

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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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	%
Geography		
North	262	32
South	570	68
Damage		
High (> 40% of households > minor)	79	10%
Low (affected)	393	47%
Unassessed	360	43%
Children		
High children (>35% of households have children)	305	37%
Low children(<35% of households have children)	527	63%
Poverty (#families)		
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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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							
GEOGRAPHY		North				South			
Total # block groups		262 (31%)				570 (69%)			
Sampled # block groups		18 (35%)				34 (65%)			
DAMAGE¹		High		Low		High		Low	
Total # block groups		3		256		76		493	
Sampled # block groups		3		15		24		10	
POVERTY		High	Low	High	Low	High	Low	High	Low
Total # block groups		1	2	99	157	16	60	133	360
Sampled # block groups		1	2	12	3	13	11	7	3
SAMPLED HOUSEHOLDS		50	100	300	75	325	275	175	75
COMPLETED HOUSEHOLDS		58	97	118	52	257	190	154	74

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

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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^{2,3}).

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.^{4,5} The overall 95% sampling error based on these adjustments is about 4%.

² Lohr, S. L. (2010). *Sampling: Design and Analysis*. Boston, MA: Brooks Cole Publishing.

³ 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.

⁴ Valliant, R., Dever, J. A., & Kreuter, F. (2013). *Practical Tools for Designing and Weighting Survey Samples*. New York, NY: Springer.

⁵ Moore, W., Pedlow, S., Krishnamurty, P., & Wolter, K. (2000). *National Longitudinal Survey of Youth 1997 (NLSY97)*. Chicago, IL: National Opinion Research Center (NORC).

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

	SURVEY DATA			
	UNADJUSTED		WEIGHTED	
	N	%	N	%
Household Characteristics	1000	100	1,047,286	100
Region				
North	325	32.5	314,186	30.0
South	675	67.5	733,100	70.0
Damage				
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
Income				
<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
Children Present in Home				
Yes	300	30.0	382,259	36.5
No	700	70.0	665,027	63.5
Individual Characteristics	1000	100	1,047,286	100
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
Age				
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
Race				
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

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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.

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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:

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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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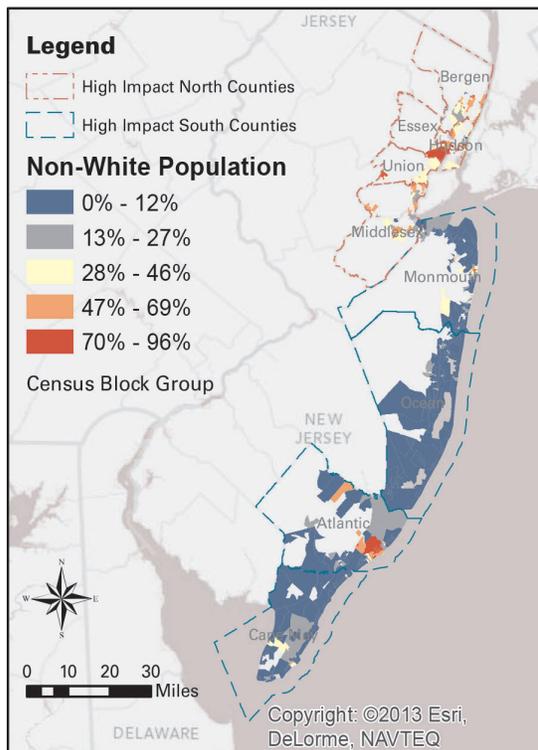
County, are overwhelmingly white, with most neighborhoods between 70% and 96% white. The six northern counties, Bergen, Essex, Hudson, Union, Monmouth, and Middlesex, are considerably more diverse. A similar economic divide can be seen in the map displaying the proportion of residents who are “Poor or Struggling”⁶ in which there are greater numbers of pockets of poverty up north than in the south.

Demographics

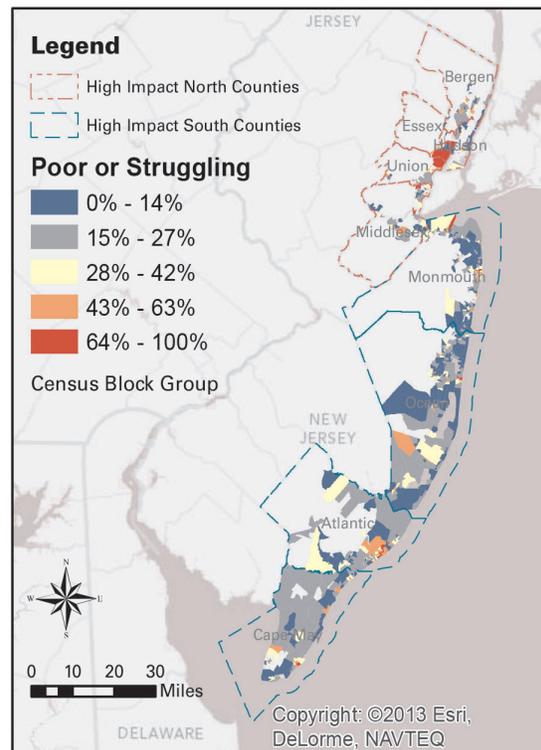
Appendix A Figure 1

Demographics

Non-White Population



Poor or Struggling



⁶ 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).

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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.