The National Academies of SCIENCES ENGINEERING MEDICINE
GULF RESEARCH PROGRAM

Healthy Ecosystems Grants 2 Final Report

Project Title: Utilizing Secondary Data to Assess the Health and Health System Impacts of Natural and Technological Disasters in the Gulf
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Project Director: Jennifer Horney
Affiliation: Department of Epidemiology & Biostatistics, Texas A&M University
Address: 212 Adriance Lab Rd, 1266 TAMU, College Station, TX 77843-1266
Email: horney@sph.tamhsc.edu
Phone: 979.436.9391

Project Key Personnel:
- Tiffany Radcliff, Associate Professor of Health Policy and Management, Texas A&M Health Science Center School of Public Health
- Hongwei Zhao Professor of Biostatistics, Texas A&M Health Science Center School of Public Health

I. PROJECT SUMMARY (from proposal)

As we look to the challenge of building a more resilient future, we face a triple threat -- a growing population of socially vulnerable groups who live in hazard prone coastal areas such as the U.S. Gulf Coast where the number and severity of large-scale natural and technological disasters is increasing. Prior research demonstrates that socially vulnerable groups, including the elderly, suffer disproportionately from disasters. However, the status quo pertaining to disaster research is to conduct single disaster case studies with relatively small sample sizes, typically including the collection and analysis of primary data from cross-sectional surveys, rather than regional- or national-level evaluations using standard variables that can be compared across disasters, over time, and in different geographic locations. Collecting case-study data can be expensive and time consuming, and in some cases may place additional burdens on individual respondents or health systems during their disaster response and recovery. More critically, because of the focus on a single event, case study research limits our capacity to enhance the resilience of individuals and communities, or the systems that serve them, to future disasters of a different type, scale, or location.

The objective of the proposed research is to conduct a large-scale evaluation of the effects of natural and technological disasters on the health status and health system utilization of Medicare beneficiaries living in coastal communities in the Gulf Region between 1999 and 2010. This objective will be achieved through the analysis of restricted access, individual-level, linked data from the National Center for

Health Statistics (NCHS). We have applied for and received permission to access this data through the Texas Census Data Research Center (TXCRDC), which is located on the campus of Texas A&M University. Restricted access individual-level linked claims data will be merged with publically available data from the Federal Emergency Management Agency to create a single longitudinal dataset that can be analyzed to better understand linkages between disaster exposure and subsequent health and health system outcomes across the Gulf Region. The results of this analysis are expected to support improved planning, preparedness, and the development of interventions that will contribute to enhanced disaster resilience among individuals, communities, and health systems in the U.S. Gulf Coast region.

The proposed research directly addresses Goal 2 of the Gulf Research Program. Findings from the proposed research will support an improved understanding of the connections between human health and the environment that will contribute to enhanced disaster resilience. The proposed research is a significant part of meeting this Goal because resilient individuals and systems that effectively anticipate potential disaster impacts before they happen are likely to reduce disaster losses and ensure the maintenance of health and quality of life after a disaster. Enhanced resilience and better anticipation of inevitable future disasters is a challenge that must be met as we face the growing fiscal, social, cultural, and environmental costs of natural and technological disasters in the Gulf.

II. PROJECT SUMMARY (from final report)

Elderly residents of the U.S. Gulf Coast are disproportionately vulnerable to health hazards resulting from natural disasters, in part due to impaired mobility or chronic health conditions. Nearly two-thirds of the people who died in Hurricane Katrina were over age 65. Older people are more likely to live in a home and a region vulnerable to disaster and less likely to be prepared. While studies of the impacts of specific disasters (e.g., Hurricane Sandy or Hurricane Harvey) can explain the impacts of a single type of disaster on residents of a specific geographic location, comparing impacts from disasters over time and across locations is generally not possible.

The main objective of this research was to use individual level Medicare claims data to assess the impact of disasters on the health of older adults, by determining if more disaster exposure led to higher utilization of Medicare. At the time of this project, only one study had examined the use of Medicare after a disaster. After Hurricane Katrina, the rate of physician office visits among Medicare Advantage enrollees in four Louisiana Parishes declined by 57% compared with the 11 months before Katrina, while emergency department visits and inpatient hospitalization rates increased. Changes in the utilization of mental health services have been more widely documented among the general population and among veterans post-disaster, although findings have been mixed. This project set out to establish whether residents of the U.S. Gulf Coast impacted by natural disasters had higher levels of Medicare use and higher costs compared with residents in the rest of the U.S.

III. PROJECT RESULTS

Accomplishments

The limitations of disaster research including the following: typically, single disaster case studies that use primary data from cross-sectional surveys that are not applicable across disasters, over time, or in other geographic regions; these cross-sectional studies may use non-probability sampling such as convenience

samples are are therefore not generalizable to the wider public impacted by the disaster; the collection of post-disaster data is delayed due to the time it takes to develop survey instruments and have research protocols approved by institutional review boards, as well as concerns about researchers interfering with emergency response and recovery operations.

The approach of using secondary data addresses these identified limitations for disaster research. We merged Individual-level Medicare claims for the years 2001-2007 with Federal Emergency Management Agency (FEMA) data related to disasters in each U.S. County from 2001-2007 to create a panel dataset. Residents of states located along the U.S. Gulf Coast (Texas, Louisiana, Mississippi, Alabama, and Florida) were compared with the rest of the U.S. FEMA data was used to determine counties that experienced no, some, high, and extreme hazard exposure. We used panel models to calculate changes in overall Medicare expenditures, total inpatient expenditures, and total home health expenditures for 32,819 people. Individual demographic characteristics were included as predictors of change in expenditures.

We found that, in general, total expenditures and utilization increased as hazard exposure increased. Increases in expenditures persisted in the year subsequent to a disaster. The exception to this was home health. Utilization of home health services was lower in counties with more hazard exposure. In addition, for the most extreme disasters, total expenditures and inpatient expenditures decreased. This study provided some evidence of the possibility that exposure to extreme disasters may limit access to health care and therefore reduce expenditures. Additional research is needed to determine if there is a substitution of services (e.g., inpatient rehabilitation for home health) in disaster-affected areas during the post-disaster period, as well as relationship between disasters and deaths.

Implications

It has long been appreciated that older adults are particularly vulnerable to health hazards resulting from disasters and have unique needs in emergency situations. One subpopulation of the elderly that has not been extensively studied in regards to the impact of disaster is those who are receiving home health or other types of post-acute care at the time of disaster. The only study we are aware of that uses National Center for Health Statistics' (NCHS) individual level restricted data was limited to the study of the variation in re-hospitalization rates comparing for-profit and not-for profit Home Health Agencies (HHAs). In our current study, we found that home health utilization and expenditures decreased following a disaster. To better understand the causes of this negative association between home health utilization and disaster, and its subsequent impact on health, we have submitted an application to NCHS for the HHA file and other related datasets.

Home Health Agencies (HHAs) serve patients who, due to both acute and chronic conditions, are in need of skilled nursing care and/or assistance performing various activities of daily living. Medicare is the largest payer in home health, paying for 37% of all home health services. After disasters, disruptions to health care and other infrastructure systems (e.g., transportation, communications) can lead to an interruption in home health and other post-acute care services. We have developed a new proposal based on the findings of the current work to conduct a large-scale evaluation of the effects of disasters on the cost and utilization of home health and other types of post-acute care.

It has been well-established in the disaster literature that while older adults are uniquely vulnerable to disasters and typically experience greater disaster loss, they receive less social and financial support after a disaster relative to other groups. In the social context, they may hesitate to ask for assistance or have fewer family members to help them get assistance. Older adults are also less likely to have adequate property insurance coverage and more likely to report problems with using their coverage . Since most persons over age 65 are eligible beneficiaries of Medicare Part A insurance, concerns about adequate coverage and problems with using coverage to seek health care after a disaster should be mitigated to some extent by this factor. However, as Medicare beneficiaries become displaced by disasters – particularly older and disabled beneficiaries – they may experience problems with using services or benefits.

Unexpected Results

N/A

Project Relevance

The following audiences would be most interested in the results of this project:

- Researchers
- Federal Government Officials

Quantifying the disproportionate health impacts of natural disasters on older adults provides data to assist in the disaster preparedness and planning efforts of the Medicare system. The identification and quantification of the impacts of disasters on costs and utilization within the Medicare system may provide insights to improve predisaster planning and preparedness for both individual elderly and specific groups of beneficiaries (e.g., those receiving home health) as well as the Medicare system overall.

Education and Training

Number of students, postdoctoral scholars, or educational components involved in the project:

- Undergraduate students: 0
- Graduate students: 2
- Postdoctoral scholars: 0
- Other educational components: 0

IV. DATA AND INFORMATION PRODUCTS

This project produced data and information products of the following types:

- Data

DATA

See attached Data Report.

Relationships Between Data Sets:

We have only the panel data set that we created by merging publicly available FEMA data with the restricted use National Center for Health Statistics Data. This data may only be used at a Federal Statistical Research Data Center. Access to the data is restricted to researchers with approval from the

National Center for Health Statistics who have completed a background check for Special Sworn Status through the U.S. Census Bureau.

Additional documentation produced to describe data:
N/A

Other Activities to Make Data Discoverable:
No documentation of the data is possible. Any files removed from the Federal Statistical Research Data Center must be cleared by the National Center for Health Statistics.

V. PUBLIC INTEREST AND COMMUNICATIONS

Most Unique or Innovative Aspect of the Project
By linking data from the participants in the National Health Interview Survey (NHIS) to Medicare claims, we were able to follow NHIS participants who were Medicare beneficiaries over a 9 year period. This linked data included individual level demographic information in individual beneficiaries as well. The linked data file was merged with FEMA data related to disaster declarations as well as data related to the dollar amounts distributed to counties for disaster response and recovery. Approximately 44,800 beneficiaries per year had between 4 and 7 years of data. The final sample included approximately 7,000 residents of the U.S. Gulf of Mexico States, including Texas, Louisiana, Mississippi, Alabama, and Florida).

Most Exciting or Surprising Thing Learned During the Project
The most interesting finding is that exposure to extreme disasters (compared to none, some, or high levels of disaster exposure) may limit access to health care and therefore reduce expenditures. There also seems to be a substitution of services (e.g., inpatient rehabilitation for home health) in disaster-affected areas during the post-disaster period. More research is needed to demonstrate that these substitutions had a negative impact on health.

Most Important Outcome or Benefit of Project
Residents of U.S. Gulf of Mexico states had significantly higher total Medicare expenditures and home health care expenditures compared to residents of the rest of the U.S. U.S. Gulf Coast residents as a group were slightly younger, more likely to be African-American or Hispanic, have no college education, live below poverty, and have Medicare coverage for reasons other than old age or being a survivor. Minority status, lower education levels and poverty status are all indicators for socially vulnerable populations. When compared with hazard exposure, the Gulf of Mexico region has both a more socially vulnerable population and higher hazard exposure.

Communications, Outreach, and Dissemination Activities of Project
N/A

Data Report										
Italicized text are sample answers.										
DataType: Select the option (from the dropdown) that best matches the data's domain or discipline (e.g., earth science data, ecological data, human health data)	**DigitalResourceType**: Select the option (from the dropdown) that best matches the resource format (e.g., data set, text, image or visual data, etc.)	**Title**: Provide a title for the resource	**FileName**: Provide the name of the digital file(s) (incuding file extension)	**Creators**: Provide the names of the persons who produced the resources (last name, first name; last name, first name; etc.	**Point of Contact**: Provide person responsible for answering questions about the data if other than project PI	**PublicationYear**: Provide the year that the resource was published or made available	**RepositoryName/Publisher**: Provide the name of the digital repository or curation facility where the resource is archived and available	**DOIorPersistentURL**: Provide a persistent identifier for the resource's location	**Dataset Keywords**: Please list any keywords used to describe the resource.	**Publications:** Provide the DOI for any publication that uses or references this resource
DataType	**DigitalResourceType**	**Title**	**FileName**	**Creators**	**PointofContact**	**PublicationYear**	**RepositoryName**	**DOIorPersistentURL**	**Keywords**	**Publications**
Physical and Computational Sciences	*Tabular/Spreadsheet*	*Gravity Tests*	*GravityRawData.txt*	*Galieli, Galileo; Newton, Isaac*	*Lab Manager labmanager@science.edu 123-456-7890*	*1700*	*Really Big Digital Repoitory*	*doi: 10.1000/grav.1000*	*Gravity, object mass, force*	*doi: 10.1000/grav.1000.000, doi: 55.1097/science.4567*
Human Health	Tabular/Spreadsheet	Panel Dataset		Rosenheim, Nathanael; Horney, Jennifer; Radcliff, Tiffany; Zhao, Hongwei	Jennifer Horney; horney@sph.tamhsc.edu; 979-436-9391	NA	Federal Statistical Research Data Center at Texas A&M			

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Project Director: Jennifer Horney

Information Products Report

InfoProductType	DigitalResourceType	Title	FileName	Creators	PublicationYear	Publisher	RepositoryName	DOIorPersistentURL	DatasetReference
Workshop or Conference Proceeding	Image	The Impacts of Disasters on Medicare Costs in U.S. Gulf Coast States		Radcliff T, Horney JA, Rosenheim N, Zhao H.	2017	National Healthcare Coalition Preparedness Conference			
Workshop or Conference Proceeding	Image	Utilizing Secondary Data to Assess the Health and Health System Impacts of Natural and Technological Disasters in the Gulf		Horney JA, Rosenheim N, Radcliff T, Zhao H	2016	Census Research Data Centers Annual Conference			
Scholarly Publication	Text	Disaster impacts on cost and utilization of Medicare.		Rosenheim N, Grabich SC, Horney JA	Under review	BMC Health Services Research			
Scholarly Publication	Text	Quantifying the Impacts of Disasters on Medicare Expenditures in U.S. Gulf Coast States		Horney JA, Rosenheim N, Radcliff T, Zhao H	In Preparation				