

DISASTER EXPOSURE,  
HEALTH IMPACTS,  
ECONOMIC BURDEN,  
AND SOCIAL  
WELL-BEING



# PERSON REPORT

## The Sandy Child & Family Health Study

## Recommended Citation

“The Hurricane Sandy Person Report: Disaster Exposure, Health Impacts, Economic Burden, and Social Well-Being.” David Abramson, Donna Van Alst, Alexis Merdjanoff, Rachael Piltch-Loeb, Jaishree Beedasy, Patricia Findley, Lori Peek, Meghan Mordy, Sandra Moroso, Kerrie Ocasio, Yoon Soo Park, Jonathan Sury, Jennifer Tobin-Gurley. Sandy Child and Family Health Study, Rutgers University School of Social Work, New York University College of Global Public Health, Columbia University National Center for Disaster Preparedness, Colorado State University Center for Disaster and Risk Analysis , Briefing Report 2015\_2. (Release date 1 June 2015).

## Acknowledgments

This study would not have been possible without the guidance and advice of the Public Partnership Group: Lori Garg, MD and Christopher Neuwirth (NJ Department of Health), Beth Connolly (NJ Department of Human Services), and Amanda O’Reilly and LaTasha Holmes (NJ Department of Children and Families). The advice garnered from local stakeholders throughout New Jersey also helped with the development of this study.

This work was supported by the New Jersey State Department of Health, using Social Services Block Grant funds. All views expressed in this report represent those of the authors and not necessarily those of the funding agency or Public Partnership Group members.

For further information about the Sandy Child and Family Health Study you may visit the project website, at [www.scafh.org](http://www.scafh.org) or contact co-Principal Investigator David Abramson, PhD, MPH at [david.abramson@nyu.edu](mailto:david.abramson@nyu.edu).

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# TABLE OF CONTENTS

## THE SANDY CHILD AND FAMILY HEALTH BRIEFING REPORT SERIES V

<b>EXECUTIVE SUMMARY</b>	<b>1</b>
<b>BACKGROUND</b>	<b>3</b>
Disasters and Health	3
Health and Exposure	5
<b>METHODS</b>	<b>7</b>
<b>S-CAFH STUDY FINDINGS</b>	<b>8</b>
Exposure to Hurricane Sandy in the Disaster Footprint	8
Changes in Health Status Following Hurricane Sandy	9
Physical Health Status	9
Emotional and Psychological Health Status, and Risk Behaviors	10
Social Health and Well-Being Following Hurricane Sandy	10
Economic Indicators and Hurricane Sandy	11
Children’s Health Status	13
Association of Disaster Exposure and Health	15
<b>CONCLUSION</b>	<b>19</b>
<b>APPENDICES</b>	
<b>APPENDIX A: STUDY DESCRIPTION</b>	<b>20</b>
Disaster Footprint	20
Sampling	21
Weighting	23
Field Effort	25
Description Of The S-Cafh Cohort	27
Demographics	28
<b>APPENDIX B: HOW TO INTERPRET STATISTICAL TABLES</b>	<b>30</b>
<b>APPENDIX C: PERSON REPORT DATA TABLES</b>	<b>32</b>



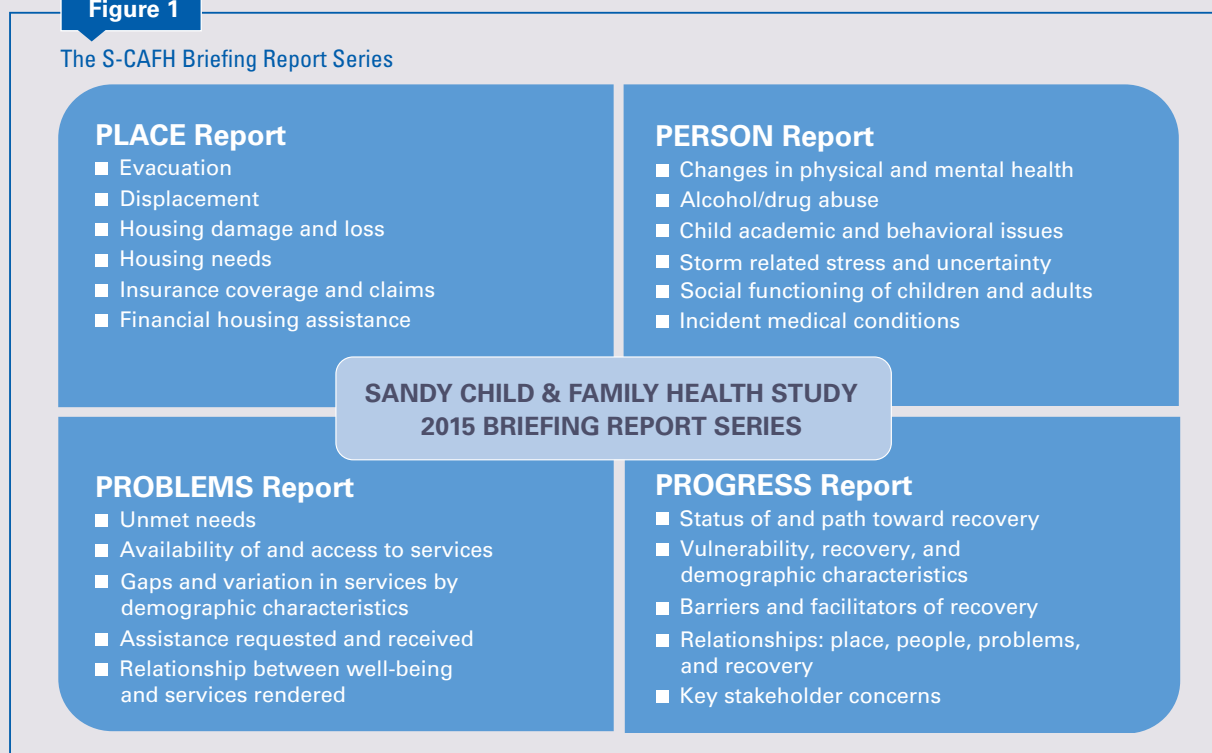
# THE SANDY CHILD AND FAMILY HEALTH BRIEFING REPORT SERIES

This report is part of the 2015 Briefing Report Series of the Sandy Child and Family Health (S-CAFH) Study, a project designed to survey the impact of Hurricane Sandy on several key aspects of New Jersey residents' lives. Four briefing reports will be provided by the team that cover the following topics: (1) **The Place Report** – the decisions and actions related to evacuation, housing, community, and restoration and repair; (2) **The Person Report** – the physical and mental health status and well-being of residents who lived in areas exposed to Hurricane Sandy, with an additional focus on children's health; (3) **The Problems Report** – residents' current unmet needs and their experience with systems of formal help; and (4) **The Progress Report** – the factors associated with stalled or facilitated recovery among affected residents.

Each report will follow a similar format, opening with a brief summary of the existing knowledge, a description of the study and the methods used to collect the data, key findings including figures and graphs that may assist readers in interpreting the data, a summary with policy and programmatic implications, and an appendix of detailed tables of the study results. Across all of these reports we employ a common approach for analyzing the data. We have constructed "presentation" categories so that we can represent the experiences of different groupings of New Jersey residents. We have categorized the residents in the S-CAFH Study by individual characteristics – such as age, gender, race/ethnicity – and by household-level characteristics – including the state region where they live, the amount of damage their home sustained, the presence or absence of children living in the household, and their annual household income. The series will conclude with a summary report detailing the main findings from the four substantive briefing documents. See Figure 1 for a summary of the core content in each of the briefing reports in the series.

**Figure 1**

The S-CAFH Briefing Report Series



# EXECUTIVE SUMMARY

The impact a disaster has on the health of a population can be described as having a “dose-response” relationship: the larger the “dose” of the disaster, the greater the health impact or “response” among those individuals and communities exposed. This PERSON Briefing Report describes the impact of Hurricane Sandy (the dose) on the health and well-being of adults and children exposed to the storm (the response). Data for the report are drawn from the baseline survey of the Sandy Child and Family Health (S-CAFH) Study, an observational cohort study of nearly 1,000 randomly-selected New Jersey residents who were living in areas of the state exposed to the storm in 2012. Participants in the study represent over 1 million people living in Sandy’s “Disaster Footprint,” the hurricane-exposed portions of the state.

This report describes and examines several critical aspects of individual health and well-being that may be associated with the storm, including:

1. Physical health of adults;
2. Psychological and emotional health of adults;
3. Social and economic health of adults;
4. Health and well-being of children; and
5. The association between disaster exposure and individual outcomes.

This Briefing Report measures dose in terms of the hurricane’s impact on the lives of New Jersey residents living across nine counties most exposed to the storm: Was a member of the household killed or injured in the storm? Was a pet lost in the storm? Was a vehicle destroyed in the storm? Did a member of the household come into contact with floodwaters, debris, or mold? Was the home slightly or moderately damaged by the storm, or did it sustain major structural damage?

The response includes the incidence of health conditions such as asthma, the emergence of mental health distress, increases in risk behaviors such as smoking and alcohol consumption, and rising economic constraints on individuals and households struggling to recover from the storm. From among the many findings in this report, several stand out:

- **Housing damage can be a risk factor for poor health that has an effect on people’s lives remarkably similar to the effect of poverty.** Within the Disaster Footprint, those individuals living in homes that sustained major structural damage, regardless and independent of their household’s income level, expressed health problems that were often mirror images of those who lived in deep poverty, with household incomes less than \$20,000 a year;

**Implications:** More refined physical and mental health screening should be considered for residents

- whose homes have experienced substantial damage, and additional surveillance efforts undertaken to follow residents of significantly damaged homes and to provide ongoing access to physical and mental health services;

- **Some toxins had “double-barreled effects”:** exposure to mold was associated with both clinically-diagnosed asthma and with mental health distress. Adults who were exposed were 2.5 times as likely as those not exposed to mold to be diagnosed with asthma after the storm, and were twice as likely to report mental health distress;

# EXECUTIVE SUMMARY (CONT'D)

- **Implications:** Mold mitigation efforts should include components of psychological first aid in order to identify residents at risk for mental health problems, and provide referral mechanisms for those residents who meet the threshold established by New Jersey Hope and Healing. Similarly, disaster case management and psychological first aid programs should inquire about mold and housing damage as potential indicators or risk factors for mental health distress;
- **Children living in homes that experienced minor damage were at particularly high risk for psychological and emotional issues.** Children living in homes with minor damage were over four times as likely to be sad or depressed, and over twice as likely to have problems sleeping since the storm as were children from homes with no damage. These levels of emotional and mental distress amongst children in homes with minor damage were higher even than those reported by children living in homes with major structural damage;
  - **Implications:** The pediatric and social services communities should be particularly attentive to children's living environments, and consider homes with minor damage (which, according to FEMA definitions, may be uninhabitable for a short period of time) as significant risk factors in children's lives. Moreover, housing assistance programs should work to accelerate repairs and restorations for households with children and consider existing gaps in restoration programs that may not allow for complete repairs.

As an analysis of population health following Hurricane Sandy, this PERSON Report reflects some of the devastating and potentially enduring effects that storms of this magnitude can exert on a population.

## ABOUT THE STUDY

*The S-CAFH Study is being conducted by a partnership of academic researchers from the Rutgers University School of Social Work, New York University's Global Institute of Public Health, Columbia University's National Center for Disaster Preparedness, and Colorado State University's Center for Disaster Risk and Analysis. It is modeled upon the longitudinal Gulf Coast Child and Family Health Study that some of these researchers conducted after Hurricane Katrina. This is the second of four themed reports in the S-CAFH Briefing Reports series, developed in consultation with the New Jersey Public Partnership Group composed of officials from the state Department of Health, the Department of Children and Families, and the Department of Human Services. The data were collected by a team of two dozen community-based interviewers who conducted one-hour face-to-face surveys with sampled respondents throughout the nine-county study area in New Jersey.*

# background

Exposure to a disaster is among the most complex environmental contributors to poor health that individuals and communities may face. Rather than a single acute exposure, such as a lightning strike, there is often an “exposure continuum” in large-scale disaster settings. The disaster event may generate exposure to multiple hazards and they may unfold over time: for example, there may be traumas associated with exposure to the kinetic force of a hurricane, earthquake, or tornado. A disaster may lead to an enduring toxic environment that includes potential exposure to heavy metals, fungi, or other hazardous substances present in the water, soil, air, or surrounding buildings and infrastructure. Beyond that, there is the potential for a more insidious ongoing exposure after a disaster: the fraught emotional landscape of an uncertain environment in which the struggles of daily living can present many steep challenges to recovery, and that exact a psychological toll.

The major objectives of this Briefing Report, the second in a series of four thematic reports, are to explore the health and well-being of adults, children, and families impacted by Hurricane Sandy in New Jersey, and to investigate the relationship between the complex exposures and health outcomes. The PERSON Report examines several critical aspects of individual well-being that may be associated with the storm, including:

1. Physical health of adults;
2. Psychological and emotional health of adults;
3. Social and economic health of adults;
4. Health and well-being of children; and
5. The association between disaster exposure and individual outcomes.

As with each report in the S-CAFH Briefing Reports series, the PERSON Report begins with an overview of what is known about this topical area, describes the study methods and selected findings from the research data, and concludes with implications. The data for the report are mainly drawn from the Appendix Tables, and readers seeking more detailed information about the study methods, data sources, and findings are urged to refer to the Appendix.

## Disasters and Health

Disasters can have both immediate and enduring impacts on the health and well-being of exposed populations.<sup>1</sup> News articles often devote considerable attention to trauma-related injuries and deaths that

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<sup>1</sup> Thomas, D. S. K., M. S. Newell and D. Kreisberg (2010). “Health.” Social Vulnerability to Disasters. B. D. Phillips, D. S. K. Thomas, A. Fothergill and L. Blinn-Pike. Boca Raton, FL: CRC Press: 235-264; Bourque, L. B., J. M. Siegel, M. Kano and M. M. Wood (2007). “Morbidity and Mortality Associated with Disasters.” Handbook of Disaster Research. H. Rodriguez, E. L. Quarantelli and R. R. Dynes. New York, Springer.



# background

result from direct exposure to disasters, however there are additional, complex pathways to death, disease and disability that might result from direct and indirect exposure to a hazard.<sup>2</sup> There is also a growing literature on long-term effects – including the development of chronic illnesses much later in life – that may be traced back to a disaster exposure and its stressors.<sup>3</sup> Although it is beyond the scope of the research project to measure or analyze such long-term consequences, this Briefing Report begins to establish the incidence of selected health conditions that have emerged in the first few years after Sandy, considers a number of domains in which the well-being of adults, children, and families may have been impacted by the storm, and begins to explore the association of disaster exposure and health outcomes.

As collectively-experienced traumas, disasters can have both physical and mental health consequences, although these often prove particularly difficult to measure. To estimate some of these effects on the population, researchers and policymakers often look at mortality data, as well as utilization rates of the medical and mental health systems as a means of gauging a disaster's impact. Although imperfect, these statistics provide a useful starting point. According to the Centers for Disease Control, 117 people lost their lives as a result of Sandy. Sixty-seven people died as a result of causes directly related to the storm (drowning, hit by falling trees, etc.) while 38 died from causes indirectly related (carbon monoxide poisoning, car accidents). In New Jersey, 75 people died.<sup>4</sup> These mortality statistics, often cited in popular accounts

of the disaster, offer a rough marker for judging the magnitude of such a catastrophic event. However, they cannot capture the breadth of health-related effects; much less encompass the subtler and more enduring health outcomes.

Another population-based measure of mental health effects can be estimated from FEMA-funded psychological first aid efforts. When Sandy struck, the New Jersey Department of Human Services' Disaster and Terrorism Branch established the New Jersey Hope and Healing program. Over a 28-month period the program deployed crisis counselors directly into disaster-declared counties to provide emotional support and referrals for additional assistance as needed. Counselors met with impacted residents individually and also held support sessions for children and adults at community centers, restaurants, child care centers, churches, and other settings. Program staff conducted a total of 37,561 individual visits with New Jersey households, of which 14,717 visits (39.2%) resulted in referrals for further crisis counseling and 3,923 (10.4%) were referred for more intensive mental health services.<sup>5</sup> As with the mortality data, these utilization data offer a glimpse into the magnitude of the mental health issues that may have been generated by Sandy, but the denominator of the nearly 38,000 encounters does not necessarily represent the entirety of the exposed population; nor do the 14,717 who were referred for follow-up care necessarily represent all of the exposed individuals who experienced mental health problems.

<sup>2</sup> Abramson, D., T. Stehling-Ariza, R. Garfield and I. Redlener (2008). "Prevalence and Predictors of Mental Health Distress Post-Katrina: Findings From the Gulf Coast Child and Family Health Study." *Disaster Medicine & Public Health Preparedness* 2(2): 77-86; Ahern, M., R. S. Kovats, P. Wilkinson, R. Few and F. Matthies (2005). "Global Health Impacts of Floods: Epidemiologic Evidence." *Epidemiologic Reviews* 27(1): 36-46; Neria, Y. and J. M. Shultz (2012). "Mental Health Effects of Hurricane Sandy: Characteristics, Potential Aftermath, and Response." *Journal of the American Medical Association* 308(24): 2571-2572.

<sup>3</sup> Shonkoff, J. P., et al. (2012). "The Lifelong Effects of Early Childhood Adversity and Toxic Stress." *Pediatrics* 129(1): e232-e246; Weissbecker, I., S. E. Sephton, M. B. Martin and D. M. Simpson (2008). "Psychological and Physiological Correlates of Stress in Children Exposed to Disaster: Current Research and Recommendations for Intervention." *Children, Youth and Environments* 18(1): 30-70.

<sup>4</sup> Kulkarni, Prathit A. "Mortality Surveillance After Hurricane Sandy." Centers for Disease Control, New Jersey Department of Health Hurricane Sandy Recovery Meeting Presentation. March 23, 2015.

<sup>5</sup> Communication with Gayle Riesser, Ph.D., New Jersey Department of Human Services, and Adrienne Fessler-Belli, Ph.D., Director of the Disaster and Terrorism Branch of New Jersey Department of Human Services, May 11, 2015.

# background

The study presented in this report provides another means for estimating a disaster's impact on health and well-being. The Sandy Child and Family Health (S-CAFH) Study is an observational cohort study of approximately 1,000 randomly-selected New Jersey residents who were living in nine of the New Jersey counties most exposed to the storm in 2012. Participants in the study represent the 1,047,000 people living in Sandy's "Disaster Footprint," the nine most severely impacted counties in the state. Their responses to a one-hour long structured survey, administered by a team of community-based interviewers, provide the basis for assessing the health effects of Hurricane Sandy. As described in greater detail later in the report and in Appendix A, participants were carefully sampled

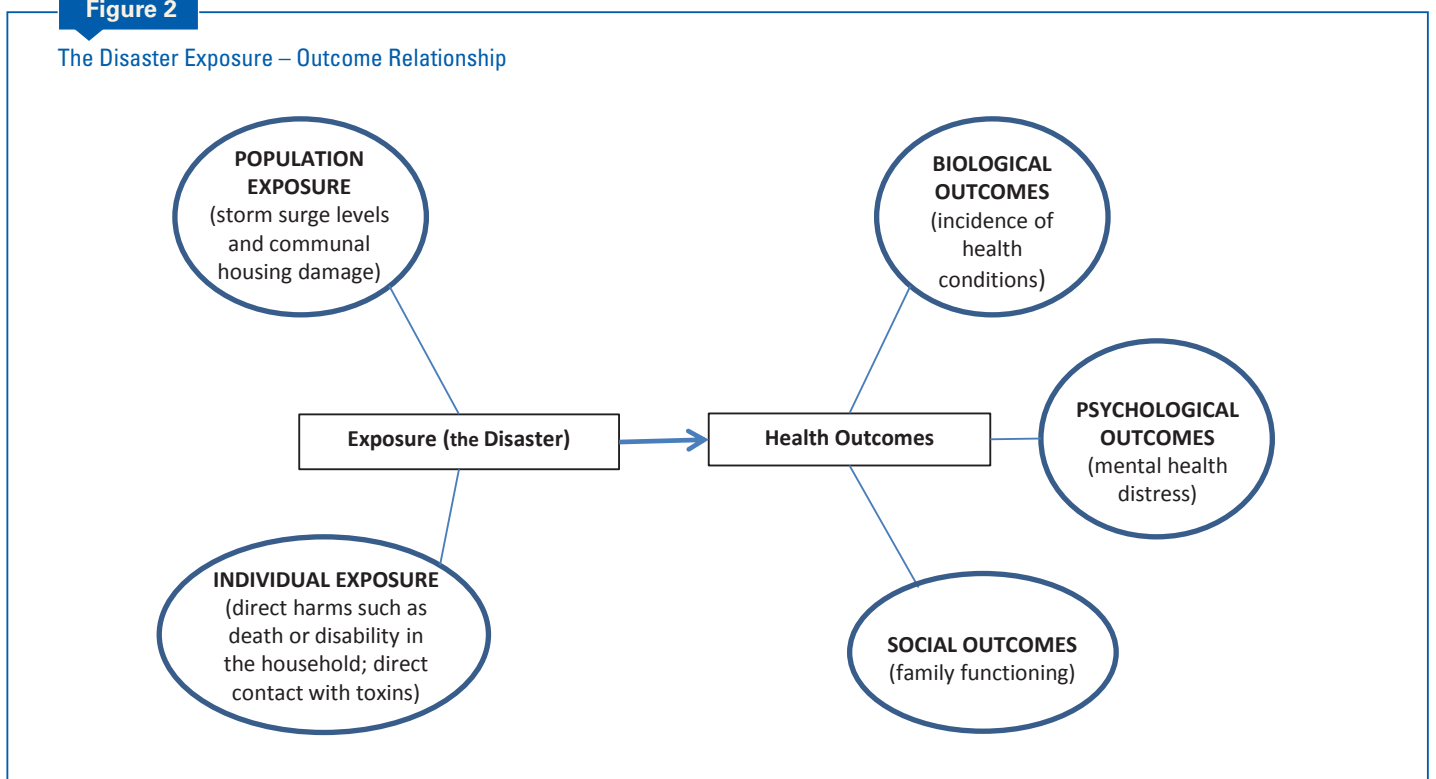
following a rigorous protocol so as to be representative of the entire exposed population and were surveyed face-to-face by a team of interviewers. The data were then weighted to represent both the probability of any household being selected, and to adjust for the actual population distribution in New Jersey.

## Health and Exposure

In order to document and consider the factors associated with a disaster's health effects we have adopted a "biopsychosocial perspective," which presumes that health is the product of biological, psychological, and social factors, and that health may be expressed in those terms as well.<sup>6</sup> As illustrated in Figure 2, we

**Figure 2**

The Disaster Exposure – Outcome Relationship



<sup>6</sup> Engel, G. L. (1977). "The Need for a New Medical Model: A Challenge for Biomedicine." *Science* 196(4286): 129-136; Frankel, R. M., T. E. Quill and S. H. McDaniel (2003). *The Biopsychosocial Approach: Past, Present, and Future*. Rochester, NY, University Rochester Press.

# background

begin by considering disaster exposure in two ways, at a population-level and at an individual-level. At a population level we defined a “Disaster Footprint” as the geographical area in which New Jersey residents were most severely impacted by Hurricane Sandy (see the maps in Appendix A). We defined this geographical region as including those areas and neighborhoods that experienced storm surges of at least one foot of water, that had at least 20% of their residential housing stock substantially damaged by the storm, or those areas of the state where high proportions of residents applied for FEMA housing assistance. Furthermore, this Disaster Footprint has been drawn within the nine New Jersey counties designated within the FEMA presidential emergency declaration. We have presumed that everyone living within this geographical area had the potential to be directly exposed to the storm. Distinct from the population-level exposure we have also measured individual’s direct exposure – asking respondents in the S-CAFH Study whether someone in their household was killed or injured as a result of the storm; whether they had direct contact with floodwater, debris or mold; whether they lost a pet in the storm; or whether they lost a vehicle as a result of Sandy.

Our approach to measuring exposure reflects the importance of both the environment within which someone lives as well as his/her personal experience in shaping health outcomes. This is echoed in the data analyses presented in this report which progress from looking at physical health manifestations, symptoms, and health-related quality of life; to psychological dimensions of health related to post-traumatic stress disorders (PTSD), depression, and anxiety; to such social factors as the strength of informal social support networks and the viability of family functioning; to economic health measures related to work disruptions or income losses related to Sandy. As with all of our S-CAFH Briefing Reports, chief among our objectives are to chronicle the impacts of Sandy on a representative population, and to consider the ways that such impacts may differentially affect specific sub-populations or presumably vulnerable groups. In all of the data tables in our reports we analyze Sandy’s impacts by specific household-level characteristics (i.e. region, damage, children in the home, and income), and also by specific individual-level characteristics (i.e. gender, age, race and ethnicity).

# methods

The S-CAFH Study recruited a random sample of New Jersey residents from those areas in the state that experienced: a) storm surges; b) flooding; and/or c) substantial property damages. Data was collected for the longitudinal cohort study between August 2014 and April 2015.

Respondents were sampled from census block groups taken from the nine most impacted counties in New Jersey exposed to Hurricane Sandy: the North Jersey counties of Bergen, Essex, Hudson, Middlesex and Union, and the South Jersey counties of Atlantic, Cape May, Monmouth and Ocean (selection of these counties is further explained in Appendix A). Within the nine counties, 832 census block groups were categorized into eight sampling strata by region, damage, and poverty. These strata were developed to ensure the research team would have sufficient power of analysis among these sub-categories. From each of these strata, a total of 52 census block groups were randomly chosen. Within each of these 52 selected census blocks, households were randomly selected for an interview.

Community-based interviewers conducted face-to-face surveys with adult members of the selected New Jersey households in the study. To be eligible to complete a survey, selected individuals had to be the primary

household resident at the time of the storm and 18 years of age or older. A cohort summary can be found in Appendix C Table 1. The survey instrument for the first wave of data collection covered such topics as the decisions households made related to both evacuation and to recovery issues, to their health and well-being, and to the help they have sought or received. In addition to learning about the adult or adults in the household, the team also asked specific questions about children living in the house, so as to learn of any long-term impacts of the storm on young people. Wave 2 of data collection will be conducted between April 2015 and June 2015 and cover additional thematic areas of recovery. After data collection, a weighting protocol was applied using sampling weights that (1) compensate for unequal probabilities of selection such as damage, (2) compensate for non-response<sup>7</sup>, and (3) adjust for weighted sample distribution among key variables of interest.

<sup>7</sup> Non-response occurs when individuals chosen for a sample are unwilling or unable to participate in the survey.

# s-cafh STUDY FINDINGS

## Exposure to Hurricane Sandy in the Disaster Footprint

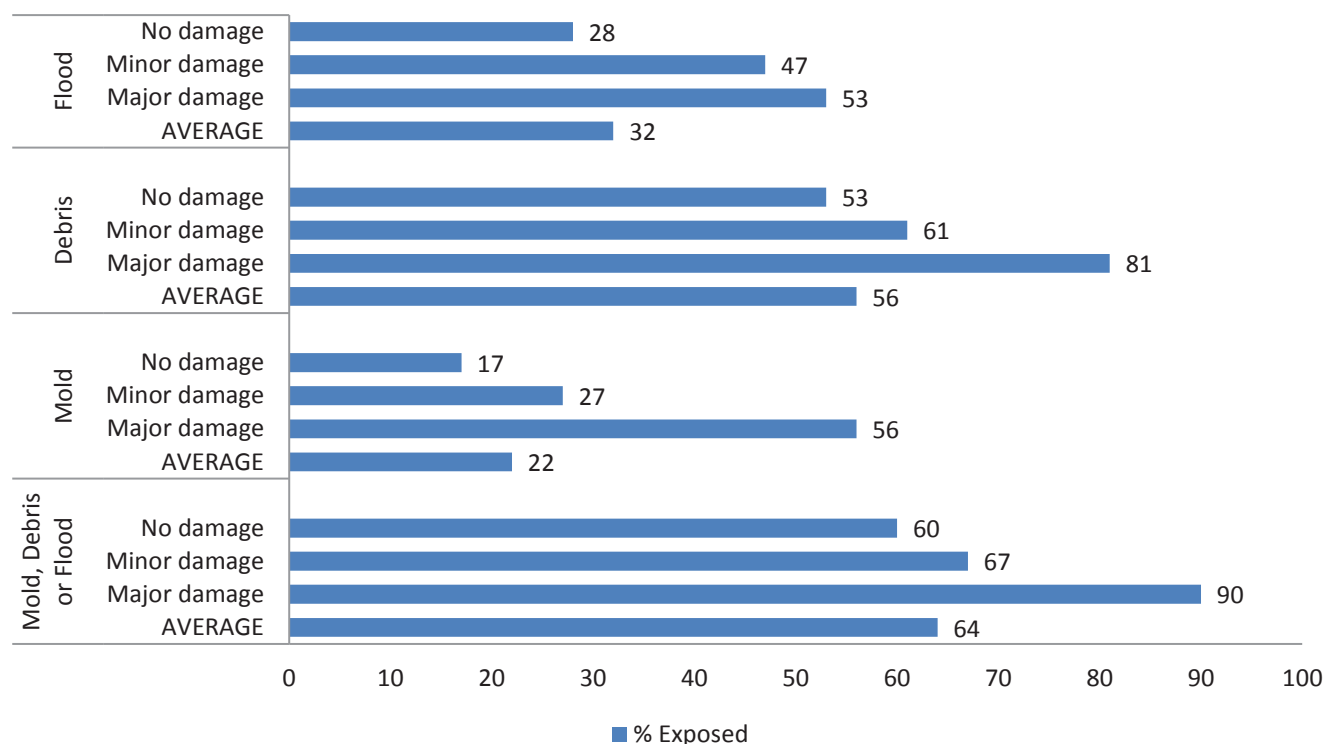
As illustrated in Appendix C Tables 2–3, most New Jersey residents living in the Disaster Footprint did not suffer significant direct harms: fewer than one percent of residents reported that someone in their household died as a result of Hurricane Sandy, approximately seven percent reported that someone fell ill or was injured as a direct result of the storm, and one percent indicated that they lost a pet in the storm.

Over 60% of residents were directly exposed to at least one of the immediate hazards associated with the storm: 32% of residents came into direct contact with the floodwaters, 56% came into direct contact with storm debris, and 22% were directly exposed to

storm-related mold in their homes. For the most part, these disaster exposures were relatively consistent: they did not vary significantly by the region in which residents lived; by their gender, age, or race/ethnicity; or by whether they lived in households with children. Disaster exposure did vary significantly in two important aspects, though. As illustrated in Figure 3, residents who lived in homes that were destroyed or sustained major damage were significantly more likely to come in to direct contact with floodwaters, debris, or mold. Almost all (90%) of the residents whose homes suffered major structural damage reported being directly exposed to floodwaters, debris, or mold. Comparatively, only 60% of respondents whose homes suffered little or no damage reported direct exposure to the same environmental hazards.

**Figure 3**

Direct Contact with Flood, Debris, or Mold by Extent of Housing Damage



# s-cafh STUDY FINDINGS

There was considerable range in the proportion of residents reporting direct contact with each one of the hazards, with exposure to mold reflecting the widest range: among residents whose homes experienced little or no damage, 17% reported any exposure to mold, whereas among residents whose homes suffered severe or major structural damage, 56% reported exposure to mold.<sup>8</sup> The environmental hazard most commonly encountered by residents was debris. Fifty-two percent of those residents living in homes with little or no damage reported exposure to debris whereas 81% of those residents living in homes that experienced major structural damage reported such debris exposure.

The relationship between disaster exposure and residents' income was more complicated than that found when looking at exposure by housing damage. There were no differences between the poorest and wealthiest households in terms of exposure to floodwaters, with approximately one-third of residents from each of the income brackets reporting such exposure. Residents living in households earning more than \$51,000 per year were more likely to come into contact with debris than were residents living in households earning less than that. And New Jersey residents living in households earning less than \$20,000 per year were over twice as likely to come into direct contact with mold. The data suggest that poorer residents were more likely to come into contact with mold – perhaps because of the nature of the housing construction – in contrast to middle-class and wealthier residents who were exposed to more debris, perhaps reflecting more wooded or elaborately constructed homes.

## Changes in Health Status Following Hurricane Sandy

### Physical health status

Overall, only 11% of New Jersey residents characterize their current health status as either fair or poor (see Appendix C Tables 2-3), which is lower than the national norm of 16.9%.<sup>9</sup> This proportion does not vary by most household or individual characteristics; the same is true of residents' ranking of their physical health-related quality of life, in which three-quarters of residents indicated their quality of life was good.<sup>10</sup> Older residents, particularly those over the age of 65, reported poorer physical health status and quality of life, but it is possible that this trend is related to normal aging and not to hurricane exposure. Residents living in households earning less than \$20,000 were more likely to report poor health than were residents in households earning over \$20,000.

Similarly, most chronic medical conditions, such as hypertension, diabetes, stroke, cancer, and heart disease, conditions associated with aging, were more prevalent among older residents than among younger ones (see Appendix C Tables 4-5), and also more prevalent among men than women. Except for hypertension, which was less common among North Jersey residents than South Jersey residents (and which may be explained by fewer numbers of seniors in the North as compared with the South), there were no regional differences. Rates of incident disease, in which residents were asked about physical medical conditions that were diagnosed after Hurricane Sandy, did not reveal any unusual spikes or differences by individual or household characteristics.

<sup>8</sup> It should be noted that the mold exposure reported by residents was not necessarily an exposure within their own homes. Study participants were asked, "The next question is about the harms that occurred to individuals as a result of the storm. Did you come into direct contact with mold after the hurricane?"

<sup>9</sup> Based on 9,235 US adults, ages 20-80, surveyed as part of the National Health and Nutrition Examination Study, between 2005-2008. Zajacova, A. and J.B. Dowd (2011). "Reliability of Self-rated Health in US Adults." *American Journal of Epidemiology*. 174(8): 977-983.

<sup>10</sup> Physical health-related quality of life is measured by the Medical Outcome Study's Short-Form 12, version 2, physical component summary score, a nationally validated scale. Ware J.E., M Kosinski, and SD Keller (1996). "A 12-item short-form health survey- construction of scales and preliminary tests of reliability and validity." *Med Care* 34:220-233.

# s-cafh STUDY FINDINGS

## Emotional and psychological health status, and risk behaviors

Approximately 6% of all residents (as illustrated in Appendix C Tables 6-7) reported post-traumatic stress disorder (PTSD), which is a fairly typical rate among disaster-exposed populations two to three years after the event. With that in mind, two important patterns emerge from the data. First, higher rates of PTSD were associated with the level of housing damage, but in a bit of a bell curve. The PTSD rate among residents whose homes experienced little or no damage was 3.5%, compared to 16.5% among residents whose homes suffered minor damage and 13% among those with major damage.

The other pattern of note is a bit more linear: as damage increases so do rates of moderate mental health distress.<sup>11</sup> This is the inverse of what is seen by examining the income brackets: PTSD rates fall as income rises, as does severe mental health distress. Although underlying rates of mental health distress or PTSD varied among those living in New Jersey's Disaster Footprint, the number of those who wanted to speak with someone about current emotional or psychological issues did not fluctuate significantly. Approximately 15% of all New Jersey residents in the Disaster Footprint said they wanted to speak with someone about mental health issues, a rate reasonably similar across all household and individual characteristics.

Risk behaviors such as smoking and consumption of alcohol often increase after major disasters. Among

New Jersey residents in the Disaster Footprint, approximately one-fifth were cigarette smokers and three-quarters were current consumers of alcohol (see Appendix C Tables 6-7). Of those who indicate that they currently drink alcohol, approximately 7% would be considered "problem drinkers" according to their scores on the CAGE scale.<sup>12</sup> Residents of the North were significantly more likely to smoke but less likely to drink than were residents of the South. Similarly, rates of smoking were higher among younger residents, and among those in lower income brackets. Drinking was lower among residents living in poverty and higher among wealthier households.

The rates of increased drinking and smoking since Sandy was reasonably similar across all household and individual characteristics – an increase in smoking was reported by 30% of smokers, and an increase of alcoholic consumption was reported by 8% of drinkers.

## Social health and well-being following Hurricane Sandy

As with other factors examined in the S-CAFH Study, there were significant differences in social well-being based on income, as illustrated in Appendix C Tables 8-9. As income increased so did residents' report of strong social support networks and better family functioning.<sup>13, 14</sup> For example, 27% of residents living in households earning below \$20,000 a year indicated they had weak or absent social support networks, compared to only 4% of residents living in households earning over \$100,000 per year. A comparable trend is found when examining family functioning.<sup>15</sup> While

<sup>11</sup> Mental health distress is based on a score below 42 in the Mental Composite Score (MCS) of the Short Form-12 Scale; severe mental health distress are those below 37 on this scale. Ware J.E., M Kosinski, and SD Keller (1996). "A 12-item short-form health survey- construction of scales and preliminary tests of reliability and validity." *Med Care* 34:220-233.

<sup>12</sup> "CAGE Substance Abuse Screening Tool". Johns Hopkins Medicine. [http://www.hopkinsmedicine.org/johns\\_hopkins\\_healthcare/downloads/CAGE%20Substance%20Screening%20Tool.pdf](http://www.hopkinsmedicine.org/johns_hopkins_healthcare/downloads/CAGE%20Substance%20Screening%20Tool.pdf). Retrieved 30 July 2014.

<sup>13</sup> The social support scale provides a measure of the strength of network of family, friends, and others who can help with tasks such as caring for someone who is sick, lending a small amount of money, or offering advice for emotional or practical problems.

<sup>14</sup> The family functioning scale captures the strength of cohesion and unity among family members, as well as a family's reliance upon one another for emotional and practical help. The family functioning scale does not presume that families live together.

# s-cafh STUDY FINDINGS

52% of residents in the poorest households report poor family functioning only 21% of residents in the wealthiest households report likewise. Hispanic residents were more likely to report that they had weak or absent social support networks, but their reported rates of poorly-functioning families were similar to those of black or white residents.

The survey asked residents to characterize the types of social roles that they inhabited, and to estimate whether Hurricane Sandy had an impact on their ability to carry out these roles, either positively or negatively (see Appendix C Tables 8-9). For example, under the category of “community-focused roles” we asked residents how important it was for them to think of themselves as advocates, teachers, volunteers, or “creators.” This category of roles was intended to encompass those aspects of a person’s life which are outward-facing, and which are generally oriented to engaging in activities that are for the public good. For the category of “resource-focused roles” we asked whether residents thought of themselves as breadwinners, leaders, or “problem-solvers.” This role is generally more focused on finding, acquiring, or fixing resources. And for “home-focused roles” we asked residents about their views of themselves as caregivers or homemakers. This last role was intended to represent an internal focus.

In examining how residents describe changes in these roles, it appeared that the storm provided an opportunity for what psychologists refer to as “post-traumatic growth.”<sup>15</sup> Residents who experienced significant structural damage to their homes were considerably more likely than other residents to say that the hurricane had a positive effect on their ability to carry out their role. This was true for each of the roles described

above, the community-focused, resource-focused, and home-focused roles.

## Economic indicators and Hurricane Sandy

Storms of the magnitude of Sandy can exact enormous financial tolls on individuals, households, and communities. Many residents sought help from public assistance programs, and a substantial number used their savings and tapped their credit lines to meet the costs of recovery. As noted in the earlier PLACE Report (Briefing Report 1), most homeowners had property insurance and a number also maintained windstorm and flood insurance. Additionally, approximately 37% of renters had renters’ insurance. Nevertheless, there was a great deal of variation in the extent to which residents made claims against these insurance policies and how much of the true cost of recovering or restoring their homes was covered.

The financial stresses experienced by New Jersey residents in the Disaster Footprint was expressed in several ways, as illustrated in Appendix C Tables 10-11. Overall, approximately 18% residents lived in a household whose income decreased after Sandy. Thirteen percent of residents noted that their household had lost income, a business, or a job. Approximately one in every ten residents reported problems in the prior six months with having enough money to cover the rent or mortgage, to cover utilities, to pay for transportation, or to pay for food.

As illustrated in Figure 4, those with major structural damage and those in the deepest poverty were similar in their expressed difficulty when it came to these household constraints. This is not to say that the absolute amounts of financial resources are the same, but that the relative stress of constrained resources

<sup>15</sup> Scale developed by Tatsuki and Hayashi following research after the Kobe earthquake: Tatsuki, S (2007). “Long-term Life Recovery Processes Among Survivors of the 1995 Kobe Earthquake: 1999, 2001 2003, and 2005 Life Recovery Social Survey Results.” *Journal of Disaster Research* 2(6): 484-501.

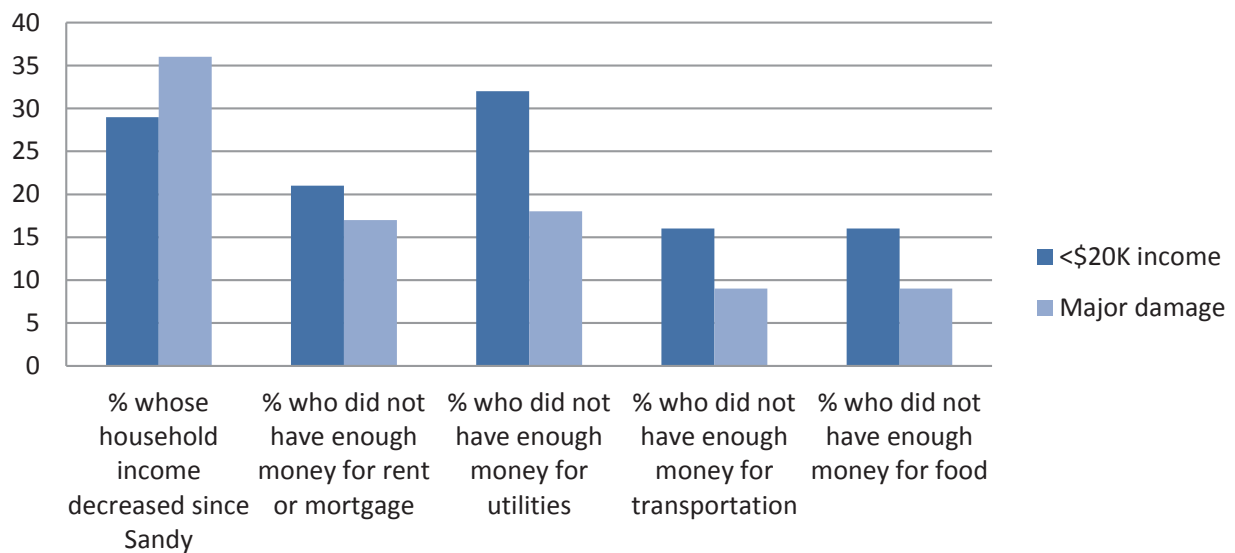
<sup>16</sup> Tedeschi, R.G. and L.G. Calhoun (1996). “The Posttraumatic Growth Inventory: Measuring the positive legacy of trauma.” *Journal of Traumatic Stress* 9(3): 455-471.



# s-cafh STUDY FINDINGS

**Figure 4**

Household Financial Constraints: How Housing Damage Looks Like Poverty



was equivalent. What is particularly striking about the data findings in Appendix C Table 10 is the similarity in the economic burdens of residents whose homes sustained major structural damage and residents who are living in poverty with household incomes below \$20,000.

Among residents whose homes suffered major damage, 17% had problems covering rent or mortgage; this parallels the 21% of the poorest residents who were having similar problems. Similarly, approximately 18% of residents with major damage often did not have enough money for utilities; 32% of the poorest residents experienced the same financial constraints, regardless of damage. Nine percent of those living in structurally-damaged homes often did not have enough money for food; sixteen percent of those in poverty experienced the same.

In order to test whether major damage and poverty

are having an effect independently of one another in their association with these household constraints, we conducted a logistic regression analysis. For example, it might be possible that all of the residents with structural damage who are having difficulties paying for food, utilities, or rent or mortgage are also in the income bracket of those earning below \$20,000 a year. As illustrated in Table 1, results suggest that this is not the case.<sup>17</sup> Poverty and damage are each independently associated with having one of these household constraints. Residents with major structural damage are 2.5 times as likely to have one of these household constraints as are residents without such damage, regardless as to which income bracket they are in. And residents living in poverty, with household incomes below \$20,000 per year, are 6.7 times as likely to experience one of these household constraints, regardless as to whether their homes were damaged or not. Housing damage is associated with this significant financial stressor just as extreme poverty is associated

<sup>17</sup> Odds ratios presented are statistically significant at the  $p < 0.05$  level

# s-cafh STUDY FINDINGS

**TABLE 1. ODDS THAT THERE WAS OFTEN NOT ENOUGH MONEY IN THE HOUSEHOLD FOR RENT, MORTGAGE, UTILITIES, FOOD OR TRANSPORTATION**

DEMOGRAPHIC FACTOR	ODDS RATIO
Among residents living in structurally-damaged homes, versus all others	<b>2.54</b>
Among residents living in households earning less than \$20,000, versus all others	<b>6.72</b>

Notes: The analysis held constant the race/ethnicity and age of residents while testing the factors above. Those odds ratios whose p-values are statistically significant, indicating that the factor is displaying a statistically significant effect, all other factors being equal, are illustrated in **boldface**.

with the same financial stressor.

In addition to these household-level characteristics associated with greater financial stress, several individual characteristics of New Jersey residents in the Disaster Footprint were also associated with experiencing one of these stressors (see Appendix C Table 11): women were more likely than men to experience each of the financial stressors, younger residents were more likely than older residents to have trouble paying for utilities, and black and Hispanic residents were more likely to have difficulty paying for rent or mortgage than were white residents.

### Children's health status

During the course of the initial survey with impacted residents, one child between the ages of 5- and 18-years-old was randomly selected in each household with children. An additional set of questions about this randomly-selected child was posed to the adult answering the survey.<sup>18</sup> Most of the questions were about the child's physical and mental health, their academic experiences, and risk-taking behaviors such as smoking, drinking, and drug use. Appendix C Tables 12-13 illustrate some of the data findings about this representative group of children exposed to Hurricane Sandy.

Overall, the portrait of residents' children was a

positive one: 93% of parents or caregivers said their child's overall health was excellent, very good, or good, a finding that did not vary by household or individual characteristics. Less than one percent of parents reported that their children had been expelled or suspended from school, or used alcohol, tobacco, or drugs (data not shown). Only 5% of parents said that the child's academic performance had gotten worse since Hurricane Sandy, and this did not vary by individual or household factors, either.

What did vary among children was the reported incidence of mental health issues that had emerged since the storm. Overall, 18% of parents said that their child had experienced the symptoms of being sad or depressed, nervous or afraid, having problems sleeping, or problems getting along with other children since Hurricane Sandy. This rate rose to 42% among children living in households with minor damage, 28% among households with major damage, and 35% among children living in households earning less than \$20,000 per year.

Many factors can influence a child's health and well-being following a disaster. This can include a variety of exposures similar to those of adults, in addition to the health and functioning of that child's parents and social environment. To understand how damage, parent's mental health, and poverty influenced the

<sup>18</sup> Due to time and resource constraints, our team was only able to interview adults about children's experiences and behaviors; we were not able to ask the children directly about their own experiences. For a statement on why it is important to include children themselves in post-disaster research, when feasible, see: Peek, L (2008). "Children and Disasters: Understanding Vulnerability, Developing Capacities, and Promoting Resilience." *Children, Youth and Environments* 18(1): 1-29.

# s-cafh STUDY FINDINGS

mental health distress of children in the S-CAFH study, we applied a logistic regression model so that we could examine each of these factors in the presence of the others. For example, as noted earlier, housing damage was associated with children's mental health; however what is unknown from that "unadjusted" number is how much of that effect may be attributable to the parent's mental health (in that adults in mental health distress are more likely to report that their children are distressed), or to the child living in poverty, since each of these factors appears to be influencing children's mental health when taken by itself. Table 2 illustrates the relationship among housing damage, poverty, and children's mental health, as reported by an adult in the household.

The analysis, which controls for poverty and mental health status, reveals one particularly striking result: the effect of minor housing damage on children's mental health. Children living in homes that sustained minor damage (which might have made the home uninhabitable for a short period), were over four times

as likely as children from homes with no damage to be sad or depressed and over two and a half times more likely to have difficulty sleeping as children in homes with no damage. These children living in homes with minor damage are at greater risk for mental health issues than children in homes that sustained major damage. These children may feel greater stress due to burdens on their parents or possibly because they are living in homes that are still undergoing repairs, which can serve as a perpetual reminder of Sandy and prevent closure.<sup>19</sup> In addition to these findings regarding damage, are the findings on the relationship between poverty and mental health distress in children. For these individuals, poverty is only associated with "externalizing" their emotions by not getting along with other children rather than "internalizing" their emotions by being sad, nervous, depressed, or anxious. Finally, as anticipated, parental mental health is independently associated with reports of the child being sad, depressed, or having problems getting along with others.

**TABLE 2. RELATIONSHIP OF HOUSING DAMAGE AND POVERTY TO CHILDREN'S MENTAL HEALTH**

	FEELING SAD OR DEPRESSED	HAVING DIFFICULTY SLEEPING	FEELING NERVOUS OR AFRAID	HAVING PROBLEMS GETTING ALONG WITH OTHER CHILDREN
<b>Characteristic of Child's Home Environment</b>	<b>Odds of Experiencing Outcome Above</b>			
Home experienced minor damage, vs. no damage	<b>4.34</b>	<b>2.63</b>	1.72	0.63
Home experienced major damage, vs. no damage	<b>3.23</b>	1.85	<b>2.24</b>	0.45
Living in household earning <\$20,000, vs. all others	1.02	0.78	0.75	<b>9.24</b>
Parent is measured as having mental health distress	<b>2.83</b>	1.87	0.93	<b>7.00</b>

Notes: The analysis held constant the race/ethnicity and age of residents while testing the factors above. Those odds ratios whose p-values are statistically significant, indicating that the factor is displaying a statistically significant effect, all other factors being equal, are illustrated in **boldface**.

<sup>19</sup> Merdjanoff, A 2013. "There's no place like home: Examining the emotional consequences of Hurricane Katrina on the displaced residents of New Orleans." *Social Science Research*, 42: 1222-35.

# s-cafh STUDY FINDINGS

## Association of disaster exposure and health

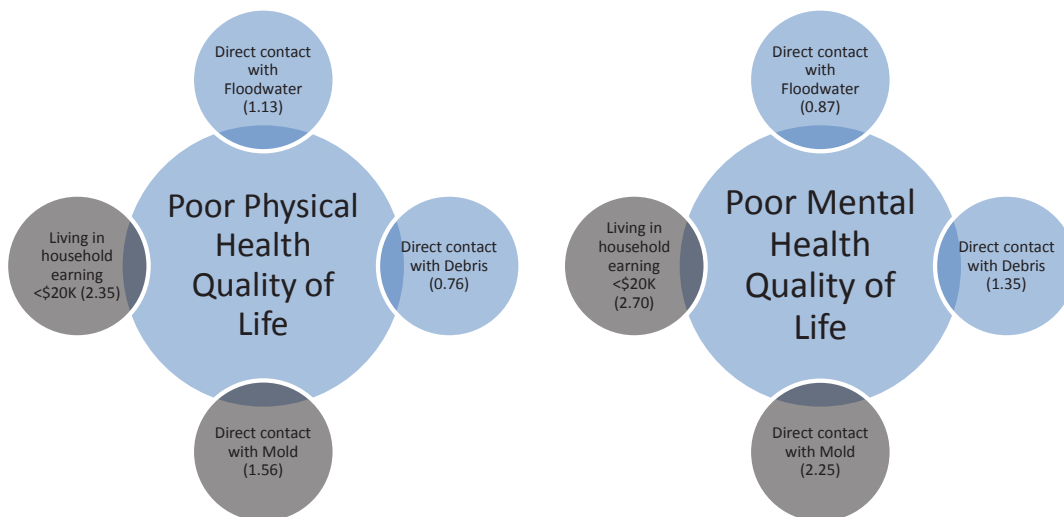
As noted in the introduction to this report, one of the central objectives of the Sandy Child and Family Health study is to begin to explore the associations between disaster exposure and health outcomes. The previous sections have described the distribution – or epidemiology – of exposure and selected health outcomes. Disaster exposure appeared to be a relatively common experience among residents: approximately two-thirds of New Jersey residents in the Disaster Footprint reported some direct physical contact with floodwater, debris, or mold (Appendix CTable 2). Although less common, the measures of physical and mental health distress represented substantial numbers of residents in the Disaster Footprint. About one in four of all New Jersey residents described a poor physical quality of

life (Appendix CTable 2), which was primarily measured by how much one’s physical health or pain limits one’s activities of daily living.<sup>20</sup> Approximately one out of seven New Jersey residents indicated that they suffered from levels of moderate to severe mental health distress (Appendix CTable 6), which mainly measures the extent to which emotional or psychological factors limit one’s activities of daily living.

In this section we consider several types of adult health outcomes that could be affected by disaster exposures, including: (1) health-related quality of life, reflecting both physical health and mental health; (2) the clinical diagnosis of asthma, a respiratory disease that has been linked to mold exposure; and (3) the association between housing damage and PTSD. Examining the association between exposure and health outcomes in the context of other demographic

**Figure 5**

The Increased Odds that Certain Exposures Led to Poor Health



Statistically significant odds ratios are highlighted in grey.

<sup>20</sup>Poor physical quality of life is determined by a score below 45.0 in the Physical Composite Score (PCS) of the Short Form-12 Scale.

# s-cafh STUDY FINDINGS

**TABLE 3. RELATIONSHIP OF CUMULATIVE DISASTER EXPOSURES AND HEALTH OUTCOMES**

THE ODDS THAT NEW JERSEY RESIDENTS WITH THE FACTORS BELOW WERE MORE LIKELY TO HAVE EXPERIENCED ONE OF THESE HEALTH OUTCOMES:	POOR PHYSICAL HEALTH QUALITY OF LIFE	POOR MENTAL HEALTH QUALITY OF LIFE
Had direct contact with floodwaters + debris + mold	0.99	<b>1.92</b>
Living in household earning <\$20,000, vs. all others	<b>2.44</b>	<b>2.79</b>

Note: The analysis held constant the race/ethnicity and age of residents while testing the factors above. Those odds ratios whose p-values are statistically significant, indicating that the factor is displaying a statistically significant effect, all other factors being equal, are illustrated in **boldface**.

characteristics allows us to better describe the impact of the storm on individuals' lives.

### Disaster Exposure and Health Related Quality of Life

In order to look at the relationship between disaster exposure and health-related quality of life, we looked at two logistic regression models. In the first, we explored the impact of each of the direct exposure routes – mold, debris, and floodwater – and their independent impact on physical health quality of life and on mental health distress. In the second, we analyzed the cumulative effect of being exposed to all three of these routes (essentially, maximal exposure) and the same two health outcomes. Figure 5 and Table 3 illustrate the results of these models.

Figure 5 illustrates the powerful effect of poverty on health-related quality of life even when controlling for demographic characteristics such as race, age, and gender.<sup>21</sup> None of the exposure routes had a statistically significant effect on increasing a poor health-related quality of life, where as those residents living in households earning below \$20,000 a year were nearly three times as likely to report poor physical health, all other things being equal. That finding is mirrored in Table 3, which considers the cumulative effect of disasters; again, poverty has a similar effect on poor physical health, and the routes of disaster exposure are not statistically significant.

In exploring the relationship between the routes of disaster exposure and mental health, residents who were exposed to mold were two times as likely to also report moderate to severe mental health distress, as illustrated in Figure 5. Neither of the other two exposure routes – contact with floodwater or debris – was significantly associated with poor mental health. Poverty was associated with poor mental health quality of life. In Table 3, when controlling for cumulative disaster exposure and poverty, both have independent and significant relationships with poor mental health quality of life.

### Mold Exposure and Asthma Diagnosis

Given the importance of mold exposure to mental health distress, we also wanted to test whether there was an association with the clinical diagnosis of asthma after Hurricane Sandy. The overall asthma rate among New Jersey residents living in the Disaster Footprint is 15%, which is comparable to the statewide average of 13.6% reported by the Centers for Disease Control.<sup>22</sup> Among the group of residents who had ever been diagnosed with asthma in the Disaster Footprint, approximately 19% of them had received that diagnosis after Sandy (data not shown).

Based on a logistic regression model, as illustrated in Figure 6, the residents in the Disaster Footprint who were exposed to mold were over twice as likely to be

<sup>21</sup> Statistical significance at the p < 0.05 level is denoted in grey in Figure 5.

<sup>22</sup> Based upon data for the state of New Jersey derived from the 2013 Behavioral Risk Factor Survey, <http://www.cdc.gov/asthma/brfss/2013/tableL1.htm> (accessed April 6, 2015).

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# s-cafh STUDY FINDINGS

diagnosed with asthma after Sandy as were people who were not exposed to mold. The findings control for damage in their home and for poverty, and show that experiencing minor damage is related to increased odds of being diagnosed with asthma after Hurricane Sandy, though poverty does not. However, there is still

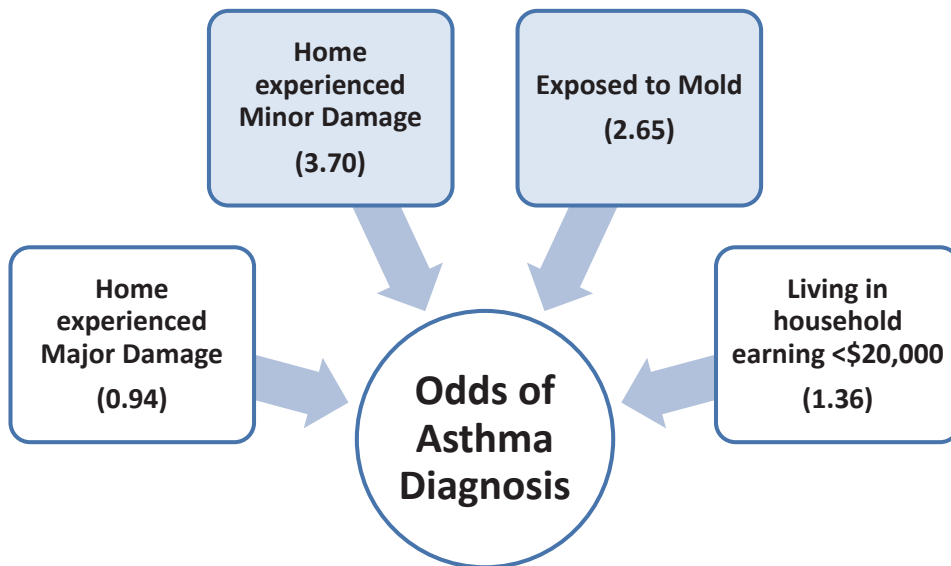
a direct and significant relationship between mold and asthma.

### Housing Damage and PTSD

Finally, when exploring the relationship between disaster exposure and health outcomes we considered the impact of housing damage on post-traumatic

**Figure 6**

Odds of being diagnosed with asthma after Hurricane Sandy



Statistically significant odds ratios are highlighted in blue.

**TABLE 4. RELATIONSHIP OF HOUSING DAMAGE AND PTSD**

	ODDS OF HAVING PTSD AFTER HURRICANE SANDY
Home experienced minor damage, versus no damage	<b>2.67</b>
Home experienced major damage, versus no damage	<b>3.70</b>
Living in household earning <\$20,000, versus all others	1.55
Respondent was clinically diagnosed with depression prior to Hurricane Sandy	<b>2.97</b>
Black, versus white residents	1.59
Hispanic, versus white residents	<b>3.49</b>
Men versus women	0.66
Residents ages 19-35, versus those who are 36-64	<b>0.29</b>
Residents ages 65 and over, versus those who are 36-64	0.81

Note: The analysis held constant the race/ethnicity and age of residents while testing the factors above. Those odds ratios whose p-values are statistically significant, indicating that the factor is displaying a statistically significant effect, all other factors being equal, are illustrated in **boldface**. The presence of PTSD is determined by scoring over a “6” on the Trauma Screening Questionnaire, a validated scale measuring post-traumatic stress disorder.

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## s-cafh STUDY FINDINGS

stress disorder (PTSD). As noted in the earlier section on mental health, residents whose homes had experienced considerable structural damage reported higher rates of PTSD than did residents whose homes suffered little or no damage, and surprisingly those with minor damage reported the highest rates of PTSD. In order to determine the independent effect of these levels of damage on PTSD, and to account for other explanatory factors – such as a pre-Sandy diagnosis of clinical depression, or living in poverty, or age, race, or gender – we conducted a logistic regression analysis that controlled for all of these factors.

In the resulting model, presented in Table 4, housing damage is significantly associated with PTSD, all other factors being equal. Residents with minor damage were over two times as likely to have symptoms of PTSD as were those with little or no home damage, an odds ratio similar to that of residents with major home damage. Residents who had a pre-Sandy diagnosis of clinical depression were over 3 times as likely to report PTSD symptoms. In terms of demographic differences, Hispanic residents were over 3 times as likely as white residents to have PTSD symptoms, and young adults were 70% less likely than middle age adults to have PTSD symptoms.

# conclusion

This PERSON Briefing Report focused on the impact of Sandy on the health and well-being of New Jersey residents living in areas of the state exposed to the hurricane. The report began with a description of the types of disaster exposure experienced by New Jersey residents, and the ways such exposure varied across the state.

The report considered the physical, mental, social and economic health status of disaster-affected individuals, and whether these “types” of health varied by individual or household characteristics. Lastly, we introduced an analysis to determine whether there were associations between disaster exposure and health outcomes. Among the many findings and data points described in the report, three themes with policy and programmatic implications emerged:

- **Housing damage can be a risk factor for poor health that has an effect on people’s lives remarkably similar to the effect of poverty.** Within the Disaster Footprint, those individuals living in homes that sustained major structural damage, regardless and independent of their household’s income level, expressed health problems that were often mirror images of those who lived in deep poverty, with household incomes less than \$20,000 a year;
  - **Implications:** More refined physical and mental health screening should be considered for residents whose homes have experienced substantial damage, and additional surveillance efforts undertaken to follow residents of significantly damaged homes and to provide ongoing access to physical and mental health services;
- **Some toxins had “double-barreled effects”:** **exposure to mold was associated with both clinically-diagnosed asthma and with mental health distress.** Adults who were exposed were 2.5 times as likely as those not exposed to mold to be diagnosed with asthma after the storm, and were twice as likely to report mental health distress;
  - **Implications:** Mold mitigation efforts should include components of psychological first aid in order to identify residents at risk for mental health problems, and provide referral mechanisms for those residents who meet the threshold established by New Jersey Hope and Healing. Similarly, disaster case management and psychological first aid programs should inquire about mold and housing damage as potential indicators or risk factors for mental health distress;
- **Children living in homes that experienced minor damage were at particularly high risk for psychological and emotional issues.** Children living in homes with minor damage were over four times as likely to be sad or depressed, and over twice as likely to have problems sleeping since the storm as were children from homes with no damage. These levels of emotional and mental distress amongst children in homes with minor damage were higher even than those reported by children living in homes with major structural damage;
  - **Implications:** The pediatric and social services communities should be particularly attentive to children’s living environments, and consider homes with minor damage (which, according to FEMA definitions, may be uninhabitable for a short period of time) as significant risk factors in children’s lives. Moreover, housing assistance programs should work to accelerate repairs and restorations for households with minor children and consider existing gaps in restoration programs that may not allow for complete repairs.



# APPENDIX A

## STUDY DESCRIPTION

The strategic objectives for the S-CAFH study are two-fold: (1) to create a study sample of 1,000 households representative of residential areas within New Jersey exposed to Hurricane Sandy, and (2) to have sufficient numbers of cases within the sample for sub-group analyses that can be conducted of “high” damage versus “not high damage” areas, “northern” versus “southern” regions, and households with low income versus all other income levels. Addressing the first objective enables us to estimate population-level impacts and needs across the hardest-hit areas of the state. Addressing the second objective enables us to examine the extent to which New Jersey residents’ decisions, needs, health effects, and recovery may be explained by the damage they were exposed to, by regional differences, and by access to economic resources. To accomplish these objectives, we defined an area within New Jersey that was exposed to the storm (referred to as the “S-CAFH Disaster Footprint”), and developed a multi-stage stratified sampling design to yield sufficient numbers of cases for sub-group analyses. Sampling and post-stratification weights were developed and applied to the data once sampling and data collection were complete. The various elements of this approach are described in more detail in this appendix.

### Disaster Footprint

The S-CAFH Study was designed to examine the impact of Hurricane Sandy on the Disaster Footprint presented in Appendix A Figure 3. Approximately 1,047,000 people—including about 411,000 households—live within this geographical area. The Disaster Footprint covers an area approximately 14% of the state, and that the population represents about 12% of the state. The disaster footprint was created based on three criteria:

1. The Hurricane Sandy Impact Analysis by the FEMA Modeling Task Force (MOTF) was used to identify the nine counties in New Jersey with a “Very High Impact” rating. The FEMA MOTF impact model is a composite of storm surge, wind, and precipitation. These very high impact counties had a population of over 10,000 persons exposed to storm surge in addition to more than 8 inches of precipitation during the storm and an estimate of over \$100M in wind-related damages. The counties that met these criteria included **Atlantic, Bergen, Cape May, Essex, Hudson, Middlesex, Monmouth, Ocean and Union**.
2. Once these nine counties were selected, the study team developed a sampling frame using a geographic information system (GIS) based procedure. Storm surge within the nine counties was identified using FEMA storm surge raster data based on satellite imagery and further filtered to include all areas with storm surge of greater than or equal to one foot. Housing damage data was acquired based on FEMA damage assessments. These data were available for the majority of housing lots in high impact zones. Lots which were classified by FEMA as minor (Full Verified Loss of \$5,000-\$17,000), major (Full Verified Loss of more than \$17,000), or destroyed (indicated by an Individual Assistance (IA) inspector) were aggregated at the census block group level. Block groups with at least 20% of all assessed units having one of the prior three classifications were then selected for inclusion in the study. FEMA Individual Assistance data were acquired at the ZIP code level. Valid registrations were summed and standardized (z-score) for the ZIP codes in the nine counties and those which summed to greater than the mean (a z-score of >0) were selected to be part of the footprint.

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# APPENDIX A

## STUDY DESCRIPTION

3. Finally, these three resultant geographic layers were superimposed upon one another and any census block group, which intersected any one of the three layers was selected to be included in the final Disaster Footprint.

In summary, then, the Disaster Footprint within the nine high impact counties is composed of:

- a. Census block groups which experienced a storm surge of at least one foot, OR
- b. Census block groups in which at least 20% of all housing units sustained “Minor Damage,” “Major Damage,” or were “Destroyed,” per FEMA assessments, OR
- c. ZIP codes which reported a greater than average number (z-score >0) of valid FEMA Housing Assistance registrations.

### Sampling

When conducting a household survey, researchers often use a random sample, which is a subset of individuals that have been randomly selected from the population. Sometimes, because researchers cannot ask survey questions of every member of the population—at least in heavily populated areas such as the one where we were working—a smaller subset of people is drawn at random that is intended to be representative of the larger population. We first determined the target number of New Jersey residents to be sampled by calculating the number necessary to have sufficient power in the sample, which would allow us to detect meaningful differences on key characteristics. In other words, there had to be enough people randomly sampled who could potentially exhibit a given characteristic to detect statistically significant differences between groups. Therefore, the research team determined that we needed a target sample size of 1,075 respondents.

**APPENDIX A TABLE 1. CENSUS BLOCK GROUPS USED FOR SAMPLING IN THE DISASTER FOOTPRINT**

	N	%
<b>Geography</b>		
North	262	32
South	570	68
<b>Damage</b>		
High (> 40% of households > minor)	79	10%
Low (affected)	393	47%
Unassessed	360	43%
<b>Children</b>		
High children (>35% of households have children)	305	37%
Low children(<35% of households have children)	527	63%
<b>Poverty (#families)</b>		
High poverty ( >30% family below poverty)	249	30%
Low poverty ( <30% family below poverty)	579	69%
N/A - Block groups with 0 families	4	<1%

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# APPENDIX A

## STUDY DESCRIPTION

One approach to selecting study respondents is to conduct a simple random sample, in which all the households within a given area of interest, in this case the Disaster Footprint, would be enumerated and then 1,075 of them, would be “picked out of a hat.” Although this selection strategy does provide the basis for estimating the characteristics of the entire population within the Disaster Footprint, it would not have guaranteed that there would be enough cases in the sub-groups of research interest – particularly those households that suffered varying degrees of damage or that were living in lower socio-economic neighborhoods. Thus, it also would not allow our team to make estimates that were reliably representative of these smaller populations.

An alternative approach, which our team ultimately employed, was to first group the “neighborhoods” (census block groups) into different strata, such as neighborhoods in the north, or neighborhoods that suffered considerable housing damage, or neighborhoods that were composed of households living at or below a poverty threshold. Once this grouping was completed, we could then randomly select households within these strata and make sure that there would be enough households to be representative. The table below shows the distribution of block groups by these characteristics of interest:

**APPENDIX A TABLE 2. MATRIX OF CENSUS BLOCKS IN DISASTER FOOTPRINT BY STRATA**

		DISASTER FOOTPRINT							
Total # block groups		832							
Sampled # block groups		52							
<b>GEOGRAPHY</b>		<b>North</b>				<b>South</b>			
Total # block groups		262 (31%)				570 (69%)			
Sampled # block groups		18 (35%)				34 (65%)			
<b>DAMAGE<sup>23</sup></b>		<b>High</b>		<b>Low</b>		<b>High</b>		<b>Low</b>	
Total # block groups		3		256		76		493	
Sampled # block groups		3		15		24		10	
<b>POVERTY</b>		<b>High</b>	<b>Low</b>	<b>High</b>	<b>Low</b>	<b>High</b>	<b>Low</b>	<b>High</b>	<b>Low</b>
Total # block groups		1	2	99	157	16	60	133	360
Sampled # block groups		1	2	12	3	13	11	7	3
<b>SAMPLED HOUSEHOLDS</b>		<b>50</b>	<b>100</b>	<b>300</b>	<b>75</b>	<b>325</b>	<b>275</b>	<b>175</b>	<b>75</b>
<b>COMPLETED HOUSEHOLDS</b>		<b>58</b>	<b>97</b>	<b>118</b>	<b>52</b>	<b>257</b>	<b>190</b>	<b>154</b>	<b>74</b>

<sup>23</sup> When sufficient block groups are available, high damage and high poverty strata are sampled at approximately a 2:1 ratio

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# APPENDIX A

## STUDY DESCRIPTION

Respondents surveyed in the S-CAFH data were sampled from a total of 832 census block groups (262 in the North, 570 in the South) taken from nine New Jersey counties exposed to Hurricane Sandy (Atlantic, Bergen, Cape May, Essex, Hudson, Middlesex, Monmouth, Ocean, and Union). The 832 block groups were categorized into eight sampling strata by region, damage, and poverty. From each of these strata census block groups were randomly selected resulting in the selection of 52 census block groups within the nine counties from the 832 total census block groups (these block groups serve as primary sampling units [PSUs] from which a two-stage sampling plan was created<sup>24, 25</sup>).

Within each of these 52 selected census blocks, households were randomly selected for survey interviewers, hired by Rutgers University and trained by the larger research collaborative, to visit their homes to attempt an interview. The sampling strategy employed by the S-CAFH team, including the stratifications can be found in the below Sampling Matrix. In this matrix, completion rates by strata are also exhibited.

### Weighting

Even when random sampling has been used, it is important to compare the resulting survey data to population data, to see whether it is representative of the population. When the resulting data is different from the population level estimates, weights are often applied in order to allow researchers to generalize the results of that data to the population as a whole. Surveys often have imperfections due to various real-world conditions which can bias population-level estimates, so these sampling weights are also used to refine such imperfections within reasonable margins of error.

The S-CAFH weighting protocol used sampling weights that (1) compensate for unequal probabilities of selection such as damage (see above), (2) compensate for non-response, and (3) adjust for weighted sample distribution among key variables of interest. Specifically, base weights were calculated to map S-CAFH respondents to the total footprint population; subsequently, adjustments to the strata (geography, damage, and poverty) were made to reflect proportional distributions in relation to census block group characteristics. In addition, potential bias due to non-response was compensated by examining differences between target and sampled households in the strata; hard-to-reach housing units were adjusted by applying a correction for areas with high prevalence of vacant rental housing units. Adjustments were also made for gender, age, and households with children so that they reflect population distributions. Standard guidelines and techniques for constructing weights were applied in making these adjustments.<sup>26, 27</sup> The overall 95% sampling error based on these adjustments is about 4%.

<sup>24</sup> Lohr, S. L. (2010). *Sampling: Design and Analysis*. Boston, MA: Brooks Cole Publishing.

<sup>25</sup> Yansaneh, I. (2005). Construction and use of sampling weights. In United Nations Department of Economic and Social Affairs, *Designing Household Survey Samples: Practical Guidelines* (pp. 119-140). New York, NY: United Nations Statistics Division.

<sup>26</sup> Valliant, R., Dever, J. A., & Kreuter, F. (2013). *Practical Tools for Designing and Weighting Survey Samples*. New York, NY: Springer.

<sup>27</sup> Moore, W., Pedlow, S., Krishnamurty, P., & Wolter, K. (2000). *National Longitudinal Survey of Youth 1997 (NLSY97)*. Chicago, IL: National Opinion Research Center (NORC).

cont'd

# APPENDIX A

## STUDY DESCRIPTION

**APPENDIX A TABLE 3. COMPARISON OF UNADJUSTED AND ADJUSTED SURVEY DATA**

	SURVEY DATA			
	UNADJUSTED		WEIGHTED	
	N	%	N	%
<b>Household Characteristics</b>	<b>1000</b>	<b>100</b>	<b>1,047,286</b>	<b>100</b>
Region				
North	325	32.5	314,186	30.0
South	675	67.5	733,100	70.0
<b>Damage</b>				
Major/Destroyed	298	29.8	115,201	11.0
Minor	156	15.6	84,256	9.0
None/Affected	543	54.3	836,782	79.9
Missing/Don't Know/Refused	3	0.3	1,047	0.01
<b>Income</b>				
<20K	104	10.4	84,831	8.1
20K-50K	224	22.4	191,653	18.3
51-99K	352	35.2	384,354	36.7
100K+	203	20.3	250,301	23.9
Missing/Don't Know/Refused	117	11.7	136,147	13.0
<b>Children Present in Home</b>				
Yes	300	30.0	382,259	36.5
No	700	70.0	665,027	63.5
<b>Individual Characteristics</b>	<b>1000</b>	<b>100</b>	<b>1,047,286</b>	<b>100</b>
Gender				
Male	419	41.9	488,035	46.6
Female	577	57.7	551,920	52.7
Missing/Don't Know/Refused	4	0.4	7,331	0.7
<b>Age</b>				
18-35	111	11.1	251,349	24.0
36-64	563	56.3	583,338	55.7
65+	326	32.6	211,552	20.3
<b>Race</b>				
Non-Hispanic White	758	75.8	745,668	71.2
Non-Hispanic Black	67	6.7	105,776	10.1
Hispanic	118	11.8	138,242	13.2
Asian Pacific Islander	26	2.6	209,457	2.0
Other	31	3.1	36,655	3.5

cont'd

# APPENDIX A

## STUDY DESCRIPTION

### Field Effort

S-CAFH Field Team members conducted face-to-face and phone surveys with residents living in the Disaster Footprint between August 2014 and April 2015. Interviewers were rigorously trained over the course of five days on field protocols and on how to utilize mobile technology to conduct the survey. Team members were assigned to work certain census block groups and led by one of three team captains who were primarily responsible for managing the field effort.

The field team started working each census block group with a list of ordered addresses per block group. To be eligible to participate in S-CAFH, sampled respondents had to be the primary resident of the household at the time of the storm. The field team attempted to survey the first 25-50 addresses on that list. Any given visit to a household could result in a variety of outcomes that the team member documented through a status code for the rest of the staff. These status codes included the following:

1. Complete: Respondent has completed the entire interview.
2. Incomplete: Respondent has completed portions of the interview but not the entire interview.
3. Not Available: Respondent answers the door but does not have time to complete the interview. Interviewer should attempt to schedule future appointment with respondent to complete the interview.
4. Soft Refusal: Respondent answers the door but has low interest in completing the survey. Interviewers should attempt to persuade respondent and flip the case.
5. Hard Refusal: Respondent answers the door and it is clear that he or she does not have any interest in participating in the study.
6. No Answer: Respondent does not answer the door.
7. Ineligible (needs follow-up from captain): Respondent was not primary resident at the time of Hurricane Sandy. No contact information is given so interviewer should return the case to the team captain for tracking and tracing.
8. Ineligible (has contact information): Respondent was not primary resident at the time of Hurricane Sandy. Interviewer is able to obtain contact information on primary resident/owner at the time of Sandy.
9. Bad Address: Address given to interviewer does not exist. Please note that this is different from finding a vacant home/lot.
10. Vacant (needs follow-up): Interviewer arrives at sampled address to find a slab or uninhabitable/vacant home. This case should be returned to the team captain for tracking and tracing.
11. No access: Interviewer arrives at sampled address to find a gated area or other barrier to physically obtaining entrance to the property. This case should be returned to the team captain for tracking and tracing.

cont'd

# APPENDIX A

## STUDY DESCRIPTION

**APPENDIX A TABLE 4A. FIELD EFFORT SUMMARY INCLUDING COOPERATION RATE AND RESPONSE RATE**

	STATUS	CALCULATION	#
A	Completed Interviews		1000
B	Eligible, no interview	[C + D + E + F + H + I + J]	3692
C	Refusal / break-off		1141
D	No contact made because no access to sampled unit		84
E	No contact made because no one reached at sampled unit		2251
F	No contact made because R away or unavailable (but elig R exists)		216
G			
H	Physically or mentally unable		**
I	Language problem		**
J	Other reason (ex: incarcerated)		0
K	Unknown eligibility, no interview	[L + M + N + O]	524
L	Not attempted		**
M	Not safe		**
N	Cannot locate housing unit		230
O	Unknown whether there is an eligible respondent present		294
P	Not eligible	[Q + R + S + T + U]	1753
Q	Not in sample / sampled in error		92
R	Not a housing unit (including vacation rentals)		87
S	Vacant / abandoned		872
T	Quota has been filled (ex: replacements not used)		261
U	No eligible respondent in unit meets criteria		441
	Response Rate	$A / [A + B + K]$ RR2*	19.2%
	Cooperation Rate	$A / [A + C]$ COOP2*	46.7%
	Refusal Rate	$C / [A + B + K]$ REF1*	21.9%

\*In accordance with "Standard Definitions: Final Dispositions of Case Codes and Outcome Rates for Surveys, Revised 2011," American Association of Public Opinion Research.

\*\*No status codes exist for these categories, as data was collected under prior AAPOR standard.

\*\*\*Completes by visit:

cont'd

# APPENDIX A

## STUDY DESCRIPTION

**APPENDIX A TABLE 4B. COMPLETED INTERVIEWS BY UNIQUE ATTEMPT**

VISIT #	# OF COMPLETES IN THIS VISIT	PROPORTION COMPLETED
1	220	22.0
2	275	27.5
3	211	21.1
4	177	17.7
5	117	11.7
Total	1000	100.0

Total # of visits, including non-completes: 17,020

Appendix A Table 4A describes the field team’s efforts in working cases to completion. Specifically, the final response rate was 19.2%, the cooperation rate was 46.4%, and the refusal rate was 22.2%. The response rate is the proportion of all eligible individuals who agreed to participate, whether or not we were able to find them and recruit them. The cooperation rate is the proportion of individuals who agreed to participate from among those individuals with whom we spoke. The field team made repeated visits to each sampled household, returning as many as five times and alternating the days of the week and time of day. As illustrated in Appendix A Table 4b, this persistence resulted in case completions: 30% of all cases were completed at either the fourth or fifth visit.

### Description of the S-CAFH Cohort

The participants in the Sandy Child and Family Health Study are representative of the 1,047,000 New Jersey residents living in the Disaster Footprint. We have assembled the cohort – principally through the sampling and weighting described above – so that the experiences, attitudes, and characteristics of the 1,000-member cohort reflect those of the actual population in this hurricane-affected area of New Jersey. This design also allows us to cross-tabulate the characteristics of people living in the Disaster Footprint so that we can estimate the size of different sub-groups, such as the rate of homeownership among people who reside in the southern part of the footprint. Appendix C Table 1 describes the composition of the cohort, as it has been weighted, in some detail. This table has been formatted so that the columns represent household-level characteristics – such as whether the household is in the North Jersey portion of the Disaster Footprint or the South Jersey, how much damage the home sustained in the storm, whether there are children living in the house, and household income – and the rows represent selected individual-level characteristics of the residents – their gender, age, race/ethnicity, marital status, education, and homeownership status.

Approximately one-third of the population of this hurricane-affected area is in the north and two-thirds in the south. A little over a third of all residents are living in homes with minor children present. Approximately 10% of residents live in households earning less than \$20,000 per year.

According to population data, and as illustrated in the maps in Appendix A Figure 1, there are some widespread differences between North and South Jersey. The three southern counties, Ocean, Cape May and Atlantic



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# APPENDIX A

## STUDY DESCRIPTION

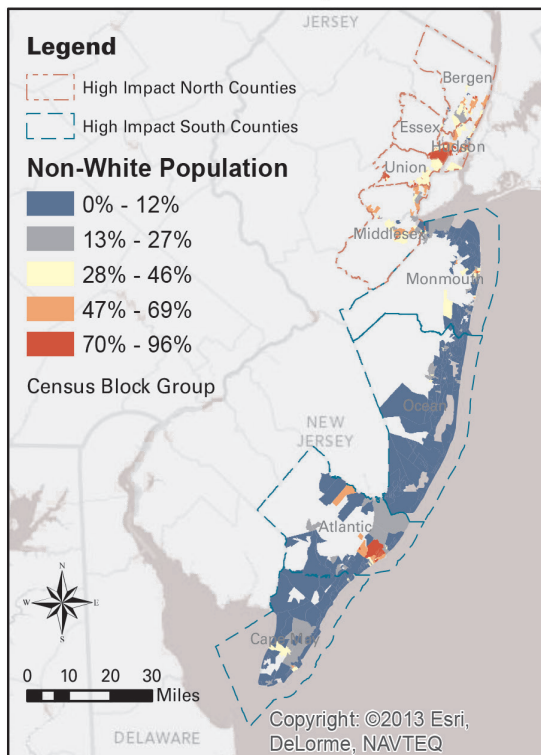
County, are overwhelmingly white, with most neighborhoods between 70% and 96% white. The six northern counties, Bergen, Essex, Hudson, Union, Monmouth, and Middlesex, are considerably more diverse. A similar economic divide can be seen in the map displaying the proportion of residents who are “Poor or Struggling”<sup>28</sup> in which there are greater numbers of pockets of poverty up north than in the south.

## Demographics

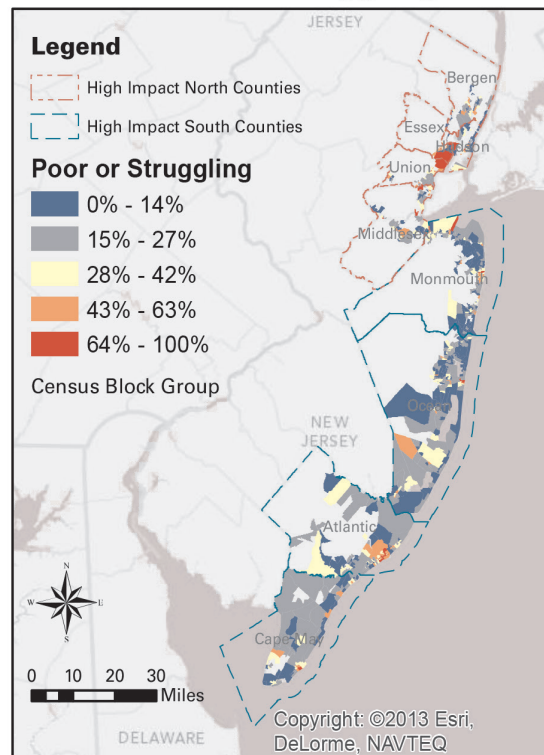
Appendix A Figure 1

Demographics

### Non-White Population



### Poor or Struggling



<sup>28</sup> A designation of “Poor or Struggling” is based on the ratio of income to poverty level, using data from the US Census’s American Community Survey, as supplied by Social Explorer. A ratio of under 1.0 indicates a population who is doing poorly, 1.00-1.99 indicates a population who is struggling, under 2.0 is poor or struggling and over 2.0 is doing moderately better. The values depicted in the map indicate the percentage of the census block group population who is doing poorly or struggling (population with a ratio of less than two divided by the total population in the census block).

cont'd

# APPENDIX A

## STUDY DESCRIPTION

A more detailed portrait of the cohort, as illustrated in Appendix C Table 1, also reveals differences in the types of individuals who comprise the households when they are categorized by north or south, by housing damage, by children living in the home, or by income:

- Women are more likely to be represented in homes with children, and in lower-income homes;
- The population in the south is older, with proportionately twice as many seniors over 65 than in the north;
- In the south there are proportionately more homeowners, more highly educated residents, and more people who report that they are married or partnered; and
- White and black residents are over-represented in the wealthiest income brackets, whereas Hispanic residents are over-represented in the lowest income brackets.

# APPENDIX B

## HOW TO INTERPRET STATISTICAL TABLES

Data tables like the ones presented in Appendix C can sometimes be difficult to interpret. To help the reader interpret the data tables presented here, we have included this guide. The boxes on this page each correspond to an explanation on the next page. One thing to note in viewing the table below is the use of grey shading within a given row heading; this is done to indicate when results should be read as a row rather than column percentage.

**TABLE 3. HOUSING DAMAGE BY INDIVIDUAL CHARACTERISTICS (COLUMN %)**

	ALL	GENDER		AGE				RACE / ETHNICITY				
		MALE	FEMALE	19-35	36-49	50-65	66+	NON-HISPANIC WHITE	NON- HISPANIC BLACK	HISPANIC	ASIAN/ PACIFIC ISLANDER	OTHER <sup>1</sup>
<b>FEMA Damage Level<sup>2</sup></b>												
No Damage	24.0	26.2	22.3	22.6	21.4	23.6	26.9	23.5	30.2	26.3	21.1	22.7
Minor/Affected	49.8	50.8	49.3	50.0	55.7	50.0	45.1	48.8	51.2	49.1	63.2	54.6
Major/Destroyed	26.2	23.0	28.5	27.4	22.9	26.4	28.0	27.8	18.6	24.6	15.8	22.7
<b>Type of Damage</b>												
Wind	46.1	41.8	48.1	45.2	51.9	46.3	39.6	46.1	37.2	47.4	26.3	54.6
Flood	64.5	63.5	65.2	61.3	61.8	66.2	65.0	64.8	53.5	63.2	84.2	59.1
Mold	32.0	30.7	32.7	37.1	35.9	30.6	28.8	30.0	39.5	35.1	47.4	36.4
<b>Loss of Utility<sup>3</sup></b>												
Heat	84.3	82.4	85.3	83.9	85.5	86.6	80.2	84.3	83.7	86.0	94.7	72.7
Hot Water	73.0	71.7	73.7	74.2	68.7	77.8	69.5	73.0	72.1	75.4	94.7	54.6
Electricity	90.6	90.6	90.5	93.6	93.9	88.9	88.7	90.5	90.7	91.2	100.0	81.8

Margins of error for all cells are +/-5 percentage points. P-values are indicated in the left corner cell of a given section as the following: \* ≤ 0.05 \*\* ≤ 0.01 \*\*\* ≤ 0.001

**Footnotes to Table 3:**

<sup>1</sup> Other includes Native American and Multiracial.

# APPENDIX B

## HOW TO INTERPRET STATISTICAL TABLES

### Elements of Data Tables

- **Table Title:** Each table in this and subsequent reports includes a title that provides a brief description of the content of the table. In the sample table above, you can see that we are describing “Housing Damage” (Left Column) by “Individual Characteristics” (Top Row), and that the numbers in the columns should be read as percentages “column %.”
- **Row Headings:** The left column of the table lists category names in bold followed by the survey options for each category. In the table above, the “Row Headings” arrow is pointing to “Type of Damage.” Under this category in the survey, respondents are able to choose “Wind,” “Flood,” or “Mold” to describe the type of damage they experienced.
- **Column Headings:** The top row of the table lists category names in bold. Under these headings, you will see split columns that include divisions within that variable. In the table above, the “Column Headings” arrow is pointing to “Race/Ethnicity.” This variable is then further divided into “Non-Hispanic White,” “Non-Hispanic Black,” “Hispanic,” “Asian/Pacific Islander,” and “Other.”
- **Column Percentages:** Aside from the sample row labeled N, all numbers should be read as column percentages. In the sample table, you can see an arrow pointing to 3 values in the column labeled “Female” within the survey category of “FEMA Damage Level.” The appropriate way to read this statistic is “Of all the females that responded to the question regarding FEMA Damage Level, 22.3 experienced no damage, 49.3 had property that was affected or experienced minor damage, and 28.5 had major damage or their property was destroyed.”
- **Margin of Error:** The margin of error expresses the amount of random sampling error in a survey’s results. It represents the likelihood that the result from a sample is close to the number one would get if the whole population had been surveyed. In this case the margin of error is plus or minus five percentage points, meaning that the population statistic is likely within that range.
- **Statistical Significance:** A p-value helps to determine statistical significance by describing the probability of observing such a large difference if the findings were purely by chance in two groups of exactly the same people. For example, a p-value of 0.01 (or 1%) would mean that the probability of obtaining a difference between two groups that is this large (or larger) is 1%, assuming that the two groups are in fact NOT different. The smaller the p value, the more evidence we have to reject the null hypothesis in favor of the research hypothesis. Statistical significance is identified by asterisks that correspond to the levels of \*  $\leq 0.05$  \*\*  $\leq 0.01$  \*\*\*  $\leq 0.001$ .
- **Footnotes:** These are table notes that will be used to provide further clarification on category definitions, data points, or anything else that may not be self-explanatory.
- **Total:** The total column will represent a weighted population figure.

# APPENDIX C

## PERSON REPORT DATA TABLES

**APPENDIX C TABLE 1. S-CAFH SURVEY RESPONDENTS (COLUMN % WEIGHTED DATA)**

	ALL	REGION <sup>1</sup>		DAMAGE <sup>2</sup>				CHILDREN IN THE HOME		INCOME				
		NORTH	SOUTH	NONE/AFF	MINOR	MAJOR/DEST	M/D/R <sup>3</sup>	YES	NO	<\$20K	\$20-50K	\$51-99K	\$100K+	M/D/R
<b>Overall (row %)</b>		30.0	70.0	80.0	9.0	11.0	<0.01	36.5	63.5	8.1	18.3	36.7	23.9	13.0
<b>Gender</b>														
Male	46.6	49.1	45.5	45.4	59.1	45.5	36.3	35.5***	53.0	34.7	51.3	52.0	46.9	31.5
Female	52.7	50.8	53.6	53.9	40.2	54.4	63.7	64.5	46.0	64.6	45.6	48.0	52.8	68.5
M/D/R	0.7	0.1	0.9	0.8	0.7	0.1	0.0	<0.01	1.0	0.8	3.0	0.0	0.2	0.0
<b>Age</b>														
19-35	24.0	43.0**	15.9	25.6	4.7	29.0	0.0	33.9***	18.4	30.8**	22.9	19.9	13.6	52.5
36-64	55.7	44.8	60.4	55.3	75.6	43.0	0.0	65.1	50.4	39.0	42.2	60.2	76.3	34.4
65+	20.2	12.3	23.7	19.1	19.7	28.0	100.0	1.1	31.2	30.2	34.9	19.9	10.0	13.1
<b>Race / Ethnicity</b>														
Non-Hispanic White	75.8	33.0***	88.4	69.6	76.1	86.6	100.0	58.3**	80.1	66.8*	63.7	73.9	81.4	64.1
Non-Hispanic Black	6.7	23.1	4.8	12.2	2.9	1.8	0.0	13.9	8.0	4.1	8.7	8.7	14.9	11.5
Hispanic	11.8	31.7	5.8	13.3	18.0	10.5	0.0	21.8	8.5	28.9	22.5	11.0	2.3	18.5
Asian/Pacific Islander	2.6	5.3	0.7	2.4	1.5	<0.01	0.0	2.6	1.8	<0.01	3.1	2.3	1.4	2.7
Other including M/D/R	3.1	6.9	0.4	2.6	1.6	1.1	0.0	3.4	1.7	0.3	2.0	4.1	<0.01	3.2
<b>Marital Status</b>														
Married/Partnered	57.5	48.1***	61.6	58.8	65.6	41.4	26.9	72.6***	48.9	27.0***	47.8	59.8	87.8	27.8
Single, never married	24.4	38.7	18.2	24.2	18.9	30.3	36.3	18.5	27.7	42.0	22.9	21.2	7.2	55.9
Separated/Divorced/Widowed	18.1	13.2	20.1	17.0	14.7	28.3	36.	9.0	23.2	31.0	29.3	19.0	5.0	15.3
M/D/R	0.1	0.0	0.2	<0.01	0.9	0.1	0.0	0.0	0.2	0.0	0.0	0.0	0.0	1.0
<b>Education</b>														
Less than high school	4.7	5.7*	4.2	4.2	11.0	2.5	36.8	6.5	3.6	18.6*	11.2	2.0	<0.01	2.9
High school graduate	54.9	62.5	51.6	54.4	55.6	57.9	36.3	53.5	55.7	55.7	67.5	55.1	39.8	63.8
College graduate	24.5	23.4	24.9	25.5	26.7	14.9	26.9	23.6	24.9	11.1	11.2	23.4	40.2	25.4
Graduate degree	15.5	6.9	19.2	15.3	6.4	24.3	0.0	15.5	15.4	14.3	10.0	18.6	20.0	6.6
Other including M/D/R	0.5	1.5	<0.01	0.6	<0.01	0.4	0.0	0.9	0.3	0.3	0.2	0.8	0.0	1.4
<b>Homeownership Status</b>														
Homeowner	83.3	70.1*	89.0	82.0	93.9	84.4	63.2	75.9*	87.6	53.3**	77.0	86.1	92.5	86.3
Renter	15.4	29.9	9.2	16.4	6.1	15.7	36.8	22.0	11.6	41.9	23.0	13.9	3.9	13.7
Other including M/D/R	1.3	0.0	1.8	1.6	0.0	0.0	0.0	2.2	0.7	4.8	0.0	0.0	3.6	0.0

Margins of error for all cells are +/-5 percentage points and based on surveys of 1,000 New Jersey residents, representing 1,047,000 people in the Disaster Footprint. P-values are indicated in the left corner cell of a given section as the following: \* ≤ 0.05 \*\* ≤ 0.01 \*\*\*≤0.001

<sup>1</sup> North: Bergen, Essex, Hudson, Union, Middlesex Counties; South: Atlantic, Cape May, Monmouth, Ocean.

<sup>2</sup> These categories reflect federal definitions of damage: Destroyed - total loss of structure, structure is not economically feasible to repair, or complete failure to major structural components; Major Damage - substantial failure to structural elements of residence (e.g., walls, floors, foundation), or damage that will take more than 30 days to repair and the home could not be lived in during this time; Minor Damage - home is damaged and uninhabitable, but may be made habitable in a short period of time with repairs; or Affected - some damage to the structure and contents, but still habitable. Destroyed and Major Damage have been combined into one category and No Damage and Affected have been combined into one category.

<sup>3</sup> M/D/R:Missing/Don't Know/Refused.

**APPENDIX C TABLE 2. EXPOSURE AND HEALTH STATUS BY HOUSEHOLD CHARACTERISTICS (COLUMN %)**

	ALL	REGION <sup>1</sup>		DAMAGE <sup>2</sup>			CHILDREN IN THE HOME		INCOME			
		NORTH	SOUTH	NONE/AFF	MINOR	MAJOR/DEST	YES	NO	<\$20K	\$20-50K	\$51-99K	\$100K+
<b>Direct Exposure to Sandy</b>												
% who report loss of life in their household	0.1	<0.01	0.0	<0.01	0.0**	<0.01	<0.01	0.0	0.0	<0.01	<0.01	0.0
% who report illness or injury in household	7.1	6.7	4.4	7.7	3.8**	16.2	20.4	7.2	15.5	5.3	8.0	4.7
% who report loss of pet in their household	1.1	1.3	2.1	0.9	0.9	1.4	3.9	2.0**	0.9	0.7	1.8	1.6
<b>Summary Measure: % who had at least one of these exposures</b>	7.8	7.6	6.4	8.1	4.5***	16.8	22.2	8.7	16.2	5.8	9.2	6.0
<b>Direct Exposure to Sandy</b>												
% with direct contact with flood	32.2	28.1	34.0	27.7**	47.1	52.9	32.9	31.9	35.1	27.5	40.6	33.3
% with direct contact with debris	56.4	49.3	59.5	52.5*	61.4	81.1	54.4	57.6	54.9	41.1	62.4	60.6
% with direct contact with mold	22.0	18.7	23.4	16.7***	27.1	56.1	22.9	21.5	43.3**	19.4	24.6	14.8
<b>Summary Measure: % who had at least one of these exposures</b>	63.9	57.2	66.8	60.0*	66.6	89.9	62.5	64.7	60.2	56.2	64.5	69.6
<b>Overall Health Status</b>												
% who report their health as excellent/very good/good	89.2	88.8	89.3	89.5	87.6	89.2	90.5	88.5	81.6	91.2	88.5	91.3
% who report their health as fair or poor	10.8	11.2	10.7	10.5	12.4	10.8	9.5	11.5	18.4	8.8	11.5	8.7
<b>Physical Health Related Quality of Life</b>												
% with a poor physical quality of life <sup>3</sup>	25.0	22.9	25.9	25.1	22.3	26.2	18.8*	28.6	48.2	26.2	24.9	21.8
% with a good physical quality of life	75.0	77.1	74.1	74.9	77.7	73.8	81.2	71.4	51.8	73.8	75.1	78.2

Margins of error for all cells are +/-5 percentage points and based on surveys of 1,000 New Jersey residents, representing 1,047,000 people in the Disaster Footprint. P-values are indicated in the left corner cell of a given section as the following: \* ≤ 0.05 \*\* ≤ 0.01 \*\*\* ≤ 0.001

<sup>1</sup> North: Bergen, Essex, Hudson, Union, Middlesex Counties; South: Atlantic, Cape May, Monmouth, Ocean.

<sup>2</sup> These categories reflect federal definitions of damage: Destroyed - total loss of structure, structure is not economically feasible to repair, or complete failure to major structural components; Major Damage - substantial failure to structural elements of residence (e.g., walls, floors, foundation), or damage that will take more than 30 days to repair and the home could not be lived in during this time; Minor Damage - home is damaged and uninhabitable, but may be made habitable in a short period of time with repairs; or Affected - some damage to the structure and contents, but still habitable.

<sup>3</sup> Poor physical quality of life is determined by a score below 45.0 in the Physical Composite Score (PCS) of the Short Form-12 Scale.

**APPENDIX C TABLE 3. EXPOSURE AND HEALTH STATUS BY INDIVIDUAL CHARACTERISTICS (COLUMN %)**

	ALL	GENDER		AGE			RACE / ETHNICITY				
		MALE	FEMALE	19-35	36-64	65+	NON-HISPANIC WHITE	NON- HISPANIC BLACK	HISPANIC	ASIAN/ PACIFIC ISLANDER	OTHER <sup>1</sup>
<b>Direct Exposure to Sandy</b>											
% who report loss of life in their household	<0.01	0.1	<0.01	0.0	<0.01	0.4	0.1	0.0	0.0	0.0	0.0
% who report illness or injury in household	6.7	5.5	7.8	5.5	7.3	6.6	7.2	1.5	10.8	0.1	0.6
% who report loss of pet in their household	1.3	1.5	1.0	0.3**	2.1	0.1	0.8	2.4	3.6	0.0	0.0
<b>Summary measure: % who had at least one of these exposures</b>	7.6	6.7	8.4	5.7	8.7	6.7	7.5	4.0	13.9	0.1	0.6
<b>Individual Exposure to Sandy-related Hazards</b>											
% with direct contact with flood	32.2	35.7	29.4	24.7	34.8	34.0	34.7	21.2	30.9	36.2	17.8
% with direct contact with debris	56.4	59.0	54.8	51.2	58.4	57.3	61.2	54.1	39.0	62.2	37.5
% with direct contact with mold	22.0	19.5	24.4	22.0	20.2	27.0	22.1	16.5	27.1	33.7	8.5
<b>Summary measure: % who had at least one of these exposures</b>	63.9	63.5	64.9	60.1	64.8	65.8	68.0	55.5	54.8	78.2	37.5
<b>Overall Health Status</b>											
% who report their health as excellent/very good/good	89.2	86.4	91.6	97.5**	87.8	83.2	87.7	95.2	91.0	96.1	88.8
% who report their health as fair or poor	10.8	13.6	8.4	2.5	12.2	16.8	12.3	4.8	9.0	3.9	11.2
<b>Physical Health Related Quality of Life</b>											
% with a poor physical quality of life <sup>2</sup>	25.0	25.8	23.5	6.8***	25.0	46.6	28.3*	20.9	18.0	5.9	5.8
% with a good physical quality of life	75.0	74.2	76.5	93.2	75.0	53.4	71.7	79.1	82.0	94.1	94.2

Margins of error for all cells are +/-5 percentage points and based on surveys of 1,000 New Jersey residents, representing 1,047,000 people in the Disaster Footprint. P-values are indicated in the left corner cell of a given section as the following: \* ≤ 0.05 \*\* ≤ 0.01 \*\*\*≤0.001

<sup>1</sup> Other includes Native American, Multiracial, and Missing/Don't Know/Refused.

<sup>2</sup> Poor physical quality of life is determined by a score below 45.0 in the Physical Composite Score (PCS) of the Short Form-12 Scale.



**APPENDIX C TABLE 4. PHYSICAL HEALTH BY HOUSEHOLD CHARACTERISTICS (COLUMN %)**

	ALL	REGION <sup>1</sup>		DAMAGE <sup>2</sup>			CHILDREN IN THE HOME		INCOME			
		NORTH	SOUTH	NONE/AFF	MINOR	MAJOR/DEST	YES	NO	<\$20K	\$20-50K	\$51-99K	\$100K+
<b>Change in Overall Health since Sandy</b>												
% who report their health has IMPROVED	13.2	11.0	14.2	14.1	8.3	10.5	19.4	9.7	7.0	7.0	15.9	22.1
% who report their health has WORSENERD	13.0	6.9	15.6	12.4	10.5	19.1	11.1	14.0	12.2	12.0	15.0	13.0
% who report their health has REMAINED THE SAME	73.8	82.1	70.2	73.5	81.2	70.5	69.5	76.3	80.8	81.0	69.1	64.9
<b>Report of selected medical conditions</b>												
% with Hypertension before Sandy	29.7	18.8*	34.3	29.6	32.8	27.6	12.6***	39.5	33.9	40.6	29.4	27.7
% diagnosed with Hypertension after Sandy	6.6	5.2	7.2	6.4	10.8	3.8	5.0	7.5	5.7	11.3	4.3	6.2
% with Diabetes before Sandy	8.4	10.8	7.3	8.4	12.3	4.9	7.8	8.7	13.5	13.4	5.0	9.1
% diagnosed with Diabetes after Sandy	0.9	1.0	0.9	0.9	1.2	1.0	0.3	1.3	0.7	3.1	0.7	0.0
% with Asthma before Sandy	9.1	11.4	8.1	9.9	5.7	6.2	8.1	9.7	18.7*	16.4	6.3	7.5
% diagnosed with Asthma after Sandy	1.6	0.5	2.1	1.3	4.4	1.4	0.7	2.1	3.2	0.5	2.8	0.7
% with Stroke before Sandy	3.2	2.6	3.4	3.5	0.5	2.6	3.3	3.0	4.5	2.1	5.0	1.8
% diagnosed with Stroke after Sandy	1.2	0.4	1.6	1.1	0.6	2.5	0.5	1.6	1.2	2.8	1.6	<0.01
% with Cancer before Sandy	9.1	5.3	10.7	9.2	3.9	12.0	2.4**	12.9	3.5	12.1	11.9	6.8
% diagnosed with Cancer after Sandy	1.3	0.5	1.6	1.3	0.5	1.9	0.3	1.8	0.0	0.4	3.0	0.2
% with Heart Disease before Sandy	9.6	6.6	10.8	8.7	7.3	16.7	5.1**	12.1	7.3**	17.2	12.7	1.8
% diagnosed with Heart Disease after Sandy	2.7	1.3	3.3	3.1	1.7	1.3	0.7	3.9	0.0	2.5	0.9	5.5

Margins of error for all cells are +/-5 percentage points and based on surveys of 1,000 New Jersey residents, representing 1,047,000 people in the Disaster Footprint. P-values are indicated in the left corner cell of a given section as the following: \* ≤ 0.05 \*\* ≤ 0.01 \*\*\*≤0.001

<sup>1</sup> North: Bergen, Essex, Hudson, Union, Middlesex Counties; South: Atlantic, Cape May, Monmouth, Ocean.

<sup>2</sup> These categories reflect federal definitions of damage: Destroyed - total loss of structure, structure is not economically feasible to repair, or complete failure to major structural components; Major Damage - substantial failure to structural elements of residence (e.g., walls, floors, foundation), or damage that will take more than 30 days to repair and the home could not be lived in during this time; Minor Damage - home is damaged and uninhabitable, but may be made habitable in a short period of time with repairs; or Affected - some damage to the structure and contents, but still habitable.

**APPENDIX C TABLE 5. PHYSICAL HEALTH BY INDIVIDUAL CHARACTERISTICS (COLUMN %)**

	ALL	GENDER		AGE			RACE / ETHNICITY				
		MALE	FEMALE	19-35	36-64	65+	NON-HISPANIC WHITE	NON- HISPANIC BLACK	HISPANIC	ASIAN/ PACIFIC ISLANDER	OTHER <sup>1</sup>
<b>Change in Overall Health since Sandy</b>											
% who report their health has IMPROVED	13.2	15.2	10.6	7.8*	18.6	5.0	14.0	20.1	7.4	5.8	6.1
% who report their health has WORSENERD	13.0	8.5	16.9	5.6	15.2	15.6	14.4	7.7	13.3	3.9	4.4
% who report their health has REMAINED THE SAME	73.8	76.3	72.5	86.6	66.3	79.4	71.6	72.2	79.3	90.3	89.5
<b>Report of selected medical conditions</b>											
% with Hypertension before Sandy	29.7	36.3***	23.0	5.2***	27.6	64.5	31.9*	48.5	11.4	3.1	14.4
% diagnosed with Hypertension after Sandy	6.6	4.2	8.7	1.2	9.3	5.4	7.6	3.1	5.7	5.6	0.4
% with Diabetes before Sandy	8.4	12.1*	5.2	0.0*	8.2	18.8	8.4	17.5	2.9	6.8	0.6
% diagnosed with Diabetes after Sandy	0.9	0.5	1.4	0.0	1.6	0.4	1.0	1.9	<0.01	0.0	0.0
% with Asthma before Sandy	9.1	8.3	8.9	8.5	9.0	10.1	8.9	11.0	7.8	17.8	11.1
% diagnosed with Asthma after Sandy	1.6	0.6	2.4	0.2	2.5	1.0	2.0	0.9	0.9	0.0	0.0
% with Stroke before Sandy	3.2	4.8	1.7	0.1*	4.3	3.6	3.8	3.9	<0.01	0.0	0.6
% diagnosed with Stroke after Sandy	1.2	1.2	1.2	0.0	0.6	4.3	1.6	0.0	0.5	0.0	0.2
% with Cancer before Sandy	9.1	11.6***	6.9		5.0	30.9	11.1	11.0	0.3	<0.01	0.0
% diagnosed with Cancer after Sandy	1.3	0.2	2.3	0.0	1.9	1.3	1.8	0.0	0.3	0.0	0.0
% with Heart Disease before Sandy	9.6	12.8*	6.8	1.3***	5.7	29.9	11.5	8.4	2.3	0.0	7.6
% diagnosed with Heart Disease after Sandy	2.7	3.2	2.4	0.0	3.1	4.8	3.4	1.1	0.7	<0.01	3.7

Margins of error for all cells are +/-5 percentage points and based on surveys of 1,000 New Jersey residents, representing 1,047,000 people in the Disaster Footprint. P-values are indicated in the left corner cell of a given section as the following: \* ≤ 0.05 \*\* ≤ 0.01 \*\*\*≤0.001

<sup>1</sup> Other includes Native American, Multiracial, and Missing/Don't Know/Refused.

**APPENDIX C TABLE 6. EMOTIONAL AND PSYCHOLOGICAL HEALTH AND WELL-BEING BY HOUSEHOLD CHARACTERISTICS (COLUMN %)**

	ALL	REGION <sup>1</sup>		DAMAGE <sup>2</sup>			CHILDREN IN THE HOME		INCOME			
		NORTH	SOUTH	NONE/AFF	MINOR	MAJOR/DEST	YES	NO	<\$20K	\$20-50K	\$51-99K	\$100K+
<b>Mental Health Issues since Sandy</b>												
% with Post-Traumatic Stress Disorder <sup>3</sup>	5.8	9.4	4.2	3.5***	16.5	13.4	6.9	5.2	8.7**	10.2	5.4	1.3
% who report wanting to speak to someone about emotional or psychological issues in the past month	14.6	11.5	15.9	13.8	16.8	19.1	13.9	15.0	24.0	16.3	16.7	7.1
<b>Mental Health Related Quality of Life</b>												
% without mental health distress <sup>4</sup>	84.1	86.7	83.0	85.9	80.3	74.5	78.0	87.6	79.0*	78.8	79.8	94.1
% with moderate mental health distress	5.6	4.4	6.2	4.2*	10.6	11.7	4.7	6.1	5.8*	10.5	6.5	2.1
% with severe mental health distress	10.3	8.9	10.9	10.0	9.1	13.8	17.3*	6.3	15.2	10.7	13.7	3.8
<b>Depression and Anxiety</b>												
% with Depression or Anxiety before Sandy	15.8	7.9*	19.2	15.7	20.4	12.6	13.0	17.4	27.2	15.8	15.7	14.9
% diagnosed with Depression or Anxiety after Sandy	4.0	3.6	4.2	4.2	0.4	5.6	1.9	5.3	8.8	2.4	5.8	1.2
<b>Risk Behaviors</b>												
% who presently smoke	18.8	25.2**	16.0	19.4	10.6	21.2	17.2	19.7	26.8*	22.2	14.9	10.3
% of smokers smoking more since Sandy	30.5	24.3	34.8	30.8	16.3	34.6	32.4	29.6	44.8	31.6	47.3	20.9
% who had no alcohol consumption in prior 6 months	24.3	37.3**	18.7	23.7	21.4	30.8	29.8	21.1	36.2	33.9	16.9	18.5
% who consumed alcohol 1-6 times in prior 6 months	33.9	34.4	33.7	35.5	33.5	22.0	32.3	34.8	49.0	36.3	33.5	32.6
% who consumed alcohol 1-5 times per week in prior 6 months	32.9	22.9	37.2	33.2	21.7	40.4	34.4	32.1	10.9	21.7	38.7	39.7
% who consumed alcohol almost daily in prior 6 months	8.9	5.4	10.4	7.6	23.4	6.8	3.5	12.0	3.9	8.1	10.9	9.3
% of all who consumed alcohol who are drinking more since Sandy	8.3	6.0	9.0	4.9*	26.9	17.8	9.3	7.8	1.7	6.9	9.8	8.3
<b>Summary Measure: % of all who are problem drinkers<sup>5</sup></b>	7.0	8.4	6.5	7.1	6.7	6.1	10.8	5.0	5.2	4.1	8.8	7.4

Margins of error for all cells are +/- percentage points and based on surveys of 1,000 New Jersey residents, representing 1,047,000 people in the Disaster Footprint. P-values are indicated in the left corner cell of a given section as the following: \* ≤ 0.05 \*\* ≤ 0.01 \*\*\* ≤ 0.001

<sup>1</sup> North: Bergen, Essex, Hudson, Union, Middlesex Counties; South: Atlantic, Cape May, Monmouth, Ocean.

<sup>2</sup> These categories reflect federal definitions of damage: Destroyed - total loss of structure, structure is not economically feasible to repair, or complete failure to major structural components; Major Damage - substantial failure to structural elements of residence (e.g., walls, floors, foundation), or damage that will take more than 30 days to repair and the home could not be lived in during this time; Minor Damage - home is damaged and uninhabitable, but may be made habitable in a short period of time with repairs; or Affected - some damage to the structure and contents, but still habitable.

<sup>3</sup> Based on a score of six or greater on the Trauma Screening Questionnaire (TSQ).

<sup>4</sup> Mental health distress is based on a below in the Mental Composite Score (MCS) of the Short Form-12 Scale; severe mental health distress are those below 37 on this scale.

<sup>5</sup> Based on a score of greater than two on the CAGE Screening Tool which consists of the following four questions: Have you ever felt you needed to Cut down on your drinking? Have you ever felt Annoyed you by criticizing your drinking? Have you ever felt Guilty about drinking? Have you ever felt you needed a drink first thing in the morning (Eye-opener) to steady your nerves or to get rid of a hangover?

**APPENDIX C TABLE 7. EMOTIONAL AND PSYCHOLOGICAL HEALTH AND WELL-BEING BY INDIVIDUAL CHARACTERISTICS (COLUMN %)**

	ALL	GENDER		AGE			RACE / ETHNICITY				
		MALE	FEMALE	19-35	36-64	65+	NON-HISPANIC WHITE	NON- HISPANIC BLACK	HISPANIC	ASIAN/ PACIFIC ISLANDER	OTHER <sup>1</sup>
<b>Mental Health Issues since Sandy</b>											
% with Post-Traumatic Stress Disorder <sup>2</sup>	5.8	4.2	7.1	3.0	7.0	6.0	3.5***	4.8	19.6	0.2	7.5
% who report wanting to speak to someone about emotional or psychological issues in the past month	14.6	11.7	17.2	9.0	16.2	16.9	14.6	10.2	22.0	0.1	11.2
<b>Mental Health Related Quality of Life</b>											
% without mental health distress <sup>3</sup>	84.1	88.4	81.2	84.3	82.7	87.7	84.7	89.7	81.1	84.0	50.0
% with moderate mental health distress	5.6	3.9	6.2	4.0	6.5	5.1	6.1	2.4	6.5	6.6	<0.01
% with severe mental health distress	10.3	7.7	12.6	11.7	10.8	7.1	9.2*	7.9	12.4	9.4	49.9
<b>Depression and Anxiety</b>											
% with Depression or Anxiety before Sandy	15.8	10.7**	19.4	7.0	21.0	11.9	19.2	1.7	12.6	0	11.2
% diagnosed with Depression or Anxiety after Sandy	4.0	2.7	5.3	2.6	4.2	5.4	5.1	1.7	1.9	<0.01	0
<b>Risk Behaviors</b>											
% who presently smoke among ever smoked	18.8	17.3	19.1	27.5	18.6	9.0	18.0	28.3	18.2	17.9	13.3
% of smokers smoking more since Sandy	30.5	38.1	19.9	17.1	33.1	63.3	29.8	24.9	43.0	0.6	45.6
% who had no alcohol consumption in prior 6 months	24.3	26.0	23.0	23.4	24.2	25.8	20.0**	49.4	29.4	40.1	13.2
% who consumed alcohol 1-6 times in prior 6 months	33.9	31.8	35.0	39.1	32.8	30.6	30.7	28.7	54.3	24.4	18.9
% who consumed alcohol 1-5 times per week in prior 6 months	32.9	30.4	35.5	32.1	35.2	27.5	38.6	14.6	15.0	35.5	53.9
% who consumed alcohol almost daily in prior 6 months	8.9	11.8	6.5	5.4	7.8	16.1	10.7	7.3	1.3	<0.01	14.0
% of all who consumed alcohol who are drinking more since Sandy	8.3	12.3	5.0	3.3	10.1	9.3	8.6	0.4	7.7	26.6	14.7
<b>Summary Measure: % of all who drink who are problem drinkers<sup>4</sup></b>	7.0	10.2**	4.2	5.0	9.3	2.8	7.3***	1.6	0.9	56.3	12.2

Margins of error for all cells are +/-5 percentage points and based on surveys of 1,000 New Jersey residents, representing 1,047,000 people in the Disaster Footprint. P-values are indicated in the left corner cell of a given section as the following: \* ≤ 0.05 \*\* ≤ 0.01 \*\*\* ≤ 0.001

<sup>1</sup> Other includes Native American, Multiracial, and Missing/Don't Know/Refused.

<sup>2</sup> Based on a score of six or greater on the Trauma Screening Questionnaire (TSQ).

<sup>3</sup> Mental health distress is based on a score below 42 in the Mental Composite Score (MCS) of the Short Form-12 Scale; severe mental health distress are those below 37 on this scale.

<sup>4</sup> Based on a score of greater than two on the CAGE Screening Tool which consists of the following four questions: Have you ever felt you needed to Cut down on your drinking? Have people Annoyed you by criticizing your drinking? Have you ever felt Guilty about drinking? Have you ever felt you needed a drink first thing in the morning (Eye-opener) to steady your nerves or to get rid of a hangover?

**APPENDIX C TABLE 8. SOCIAL HEALTH AND WELL-BEING BY HOUSEHOLD CHARACTERISTICS (COLUMN %)**

	ALL	REGION <sup>1</sup>		DAMAGE <sup>2</sup>			CHILDREN IN THE HOME		INCOME			
		NORTH	SOUTH	NONE/AFF	MINOR	MAJOR/DEST	YES	NO	<\$20K	\$20-50K	\$51-99K	\$100K+
<b>Social support</b>												
% who report strong social support networks	75.5	74.4	76.0	77.3*	64.7	71.5	79.9	73.0	39.7***	51.6	83.9	91.1
% who report moderate social support networks	15.6	14.6	16.0	16.0	11.5	15.6	12.6	17.3	33.0	33.8	10.0	5.3
% who report weak or absent social support networks	8.9	11.0	8.0	6.7	23.8	12.9	7.5	9.7	27.3	14.6	6.1	3.6
<b>Family Functioning</b>												
% who report highly-functioning families	64.4	63.1	65.0	65.7	53.6	64.0	78.1**	56.6	47.8**	49.0	67.0	79.4
% who report poorly-functioning families	35.6	36.9	35.0	34.3	46.4	36.0	21.9	43.4	52.2	51.0	33.0	20.6
<b>Changing social roles</b>												
<b>Community-focused role: % who report roles of advocate/teacher/creator/volunteer are important</b>	89.2	86.4	90.6	89.6	83.9	93.5	95.2*	85.1	91.7	84.7	92.3	85.3
% who indicated Sandy had positive change on role among those who report role	4.2	5.8	3.5	4.0**	2.5	9.9	8.3*	2.1	2.5	3.4	6.3	3.8
% who indicated Sandy had negative change on role among those who report role	1.1	2.5	0.4	0.4	6.2	2.6	1.9	0.7	0.2	1.5	1.7	0.4
<b>Resource-focused role: % who report roles of wage-earner/leader/problem-solver as important</b>	95.4	97.0	94.5	95.8	90.1	98.0	96.1	95.0	95.4	89.2	97.0	95.4
% who indicated Sandy had positive change on role among those who report role	6.5	10.3	4.8	4.9*	2.2	26.1	7.5	6.0	1.4	3.0	10.5	3.2
% who indicated Sandy had negative change on role among those who report role	2.7	2.1	3.0	2.0	8.1	3.7	3.0	2.5	13.1	3.1	1.9	0.4
<b>Home-focused role: % who report roles of caregiver or homemaker as important</b>	95.0	94.5	95.2	94.1*	99.0	98.0	95.8	94.4	95.1	92.3	96.4	94.2
% who indicated Sandy had positive change on role among those who report role	12.1	14.6	11.1	10.2	17.4	25.0	16.3	9.2	9.6	7.7	13.2	14.3
% who indicated Sandy had negative change on role among those who report role	2.5	2.5	2.5	1.5	8.5	6.0	2.1	2.8	13.0	0.7	2.6	0.7

Margins of error for all cells are +/- percentage points and based on surveys of 1,000 New Jersey residents, representing 1,047,000 people in the Disaster Footprint. P-values are indicated in the left corner cell of a given section as the following: \* ≤ 0.05 \*\* ≤ 0.01 \*\*\* ≤ 0.001

<sup>1</sup> North: Bergen, Essex, Hudson, Union, Middlesex Counties; South: Atlantic, Cape May, Monmouth, Ocean.

<sup>2</sup> These categories reflect federal definitions of damage: Destroyed - total loss of structure, structure is not economically feasible to repair, or complete failure to major structural components; Major Damage - substantial failure to structural elements of residence (e.g., walls, floors, foundation), or damage that will take more than 30 days to repair and the home could not be lived in during this time; Minor Damage - home is damaged and uninhabitable, but may be made habitable in a short period of time with repairs; or Affected - some damage to the structure and contents, but still habitable.

**APPENDIX C TABLE 9. SOCIAL HEALTH AND WELL-BEING BY INDIVIDUAL CHARACTERISTICS (COLUMN %)**

	GENDER		AGE			RACE & ETHNICITY					
	MALE	FEMALE	19-35	36-64	65+	NON-HISPANIC WHITE	NON-HISPANIC BLACK	HISPANIC	ASIAN/PACIFIC ISLANDER	OTHER <sup>1</sup>	
<b>Social support</b>											
% who report strong social support networks	75.5	73.6	77.0	83.5	77.8	59.7	78.2	71.0	58.5	90.4	86.7
% who report moderate social support networks	15.6	17.2	14.3	8.4	13.9	28.9	15.1	16.4	23.3	<0.01	6.6
% who report weak or absent social support networks	8.9	9.2	8.7	8.1	8.3	11.4	6.7	12.6	18.2	9.6	6.7
<b>Family Functioning</b>											
% who report highly-functioning families	64.4	56.2**	71.3	60.9	69.4	54.9	65.2	67.5	60.3	70.1	32.9
% who report poorly-functioning families	35.6	43.8	28.7	39.1	30.6	45.1	34.8	32.5	39.7	29.9	67.1
<b>Changing social roles</b>											
<b>Community-focused role: % who report roles of advocate/teacher/creator/volunteer</b>	89.2	83.6	95.3	94.3	87.3	90.5	87.5	90.8	92.7	100.0	100.0
% who indicated Sandy had positive change on role among those who report role	4.2	5.0	3.5	3.2	5.6	2.0	3.1	10.0	2.2	27.1	0.0
% who indicated Sandy had negative change on role among those who report role	1.1	1.9	0.2	0.0	1.7	0.6	0.4	0.0	5.0	<0.01	0.0
<b>Resource-focused role: % who report roles of wage-earner/leader/problem-solver</b>	95.4	93.2*	97.7	99.3**	96.4	84.6	94.3	95.8	98.3	100.0	100.0
% who indicated Sandy had positive change on role among those who report role	6.5	6.8	6.3	11.1	4.6	5.6	6.7	7.0	6.1	0.0	2.6
% who indicated Sandy had negative change on role among those who report role	2.7	3.0	2.4	1.7	4.0	0.9	2.1	4.5	3.5	<0.01	15.3
<b>Home-focused role: % who report roles of caregiver or homemaker</b>	95.0	91.9*	97.2	95.4	94.7	95.1	94.7	100.0	95.3	100.0	65.9
% who indicated Sandy had positive change on role among those who report role	12.1	12.6	11.9	19.8	10.9	7.1	12.1	18.6	9.1	9.0	0.0
% who indicated Sandy had negative change on role among those who report role	2.5	2.2	2.8	<0.01	4.1	1.2	2.6	1.1	3.2	0.2	13.9

Margins of error for all cells are +/-5 percentage points and based on surveys of 1,000 New Jersey residents, representing 1,047,000 people in the Disaster Footprint. P-values are indicated in the left corner cell of a given section as the following: \* ≤ 0.05 \*\* ≤ 0.01 \*\*\* ≤ 0.001

<sup>1</sup> Other includes Native American, Multiracial, and Missing/Don't Know/Refused.

**APPENDIX C TABLE 10. ECONOMIC HEALTH AND WELL-BEING BY HOUSEHOLD CHARACTERISTICS (COLUMN %)**

	ALL	REGION <sup>1</sup>		DAMAGE <sup>2</sup>			CHILDREN IN THE HOME		INCOME			
		NORTH	SOUTH	NONE/AFF	MINOR	MAJOR/DEST	YES	NO	<\$20K	\$20-50K	\$51-99K	\$100K+
<b>Economic Changes since Sandy</b>												
% who report household income has INCREASED	17.6	17.8	17.5	17.7**	27.4	8.1	24.8*	13.2	13.2	11.8	18.9	23.8
% who report household income REMAINED THE SAME	64.4	62.9	64.9	65.5	63.1	55.9	57.2	68.7	57.9	65.3	62.5	67.3
% who report household income has DECREASED	18.0	19.3	17.6	16.8	9.5	36.0	18.0	18.0	28.9	23.0	18.6	8.9
<b>Financial Loss since Sandy</b>												
% who report lost job or income	12.7	5.5**	15.8	11.7	11.4	20.8	15.6	11.0	13.0	18.9	15.0	7.0
% who report lost business	0.9	0.3	1.2	0.3***	0.7	5.4	1.5	0.6	0.3	1.6	0.4	0.4
<b>Household constraints</b>												
% who report that very often or often in the prior 6 months, the household did not have enough money for rent or mortgage	7.2	9.1	6.4	5.4**	11.6	17.4	13.2***	3.7	20.9***	14.1	3.6	0.6
% who report that very often or often in the prior 6 months, the household did not have enough money for utilities	8.1	10.7	7.0	6.4*	11.6	17.6	11.6**	6.1	32.2***	13.7	3.6	0.3
% who report that very often or often in the prior 6 months, the household did not have enough money for transportation	2.7	4.6	1.9	1.7*	3.3	9.2	3.4	2.2	15.7***	2.6	0.5	<0.01
% who report that very often or often in the prior 6 months, the household did not have enough money for food	2.6	4.3	1.9	1.5*	4.8	8.9	3.2**	2.3	15.9***	2.6	<0.01	<0.01
<b>Summary measure: % with any household constraints</b>	9.8	12.5	8.7	8.0*	13.4	20.1	14.5*	7.2	34.4***	15.0	5.4	0.5

Margins of error for all cells are +/-5 percentage points and based on surveys of 1,000 New Jersey residents, representing 1,047,000 people in the Disaster Footprint. P-values are indicated in the left corner cell of a given section as the following: \* ≤ 0.05 \*\* ≤ 0.01 \*\*\* ≤ 0.001

<sup>1</sup> North: Bergen, Essex, Hudson, Union, Middlesex Counties; South: Atlantic, Cape May, Monmouth, Ocean.

<sup>2</sup> These categories reflect federal definitions of damage: Destroyed - total loss of structure, structure is not economically feasible to repair, or complete failure to major structural components; Major Damage - substantial failure to structural elements of residence (e.g., walls, floors, foundation), or damage that will take more than 30 days to repair and the home could not be lived in during this time; Minor Damage - home is damaged and uninhabitable, but may be made habitable in a short period of time with repairs; or Affected - some damage to the structure and contents, but still habitable.

**APPENDIX C TABLE 11. ECONOMIC HEALTH AND WELL-BEING BY INDIVIDUAL CHARACTERISTICS (COLUMN %)**

	ALL	GENDER		AGE			RACE & ETHNICITY				
		MALE	FEMALE	19-35	36-64	65+	NON-HISPANIC WHITE	NON- HISPANIC BLACK	HISPANIC	ASIAN/ PACIFIC ISLANDER	OTHER <sup>1</sup>
<b>Economic Changes since Sandy</b>											
% who report household income has INCREASED	17.6	24.2	12.1	22.6*	21.5	1.2	16.0	20.0	21.9	38.2	16.1
% who report household income REMAINED THE SAME	64.4	61.7	67.5	63.3	58.3	82.5	66.4	54.5	61.3	55.4	68.4
% who report household income has DECREASED	18.0	14.1	20.4	14.0	20.2	16.3	17.6	25.5	16.8	6.4	15.5
<b>Financial Loss since Sandy</b>											
% who report lost job or income	12.7	9.0*	15.1	13.1*	16.1	2.9	12.4	7.1	18.2	23.7	10.4
% who report lost business	0.9	0.4*	1.4	1.3	0.9	0.7	1.1	1.0	0.0	0.2	0.0
<b>Household constraints</b>											
% who report that very often or often in the prior 6 months, the household did not have enough money for rent or mortgage	7.2	4.6	9.7	9.2	7.3	4.5	4.8**	13.7	17.6	0.3	0.6
% who report that very often or often in the prior 6 months, the household did not have enough money for utilities	8.1	5.3	10.7	10.0	8.3	5.3	5.6	16.6	17.6	4.3	0.6
% who report that very often or often in the prior 6 months, the household did not have enough money for transportation	2.7	2.2*	3.1	3.7	2.0	3.4	1.8	4.0	7.4	<0.01	0.0
% who report that very often or often in the prior 6 months, the household did not have enough money for food	2.6	2.5*	2.7	3.9	1.9	3.2	1.7	4.3	7.0	0.0	0.0
<b>Summary measure: % with any household constraints</b>	9.8	5.9*	13.4	11.0	10.7	6.0	7.2**	18.2	20.2	4.1	0.6

Margins of error for all cells are +/-5 percentage points and based on surveys of 1,000 New Jersey residents, representing 1,047,000 people in the Disaster Footprint. P-values are indicated in the left corner cell of a given section as the following: \* ≤ 0.05 \*\* ≤ 0.01 \*\*\*≤0.001

<sup>1</sup> Other includes Native American, Multiracial, and Missing/Don't Know/Refused.



**APPENDIX C TABLE 12. CHILDREN’S HEALTH, SOCIAL AND ACADEMIC CHANGES BY HOUSEHOLD CHARACTERISTICS AMONG HOUSEHOLDS WITH KIDS (COLUMN %)<sup>1</sup>**

	ALL	REGION <sup>2</sup>		DAMAGE <sup>3</sup>			CHILDREN IN THE HOME		INCOME			
		NORTH	SOUTH	NONE/AFF	MINOR	MAJOR/DEST	YES	NO	<\$20K	\$20-50K	\$51-99K	\$100K+
<b>Overall child health status</b>												
% who report their child’s health as excellent/very good/good	92.6	91.3	93.2	91.9	95.1	97.5			85.1	100.0	86.2	87.5
% who report their child’s health as fair or poor	7.4	8.7	6.8	8.1	4.9	2.5			14.9	0.0	13.8	2.5
<b>Incidence of selected medical conditions since Sandy</b>												
% who report child diagnosed with Asthma or Diabetes	3.4	<0.01***	4.7	3.3	<0.01	6.5			12.6	0.0	8.3	<0.01
% who report child diagnosed with Depression, Anxiety, Behavioral or Conduct Disorder	5.7	10.7	3.7	2.4*	27.7	16.0			24.2*	<0.01	10.8	2.0
<b>Incidence of Mental Health Distress since Sandy</b>												
% who report child has been sad or depressed	17.7	17.9	17.7	14.2*	42.1	28.0			35.1	19.7	19.7	12.0
% who report child has had sleeping problems	13.6	17.8	11.7	11.7*	42.6	9.7			6.8**	24.8	17.8	2.3
% who report child has been nervous or afraid	24.1	37.5	18.4	19.4*	49.5	42.2			28.1	29.6	22.8	16.1
% who report child has had trouble getting along with others	13.3	22.8	9.2	11.9	26.7	13.7			42.5	24.8	10.4	6.0
<b>Summary measure: % who report child experienced any of the above</b>	37.0	53.4	30.4	32.8	70.9	46.1			69.6	48.2	33.1	25.4
<b>Academic performance since Sandy</b>												
% who report child’s academic performance has gotten BETTER	26.2	22.7	27.7	28.4	10.6	19.6			45.6	24.4	43.2	13.4
% who report child’s academic performance REMAINED THE SAME	69.1	72.2	67.8	68.2	70.3	76.5			48.5	75.6	50.0	85.9
% who report child’s academic performance has gotten WORSE	4.7	5.1	4.5	3.4	19.1	4.0			5.9	0.0	6.7	0.7

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<sup>1</sup> Percentages presented are representative of 393, 000 households in the Disaster Footprint which reported at least one child in the household between the ages of 5 and 17

<sup>2</sup> North: Bergen, Essex, Hudson, Union, Middlesex Counties; South: Atlantic, Cape May, Monmouth, Ocean.

<sup>3</sup> These categories reflect federal definitions of damage: Destroyed - total loss of structure, structure is not economically feasible to repair, or complete failure to major structural components; Major Damage - substantial failure to structural elements of residence (e.g., walls, floors, foundation), or damage that will take more than 30 days to repair and the home could not be lived in during this time; Minor Damage - home is damaged and uninhabitable, but may be made habitable in a short period of time with repairs; or Affected - some damage to the structure and contents, but still habitable.

**APPENDIX C TABLE 13. CHILDREN’S HEALTH, SOCIAL AND ACADEMIC CHANGES BY INDIVIDUAL CHARACTERISTICS AMONG HOUSEHOLDS WITH KIDS (COLUMN %)<sup>1</sup>**

	ALL	GENDER		AGE			RACE / ETHNICITY				
		MALE	FEMALE	19-35	36-64	65+	NON-HISPANIC WHITE	NON- HISPANIC BLACK	HISPANIC	ASIAN/ PACIFIC ISLANDER	OTHER <sup>2</sup>
<b>Overall child health status</b>											
% who report their child’s health as excellent/very good/good	92.6	92.9	92.5	90.7	93.2	100.0	91.3	99.8	90.1	100.0	100.0
% who report their child’s health as fair or poor	7.4	7.1	7.5	9.3	6.8	0.0	8.7	0.2	9.9	0.0	0.0
<b>Incidence of selected medical conditions since Sandy</b>											
% who report child diagnosed with Asthma or Diabetes	3.4	6.1	1.6	2.4	3.8	0.0	5.2	0.0	0.0	0.0	0.0
% who report child diagnosed with Depression, Anxiety, Behavioral or Conduct Disorder	5.7	4.2	6.6	12.3	3.6	0.0	6.6	0.2	8.3	0.0	0.0
<b>Incidence of Mental Health Distress since Sandy</b>											
% who report child has been sad or depressed	17.7	15.5	19.2	17.2	17.8	22.3	18.1	4.9	28.2	12.5	5.6
% who report child has had sleeping problems	13.6	12.1	14.6	9.5	14.8	9.9	12.7	13.6	23.2	0.0	0.0
% who report child has been nervous or afraid	24.1	13.0*	31.7	30.6	22.3	25.7	21.9	29.6	27.1	55.5	5.5
% who report child has had trouble getting along with others	13.3	18.3	9.9	19.5	11.6	9.7	8.9	20.4	21.8	26.6	11.3
<b>Summary measure: % who report child experienced any of the above</b>	37.0	29.8	41.6	37.1	37.2	27.2	31.2	49.0	50.2	70.0	17.0
<b>Academic performance since Sandy</b>											
% who report child’s academic performance has gotten BETTER	26.2	23.9	27.7	28.1	26.0	1.4	31.3	19.1	20.5	0.1	12.2
% who report child’s academic performance REMAINED THE SAME	69.1	72.5	67.0	70.2	68.6	79.4	64.4	79.9	69.4	99.9	87.8
% who report child’s academic performance has gotten WORSE	4.7	3.6	5.3	1.7	5.4	19.2	4.3	1.0	10.1	0.0	0.0

Margins of error for all cells are +/-5 percentage points and based on surveys of 1,000 New Jersey residents, representing 1,047,000 people in the Disaster Footprint. P-values are indicated in the left corner cell of a given section as the following: \* ≤ 0.05 \*\* ≤ 0.01 \*\*\* ≤ 0.001

<sup>1</sup> Percentages presented are representative of 393,000 households in the Disaster Footprint which reported at least one child in the household between the ages of 5 and 17.

<sup>2</sup> Other includes Native American, Multiracial, and Missing/Don’t Know/Refused.



