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Assessing the living environment of persons displaced following a strong earthquake sequence in Puerto Rico, 2020

Miguel A. Cruz, PhD,

National Center for Environmental Health, (Now) Office of Emergency Management Agency for Toxic Substances and Disease Registry, Centers for Disease Control and Prevention, Atlanta, Georgia.

Richard Garfield, PhD,

Center for Global Health, Centers for Disease Control and Prevention, Atlanta, Georgia.

Jessica Irizarry, PhD,

Puerto Rico Department of Health, San Juan, Puerto Rico.

Norma I. Torres-Delgado, MHSA,

Puerto Rico Department of Health, San Juan, Puerto Rico.

Melanie Z. Rodriguez-Rivera, MSHN,

Puerto Rico Public Health Trust and Puerto Rico Hurricane Response Hub Technical Assistance Center, San Juan, Puerto Rico.

Martin Montoya-Zavala, PhD,

Puerto Rico Public Health Trust and Puerto Rico Hurricane Response Hub Technical Assistance Center, San Juan, Puerto Rico.

Leslie Maas Cortes, MHS,

Puerto Rico Public Health Trust and Puerto Rico Hurricane Response Hub Technical Assistance Center, San Juan, Puerto Rico.

Gabriela Algarín, MPH,

Puerto Rico Public Health Trust and Puerto Rico Hurricane Response Hub Technical Assistance Center, San Juan, Puerto Rico.

Tesfaye Bayleyegn, MD,

National Center for Environmental Health Disease Control and Prevention, Atlanta, Georgia.

Renee H. Funk, DVM,

National Center for Environmental Health, (Now) Agency for Toxic Substances and Disease Registry, Centers for Disease Control and Prevention, Atlanta, Georgia.

Jose F. Rodriguez-Orengo, PhD,

Puerto Rico Public Health Trust and Puerto Rico Hurricane Response Hub Technical Assistance Center, Department of Biochemistry, School of Medicine, University of Puerto Rico, San Juan, Puerto Rico.

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Diego E. Zavala, PhD

Public Health Program, Ponce Health Sciences University, Ponce, Puerto Rico.

Abstract

In the public health portfolio of disaster tools, rapid needs assessments are essential intelligence data mining resources that can assess immediate needs in almost all hazard scenarios. Following prolonged and unusual seismic activity that caused significant structural damage, mainly in the south-west part of the island of Puerto Rico, thousands of area residents were forced to leave their homes and establish improvised camps. The austere environmental exposure and limited access to safety and hygiene services prompted public health authorities to request assistance with conducting a rapid needs assessment of those encampments. This report summarizes the design, organization, and execution of a rapid needs assessment of improvised camps following a strong sequence of earthquakes in Puerto Rico.

Keywords

rapid assessments; public health; emergency response; emergency management; natural hazards

BACKGROUND

Rapid needs assessments after disasters can provide timely and useful information for understanding and documenting the immediate needs of the survivors. However, several factors affect the time frame for completing the assessments, including the magnitude of the disaster, resources available, and prioritization in relation to more urgent disaster response activities. Recommended time frames for execution might range from “immediately” after the event through up to 6 weeks.¹⁻³

The island of Puerto Rico, with a population of approximately 3,200,000, is a United States (US) territory in the Caribbean.⁴ This island is frequently affected by environmental disasters and remains in recovery mode from the destruction caused by Hurricanes Irma and Maria in 2017.⁵ On January 6, 2020, a 5.9 magnitude earthquake occurred in the southern part of Puerto Rico with an epicenter location near the municipality of Guanica. That event was later followed by a much stronger 6.4 magnitude earthquake hours later.⁶ The earthquakes and thousands of aftershocks (Figure 1) that followed damaged and collapsed homes, businesses, and government buildings, including schools. Most of the movement and damage affected other municipalities around Guanica, Guayanilla, Peñuelas, Ponce, and Yauco. This area has a combined population of approximately 207,711 residents, many of whom evacuated, fearing that the structural integrity of their homes was compromised.^{4,6}

Residents began to assemble in improvised camp settlements, along roadsides and in any open outdoor spaces available, such as parks and empty parking lots. These improvised camps, many of which lacked basic services and safety, quickly became overcrowded with thousands of residents of all ages, along with their pets. The Puerto Rico Emergency Management Bureau established five large tent base camps that provided the essentials, including food, basic medical services, sleep areas, and hygiene and sanitation services.⁷

Peak occupancy in these facilities occurred around mid-January 2020, when more than 4,100 persons were known to be registered as guests.

Despite government assurances and efforts, many of the residents of the improvised camps refused to move to or stay in the government-run encampments and remained in their camp settlements. Planning discussions among the agencies involved in the response centered on the lack of reliable information about the living and safety conditions of people staying in the camps. Representatives from local, federal, and nongovernment groups met to discuss the public health situation and to organize a multiagency earthquake task force. The task force recommended conducting a rapid assessment to estimate the number of camps and persons in the camps, identify any health issues, evaluate the living conditions, and ascertain why people were reluctant to move to government-run shelters. This report describes the efforts of various agencies and organizations in the earthquake task force to design and perform a public health rapid needs assessment of displaced persons affected by the earthquakes in Puerto Rico.

METHODS

Locating the camps

The task force met municipal government officials, emergency management agencies, local government officials, and mass care, shelter, and support services to gather additional information about the location and composition of these settlements. Maps and other geographical information were obtained from the National Aeronautics and Space Administration Resource Center, the Centers for Disease Control and Prevention (CDC) Geospatial Research, Analysis, and Services Program, and other volunteer organizations interacting with the settlers. Task force members drove through affected municipalities to observe and identify new settlement locations. Unstructured discussions were conducted with settlers in some camps about issues and needs to include in the assessment tool. In total, 33 settlements with approximately 2,171 people were included.

Data collection and analysis

The task force met with representatives from multiple universities with academic programs on public health, medicine, and social science and recruited hundreds of students and faculty staff to support the assessments. The data collection plan for the rapid needs assessment was finalized on January 28, 2020. Subsequently, all the volunteers received in-person training on January 29, 2020, and were assigned to various field assessment teams supervised by at least one faculty member. Teams collected information during January 30–February 1, 2020. Each team was assigned at least one known camp location and encouraged to identify others nearby. The most recent coordinates of the camps were uploaded to all interviewers' phones, along with the corresponding assessment tool created using ArcGIS Survey 123.⁸

Data were collected by (1) interviewing camp leaders, identified as such by camp residents, (2) observing and documenting camp conditions, and (3) interviewing individual households. Data were collected on computer tablets and smart phones. Results were transferred in real time to the command center established, allowing for rapid analysis.

Volunteers used a structured questionnaire to ask camp leaders for their subjective estimates of how many persons and in what age groups were living in the camp and overall camp conditions. Team leads also used a standardized checklist to observe and document conditions, map households, and conduct a transect walk through the camp. (A transect walk is a method used for gathering data and information by walking through, observing, documenting, and talking with key informants and others that can help obtain information about camp conditions.)⁹ Finally, team members conducted structured interviews with heads of households located near the coordinate compass points in each camp. Data were analyzed using the initial results, which were available within 2 days, and a full initial report was provided 5 days later. This approach provided maximum coverage of a wide variety of improvised settlements via convenience sampling.

RESULTS

Field teams visited a total of 31 camps in 11 different municipalities. The sample included 28 previously identified campsites; field teams identified three additional camps. For safety and greater access to remote locations, all campsite visits were scheduled during the morning and early afternoon. Camp leaders estimated the total population at the time of the team visits to be approximately 2,171 people, including 258 children younger than 5 years (12 percent) and 385 persons aged 60 years or older (18 percent) (Table 1). The largest camp had 330 residents, but about half of all residents were outside or not present at the time of the teams' visits because they were working or running errands. During the interviews, camp leaders reported that camp populations almost doubled in the evenings and at night. Camp leaders said they had residents with physical disabilities and special needs, pregnant or lactating mothers, and some residents who were receiving dialysis. Immediate health issues included chronic health management and respiratory illness. Camp leaders were most concerned with accommodating specialized transportation needs, mental healthcare, and access to refrigeration. During camp walkthroughs, a key observation was lack of access to handwashing near latrines (Table 2).

Field teams interviewed 95 heads of households. Of these, 37 percent reported that their homes were completely damaged, and 49 percent reported partial damage. Overall, 86 percent or more of these camp residents reported some level of damage to their homes (Figure 2). Many respondents said they were waiting for engineers to review the safety of their homes, where utilities had not yet been restored. Other concerns were repairing roads and clearing debris. In addition, 41 percent of respondents reported having school-age children; however, only 27 percent of those were willing to send their children to school, even after the school was certified as structurally safe (Figure 3). Among heads of households, 17 people were identified with a chronic disease but not currently under treatment. These included diabetes, lupus, cardiac conditions, cancer, post-operative care, arthritis, and thyroid conditions.

Heads of households' greatest concerns about the camps were limited access to recreation and entertainment and exposure to mosquitos and pests (Table 1). Heads of households most often reported staying in an informal camp rather than a formal camp because the informal settlement allowed them to remain with family and friends (Figure 4). To get earthquake

information, heads of households sought information mostly from friends and family (87 percent). These information sources were complemented by social networks (74 percent) and community leaders (67 percent). Government sources were reportedly consulted by only 23 percent of respondents. The most trusted sources reported were friends and family (43 percent), television (34 percent), and broadcast radio (22 percent) (Figure 5). Preliminary results of the assessment were presented 2 days later to health officials. A full brief was presented to the rest of the agencies involved in the earthquake response days later at Puerto Rico Emergency Management Bureau.

DISCUSSION

Rapid needs assessment methods are versatile, convenient, and applicable to most disaster situations. Because disasters do not follow a guidebook, assessment methods must adapt to the specific needs of the response. The assessment team leaders must weigh designing a perfect tool against meeting urgent needs of emergency management officials for information and quickly collect essential information to expedite disaster assistance and initiate measures to protect people and prevent an emergency from becoming a complex disaster. During the rapid needs assessment, the field team quickly gathered information from camp residents. The information was used to identify essential needs, residents' concerns, and reasons as to why so many persons were staying in improvised camps. The high percentage of persons with damage to their homes (86 percent) showed that many of those interviewed were, indeed, persons who left damaged homes. Another significant result was that at the time of the assessment, more persons (2,171) were living in the improvised camps than in government shelters (1,440).

A concern in any disaster is the safety of the children who might be exposed to environmental safety hazards. Relief efforts usually include returning children to a safer environment, such as those offered by schools. However, during this assessment, most parents interviewed reported a sense of mistrust about sending children back to school because of concerns about school building safety. Lastly, responses from camp leaders and households and direct observations by assessors indicated that most camps were in fair condition, and most needs identified were being met by agencies and other relief groups. However, the availability and delivery of these resources also helped keep people away from government-run shelters, where authorities thought that they would be better serviced and protected.

Our assessment methods were subject to several limitations. A main challenge in this response was locating settlements spread across coastal and mountainous areas, and the unknowns surrounding the location of new camps. Improvised camps could appear in the evenings and disappear during the day. Anecdotal information collected during field visits to the camps indicated that improvised camps often formed after people returned from work, school, or daily chores, and the camp populations almost doubled at night, but our team worked only during daylight hours because of difficult terrain and safety concerns. Another concern was that assessors might have overestimated the number of campsites because camp residents frequently relocated seeking better areas. However, our information suggests that none of the camp residents recalled having previous visits by our assessors to

determine if residents' needs were met over time or if conditions improved or worsened. The assessment by public health teams began approximately 3 weeks after the strongest earthquakes occurred. By then, many of affected persons living in the camps might have returned to their homes or were moved by disaster agencies to other facilities.

Our assessment took longer than usual from time of arrival to execution. However, in only 10 days, the task force was able to design and carry out a rapid needs assessment and report on the status and living conditions of people staying in improvised camps. The speed of this process was facilitated by an army of local volunteers and simple and easy-to-adapt tools, which enabled us to rapidly collect data that agencies needed to understand the dynamics of this unique event. The volunteers understood that residents had, just a little over 2 years earlier, endured months of post-disaster conditions and loss after two back-to-back, destructive hurricanes.

During the presentation of field assessment results to incident command leadership and supporting agencies, several recommendations were proposed, including the following:

- Deploy teams to camps to increase vigilance over the hygiene and sanitation issues reported;
- Establish multiagency teams (instead of individual agency teams) to visit camps for a holistic approach to service delivery at camp locations, instead of service centers at government-run shelters;
- Use information about existing conditions to craft appropriate health communication messages highlighting health risks and motivating people to move to government shelters;
- Design surveys to be more comprehensive to better quantify public health and medical needs, which could not be fully assessed during the rapid needs assessment.

US Geological Survey experts studying the earthquake sequence in Puerto Rico have forecasted that the earthquake aftershocks could persist for several years, although with decreasing frequency.⁶ Unfortunately, several weeks into the planning for conducting more comprehensive needs assessments using the CDC Community Assessment of Public Health Response method, the initial outbreak and subsequent pandemic of COVID-19 began to also affect the island.³ A shift to other priority work, coupled with public health requirements for safety, social distancing, and adoption of infection control precautions, resulted in an indefinite postponement of a more comprehensive survey of the survivor needs.

CONCLUSION

The island of Puerto Rico will continue to experience sporadic seismic activity and other threats posed by natural hazards. Maintaining a cadre of trained volunteers in rapid needs assessment methods may expedite the execution of the initial and additional follow-up surveys, as the response or emergency phase transitions to recovery and the long-term needs of those affected. The long-term needs of the earthquake survivors, such as safe return home,

reestablishment of health services, and economic impacts, may still have to be assessed by the agencies leading the recovery efforts to help ensure there are no unmet needs.

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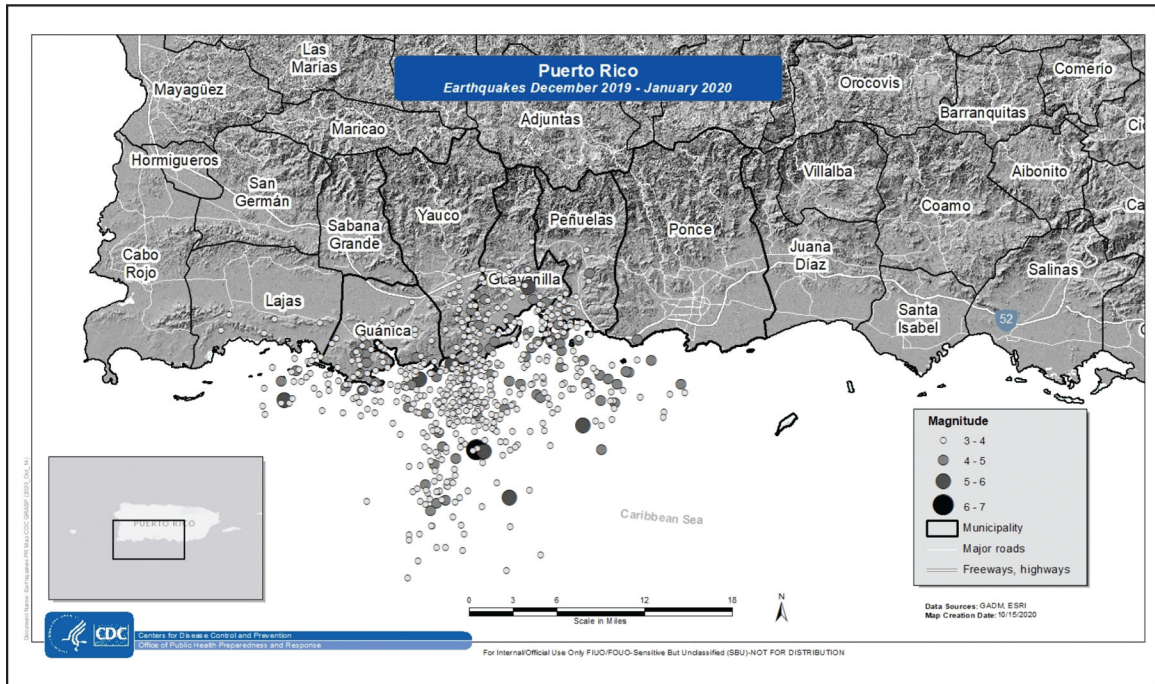


Figure 1. Puerto Rico earthquake sequence, December 2019-January 2020.

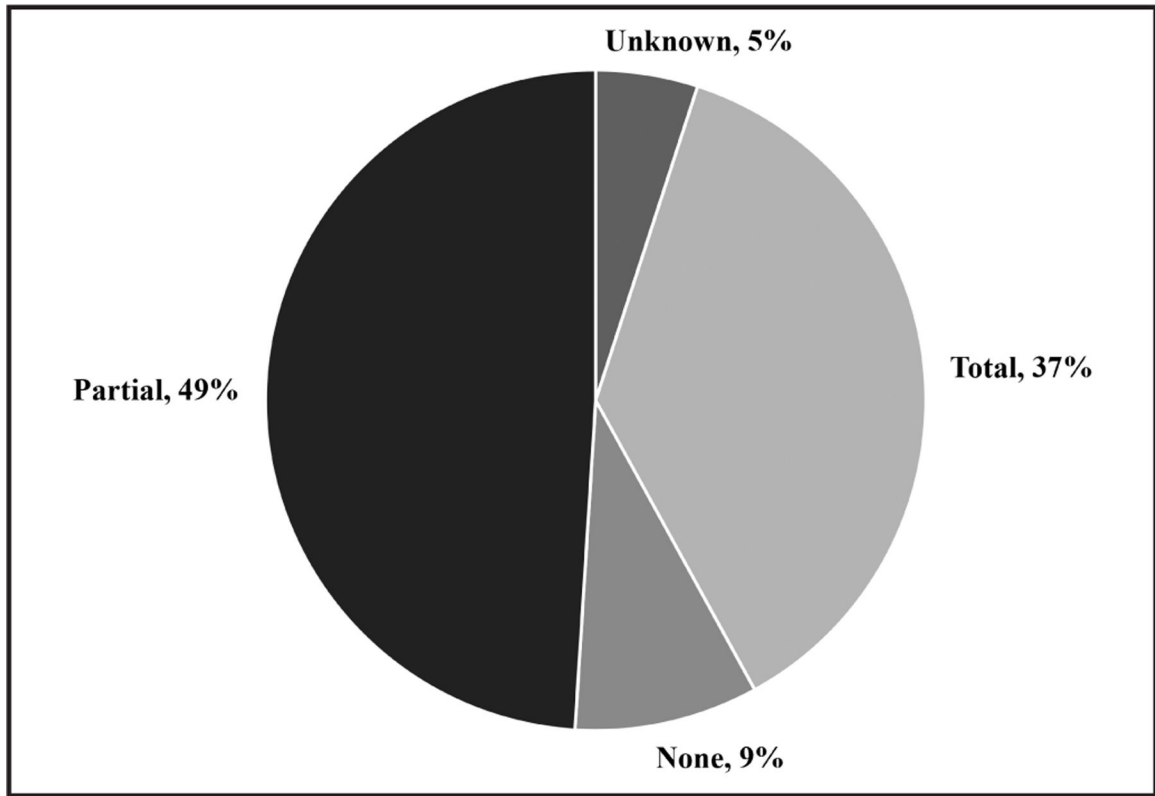


Figure 2.
Level of earthquake damage reported by households staying in the improvised camps.

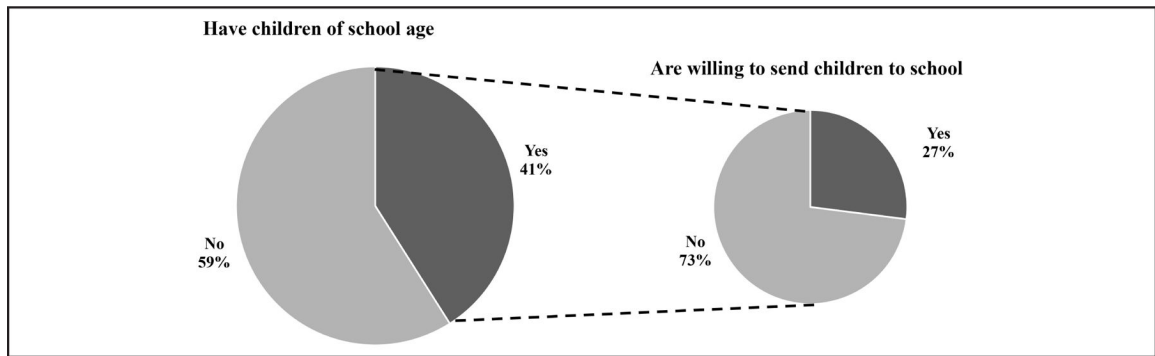


Figure 3. Households with children and parents' willingness to send them to school.

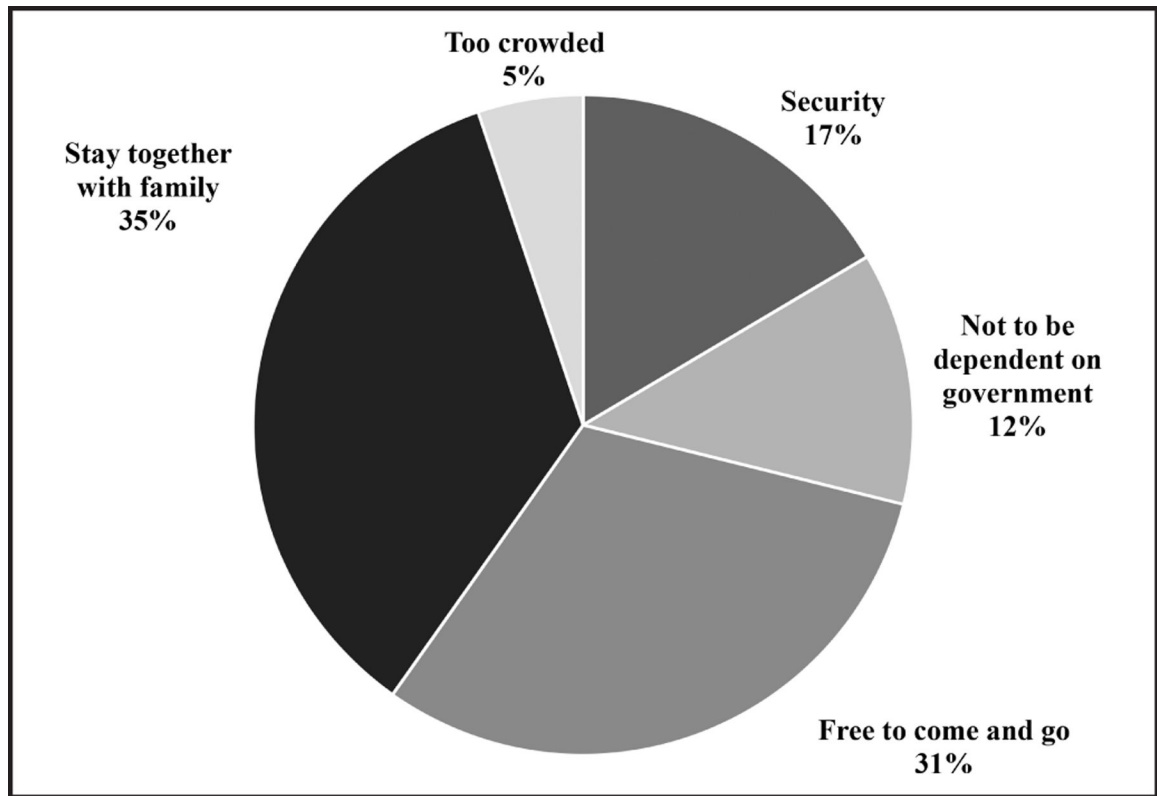


Figure 4.
Household reported reasons for not staying in government shelters.

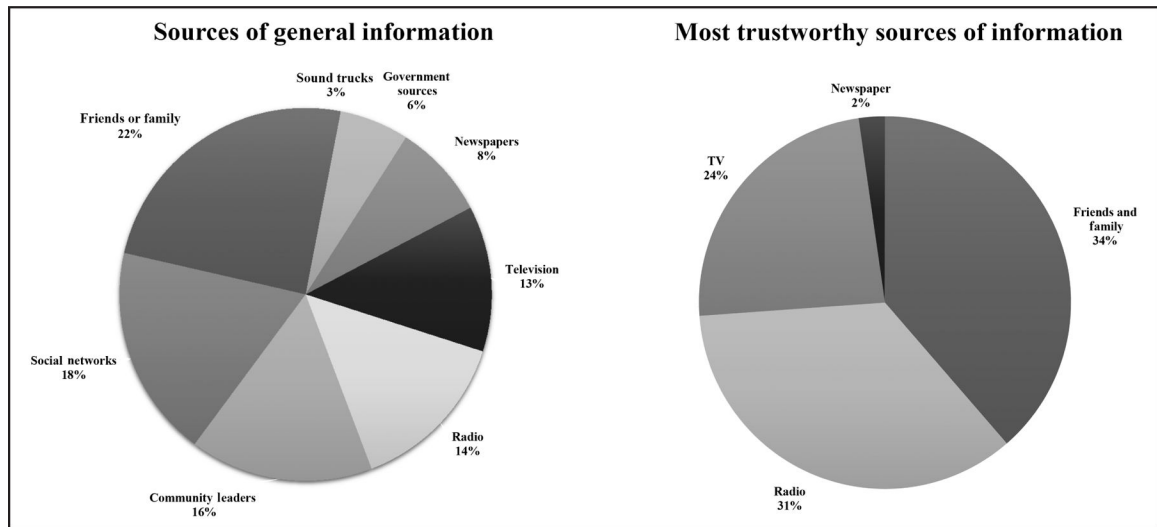


Figure 5. Sources of general information for households.

Camp leaders, household perceptions, and field team observations of improvised camp conditions during a rapid needs assessment in Puerto Rico, January–February 2020

Table 1.

	Perceived conditions of camps		
	Good (percent)	Average (percent)	Poor (percent)
<i>Camp leaders' responses</i>			
Solid waste removal	72.7	21.2	6.1
Access to recreation/entertainment	63.6	30.3	6.1
Mental healthcare	60.6	15.2	24.2
Emotional and spiritual support	59.4	28.1	12.5
Access to medical care	54.6	24.2	21.2
Security (police)	51.5	30.3	18.2
Power/electricity	48.5	30.3	21.2
Access to refrigeration	45.5	30.3	24.2
Access to transportation (medical/shopping)	41.9	32.3	52.8
<i>Household responses</i>			
Relations between camp neighbors	80.7	1.1	18.3
Solid waste removal	76.1	8.7	15.2
Power/electricity	76.1	8.7	15.2
Access to medical care	74.7	9.6	16.0
Physical environment and surrounding conditions	73.4	5.3	21.3
Access to transportation (medical/shopping)	73.1	7.5	19.4
Mental healthcare	71.0	16.1	12.9
Issues with wild/stray animals	67.7	9.7	22.6
Water quality	67.7	9.7	22.6
Air quality issues	37.6	38.7	23.7
Mosquitos	37.6	38.7	23.7
Other insects	27.7	39.4	33.0
Access to recreation/entertainment	27.7	39.4	33.0
<i>Field teams' observations</i>			

	Perceived conditions of camps		
	Good (percent)	Average (percent)	Poor (percent)
Food supply	78.8	18.2	3.0
Drinking water (within 500 m)	69.7	18.2	12.1
Washing and bathing water	69.7	18.2	12.1
Access to hygiene products	62.5	34.4	3.1
Household pet safety	59.4	40.6	0.0
Latrines' distance to living quarters	45.5	39.4	15.2
Washing station near to latrines	43.8	25.0	31.3
Fuel and generators' distance to living quarters	42.4	42.4	15.2

Responses to questions about health issues in improvised camps during rapid needs assessment in Puerto Rico, January–February 2020

Table 2.

Health issues identified	Yes (percent)	No (percent)	Unknown (percent)
Chronic illness not being treated	51.5	45.5	3.0
Respiratory disease	48.5	45.5	6.1
Skin disease	18.2	69.7	12.1
Missing daily medication	18.2	69.7	12.1
Other diseases	16.1	67.7	16.1
Fever	9.1	84.8	6.1
Lice infestation	3.0	84.8	12.1
Vomit or diarrhea	12.5	78.1	9.4
Human scabies	0.0	90.9	9.1