

ORIGINAL RESEARCH

Personal Disaster Preparedness: An Integrative Review of the Literature

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ABSTRACT

Experts generally agree that individuals will require partial or complete self-sufficiency for at least the first 72 hours following a disaster. In the face of pervasive environmental and weather hazards, emerging biological threats, and growing population densities in urban areas, personal preparedness is critical. However, disaster planners and policymakers require further information to create meaningful improvements to this aspect of disaster preparedness. A systematic review of the literature was conducted to determine the state of evidence concerning personal disaster preparedness. The purpose of this integrative review is to describe and analyze the professional literature as an intended basis for advancing the field of disaster management research and practice. Included in the review were 36 studies that met the predetermined inclusion criteria. The current evidence indicates that factors influencing preparedness attitudes and behaviors are complex and multifaceted, including demographic characteristics, trust in government efforts, previous exposure to a disaster, and number of dependents in a household. Furthermore, certain population groups, households, and individuals have different disaster preparedness needs and vulnerabilities. This constellation of findings has significant implications for community and national emergency planning and policymaking.

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Key Words: disaster, preparedness, household, family

In the face of pervasive environmental hazards, emerging pandemic threats, and growing population densities, personal disaster preparedness is a critical need.¹ The importance of personal preparedness has long been recognized, with basic strategies such as stockpiling, sheltering-in-place, and citizen education dating back to the Cold War.² Experts agree that individuals will require partial or complete self-sufficiency for at least the first 72 hours after a disaster.^{1,3}

The significance of postdisaster self-reliance and preparedness has been observed in many incidents. For example, in the aftermath of the 2005 London bombings, an inability to contact loved ones was associated with significant mental distress.⁴ A 2006 study of Londoners suggests that following the 2005 attacks, more than 70% of people sampled made plans for contacting family members in future emergencies.⁴ After Hurricane Katrina hit the US Gulf Coast in 2005, authorities came under criticism for mismanagement and lack of leadership in relief efforts.^{5,6} The devastating impact of the storm, combined with a flawed response strategy, left more than 60 000 people stranded in New Orleans to fend for themselves for several days.⁵ Amid ongoing recognized health care system surge capacity limitations, examples such as these underscore the crucial consequences of personal disaster preparedness.⁷

In recognizing the importance of personal preparedness, the Federal Emergency Management Agency (FEMA)

launched its Ready campaign in February 2003. It should be noted that this campaign preceded Hurricane Katrina. Ready is a national campaign designed to increase public awareness and involvement in disaster preparedness and response across the United States. Specifically, the campaign promotes the message to “get a kit, make a plan and be informed” about different types of emergencies and their appropriate responses.⁸ The “make a plan” step refers to creating a personal preparedness plan that is applicable to individual, family, or household disaster planning. In the professional literature, these plans are sometimes called communication, disaster, or family plans and are referred to by FEMA as “family emergency plans.” A personal preparedness plan may include such information as a nominated out-of-town contact, neighborhood meeting place, or important medical information.

Using the Ready model, the American Red Cross (ARC) launched a campaign encouraging the public to “do more than cross your fingers,” using instructional pamphlets and videos as well as celebrity endorsements.⁹ In 2006, following Hurricane Katrina, the federal “lessons learned” report highlighted the essential role of citizens in creating a foundation of partnerships for “transforming national preparedness.”¹⁰ Federal government efforts urging the American public to “resolve to be ready” have continued.⁸

In spite of governmental efforts to increase personal preparedness, numerous studies and polls suggest that pre-

paredness levels in communities are lacking.^{1,10,11} As part of the 2009 National Hurricane Survival Initiative, an independent polling firm found that 66% of people living in Atlantic and Gulf coastal states had no hurricane survival kit and 55% had no family disaster plan.¹² A 2009 ARC influenza A(H1N1-09) poll suggested that only 46% of Americans had enough food, water, and medicine, in accordance with government recommendations, to allow them to remain home if they became sick.¹³

In light of these salient deficits, a review of the research literature can offer meaningful insight into gaps, strengths, and opportunities for enhancing rates of personal disaster preparedness as a critical element of citizen engagement in community disaster readiness. The purpose of this integrative review is to describe and analyze the state of evidence concerning personal preparedness in disasters. The research question for this review is, what do we know about personal disaster preparedness and the factors that shape its practice? In addressing this question, the objective is to present the best available evidence on personal disaster preparedness as an intended basis for advancing disaster management research, policy, and practice.

METHODS

The purpose of this review was to describe and analyze the current scientific literature on personal disaster preparedness. A literature search via the Cochrane Library found no prior systematic literature reviews on this topic.

Search Strategy

Using key words and MeSH terms, a broad group of medical, public health, and social science electronic databases were searched, including PubMed, ISI Web of Science, BIOSIS, LILACS, CRISP, PsycINFO, EBSCO Psychological and Behavioral Sciences Collection and SSCI, CINAHL, Public Affairs Information Service, Education Full Text, and SCOPUS. The following MeSH terms were employed wherever possible: "Disaster Planning," "Health Knowledge, Attitudes, and Practices," "Civil Defense," and "Terrorism." In addition, the following key words were used: "preparedness," "personal preparedness," "family," "household," "individual," "adult," "children," "disaster," "planning," "health knowledge," "health attitudes," "health practices," "emergencies," "pandemic," and "workplace."

Next, all issues of the following disaster medicine- and public health-focused journals were individually examined: *Australasian Journal of Disaster and Trauma Studies*; *Disasters*; *Disaster Medicine and Public Health Preparedness*; *The Internet Journal of Rescue and Disaster Medicine*; *Disaster Management and Response*; *Biosecurity and Bioterrorism*; *Public Health Management and Practice*; and *Annals of Emergency Medicine*. Following this examination, references from each publication selected for inclusion were examined for additional relevant literature. Finally, a search of publicly available Internet content was conducted using Google and Google Scholar. The same search terms were used as those with the electronic database searches.

Inclusion Criteria

Only original quantitative or qualitative research designs were included in this review. The types of research reports included were peer-reviewed research articles, abstracts, and summaries of research findings. Primary study subjects selected were individuals, families, and households, as well as health care providers and first responders. Outcome measures incorporated into the review were knowledge, attitudes, and practices related to personal disaster preparedness planning. In addition, an operational definition of personal disaster preparedness was developed. Personal disaster preparedness was defined as behaviors meeting two major goals: preparation of supplies or an "emergency kit" and creation of a family or household plan. Only studies published in English were included in this review. The review took place from August 5, 2009, to January 5, 2010, and assessed articles published between 1950 and 2010.

Article Review Protocol

A three-stage screening process identified candidate articles for review and assessed the extent to which articles met predetermined inclusion criteria derived from prior systematic reviews.¹⁴⁻¹⁶ First, search results were sorted by title relevance, yielding 157 candidate articles. Second, inclusion criteria were applied to abstracts. In the third stage, criteria were applied to 50 full-article texts to generate a final list of 36 publications for inclusion in the review. The primary reason for manuscript exclusion from the review was that many studies focused on responder readiness (work-related preparedness), willingness, or ability to respond rather than personal preparedness. In such articles the working definition of personal preparedness (ie, making a kit or writing a plan) was not discussed or was not an important focal point of the research and thus did not meet the inclusion criteria. In addition, multiple excluded articles did not present original research; for example, editorials, opinion pieces, or policy analyses.

Each of the 36 articles included in this review was evaluated for methodological quality using a checklist of nine a priori criteria (see eAppendix available at <http://www.dmphp.org>) established by the researchers in adapting criteria previously employed by Chaffee,¹⁴ Harris et al,¹⁵ and Akers et al.¹⁶ The assessment of study quality focused on relevance to the key review question, reliability, validity, instrument development, sampling strategy, and identification of potential bias. All 36 articles selected articulated a clear purpose statement and identified where their results fit within the larger body of research on personal disaster preparedness.

All original research designs, both qualitative and quantitative, were included in this review to capture the full breadth of current evidence. Many systematic reviews, particularly in the medical literature, do not include qualitative work.¹⁴ In the public health arena, the utility of scientific evidence informs decisions for public health interventions, programs, and policy. Integration of qualitative and quantitative data provides a richer, more nuanced perspective on motivations and structural forces that shape observed actions. Content analysis and narrative summary were used to abstract and organize qualitative themes. Qualitative findings were used to add context and depth to quantitative data trends (Table 1).

TABLE 1

Key Findings in Studies of Personal Disaster Preparedness (1993–2010)^a

Study	Year	Key Findings
Basolo et al ¹	2009	Confidence in government disaster management capacity and exposure to preparedness information sources were associated with greater perceived and actual preparedness (having a family plan). Respondents with children were more likely to have recommended disaster supplies in the home.
Russell et al ²	1995	In two samples of residents living in earthquake-prone areas in California, disaster-specific preparations such as storing food (38%-43%) or water (37%-40%) were less common than general home readiness measures such as having a first-aid kit (42%-48%) or radio (48%-50%). Family planning levels were even lower at 23%-28%.
Page et al ⁴	2008	In a survey of city residents immediately after the 2005 London bombings, 51% had emergency plans and 48% had stocked supplies. After 7-8 mo, 90% had developed emergency plans but there was no evidence of an increase in supply gathering. Nonwhite race or minority ethnicity, low social status, and perceived threat predicted increased preparedness between the two time points.
Kapucu ¹⁰	2008	While 61% of central Florida survey respondents perceived that they were adequately prepared for a disaster, only 50% had a family evacuation plan and less than 10% had an adequately stocked 3-d disaster supply kit. Participants were much more likely to have general household items that are also useful in emergency (eg, first-aid kit) vs more specific emergency supplies such as an extra supply of food and water.
Boscarino et al ¹⁷	2006	In a random survey of New York City residents 2 y after the World Trade Center (WTC) terrorist attack, the best predictors of individual preparedness were age 30-60 y compared with age <30, greater exposure to the WTC disaster, and greater unrelated lifetime traumatic-event exposure. Between study years 1 and 2, a significantly larger percentage of respondents reported making some plans for future attack.
Eisenman, Glik, et al ¹⁸	2009	<i>Among low-income Latino focus group participants, income and space limitations were barriers to maintaining a specific disaster kit. Participants were more likely to store extra food and water supplies than to designate a specific disaster stockpile. Researcher identified family communication planning and proper quantity of water as education needs in this group.</i>
Eisenman, Wold, et al ¹⁹	2006	People with self-rated fair/poor mental health and serious mental illness were less likely to have disaster supplies or an emergency plan. Disability status was not associated with lower rates of disaster preparedness.
Heller et al ²⁰	2005	In a study of families before and after a major earthquake, the single best predictor of pre-earthquake preparedness was the amount of social support respondents provided to others. Respondents were most likely to complete disaster preparation tasks associated with general emergencies vs earthquake-specific hazard mitigation activities. Post-earthquake, the best predictor of preparedness was higher level of damage previously experienced. Older respondents reported fewer emergency preparations compared with the younger respondents (age 30-43 y), who were also more likely to have children at home.
Mishra and Suar ²¹	2005	Older age, higher income, and larger extended family were associated with higher preparedness levels in flood-prone areas of India. Extended family structure but not older age or income was associated with heat wave preparedness. Characteristics of disaster threat may explain preparedness differences.
Mishra and Suar ²²	2007	Respondents with higher levels of disaster experience and education perceived higher risk for floods and heat waves. Subjects with more disaster experience and education were significantly more prepared for future events.
Mulilis et al ²³	2003	Results of surveys pre- and post-tornados showed participants were significantly more prepared, perceived greater risk, and felt greater responsibility for future disasters after personal experience with these events. Respondents assessed preparedness actions as less difficult after having performed these tasks.
Murphy et al ²⁴	2009	Demographic predictors of having disaster supplies were older age, male gender, white race, and increased household income. Higher educational level and presence of children in the home were significantly associated with emergency planning. Controlled for demographics, preparedness was associated with higher perceived likelihood of natural but not terrorist threats, perceived efficacy of tasks, and trust in local health care systems.
Norris et al ²⁵	1999	Black residents in hurricane-affected areas were more likely than white residents to have a plan of action but less likely to have basic emergency supplies. More educated persons were more likely to have an emergency plan and basic supplies. Prior disaster exposure explained 20% of variance in perceived control, 7% of variance in planning, but only 1% of variance in basic supplies.
Smith and Notaro ²⁶	2009	Persons with a disability were significantly (1.22 times) more likely to report being unprepared for an emergency compared to those without disabilities. Among disabled respondents, being female, nonwhite, lower income, less education, and urban residence increased this risk.
Hurnen and McClure ²⁷	1997	Greater knowledge of earthquake-response measures was associated with higher actual preparation scores. No correlation was found between perceived preventability of earthquakes and knowledge or preparation for these events.
Marshall et al ^{28,b}	2007	After a social marketing intervention (educational pamphlet), 10% of the target population changed their preparedness behavior. Increases in percentage of respondents assembling supplies for an emergency kit (56.2%-68.4%) and increase in awareness of emergency plans were significant. Actual number of emergency plans did not significantly change.
Blessman et al ²⁹	2007	Among a cohort of public health employees, the greatest barriers to at-home preparedness were lack of time or financial resources to complete tasks (43%), lack of clear instructions (24%), and difficulty maintaining prior preparations (16%). Overall, only 43% rated "minimally prepared" by completing 10 of 21 FEMA checklist items, while 32% were "not prepared" with fewer than 2 items completed.
Cretikos et al ³⁰	2008	Two weeks after a major natural disaster, >80% of households reported having a 3-d food supply and basic disaster supplies (cellular phone, candles, matches) before the event. Less than half of respondents had a sufficient 3-d water supply. Slightly more than half had an emergency contact list prepared.
Edwards ³¹	1993	Households with higher educational levels, higher incomes, and children were more likely to adopt commonly recommended preparedness measures. With education and income controlled, Blacks were less likely to report engaging in preparedness behaviors, with 31% reporting having a family plan and 37% storing food or water.
Nozawa et al ³²	2008	Among Japanese residents exposed to a typhoon, those who decided to evacuate were significantly more likely to have prepared emergency supplies (37.1%) vs nonevacuees (24.5%) and more likely to know how to contact family members during an emergency (43.8% vs 34.2%). The two groups did not differ by age, family composition, or prior disaster exposure.
Paton et al ³³	2008	Negative outcome expectancy (belief that severity of pandemic consequences would render personal actions futile) decreased the likelihood of preparedness behavior. Positive outcome expectancy was associated with increased intention to act.
Phillips et al ³⁴	2005	In a sample of persons living near a chemical weapons storage facility, higher income respondents were twice as likely as those in the lowest income quartile to report having a family emergency plan (22.3% vs 11.9%) and emergency preparedness kit (15.3% vs 7.4%). At the same time, low-income respondents reported greater concern about a major chemical accident.
Farley ³⁵	1998	After an initial increase in the years immediately following a widely disseminated, ultimately false prediction of a severe earthquake (Browning prediction), both perceived and actual personal disaster preparedness gradually declined. Between 1992 and 1997, food and water storage decreased from 63.8%-57.6%, while presence of family earthquake plans decreased from 32.5%-22.8%.
Kirschenbaum ³⁶	2006	Single-headed households were significantly more likely to be "very well prepared" and have emergency supplies. There was no significant difference in coordination of family emergency plans between single- and dual-headed households. Number and age of children did not significantly impact family preparedness behaviors.
Aspinwall et al ³⁷	2005	Greater self-reported preparedness was independently associated with higher levels of proactive coping, worry, and dispositional optimism. Greater age was a significant predictor of greater preparedness.
Eisenman, Zhou, et al ³⁸	2009	In a survey of Los Angeles residents, 28% had emergency supplies while 17.1% had an emergency plan. Demographic characteristics associated with higher likelihood of emergency supplies were African-American or Latino race/ethnicity, foreign birth, post-high school education, and having children in the home. Respondents who were African American, disabled, or had children were more likely to have an emergency plan. Higher perceived likelihood of terrorist event was positively associated with emergency supply but not with a family emergency plan.
Feret and Bratberg ³⁹	2008	At baseline, most (>805) elderly assisted-living residents did not have an emergency kit or personal emergency plan. After a pharmacist-led educational intervention, statistically significant changes in preparedness for hurricane, avian influenza, bioterrorism, and flood were observed.
Hausman et al ⁴⁰	2007	Non-white race, prior disaster experience, and higher perceived risk of future disaster were significantly associated with higher preparedness levels. While education and income were not significant predictors, higher levels of social capital (positive relationships, sense of community) were associated with increased preparedness.
Chesser et al ⁴¹	2006	<i>Participants in all focus groups identified needs for further education and practical training about emergency planning and household preparations. Rural respondents perceived lower threat risk to their communities compared with urban participants.</i>

(continued)

TABLE 1

Key Findings in Studies of Personal Disaster Preparedness (1993–2010)^a (continued)

Study	Year	Key Findings
Faupel and Styles ⁴²	1993	Participation in disaster education workshops, having a household emergency plan, or supplies were all associated with higher stress levels compared to those who did not.
Terpstra and Gutteling ⁴³	2008	Among Dutch households, 50% perceived disaster preparedness to be an equal responsibility between themselves and the government. Attributed responsibility was not significantly correlated with intention to prepare for disaster.
Lee et al ⁴⁴	2009	Thinking about engaging in preparedness behavior (appraisal) was associated with increased psychological stress, while actual preparedness behavior significantly predicted decreased stress. Actual individual preparedness accounted for 10% of the variation on current psychological stress. Avoidance behaviors were associated with increased stress.
Rooney and White ⁴⁵	2007	<i>In a sample of disabled Americans who had prior disaster experience, respondents felt that chances of survival can likely be increased by pre-event personal disaster planning, specifically having gathered general disaster supplies and developing disability specific evacuation plans. Respondents identified needs for further disaster planning education for mobility-impaired individuals and emergency responders.</i>
Ablah et al ⁴⁶	2009	45.1% of respondents were classified as “prepared” despite only 78% subjectively rating themselves as “somewhat well prepared” or “well prepared.” 66.5% of under prepared individuals believed they were “somewhat well prepared” or “well prepared.” Demographic factors associated with greater preparedness included greater age, white ethnicity, male gender, income greater than \$50 000, employment, and possession of a high school diploma. Medical factors included having diabetes, a history of cardiovascular disease, and requiring special medical equipment.
Baker and Baker ⁴⁷	2010	Results indicated that participants had lower level of preparedness than the general population. Level of preparedness was neither influenced by medical needs of the child nor the caregiver’s level of concern about disaster.
Diekman et al ⁴⁸	2007	<i>In a sample of white homeowners in metro-Atlanta, respondents defined preparedness as being able to “survive” for 2 d to 1 wk using basic supplies without help from the local, state, or federal agencies. Both previous disaster experience and the presence of children in the household were deemed important motivating factors in disaster preparedness, with peace of mind and reduction of panic during a disaster situation cited as benefits of being prepared. Respondents felt supply logistics and communication, both within families and between emergency responders and the community, were major barriers to household preparation.</i>

Abbreviation: FEMA, Federal Emergency Management Agency.

^a Italicized text denotes qualitative studies, and nonitalicized text denotes quantitative studies.

^b Study has both qualitative and quantitative research methodologies.

RESULTS

A total of 36 peer-reviewed articles met inclusion criteria for this review. Among these, 31 were quantitative studies (N = 225 667; range 42–188 288), 4 were purely qualitative research (N = 190; range 34–100),^{18,41,45,48} and 1 article presented both qualitative and quantitative results (N = 131 and N = 501, respectively)²⁸ (Table 1). The earliest identified article meeting inclusion criteria was from 1993. Twenty-seven of the studies were completed in the United States, with multiple studies in California and the Southeastern United States. International research was identified from Australia, Canada, Israel, India, Japan, England, and the Netherlands. The most common subject group comprised members of the general public surveyed at the household level (Table 2). While exact definitions varied, fundamentally the professional literature points to two operational constituents of personal preparedness: assembly of supplies for an “emergency kit” and development of a household or family plan. The majority of quantitative research in this area employs semistructured interview methodology. Qualitative research on this topic has been informed by both interviews and focus groups (Table 2).

Reliability

A checklist of a priori criteria was used to evaluate the quality of articles included in this review. Source articles were assessed for reports of statistical reliability, including test-retest, internal consistency, parallel form, split-half, and inter-rater reliability.¹⁴ Authors reported reliability data in 13 of 32 of the quantitative publications. Cronbach’s alpha was the most common measure of reliability. Two reports provided minimal evidence of instrument pretesting, and one discussed parallel forms but provided no statistical results for these reliability measures (Table 3).^{1,17} An additional 11 publications used survey instruments from previous publications or large data sets. Although

these publications did not report directly on instrument reliability, they provided reference sources.^{18–26}

Validity

Assessment of validity is a critical component in establishing quality of research methodologies and subsequent results. This review examined source articles for five types of validity: face, content, construct, convergent, and criterion validity (Table 3). Twenty-eight articles provided evidence of validity, with construct validity being the most common type evaluated (12 of 16 studies). Authors rarely discussed face validity,^{4,21,22,27} and only one publication evaluated study measures for all five types of validity¹⁷ (Table 3). As disaster preparedness is an emerging science, this review considered construct validity in particular detail. Each article was evaluated for discussion and application of public health or social science conceptual models. Seventeen articles directly used conceptual models in framing their research and/or discussing their results. Among these, the stages of change, person-relative-to-event, and Slovic’s theory of risk perception were most commonly referenced (Table 3).

Instrument Development

No one standardized definition of personal emergency preparedness is used in current research or practice, although common elements are consistently studied in most recent publications. As previously noted, multiple authors used survey instruments or subscales from earlier studies and thus did not directly report on instrument development. Eight publications developed new instruments and provided evidence of psychometric evaluation. These measures included focus groups, key informant interviews, expert review and evaluation of reading level, reliability, and factor analysis (Table 3). In general, the process of instrument development or selection was not described in functional detail.

TABLE 2

Overview of Studies by Report Type, Study Purpose, Methods, and Sample Characteristics

Study Citation	Type of Report	Type of Data	Study Purpose	Methods	N	Population	Sample Design and RR
Basolo et al ¹ (2009)	PR Research article	QN	To examine perceived and actual preparedness for 2 types of natural hazard risks: earthquakes in the Los Angeles County area and hurricanes within the New Orleans metropolitan area	Telephone survey	404	Households in Los Angeles County and the greater New Orleans region	Random sample; RR 34.6% Los Angeles; 44.7% New Orleans
Russell et al ³ (1995)	PR Research article	QN	To provide an assessment of the current state of preparedness among Los Angeles County and San Francisco Bay area residents to determine how the level of preparedness has changed since the earthquake of 1971, identify the circumstances under which people have prepared, and assess the degree of fit between respondents' perceptions of their preparedness and the reported number of preparedness activities accomplished	Telephone interview	1346	Los Angeles County and San Francisco City residents after 2 earthquakes	Multiple random sample; RR not specified
Page et al ⁴ (2008)	PR Research article	QN	To assess individual preparedness within a single sample of Londoners at 2 time points: immediately after the London bombings (T1) and 7 to 8 mo later (T2)	Telephone survey	T1 = 1010 T2 = 574	London residents >18 y	Random, Proportional quota sample; RR 70.4%
Kapucu ¹⁰ (2008)	PR Research article	QN	To examine household preparedness in response to disasters and the role of nonprofit organizations in the public's preparedness	Self-administered mail survey	187	Central Florida residents	Random sample; RR 12.5%; N had to be calculated (not reported)
Boscarino et al ¹⁷ (2006)	PR Research article	QN	To examine psychosocial predictors of terrorism fear and preparedness among New York City (NYC) residents after the World Trade Center disaster (WTCD)	Telephone interview	T1: 2368 T2: 1681	English- or Spanish-speaking residents of NYC on the day of the WTCD	Random sample; RR 63% (year 1); RR 71% (year 2)
Eisenman, Glik, et al ¹⁸ (2009)	PR Research article	QL	To understand perceptions, understandings, facilitators, and obstacles to disaster preparedness among low-income immigrant Latino residents	Focus groups	100	Immigrant Latino residents in low-income neighborhoods in Los Angeles County	Convenience sample; RR not reported
Eisenman, Wold, et al ¹⁹ (2006)	PR Research article	QN	To describe variations in preparedness among the population of Los Angeles County after the September 11, 2001, and subsequent anthrax attacks	Telephone survey	1038	Non-institutionalized Los Angeles County residents	Random sample; RR 58%
Heller et al ²⁰ (2005)	PR Research article	QN	To understand personal and social factors contributing to the generally low level of earthquake preparedness found among residents living in high earthquake regions	Telephone interviews and questionnaire	163	Longitudinal survey of generations panelists residing in Southern California during the Northridge earthquake (1994)	Random sample; RR 88.8%
Mishra and Suar ²¹ (2005)	PR Research article	QN	To examine the influence of age, family type, and income on preparedness behavior in the context of floods and heat waves in India	Self-administered survey	300	Residents of flood-prone areas of India	Sampling strategy not reported; RR 50%
Mishra and Suar ²² (2007)	PR Research article	QN	To test influence of experience and education via risk perception on preparedness behavior	Self-administered survey	300	Residents of flood-prone areas of India	Sampling not reported; RR 50%
Mullis et al ²³ (2003)	PR Research article	QN	To investigate the relationship between previous experience with disasters and preparedness actions	Self-administered survey	50 (pre) 149 (post)	Students in introductory psychology course at Penn State University, Pennsylvania	Convenience sample; RR not reported
Murphy et al ²⁴ (2009)	PR Research article	QN	To identify who in the public is prepared for emergencies and those factors that predict preparedness and compliance	Online survey	1629	Adults living in the US between August 2005 and February 2006	Random sample; RR 75%
Norris et al ²⁵ (1999)	PR Research article	QN	To examine the effects exposure to Hurricane Hugo on citizens' subsequent efforts to protect themselves from traumatic life events	In-person interviews	1000	4 Southeastern US cities with differing exposures to Hurricane Hugo (1989)	Purposive sample; RR 71%
Smith and Notaro ²⁶ (2009)	PR Research article	QN	To examine personal emergency preparedness of people with disabilities compared to those without	Telephone survey	188 288	Non-institutionalized US adults ≥18 y, national sample	Random sample; RR not directly reported
Humen and McClure ²⁷ (1997)	PR Research article	QN	To compare expert and lay understanding of natural disasters using a knowledge-based, structured educative questionnaire	Individual questionnaire	96	Residents of Tawa suburb in Wellington, NZ	Purposive sample; RR not reported
Marshall et al ²⁸ (2007)	PR Research article	QL and QN	Using a social marketing approach, to identify the public's "wants and needs" in anticipation of an emergency	Focus group, key informant interviews (QL) Telephone survey (QN)	112 (QL) 501 (QN)	Rhode Island residents	Purposive (QL) Random (QN); RR 70.5% (pre) and 75.3% post-intervention
Blessman et al ²⁹ (2007)	PR Research article	QN	To assess "at-home" preparedness and barriers to preparedness in a cohort of public health employees	Self-administered survey	100	Local health department employees, in the Michigan and Detroit metro areas	Convenience sample; RR not reported
Cretikos et al ³⁰ (2008)	PR Research article	QN	To investigate household disaster preparedness, emergency radio network awareness, household information needs, and information sources accessed by households before and during a storm-related disaster	Self-administered surveys (59.9%) and face-to-face interviews (40.1%)	227	Households in New South Wales, Australia	Random sample; RR 70.9%

(continued)

TABLE 2

Overview of Studies by Report Type, Study Purpose, Methods, and Sample Characteristics (continued)

Study Citation	Type of Report	Type of Data	Study Purpose	Methods	N	Population	Sample Design and RR
Edwards ³¹ (1993)	PR Research article	QN	To assess relationships between social structural location and the adoption of household preparedness measures	Self-administered mail surveys	544	Households in Memphis, Tenn	Random sample; RR 47%
Nozawa et al ³² (2008)	PR Research article	QN	To examine the awareness, behavior, and related factors of residents who, in 2004, were issued an evacuation advisory alert on the approach of the season's 23rd typhoon	Self-administered survey	481	Residents of Hyogo Prefecture, Japan	Purposive sample; RR 17.1%
Paton et al ³³ (2008)	PR Research article	QN	To systematically examine how relationships among people, communities, and health agencies influence decisions about whether to prepare for an influenza pandemic	Telephone survey	400	Citizens of Auckland, NZ	Sampling strategy not reported; RR not reported
Phillips et al ³⁴ (2006)	PR Research article	QN	To examine the preparedness and response behaviors reported by households in a northeastern Alabama community facing the threat of possible chemical release by an US Army depot	Telephone Interview (80%), in-person interview (20%)	2460	Households within 13- to 16-km radius from Anniston Army Depot, NE Alabama	Random sample; RR 80%
Farley ³⁵ (1998)	PR Research article	QN	To determine the extent to which improvements in earthquake awareness and preparedness were stimulated by the Browning prediction (1990), and which improvements were sustained through 1993, and remained longer term	Telephone survey	250	St. Louis metropolitan-area households	Random sample; RR 44%
Kirschenbaum ³⁶ (2006)	PR Research article	QN	To re-examine the robustness of the family household in predicting disaster preparedness behaviors	Telephone survey	814	Israeli urban households, national survey	Random sample; RR not reported
Aspinwall et al ³⁷ (2005)	PR Research article	QN	To examine how different approaches to thinking about and preparing for future events is related to estimates of magnitude and duration of Y2K-related problems, coping efforts directed toward controllable vs uncontrollable aspects of the situation, and the adoption of recommended precautions	Online survey	697	International sample of 15 countries, respondents 90% US, 5.6% Canada	Convenience sample; RR not reported
Eisenman, Zhou, et al ³⁸ (2009)	PR Research article	QN	To examine the relationship between health status (mental health, perceived general health, and disability) and disaster preparedness (home disaster supplies and family communication plan)	Telephone survey	2207	Non-institutionalized Los Angeles County population	Random sample; RR 59.1%
Feret and Bratberg ³⁹ (2008)	PR Research article	QN	To assess views of disaster preparation and readiness of assisted-living residents after a comprehensive program on the importance of preparing for an emergency	Self-administered survey	58 (pre) 42 (post)	4 assisted-living facilities in Rhode Island	Convenience sample; RR not reported
Hausman et al ⁴⁰ (2007)	PR Research article	QN	To investigate how social capital might be instrumental in mediating concerns about terrorism and promoting appropriate responses for emergency preparedness	Telephone survey	663	Philadelphia metropolitan-area households	Random sample; RR 21%
Chesser et al ⁴¹ (2006)	PR Research article	QL	To gather information about the preparedness education, training needs, and information-seeking behavior of a mixed urban/rural public in Kansas by carrying out a series of focus groups	Focus groups	34	4 Kansas counties: 2 rural (Finney, Pratt), 2 urban (Shawnee, Sedgwick)	Convenience sample; RR not reported
Faupel and Styles ⁴² (1993)	PR Research article	QN	To examine the impact of disaster education and household preparedness activities on stress response among adults in the Charleston, SC, area following Hurricane Hugo	Telephone survey	Study: 198 Control: 511	Charleston, SC, disaster education workshop participants	Convenience sample (study group); RR 73.1% Random sample (control); RR 59.1%
Terpstra and Gutteling ⁴³ (2008)	PR Research article	QN	To explore Dutch households' perceived responsibility for taking private protection measures	Online survey	658	Households in Friesland Province, Netherlands	Random sample; RR 11.8%
Lee et al ⁴⁴ (2009)	PR Research article	QN	To improve understanding of individual response to terrorism in Canada	Telephone interview	1502	Canadian Individuals, national sample	Random sampling; RR not specified
Rooney and White ⁴⁵ (2007)	PR Research article	QL	To gain a better understanding of disaster preparedness behaviors and the difficulties faced by persons with mobility impairments to guide future research and policy development	Online, key informant survey	56	Persons with mobility impairments and first-hand disaster experience, US national sample	Purposive sample; RR not reported
Ablah et al ⁴⁶ (2009)	PR Research article	QN	To examine and identify factors most likely to predict individual disaster preparedness	Computer-assisted telephone interview	15 630	Non-institutionalized adults in Arizona, Connecticut, Montana, Nevada, and Tennessee	Random sample; RR not reported
Baker and Baker ⁴⁷ (2010)	PR Research article	QN	To assess the level of disaster preparedness among families of children with special health care needs as compared to that of the general population	Self-administered survey	145	English-speaking caregivers of a child with special needs who presented to the Children's Hospital of Alabama at the University of Alabama in Birmingham	Convenience sample; RR not reported
Diekman et al ⁴⁸ (2007)	PR Research article	QL	To investigate the effects of individual homeowners' perceptions and experiences regarding household emergency situation on their emergency preparedness	Focus groups	16	English-speaking members of 2 metro-Atlanta homeowners associations	Convenience sample; RR not reported

TABLE 3

Variables, Evidence of Reliability/Validity, and Quality Considerations in 32 Quantitative Studies Reviewed

Study	Independent Variable(s)	Dependent Variable(s)	Evidence of Reliability	Evidence of Validity	Quality Considerations
Basolo et al ¹ (2009)	Confidence in local government's ability to manage disaster, exposure to information on natural-disaster preparedness, sociodemographic variables	Perceived level of household preparedness, actual level of household preparedness (existence of family plan, quantity of supplies, ability to shut off utilities, mitigation measures)	Partial internal consistency results presented in notes section	Hypotheses based on theoretical framework; random sampling used; instrument was pilot tested and revised before implementation; nonresponse bias evaluated; results consistent with prior disaster research on under-preparedness; findings support person-relative-environment (PrE) theory	Research questions and hypotheses clearly stated; nonresponse bias assessed; limitations acknowledged small sample sizes and cross-sectional nature of study
Russell et al ⁵ (1995)	Age, gender, ethnicity/race, marital status, employment, educational level, income, number children in home, length of residence in California, length of residence in neighborhood, home ownership, perceived preparedness, prior earthquake exposure, fear during earthquake	Survival supplies and techniques, planning activities, hazard mitigation (preparedness battery items adapted from Turner et al [1986])	Instruments implemented in 2 areas: Whittier Narrows: Cronbach α reported for survival ($\alpha = 0.73$), planning ($\alpha = 0.42$), and hazard mitigation ($\alpha = .44$) Loma Prieta: Cronbach α reported for survival ($\alpha = 0.69$), planning ($\alpha = 0.43$), and hazard mitigation ($\alpha = 0.53$)	Random sampling; sample weighting to account for oversampling; instrument adapted from previous studies; factor analysis used to develop preparedness subscales	Intentional oversampling of areas with high earthquake exposure
Page et al ⁴ (2008)	Gender, race/ethnicity, religion, social class, No. of children ≤ 18 y in household, received/read government educational booklet, perceived threat due to London bombings, stress levels	Possession of emergency plan (7 measures) and emergency supplies (5 measures), perception of preparedness	Not reported.	Proportional quota random sampling; reports face validity of preparedness measures but not how assessed	Limitations acknowledge potential bias introduced by quota-sampling technique; lack of retest reliability and full validity testing
Kapucu ¹⁰ (2008)	Gender, age, income, ethnicity, household size, number of children in household, housing status (rent/own), location, length of residency in current house, awareness of available emergency services	Household preparedness (emergency plan, disaster supplies kit, disaster training, volunteering, giving blood), awareness of emergency services (Red Cross survey items)	Cronbach α reported for emergency preparedness and awareness of services indices ($\alpha = 0.91$ and $\alpha = 0.99$, respectively)	Stratified random sampling	Findings consistent with prior studies revealing low levels of household preparedness; low (12.5%) response rate
Boscarino et al ¹⁷ (2006)	Age, gender, race/ethnicity, education, children at home, stressors exposure variables, stress moderator variables, fear of death, predicted evacuation behavior	Fear of terrorism; preparedness for terrorist attack (escape routes, communication plans, stockpiling food or supplies)	Cronbach α and parallel-forms reliability reported for some but not all scales; use of standardized scales from prior survey research with prior reliability evidence noted	Random sampling; demographically representative; some scales pretested; use of previously validated scales; content and face validity assessed; theoretical framework (terrorism management theory) guided research design	Findings consistent with terrorism management theory and prior findings regarding trust in government; weighting scheme developed to correct for nonresponse and selection bias; limitations acknowledge low response rate 63% and exclusion of non-English or non-Spanish speakers
Eisenman, Wold, et al ¹⁹ (2006)	Race/ethnicity, age, educational level, presence of dependent ≤ 18 y in household, country of birth, income level, Internet access, physical disability status, perceived likelihood of terrorist attack	Possession of emergency supplies, presence of household emergency plan	Not stated	Random sampling; weighting used to improve representativeness; Gelberg and Anderson behavioral model used to develop study questions; findings support behavioral model for vulnerable populations; results consistent with prior data on risk perception, age, and preparedness	58% cooperation rate; limitations note that single-item preparedness questions may not capture intended constructs; checklist not validated; potential nonresponse bias due to telephone-based survey
Heller et al ²⁰ (2005)	Age, educational level, income, degree of neuroticism and worry, degree of emotional and practical support provided to others regarding earthquake preparation, degree of emotional and practical support received from others regarding earthquake preparation	Subjective preparedness, completion of preparedness tasks (17 items from Bourque scale such as having a working flashlight, securing a water heater, rearranging breakable items within home)	Cronbach α reported for social support given and received ($\alpha = 0.74$ and $\alpha = 0.59$, respectively)	Construct validity (factor analysis and principal components analysis) of social support and preparedness scales reported	Participants obtained from systematic longitudinal panel survey; social support literature used to frame study questions and findings; findings consistent with larger under-preparedness data; limitations acknowledge lack of racial generalizability
Mishra and Suar ²¹ (2005)	Age, gender, family type, caste, education, housing status (rent/own), income	Flood preparedness and heat wave preparedness and perceived difficulty scales based on Mulilis Lippa earthquake preparedness scale (1990)	Cronbach α reported for flood preparedness and perceived difficulty scales ($\alpha = 0.80$ and $\alpha = 0.76$, respectively), Cronbach α reported for heat wave preparedness and perceived difficulty scales ($\alpha = 0.75$ and $\alpha = 0.76$, respectively)	Face and convergent validity reported for heat wave preparedness scale; PrE theory of coping (Duval 1985) to anchor study questions	Limitations acknowledge purposive sampling; overrepresentation of males

(continued)

TABLE 3

Variables, Evidence of Reliability/Validity, and Quality Considerations in 32 Quantitative Studies Reviewed (continued)

Study	Independent Variable(s)	Dependent Variable(s)	Evidence of Reliability	Evidence of Validity	Quality Considerations
Mishra and Suar ²² (2007)	Severity of past flood and heat wave exposure, degree of flood and heat wave education, flood and heat wave risk perception	Flood and heat wave preparedness and perceived difficulty scales developed from modified Mulilis Lippa earthquake preparedness scale (1990)	Dependent measures: Cronbach α reported for flood preparedness/perceived difficulty ($\alpha = 0.80$, $\alpha = 0.76$), heat wave preparedness/perceived difficulty ($\alpha = 0.75$, $\alpha = 0.76$) Independent measures: Cronbach α reported for flood/heat wave past exposure ($\alpha = 0.73$, $\alpha = 0.70$), flood/heat wave education ($\alpha = 0.78$, $\alpha = 0.73$), flood/heat wave risk perception ($\alpha = 0.81$, $\alpha = 0.60$)	Content validity of preparedness items assessed by expert panel; hypothesis testing anchored on conceptual model (Slovic risk perception); face and convergent validity evaluated	Research hypotheses and questions clearly stated; limitations acknowledge purposive sampling and noncritical measure of disaster education; findings support experience-behavior hypothesis; consistent with some prior data
Mulilis et al ²³ (2003)	Occurrence of tornados, demographics	Mulilis tornado-preparedness scale (1997), personal responsibility for tornado preparation, appraised threat of future tornados	Not reported	Not reported	Threat of recall bias to internal validity discussed; purposive sample; findings discussed in context of PrE theory and self-efficacy; cohort design
Murphy et al ²⁴ (2009)	Demographics, media usage, perceived preparedness of local health care system, perceived threat of disaster, perceived response efficacy	Possession of emergency supplies and an emergency plan, compliance during emergency (emergency preparedness survey, a subcomponent of Annenberg National Health Communication Survey)	Cronbach α of preparedness scales reported: supplies ($\alpha = 0.89$), emergency plan ($\alpha = 0.66$) and compliance ($\alpha = 0.90$)	Random sampling; study questions focus on psychosocial variables (perceived preparedness, efficacy, threat) but not anchored in specific model; factor analysis used to develop dependent scales	Limitations acknowledge possible underrepresentation of Hispanics and other non-English speakers as well as indeterminate causality due to cross-sectional design of study
Norris et al ²⁵ (1999)	Hurricane exposure, severity of exposure, perceived control of precautionary behavior, race/ethnicity, gender, age, educational level	Level of hazard planning, level of hazard alertness, degree of possession of basic supplies (items in these scales from Norris (1997), Mulilis and Lippa (1990), Faupel, Kelley and Petee (1992)	Cronbach α of preparedness subscales reported ($\alpha = 0.63$ to 0.76), Cronbach α of perceived control subscales reported ($\alpha = 0.51$ to 0.75)	Study hypotheses anchored in experience-behavior hypothesis; nonresponse bias statistically evaluated; factor analysis used in the development of scales	Study questions clearly stated; limitations acknowledge potential social desirability bias; lack of pre-event data; purposive sampling
Smith and Nottaro ²⁶ (2009)	Disability, gender, age, location, race/ethnicity, educational status, employment status, marital status, income	BRFSS emergency preparedness module (11 items such as general level of preparedness, development of evacuation plan, and possession of a 3-d supply of water (CDC [2006])	Not reported	Random sampling from CDC surveillance system	Research questions clearly stated; limitations acknowledge generalizability issues introduced by telephone survey; exclusion of institutionalized populations; limited definitions of disability and preparedness
Hurnen and McClure ²⁷ (1997)	Participation in an educative test of earthquake knowledge, type of damage (general damage vs building damage)	Perceived preventability of earthquake damage; earthquake preparedness	Not reported	Instrument questions developed using expert opinion	Hypotheses clearly stated; sampling schema not clearly defined
Marshall et al ²⁸ (2007)	Distribution of educational emergency preparedness booklet	Engagement in preparedness behaviors (development of emergency kit and family plan, ensuring ability to stay informed via electronic media during an emergency)	Not reported	Random sampling; no statistically significant demographic differences between cohorts	Limitations acknowledge lack of a priori application of theoretical model; reliance on focus group data in developing survey instrument; full focus group results and survey instrument available
Blessman et al ²⁹ (2007)	Sociodemographic variables, perceived likelihood of disaster, concern of disaster	At-home preparedness of public health employees, barriers to preparedness (items adapted from FEMA's emergency preparedness checklist [1997])	Not stated	Theoretical framework (trans-theoretical model) used to develop study questions; results consistent with prior findings of low level at home preparedness and lack of relationship between concern and preparedness	Full survey available; convenience sample
Cretikos et al ³⁰ (2008)	Sociodemographic variables	Household disaster preparedness, storm-warning awareness, emergency information sources used	Not stated	2-stage cluster-based random sampling; instrument pilot-tested before implementation; preparedness items adapted from Australia's emergency management checklist	Response rate 70.9%; survey conducted within 2 wk post-major storm; limitations acknowledge potential lack of generalizability to other local government areas and disaster types
Edwards ³¹ (1993)	Social structural location as indicated by race/ethnicity, age, educational level, household income, and presence of children in home	Ratio of household disaster preparedness actions taken to actions available to respondent	Not stated	Random, stratified sampling	Hypotheses clearly stated; 47% response rate; findings consistent with prior research on education level, income, children in home, and preparedness

(continued)

TABLE 3

Variables, Evidence of Reliability/Validity, and Quality Considerations in 32 Quantitative Studies Reviewed (continued)

Study	Independent Variable(s)	Dependent Variable(s)	Evidence of Reliability	Evidence of Validity	Quality Considerations
Nozawa et al ³² (2008)	Previous evacuation behavior (whether respondent evacuated after hearing advisory or did not), perceived danger of typhoon, prior disaster experience	Possession of emergency supplies, knowledge of danger areas in the vicinity of the home, ability to contact family during emergency, awareness of evacuation advisory alert	Not reported	Study questions anchored in conceptual framework from prior research (Hirose, 2004)	Low response rate (17.1%)
Paton et al ³³ (2008)	Outcome expectancy, participation in community, ability to articulate problems, perception of agency, trust in health care agencies	Pandemic preparedness (17 items such as possession of pandemic plan, possession of emergency water supplies, and securing important documents)	Not reported	Theory of social trust (Kee and Knox, 1970); outcome expectancy, and author's unique model ground research hypotheses and framework	Clearly stated hypotheses
Phillips et al ³⁴ (2006)	Income level (<\$25 000 vs ≤\$25 000), race/ethnicity, gender, education, marital status, children ≤16 y, health status, self-reported coping skills (general life coping), community	Hazard knowledge, disaster concern, emergency planning, knowledge of emergency warning systems, emergency preparedness, likelihood of taking protective actions	Not reported	Random sampling; sociodemographic characteristics of sample similar to census	Findings consistent with prior research demonstrating higher perceived threat and less resource access among lower income households; supervisory quality checks of random sample of surveys
Farley ³⁵ (1998)	Perceived likelihood of earthquake, perception of earthquake risk, concern about earthquakes	Actions taken to prepare for earthquake (15 actions such as storing food/water, possessing a first-aid kit, and making structural changes to place of residence)	Not reported	Random sampling; representativeness compared with census data; instrument questions verbatim in previous studies	High refusal rate (56%) suggests nonresponse bias though comparable to previous surveys indicating trends over time are still valid
Kirschenbaum ³⁶ (2006)	Family household structure, extent of familial social networks, marriage-related gender roles, presence of children in household, existence of social networks outside of the family	Kirschenbaum's preparedness component scale (2002) (level of emergency supplies in home, knowledge of emergency first aid, possession of family plan, protective rooms in house)	Not reported	Random sampling; factor analysis used to develop preparedness scale; family stress model (Murry 2001) and gender division of household labor (Kroska 2004) anchor study hypotheses; sample characteristics similar to census data	Study hypotheses clearly stated and results directly related back to hypotheses; unique theoretical model tested
Aspinwall et al ³⁷ (2005)	Dispositional optimism, proactivity, worry, and distressed mood	Personal and household preparedness	Cronbach α reported for each subscale ($\alpha = 0.73$ to 0.92)	Preliminary evidence for construct and concurrent predictive validity; theoretical framework (stages of change) used to develop study; factor analysis used to develop instruments	Preparedness variables adapted from American Red Cross (ARC) recommendations (1999); limitations acknowledge potential bias of cross-sectional design; social desirability; Internet-based non-representative sample
Eisenman, Zhou, et al ³⁸ (2009)	Gender, age, race/ethnicity, marital status, educational level, income, mental illness score, disability status, perceived health status, preferred language of interview	Possession of household emergency supplies, possession of emergency plan	Cronbach $\alpha = 0.62$ reported for emergency supplies scale	2-phase random sampling; 2-part weighting system implemented to improve representativeness; Gelberg and Anderson behavioral model for vulnerable populations used to develop study questions; Kessler-6 scale of psychological distressed used to develop independent scale	Hypotheses clearly defined; 59.1% cooperation rate; nonresponse bias discussed; includes multiple non-English survey versions; lack of similar research makes it hard to compare results to other studies, though health status has been shown to be associated with other areas of injury prevention
Feret and Bratberg ³⁹ (2008)	Participation in educational disaster preparedness program, type of disaster (ie, hurricanes, bioterrorism, avian influenza, floods, fire)	Personal disaster preparedness, concern for each of the 5 types of disaster included in the study	Not reported	Not reported	Nonrandom sampling; limitations acknowledge potential selection bias; lack of generalizability to general population; full survey available
Hausman et al ⁴⁰ (2007)	Demographics, previous exposure to disasters, concern for future disasters, social capital, perceived problems in community	Emergency preparedness (9 actions such as development of a family plan, secured important documents, purchased extra food, and purchased extra batteries); concerns about future terrorism	Cronbach α reported for social capital index ($\alpha = 0.84$)	Random sampling; 2-stage weighting procedure to improve accuracy of sample estimates	Low (21%) response rate; nonresponse bias discussed

(continued)

Generalizability

In this review, three aspects that directly impact generalizability of results were evaluated: sampling strategy, power analysis, and consideration of potential bias. With one exception (a qualitative study),²⁸ every study included in this review described sampling strategy in sufficient detail. Random sampling was the most common approach (19 of 36 reports). Multiple types of convenience and purposive samples were employed, more commonly in smaller studies. Only two studies provided details of power analysis, with multiple authors referencing previous publications or use of preexisting data (Table 3). Few publications (14 of 36) addressed issues of potential bias such as nonresponse, social desirability, or missing data. Only five studies reported statistical evaluation of bias. Ten reports tackled issues of potential bias in the discussion section (Table 3).

DATA SYNTHESIS

Levels of Personal Disaster Preparedness

Multiple studies have demonstrated that, overall, families and households are underprepared for disaster both in the United States and abroad.^{1,10,19,29-33,46,47} Publications reported a wide range of personal preparedness in their samples. For supply-stocking, results ranged from 7.4% in low-income northeastern Alabama residents living near a military chemical plant to 80% in Australian households affected by a storm-related disaster. For plan creation, results ranged from 11.9% in low-income Alabama residents to 90% in London residents following the July 2005 London terrorist bombings.^{4,30,34} Blessman et al's study of US public health employees' at-home behaviors revealed 75% to be either "minimally prepared" or "not prepared."²⁹ A study of residents near a chemical weapons storage depot revealed that, in spite of high levels of concern about potential accidents, most respondents had neither a family disaster plan nor supplies.³⁴

TABLE 3

Variables, Evidence of Reliability/Validity, and Quality Considerations in 32 Quantitative Studies Reviewed (continued)

Study	Independent Variable(s)	Dependent Variable(s)	Evidence of Reliability	Evidence of Validity	Quality Considerations
Faupel and Styles ⁴² (1993)	Prior disaster education, level of household planning, and adaptive response activities before exposure to hurricane	Physiological and psychological stress	Cronbach α reported for all subscales ($\alpha = 0.54$ -0.82)	Factor analysis used to develop stress and preparedness measures	Study objectives clearly stated; convenience sampling of "workshop" group; nonrepresentative sample
Terpstra and Gutteling ⁴³ (2008)	Perceived likelihood and personal risk of flooding, fear of flooding, trust in and credibility of public authority regarding flood-risk management	Attributed responsibility for flood damage mitigation, attributed responsibility for disaster preparedness	Cronbach α of risk perception scales reported ($\alpha = 0.87$ to 0.92)	Random sampling; study hypotheses and questions derived from literature on responsibility-attribution processes around disaster preparedness and damage mitigation	Research questions clearly stated; low (11.8%) response rate
Lee et al ⁴⁴ (2009)	Psychological stress measure (PSM)	Extent to which individuals thought about and engaged in preparedness behavior (13 behaviors such as consulting others for preparedness advice, establishing a preparedness plan, and putting together an emergency kit)	Reliability of PSM from previous studies reported	Random sampling; sample similar to census data; construct validity of PSM reported; theoretical model fit evaluated by factor analysis	Authors note that information on survey questionnaire published elsewhere; findings discussed in context of stages of change model; limitations acknowledge potential lack of generalizability due to low response rate and inability to determine causality due to cross-sectional nature of study
Ablah et al ⁴⁶ (2009)	Asthma, disability, use of special equipment, diabetes, cardiovascular disease, have suffered a fall, pregnant, race/ethnicity, gender, age, educational level, employment status, presence of children <18 y, reside in rural area, ability to afford doctor in past year	Objective disaster preparedness, defined as possessing at least 5 of the following items: evacuation plan, 3-d water supply, 3-d food supply, 3-d medication supply, working battery-operated radio, and working flashlight	Not reported	Data collected via BRFSS; instrument developed by the CDC	Study goals clearly stated; acknowledges generalizability issues introduced by using BRFSS data and using data from only 5 states as well as inability to determine causality in a cross-sectional study
Baker and Baker ⁴⁷ (2010)	Presence of special health care need, use of daily medication, use of a nebulizer, use of a home ventilator, use of a wheelchair, presence of multiple medical needs, caregiver level of concern for terrorism, power outage, tornado/severe weather, and disease outbreak in the next 2 y	5-point overall preparedness scale: 1 point awarded for possession of each the following 5 items: family emergency plan, emergency supply kit, 3-d supply of water for each member of household, 3-d supply of nonperishable food for each member of household, copy of child's medical emergency plan as completed by physician	Not reported	Not reported	Convenience sample; research questions clearly stated; preparedness scale items derived from current recommendations of the ARC, FEMA, and the American Academy of Pediatrics; limitations acknowledge small sample size and convenience sampling

Abbreviations: BRFSS, behavioral risk factor surveillance system; CDC, Centers for Disease Control and Prevention; FEMA, Federal Emergency Management Agency.

Differences in Personal Preparedness Tasks

Personal preparedness incorporates both plan-making and stockpiling. These tasks present different challenges in education, comprehension, and implementation. Given these differences, it is not surprising that success in each task set is highly variable. In a post-Hurricane Katrina New Orleans study, 58.6% of participants reported having a high level of preparedness for disasters. Among this group, 85% had a family plan in place, while only 22% had a full set of supplies prepared.¹

Conversely, other studies have found that people are less likely to create a family plan than assemble a supply kit.^{18,24,35,47} Similarly, educational interventions have met variable success in encouraging supply-gathering versus planning. A large-scale Rhode Island social marketing campaign motivated a greater proportion of recipients to create an emergency kit (an 11.8% increase from baseline) than to generate a family plan (no significant change).²⁸

Perceived vs Actual Personal Preparedness

A number of publications note a gap between perceived and actual preparedness.^{1,3,5,10,46,48} Russell et al suggested that perceived earthquake preparedness was significantly correlated with having both preparedness supplies and plans, and most strongly correlated with stockpiling behaviors.³ In Basolo et al's study,¹ 61% of Los Angeles County residents reported high levels of disaster preparedness, but less than 25% had a full set of recommended disaster supplies. Results suggested that creating a family plan was more tightly correlated with self-reported preparedness (63% of respondents).¹

Influence of Demographic Characteristics

Demographic characteristics have suggested mixed impact on personal disaster preparedness. Multiple regression analysis has been used to estimate the degree to which race, education level, socioeconomic status (SES), and age influence disaster preparedness planning. In a 1999 study of Southern US residents after Hurricane Hugo, gender, education, age, and race explained 20% of variance in stockpiling basic supplies but only 1% of planning differences.²⁵ In two additional studies, gender appeared to exert an effect on risk perception, as women perceived greater threat risk from potential disasters as compared to men.^{23,36}

Older age, more education, and higher incomes are associated with increased emergency preparedness in US and international samples.^{21,24,25,31,37,38,46} These findings hold true for respondents both with and without disabilities.²⁶ When compared to younger individuals, older age is a strong predictor of greater personal disaster preparedness.^{17,21,37,38,46} While preparedness appears to peak somewhere after age 30 years, it may drop off again among the elderly, especially disabled elders and residents in assisted-living facilities.^{17,39}

Higher SES variables (higher income, home ownership) have been consistently associated with completion of disaster pre-

paredness tasks such as storing food, water, or first-aid supplies.^{3,21,22,25,31,34} Russell et al suggested earthquake preparedness was correlated with higher education and income, home ownership, children living in the home, being married, and female gender.³

Minority race and ethnicity have been inconsistent predictors, with results varying widely depending on the definition and measures of personal disaster preparedness. In multiple large studies, racial/ethnic minority status was associated with lower scores on multi-item scales assessing specific disaster items.^{24,26,31,38} While minorities tend to be less prepared before a disaster, these groups may demonstrate greater increases in preparedness post-event.^{4,19,25} Among Londoners after the 2005 subway bombings, ethnic minority status and low SES were associated with increased personal preparedness, specifically gathering of basic supplies.⁴ This trend has also been seen in multiple surveys.^{19,25} It has been hypothesized that minority and lower SES individuals may feel greater personal threat, less confidence in government, and less trust in mainstream disaster information sources.^{4,19,34,49-51}

Marital status has appeared salient to the task of developing a family preparedness plan. Compared with unmarried couples, the rate of creating such plans is greater among married respondents.^{1,36} Having dependent minors in the home has also been correlated with greater rates of emergency supply possession,^{1,19,20,31} and family plan creation.^{19,24} Regardless of family structure, an essential element may be extent of social support network. In two non-US studies, family and household disaster preparedness appeared to increase with size and function of social support networks.^{21,36}

The highly heterogeneous context and nature of studies to date examining demographic influences on personal disaster preparedness poses challenges to any clear demarcation of "exceptions" per se among this set of modifier domains, beyond the mixed findings (eg, with respect to minority race and ethnicity) described here.

The Role of Psychosocial Predictors

Researchers have examined the impact of psychological variables on personal preparedness. Higher perceived risk has been associated with greater rates of personal preparedness activities.^{1,19,22,24,37,40} In a 1999 survey of Washington, DC, residents' preparedness for the anticipated threat of the 2000 Y2K computer bug, optimism, and distressed mood were associated with more preparations for Y2K.³⁷ A study of New Orleans residents that same year revealed that higher levels of perceived risk, specifically dread risk, increased likelihood of having a family plan more than 6-fold.¹ Faupel and Styles found that psychological stress correlated with increased household disaster planning.⁴² After the 2005 London subway bombings, perceived personal threat among city residents was a predictor of gathering new disaster supplies (OR 1.50).⁴ Of interest, degree of psychological distress due to previous disaster experience did

not suggest a clear relationship to increased preparedness behaviors in this study.⁴

Disaster Preparedness Knowledge

Studies have suggested variation in the nature and extent of personal disaster preparedness knowledge among the general public. In a qualitative study of Los Angeles low-income Latino residents, participants identified gang violence, school shootings, home robberies, and other violent crimes as examples of relevant disasters. Less than half of this group recognized the terms “disaster kit” or “emergency kit” but most were comfortable with the concept of emergency supplies.¹⁸ Among rural Kansas residents, focus group participants correctly identified basic contents of a preparedness kit; however, many were unsure regarding what additional supplies were required.⁴¹

Research on the impact of personal preparedness education on knowledge and behavioral outcomes has revealed mixed findings. In two studies conducted on preparedness to various natural disasters (flood, heat wave, and earthquakes), those with higher threat-specific knowledge were more likely to have prepared for these events.^{22,27} Basolo et al’s study suggests that exposure to preparedness information sources was associated with greater perceived and actual preparedness (having a personal preparedness plan).¹ Among a cohort of public health employees, one of the greatest barriers to at-home preparedness was lack of clear instructions and information on how to prepare (24%).²⁹ In Murphy et al’s study, watching national news or listening to radio talk shows was related to having more supplies.²⁴

Multiple studies have examined the impact of educational interventions in this arena. In 2004, the UK government sent an educational booklet, *Preparing for Emergencies: What You Need to Know*, to every household in the country. This distribution preceded the 2005 London subway bombings by approximately one year. In a subsequent analysis, people who could recall receiving the booklet were more likely to have gathered preparedness items but not to have made an emergency plan.⁴

Influence of Prior Disaster Experience

Prior disaster experience has been correlated with increased general preparedness.^{17,20,22,23,40,48} Intensity of exposure to the September 2001 World Trade Center terrorism attack and greater lifetime exposure to traumatic events were both predictive of greater personal preparedness in a multivariate model.¹⁷ In a postearthquake California study, extent of damage experienced (direct) and providing instrumental social support to others (indirect) were the best predictors of future preparation.²⁰

However, when each preparedness task (planning vs stockpiling) received separate consideration, experience was not clearly related to both types of preparedness actions. After the London subway bombings, Page et al’s 2005 study found that emergency planning increased from 51% to 90%. However, the number of respondents who gathered emergency supplies before and after the events did not increase.⁴ Among Northern Califor-

nian residents who experienced an earthquake, storing food and water were the least prevalent disaster preparedness behaviors before the event but became the most prevalent afterward (12% to 23%).³⁵

DISCUSSION

Emergency preparedness is an inherently multidisciplinary field, drawing on data and expertise from a broad variety of sources, including economics, informatics, medicine, psychology, and public health. Given this diversity, definitions and measures of personal preparedness have varied considerably among researchers.

Academic researchers and emergency planners, both in the United States and internationally, have generally coalesced around a framing of personal disaster preparedness that contains two fundamental tasks: collecting a standard set of emergency supplies and creating a personal preparedness plan. One of the ways this evolution can be observed is in the increasing use of standardized disaster preparedness scales (in academic research) and lists (in government planning documents and public education materials). In spite of the increased infusion of governmental terminology into the research literature since 1990, the current FEMA Ready tripartite model used in the United States (get a kit/make a plan/be informed) has yet to receive explicit research examination. This gap in the research literature could benefit from additional investigation.

The literature on personal preparedness is considerably diverse, addressing a broad spectrum of topics including gaps in preparedness knowledge; perceived versus actual preparedness; preferred sources of preparedness information; governmental role in personal preparedness; preparedness in minority groups; and influences of previous disaster exposure.

A number of studies have sought to identify barriers and facilitators to personal preparedness behaviors and attitudes. Operationally, lack of time and resources to establish and maintain emergency supplies has been identified as an inhibiting factor.^{1,3,18,29} Gaps in comprehension of guidance from preparedness authorities have also appeared as personal preparedness barriers among the general public.^{1,18,28,29,41} In a focus group study of Rhode Island residents, respondents identified a need for basic information about “where to go and what to do, without too many details.”²⁸ This observation underscores similar findings that the public often does not understand preparedness instructions and can perceive them as confusing or unrealistic.^{1,18,29,41} In Blessman et al’s study of public health employees, 24% reported unclear instructions as a barrier to completing recommended preparedness tasks.²⁹ Rural Kansas focus group respondents highlighted specific informational needs including details of threat severity, recommended duration of supplies, safe shelters, and sources for emergency updates.⁴¹

Accountability for preparedness behaviors has been another object of research attention. In a national survey of Dutch households, 50% of respondents viewed disaster preparedness as a co-

equal responsibility between individuals and national government. Interestingly, this research found no direct correlation between perceived responsibility and preparedness intentions.⁴³ In the wake of Hurricane Katrina, mistrust of government has been an oft-cited hypothesis for low observed rates of preparedness,^{5,6} specifically among racial and ethnic minorities. It appears reasonable that mistrust of government would provide an incentive to prepare and be self-sufficient in a disaster; however, the proposed mediating variable here is information source. Given that the government is a nontrusted information source, certain groups are less likely to follow preparedness directives. Greater perceived preparedness of the local health care system has been correlated with higher levels of personal preparedness.²⁴ Further, a high degree of confidence in local government has been associated with greater perceived preparedness and having a family plan.¹ These results may be indicative of an understanding of shared responsibility. However, further examination is needed to explore the association between feelings toward government, such as confidence in its abilities, and the division of responsibilities for disaster planning and preparedness.

We note that reference to a personal preparedness plan as a “family” emergency plan by government bodies such as FEMA may disaffect or engender disinterest in single people, young college students, and others who may believe that a family plan is not relevant to them. This belief may explain, in part, why married couples and homes with dependent minors are more likely to have a personal preparedness plan. Of note, though, the presence of dependent minors in a household may in itself contribute to an elevated sense of threat from potential emergencies or higher feelings of responsibility in parents and guardians. For purposes of accuracy, original-source terms (eg, family plan) have been used in this review; however, we suggest “personal preparedness plan” be used as a more impartial and all-encompassing term in light of these considerations.

The current body of research on personal disaster preparedness points to a synergistic interaction among established vulnerabilities. Multiple studies reveal that persons with disabilities are not more likely to be prepared for emergencies and in some examples are less prepared.^{19,26,38} One study reported that, compared to the general population, respondents with disabilities were significantly more likely to report that they were “not prepared at all” for an emergency (20.7% vs 16.1%). These findings applied to those with physical limitations, chronic medical needs, and mental illness alike.²⁶ Another study found that chronic medical and psychiatric illnesses were associated with lower rates of personal preparedness, both for supplies and plans.³⁸

All-hazards planning has become fundamental to emergency planning frameworks.⁵² Within the context of personal preparedness, all-hazards planning is rooted in the principle that a generic family kit and plan are useful in response to most disasters, regardless of their cause or severity. Thus, it is important to understand whether members of the public perceive all-

hazards personal preparedness as relevant to their own lives. Multiple studies have suggested that individuals and families are more likely to have basic household supplies that are one-time purchases (mobile phone, flashlight) than emergency-oriented items that require replenishing (food, water).^{1,3,8,20,24,30,31} These findings may be particularly important in assessing personal preparedness resources in limited-income and marginalized communities.¹⁸

It should be noted that, to our knowledge, no literature exists to date that clearly links having a kit or plan to better response outcomes. Meanwhile, there has been an intensifying focus on methods to characterize social vulnerability factors that influence community resiliency in the face of disasters.^{53,54} In terms of their locus of control, such factors have generally been macro rather than micro in scale. The current lack of explicitly-studied correlation between potential resiliency elements under individual control (eg, personal disaster preparedness) and postevent outcomes can and should become an increasing focus of rigorous research in the realm of community resiliency study. In addition to personal disaster preparedness, examples of such individually-driven behaviors that may fall under this resiliency umbrella include personal compliance with guidance on vaccination measures in the face of emergent infectious disease threats and willingness to follow community directives to evacuate in disasters.

Other priority areas for future research in this field include the relationship between personal preparedness and reduced overall burden on emergency and community services during incident response and recovery. In addition, the association between personal preparedness and reduction in total incident recovery time would provide useful information to disaster management professionals.

Limitations

In spite of the systematic protocol applied for this literature review, it is possible that some relevant publications were not identified. Furthermore, this review included only English-language publications that were subject to full peer review. With this search strategy and inclusion criteria, it is possible that potentially relevant studies were omitted. In spite of these limitations, this review identified a robust number of articles on the topic.

Twenty-seven of the studies included in this review were conducted in the United States, and 9 studies were internationally based. The researchers note that the inclusion of international studies may confound the ability to compare demographic findings on socioeconomic, racial, and ethnic minority status. However, inclusion of these studies is important for a strong, integrative review of the literature, and gives a more accurate overall picture of global preparedness.

Another important consideration is our decision to conceptualize personal disaster preparedness as two essential tasks (supply gathering and plan creation), as characterized in the vast

majority of recent publications. Although these two are the most frequently observed constituents of personal preparedness activities, they are not exhaustive. As previously mentioned, for example, current US federal guidance on personal preparedness from FEMA and the ARC includes a third task—to stay informed.⁸

CONCLUSIONS

This integrative review of the literature points to the need for clear, actionable, realistic, and trusted personal preparedness guidance, including explicit attention to vulnerable populations. Disaster preparedness behaviors rely on complex, multifactorial processes with many variables, such as knowledge about risks, attribution of preparedness responsibility, and cognitive construction of threats. However, there is no standardized understanding of how these factors optimally interact to promote preparedness behaviors. In the aftermath of events such as Hurricane Katrina, the importance of individual and community self-reliance within the first days of disaster response has again come into focus. Given the critical relevance of these findings to public health and safety, it is important to understand how personal preparedness behaviors and perceptions are formed, while being aware of differing needs and vulnerabilities of certain population groups.

Another significant gap found through this review is the lack of a universal set of personal preparedness definitions and measurement criteria. Specifically noted were the inconsistencies between governmental and academic definitions. A standardized set of criteria would facilitate improved exploration of personal preparedness parameters and allow for a better understanding of behaviors and practice. It also would improve program evaluation and enable greater alignment of research and practice initiatives with public policy and planning goals.

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