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A Review of Measurement Methods for the Recovery of Households After Disasters: An Annotated Bibliography

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Kurtis Goad
Materials and Structural Systems Division
Engineering Laboratory

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Author ORCID iDs

Kurtis Goad: 0009-0008-0639-2582

Jennifer Helgeson: 0000-0002-3692-7874

Contact Information

kurtis.goad@nist.gov

Abstract

Household recovery after disasters is a complex process influenced by various factors. By compiling research on household recovery, this work seeks to support researchers and practitioners in identifying effective approaches to measuring and promoting household resilience. As a direct continuation of a previous review on the measurement of business recovery [1], this companion bibliography examines household recovery. It compiles studies across a broad range of disaster types, household characteristics, and research methodologies, highlighting the complex dynamics that shape domestic post-disaster stabilization. The objectives of this work are to: 1) Summarize academic studies on household recovery after disasters, 2) provide a concise presentation of each study's context and methodology, and 3) highlight the significance of each study's findings to inform future research and practice. The compilation of 56 peer-reviewed studies indicates the multifaceted nature of household recovery, revealing that factors such as socioeconomic status, household demographics, social capital, and access to financial aid play a crucial role in determining recovery outcomes. The studies also emphasize the importance of considering the built environment, residential housing, utility infrastructure access, and broad well-being indicators in understanding household recovery. While the research has made significant contributions, a notable limitation is the lack of validation efforts in many studies, underscoring the need for continued research to develop more robust and validated methods for measuring household recovery. By documenting the various approaches to measuring recovery, this work sheds light on the challenges and opportunities in measuring household recovery and promoting community resilience.

Keywords

Community resilience; Disaster resilience; Disaster risk reduction; Economic recovery; Household continuity; Household recovery; Methodology; Natural hazards; Recovery measurement.

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1. Introduction and Objectives

Measuring household recovery after a disaster is a complex task due to the diverse range of circumstances that can affect the recovery process. A household's demographic makeup, size, and socioeconomic status, within the context of regional economic circumstances, influence the speed and extent of household recovery after a disaster. Furthermore, the severity of damage to the built environment in the surrounding community—including residential housing, local utility grids, and neighborhood infrastructure—can either obstruct or accelerate the path to household recovery. Consequently, a thorough evaluation of recovery accounts for the physical condition of local infrastructure and a household's access to these vital infrastructure systems, as well as the health of socioeconomic systems within the community.

Household and community recovery are mutually reinforcing, as residents depend on restored infrastructure and public services. Maintaining households within the community helps local businesses stay open [2], helps revive property values, and maintains the municipal tax base, which helps in long term recovery and future resilience planning. Conversely, prolonged displacement and delayed housing reconstruction erode local fiscal capacity and consumer demand, creating a negative feedback loop that hinders progress across household and business levels [3–6].

The specific type and scale of the disaster also play a pivotal role in shaping a household's recovery process, as different crises introduce distinct hardship types, especially in terms of the type and extent of physical damage to the house structure. A household displaced by a hurricane that causes extensive structural damage across a community, for instance, faces vastly different obstacles than one navigating the financial and health strains of local displacement following local structural damage by an earthquake.

Disasters can affect households through both covariate and idiosyncratic impacts. Covariate impacts arise from hazards or disruptions that affect many households simultaneously, whereas idiosyncratic impacts vary across households because of differences in exposure, vulnerability, resources, and individual circumstances. Impacts may also be direct, such as physical damage to a home, or indirect, such as disruptions to utilities, employment, supply chains, or other systems. For example, a wildfire may directly damage homes in one community while smoke or power disruptions affect households in another. These distinctions help explain why households experiencing the same disaster may nevertheless follow substantially different recovery pathways. Because these diverse elements interact in complex ways, a universal standard for measuring household recovery is difficult to imagine. This reality underscores the necessity for flexible, localized, and context-specific assessments of recovery.

The present annotated bibliography compiles academic research on the various methodologies used to measure household recovery following disasters. This is a direct continuation of the efforts of a previous annotated bibliography which examined the measurement of business recovery [1]. This study strives to deliver concise yet comprehensive overviews of each reviewed study's technical approach to determining and tracking household recovery. By

situating these metrics within their specific environmental and social contexts, this resource serves as a comparative guide to assist researchers and practitioners in selecting the evaluation tools best suited to their localized goals. Ultimately, it provides a foundational step toward developing more consistent, replicable, and refined methods for measuring household recovery in post-disaster settings.

The objectives of this annotated bibliography are to:

- Report and summarize studies from the academic literature that include the measurement of recovery at the individual household level after a disaster.
- Provide a concise presentation of each study's context, including its purpose, the type of businesses and disaster examined, the measurement methods' consideration of the built environment, the timeframe assessed, and key methodological aspects, so that researchers and practitioners can use the bibliography as a comparative resource for selecting and improving upon recovery measurement methods.
- Detail each study's findings and significance to guide future methodology choices.

2. Article Selection

This annotated bibliography focuses on studies from peer-reviewed literature that include measurements of household recovery at the single entity level. Although household and business recovery processes are interdependent—given that households supply labor and demand for businesses, while businesses provide income, goods, and services to households—there remain critical distinctions that warrant separate examination.

While researchers often separate household and business recovery to isolate specific metrics, overall community resilience relies on the systemic interdependence of these two sectors [7]. This relationship is structurally bound by two reciprocal dynamics: labor supply and service demand. Under the labor dynamic, businesses require a functioning workforce to resume operations, while households depend on business-provided wages to fund their own rebuilding efforts [2, 8]. Simultaneously, the service dynamic dictates that local businesses need household consumer spending to survive, while households rely on the swift reopening of these commercial entities for critical daily goods and services [9, 10]. Ultimately, although studying these domains separately offers analytical clarity, recognizing their structural intersections is vital for a comprehensive, realistic understanding of long-term post-disaster recovery trajectories.

This bibliography follows the same principles of the business recovery bibliography by specifically reviewing peer-reviewed scientific research [1]. Focusing on peer-reviewed studies is highly valuable for applied fields like disaster recovery because they generally offer systematic and reproducible methodologies. Unlike other inquiries, peer-reviewed research grounds its innovative approaches in theoretical context, explaining the reasoning behind specific methodological choices. Consequently, these studies provide a strong, comparative foundation to guide the development of more robust future measurement tools. For a more complete explanation of the choice to focus on peer-reviewed research see *A Review of Measurement Methods for the Recovery of Businesses After Disasters: An Annotated Bibliography* [1].

To establish a precise methodological scope, this study explicitly conceptualizes the household as a discrete, individual entity operating as a foundational domestic subunit within the broader community ecosystem. Within this framework, a household is defined primarily by its single-entity scale of measurement, which intentionally isolates the localized experiences, assets, and stabilization trajectories of individual residential units. Consequently, this definition excludes macro-level socio-economic groupings or geographic data aggregations, ensuring that studies examining post-disaster dynamics solely at the neighborhood, ZIP code, county, or regional levels are omitted from the core analytical boundaries of this bibliography. By restricting the operational definition to individual household-level entities that maintain these relational intersections, this study isolates specialized empirical indicators—such as housing structural replacement, temporary displacement duration, and targeted financial aid acquisition—necessary to systematically evaluate long-term domestic stabilization independent of aggregate macro-economic trends.

A significant challenge in disaster recovery research lies in how recovery is conceptualized, operationalized, and measured. Existing evaluations, particularly those found within operational literature, demonstrate a historical emphasis on measuring the execution of the recovery process rather than the long-term outcomes resulting from that process [11]. Distinguishing between these two orientations is critical for understanding the scope and limitations of current household recovery methodologies.

- *Process-based* measurements often focus on the influence of particular factors or the role of certain variables throughout the recovery period, such as project completion and expenditures, without actually measuring the outcomes of the process.
- *Outcome-based* evaluation measures the tangible impacts, benefits, or changes resulting from a recovery process, and are often limited to narrow 'snapshots' of specific outcomes at one or a few specific points in time.

Certain recovery variables defy simple classification and operate simultaneously as both a process and an outcome. For example, social capital involves the active, ongoing processes of social interaction and community networking during the stabilization phase [12]. Yet, when properly leveraged, these interactions lead to constructive outcomes, such as permanently strengthened community bonds (e.g., Individual property owners pool land rights and private assets to construct shared, disaster-resilient multi-family housing) and increased collective resilience post-disaster (e.g., Tightly bonded groups pool and redistribute major donated capital assets or divide cash proceeds across all member families to ensure communal survival) [12, 13].

Academic articles were retrieved through a Web of Science search using the following terms and Boolean operators: "ALL=((household OR business) AND (recovery) AND (disaster OR emergency))." The search initially returned 1,899 articles. After individually reviewing articles and removing irrelevant results, 315 articles remained that addressed the measurement of either household or business recovery following disasters. Studies focused on business recovery were then excluded, as these were addressed in the previous review [1]; the present work is limited to household recovery.

The remaining 120 articles were screened against three inclusion criteria:

- The study must directly measure the recovery of a household or households.
- Measurement must be conducted at the individual household level (excluding analyses conducted solely at county, sector, regional, or other aggregate levels).
- Household recovery must be measured following a disaster, whether originating from natural or technological hazards.

A total of 56 studies met all criteria and were included in this annotated bibliography.

3. Annotated Bibliography of Household Recovery Studies

This section provides an annotated bibliography of the peer-reviewed papers selected for review. The studies are organized alphabetically by first author. The collection encompasses 16 earthquake studies, 15 hurricane/typhoon studies, 12 flood studies, four tsunami studies, three winter storm studies, one drought study, and one volcanic eruption study, conducted across different countries in Asia, Africa, North America, Oceania, and Europe. The methodologies employed in these studies include 34 studies utilizing surveys/quantitative methods, seven studies utilizing only qualitative methods, and 19 studies utilizing mixed methods.

Each study in this review is summarized by categorizing information about its context, methodological approach, and theoretical contributions. The household recovery bibliography entries retained many of the same categories of the business recovery review [1]. These include Study Purpose, Disaster, Built Environment, Timeframe Measured, Measurement of Recovery, Methodology, and Validation. Categories that are unique to household recovery entries include Sampling Characteristics, Recovery Focus, and Instrument Included. Definitions of each category are listed below:

Study Purpose: The objectives or goals of the study.

Sampling Characteristics: Information on the sample size, strategy, and the types of people sampled.

Disaster: A single-word description of the disaster type affecting the businesses (e.g., Hurricane, Earthquake, Flood, Drought)

Built Environment: Indicates whether aspects of the built environment¹ were included in the recovery measurement (Yes/No).

Timeframe Measured: The period after the disaster during which business recovery was assessed.

Recovery Focus: Whether the paper looks at recovery via process-based or outcome-based recovery metrics or a combination thereof.

Measurement of Recovery: The specific approach or metric used to evaluate business recovery.

Instrument Included: Whether the study included the specific measurement instruments or a functional description (could be used for reproduction) of instrument items used to gather data (Yes/No/Partially).

Methodology: The research methods and procedures employed in the study.

Validation: The steps taken to verify or validate the measurement approach or model.

Significance: The study's relevance to disaster recovery measurement and research and the key theoretical contributions asserted by the study.

¹ The built environment is defined as: "All buildings and infrastructure systems. Also referred to as built capital." [14]

The next subsections present all reviewed articles, organized by disaster type, in alphabetical order by citation author's last name.

3.1. Drought

1. Tp, H. "Economic Impact of Drought on Agrarian Society: The Case Study of a Village in Maharashtra, India." *INTERNATIONAL JOURNAL OF DISASTER RISK REDUCTION* 96 (October 2023). WOS:001059546700001. <https://doi.org/10.1016/j.ijdr.2023.103912>.

Study Purpose: The purpose of this study is to assess the economic impact of drought on households in a village in Maharashtra, India, based on their landholding structure, and to identify the determinants of household-level vulnerability and recovery.

Sampling Characteristics: The study sampled 67 households affected by the drought. Households were selected based on size of land owned (Landless – 0 acres to Landlords – above 20.1 acres).

Disaster: Drought

Built Environment: No

Timeframe Measured: One year after the year of the drought. Multiple data collections: one for the drought year (2013 to 2014) and one for the year after the drought (2014 to 2015).

Recovery Focus: Outcome

Measurement of Recovery:

- **Change in income** – The self-reported household incomes from cultivating land for the year of the drought and the year after the drought.
- **Change in operational holdings** – The self-reported shares of ownership holding, area under ownership holding, and share of land holding for the year of the drought and the year after the drought.
- **Change in income source** – The self-reported household incomes from different sources (cultivation; agriculture labor; manual labor; salary; business) for the year of the drought and the year after the drought.

Instrument Included: No

Methodology:

- Survey of 67 households affected by the drought. The survey collected information regarding household demographics, land ownership, operational holdings, and cropping patterns, alongside detailed income records from cultivation, livestock, and various non-agricultural sources such as manual labor, salaried employment, and business enterprises.
- Statistical analysis used to examine the relationship between household experiences during the drought and vulnerability and recovery.

Validation: None described.

Significance: This study adds to the overall measurement of recovery by providing insights into the differential impact of drought on households based on their landholding structure. The findings suggest the importance of non-agricultural sources of income in facilitating recovery and reducing vulnerability to drought.

3.2. Earthquake

2. Basaglia, A, A Aprile, E Spacone, and L Pela. "ASSESSING THE IMPACT OF SEISMIC RISK MITIGATION AT THE URBAN SCALE ON COMMUNITY RESILIENCE AND HOUSING RECOVERY." In *G d'Annunzio University of Chieti-Pescara*, edited by P Roca, L Pela, and C Molins. 2021. WOS:000856026403041.

Study Purpose: The study aims to assess the impact of seismic risk mitigation strategies on community resilience and housing recovery after the 2012 Northern Italy earthquake, using a case study approach.

Sampling Characteristics: Data on households in temporary housing and those receiving monetary contributions after the 2012 Northern Italy earthquake were collected from publicly available municipal journals in two Italian cities affected by the earthquake, specifically Concordia sulla Secchia and Mirandola.

Disaster: Earthquake

Built Environment: Yes

Timeframe Measured: Seven years after the earthquake. Multiple data collections between May 2012 and May 2019.

Recovery Focus: Mixed

Measurement of Recovery:

- **Return to permanent housing** – defined by the number of households still in temporary housing or receiving monetary contributions.
- **Housing recovery method** – Whether respondents lived in temporary shelters (PMARs) or received monetary contributions (CAS)

Instrument Included: N/A. No new or existing instruments were created or used for collection of data from publicly available sources.

Methodology:

- **Housing Recovery Analysis:** The data collected were used to analyze the housing recovery process in the two cities, including the number of people displaced, those living in temporary shelters (PMARs), and those receiving monetary contributions (CAS).
- **Seismic Risk Mitigation Strategies:** The study proposed a suite of seismic mitigation strategies, referred to as "class upgrades" (CUs), which involve strengthening buildings to improve their seismic performance.

- **Cost-Benefit Analysis:** A cost-benefit analysis was performed to assess the effectiveness of the proposed seismic mitigation strategies. The analysis considered both the costs of strengthening the buildings and the benefits in terms of reduced repair and replacement costs.
- **Damage Data Collection:** The study used the Da.D.O. (Database of Damage Observed) online database to collect information on the structural type and damage distribution for the buildings in the two cities.
- **Repair and Replacement Cost Estimation:** Repair and replacement costs were estimated based on a recent study about the reconstruction after the 2009 L'Aquila earthquakes.
- **Casualty Estimation:** The expected number of injuries and fatalities was estimated using the approach defined by Zuccaro and Cacace [15].

Validation: Use of methods from previous studies.

Significance: This study contributes to the understanding of housing recovery after an earthquake and the impact of seismic risk mitigation strategies on the recovery process. It provides analysis of the reconstruction process in two affected locations, offering insights into the effectiveness of different approaches to recovery.

3. Bhusal, NP, K Bhattarai, and F Walkley. "Effectiveness of Socio-Technical Assistance (STA) Program for Vulnerable Beneficiaries: Evidence from Nepal's Post-Earthquake Reconstruction." *SUSTAINABILITY* 16, no. 15 (2024). WOS:001287009500001. <https://doi.org/10.3390/su16156284>.

Study Purpose: The study aimed to assess the effectiveness of the Socio-Technical Assistance (STA) program in supporting vulnerable households in reconstructing their homes after the 2015 Nepal earthquake.

Sampling Characteristics: The study sampled 304 households who received STA support. Purposive sampling was used.

Disaster: Earthquake

Built Environment: Yes

Timeframe Measured: Eight years after the earthquake. Single data collection between May and July 2022.

Recovery Focus: Mixed

Measurement of Recovery:

- **Socio-Technical assistance (STA) program engagement** – Respondents stated whether they participated in any of seven program activities (Community/household Orientation; Door-to-door technical assistance; Short training for masons; Helpdesk &

communication center; Demo-Construction; Reconstruction committee support; On-job training for masons)

- **Program effectiveness** – Several self-reported responses about respondents' experiences with the program.
 - **House building capacity without programs support** – Respondents answered (Yes/No) whether they were able to rebuild their homes without program support.
 - **Reconstruction satisfaction** – Likert response on agreement that the new house meets their needs (Strongly Agree to Strongly Disagree).
 - **Financial grant effectiveness** – Three responses (Less effective; Effective; Highly effective).
 - **Technical assistance effectiveness** – Three responses (Less effective; Effective; Highly effective).
 - **Satisfaction with support in receiving grants** – Likert response on agreement that they are satisfied with support (Strongly Agree to Strongly Disagree).
 - **STA sped up reconstruction** – Likert response on agreement that STA support sped up recovery (Strongly Agree to Strongly Disagree).
 - **Method of receiving support** – Five responses (Self approached for the need of the program activities; Approached by organization; Recommended or referred; Local community; Social mobilizer).
 - **STA importance** – Likert response on agreement that STA support was important to their recovery (Strongly Agree to Strongly Disagree).
 - **Disaster risk reduction (DRR) awareness** – Likert response on agreement that respondents are aware of DRR strategies (Strongly Agree to Strongly Disagree).
 - **STA benefit** – Eight responses on how STA benefited respondents (Financial support; Technical support; Accessible house; Build earthquake resilient house; Improved livelihood; Training & orientations; Sufficient place to live; Enhanced safety).

Instrument Included: Yes

Methodology:

- Survey of 304 households who received STA support. The survey collected information on the experiences and perceptions of households regarding the STA program and its impact on their recovery efforts.
- Statistical analysis used to observe the relationship between STA activities respondents participated in and the perceived effectiveness of the program.

Validation: None described.

Significance: This study contributes to the understanding of household-level recovery by evaluating the effectiveness of a specific post-disaster reconstruction program (STA) in supporting vulnerable households. The study's findings provide insights into the impact of STA interventions on household recovery outcomes, including housing reconstruction and DRR awareness.

4. Bin Tan, S, JW McCaughey, S Loos, et al. "Seen and Unseen Vulnerabilities: Evaluating Recovery from the 2015 Nepal Earthquake to Inform More Equitable Post-Disaster Needs Assessments." *INTERNATIONAL JOURNAL OF DISASTER RISK REDUCTION* 115 (December 2024). WOS:001385990700001.
<https://doi.org/10.1016/j.ijdr.2024.105021>.

Study Purpose: The study aimed to evaluate the accuracy of a Post Disaster Needs Assessment (PDNA) in identifying socially vulnerable groups after the 2015 Nepal earthquake by comparing its findings with household recovery outcomes observed four years later.

Sampling Characteristics: The study surveyed 863 households across seven districts affected by the earthquake. The sample was drawn from 42 Village Development Committees (VDCs) and wards, representing a mix of rural and urban areas, and various ethnic and socioeconomic groups.

Disaster: Earthquake

Built Environment: Yes

Timeframe Measured: Four years after the earthquake. Single data collection between April and June 2019.

Recovery Focus: Outcome

Measurement of Recovery:

- **Stable Housing** – Degree of repair/reconstruction on the previous house (0 % to 100 %) and physical comfort of the current house compared to the house before the earthquake ("much less" to "much more").
- **Social Roles** – Degree to which people in the community help each other out ("People almost never help each other out" to People almost always help each other out").
- **Economic Stability** – Change in monthly household cash income compared to before the earthquake ("Less than Rs. 10 000" to "More than Rs. 50 000")
- **Physical Health** – Perceived general health compared to before the earthquake.
- **Mental Health** – Individual's Primary Care Post Traumatic Stress Disorder (PC-PTSD) screening Score (four item screening instrument)

Instrument Included: Partially

Methodology: The study employs a mixed-methods approach:

- Informatics for Equitable Recovery (IER) Survey: The research team administered the survey to 863 households through face-to-face interviews, collecting data on various aspects of household well-being, including demographic characteristics, housing, physical/mental health, livelihoods, and social connections.
- PDNA data, which was conducted shortly after the earthquake, provided information on the initial assessment of damage, losses, and needs. Statistical analysis was used to compare the PDNA's vulnerability assessments with the observed recovery outcomes from the IER survey.

Validation:

- The five measures used were from a previously validated (construct validity was statistically tested) recovery measurement framework [16], however, the framework was designed for the measurement of individual recovery.
- None described for survey questions.

Significance: This study adds to the understanding of household-level recovery by comparing the effectiveness of a widely used post-disaster needs assessment tool (PDNA) in identifying vulnerable populations with actual recovery outcomes observed four years later. The study's findings suggest the importance of considering multiple dimensions of recovery and the need for more nuanced assessments of vulnerability to inform post-disaster recovery efforts.

5. Di, BF, JR Li, M Dandoulaki, AM Cruz, RX Zhang, and ZP Niu. "Household Recovery Strategies in Longmen Mountain Area, Sichuan, China, Following the 2008 Wenchuan Earthquake Disaster." *NATURAL HAZARDS* 104, no. SUPPL 1 (2020): 123–37. WOS:000568629000002. <https://doi.org/10.1007/s11069-020-04287-z>.

Study Purpose: The study aims to investigate the household recovery strategies employed by rural households in the Longmen Mountain area after the 2008 Wenchuan earthquake, with a focus on understanding the bottom-up adaptation strategies adopted by households to cope with the disaster and its aftermath.

Sampling Characteristics: The survey sampled 110 households from six villages along the Jianjiang River who were affected by the earthquake. The sample consisted of 86 households that undertook "Owner-Driven Reconstruction" and 24 households that were part of "Donor-Driven Reconstruction".

Disaster: Earthquake

Built Environment: Yes

Timeframe Measured: Up to six years after the earthquake. Multiple data collections occurring in October 2012, August 2014, and June 2018.

Recovery Focus: Outcome

Measurement of Recovery: Recovery was measured through several detailed metrics across three time periods:

- **Physical recovery –**
 - Change in total built area, measured in meters squared.
 - Change in settlement patterns, measured in spatial transfer of locations of settlements.
 - Change in size of housing structures, measured in meters squared.
 - Change in structure type of housing structures (“traditional, reinforced concrete, or hybrid structure”).
- **Social economic recovery –**
 - Change in income sources among households.
 - Change in work location among households (in or outside of the area).
 - Change in cultivated land, measured in meters squared.
- **Mental recovery –**
 - Self-reported responses where respondents chose if they felt “worry”, “panic”, “concern”, or “No Worry” for future earthquake disasters.

Instrument Included: No

Methodology:

- Semi-structured interviews of 110 households. The interview asked about building characteristics (size, structure, use, and morphology), household characteristics (size, primary income source, outside workers), and the overall mental impact of the disaster.
- A combination of satellite imagery, drone data, field investigations, maps, and literature review were used to obtain settlement distribution data in a spatio-temporal format and to analyze changes in the built area between 2008 and 2018.

Validation: None described.

Significance: This study contributes to the measurement of household-level recovery after a disaster by providing insights into the recovery strategies employed by rural households by using multiple indicators to measure recovery. It suggests the importance of considering the diverse income sources and livelihood strategies of households in disaster recovery efforts.

6. Fayazi, M, and G Lizarralde. “The Impact of Post-Disaster Housing Reconstruction Policies on Different Beneficiary Groups: The Case of Bam, Iran.” In *Sichuan University*, edited by A Asgary. 2019. WOS:000455385400009. https://doi.org/10.1007/978-3-319-92498-4_9.

Study Purpose: The study examines the impact of post-disaster housing reconstruction policies on different categories of households affected by the 2003 Bam earthquake in Iran, with a focus on understanding how these policies influenced household recovery.

Sampling Characteristics: The study sampled 70 households who were residents of Bam. No explanation provided for sampling strategies. Households were categorized into six categories: Pre-disaster house-owners, members of extended family, young couples who married after the disaster, apartment owners, pre-disaster tenants, and informal settlers.

Disaster: Earthquake

Built Environment: No

Timeframe Measured: 11 years after the earthquake. Multiple data collections between July and August 2004, November 2008, January 2011, March 2012, and June and July 2014.

Recovery Focus: Mixed

Measurement of Recovery:

- **Housing outcomes** – Self-reported housing recovery outcomes from each of the six categories of households after the implementation of each of three housing reconstruction policies. These included: reconstructed their houses, purchased land and built a new house, split land and reconstructed in the yards of parents' houses, received an apartment, stayed in temporary shelters/housing camps, formed a new settlement, migrated from the city, and did not receive aid.

Instrument Included: No

Methodology:

- Data on the outcomes of policy implementations were collected from multiple sources:
 - 12 interviews with officers and authorities in Bam and Tehran.
 - 70 interviews with residents in Bam.
 - Secondary data from more than 32 reports and 6 policy documents, including minutes of project meetings, press releases, and construction documents.
 - 11 thematic reports of the Bam Reconstruction Documentation Project (BRDP) conducted by the Housing Foundation of Islamic Republic (HFIR).

Validation: Triangulation of data to corroborate outcomes reported from each of the data sources.

Significance: This study adds to the understanding of household-level recovery by suggesting the importance of considering the diversity of affected households and the need for tailored policies to support their recovery. The study's findings provide insights into the impact of housing reconstruction policies on different household categories.

7. He, LL, D Dominey-Howes, JC Aitchison, A Lau, and D Conradson. "How Do Post-Disaster Policies Influence Household-Level Recovery? A Case Study of the 2010-11 Canterbury Earthquake Sequence, New Zealand." *INTERNATIONAL JOURNAL OF DISASTER RISK REDUCTION* 60 (June 2021). WOS:000660507600010.
<https://doi.org/10.1016/j.ijdr.2021.102274>.

Study Purpose: The purpose of this study is to examine the impact of post-disaster policies on household-level recovery after the 2010-11 Canterbury earthquake sequence in New Zealand.

Sampling Characteristics: The study sampled 32 households who were affected by the earthquakes. Participants were recruited via postings in three local churches' weekly newsletters.

Disaster: Earthquake

Built Environment: Yes

Timeframe Measured: Six to Seven years after the earthquakes. Single data collection from October to November 2017.

Recovery Focus: Mixed

Measurement of Recovery:

- **Recovery status** – Households were categorized by researchers as recovered, partially recovered, or not recovered based on their statements during interviews.
 - Recovered – participants indicated that they felt their family had achieved recovery, meaning they were better-off or living a comparable life to that before the earthquake.
 - Partially Recovered – participants indicated they did not (or felt it hard to) give a definite level to the recovery status of their families.
 - Not Recovered – Participants clearly indicated that they were worse-off compared with their pre-earthquake life.
- **Perception of recovery policies** – Qualitative interview responses evaluating the effectiveness of implemented recovery policies.
- Additional data from the Census Bureau, Federal Emergency Management Agency, State of Louisiana, and Army Corps of Engineers were used to record the median household income of the surrounding neighborhood, the area's topographic elevation, and depths of flood after Hurricane Katrina.

Instrument Included: No

Methodology:

- Semi-structured interviews of 32 households affected by the earthquakes. The interviews explored the households' experiences with the recovery process, including their interactions with government agencies, insurance companies, and construction companies.
- Interview transcripts were analyzed using a thematic analysis approach, with the researchers identifying patterns and themes in the data related to household recovery experiences and the factors that influenced them.

Validation: None described.

Significance: This study adds to the measurement of household-level recovery by highlighting the complex interactions between government policies, institutional factors, and household experiences. The qualitative measurement of recovery provides rich insights into the household recovery process.

8. Karki, J., S. Matthewman, and JH Grayman. "From Goods to Goats: Examining Post-Disaster Livelihood Recovery in the Aftermath of the Nepal Earthquake 2015." *NATURAL HAZARDS* 114, no. 3 (2022): 3787–809. WOS:000841695200002.
<https://doi.org/10.1007/s11069-022-05543-0>.

Study Purpose: The study aims to examine the post-disaster livelihood recovery of households affected by the 2015 Nepal Earthquake, with a focus on understanding the processes and outcomes of livelihood recovery interventions.

Sampling Characteristics: The study sampled 46 households using purposeful selection. They focused specifically on disadvantaged and marginalized groups affected by the earthquake, primarily the Dalit and Adibāsi Janajāti (specifically Chepang and Majhi ethnic groups). These groups were chosen due to their shared history of systemic marginalization and high rates of poverty.

Disaster: Earthquake

Built Environment: No

Timeframe Measured: Five years after the earthquake. Single data collection between June 2020 and April 2021.

Recovery Focus: Process

Measurement of Recovery:

- Qualitative interview responses from respondents that provided information on types of recovery assistance received and their perceptions of the effectiveness of the assistance.

Instrument Included: No

Methodology:

- Qualitative interviews of 46 households asking about their recovery experience after the earthquake.
- Thematic coding and qualitative analysis were conducted on interview responses.

Validation: None described.

Significance: This study adds to the understanding of household-level recovery by providing a nuanced and contextualized understanding of the processes and outcomes of livelihood recovery interventions in a post-disaster setting. The study's findings on the shift from goods-based to asset-based livelihood recovery strategies contribute to the existing literature on

disaster recovery and provide insights for policymakers and practitioners seeking to improve recovery outcomes.

9. Kotani, H., R. Honda, S. Imoto, L. Shakya, and BK Shrestha. "Transition of Post-Disaster Housing of Rural Households: A Case Study of the 2015 Gorkha Earthquake in Nepal." *INTERNATIONAL JOURNAL OF DISASTER RISK REDUCTION* 44 (April 2020). WOS:000517832100036. <https://doi.org/10.1016/j.ijdrr.2019.101443>.

Study Purpose: The study aims to understand the recovery process of rural households after the 2015 Gorkha earthquake in Nepal, focusing on the transitions in their residential status and the factors influencing these transitions.

Sampling Characteristics: The study sampled 124 households from a village affected by the earthquake. Researchers went door-to-door to select participants.

Disaster: Earthquake

Built Environment: Yes

Timeframe Measured: Two and a half years after the earthquake. Single data collection in late 2017.

Recovery Focus: Mixed

Measurement of Recovery:

- **Residential Status** – Self-reported responses where respondents reported their residential status (Open Space; Temporary House; Houses of Relatives and Friends; Unrepaired House; Repaired House; Rebuilt House) at multiple time intervals after the earthquake (Day 1, Day 5, 1 month, 1 year, 2 years, and 2.5 years).

Instrument Included: Partially

Methodology:

- Surveys of 124 households affected by the earthquake. The survey collected data on the households' housing conditions, reconstruction activities, and the factors influencing their recovery decisions, including social relations, physical resources, and financial assistance.
- Descriptive statistics and data visualization were used to examine the change in residential status over time.

Validation: None described.

Significance: This study contributes to the understanding of household-level recovery by detailing the diverse patterns of residential status transitions post-disaster. It suggests the importance of factors such as social relations, physical resources, and financial assistance in facilitating recovery. The study's findings on the role of government subsidies and household characteristics in influencing recovery decisions add to the existing body of research on post-disaster recovery, providing a nuanced understanding of the recovery process in rural context.

10. Lin, L., Y. Wang, and TX Liu. "Perception of Recovery of Households Affected by 2008 Wenchuan Earthquake: A Structural Equation Model." *PLOS ONE* 12, no. 8 (2017). WOS:000408693600051. <https://doi.org/10.1371/journal.pone.0183631>.

Study Purpose: The study aimed to explore the factors influencing the perception of recovery among households affected by the 2008 Wenchuan earthquake, using a structural equation model to understand the complex relationships between various recovery-related factors.

Sampling Characteristics: The study sampled 611 households from two rural areas that were affected by the earthquake. Random sampling was utilized.

Disaster: Earthquake

Built Environment: Yes

Timeframe Measured: Four years after the earthquake. Single data collection in August 2012.

Recovery Focus: Outcome

Measurement of Recovery:

- **Perception of recovery** – A latent variable defined by the measurement of three influential factors:
 - **Self-evaluated quality of life** – Measured by asking households to provide a general assessment (Likert response) of their quality of life at the time of the survey compared to their situation before the 2008 earthquake.
 - **Self-evaluated recovery speed** – Measured by asking households to provide a general assessment (Likert response) of their recovery speed in comparison to other families in their surrounding community.
 - **Family atmosphere** – Measured by asking households to provide a general assessment (Likert response) of the general mental health of family members, family bonds, and the overall atmosphere within the household.

Instrument Included: Yes

Methodology:

- Survey of 611 households affected by the hurricane. The survey asked households to subjectively evaluate their family's recovery progress, current quality of life, and internal financial or labor resources five years after the 2008 Wenchuan earthquake.
- Structural equation modeling used to examine the relationships between House recovery conditions, family recovery power, reconstruction investment, and perception of recovery.

Validation: None described.

Significance: This study contributes to the understanding of household recovery by suggesting the importance of subjective measures of recovery. By examining the factors that influence

households' perception of recovery, the study provides insights into the complex recovery process. The use of a structural equation model to analyze the relationships between various recovery-related factors adds a nuanced understanding of how different aspects of recovery interrelate.

11. Lines, R., JPF Walker, and R. Yore. "Progression through Emergency and Temporary Shelter, Transitional Housing and Permanent Housing: A Longitudinal Case Study from the 2018 Lombok Earthquake, Indonesia." *INTERNATIONAL JOURNAL OF DISASTER RISK REDUCTION* 75 (June 2022). WOS:000793767500002.
<https://doi.org/10.1016/j.ijdrr.2022.102959>.

Study Purpose: The study aims to examine the progression of households through different stages of shelter and housing after the 2018 Lombok earthquake, and to identify the factors that influence their recovery.

Sampling Characteristics: The study sampled 195 households across seven villages affected by the earthquake. Random sampling was utilized.

Disaster: Earthquake

Built Environment: Yes

Timeframe Measured: Nine months after the earthquake. Multiple data collections between March and August 2019.

Recovery Focus: Mixed

Measurement of Recovery:

- **Housing Status** – Respondents reported what category of housing they were in (No shelter; Basic temporary shelter; Temporary shelter at homesite; Transitional housing in camp; Transitional housing at homesite; and Permanent housing) at specific time points after the earthquake.
- **Household progress through grant system** – Tracked if households had been assessed, opened a bank account, or started construction through the government grant system at specific time points after the earthquake.

Instrument Included: No

Methodology:

- A longitudinal survey of 195 households affected by the earthquake. The survey gathered information on household characteristics, shelter and housing conditions, aid received, financial situation, employment, and progress through the government grant process.
- Semi-structured interviews of 41 community leadership, business owner, and emergency response personnel. The interviews gathered information on recovery strategy, finance, resources, recovery factors, and impacts of the earthquake.

- Descriptive statistics and data visualization were utilized to present the housing statuses of respondents over time.

Validation: None described.

Significance: This study adds to the understanding of household recovery after disasters by providing a detailed analysis of the progression of households through different stages of shelter and housing. By measuring these shifts over time, the research suggests how unrealistic government timelines and a lack of transitional housing policy can create public dissatisfaction even when rebuilding occurs.

12. Liu, WM, E. Gerber, SY Jung, and A. Agrawal. "The Role of Human and Social Capital in Earthquake Recovery in Nepal." *NATURE SUSTAINABILITY* 5, no. 2 (2022): 167-+. WOS:000725449500001. <https://doi.org/10.1038/s41893-021-00805-4>.

Study Purpose: This study examines the relationship between human and social capital and the economic recovery of households after the 2015 Nepal earthquakes.

Sampling Characteristics: The study sampled 1064 households affected by the earthquake. Random sampling was utilized.

Disaster: Earthquake

Built Environment: No

Timeframe Measured: Two years after the earthquake. Multiple data collections between November 2014 and May 2015 (before the earthquake) and between January and May 2017 (two years after the earthquake).

Recovery Focus: Outcome

Measurement of Recovery:

- **Economic recovery** – the percentage change in household income after the earthquake compared to before the earthquake.

Instrument Included: No

Methodology:

- Survey of 1064 households affected by the earthquake. The survey collected information on human, social, and economic capital, as well as impact and recovery information after the earthquake.
- Statistical analysis used to examine the relationship between recovery and human capital.

Validation:

- Placebo test and Bayesian simulation for prediction model.
- None described for the survey.

Significance: This study adds to the overall measurement of household recovery by providing insight into the role of human and social capital in facilitating household economic recovery after a disaster. The use of survey data and a fixed-effects regression model allow for a more nuanced understanding of the changes in household income over time, and the findings suggest the importance of considering the diverse forms of capital that households possess when assessing recovery.

13. Pooyan, Z., and A. Hokugo. "Community Resilience and Social Capital: Hindering vs Fostering Factors." *INTERNATIONAL JOURNAL OF DISASTER RISK REDUCTION* 118 (February 2025). WOS:001419700900001. <https://doi.org/10.1016/j.ijdrr.2025.105213>.

Study Purpose: The study aims to investigate the role of social capital in community resilience during the recovery phase after the Great East Japan Earthquake and Tsunami (GEJET).

Sampling Characteristics:

- Household survey: The study sampled 445 households who lived in temporary housing after the GEJET. Purposive sampling was used.
- Community/Expert interviews: The study 14 interviewed organizations between, including neighborhood associations, voluntary fire brigades, social welfare associations, and chambers of commerce.

Disaster: Earthquake

Built Environment: Yes

Timeframe Measured:

- Household survey: Three and a half years after the earthquake. Single data collection between November 2014 and January 2015.
- Community/Expert interviews: Up to seven years after the earthquake. Two data collections in November 2016 and April 2018.

Recovery Focus: Mixed

Measurement of Recovery:

- **Housing status** – Self-reported housing situations of respondents before the earthquake and current status ranging from temporary housing to the same housing as before the earthquake.
- **Occupation status** – Self-reported current occupation status in relation to respondents' occupation status before the earthquake. Responses included: Restarted (self-employed, salaryman, part-time); Different job; Entrepreneurs in different industries; Other; Pension/unemployed (continued); Pension/unemployed (retirement).
- **Livelihood status** – Self-reported livelihood situation of respondents (worse/same/better than before the earthquake)

- **Qualitative interview responses** – from experts on the recovery process including topics such as community actions during emergency response, efforts to improve local capacities, initiatives for community development, and community relationships with upper levels.

Instrument Included: Partially

Methodology:

- Survey of 445 households affected by the earthquake. The survey collected information on residents' demographic characteristics, the severity of their housing and occupation damages, their current livelihood recovery status, and their subjective opinions regarding reconstruction priorities and future community safety.
- Qualitative interviews of 14 experts and community officials. The interviews collected information on community actions during emergency response, efforts to improve local capacities, initiatives for community development, and community relationships with upper levels.

Validation: None described.

Significance: This study contributes to the measurement of household recovery by evaluating the actual alignment between what residents needed and what was provided in terms of housing and employment. It suggests that a household's successful return to a normal daily life depends as much on the restoration of community social ties as it does on physical reconstruction. By tracking these families over several years, the research identifies how specific barriers, such as top-down policies and financial loss, directly affect a household's path to full recovery.

14. Sapkota, JB, K. Kurita, and P. Neupane. "Progress after the 2015 Nepal Earthquake: Evidence from Two Household Surveys in One of the Hardest-Hit Mountain Villages." *SUSTAINABILITY* 13, no. 21 (2021). WOS:000720009500001.
<https://doi.org/10.3390/su132111677>.

Study Purpose: The study aims to assess the progress of recovery and reconstruction efforts after the 2015 Nepal earthquake in a rural mountain village, Ramche, by examining changes in objective and subjective well-being of households.

Sampling Characteristics: The survey sampled 383 households from a village in affected by the earthquake. Random sampling was used.

Disaster: Earthquake

Built Environment: Yes

Timeframe Measured: Five years after the earthquake. Multiple data collections in February 2016 (the time of the earthquake) and March 2020.

Recovery Focus: Mixed

Measurement of Recovery:

- **Recovery status** – self-reported status of the households' recovery. Respondents chose one of four responses (not recovered yet still sadness; not recovered yet but well; recovered basically; recovered fully mentally/physically).
- **Change in income** – self reported responses on whether households' income decreased, stayed the same, or increased compared to before the earthquake.
- **Quality of life and happiness** –
 - Self-reported quality of life responses compared to before the earthquake (much worse; slightly worse; basically same unchanged; slightly better; much better)
 - Likert responses to the Oxford Happiness Questionnaire (1 being the most unhappy and 6 being the happiest).
- **Changes in poverty and inequality** – per capita consumption scores for each household to determine poverty level. Difference in income distribution from a normal curve (Gini index) to determine inequality.
- **Reconstruction source** – self-reported sources of reconstruction aid (no amendment; retrofit/repair by self; retrofit/repair by government; planned by govt. build by self).
- **Satisfaction with government assistance** – self-reported responses as to whether the government financial assistance should operate differently or not in the future.

Instrument Included: Partially

Methodology:

- Survey of 383 households affected by the earthquake. The survey collected information on demographics, infrastructure access, income, consumption, health, education, public service perceptions, earthquake impact, recovery progress, reconstruction investments, and subjective well-being.

Validation: Use of previous survey instruments and frameworks:

- Nepal Living Standard Survey (NLSS) [17]: The authors adopted the questionnaire from the third round of the NLSS (NLSS-III) to assess the objective well-being of households, including data on income, consumption, and infrastructure access.
- Oxford Happiness Questionnaire (OHQ) [18]: This 29-item scale was used to measure subjective well-being. It was developed by Hills and Argyle (2002) as a compact version of the original Oxford Happiness Inventory (OHI).
- Recovery Perception Redesign: The survey section regarding the perception of recovery for affected households was redesigned based on the framework developed by Lin, Wang, and Liu [19].

Significance: This study adds to the overall measurement of recovery by providing a longitudinal assessment of household-level recovery in a rural, disaster-affected area. The use

of both objective and subjective indicators provides a more comprehensive understanding of recovery.

15. Spoon, Jeremy, Drew Gerkey, Ram Bahadur Chhetri, Alisa Rai, and Umesh Basnet. "Navigating Multidimensional Household Recoveries Following the 2015 Nepal Earthquakes." *World Development* 135 (November 2020): 105041. <https://doi.org/10.1016/j.worlddev.2020.105041>.

Study Purpose: The study aims to understand how rural mountain households, as part of integrated social and environmental systems, recover from catastrophic disturbances. It explores the relationships between specific recovery indicators and household characteristics to identify patterns of resilience or transformation.

Sampling Characteristics: The study sampled 400 households affected by the earthquakes. Random sampling was used.

Disaster: Earthquake

Built Environment: Yes

Timeframe Measured: One and a half years after the earthquakes. Multiple data collections at nine months and one and a half years after the earthquakes.

Recovery Focus: Outcome

Measurement of Recovery: A series of Yes/No indicators respondents reported having or not at the time of each data collection:

- **Housing and infrastructure status** – Whether a household was able to return to their primary house and if they were facing issues trying to rebuild, and whether they had access to cellphone, internet and electricity.
- **Livelihood status** – The recovery of agricultural fields (irrigated and non-irrigated), standing crops, seed storage, and livestock health, behavior, and productivity.
- **Economic status** – The to participate in wage labor or tourism and the sale of livestock products.

Instrument Included: Partially

Methodology:

- Survey of 400 households affected by the earthquakes. The survey gathered data on 34 critical indicators that measured the recovery status of housing, agricultural and livestock livelihoods, market-based economic participation, and access to electricity and communications technology.
- Infrastructure survey that assessed the damage and reconstruction progress of communal assets including schools, health posts, religious buildings, and hydropower plants.

- 40 qualitative interviews that collected information on personal experiences, perceptions of the recovery process, and the impacts of cascading hazards to provide contextualization for the quantitative survey data.
- Statistical analysis used to explore patterns among indicators.

Validation: Pilot study for qualitative interviews and creation of indicators.

Significance: This study contributes to the measurement of household recovery by measuring recovery as multidimensional using 34 variables rather than a single metric. It suggests empirical evidence of both linear and non-linear recovery patterns within a random sample of 400 households tracked over time.

16. Versailot, PD, and R. Honda. "Building Social Capital through Konbit for Post-Disaster Recovery: A Case Study of Rural Areas in the Xaragua Peninsula, Haiti." *INTERNATIONAL JOURNAL OF DISASTER RISK REDUCTION* 109 (July 2024). WOS:001256579900001. <https://doi.org/10.1016/j.ijdr.2024.104604>.

Study Purpose: The study investigates the role of the traditional community group, konbit, in post-disaster recovery within earthquake-affected rural villages in Haiti in 2021. It aims to elucidate how konbit participation strengthens both cognitive and structural social capital and facilitates household recovery processes.

Sampling Characteristics: The study sampled 592 households affected by the earthquake. Stratified random sampling was used.

Disaster: Earthquake

Built Environment: No

Timeframe Measured: Five to six months after the earthquake. Single data collection between January and February 2022.

Recovery Focus: Outcome

Measurement of Recovery:

- **Short-term recovery** – A series of Likert responses (1 – strongly disagree to 5 – strongly agree) to three questions: Satisfaction with recovery speed; satisfaction with post-recovery income; community was helpful to marginalized people during recovery.
- **Long-term recovery** – A series of Likert responses (1 – strongly disagree to 5 – strongly agree) to three questions: Confidence in future disaster preparedness; concern for the community's overall recovery; consideration of future disasters during current rebuilding.

Instrument Included: Yes

Methodology:

- Survey of 592 households affected by the earthquake. The survey collected information on Konbit participation, cognitive social capital, structural social capital, and short- and long-term recovery.
- Statistical analysis used to explore the relationships between Konbit participation, cognitive social capital, structural social capital, and recovery.

Validation: None described.

Significance: This study adds to the overall measurement of recovery by providing insights into the role of traditional community practices (konbit) in building social capital and facilitating post-disaster recovery in rural areas. It suggests the importance of considering both cognitive and structural social capital in understanding recovery processes.

17. Wang, Y., YQ Zhu, and Q. Sui. "Ethnic Groups Differences in Domestic Recovery after the Catastrophe: A Case Study of the 2008 Magnitude 7.9 Earthquake in China." *INTERNATIONAL JOURNAL OF ENVIRONMENTAL RESEARCH AND PUBLIC HEALTH* 14, no. 6 (2017). WOS:000404107600038. <https://doi.org/10.3390/ijerph14060590>.

Study Purpose: The study examines the differences in household recovery between Han and Qiang & Zang ethnic groups after the 2008 Wenchuan Earthquake in China.

Sampling Characteristics: The study sampled 866 households from two different villages affected by the earthquake. Random sampling was used.

Disaster: Earthquake

Built Environment: No

Timeframe Measured: Five and a half years after the earthquake. Single data collection in January 2014.

Recovery Focus: Outcome

Measurement of Recovery:

- **Recovery time** – the self-reported amount of time (in months) it took households to recover.
- **Income recovery** – The self-reported change in income, income source, and number of household members employed after the earthquake compared to before the earthquake.

Instrument Included: Yes

Methodology:

- Survey of 866 households from two villages affected by the earthquake. The survey collected information on household characteristics and recovery experiences regarding income, recovery time and government aid.

- Statistical analysis used to compare the results between the two villages and examine the relationships between recovery time and the other variables.

Validation: None described.

Significance: This study contributes to the understanding of household recovery after disasters by highlighting the differences in recovery processes between ethnic groups. It identifies factors that influence recovery, such as the main source of household income and the role of household members. The findings suggest that local workers in a household are more helpful to household recovery than migrant workers, and that the government should create more local jobs and provide assistance specifically for the psychological recovery of women in Qiang households.

18. Wang, Y., ZH Zou, and J. Li. "Influencing Factors of Households Disadvantaged in Post-Earthquake Life Recovery: A Case Study of the Wenchuan Earthquake in China." *NATURAL HAZARDS* 75, no. 2 (2015): 1853–69. WOS:000346407100041.
<https://doi.org/10.1007/s11069-014-1400-4>.

Study Purpose: The study examines the factors influencing households that are disadvantaged in post-earthquake life recovery after the 2008 Wenchuan earthquake.

Sampling Characteristics: The study sampled 419 households affected by the earthquake. Random sampling was used.

Disaster: Earthquake

Built Environment: Yes

Timeframe Measured: Four years after the earthquake. Single data collection in July 2012.

Recovery Focus: Outcome

Measurement of Recovery:

- **Life recovery time** – the self-reported duration of recovery of households (in months).
- **Job recovery time** – The self-reported duration of unemployment of households (in months).

Instrument Included: No

Methodology:

- Survey of 419 households affected by the earthquake. The survey collected information on life recovery time, socioeconomic and demographic characteristics, structural damage, casualties, and external assistance received.
- Statistical analysis used to test whether survey variables could predict if households became disadvantaged (slower recovery time).

Validation: None described.

Significance: This study contributes to the measurement of household recovery by identifying factors that influencing the recovery of disadvantaged households, such as economic status, work recovery time, and the greatest perceived impact of the earthquake.

19. Wei, JW, and Y. Han. "Pre-Disaster Social Capital and Disaster Recovery in Wenchuan Earthquake-Stricken Rural Communities." *SUSTAINABILITY* 10, no. 6 (2018).
WOS:000436570100358. <https://doi.org/10.3390/su10062046>.

Study Purpose: The study examines the impact of pre-disaster social capital on housing reconstruction after the 2008 Wenchuan earthquake in rural China.

Sampling Characteristics: The study sampled 558 households affected by the earthquake. Convenience sampling was used.

Disaster: Earthquake

Built Environment: Yes

Timeframe Measured: Eight to 15 months after the earthquake. Single data collection between January and July 2009 (The study notes that most surveys were collected in July).

Recovery Focus: Outcome

Measurement of Recovery:

- **Housing recovery status** – A self-reported binary response (yes/no) to a question asking respondents if their houses were rebuilt at the time of the survey.

Instrument Included: Partially

Methodology:

- Survey of 558 households affected by the earthquake. The survey collected information on reconstruction status, the degree of earthquake damage and mortality, the amount of government aid and housing subsidies received, various forms of post-disaster assistance, household socio-economic and demographic characteristics, and specific measures of social capital such as network size and political affiliations.

Validation: None described.

Significance: This study adds to the overall measurement of recovery by highlighting the importance of social capital in facilitating household recovery after disasters. The findings suggest that households with larger social networks were more likely to rebuild their houses and receive government aid, providing insight into the mechanisms by which social capital influences recovery outcomes.

20. Xiang, TY, EW Welch, and B. Liu. "Power of Social Relations: The Dynamics of Social Capital and Household Economic Recovery Post Wenchuan Earthquake." *INTERNATIONAL JOURNAL OF DISASTER RISK REDUCTION* 66 (December 2021).
WOS:000704647700004. <https://doi.org/10.1016/j.ijdrr.2021.102607>.

Study Purpose: The study examines the dynamic effects of social capital on household economic recovery after the 2008 Wenchuan earthquake in China, focusing on the differential roles of pre-disaster and post-disaster social capital in shaping middle- and long-term economic recovery.

Sampling Characteristics: The study sampled 242 rural households affected by the earthquake. Random sampling was used.

Disaster: Earthquake

Built Environment: Yes

Timeframe Measured: 10 years after the earthquake. Multiple data collections in July 2009, April 2012, and February 2018.

Recovery Focus: Mixed

Measurement of Recovery:

- **Change in income** – The differences in income from before the earthquake and at different times after the earthquake (mid-term: between 2007 and 2011; long-term: between 2007 and 2017).
- **Change in social capital** – the reported changes in number of core connections (family and friends) and number of authority relations (known government officials) from before the earthquake and at different times after the earthquake (mid-term: between 2007 and 2011; long-term: between 2007 and 2017).

Instrument Included: Partially

Methodology:

- Longitudinal survey of 242 households affected by the earthquake with data collected in 2009, 2012, and 2018. The survey collected information on rural household socioeconomic conditions, family demographics, financial application status, and features of social capital to evaluate recovery outcomes.
- Statistical analysis used to examine the effects of social capital on household recovery over time.

Validation: None described.

Significance: This study adds to the overall measurement of recovery by providing insights into the dynamic effects of social capital on household economic recovery over time. The longitudinal findings suggest the importance of both pre-disaster and post-disaster social capital in shaping recovery outcomes, with pre-disaster core connections being beneficial in the mid-term and post-disaster changes in core connections being critical for long-term recovery.

21. Yang, HB, T. Dietz, W. Yang, JD Zhang, and JG Liu. "Changes in Human Well-Being and Rural Livelihoods Under Natural Disasters." *ECOLOGICAL ECONOMICS* 151 (September

2018): 184–94. WOS:000437078900019.
<https://doi.org/10.1016/j.ecolecon.2018.05.008>.

Study Purpose: The study aims to examine the linkages between post-disaster changes in rural livelihoods and recovery outcomes, specifically focusing on the impact of the 2008 Wenchuan Earthquake on human well-being in Wolong Nature Reserve, China.

Sampling Characteristics: The study sampled 199 households in 2007, 287 households in 2010, and 245 households in 2015 who were randomly sampled from the earthquake impacted area. The study notes that only the households surveyed in both 2010 and 2015 were used for modeling recovery).

Disaster: Earthquake

Built Environment: No

Timeframe Measured: One year before and six years after the earthquake. Multiple data collections in 2007, 2010, and 2015.

Recovery Focus: Outcome

Measurement of Recovery:

- **Well-being** - The study used a Human Well-being Index (HWBI) system based on the Millennium Ecosystem Assessment. Well-being was measured across five sub-indices:
 - **Basic materials for good life:** (e.g., sufficient food, housing).
 - **Security:** (e.g., safety from disasters).
 - **Health:** (e.g., feeling well, access to healthcare).
 - **Good social relations:** (e.g., social cohesion, mutual respect).
 - **Freedom of choice and action:** (e.g., ability to find a job).

Instrument Included: Yes

Methodology:

- Longitudinal survey of households affected by the earthquake. The survey collected demographic data and socioeconomic information alongside livelihood activities and five dimensions of human well-being both before and after the 2008 Wenchuan Earthquake.
- Statistical analysis used to explore the effects of changes in livelihood on well-being recovery.

Validation: The use of a previously established framework [20].

Significance: This study adds to the overall measurement of household recovery by providing a systematic, empirical evaluation linking shifting rural livelihood portfolios to long-term human well-being outcomes after a catastrophic natural disaster. By employing panel data and a multidimensional human well-being index system, it measures recovery across distinct facets like health, security, and freedom of choice.

22. Yang, SN, J. Du, SA He, MM Shi, and XH Sun. "The Emerging Vulnerable Population of the Urbanisation Resulting from Post-Disaster Recovery of the Wenchuan Earthquake." *NATURAL HAZARDS* 75, no. 3 (2015): 2103–18. WOS:000347161900003.
<https://doi.org/10.1007/s11069-014-1413-z>.

Study Purpose: The study aimed to explore the perceptions of the post-disaster recovery process and analyze the relationships between economic recovery level and household characteristics during the post-Wenchuan earthquake recovery period, with a focus on the impact of urbanization.

Sampling Characteristics: The study sampled 513 households from one village that was affected by the earthquake. All houses in the village were visited but 513 surveys were used.

Disaster: Earthquake

Built Environment: No

Timeframe Measured: Five years after the earthquake. Single data collection in January 2013.

Recovery Focus: Outcome

Measurement of Recovery:

- **Financial Condition** – Self-reported Likert response on households' perceived financial condition compared to before the earthquake (1 – much better to 5 – much worse).
- **Satisfaction Levels** – Self-reported Likert responses on the degrees of satisfaction with life status and post-disaster recovery (Degrees of satisfaction with both "life status" and "post-disaster recovery" (1 – very satisfied to 5 – very unsatisfied).
- **Change in income** – Self-reported change in households' incomes before and after the earthquake.

Instrument Included: Partially

Methodology:

- Survey of 513 households affected by the earthquake. The survey collected information on the state of progress of post-disaster recovery, household structure, and recovery resources available, including financial capital, human capital, and social capital.
- Statistical analysis used to explore relationships between household characteristics and recovery outcomes.

Validation: Pretesting of survey.

Significance: This study adds to the overall measurement of recovery by suggesting the importance of considering the impact of urbanization on household recovery after a disaster. It identifies newly urbanized households, particularly those with householders between 46 and 55 years of age, as a vulnerable population that requires special attention during the recovery process.

3.3. Flood

23. Ahmad, MI, and HY Ma. "An Investigation of the Targeting and Allocation of Post-Flood Disaster Aid for Rehabilitation in Punjab, Pakistan." *INTERNATIONAL JOURNAL OF DISASTER RISK REDUCTION* 44 (April 2020). WOS:000517832100006.
<https://doi.org/10.1016/j.ijdrr.2019.101402>.

Study Purpose: The purpose of this study is to examine the effectiveness of post-disaster aid allocation in supporting household recovery after the 2010 floods in Punjab, Pakistan, with a focus on the targeting and allocation of cash aid for housing reconstruction and agricultural assistance for crop damages.

Sampling Characteristics: The study sampled 151 households affected by the floods. The study used a combination of purposive sampling (selecting the province, district, Tehsil, and Union Councils based on their vulnerability and severity of damage) and random sampling (selecting households within the selected villages).

Disaster: Flood

Built Environment: Yes

Timeframe Measured: Approximately one year after the hurricane. Single data collection in 2011.

Recovery Focus: Mixed

Measurement of Recovery:

- **Pre- and post-disaster house value** – comparison of the values of homes before the flood and values at the time of data collection.
- **Receipt of cash aid** – Yes/No answer on whether respondents received cash aid.

Instrument Included: No

Methodology:

- Survey of 151 households affected by the flood. The survey collected data on household characteristics, flood impacts, and aid received, including cash aid for housing reconstruction and agricultural assistance for crop damages.
- Statistical analysis used to examine the factors influencing the receipt and amount of aid received.

Validation: None described.

Significance: This study contributes to the understanding of household-level recovery processes after disasters by examining the effectiveness of post-disaster aid allocation in supporting recovery. The findings suggest challenges and opportunities for improving aid targeting and allocation and considering the specific needs and characteristics of affected households in disaster recovery efforts.

24. Chowdhury, JR, and Y Parida. "Flood Shocks and Post-Disaster Recovery of Households: An Empirical Analysis from Rural Odisha, India." *INTERNATIONAL JOURNAL OF DISASTER RISK REDUCTION* 97 (October 2023). WOS:001102361000001.
<https://doi.org/10.1016/j.ijdrr.2023.104070>.

Study Purpose: The study aims to examine the factors that enhance rural households' disaster recovery capacities, distinguishing between income (economic) recovery and housing structure (structural) recovery outcomes after the 2014 flood in Odisha, India.

Sampling Characteristics: The study sampled 400 rural households. The study used a two-stage sampling method, where flood-affected Gram Panchayat (G.P.) units were randomly selected in the first stage, and then villages were randomly selected within each G.P. unit. In the second stage, 10 agricultural households were randomly sampled from each village.

Disaster: Flood

Built Environment: Yes

Timeframe Measured: One year after the flood. A single data collection between July and August 2015.

Recovery Focus: Outcome

Measurement of Recovery:

- **Income recovery** – households' self-rated income recovery. Responses ranged from 1 for "not yet recovered from the income shock" to 4 for "fully recovered from the income shock."
- **Structural recovery** – households' self-rated structural recovery. Responses ranged from 1 for "no recovery of the house structure" to 4 for "full recovery of the house structure."

Instrument Included: Partially

Methodology: The study integrates multiple data sources and employs a comprehensive analytical framework:

- Survey of 400 households' recovery experiences, including their income and housing recovery.
- Statistical analysis used to examine the factors that influence households' recovery capacities. The analysis controlled for various household characteristics, such as socioeconomic status, access to credit, and social capital, to identify the key determinants of recovery.

Validation: None described.

Significance: This study adds to the overall measurement of recovery by providing insights into the factors that influence rural households' disaster recovery capacities, particularly in the context of a flood disaster.

25. Dinh, NC, Ubukata, F, Tan, NQ, and Ha, VA. "How Do Social Connections Accelerate Post-Flood Recovery? Insights from a Survey of Rural Households in Central Vietnam." *INTERNATIONAL JOURNAL OF DISASTER RISK REDUCTION* 61 (July 2021). WOS:000664194900012. <https://doi.org/10.1016/j.ijdrr.2021.102342>.

Study Purpose: The study aimed to examine the role of social connections in accelerating household recovery after a flood, with a focus on understanding how different types of social connections influence recovery speed.

Sampling Characteristics: The study sampled 164 households that were damaged in the flood. Random sampling from a list of households provided by village leaders was used.

Disaster: Flood

Built Environment: Yes

Timeframe Measured: Two years after the flood. Single data collection between September and November 2019.

Recovery Focus: Outcome

Measurement of Recovery:

- **Recovery time** – Self-reported responses where respondents provided the time, in months, it took to fully recover.

Instrument Included: Partially

Methodology:

- Survey of 164 households. The survey asked questions on household characteristics, flood impacts, recovery outcomes, and social connections.
- Semi-structured interviews of 20 households. The interview asked about the role of social connections in the recovery process.

Validation: None described.

Significance: This study contributes to the measurement of household-level recovery after a disaster by suggesting the importance of social connections in accelerating recovery. The study's findings on the role of different types of social connections (e.g., relatives, neighbors, friends, formal groups, and informal groups) in the recovery process add nuance to the understanding of disaster recovery.

26. Gaisie, E, SS Han, and HM Kim. "Complexity of Resilience Capacities: Household Capitals and Resilience Outcomes on the Disaster Cycle in Informal Settlements." *INTERNATIONAL JOURNAL OF DISASTER RISK REDUCTION* 60 (June 2021). WOS:000660501600003. <https://doi.org/10.1016/j.ijdrr.2021.102292>.

Study Purpose: The purpose of this study is to investigate the relationship between household capitals and resilience outcomes, including recovery, on the disaster cycle in informal settlements in Accra, Ghana.

Sampling Characteristics: The study sampled 392 households from high flood risk zones that were affected by floods. Random sampling was used to choose households from four settlements chosen in consultation with a city disaster planning and management agency.

Disaster: Flood

Built Environment: Yes

Timeframe Measured: Single data collection between May and July 2018.

Recovery Focus: Outcome

Measurement of Recovery:

- **Recovery status** – Self-reported responses where respondents chose a binary choice of recovered or not recovered.

Instrument Included: No

Methodology:

- Survey of 392 households. The survey asked questions about households' access and ownership (or lack) of capital as well as their experiences with flooding including impacts suffered, activities implemented in preparing and/or responding to as well as their assessments of recovery from flooding.
- Statistical analysis used to examine the relationship between household capitals and the likelihood of recovery.

Validation: None described.

Significance: This study adds to the measurement of household-level recovery by examining the relationship between household capitals and recovery outcomes in informal settlements. The findings suggest the importance of considering the complex interplay between different household capitals in understanding recovery outcomes.

27. Joerin, J., F. Steinberger, RR Krishnamurthy, and A. Scolobig. "Disaster Recovery Processes: Analysing the Interplay between Communities and Authorities in Chennai, India." In *Swiss Federal Institutes of Technology Domain*, vol. 212, edited by D. Amaratunga and R. Haigh. 2018. WOS:000552392300082.
<https://doi.org/10.1016/j.proeng.2018.01.083>.

Study Purpose: This study analyzes the underlying factors of the disaster recovery process by comparing how residents in the Chennai constituencies of Mylapore and Velachery experienced the aftermath of the 2015 South Indian floods. Its primary objective is to determine if the disaster created a "window of opportunity" to enhance the interplay between communities and authorities or if pre-existing institutional and social structures remained static.

Sampling Characteristics: This study sampled 257 households from Mylapore and 264 households from Velachery who were affected by the floods. The study utilized stratified random sampling.

Disaster: Flood

Built Environment: Yes

Timeframe Measured: 10 months after the flood. Single data collection between October and November 2016.

Recovery Focus: Mixed

Measurement of Recovery:

- **Physical recovery** – Self-reported recovery outcomes (0 = no recovery to 3 = better; and number of days to recovery) for electricity, water, roads, sanitation, solid waste management, communication, and housing.
- **Social recovery** – Self-reported recovery outcomes (0 = no recovery to 3 = better; and number of days to recovery) for physical health, mental health, nutrition, education, and culture.
- **Economic recovery** – Self-reported recovery outcomes (0 = no recovery to 3 = better; and number of days to recovery) for income, employment, credits, and household assets.
- **Factors in recovery process** – Self-reported recovery satisfaction (Likert scale 1 to 5) as well as a number of questions about who led the recovery process, respondents level of trust in the recovery process, and communication with leadership during the recovery process.

Instrument Included: Partially

Methodology:

- Survey of 521 households affected by the flood in two different constituencies. The survey asked about physical, social, and economic recovery, as well as respondents' perceptions of the recovery process and interactions with leadership.
- Statistical analysis used to compare the results from the two different constituencies.

Validation: None described.

Significance: This study adds to the measurement of household recovery by providing a quantitative approach to measuring household recovery across physical, social, and economic dimensions. By comparing two differently impacted areas, it demonstrates that longer recovery times for infrastructure can result in residents perceiving a better "build back better" outcome. Furthermore, it reveals that while a disaster may increase solidarity among neighbors, it does not necessarily improve the underlying institutional relationship or communication between households and local authorities.

28. Khan, FA, and A. Salman. "A Simple Human Vulnerability Index to Climate Change Hazards for Pakistan." *INTERNATIONAL JOURNAL OF DISASTER RISK SCIENCE* 3, no. 3 (2012): 163–76. WOS:000209369100005. <https://doi.org/10.1007/s13753-012-0017-z>.

Study Purpose: The study aimed to develop a Human Vulnerability Index (HVI) to assess the vulnerability of households to hazards, specifically floods, in Pakistan.

Sampling Characteristics: This study sampled 235 households from areas that covered varying physical features in the Indus River Basin. Households were randomly sampled from selected villages.

Disaster: Flood

Built Environment: Yes

Timeframe Measured: One year after the flood. Single data collection in 2011.

Recovery Focus: Outcome

Measurement of Recovery:

- **House structure damage recovery rate** – a percentage of recovery (0 % = no recovery to >100 % = Better than before the flood) based on respondents' survey responses about the recovery status of their houses.

Instrument Included: No

Methodology:

- Survey of 235 households. The survey gathered information on various aspects of household vulnerability and recovery, including damage to houses, livestock, and crops, as well as socioeconomic characteristics of households.
- Descriptive statistics and correlation analysis were performed to examine the relationships between household characteristics, damage, and recovery.

Validation: None described.

Significance: This study contributes to the measurement of recovery by providing a household-level assessment of recovery after a disaster. The use of a "house recovery degree" variable provides a quantifiable measure of recovery, which can be useful for comparing recovery outcomes across different households and communities. The study's findings on the factors influencing household recovery, such as access to electricity and adult literacy rate, can inform the development of recovery policies and interventions.

29. Kienzler, S., I. Pech, H. Kreibich, M. Müller, and AH Thieken. "After the Extreme Flood in 2002: Changes in Preparedness, Response and Recovery of Flood-Affected Residents in Germany between 2005 and 2011." *NATURAL HAZARDS AND EARTH SYSTEM SCIENCES* 15, no. 3 (2015): 505–26. WOS:000352160900011. <https://doi.org/10.5194/nhess-15-505-2015>.

Study Purpose: The study aimed to investigate changes in preparedness, response, and recovery of flood-affected residents in Germany between 2005 and 2011, with a focus on households that experienced property damage due to flooding.

Sampling Characteristics: The study sampled 1019 households that suffered property damage in specific flood events (August 2005, March/April 2006, August 2010, and January 2011). Random sampling was utilized from areas that were known to be affected by the floods.

Disaster: Flood

Built Environment: Yes

Timeframe Measured:

- **2005 flood event:** 15 to 16 months after the flood. Single data collection between November and December 2006.
- **2006 flood event:** 7 to 8 months after the flood. Single data collection between November and December 2006.
- **2010 flood event:** 18 to 19 months after the flood. Single data collection between February and March 2012.
- **2011 flood event:** 13 to 14 months after the flood. Single data collection between February and March 2012.

Recovery Focus: Outcome

Measurement of Recovery:

- **Recovery status:** Self-reported responses where respondents provide a Likert scale response (1 - completely restored/replaced to 6 - still considerable damage) when asked to assess the state of their building and contents at the time of the interview compared to their state before the flood.

Instrument Included: Partially

Methodology:

- Survey of 1019 households. The survey collected information on household characteristics, flood impact, preparedness, response, and recovery.
- Statistical analysis used to examine the differences in impact, preparedness, response, and recovery over time with different flood events.

Validation: None described.

Significance: This study contributes to the understanding of household recovery after floods by providing insights into the recovery process over time. The use of a comparative approach and multiple data collection points allows for a nuanced understanding of how households recover from flood events.

30. Sairam, N., A. Buch, ML Zenker, et al. "Health-Related Quality of Life and Everyday Functioning in the Flood-Affected Population in Germany - A Case Study of the 2021 Floods in West Germany." *GEOHEALTH* 9, no. 6 (2025). WOS:001498543400001. <https://doi.org/10.1029/2024GH001135>.

Study Purpose: This study aimed to assess the health-related Quality of Life (QoL) and everyday functioning of households affected by the 2021 floods in West Germany, examining the relationship between flood impact and various recovery indicators.

Sampling Characteristics: The study sampled 609 households that were affected by the floods. Every third household from a list of households that applied for emergency relief was used, as well as social media advertisement.

Disaster: Flood

Built Environment: Yes

Timeframe Measured: 17 months after the floods. Single data collection between November and December 2022.

Recovery Focus: Outcome

Measurement of Recovery:

- **Recovery status** – self-reported status of repairs/re-purchasing of damaged contents, repairs to building damages, the psychological burden of the flood, claim settlement status and satisfaction with claim settlement, and forms of financial assistance received. All questions featured Likert scale response options or a yes/no response.

Instrument Included: Yes

Methodology:

- Survey of 609 households affected by the floods. The survey collected information on flood impact, recovery indicators, health status, recovery status, and household characteristics.
- Statistical analysis used to explore the relationships between recovery and health status and recovery indicators.

Validation: Partial use of standardized measurement tools:

- **EQ-5D VAS:** This tool was used to measure health-related Quality of Life (QoL) by asking respondents to rate their health on a visual scale from 0 to 100.
- **WHODAS 2.0:** The 12-item World Health Organization Disability Assessment Schedule was used to assess functioning across six domains, such as cognition and mobility.

Significance: This study contributes to the understanding of household recovery after disasters by examining multiple indicators of recovery, including financial, physical, and health and psychological aspects. The findings provide insights into the long-term effects of flooding on households and highlight the importance of considering various recovery indicators in post-disaster assessments.

31. Thieken, AH, H. Kreibich, M. Müller, and B. Merz. "Coping with Floods:: Preparedness, Response and Recovery of Flood-Affected Residents in Germany in 2002."

HYDROLOGICAL SCIENCES JOURNAL-JOURNAL DES SCIENCES HYDROLOGIQUES 52, no. 5 (2007): 1016–37. WOS:000249984500011. <https://doi.org/10.1623/hysj.52.5.1016>.

Study Purpose: The study aimed to investigate how flood-affected private households in three different regions in Germany coped with the 2002 flood event, focusing on preparedness, response, and recovery.

Sampling Characteristics: The survey sampled 1697 households affected by the flood. Random sampling was used.

Disaster: Flood

Built Environment: Yes

Timeframe Measured: Eight to nine months after the flood. Single data collection between April and June 2003.

Recovery Focus: Outcome

Measurement of Recovery:

- **Housing recovery status** – Self reported ratings (1-completely restored to 6-still considerable damage) of the status of restoration of their household contents and buildings.

Instrument Included: Partially

Methodology:

- Survey of 1697 households affected by the flood. The survey collected information about various topics, including flood impact, warning, damage, recovery, preparedness, and socio-economic variables.
- Descriptive statistics were presented to characterize the preparedness, response, and recovery experiences of households.

Validation:

- None described for recovery measure.
- The use of several proxy indicators aggregated into a single variable was cited for other aspects of the survey in Thieken et al [21].

Significance: This study adds to the overall measurement of recovery by providing insights into the recovery process of households after a flood event. It highlights the importance of factors such as flood impact, preparedness, and socio-economic variables in influencing recovery.

3.4. Hurricane / Typhoon / Cyclone

32. Berke, PR, T Beatley, and C Feagin. "Hurricane Gilbert Strikes Jamaica - Linking Disaster Recovery To Development." *COASTAL MANAGEMENT* 21, no. 1 (1993): 1–23. WOS:A1993KW31400001. <https://doi.org/10.1080/08920759309362189>.

Study Purpose: To evaluate long-term household housing recovery following Hurricane Gilbert (1988) in Jamaica. The study specifically examines the effectiveness of large-scale housing aid programs and explores how to link disaster recovery to long-term sustainable development through institutional design.

Sampling Characteristics: The study sampled 240 households from two comparable jurisdictions: St. James Parish and St. Thomas Parish. Socioeconomic status stratification and random sampling were used. The study also included semi-structured interviews with key informants (government officials and aid providers).

Disaster: Hurricane

Built Environment: Yes

Timeframe Measured: 15 months after the hurricane. Single data collection in December 1989.

Recovery Focus: Process

Measurement of Recovery:

- **Building stamp program process** – Several self-reported responses about respondents' experience with the building stamp program
 - **Receipt of building stamps** – Yes/No response
 - **Value of building stamps** – Three response options (Less than 1500 JMD; 1500 JMD to 3999 JMD; 4000 JMD or more)
 - **Compliance with program** – decisions on how building stamps were used (Traded for cash; Traded for goods other than building materials; Traded for building supplies).
 - **Availability of building materials** – time before materials became available (Less than 2 weeks; 2 to 6 weeks; 7 to 14 weeks; 15 to 24 weeks; 25 weeks or more).
 - **House displacement time** – time before respondents could move back into their homes (Did not move or less than 1 month; 1 to 3 months; 4 to 6 months; 7 to 9 months; 10 months or more)
 - **Material acquisition method** – Five response options (Purchased from building supplier; Traded; Salvaged from previous; Donated from family or friends; Salvaged from neighborhood)
- **Satisfaction with government intervention** – Likert ratings (1 – Very well to 5 – Very poor) of how well the government handled several interventions: Damage assessments; Restoration of telephone; Providing shelters; Demolishing buildings; Clearing debris; Enforcing mitigation; Beautifying community; Honestly handling foreign aid; Restoring streets; Providing housing assistance; Reconstructing medical facilities; Informing public; Restoring water; Reconstructing schools; Restore transportation; Restore electricity; Making building materials available; Provide permanent housing.

- **Qualitative interview responses** – Interview responses of government officials and aid providers about concerns about recovery issues, modes of recovery, and interactions among participants of the recovery process

Instrument Included: Partially

Methodology:

- Survey of 240 households affected by the hurricane. The survey collected information about households' experiences and satisfaction with the building stamp program and government interventions.
- Qualitative interviews of government officials and aid providers about the recovery process.

Validation: None described.

Significance: This study contributes to the measurement of recovery by providing insights into the effectiveness of different recovery strategies and the challenges faced by households in recovering from a disaster. The study argues that recovery programs should move away from "relief-oriented" models toward "development-oriented" models that build local institutional capacity. It highlights how political patronage and top-down aid can hinder recovery and proposes a "learning process" approach to disaster planning.

33. Clay, LA, JB Goetschius, MA Papas, J Trainor, N Martins, and JM Kendra. "Does Preparedness Matter? The Influence of Household Preparedness on Disaster Outcomes During Superstorm Sandy." *DISASTER MEDICINE AND PUBLIC HEALTH PREPAREDNESS* 14, no. 1 (2020): 71–79. WOS:000524927400014. <https://doi.org/10.1017/dmp.2019.78>.

Study Purpose: The study aimed to examine the relationship between household disaster preparedness and disaster outcomes in households impacted by Superstorm Sandy in New York City.

Sampling Characteristics: The study sampled 2086 households with a mix of income levels. Households were randomly sampled from New York City's 5 boroughs.

Disaster: Hurricane

Built Environment: Yes

Timeframe Measured: 21 to 34 months after the storm. Single data collection between July 2014 and October 2015.

Recovery Focus: Outcome

Measurement of Recovery:

- **Perceived Recovery** – Self-reported responses where respondents reported how well their households have recovered from the storm by indicating "completely, almost, somewhat, or not at all recovered."

Instrument Included: Partially

Methodology:

- Survey of 2086 households conducted via computer assisted telephone interviews. The survey asked about perceived recovery, disaster preparedness, warning and evacuation, impacts such as property damage, and physical and mental health services utilized.
- Statistical analysis used to predict the odds of disaster outcomes given the level of preparedness. The models were adjusted for individual characteristics, including sex, race, income, and education level.

Validation: Pilot Testing.

Significance: This study adds to the overall measurement of recovery by providing insight into the relationship between household preparedness and perceived recovery after a disaster. It suggests that having an evacuation plan was associated with poor perceived recovery, while higher income and education were protective against poor recovery.

34. Clay, LA, MA Papas, KB Gill, and DM Abramson. "Factors Associated with Continued Food Insecurity among Households Recovering from Hurricane Katrina."
INTERNATIONAL JOURNAL OF ENVIRONMENTAL RESEARCH AND PUBLIC HEALTH 15, no. 8 (2018). WOS:000443168200087. <https://doi.org/10.3390/ijerph15081647>.

Study Purpose: The study aimed to identify factors associated with continued food insecurity among households recovering from Hurricane Katrina, with a focus on understanding the challenges faced by vulnerable populations in the aftermath of a disaster.

Sampling Characteristics: The study sampled 683 households from census blocks classified by the Federal Emergency Management Agency (FEMA) as moderately to extensively damaged, as well as from FEMA subsidized housing. Random sampling was used.

Disaster: Hurricane

Built Environment: No

Timeframe Measured: Approximately five years after the hurricane. Multiple data collections between May and July 2007, June and August 2008, and October and March 2010.

Recovery Focus: Mixed

Measurement of Recovery:

- **Prevalence of food insecurity** – Two different questions asked in separate data collection instances:
 - Between May and July 2007: "In the past 6 months, how well has your need for food for the household been met?" (not met, somewhat met, or met completely)
 - Between June and August 2008, and October and March 2010: "In the past 3 months, how often it has happened there was not enough money in the

household for food that you (the family) should have?" (never, once in a while, fairly often, or very often).

- **Social support** – Yes/No responses when respondents were asked “if they had someone they could count on for everyday favors, such as borrowing a little money, to care for you if you were confined to a bed for several weeks, to lend you money for a medical emergency, to talk to about family relationship troubles, or to help you find housing if you had to move”
- **Physical and mental health** – self-reported responses to the Short Form (SF)-12 Health Survey [22].

Instrument Included: Partially

Methodology:

- Longitudinal surveys of 683 households affected by hurricane Katrina, conducted over a period of five years after the hurricane. The surveys collected information on household demographics, socioeconomic status, housing, food security, and other factors.
- Statistical testing used to examine the associations between various factors and food insecurity over time, accounting for the correlated nature of the data and adjusting for potential confounding variables.

Validation: Use of validated instrument for physical and mental health – Short Form (SF)-12 Health Survey.

Significance: This study contributes to the measurement of recovery by suggesting the importance of food security as a critical aspect of household well-being in the aftermath of a disaster. By examining the factors associated with continued food insecurity using a longitudinal design, the study provides insights into the challenges faced by households in recovering from a disaster over time.

35. Griego, AL, AB Flores, TW Collins, and SE Grineski. “Social Vulnerability, Disaster Assistance, and Recovery: A Population-Based Study of Hurricane Harvey in Greater Houston, Texas.” *INTERNATIONAL JOURNAL OF DISASTER RISK REDUCTION* 51 (December 2020). WOS:000599711800006.
<https://doi.org/10.1016/j.ijdr.2020.101766>.

Study Purpose: The purpose of this study is to examine the relationships between social vulnerability variables, receipt of recovery assistance, and the extent of near-term household recovery after Hurricane Harvey.

Sampling Characteristics: The survey sampled 312 households who were affected by the hurricane. The majority of participants were randomly sampled via random digit dialing of cellphone numbers of residents of the Greater Houston area. The rest were contacted because of their participation in a previous study on flood hazards conducted in 2012.

Disaster: Hurricane

Built Environment: Yes

Timeframe Measured: Three to four and a half months after the hurricane. Single data collection between November 2017 and January 2018.

Recovery Focus: Outcome

Measurement of Recovery:

- **Recovery status** – Self-reported responses where respondents selected a number from a Likert scale to report recovery status (1 – “has recovered very little” to 10 – “has recovered completely).

Instrument Included: Yes

Methodology:

- Survey of 152 households impacted by Hurricane Harvey. The survey asked about the receipt and type of post-disaster assistance received, recovery status, and social vulnerability indicators.
- Statistical analysis used to examine the relationships between social vulnerability indicators and the receipt of assistance, as well as the influence of assistance on near-term recovery.

Validation: None described.

Significance: This study adds to the overall measurement of business recovery by exploring the relationship between social vulnerability and near-term recovery. The study's results suggest that traditional measures of recovery, such as the receipt of assistance, may not be sufficient to capture the full extent of recovery. This finding underscores the need for more nuanced measures of recovery that take into account the various factors that influence household recovery, such as income, disability status, and post-traumatic stress symptoms.

36. Hsueh, HY. “The Role of Household Social Capital in Post-Disaster Recovery: An Empirical Study in Japan.” *INTERNATIONAL JOURNAL OF DISASTER RISK REDUCTION* 39 (October 2019). WOS:000487835400036. <https://doi.org/10.1016/j.ijdrr.2019.101199>.

Study Purpose: The study aimed to investigate the role of household social capital in post-disaster recovery after Typhoon No. 26 in Izu-Oshima, Japan, focusing on the types of assistance accepted by households and the impact of social ties on recovery satisfaction.

Sampling characteristics: The study sampled 166 households from the area most impacted by the Typhoon. No details on sampling strategies were described.

Disaster: Hurricane

Built Environment: Yes

Timeframe Measured: Three years after the hurricane. Multiple data collections occurring in November 2019, and between October and November 2020.

Recovery Focus: Mixed

Measurement of Recovery:

- **Recovery status** – Self-reported responses where respondents selected a recovery satisfaction score from a Likert scale (1 – “Extremely dissatisfied” to 5 – “Extremely satisfied”).
- **Changes in social ties** – Self-reported responses where respondents selected how much they contact people they have ties to in relation to the hurricane (No one from before; Decreased; No change; Increased).

Instrument Included: Yes

Methodology:

- Survey of 166 households impacted by the typhoon. The survey asked about the types of assistance victims accepted through formal and informal support systems, their social ties before and after the disaster, current recovery situation, and personal attributes.
- Statistical analysis used to examine the role of social capital in facilitating recovery.

Validation: None described.

Significance: This study contributes to the measurement of household-level recovery by examining the role of social capital in post-disaster recovery. It provides insights into the types of assistance accepted by households and the impact of social ties on recovery satisfaction.

37. Islam, R., and G. Walkerden. “How Do Links between Households and NGOs Promote Disaster Resilience and Recovery?: A Case Study of Linking Social Networks on the Bangladeshi Coast.” *NATURAL HAZARDS* 78, no. 3 (2015): 1707–27.
WOS:000358410300013. <https://doi.org/10.1007/s11069-015-1797-4>.

Study Purpose: The study aimed to investigate how links between households and NGOs promote disaster resilience and recovery, with a focus on the role of linking social networks in the recovery process after Cyclone Sidr in 2007.

Sampling Characteristics: The study sampled 156 households from two villages affected by the cyclone. Random sampling was used based on the number of households in the two villages. No sampling strategies were explained for focus group discussions, key informant interviews, or disaster practitioner interviews.

Disaster: Cyclone

Built Environment: No

Timeframe Measured: Six years after the cyclone. Single data collection between February and July 2013.

Recovery Focus: Process

Measurement of Recovery:

- **Linking social networks** – Social networks that participants reported being linked to (percentage), including NGO’s, fishermen groups, religious groups, and Union Parishad.
- **NGO support** – Qualitatively collected information on the types of support participants received from NGO’s during short-term and long-term recovery phases.
- **Weaknesses in NGO practice** – Qualitatively collected information on areas where NGO support was lacking.
- **Impact of NGO Support** – Qualitatively collected information on the impacts of NGO support on participants.

Instrument Included: No

Methodology:

- Interviews with 156 households. The interview collected qualitative and quantitative data on participant household vulnerabilities, experiences, and needs related to cyclones. It also asked questions about their physical settings, everyday lives, and the effectiveness of NGO’s initiatives after the cyclone.
- Qualitative case studies:
 - Eight focus group discussions (FGDs) were held with villagers to explore their perceptions of the threats of cyclones, recovery challenges, and benefits from NGOs.
 - 37 key informant interviews (KIIs) with local leaders, including NGO workers, local government officials, and village headmen.
 - 14 disaster practitioner interviews (DPIs) and five policy-maker interviews (PMIs) were conducted to gather insights from national-level experts.

Validation: Triangulation – correlations between qualitative and quantitative data.

Significance: This study contributes to the understanding of household-level recovery by suggesting the importance of linking social networks between households and NGOs. The findings provide insights into the types of support that are effective in promoting recovery and the challenges that households face in accessing these resources. The study's use of a mixed-methods approach and its focus on the role of NGOs in supporting household recovery add to the existing literature on disaster recovery measurement.

38. Lee, S., LK Siebeneck, BC Benedict, T. Yabe, CM Jarvis, and SV Ukkusuri. “Patterns of Social Support and Trajectories of Household Recovery after Superstorm Sandy: Contrasting Influences of Bonding and Bridging Social Capital.” *NATURAL HAZARDS REVIEW* 23, no. 2 (2022). WOS:000769062200014.
[https://doi.org/10.1061/\(ASCE\)NH.1527-6996.0000548](https://doi.org/10.1061/(ASCE)NH.1527-6996.0000548).

Study Purpose: The study aimed to investigate the relationship between social support patterns and household recovery trajectories after Superstorm Sandy, with a focus on the differential effects of bonding and bridging social capital.

Sampling Characteristics: The study surveyed 556 households from areas affected by the hurricane. Random sampling was used.

Disaster: Hurricane

Built Environment: Yes

Timeframe Measured: Five and a half years after the hurricane. Single data collection in March 2018 that collected data for different time intervals of One week, three months, One year, three years, four years, and five and a half years after the storm.

Recovery Focus: Mixed

Measurement of Recovery:

- **Recovery status** – Self-reported responses where respondents rated their household's recovery on a scale of 1 (not at all recovered) to 5 (completely recovered) at multiple time points of One week, three months, One year, three years, four years, and five and a half years after the storm.
- **Reconstruction status** – Self-reported responses where respondents reported at what time point they entered each rebuild phase (initial return, begin rebuilding, permanent return, and rebuilding complete).
- **Social Support** – Self-reported responses where respondents reported the types of support (instrumental, emotional, or informational) and the sources of support (informal, institutional, or online) that were the most helpful at each time point.

Instrument Included: No

Methodology:

- Survey of 556 households affected by the hurricane. The survey asked respondents to retrospectively report their household's recovery level, the timing of their return and rebuilding, the specific types and sources of social support they received, and the extent of storm damage they experienced over a 5.5 year period.
- Statistical analysis used to examine the relationship between social support patterns and household recovery trajectories.

Validation: None described.

Significance: This study adds to the understanding of household recovery after disasters by examining the role of social support patterns in shaping recovery trajectories. It suggests that by classifying these temporal patterns into clusters, researchers can identify how specific combinations of support influence the speed and success of household recovery.

39. Madajewicz, M. "Who Is Vulnerable and Who Is Resilient to Coastal Flooding? Lessons from Hurricane Sandy in New York City." *CLIMATIC CHANGE* 163, no. 4 (2020): 2029–53. WOS:000599011400001. <https://doi.org/10.1007/s10584-020-02896-y>.

Study Purpose: The purpose of this study is to identify the factors that influence household vulnerability and resilience to coastal flooding, using Hurricane Sandy as a case study.

Sampling Characteristics: The study sampled 292 low-rise households from two New York City areas (Queens and Staten Island) that were affected by the Hurricane. Random sampling was utilized.

Disaster: Hurricane

Built Environment: Yes

Timeframe Measured: Two and three years after the hurricane. Single data collection for each area (late 2014 in Queens, and late 2015 in Staten Island).

Recovery Focus: Outcome

Measurement of Recovery:

- **Recovery time** – Several self-reported measures on how long it took households to recover:
 - How long until access to food returned to normal (months)
 - How long the household was displaced (months)
 - How long to rebuild the home (months)
 - How long the house had mold (days)
 - How long for hot water to return (weeks)
 - How long before the home returned to pre-hurricane condition (months)

Instrument Included: Partially

Methodology:

- Survey of 292 households affected by the hurricane. The survey captured information on household characteristics, flood damage, insurance coverage, recovery efforts, and impacts on household well-being.
- Statistical analysis used to examine the relationship between recovery outcomes and factors associated with household vulnerability and resilience.

Validation: None described.

Significance: This study adds to the understanding of household recovery after disasters by examining a range of recovery outcomes and identifying the factors that influence vulnerability and resilience. The findings provide insights into the characteristics of households that are more likely to experience difficulties in recovering from disasters.

40. Masud-All-Kamal, M., and SMM Hassan. "The Link between Social Capital and Disaster Recovery: Evidence from Coastal Communities in Bangladesh." *NATURAL HAZARDS* 93, no. 3 (2018): 1547–64. WOS:000442515600021. <https://doi.org/10.1007/s11069-018-3367-z>.

Study Purpose: The purpose of this study is to examine the role of social capital in facilitating disaster recovery at the household and community levels, using Cyclone Aila in Bangladesh as a case study.

Sampling Characteristics: The study sampled 28 households for qualitative interviews and 13 households for focus group discussions. Purposive sampling was used to recruit households with direct experience with the hurricane.

Disaster: Hurricane

Built Environment: Yes

Timeframe Measured: Five years after the hurricane. Single data collection between January and February 2014.

Recovery Focus: Process

Measurement of Recovery:

- Qualitative interview responses from respondents that provided information on social networks' influences on post-disaster recovery and coping.

Instrument Included: No

Methodology:

- Semi-structured interviews with 28 households which collected information on respondents' recovery experience in relation to their social networks.
- Focus group discussions with 13 households which collected information on the influence of government, non-government, and humanitarian groups influenced respondents' recovery process.

Validation: None described.

Significance: This study suggests that household recovery is driven more by the strength of social networks than by the specific amount of aid or physical damage a family receives. It argues that recovery measurements must account for local social structures, as these hierarchies can either facilitate mutual help or allow elites to misappropriate resources. Consequently, the researchers argue that effective recovery depends on aligning external assistance with the community's existing social capital and power dynamics.

41. Mitsova, D., AM Esnard, M. Escaleras, A. Sapat, and L. Besser. "Disparate Household Recovery Outcomes in Rural Communities: A Longitudinal Analysis of Hurricane Michael's Impact on the Florida Panhandle." *NATURAL HAZARDS* 121, no. 10 (2025): 11337–69. WOS:001478409600001. <https://doi.org/10.1007/s11069-025-07231-1>.

Study Purpose: The study aims to examine the effects of Hurricane Michael on household recovery outcomes in rural communities in the Florida Panhandle, exploring factors such as infrastructure disruptions, income loss, disaster assistance, and access to basic supplies and services.

Sampling Characteristics: The study was conducted in two waves with differing recruitment strategies:

- Wave 1:
 - Automated telephone interviews (ATI): 451 responses collected via landlines using random selection from voter lists.
 - Online Opt-in Survey: 458 responses collected via digital recruitment (emails, social networks).
- Wave 2:
 - This wave recontacted the original ATI participants, resulting in a matched panel of 156 respondents.

Disaster: Hurricane

Built Environment: Yes

Timeframe Measured: Wave one data was collected five months after the hurricane. A single data collection in March 2019. Wave two data was collected 17 months after the hurricane. A single data collection in February 2020.

Recovery Focus: Outcome

Measurement of Recovery:

- **Recovery status** – A self-reported response where respondents answer the question “How would you rate your overall recovery from Hurricane Michael?” (Completely recovered; Mostly recovered; Somewhat recovered; Not recovered at all; Not affected).

Instrument Included: Yes

Methodology:

- Automated telephone interviews with 451 households. The survey was conducted with automatic voice instructions. Respondents pressed number buttons to answer questions about their recovery status and various factors influencing recovery such as damage, infrastructure disruptions and access to supplies and services.
- Online opt in surveys of 458 households. Respondents answered questions about their recovery status and various factors influencing recovery such as damage, infrastructure disruptions and access to supplies and services.
- Follow-up survey of 156 ATI households. One year later, respondents answered the same questions about their recovery status and various factors influencing recovery such as damage, infrastructure disruptions and access to supplies and services.

- Statistical analysis used to examine the relationship between recovery status and the factors influencing recovery collected in the survey.

Validation: None described.

Significance: This study adds to the overall measurement of recovery by providing insights into the challenges faced by rural communities during the post-disaster period, highlighting the importance of factors such as infrastructure resilience, access to healthcare, and disaster assistance in household recovery outcomes. The longitudinal design allows for an understanding of how recovery varies over time.

42. Mitsova, D., AM Esnard, A. Sapat, A. Lamadrid, M. Escaleras, and C. Velarde-Perez. "Effects of Infrastructure Service Disruptions Following Hurricane Irma: Multilevel Analysis of Postdisaster Recovery Outcomes." *NATURAL HAZARDS REVIEW* 22, no. 1 (2021). WOS:000672397700002. [https://doi.org/10.1061/\(ASCE\)NH.1527-6996.0000421](https://doi.org/10.1061/(ASCE)NH.1527-6996.0000421).

Study Purpose: The purpose of this study was to examine the impact of infrastructure service disruptions on household recovery outcomes after Hurricane Irma.

Sampling Characteristics:

- Automated telephone interviews (ATI): 334 responses collected via landlines using random selection from voter lists.
- Online Opt-in Survey: 654 responses collected via digital recruitment (emails, social networks).

Disaster: Hurricane

Built Environment: Yes

Timeframe Measured: Eight months after the hurricane. Single data collection in May 2018.

Recovery Focus: Outcome

Measurement of Recovery:

- **Recovery status** – A self-reported response where respondents answer the question "How would you rate your overall recovery from Hurricane Irma?" (Completely recovered; Mostly recovered; Somewhat recovered; Not recovered at all; I was not affected by Hurricane Irma).

Instrument Included: Yes

Methodology:

- Automated telephone interviews with 334 households. The survey was conducted with automatic voice instructions. Respondents pressed number buttons to answer questions about their recovery status and various impacts influencing recovery such as damage, infrastructure disruptions and access to supplies and services.

- On-line opt in surveys of 654 households. Respondents answered questions about their recovery status and various impacts influencing recovery such as damage, infrastructure disruptions and access to supplies and services.
- Statistical analysis used to examine the relationship between recovery status and the impacts influencing recovery collected in the survey.

Validation: None described.

Significance: This study adds to the overall measurement of recovery by providing insight into the impact of infrastructure service disruptions on household recovery outcomes. The use of a binary measure of recovery and multilevel analysis allows for a nuanced understanding of the factors influencing household recovery.

43. Nejat, A., and S. Ghosh. "LASSO Model of Postdisaster Housing Recovery: Case Study of Hurricane Sandy." *NATURAL HAZARDS REVIEW* 17, no. 3 (2016).
WOS:000381058100004. [https://doi.org/10.1061/\(ASCE\)NH.1527-6996.0000223](https://doi.org/10.1061/(ASCE)NH.1527-6996.0000223).

Study Purpose: The purpose of this study is to model household-level recovery decisions after a disaster, specifically focusing on the factors that influence households' decisions to rebuild or repair their homes after Hurricane Sandy.

Sampling Characteristics: The researchers utilized two primary sampling methods to recruit 126 households:

- Door-to-Door Surveying: Conducted in heavily damaged coastal areas, specifically New Dorp Beach and Midland Beach. The team selected random starting addresses and then approached approachable neighboring homes.
- Snowball Sampling: Targeted survivors staying in major shelters (e.g., Bayley Seton Hospital), those at FEMA disaster recovery centers, and individuals visiting local food banks.

Disaster: Hurricane

Built Environment: Yes

Timeframe Measured: One month after the hurricane. Single data collection in December 2012.

Recovery Focus: Outcome

Measurement of Recovery:

- **Recovery decision** – a self-reported response from households on whether they decided to rebuild or repair, wait and stay in temporary housing, or relocate.

Instrument Included: No

Methodology:

- Survey of 126 households affected by the hurricane. The survey collected information on experiences after the hurricane and household decisions about relocating and reconstructing.
- Statistical analysis used to create a model that predicts which factors influence recovery decision making.

Validation:

- Cross-validation for the prediction model.
- None described for survey.

Significance: This study adds to the overall measurement of recovery by providing insights into the factors that influence household-level recovery decisions after a disaster. The study's use of a logistic regression framework with LASSO methodology provides a nuanced understanding of the complex factors shaping recovery outcomes.

44. Santos, J., SS Meng, and P. Mozumder. "Integrating Household Survey with Inoperability Input-Output Model of Critical Infrastructure Systems: A Case Study of Hurricane Sandy." *RISK ANALYSIS* 44, no. 7 (2024): 1716–29. WOS:001104365900001.
<https://doi.org/10.1111/risa.14257>.

Study Purpose: The study aimed to integrate household survey data with an inoperability input-output model (IIM) to assess the economic losses and recovery of critical infrastructure systems after Hurricane Sandy.

Sampling Characteristics: The study sampled 427 households from New Jersey who were affected by the hurricane. Address-based sampling from USPS records was used.

Disaster: Hurricane

Built Environment: No

Timeframe Measured: Eight months after the hurricane. Single data collection in July 2013.

Recovery Focus: Outcome

Measurement of Recovery:

- **Utilities recovery time** – self-reported responses of how many days until respondents' access to utilities returned (electricity, water, gas, phone, and transportation).
- **Evacuation length** – The self-reported length of time respondents had to evacuate.

Instrument Included: No

Methodology:

- Survey of 427 households affected by the hurricane. The survey collected information on the magnitude and duration of critical infrastructure failures, property damages, evacuation behaviors, and socioeconomic characteristics of households.

- A predictive model was used with the survey data to estimate the resulting economic losses and cascading ripple effects across economic sectors.

Validation: None described.

Significance: This study adds to the overall measurement of recovery by demonstrating the value of integrating household survey data with economic modeling to assess the impacts of disasters on critical infrastructure systems and the economy.

45. Schnall, AH, J. Roth, B. Ellis, K. Seger, M. Davis, and EM Ellis. "Addressing Community Needs During the Hurricane Response and Recovery Efforts Through Community Assessments for Public Health Emergency Response (CASPER)-United States Virgin Islands, 2017-2018." *DISASTER MEDICINE AND PUBLIC HEALTH PREPAREDNESS* 13, no. 1 (2019): 53–62. WOS:000460656000011. <https://doi.org/10.1017/dmp.2019.6>.

Study Purpose: The study aimed to describe the use of the Community Assessment for Public Health Emergency Response (CASPER) methodology to assess the needs of households in the US Virgin Islands after Hurricanes Irma and Maria in 2017.

Sampling Characteristics: The study sampled 387 households in the first data collection phase, and 200 of the sample completed the second phase 3 months later. Two-stage cluster sampling was used: 30 clusters were chosen based on census blocks, and 7 households were randomly sampled from each cluster.

Disaster: Hurricane

Built Environment: Yes

Timeframe Measured: Five months after the storms. Multiple data collections in November 2017 (response assessment) and February 2018 (recovery assessment).

Recovery Focus: Mixed

Measurement of Recovery:

- **Housing recovery status** – self-reported selected responses (fixed answer selections from survey) on the repair status of houses, perceived safety and the presence of various safety issues (e.g. mold and mildew), and perceived barriers to housing recovery.
- **Infrastructure recovery status** – self-reported selected responses (fixed answer selections from survey) on access to utilities and perceived "top current needs."
- **Physical and mental health recovery status** – self-reported selected responses (fixed answer selections from survey) on recovery or worsening of physical injuries and mental and behavioral indicators of mental health issues.
- **Displacement status** – self-reported selected responses (fixed answer selections from survey) on the status of those displaced from their homes.

- **Communication status** – self-reported selected responses (fixed answer selections from survey) on the recovery of access to communication methods.

Instrument Included: Yes

Methodology:

- Surveys of 387 households affected by the hurricanes. The Community Assessment for Public Health Emergency Response (CASPER) surveys collected household-based data on demographics, hurricane experiences, communication preferences, vector concerns, physical and behavioral health status, and evolving household needs during the response and recovery phases.

Validation: Use of an existing validated survey: The Community Assessment for Public Health Emergency Response (CASPER) survey [23].

Significance: This study adds to the overall measurement of recovery by providing household-level data on the recovery process after a disaster, highlighting the evolving needs of households over time. The use of the validated CASPER methodology demonstrates a practical approach to assessing community needs in the aftermath of a disaster, and the findings provide insights into the recovery trajectory of households in the US Virgin Islands.

46. Su, Y. "Networks of Recovery: Remittances, Social Capital and Post-Disaster Recovery in Tacloban City, Philippines." *INTERNATIONAL JOURNAL OF DISASTER RISK REDUCTION* 67 (January 2022). WOS:000716819600004. <https://doi.org/10.1016/j.ijdrr.2021.102641>.

Study Purpose: The study aims to investigate the role of social capital and remittances in household recovery after Typhoon Haiyan in Tacloban City, Philippines, with a particular focus on how different types of social capital ties influence remittance receipt and recovery.

Sampling Characteristics: The study sampled 72 households across three heavily damaged communities in Tacloban City. Random sampling (knocking on every two to four doors) was used.

Disaster: Typhoon

Built Environment: No

Timeframe Measured: Three years after the typhoon. Single data collection between April 2016 and February 2017.

Recovery Focus: Process

Measurement of Recovery:

- **Qualitative interview responses** – self-reported recovery experiences of households.
- **Recovery-grams** – participant aided sociograms used to visually map a household's social network and document the specific financial and non-financial assistance received, including the timing of that support and its importance to the post-disaster recovery process.

Instrument Included: Partially

Methodology:

- Qualitative semi-structured interviews of 72 households affected by the typhoon. The interviews gathered qualitative data on households' experiences during the disaster and recovery process, as well as their perceptions of the role of social capital and remittances in their recovery. During the interviews, Respondents created the "Recovery-grams."

Validation: None described.

Significance: This study contributes to the measurement of recovery by introducing and utilizing a novel tool (recovery-grams) that captures the complex networks of assistance households rely on during recovery. By focusing on the role of social capital and remittances, it highlights the importance of social networks in facilitating household recovery.

47. Subaiya, S., C. Moussavi, A. Velasquez, and J. Stillman. "A Rapid Needs Assessment of the Rockaway Peninsula in New York City After Hurricane Sandy and the Relationship of Socioeconomic Status to Recovery." *AMERICAN JOURNAL OF PUBLIC HEALTH* 104, no. 4 (2014): 632–38. WOS:000341789200032. <https://doi.org/10.2105/AJPH.2013.301668>.

Study Purpose: The purpose of this study was to assess the immediate needs and recovery status of households in the Rockaway Peninsula, New York City, after Hurricane Sandy and to examine the relationship between socioeconomic status and recovery.

Sampling Characteristics: The study sampled 91 households affected by the hurricane. Cluster sampling and random sampling were used.

Disaster: Hurricane

Built Environment: No

Timeframe Measured: Three weeks after the hurricane. Single data collection in November 2012.

Recovery Focus: Outcome

Measurement of Recovery:

- **Utilities recovery status** – The self-reported status of the recovery of several resources including, days without electricity, heat, and telephone, as well as the source of electricity, heat, and telephone at the time of the survey, the perceived safety of respondents' houses and neighborhoods, and food insecurity.
- **Health recovery status** – The self-reported status of physical and psychological illness symptoms since the storm.

Instrument Included: Partially

Methodology:

- Survey of 91 households affected by the hurricane. The survey was a modified version of the CASPER assessment and gathered information on the immediate needs and recovery status of households, and it included questions on demographics, housing damage, utility disruptions, food access, health concerns, and receipt of relief services
- Statistical analysis used to explore the relationship between recovery status and socioeconomic status.

Validation: Use of an existing validated survey: The Community Assessment for Public Health Emergency Response (CASPER) survey [23].

Significance: This study contributes to the measurement of household-level recovery after a disaster by utilizing a systematic rapid needs assessment to quantify how socioeconomic status—measured through specific proxy variables—directly correlates with a household’s recovery experience.

48. Tyler, CG, A. Salinas, A. Guevara, H. Alva, M. Ruiz, and EY Prot. “Assessing 2019 Hurricane Harvey Recovery in Aransas County, Texas Through Community Assessment for Public Health Emergency Response (CASPER).” *DISASTER MEDICINE AND PUBLIC HEALTH PREPAREDNESS* 17 (March 2023). WOS:000954622500001.
<https://doi.org/10.1017/dmp.2023.12>.

Study Purpose: The objective of this study was to assess the recovery of Aransas County, Texas households 2 years after Category 4 Hurricane Harvey made landfall.

Sampling Characteristics: The study sampled 175 households affected by the hurricane. Cluster sampling and random sampling were used.

Disaster: Hurricane

Built Environment: Yes

Timeframe Measured: 21 months after the hurricane. Single data collection in May 2019.

Recovery Focus: Outcome

Measurement of Recovery:

- **Housing recovery status** – self-reported selected responses (fixed answer selections from survey) on the repair status of houses.
- **Physical and mental health recovery status** – self-reported selected responses (fixed answer selections from survey) on recovery or worsening of physical injuries and mental and behavioral indicators of mental health issues.
- **Displacement status** – self-reported selected responses (fixed answer selections from survey) on the status of those displaced from their homes.
- **Communication status** – self-reported selected responses (fixed answer selections from survey) on the recovery of access to communication methods.

Instrument Included: Partially

Methodology:

- Surveys of 175 households affected by the hurricane. The Community Assessment for Public Health Emergency Response (CASPER) surveys collected household-based data on demographics, hurricane experiences, communication preferences, physical and behavioral health status, and evolving household needs during the response and recovery phases.

Validation: Use of an existing validated survey: The Community Assessment for Public Health Emergency Response (CASPER) survey [23].

Significance: This study adds to the overall measurement of recovery by providing insights into the long-term recovery process of households after a major disaster. The findings highlight the effectiveness of CASPERs in assessing long-term recovery and provide data on household preparedness, greatest needs, and challenges faced during the recovery process.

3.5. Multiple Hazards

49. Chouhan, S, AH Thieken, P Bubeck, and M Mukherjee. "Role of Tourism on Disaster Recovery: A Case Study of Uttarakhand, India." *INTERNATIONAL JOURNAL OF DISASTER RISK REDUCTION* 95 (September 2023). WOS:001050082400001.
<https://doi.org/10.1016/j.ijdr.2023.103878>.

Study Purpose: The study aimed to examine the role of tourism in disaster recovery, comparing the recovery experiences of households on touristic and off-touristic routes in Uttarakhand, India.

Sampling Characteristics: The study sampled 716 households in 32 villages, with a focus on households affected by disasters in the past decade. The sample included households from both touristic (n = 376) and off-touristic (n = 340) areas, chosen using cluster sampling.

Disaster: Multiple

Built Environment: No

Timeframe Measured: Single data collection between February and July 2022, up to 10 years after any recent disaster.

Recovery Focus: Mixed

Measurement of Recovery:

- **Recovery satisfaction** – Self-reported ratings of 1 to 5 for life, health, home, living environment, financial, work, and family life satisfaction.
- **Current level of stress** – Self-reported ordinal ratings of 1 to 5, where 1 is the least stressed and 5 is the most stressed
- **Support during recovery** – Self-reported ratings of 1 to 5 for the amount of support received during recovery including financial, insurance, and "outside" support, where 1 is the least amount received.

- **Recovery status** – An unspecified rating of the recovery status. It is unclear if these ratings were assigned by the researchers or chosen by participants. No explanation is provided.

Instrument Included: No

Methodology:

- Survey of 716 households affected by disasters. The survey included questions on various aspects of recovery, such as financial support received, outside support, satisfaction with life, health, home, living environment, job, and family life.
- Statistical analysis used to examine the differences in recovery between households on touristic and off-touristic routes, as well as to compare the median values of various recovery indicators between the two groups.

Validation: None described.

Significance: This study adds to the understanding of household recovery after disasters by highlighting the role of tourism in the recovery process. The study's findings provide insights into the differences in recovery experiences between households in touristic and off-touristic areas.

3.6. Tornado

50. Sadri, AM, SV Ukkusuri, S. Lee, et al. "The Role of Social Capital, Personal Networks, and Emergency Responders in Post-Disaster Recovery and Resilience: A Study of Rural Communities in Indiana." *NATURAL HAZARDS* 90, no. 3 (2018): 1377–406.
WOS:000422661600016. <https://doi.org/10.1007/s11069-017-3103-0>.

Study Purpose: The study examines the impact of social capital, personal networks, and emergency responders on household recovery and resilience after a disaster, specifically focusing on rural communities in Indiana.

Sampling Characteristics: The study sampled 390 households close to the path of the tornado, identified from the USPS database. Multi-family homes were excluded.

Disaster: Tornado

Built Environment: Yes

Timeframe Measured: Three years after the tornado. Single data collection in spring of 2015.

Recovery Focus: Outcome

Measurement of Recovery:

- **Recovery time** – a self-reported number of days it took for the household to recover. The question was stated: "Approximately how many days did it take for you to completely recover from the damage (Personal properties such as your house, vehicle) due to the tornado?"

Instrument Included: Partially

Methodology:

- Survey of 390 households in the path of the tornado. The survey collected information on household-level recovery time and speed, damage to physical infrastructure, social capital dimensions, personal (egocentric) network characteristics, and the usefulness of recovery assistance from various emergency responders and community organizations.
- Statistical analysis used to model how factors including household characteristics, social capital, personal networks, and emergency responder helpfulness affected recovery time.

Validation:

- The researchers adapted social capital questions from a set of integrated questionnaires previously proposed by the World Bank Social Capital Thematic Group [24] to ensure they were capturing quantitative data on established dimensions of social capital.
- To measure personal networks, the study used the Personal Network Research Design (PNRD) [25–27], an approach including "name generator" and "name interpreter" items that have been used in many classical studies of egocentric networks.
- The specific wording for the name generator questions was adapted from the General Social Survey (GSS) [28], which is widely recognized for its ability to capture core social contacts.

Significance: This study contributes to the understanding of household recovery because it provides an empirical test of how physical damage and social connections simultaneously influence the speed of a household's recovery. By using a unified modeling framework, it quantifies how specific network traits—like how closely your friends know each other and how far away they live—directly impact recovery time alongside traditional factors like insurance and government aid.

51. Yang, XM, XY Li, KF Lu, and ZR Peng. "Integrating Rural Livelihood Resilience and Sustainability for Post-Disaster Community Relocation: A Theoretical Framework and Empirical Study." *NATURAL HAZARDS* 116, no. 2 (2023): 1775–803.
WOS:000894940900002. <https://doi.org/10.1007/s11069-022-05739-4>.

Study Purpose: The study aims to explore the factors and relationships between resilient rural livelihoods (RRL) and sustainable rural livelihoods (SRL) in the context of post-disaster community relocation. The authors develop a theoretical model integrating RRL and SRL and test it using a dataset from households affected by the 2016 Jiangsu Tornado in China.

Sampling Characteristics: The study sampled 429 households affected by the tornado. Cluster and random sampling were used.

Disaster: Tornado

Built Environment: No

Timeframe Measured: Two years after the tornado. Single data collection in 2018.

Recovery Focus: Outcome

Measurement of Recovery:

- **Recovery status** – Self reported Likert responses on respondents’ changes in health, education, number of household members employed, and savings. (further clarification on the questions asked not provided).
- **Recovery improvement** – Self-reported Likert responses on Respondents’ level of recovery and level of improvement. (further clarification on the questions asked not provided).

Instrument Included: No

Methodology:

- Survey of 429 households affected by the tornado. The survey collected information on the social, economic, political, and psychological aspects of household-level recovery.
- Structural Equation Modeling (SEM) was used to develop a theoretical model and capture measurement relationships, causal effects between latent variables, and correlations among predictors simultaneously.

Validation: None described.

Significance: This study adds to the overall measurement of recovery by providing insights into the factors affecting household recovery and sustainability after a disaster. The findings suggest the importance of tangible assets, such as financial capital, in promoting household recovery and confidence in dealing with future disasters.

3.7. Tsunami

52. Hossain, M, T Songsermsawas, and RH Toguem. “The Role of Access to Finance in Disaster Recovery: Evidence from Coastal Communities in India.” *JOURNAL OF AGRICULTURAL ECONOMICS* 75, no. 1 (2024): 218–34. WOS:000978509600001. <https://doi.org/10.1111/1477-9552.12541>.

Study Purpose: To evaluate the long-term impacts of the Post-Tsunami Sustainable Livelihoods Programme (PTSLP) in India. The study specifically investigates how providing access to finance (credit/loans) and rehabilitating communal infrastructure contributes to the sustainable economic and livelihood recovery of coastal households.

Sampling Characteristics: The study randomly sampled 981 households (410 intervention households and 571 comparison/control households) affected by the tsunami.

Disaster: Tsunami

Built Environment: Yes

Timeframe Measured: 16 years after the Tsunami. Single data collection in 2020 for two time points (2010 and 2020).

Recovery Focus: Mixed

Measurement of Recovery:

- **Income** - Total annual household income measured in USD, broken down into specific livelihood sources: crop, livestock, fishery, enterprise, wage labor, and transfer income.
- **Asset accumulation** – Indices tracking cumulative asset holdings in 2020 (and recalled 2010 baselines), categorized into productive assets (e.g., tractors, pumps, sprayers, tools), durable assets (e.g., furniture, phones, televisions), and livestock assets (e.g., cattle, poultry).
- **Food security** - The Food Insecurity Experience Scale (FIES) developed by the Food and Agriculture Organization. This scale captures household experiences over the preceding 30 days across eight individual binary questions (ranging from worrying about food to skipping meals or spending a whole day without eating) and compiles them into a standardized aggregate score.
- **Loan access** – Total formal and informal loans received during the project duration (2010 and 2020) from different sources (e.g. bank, MFI, Money lender, Cooperatives).
- **Social Capital** – Whether any household member has membership to different communal groups (e.g. livelihoods, finance, and women associations).

Instrument Included: No

Methodology:

- Survey of 981 households affected by the tsunami. The survey collected information on household incomes, demographics, food security indicators, asset ownership, access to credit, access to markets and prices.
- Statistical analysis used to compare recovery outcomes from the intervention group (those who participated in the PTSLP) to outcomes from the control group (those who did not participate in the PTSLP).

Validation: None described.

Significance: This study contributes to the measurement of recovery by providing insights into the role of access to finance in facilitating household recovery after a disaster. The study highlights that access to finance and group participation are more significant drivers of long-term recovery than infrastructure rehabilitation alone. It provides empirical evidence for policymakers that sustainable recovery for small-scale producers requires integrated financial interventions that allow for reinvestment in new technologies and productive assets.

53. Ismail, N., K. Okazaki, C. Ochiai, and G. Fernandez. "Livelihood Strategies after the 2004 Indian Ocean Tsunami in Banda Aceh, Indonesia." In *Kyoto University*, vol. 212, edited by

D. Amaratunga and R. Haigh. 2018. WOS:000552392300070.
<https://doi.org/10.1016/j.proeng.2018.01.071>.

Study Purpose: The study aims to examine the livelihood recovery experience of households after the 2004 Indian Ocean Tsunami in Pande village, Banda Aceh, Indonesia, with a focus on understanding the adaptive strategies taken by households to recover.

Sampling Characteristics: The study sampled 77 households affected by the tsunami. Convenience sampling was used.

Disaster: Tsunami

Built Environment: Yes

Timeframe Measured: 11 to 12 years after the tsunami. Single data collection between September 2015 and March 2017.

Recovery Focus: Mixed

Measurement of Recovery:

- **Recovery status** – a mixture of self-reported participant data including financial condition, livelihood activities, satisfaction with government and NGO livelihood interventions, and home renovation choices, and data collected from secondary sources such as population, and household income.
- **Livelihood interventions** – Descriptions of government and NGO interventions including housing reconstruction, employment and livelihood programs, microcredit programs, and conservation efforts.
- **Adaptive strategies** – Descriptions of adaptive strategies adopted by households throughout recovery including agricultural intensification, and diversification of income sources.

Instrument Included: No

Methodology:

- **Questionnaire Surveys:** The researchers collected information from 77 households about demographics, livelihoods, income, and recovery experiences.
- **Semi-structured Interviews:** 15 respondents were interviewed to gather more in-depth information on their livelihoods and experiences.
- **Group Discussion:** An informal group discussion was conducted with 5 women to gain further insights into their livelihood activities and challenges.
- **Observations:** The researchers observed the livelihood activities of the villagers to complement the data gathered through other methods.
- **Secondary Data:** Relevant documents, including the Gampong Pande Village Medium Term Development Plan, journals, reports from international and local organizations, statistical data, and books, were reviewed to provide additional context.

Validation: None described.

Significance: This study adds to the overall measurement of recovery by providing insights into livelihood recovery and adaptive strategies taken by households after a disaster highlighting the importance of considering the complex and dynamic nature of household recovery. The study's findings on the effectiveness of various interventions and the role of household characteristics in shaping recovery outcomes can inform the development of more effective recovery policies and programs.

54. Siddiq, I., A. Javernick-Will, and K. Kelly. "Post-Disaster in-Situ Aid: Factors Associated with Housing Beneficiaries' Perceived Long-Term Recovery." *INTERNATIONAL JOURNAL OF DISASTER RISK REDUCTION* 127 (September 2025). WOS:001520003500001.
<https://doi.org/10.1016/j.ijdrr.2025.105653>.

Study Purpose: The study aimed to investigate the factors associated with the perceived long-term economic recovery of households that received in-situ housing assistance after the 2004 Indian Ocean tsunami in Aceh, Indonesia.

Sampling Characteristics: The study sampled 92 households who were affected by the Tsunami. Households were recruited by going to every third house in nine communities close to the shoreline.

Disaster: Tsunami

Built Environment: Yes

Timeframe Measured: 20 years after the Tsunami. Single data collection at an undisclosed time.

Recovery Focus: Outcome

Measurement of Recovery:

- **Perceived economic recovery** – Respondents' answers to the open-ended question "Have you recovered economically from the disaster? Why or why not?" were coded into one of three categories of recovery (low, medium, or high).

Instrument Included: Partially

Methodology:

- Survey of 92 households affected by the tsunami. The survey collected a mix of quantitative and qualitative information on various factors, including housing characteristics (such as housing type, size, and quality), livelihoods (including occupation, income, and assets), and demographic information (such as household size, age, and education level).
- Statistical analysis used to explore the relationships between factors that influence recovery and the perceived recovery of households.

Validation: None described.

Significance: This study contributes to the understanding of household-level recovery after disasters by examining the factors associated with perceived economic recovery. The findings suggest the importance of housing characteristics, livelihoods, and other factors in influencing recovery outcomes.

3.8. Winter Storm

55. Chakraborty, J, TW Collins, and SE Grineski. "Disability and Subsidized Housing Residency: The Adverse Impacts of Winter Storm Uri in Metropolitan Texas." *DISABILITY AND HEALTH JOURNAL* 16, no. 2 (2023). WOS:000966202000001.
<https://doi.org/10.1016/j.dhjo.2022.101403>.

Study Purpose: The study aimed to examine the impact of Winter Storm Uri on households with and without disabled persons, as well as those residing in HUD-assisted housing versus other housing, and to assess their recovery experiences.

Sampling Characteristics: The study sampled 1,054 households from eight Metropolitan Statistical Areas (MSAs) of Texas, with a focus on households with and without disabled persons and those residing in HUD-assisted housing. The survey oversampled residents of federally subsidized rental housing developments, including residents of HUD-assisted housing affiliated with programs such as public housing, Section 202, Section 811, Section 8 project-based rental assistance, and Section 8 Housing Choice Vouchers.

Disaster: Winter Storm

Built Environment: Yes

Timeframe Measured: A single data collection five months after the storm.

Recovery Focus: Outcome

Measurement of Recovery:

- **Recovery status** – Self-reported responses where respondents choose on a scale of 1 to 10 with 10 being fully recovered.

Instrument Included: Partially

Methodology:

- Telephone survey of 1054 households affected by the storm. The survey collected information on households' experiences during the storm, including disruptions to essential services, displacement, and financial impacts, as well as their recovery and demographic characteristics.
- Statistical analysis used to examine the relationships between household characteristics, such as disability status and HUD-assisted housing residency, and recovery outcomes.

Validation: None described.

Significance: This study adds to the overall measurement of recovery by providing insights into the recovery experiences of households with disabled persons and those residing in HUD-assisted housing.

56. Oniki, S., and K. Dagys. "Recovery from a Winter Disaster in Tov Province of Mongolia." *JOURNAL OF ARID ENVIRONMENTS* 139 (April 2017): 49–57. WOS:000393629500005. <https://doi.org/10.1016/j.jaridenv.2016.12.010>.

Study Purpose: The study examines the factors influencing the recovery of herders' households in Mongolia after the 2010 winter disaster (dzud), with a focus on the role of initial stock levels and household characteristics.

Sampling Characteristics: The study sampled 118 animal-owning (at least 20 animals) households from five different villages. Random sampling was used.

Disaster: Winter Storm

Built Environment: No

Timeframe Measured: One year before to two years after the storm. Multiple data collections that took place at the beginning of each year:

- 2009 – Pre-storm
- 2010 – Year of the storm
- 2011 – One year post-storm
- 2012 – Two years post-storm

Recovery Focus: Outcome

Measurement of Recovery:

- **Change in number of animals** – the change in households' number of owned animals across each data collection period. The number of animals used in the study was from census data rather than the household survey data.

Instrument Included: No

Methodology:

- Survey of 118 animal owning households. The survey collected information on household activities and characteristics such as food consumption, sales and finances, demographics, changes in number of animals, and other incomes.
- Statistical analysis used to examine the relationship between the changes in animal ownership and household activities and characteristics from the survey.

Validation: None described.

Significance: This study adds to the understanding of household-level recovery after a disaster by providing rare baseline data from before a disaster to measure the specific factors that dictate how individual households recover.

4. Findings and Impacts

The compiled disaster recovery literature spans a wide array of natural hazard types—including earthquakes, severe hydro-meteorological events (hurricanes, typhoons, floods, and cyclones), winter storms, tornadoes, tsunamis, and droughts—across diverse international contexts. Sampling strategies range from small qualitative cohorts of 28 to 72 households to large population-based surveys exceeding 2,000 households, primarily employing probability-based designs like stratified and multi-stage cluster sampling, often with oversampling for marginalized populations. Temporal scopes vary from immediate evaluations conducted weeks post-event to multi-decadal studies capturing outcomes up to 20 years later, frequently using longitudinal and multi-wave panel designs to trace non-linear recovery trajectories. Furthermore, nearly three-quarters of studies explicitly integrate built environment metrics, such as structural damage, reconstruction status, settlement relocation, and utility access. Studies were categorized by recovery focus as outcome-based (e.g., evaluating structural rebuild, income, and well-being metrics), process-based (e.g., examining assistance administration and social networks), or mixed (e.g., tracking multi-stage housing transitions alongside institutional interactions). The following table (Table 1) summarizes the types of measurements from the collected studies within each recovery focus category:

Table 1. Recovery Focus Categories

Category	Measurements
Outcome-Based Focus	• Housing & Structural Repair: Degree/percentage of structural rebuild, house value changes, built area modifications, building content restoration (1–6 scales), and rebuilding vs. relocation choices. • Income, Assets & Agriculture: Self-rated or percentage changes in household cash income, livestock herd counts, landholding operational shifts, and agricultural yield income. • Subjective & Perceived Progress: Single-item self-reported recovery ratings (1–10, 1–5, or binary scales) and composite perception indices (quality of life, perceived recovery speed, family atmosphere). • Health & Psychological Well-Being: Clinical PTSD screening scores (PC-PTSD), Quality of Life scales (EQ-5D VAS), disability schedules (WHODAS 2.0), and Human Well-being Indices (HWBI). • Recovery Speed & Infrastructure Restoration: Days/months to complete household recovery, days until utility restoration (power, water, gas, transit), displacement duration, and unemployment length. • Multidimensional Rapid Needs: Multidimensional Yes/No recovery status frameworks (34-indicator models) and rapid needs assessment metrics (CASPER).
Process-Based Focus	• Program Administration & Voucher Compliance: Compliance with building stamp/voucher programs, material acquisition delays, and satisfaction ratings across institutional interventions. • Aid Delivery & Livelihood Mechanics: Qualitative evaluations of post-disaster relief delivery, assistance effectiveness, and adaptive household coping mechanics. • Social Networks & NGO Execution: Density of linking social networks with NGOs/civic groups, institutional power hierarchies, and aid allocation dynamics.

Mixed Recovery Focus	• Social Network Mapping: Participant-drawn sociograms ("recovery-grams") tracking structural ties, assistance timing, and remittance values.
	• Housing Transitions & Policy Tracking: Multi-stage housing progression (open space to temporary shelter to permanent housing), usage of temporary shelters vs. cash grants (PMAR vs. CAS), and policy impacts across household categories.
	• Program Engagement & Livelihood Adaptation: Socio-Technical Assistance (STA) activity participation, financial loan access paired with asset accumulation/food security (FIES), and multi-wave food insecurity paired with health metrics (SF-12).
	• Multi-Domain & Longitudinal Dynamics: Integrated quantitative physical, social, and economic scores alongside institutional trust, multi-wave rebuild timing paired with bonding/bridging social support clusters, longitudinal income paired with network ties, and multi-wave CASPER tracking.

Methodologically, research in this domain relies on structured questionnaires, semi-structured interviews, focus groups, and automated telephone surveys, which are analyzed using statistical techniques such as multivariate regression, structural equation modeling, LASSO logistic regression, and spatial or Inoperability Input-Output Models. Despite these analytical approaches, a major gap exists in instrument transparency and reporting, with only about one-fifth of studies providing a full survey instrument and over a third providing no instrument descriptions at all. Moreover, a clear majority of studies do not report formal empirical validation testing for their measurement tools within their specific disaster context. Where validation is documented, researchers typically adapt pre-existing validated instruments (e.g., CASPER, SF-12, WHODAS 2.0, or the Oxford Happiness Questionnaire), apply statistical model cross-validation and placebo tests, or conduct qualitative triangulation against secondary records and expert interviews.

Table 2 summarizes the characteristics of the annotated bibliography entries focusing on household disaster recovery. The most prevalent disaster types studied are earthquakes (37.5 %), hurricanes/typhoons/cyclones (30.4 %), and floods (16.1 %), with an emphasis on the built environment in 71.4 % of the studies. Most research focuses on mid-term recovery (1 to 5 years) and utilizes a single data collection point (71.4 %). In terms of research design, the majority of studies focus on recovery outcomes (58.9 %) and employ survey or quantitative-only methodologies (75 %), with recovery most frequently measured through self-reported or perceived metrics (50 %). Notably, a significant majority of the entries (69.6 %) do not describe a formal validation process, while those that do primarily rely on the use of existing validated instruments (16.1 %).

Table 2. Summary Statistics for Annotated Bibliography Entries.

Category	Characteristic	(Frequency) Percent
Disaster Type	Earthquake	(21) 37.5 %
	Hurricane/Typhoon/Cyclone	(17) 30.4 %
	Flood	(9) 16.1 %
	Tsunami	(3) 5.4 %
	Winter Storm	(2) 3.6 %

	Tornado	(2) 3.6 %
	Drought	(1) 1.8 %
	Multiple	(1) 1.8 %
Built Environment	Yes	(40) 71.4 %
	No	(16) 28.6 %
Timeframe Measured (Duration)	Immediate/Short-term (< 1 year)	(12) 21.4 %
	Mid-term (1 to 5 years)	(39) 51.8 %
	Long-term (> 5 years)	(15) 26.8 %
Timeframe Measured (Collection Frequency)	Single Collection	(40) 71.4 %
	Multiple Collections	(16) 28.6 %
Recovery Measurement	Self-Reported/Perceived	(28) 50 %
	Objective/Physical	(13) 23.2 %
	Multidimensional/Indices	(15) 26.8 %
Recovery Focus	Outcome	(33) 58.9 %
	Mixed	(18) 32.1 %
	Process	(5) 8.9 %
Methodology	Survey/Quantitative Only	(42) 75 %
	Qualitative Only	(4) 7.1 %
	Mixed-Methods	(10) 17.9 %
Validation	Use of Validated/Existing Instruments	(9) 16.1 %
	Triangulation of Data	(3) 5.4 %
	Pilot Testing	(3) 5.4 %
	Statistical/Model Validation (Cross-validation, Placebo tests)	(2) 3.6 %
	None Described	(39) 69.6 %

For business recovery [1], a critical limitation exists within disaster research: the reliance on unvalidated survey instruments and measurement methods, even when paired with sophisticated analytical and predictive modeling. This exact deficit remains pervasive across the household recovery literature, where nearly 70% of compiled studies report no formal empirical validation or reliability testing for their primary survey instruments. Consequently, while recent studies increasingly employ advanced statistical frameworks, the field's capacity to generate generalizable, reproducible, and accurate recovery metrics remains constrained by the unverified precision of the underlying measurement tools.

Additionally, business recovery is highlighted as an inherently complex, latent concept whose measurement is complicated by context-dependent mediating factors and ad-hoc instrument design [1]. This challenge applies directly to the household recovery literature as well. Because post-disaster household studies operate in quasi-experimental environments and routinely construct custom, event-specific survey tools, cross-study validation remains exceedingly difficult. Consequently, this fragmentation severely restricts comparative analyses and meta-studies, hindering the field's ability to establish standardized, replicable metrics that advance measurement science across broader community resilience research.

The empirical synthesis of the peer-reviewed household literature reveals critical structural, temporal, and methodological paradigms in how post-disaster household recovery is quantified

and determined more broadly. By analyzing data collection timeframes, recovery indicators, and institutional frameworks, several cross-cutting themes emerge that can inform future ground-up resilience research and emergency management practices.

A defining characteristic of household recovery is its prolonged, non-linear trajectory. True stabilization—particularly permanent housing reconstruction—regularly spans multi-year horizons, with compiled evaluations capturing data anywhere from 15 months to 8 years post-disaster. Within this extended timeframe, a core conceptual tension exists between tracking administrative outputs versus lived, structural outcomes. Traditional methodologies often prioritize administrative processes, such as aid distribution or permit processing. However, capturing long-term household recovery requires evaluating deep structural shifts, such as pre- versus post-disaster home valuations [29] or multi-year transitions out of temporary assistance and shelters into permanent housing [30].

The literature exhibits an ongoing debate over traditional objective metrics versus subjective evaluations. Engineering-driven frameworks heavily favor tangible physical variables, such as structural reconstruction percentages or the financial value of seismic mitigation upgrades. As Mayer notes, social system resilience has historically focused on governance, mitigation, and physical engineering [11]. However, recent research emphasizes that physical reconstruction alone does not equate to complete recovery, driving increased scholarly focus toward assessments that capture households lived experiences and subjective perceptions.

To resolve this tension, contemporary research advocates for merging objective structural data with subjective well-being metrics. Frameworks like the Informatics for Equitable Recovery (IER) used by Bin Tan et al. exemplify this holistic approach by integrating physical housing repair with qualitative indicators of family well-being [31]. These include perceived physical health shifts, neighborhood mutual aid roles, post-reconstruction dwelling comfort, and validated psychological metrics like Primary Care Post-Traumatic Stress Disorder (PC-PTSD) screening scores. Because neither objective nor subjective indicators are sufficient on their own, integrating both dimensions is critical for uncovering the deeper dynamics of long-term community resilience. However, this does not eliminate the need to ensure the validity of methods that use mixed measures.

This annotated bibliography serves as a starting point to examine past and present practices and maps the current landscape of household recovery measurement strategies in academic literature. It provides emergency managers, urban planners, and researchers with a clear benchmark of how measurement is conducted today while revealing essential gaps in validation and standardization that must be addressed moving forward. By compiling the methodological approaches, measurement indicators, and empirical contexts of 56 peer-reviewed studies, this resource establishes a foundation for advancing and refining measurement science in post-disaster household recovery.

As a direct continuation of the review of business recovery measurement [1], this bibliography extends the assessment from business recovery to households and can be utilized in the same capacities:

- **Comparative Analysis:** Researchers can evaluate current methodologies side-by-side to establish a baseline of existing practice, expose critical limitations and identify key priorities for future tool development.
- **Methodology Selection:** Practitioners can use the bibliography to critique existing approaches, using them as starting templates to adapt, refine, or build measurement instruments tailored to their specific contexts.
- **Contextual Understanding:** The bibliography illustrates how past and present metrics attempt to capture complex recovery dynamics, allowing users to ground their own research or practice in current approaches while recognizing where measurement rigor must be advanced.

5. Conclusion and Future Research

Measuring household recovery after disasters is an intricate endeavor shaped by intersecting socioeconomic factors, built environment conditions, hazard characteristics, and temporal horizons. As a continuation of the initial review of measurement methods for business recovery [1], this review compiled and synthesized 56 peer-reviewed academic studies evaluating recovery at the single-household level. By categorizing these studies by disaster hazard type, built environment integration, temporal duration, sampling characteristics, recovery focus, and methodological approaches, this work provides a comprehensive comparative guide to assist researchers, emergency managers, and urban planners in selecting and refining recovery measurement tools tailored to localized contexts.

The synthesis of the literature reveals a significant shift in how household stabilization is conceptualized and quantified. While traditional frameworks historically emphasized administrative execution processes and outputs (e.g., aid processing) or top-down physical metrics (e.g., structural repair percentages and engineering upgrades), contemporary disaster research increasingly advocates for holistic, ground-up assessments. True household recovery extends beyond structural rebuilding to encompass multi-dimensional outcomes, including financial stabilization, food security, physical and psychological health, neighborhood social capital, and housing comfort. Achieving a complete understanding of long-term community resilience requires integrating these subjective human well-being metrics with objective housing and critical infrastructure data through robust, longitudinal research designs.

Despite these analytical advancements, a profound limitation across the current landscape of household recovery research is the pervasive lack of empirical instrument validation. Nearly 70 percent of the compiled studies failed to report formal statistical testing for construct validity within their specific disaster settings. Because post-disaster household studies operate in quasi-experimental environments and frequently rely on custom, ad-hoc survey instruments, cross-study validation and meta-analyses remain severely constrained. Similar to the findings for business recovery [1], the deployment of unvalidated measurement tools—even when paired with sophisticated analytical modeling—creates uncertainty regarding measurement accuracy and limits the generalizability and reproducibility of recovery metrics.

To advance the measurement science of post-disaster household recovery and support evidence-based policy, future research should prioritize several key areas. First, researchers should conduct formal validation testing of household survey instruments before using the resulting data in predictive models, helping to establish reliable and standardized measures across diverse hazard and socioeconomic contexts. Second, measurement approaches should adopt integrated, multidimensional frameworks that combine objective indicators—such as housing repair or reconstruction and utility restoration—with validated subjective measures, including perceived recovery, quality-of-life scales, psychological screening tools such as the PC-PTSD, and measures of social networks and support. Within such frameworks, household recovery should be explicitly defined as a staged process involving the restoration of stable housing and household functioning across physical, social, and economic dimensions, rather than simply the repair of the dwelling or return to pre-disaster occupancy. This definition can build on functional recovery research that distinguishes milestones such as repair completion,

reoccupancy, restored stability, and restored accessibility while recognizing their dependence on broader social and economic conditions. Finally, although the studies reviewed indicate that household recovery commonly unfolds over a nonlinear, multiyear period ranging from approximately 15 months to more than a decade, future research should move beyond documenting these timescales to identify the factors that delay recovery and the interventions capable of shortening them. In particular, longitudinal studies can disentangle the extent to which recovery duration is driven by physical system restoration from other potential constraints, including access to financing and insurance, availability of temporary and permanent housing, permitting and reconstruction processes, labor and material availability, social support, household resources, and broader institutional and economic conditions. Multi-wave panel designs that incorporate pre-disaster baseline information where feasible and follow households through discrete recovery milestones can help identify critical bottlenecks, interactions among these factors, and opportunities for policies or investments that accelerate recovery.

Future research efforts should prioritize the validation of household survey instruments, the integration of objective housing and infrastructure metrics with ground-up subjective well-being indicators, and the development of frameworks capable of tracking long-term trajectories across multi-year horizons. Validating existing survey tools and analytical models through empirical testing will be crucial for establishing a replicable foundation for research and emergency management practice. As an immediate next step following this report, the technical classifications, summaries, and contextual metadata from the 56 reviewed studies will be compiled into an accessible, searchable database. This interactive resource will enable practitioners and researchers to filter empirical literature by hazard type, recovery focus, and methodology to directly inform localized disaster planning and post-disaster evaluation strategies. Ultimately, by advancing measurement science, promoting validated evaluation frameworks, and making recovery research more accessible, scholars and decision-makers can better inform post-disaster policies that support families and foster long-term community resilience.

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