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The Disaster Research Center at the University of Delaware:

The World's First Center for the Social Scientific Study of Disaster

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Abstract

The Disaster Research Center (DRC) was founded in 1963 to help American government decision makers understand how citizens would respond in times of crisis. Since then, DRC personnel have embarked upon some 700 quick-response deployments to better understand the social and physical aspects of disaster mitigation, preparedness, response and recovery. This research has taken DRC faculty and students around the world, from New York City, conducting research that explored and documented the city's response to and recovery from 9/11, to the Kathmandu Valley to better understand mothering during disaster evacuation after the 2015 Nepal Earthquake. Relevant to the academy, practitioners, and the public, DRC is available to lend its expertise to answer the most pressing questions in disaster science.

The Soviet Union's attempted installation of nuclear missiles in Cuba in 1962, and the crisis that ensued, alerted American political and military leaders of the need to understand how people would respond to an atomic attack. U.S. officials believed there would be widespread panic and disorder, but would there be? How would people react to such stress? What, then, should disaster plans contain for dealing with human behavior?

The Disaster Research Center (DRC) was born, in part, to remedy the lack of knowledge needed for valid disaster planning.[1] Through an initial contract from the Office of Civil Defense in the early 1960s, a trio of sociology professors at The Ohio State University furthered the creation of the modern field of disaster research. Professors Russell Dynes, Ph.D., Enrico Quarantelli, Ph.D., and Eugene Haas, Ph.D. aimed at understanding how peacetime disasters might give insight into collective behavior that could be analogized to the behavior that would be seen during a war.[2] However, their original goal was rapidly subsumed by another: understanding the reality of human behavior in disaster, through rigorous scientific methods, and setting aside rumors, folk wisdom, and suppositions. Disaster planning could only be reliable if it was grounded in actual science. DRC moved to the College of Arts and Sciences at the University of Delaware (UD) in 1985. Its mission is to support disaster researchers worldwide by creating, gathering, and disseminating disaster knowledge in a dynamic and responsive way. While the focus of studies has changed over the years, faculty and graduate students still use the original techniques to

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explore research topics ranging from community resilience to epidemiology. The main goal remains the same: to provide the basis for decision makers to act on the best available knowledge.

History and Evolution of the Disaster Research Center

DRC has focused on fieldwork since its inception. Because hazards like hurricanes, earthquakes, or pandemics become disasters only when they interact with vulnerable systems, people, or places,[3] it is important for researchers to get on the ground quickly to observe the disruption. Drawing on the tradition of field ethnography in urban sociology, and knowing the importance of field studies during crisis, DRC developed a methodology of quick response research unique to the social sciences that had researchers monitor the news cycle and be ready to deploy.[4]

Notable Field Deployments

DRC conducted one of its first field studies in the aftermath of the 1964 Alaskan earthquake. The 9.2 magnitude earthquake and subsequent tsunami resulted in over 100 fatalities as well as widespread destruction of homes, businesses, ports, and other infrastructure that were ill prepared for such a devastating event. A contingent of five researchers deployed to the scene, arriving a day after the earthquake, to enhance the United States' scientific understanding of the earthquake and disaster response so the country might better prepare for, respond to, and recover from future disasters.[5] Through five site visits to Anchorage between March 1964 (a day after the earthquake) and August 1965, the research team conducted an in-depth study that provided some of the first modern insight into how municipal organizations adapted to the post-disaster environment and recovered.[6] The Anchorage Fire Department, for example, needed to update their processes and capacity to help manage new environmental risks posed by the expansion of the Anchorage port.

Fast forward nearly four decades later. With DRC's proximity to New York City, a team deployed two days following the September 11, 2001 attacks, first for early reconnaissance lasting two months, and later returning for an in-depth study and interviews. This required leveraging connections with local emergency managers to gain permission to attend meetings at the incident command posts and at the emergency operations center, and to shadow personnel. Research methods involved both informal and formal interviews, observation, photography, and the review of documents such as situation reports, site maps, and procedural instructions. Owing to this intensive 9/11 fieldwork, the DRC's E. L. Quarantelli Resource Collection has over 500 photographs, volumes of notes, and many sketched out maps of buildings and response areas. This research greatly enhanced the scientific understanding of organizational resilience on the part of the New York City Office of Emergency Management,[7] evacuation from Manhattan by boat,[8,9] and creativity from emergency managers to adapt to rapidly changing circumstances.[10] Such perishable data would have been lost if researchers were not present to observe what was going right and what was going wrong. Researchers identified the importance of improvisation and creativity in disaster response; the conditions under which spontaneous volunteers can be most effective (e.g., having useful skills and the ability to work unsupervised); and the value of distributed networks in disasters that overwhelm existing systems (nobody can have the "big picture").[11] They also observed the importance of suspending rules that do not work ("rule breaking with vigilance") and leadership approaches that devolve decisions and support subordinates taking reasonable steps to solve problems.

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Other field-based research has provided valuable correctives to media reports of post-disaster behavior in affected areas. In the aftermath of Hurricane Katrina in 2005, DRC researchers were on the ground in New Orleans hotels, hospitals, neighborhood groups, shelters, and the Joint Field Office to record the city's response. NBC News wrote that "looters floated garbage cans filled with clothing and jewelry down the street in a dash to grab what they could," and "it's downtown Baghdad."[12] Snopes, a fact-checking website usually known for clear thinking and skepticism, made the unsubstantiated claim that "looting is an unfortunate and largely inevitable result of large-scale disasters."[13] While the stereotype anticipates mass panic and widespread criminal behavior following the devastation of a natural hazard, DRC researchers found that prosocial behaviors – such as rescuing neighbors, sharing food and other supplies with strangers, and offering shelter and transportation assistance – far outnumbered antisocial actions.[14]

Hurricane Katrina taught researchers another lesson. The catastrophic nature of the damage made it more than simply a "bigger disaster."[15,16] Many local officials were unable to engage in their typical roles while attending to the response, given the demands of the event. Most of the immediate built environment and infrastructure were destroyed, and nearby communities were also impacted, destroying local and pre-positioned supplies, rendering communication and transportation extremely challenging, and leaving communities reliant on assistance from farther away than their mutual aid agreements had accounted for.[16] Catastrophes, then, are qualitatively different from disasters, just as disasters are qualitatively different from emergencies.[15] For this reason, response systems cannot be merely enlarged or expanded, or resources simply added. Emergency management officials must be prepared to operate flexibly and creatively through decentralized, emergent and unscripted approaches.

Some research questions are best answered by exploring multiple field sites. To study the experiences of mothers and infants escaping disaster, DRC researchers visited communities in the Kathmandu Valley, Nepal after the 2015 earthquake (see Figure 1)[17] and in Fort McMurray, Canada[18] following a devastating 2016 fire. The researchers focused on the challenges of infant feeding in emergencies and learned that safe infant feeding is a paramount food security issue. They concluded that disaster response activities should account for the actual experiences of affected people and not assumptions.

Figure 1. Daryl Yoder-Bontrager and Samantha Penta survey the damage caused by the 7.8 magnitude April 2015 Nepal Earthquake which killed 8,857 people and caused $10 billion in damage. They were part of the DRC team dispatched to explore public health issues associated with the disaster and survey the damage to physical infrastructure. Photo Credit: University of Delaware Disaster Research Center.

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Research with Relevance

DRC has been at the forefront of disaster science since its inception, helping to advance theory and develop tools that enable researchers to understand complex problems. Its namesake typology of organizational change – the DRC Typology[19] – provided a way to make sense of the routine or novel social structures and tasks in which organizations respond and recover. The work of DRC researchers studying business after the 1994 Northridge Earthquake in California determined that the most important feature in business recovery was size, and that other variables like business age and prior experience with disaster had less of an effect.[20] Other research led by DRC's Benigno Aguirre, Ph.D. greatly enhanced the understanding of how people evacuate from building fires.[21]

A major area of study has been resilience, once used as a catch-all term for all things positive in disaster. Resilience has become a key goal worldwide, with many policy statements and disaster plans in the U.S. and elsewhere emphasizing the aspiration toward resilience.[22] DRC researchers were among the first to use observation, data, and modeling to better understand resilience.[23] Through DRC's most recent endeavor to understand resilience, its researchers embarked on a large interdisciplinary collaborative project with the Bloomberg School of Public Health at Johns Hopkins University, funded by the Centers for Disease Control and Prevention (CDC). The

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result was the development of a state-of-the-art model: Composite of Post-Event Well-Being (COPEWELL). DRC researchers and their collaborators at John Hopkins transformed resilience from an abstract concept to a theoretically grounded conceptual model. The conceptual model was expressed mathematically in a system dynamics computational environment, generating maps of resilience at the county level across the U.S. COPEWELL allows U.S. counties to better understand their resilience based on a variety of inputs from publicly available data.[24] To make COPEWELL more useful to communities, the team is developing a rubric-based self-assessment toolkit that is grounded in the computational framework and informed by local knowledge and expertise.[25] These rubrics will allow communities to understand their own resilience profiles; to determine where they are strong and where lacking; and to plan needed resilience-enhancing activities.

UD scholars are also interested in understanding and modeling evacuation. Leveraging DRC's interdisciplinary expertise across engineering and the social sciences, researchers investigated how people evacuate from hurricanes from the perspectives of engineering,[26] social science,[27] and public health.[28,29] These studies typically involve an advisory group of federal, state, and non-profit organizations, with whom the information is shared and whose feedback improves the work. More than knowledge for the sake of knowledge, the goal of these efforts is to create solutions that enhance a jurisdiction's ability to conduct an evacuation before disaster can strike.

When it comes to sharing knowledge with academic audiences, DRC's first Handbook of Disaster Research[30] marked a milestone for the field. It synthesized the existing knowledge on a broad range of disaster topics, from gender differences during disasters to community innovation. It offers researchers and practitioners a place to start when conducting literature reviews or when exploring an unfamiliar new topic. The handbook was re-released in 2018[31] with updated content and an expanded set of topics.

Public outreach dispels misconceptions about human behavior in disaster, which often looms large in the public's imagination. As DRC encourages community engagement that supports disaster risk reduction, scholars frequently make public and classroom presentations and participate in workshops and meetings with leaders of major corporations and agencies. Recently, DRC developed the "DRC It" series, which serves as a source of information presented through animated videos that are accessible to many different audiences. The products tackle key areas, such as why some people do not evacuate from hurricanes. Visit "DRC It" at https://www.drc.udel.edu/research/drcit.

In an example of Delaware-focused applied research, DRC partnered with the Delaware Department of Health and Social Services' Division of Long Term Care Residents Protection and the UD School of Nursing to bolster long-term care facilities' emergency preparedness. Initial interviews and focus groups with care providers formed the basis of a two-day workshop where DRC personnel, emergency management officials, and long-term care facility administrators worked together on emergency plans.

Fostering Knowledge Through the E. L. Quarantelli Resource Collection

DRC's research materials are housed within the Enrico L. Quarantelli Resource Collection, considered the world's most complete collection of disaster-related material, with particular emphasis on rare or otherwise unavailable items, documents, and material related to the social

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and behavioral science aspects of disasters. The collection holds more than 125,000 archived items collected by other agencies and researchers, and includes archival, artifact, and popular and scholarly material. With records from more than 700 field deployments, the bulk of materials are field research and other original research data, including interview transcripts, surveys, photographs and audio-visual records of disaster events, and supplemental materials collected at disaster sites (e.g. local newspapers, meeting minutes, fliers, and memorabilia). The Center also maintains its own book, monograph, and report series. The E.L. Quarantelli Resource Collection is open to scholars and agencies looking for scientifically grounded information about disaster, mitigation, preparedness, response, and recovery. The collection is housed at 166 Graham Hall, UD, in Newark, Delaware. To schedule a visit, email elq-resource@udel.edu.

Commitment to Education

In addition to its research mission, DRC has a strong commitment to education and helped form the interdisciplinary field of disaster science. DRC faculty teach in several UD undergraduate and graduate programs, including the sociology undergraduate concentration in Emergency and Environmental Management; master's and doctoral programs in sociology, public policy, civil and environmental engineering; and epidemiology, which launched this year. All DRC faculty contribute to the Disaster Science and Management master's and doctoral degrees. Nearly 40 affiliated graduate students take on key leadership and project implementation roles including: co-authorships, field deployments, and participation in large externally funded grants from agencies such as the National Science Foundation, the National Institutes of Standards and Technology, and the CDC. Many DRC alumni continue on to tenured faculty appointments; others take on leadership positions in the private, non-profit, and government sectors.

In commemoration of the late Dr. William A. Anderson, who was among the first graduate students hired at DRC, his wife and daughter formed the Bill Anderson Fund in his memory (see Figure 2). In 2018, DRC and the University of Delaware became the Flagship Institution for this national effort. The Bill Anderson Fund Flagship is housed within the DRC, and provides mentoring and professional development workshops to historically underrepresented groups in the disaster field.

Figure 2. Dedicated to the legacy of Bill Anderson, one of DRC's first doctoral students, the Bill Anderson Fund supports African American and other minority students in becoming disaster scholars with the goal of increasing diversity in disaster science so that the field is more representative of American society. Photo credit: University of Delaware Disaster Research Center.

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Looking Ahead

DRC's four generations of faculty, staff, and alumni have been integral to the development of a field that sees disasters as social problems that need interdisciplinary solutions. As DRC approaches its 60th anniversary, it is poised to tackle the grand challenges of disaster,[32] believing that disaster management is only improved by partnering with science, and that those in the disaster science field must seek to improve peoples' lives.

For more information about this exciting work, or to explore ways to support or become involved with DRC, visit www.drc.udel.edu.

References

1. Quarantelli, E. L., Hass, J. E., & Dynes, R. R. (1963). *Studies of* organizational functioning in disaster: a research proposal submitted to Office of Civil Defense, United States Department of Defense. Historical Research Records (Series 5644, Box 1150, Document 1963-07). E. L. Quarantelli Resource Collection, Newark, Delaware.
2. Quarantelli, E. L. (1988). Disaster studies: an analysis of the social historical factors affecting the development of research in the area. Preliminary paper #128. Retrieved August 21, 2019 from http://udspace.udel.edu/bitstream/handle/19716/500/PP128.pdf?sequence=3&isAllowed=y
3. Perry, R. W. (2018). Defining disaster: an evolving concept. In H. Rodriguez, W. Donner, Trainer, J. E. (Eds), *Handbook of Disaster Research* (2nd ed). New York, NY: Springer

4. Quarantelli, E. L. (1997). The disaster research center (DRC) field studies of organized behavior in the crisis time period of disasters. Preliminary Paper #254. Retrieved August 21, 2019 from http://udspace.udel.edu/bitstream/handle/19716/198/PP254-DRC%20Field%20Studies.pdf

5. National Academy of Sciences. The great Alaska earthquake of 1964: human ecology. Washington, DC: National Academy of Sciences.

6. Anderson, W. A. (1968). Disaster and organizational change. In National Academy of Sciences (ed.) The Great Alaska Earthquake of 1964: Human Ecology. Washington, DC: National Academy of Sciences.

7. Kendra, J. M., & Wachtendorf, T. (2003). Elements of community resilience in the World Trade Center Attack. *Disasters*, *27*(1), 37–53. PubMed https://doi.org/10.1111/1467-7717.00218

8. Kendra, J., & Wachtendorf, T. (2016). American Dunkirk: the waterborne evacuation of Manhattan on 9/11. Temple University Press: Philadelphia, PA.

9. Kendra, J., Wachtendorf, T., & Quarantelli, E. L. (2003, June). The evacuation of lower Manhattan by water transport on September 11: An unplanned "success". *Joint Commission Journal on Quality and Safety*, *29*(6), 316–318. PubMed https://doi.org/10.1016/S1549-3741(03)29036-5

10. Kendra, J. M., & Wachtendorf, T. (2003). Creativity in emergency response after the World Trade Center Attack. In Beyond September 11th: An Account of Post Disaster Research. Special Publication #39 Natural Hazards Research and Applications Information Center, University of Colorado: Boulder, CO.

11. Wachtendorf, T. (2004). *Improvising 9/11: Organizational Improvisation in the World Trade Center Disaster,* Dissertation #35. Disaster Research Center: Newark, DE.

12. News, N. B. C. (2005). Looters take advantage of New Orleans mess. NBC News. Retrieved September 6, 2019 from http://www.nbcnews.com/id/9131493/ns/us_news-katrina_the_long_road_back/t/looters-take-advantage-new-orleans-mess/#.XXJnrS0ZNhE

13. Mikkelson, D. (2005). Were Hurricane Katrina 'looting' photographs captioned differently based on race? Snopes. Retrieved from https://www.snopes.com/fact-check/hurricane-katrina-looters

14. Rodriguez, H., Trainor, J., & Quarantelli, E. (2006). Rising to the challenges of a catastrophe. The emergent and prosocial behavior following Hurricane Katrina. *The Annals of the American Academy*, *604*(1), 82–101. https://doi.org/10.1177/0002716205284677

15. Quarantelli, E. L. (2006). Catastrophes are different from disasters: some implications for crisis planning and managing drawn from Katrina. In Online Forum and Essays – Social Science Research Council. Retrieved Septemeber 1, 2019 from http://understandingkatrina.ssrc.org/Quarantelli/

16. Wachtendorf, T., Brown, B., & Holguin-Veras, J. (2013). Catastrophic characteristics and their impact on critical supply chains: Problematizing material convergence and management following Hurricane Katrina. *Journal of Homeland Security and Emergency Management*, *10*(2), 497–520. https://doi.org/10.1515/jhsem-2012-0069

17. DeYoung, S., Suji, M., & Southall, H. G. (2018, May). Maternal perceptions of infant feeding and health in the context of the 2015 Nepal Earthquake. *J Hum Lact*, *34*(2), 242–252. PubMed https://doi.org/10.1177/0890334417750144

18. DeYoung, S. E., Chase, J., Branco, M. P., & Park, B. (2018, December). The effect of mass evacuation on infant feeding: The case of the 2016 Fort McMurray Wildfire. *Maternal and Child Health Journal*, *22*(12), 1826–1833. PubMed https://doi.org/10.1007/s10995-018-2585-z

19. Quarantelli, E. L. (1966). Organizations under stress. In Symposium Emergency Operations. R. Brictson (ed). Santa Monica, California: System Development Corporation, 3-19.

20. Dahlhamer, J. M. (1998). Rebounding from environmental jolts: Organizational and ecological factors affecting business disaster recovery (Order No. 9906835). Available from Dissertations & Theses @ University of Delaware; ProQuest Dissertations & Theses A&I. (304429445).

21. Aguirre, B. E., El-Tawil, S., Best, E., Gill, K. B., & Fedorov, V. (2011). Contributions of social science in agent-based models of building evacuation. *Contemporary Social Science*, *6*(3), 415–432. https://doi.org/10.1080/21582041.2011.609380

22. Kendra, J. M., Clay, L. A., & Gill, K. B. (2018). Resilience and disasters. In H. Rodriguez, W. Donner, J. E. Trainor (Eds). Handbook of Disaster Research 2nd Edition (pp. 387-410). New York, New York: Springer.

23. Aguirre, B. E., Dynes, R., Kendra, J., & Connell, R. (2005). Institutional resilience and disaster planning for new hazards: Insights from hospitals. *Journal of Homeland Security and Emergency Management*, *2*(2). https://doi.org/10.2202/1547-7355.1113

24. Links, J. M., Schwartz, B. S., Lin, S., Kanarek, N., Mitrani-Reiser, J., Sell, T. K., . . . Kendra, J. M. (2018, February). COPEWELL: A conceptual framework and system dynamics model for predicting community functioning and resilience after disasters. *Disaster Medicine and Public Health Preparedness*, *12*(1), 127–137. PubMed https://doi.org/10.1017/dmp.2017.39

25. Schoch-Spana, M., Gill, K., Hosangdi, D., Slemp, C., Burhans, R., Zeis, J., Carbone, E., Links, J. (2019). The COPEWELL Rubric: a self-assessment toolkit to strengthen community resilience to disasters. International Journal of Environmental Resilience and Public Health, 16.

26. Davidson, R. A., Nozick, L. K., Wachtendorf, T., Blanton, B., Colle, B., Kolar, R. L., . . . Leonardo, N. (2018). An integrated scenario ensemble-based framework for hurricane evacuation modelling: Part 1 – decision support system. *Risk Analysis*. PubMed

27. DeYoung, S. E., Wachtendorf, T., Farmer, A., & Penta, S. (2016). NOAA radios and neighbourhood networks: Demographic factors for channel preference for hurricane evacuation information. *Journal of Contingencies and Crisis Management*, *24*(4), 275–285. https://doi.org/10.1111/1468-5973.12123

28. Ricchetti-Masterson, K., & Horney, J. (2013, June 5). Social factors as modifiers of Hurricane Irene evacuation behavior in Beaufort County, NC. *PLoS Currents, 5*, ecurrents.dis.620b6c2ec4408c217788bb1c091ef919. PubMed

DOI: 10.32481/djph.2019.10.011

29. Horney, J. A., MacDonald, P. D. M., Van Willigen, M., Berke, P., & Kaufman, J. S. (2010). Factors associated with evacuation from Hurricane Isabel in North Carolina. *International Journal of Mass Emergencies and Disasters*, *28*(1), 33–58.

30. Rodriguez, H., Quarantelli, E. L., & Dynes, R. (2007). *Handbook of Disaster Research.* New York, NY: Springer.

31. Rodriguez, H., Donner, W., & Trainor, J. E. (2018). *Handbook of Disaster Research Second Edition*. New York, NY, Springer.

32. Wachtendorf, T. (2019). A Case for the Grand Challenge of Disaster Science. In Disaster Research and the Second Environmental Crisis: Assessing the Challenges Ahead. (J. Kendra, S.G. Knowles, & T. Wachtendorf Editors). Springer International Publishing. 335-343.