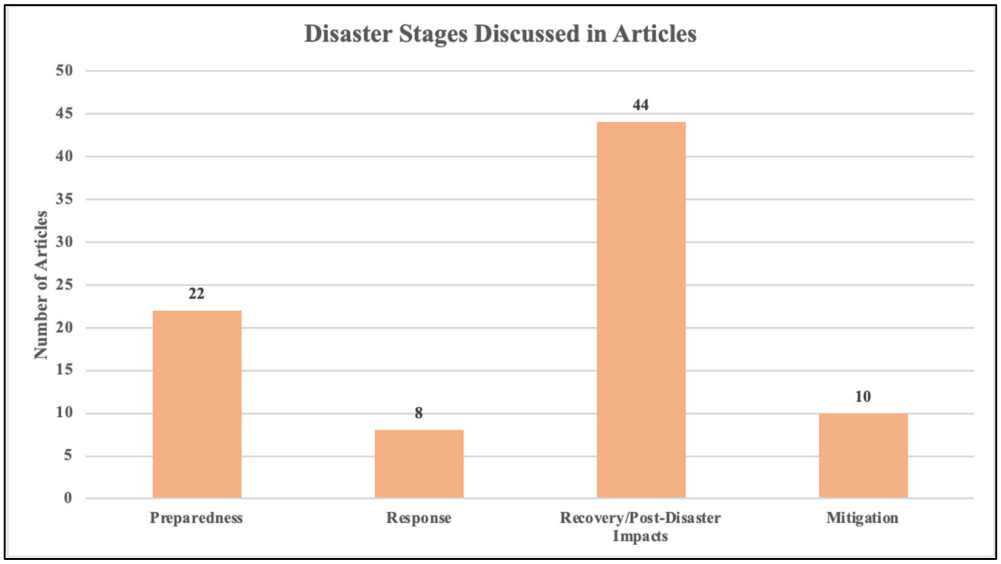


Figure 4. Disaster Stages Discussed in Articles.

To further understand the landscape of the current literature and to gain a more granular view of the research conducted on disaster type and disaster stage, we analyzed what stage of disaster occurred most frequently within the research on disaster type (Figure 5). Our analysis showed that within the "general disaster" category, the major focus was research on generalized preparedness to mitigate against negative impacts. Meanwhile, when discussing specific environmental disasters, the recovery stage along with the associated post-disaster impacts made up the largest proportion of the study topics. For example, in hurricane-related research, recovery and post-disaster impact studies represented approximately 71% of the publications. This trend held for earthquakes (57%), floods (71%), and wildfires (67%).

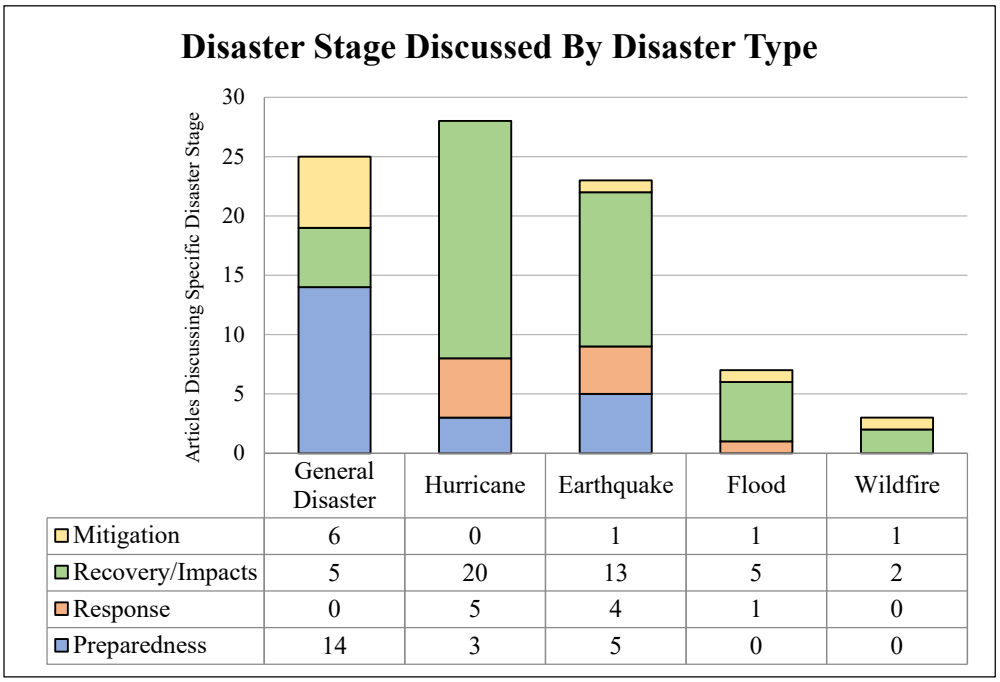


Figure 5. Disaster Stage Discussed by Disaster Type.

3.2. Qualitative Analysis

In our quantitative analysis, we detailed the characteristics of our identified articles to provide an in-depth understanding of the current landscape of the literature regarding college students and environmental disasters. In this section, we focus on the overarching themes of the research that has been conducted. Three themes emerged from the qualitative analysis: (1) examining college students' disaster literacy and preparedness, (2) enhancing disaster preparedness education in higher education, and (3) exploring the impacts of disaster. These themes show the need for a holistic approach to promote disaster management and preparedness education within the context of higher education.

3.2.1. College Students' Disaster Preparedness and Literacy

A major theme that emerged during the qualitative analysis of the publications in our review was college students' understanding of disasters (e.g., disaster literacy) and their preparedness for disasters (e.g., Bhat et al. 2017; Contreras 2014). Several studies examined the diverse impact of various factors on students' perceptions of disaster risk, emphasizing the imperative need for tailored strategies and interventions in the realm of disaster risk management (Aksa et al. 2020; Mızrak and Aslan 2020; Zhang et al. 2021). Disaster literacy and prior disaster knowledge may play a role in disaster risk perception, preparedness action, and protective behavior (Fadilah et al. 2020; Greer et al. 2018). For example, Zhang et al. (2021) identified that in China, their sample of college students had relatively low levels of disaster literacy, but factors such as disaster experience, disaster training experience, and family disaster preparedness influence college students' disaster literacy. Similar findings have been found in both Indonesia (Aksa et al. 2020) and India (Bhat et al. 2017). Particularly in Indonesia, there was a significant relationship between earthquake knowledge and risk perception (Aksa et al. 2020). Meanwhile, a vast majority of college students (approximately 83%) in Kashmir, India, noted that they were aware of disaster plans, but less than 20% knew how to access them (Bhat et al. 2017). However, it is important to continue conducting research in this space because there are mixed results regarding prior experience and risk perception, as Mızrak and Aslan (2020) did not find significant results with students in Turkey.

The research conducted with college students showed that their theoretical knowledge of disasters may indeed be misaligned with their practical preparedness. This indicates

a disconnect in overall disaster education—especially education within the context of higher education and institutions' geographic location (Choudhury and Wu 2023). For example, students living and going to school along the Gulf of Mexico have been found to be ill-prepared for hurricanes and are not familiar with how to operate and navigate the official disaster website curated by the state (Piotrowski 2015). Even when students *feel* as though they are prepared, Hasan et al. (2022) found that in reality, their preparedness levels were low. This theme showed that disaster preparedness and literacy were major points of study among scholars researching disasters and college students. However, this preparedness knowledge and disaster literacy may occur informally such as over the Internet and television, while lower amounts of this education may occur in formal settings such as disaster-specific courses (Zhang et al. 2021). The next theme that emerged examined the need for increased preparedness knowledge within the context of higher education institutions.

3.2.2. Enhancing Disaster Preparedness Education in Higher Education

Universities should play an active role in disseminating and fostering a culture of disaster risk management among college students and the community. This is particularly important in countries with high levels of risk (Wu 2022). Villasana et al. (2016) stressed the critical role of education as a potent instrument for instilling awareness regarding the significance of prevention and deliberate risk management in the development of the nation's future leaders. By integrating disaster risk management into curricula, educational programs prepare students to strengthen their values, sense of citizenship, and social sensitivity. As another example, Patel et al. (2023) highlighted the influence of the university curriculum and emergency procedures on students' disaster awareness and preparedness, calling for enhanced programs and effective disaster risk reduction courses. Their study findings reveal that the university curriculum significantly impacts students' disaster awareness, while the establishment of university emergency procedures significantly affects students' disaster preparedness. This underscores the pivotal role of disaster education in raising awareness and preparedness. Further, integrating disaster risk management into curricula in higher education can have positive impacts in other areas of a college education beyond becoming better prepared for disaster. As Gouramanis and Morales Ramirez (2021) detailed, identifying, assessing, and communicating about natural hazards and disaster risk reduction enhances students' understanding and equips them with valuable skills for addressing the challenges posed by disasters. In addition, it can build critical thinking skills. This demonstrates the direct impact of incorporating disaster risk management concepts into the classrooms of colleges globally.

Integrating disaster-related knowledge in college courses can also allow teachers to be creative in course design. For instance, Novak et al. (2019) showcased how employing innovative and engaging methods, like an interactive escape room simulating an earthquake scenario, can significantly enhance college students' knowledge of earthquake reactions and mitigation strategies, highlighting the potential of such interventions to motivate students towards better disaster preparedness. The escape room was designed as a space for personally relevant, experiential learning that replicated experiencing an earthquake while in a college dorm room. This program educated college students on understanding the appropriate actions to take during an earthquake, the ability to identify earthquake mitigation strategies, the ability to identify appropriate disaster preparedness supplies, and the intention to take preparedness actions. This study also indicated that the escape room intervention had the potential to motivate students to start or update their emergency kits, highlighting the importance of engaging methods in disaster education.

Formal disaster education at colleges and universities may be beneficial for domestic students but these benefits could be unparalleled for international students who are unaware of their new country's hazards and disaster landscape. Abukhalaf et al. (2022) indicated that it is critical to consider the diverse demographics and experiences of international students when developing disaster preparedness strategies. International students

studying in a new country may experience language barriers, weak social ties, and cultural differences that may take time to adjust to (Thorup-Binger and Charania 2019). These experiences alone can create difficulties in understanding the full scope of disaster risk information, response knowledge, and recovery information; combined, they can create devastating and disproportionate impacts on this population.

3.2.3. Disaster Impacts to the Health, Wellbeing, and Education of College Students

Our review highlighted a predominant focus within the literature on the multifaceted impact of disasters on college students' health, well-being, and education, underscoring the enduring consequences of disasters on college students.

Health and Wellbeing Impacts

Research examining the physical health of college students in the aftermath of disasters highlights the significant impact of these events on students' overall well-being. Although research on the physical health of college students following disasters is scarce, studies have shown that disasters can have related effects on feelings of physical pain (Doyle et al. 2017; Kato et al. 2017) and body function disorders (Sato et al. 2017). Both Kato et al. (2017) and Sato et al. (2017) examined college students following the Great East Japan disasters. Both scholars and their teams found that as a result of disaster impacts, college students faced disruptions caused by disaster-stress-induced back pain and difficulties sleeping (Kato et al. 2017; Sato et al. 2017). Furthermore, college students in the northeastern United States who were exposed to Superstorm Sandy experienced headaches after the storm (Doyle et al. 2017). There is an intricate relationship between physical, mental, and emotional well-being. Though our thematic analysis only found a few articles focused on the physical health of college students, mental health was a major issue faced by college students post-disaster.

Studies on the mental health impacts of college students after experiencing a disaster span the globe and disaster type (Breen and Meyer 2021; Hall et al. 2019; Kim and Oh 2019; Lemieux et al. 2020; Roque 2022; Shannonhouse et al. 2022; Sharma et al. 2021; Yuan et al. 2021a, 2021b). Mental health concerns among college students facing disaster experiences and impacts can include stress and anxiety, depression, PTSD, and suicidality. Results from our analysis indicate that research has shown that exposure and experiences such as home damage and witnessing injury heightened the likelihood of developing symptoms of depression and post-traumatic stress (Hall et al. 2019; Lemieux et al. 2020; Marthoenis et al. 2018a, 2018b; Sharma et al. 2021). While mental health concerns are prominent in college students post-disaster, the experiences are not monolithic. In research conducted in Alberta, Canada, following the 2016 Fort McMurray wildfire, students at Keyano College experienced significant rates of major depressive disorder, generalized anxiety disorder, and post-traumatic stress disorder (PTSD), even 18 months post-fire. Meanwhile, following Hurricane Maria, Roque (2022) identified that participants experienced trauma and despair in the immediate months following the disaster. Furthermore, the participants in the study carried out by Szecsi et al. (2023) specifically described the mental health toll of being displaced to the United States mainland, experiencing hardship due to resource mismanagement, and being treated as foreigners rather than Americans.

Another aspect of mental health that emerged during our analysis included help-seeking behavior post-disaster. As has been described, mental health impacts can be severe following a disaster. Due to this, students may engage in help-seeking behavior to assist with coping and building their mental health resilience. Shi and Hall (2020, 2021) reported that help-seeking intentions among their study population were dependent on the influence of peers, family, and society's support or disapproval. Students also described multiple preferences in terms of whom they seek help from. This underscores the complexities of help-seeking behavior and how a college student's readiness to seek help is heavily influenced by perceptions and expectations within their social environment.

Finally, a few articles also described positive mental health outcomes in the wake of disaster experiences by college students. Specifically, post-traumatic growth has been

documented among college students post-disaster. For example, Bianchini et al. (2015) found that among college students exposed to the 2009 L'Aquila earthquake, 12.5% of students reported a decrease in alcohol use after the earthquake, and 17.3% of the sample reported experiencing post-traumatic growth. In addition, Yuan et al. (2021a) discussed that when analyzing data from Chinese college students after a typhoon, they found that distress and growth can coexist. All these studies suggest that conceptualizing the association between post-traumatic stress symptoms and post-traumatic growth can contribute to a better understanding of recovery following traumatic events.

Educational and Academic Impacts

Several studies in our analysis focused on how various disasters disrupt or shape academic outcomes, shedding light on the intricate interplay between these external forces and students' pursuit of knowledge (Breen and Meyer 2021; Carales and Lopez 2022; Collings et al. 2018; Di Pietro 2018; Lagmay and Rodrigo 2022; Sholes et al. 2023). Several aspects of a student's academic experience in higher education have been found to be impacted by disasters. These impacts occur because disasters disrupt the overall learning environment, causing attendance issues, lower participation in class, and grade changes (Di Pietro 2018; Doyle et al. 2017; Lagmay and Rodrigo 2022). It should also be noted that students' education may still be impacted by disasters even if the disaster does not impact the campus directly. For example, Breen and Meyer (2021) found that during the Louisiana floods in 2016, students still experienced challenges at school, even though the campuses were minimally affected. In their interviews with students, they found that family connectivity played a role in education impacts as students would often spend time helping family members recover from the floods during time that would be typically used for classes and coursework (Breen and Meyer 2021).

Recognizing the impact of environmental disasters on college students' academic performance, several studies have investigated the significance of academic accommodations and support mechanisms in mitigating these disruptions. Research in the area of college students and disasters offers recommendations and best practices for supporting students who have had their academic progress disrupted by disaster (Holzweiss et al. 2020; Kornbluh et al. 2022; Loudd et al. 2018; Sholes et al. 2023; Tkachuck et al. 2018). These recommendations and accommodations span university-wide student support for academic motivation and academic continuity, such as using progressive assessments throughout the term and utilizing online course delivery, while also cultivating strong relationships with learning resource providers (Collings et al. 2019; Sholes et al. 2023).

Aside from the more granular level of support that can be offered by colleges and universities to students, our analysis also found that articles discussed proactive university crisis planning. These institutional-level macro-plans can shape university preparedness for diverse student bodies and geographic locations, and even educational formats such as online courses (Holzweiss et al. 2020). Further, institutional support can have a profound effect on the ease of transitioning back to campus following a disaster; thus, programming should be discussed at the institutional level so all students can benefit in crises (Carales and Lopez 2022; Kornbluh et al. 2022; Tkachuck et al. 2018). For example, Kornbluh et al. (2022) stated that higher education institutions impacted by disasters should invest in programs with a specific focus on socio-ecological support. These programs would aim to foster mindful self-development, positive familial bonding, peer networks, and community building to help shield students against the adverse effects of disasters. Tkachuck et al. (2018) made the following recommendations: offering disaster-related information during orientations; adding brief descriptions to course syllabi; incorporating disaster preparedness information into specialty courses to aid students in their transition to college; intensifying efforts to connect with subpopulations that exhibit preparedness weaknesses (e.g., women, international students, on-campus residents); utilizing online resources; conducting tabletop exercises; performing weather-related drills; and having students participate in exercises that involve walking through real-life scenarios, thinking through disaster responses, and physically

rehearsing their actions in case of a disaster. However, all of these policy-level interventions focus on the physical aspects of preparedness. As indicated, the mental health impacts have been profundity examined; however, little research has examined the integration of the mental health component into the planning stage.

4. Discussion

The quantitative and qualitative results from our review of the literature on college students and environmental disasters indicate that there is a pressing need for further research on this unique population. As we mentioned at the outset of this review, we identified 67 total articles discussing college students and environmental disasters published in the last ten years (2014–2023). Compared to the COVID-19 pandemic—a disaster in its own right—acute environmental disasters have received far less attention over a longer time period. Due to the limited research on college students and disasters, it is difficult to fully ascertain how to mitigate against natural hazards properly, what recovery resources and supports are needed, what preparedness knowledge is required, and how students react to or engage with the response period. With the knowledge gained from the review and analysis, we can begin to shape how the results could potentially spark questions about future practice and/or policy initiatives in higher education and disaster mitigation, preparedness, response, and recovery.

The quantitative analysis uncovered several existing gaps in the research on environmental disasters and college students. Currently, many of the publications in this field focus on North America. While this may not be surprising given the frequency of hurricanes and flooding that impact the Gulf Coast and Atlantic Coast regions each year, there are notable gaps that exist. Specifically, our review found *no* publications examining environmental disasters and college students in Africa and South America. It is critical to gain further understanding of the experiences from those continents as their unique cultural and geographical knowledge may provide different perspectives on disaster risk reduction and disaster recovery for college students and the broader global community.

Our quantitative analysis also pointed to distinct gaps in research on disaster type and disaster stage. The primary focus of the articles in our review was on hurricanes, earthquakes, and general disaster. There was a severe lack of research that existed on wildfires, floods, tornadoes, and extreme temperatures. Future research must be completed in these areas, not only so practitioners and policymakers can understand the impacts on college students, but also because the institution of higher education in general must understand how to adequately plan for, respond to, and recover from environmental disasters of the future so that student academic progress is not disrupted. Finally, there was a lack of research on the response phase, which could be due to the fast pace required to collect data during that stage. In our review, much of the response research concerning college students focused on the Student Volunteer Army in New Zealand which was formed during earthquake response and recovery periods (Carlton and Mills 2017; Carlton et al. 2022; Nissen et al. 2021). To further investigate how college students engage in the response period of a disaster, it is critical for research teams to utilize their networks and tools such as the Social Science Extreme Events Research (SSEER) network to pre-plan and rapidly build teams to conduct this research (SSEER 2023).

Our qualitative analysis identified three themes within the reviewed publications: college students' disaster literacy and preparedness, enhancing disaster education for students, and disaster impacts on college students' health, well-being, and education. Several studies examined students' disaster literacy and preparedness (Aksa et al. 2020; Bhat et al. 2017; Contreras 2014; Mızrak and Aslan 2020; Hasan et al. 2022; Kılıç and Şimşek 2019; Patel et al. 2020; Patel et al. 2023; Piotrowski 2015; Sözen 2019; Zhang et al. 2021). Many of these studies found that oftentimes, college students are ill-prepared for disasters and may not have the disaster literacy capacities to properly understand how to prepare. Additionally, of the publications that included preparedness, more than half focused on general disaster scenarios and none focused on wildfire, tornado, flood, or

extreme-temperature preparedness. This indicates that there is a need for specifically tailored, localized disaster preparedness education within the context of higher education. Furthermore, mental health preparedness is missing.

The need for disaster education among colleges and universities was made apparent by the literature we reviewed. This is because the second theme that emerged focused directly on enhancing the knowledge base of college students regarding disaster preparedness and risk reduction. The research described the benefits for both domestic and international students, noting that incorporating disaster education within university curricula can not only build a substantial knowledge base and increase preparedness, but can also have a profound effect on areas beyond disaster such as enhancing critical thinking skills (Gouramanis and Morales Ramirez 2021). That being said, disaster education and knowledge dissemination must be holistic to ensure the faculty and staff are properly trained and prepared to pass this information on to students. It is necessary as climate and disaster policies and curricula are developed within colleges and universities globally that formal training exists for these educators. Teaching candidates or those enrolled in education fields should have the option to gain the necessary disaster awareness through disaster awareness courses in their undergraduate curriculum, participating in various research projects, and attending symposiums and congresses related to disaster awareness. This comprehensive approach can contribute to a more informed and prepared community that can continue to spread disaster awareness and education (Türksever 2021).

The final theme that emerged during our analysis was related to the health, well-being, and educational impacts experienced by students post-disaster. The recovery phase—which included disaster impacts—was the most common disaster stage in our review. While physical health problems were less prevalent in the research (Kato et al. 2017; Sato et al. 2017), mental health issues were a major concern. Overall, college students face a variety of mental health problems after experiencing disaster including stress, motivation loss, anxiety, depression, PTSD, and suicidality (Breen and Meyer 2021; Hall et al. 2019; Kim and Oh 2019; Lemieux et al. 2020; Roque 2022; Shannonhouse et al. 2022; Sharma et al. 2021; Yuan et al. 2021a, 2021b). Due to the vast amount of negative mental health impacts endured by college students after experiencing a disaster, university policies must incorporate accessible and well-advertised mental and emotional health services for students that can offer support and benefits post-disaster (Abrams 2022). These university policies must also be written to expand beyond the university health centers to include community-based supports to ensure that these resources are accessible to students. In addition to policy, university teaching practice must include training regarding disaster mental health, so the faculty and staff understand how to proactively mitigate potential mental health-related issues for students, thus offering an additional level of support beyond health service providers. Finally, future research should investigate and evaluate specific university-based mental health interventions to determine better practices and potential service enhancement.

Research also focused on educational impacts and university support provisions. Overall, research on academic outcomes for students following a disaster was less pronounced (Breen and Meyer 2021; Di Pietro 2018; Doyle et al. 2017; Lagmay and Rodrigo 2022). It is imperative to study the effect that disasters have on students' academic performance because without understanding the entire scope it will be difficult to apply the proper interventions and educational strategies to protect students' academic progress when it is disrupted by disasters. Several interventions and programming recommendations were provided in the review (Holzweiss et al. 2020; Kornbluh et al. 2022; Loudd et al. 2018; Sholes et al. 2023; Tkachuck et al. 2018). Students in the literature have discussed the positive impact that receiving institutional support has had on their academic journey (Carales and Lopez 2022). However, a major collaborative effort within the entire institution of higher education is needed for effective academic support. Therefore, university policy regarding disaster response and recovery related to student academic progress must be written collaboratively, and widely disseminated and mobilized to ensure that proper institutional support is reaching students who are impacted.

Loudd et al. (2018) explained the nuances of the collaborative power needed to support students following a disaster using an example from Hurricane Harvey. The authors highlighted the critical role of academic accommodations and support systems, noting that effective recovery efforts often necessitate substantial and specialized organizational resources and university-wide collaboration. They emphasized that every member within the academic community, including the faculty, plays an equally important role in facilitating the successful transition of both fellow community members and students back to campus after a disaster. To facilitate this process, they offer six key recommendations that faculty members from all disciplines can integrate into their post-disaster recovery efforts: (1) providing post community resources on online campus portals, (2) providing secure free textbook copies, (3) adding flexibility to due dates, (4) increasing reminders about assignment due dates, (5) re-orienting students to time and date, and (6) increasing predictability during class (Loudd et al. 2018). These key points highlight distinct teaching practice interventions that can be undertaken by the university faculty and staff to enhance post-disaster educational processes. These recommendations reflect the necessary discussions, interventions, and research that must be carried out in the future regarding college students and environmental disasters in order to build their knowledge base, risk perception, and overall resilience.

5. Future Research Directions

As is displayed in the Results and Discussion sections, there are several areas within the context of college students and disasters that must be examined further. Our quantitative analysis uncovered that further research inquiry must be focused on broader geographic locations, disaster stages, and disaster types as they relate to educational impacts on college students. For example, in the Results and Discussion sections, we note that our review found zero articles examining the impacts of disasters on South American and African college students. Future research in these locations is necessary to generate a comprehensive, global view of disaster risk reduction, and response and recovery action (UNDRR 2015). Furthermore, our review found that few articles examined the response stage, as well as disasters like floods, fires, and extreme temperatures. Additional research is needed to fully comprehend the experiences, challenges, and needs of college students across the disaster cycle and disaster type due to their unique life-course position and social position making them potentially prone to disparate impacts. Indeed, as the global community continues to endure the ongoing climate crisis and these types of disasters become more frequent and devastating, it is critical to identify actionable solutions through research initiatives to help students and universities understand how to prepare for, respond to, recover from, and mitigate disaster impacts. Finally, as is noted in the Discussion section, future research must examine the post-environmental disaster educational outcomes and how social, environmental, and physical impacts converge to exacerbate or mediate these impacts. This line of research offers distinct insight into how university and government policy can provide protective action for a disproportionately impacted population on a global scale.

6. Limitations

As with any study, some limitations must be addressed. First, the filters and keywords applied in the data collection and curation phase of the PRISMA method may have removed some relevant articles from the analysis. For example, we only included articles published in the English language from the last ten years. The search parameters may have excluded valid articles from researchers writing in their own native, non-English language that may have added immense value to the analysis. Secondly, the keywords used for the data collection may have excluded articles focused on alternative forms of higher education such as trade or technical schools. Experiences from these students would also prove to be fruitful in terms of the analysis of college student experiences in a disaster context. In addition, augmenting studies with perspectives from staff and administrators at colleges

are needed to fully understand factors that influence college student life. Finally, it should be acknowledged that academic databases do not include all of the relevant knowledge on the topic of college students and acute environmental disasters. Other important avenues of knowledge, such as Indigenous knowledge and ways of knowing should be considered when understanding the experiences of this population throughout the disaster cycle.

7. Conclusions

College students are often overlooked as a population that faces disproportionate impacts of environmental disasters. However, based on their life-course position, they face unique challenges rendering them vulnerable to disaster effects. As they are often overlooked, they do not receive an adequate amount of research attention. This, in turn, creates challenges for those working in higher education, especially related to student programming and curriculum. This literature review article demonstrates the most up-to-date research and the distinct research gaps regarding college students and environmental disasters and also provides recommendations for future research initiatives to enhance the research landscape. As the climate continuously changes and disasters grow in frequency and intensity, engaging college students in research is timely and necessary in order to identify how to best support their disaster-related knowledge, health and well-being, and academic journeys.

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