Earthquakes in El Salvador: A Descriptive Study of Health Concerns in a Rural Community and the Clinical Implications, Part I

By: Joanna C. Woersching and Audrey E. Snyder

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Abstract:

Introduction: This is the first article in a series that evaluates the health concerns of people living in a Salvadoran rural community after major earthquakes. Part I reviews the background, methods, and results of post-earthquake conditions with regards to healthcare, access to healthcare, housing, food, water and sanitation. Part II reviews the implications of these results and recommendations for improvements within the community. Part III investigates the psychosocial and mental health consequences of the earthquakes and provides suggestions for improved mental health awareness, assessment, and intervention. **Background:** El Salvador experienced 2 major earthquakes in January and February 2001. This study evaluates the effects of the earthquakes on the health practices in the rural town of San Sebastian. **Methods:** The research was conducted with use of a convenience sample survey of subjects affected by the earthquakes. The sample included 594 people within 100 households. The 32-question survey assessed post-earthquake conditions in the areas of health care and access to care, housing, food and water, and sanitation. **Results:** Communicable diseases affected a number of family members. After the earthquakes, 38% of households reported new injuries, and 79% reported acute exacerbations of chronic illness. Rural inhabitants were 30% more likely to have an uninhabitable home than were urban inhabitants. Concerns included safe housing, water purification, and waste elimination. **Conclusion:** The findings indicate a need for greater public health awareness and community action to adapt living conditions after a disaster and prevent the spread of communicable disease.

Keywords: El Salvador | rural healthcare | health impact of earthquakes | community health

Article:

On Jan 13, 2001, and Feb 13, 2001, two large earthquakes of the magnitude 7.6 and 6.6 on the Richter scale, respectively, struck El Salvador.[1] The epicenter of the first earthquake was located off the Pacific Coast of El Salvador. The second earthquake was located in San Pedro Nonualco, 30 kilometers southeast of San Salvador.[1] San Sebastian is a small agricultural town (fewer than 20,000 residents) located in the mountains about 50 miles from the capital of El Salvador in the province of San Vicente.[2] The second earthquake had the largest effect on San Sebastian; approximately 80% of homes were damaged, and 50% were uninhabitable.[3]

During the past 100 years, El Salvador has experienced 13 major earthquakes.[1] All previous earthquakes, due to refractory landslides, pale in comparison to the damage caused by those of January and February 2001.[1, 4] The effects of the earthquake were compounded by basic health deficiencies before the earthquakes and historical problems that greatly influenced rural life. Enduring problems created by land distribution and low-wage labor created differences between rural communities and urban areas.[5] A brutal civil war from 1979 to 1992 left 80,000 people dead (half of whom were civilians), displaced one fifth of the population, and had devastating consequences on rural health care within the country.[6] The National Emergency Committee of El Salvador identified several epidemiologic characteristics of the affected zone that were exacerbated by the earthquakes.[1] These included a recent dengue epidemic, diarrhea caused by rotavirus, intermittent circulation of Vibrio cholera, cases of leptospirosis, regions with widespread malaria infection, and a cold front within the region.[1]

Nursing Students Without Borders

Beginning in August 2000, Nursing Students Without Borders (NSWB) visited the town of San Sebastian with the mission of "promoting health awareness, building networks to access health care resources and distributing material donations to developing world communities, while expanding the perspective of the nursing student."[2] NSWB is a student-run organization at the University of Virginia School of Nursing. Since August 2001, NSWB has made four additional trips to San Sebastian. The goals of NSWB in El Salvador involved developing community health initiatives and providing first-aid training and supplies to the local Red Cross of San Sebastian.[2] During the group's January 2001 trip to El Salvador, NSWB experienced the first of a series of devastating earthquakes.

The trip members witnessed the damage to homes and lives firsthand when they were forced to delay their return to the United States by four days. On returning to the United States, the group members knew that a new community assessment would be essential in identifying the most urgent needs of the people of San Sebastian and continuing their public health work. By the time NSWB returned to El Salvador in August 2001, the community assessment of San Sebastian would encompass a combination of a short-term survey and a long-term assessment of basic health guidelines. The study team's objective was to implement a descriptive health survey pertaining to disaster and community assessment that would take into account the rural and cultural characteristics that differentiate El Salvador from the United States.[7, 8, 9]

Methods

Design

A convenience sample of 100 households representing 594 family members was obtained from the Public Health Clinic and Red Cross Clinic of San Sebastian.

Sample

Residents of rural farming areas made up 59% of interviewees; whereas, 41% of participants were urban (i.e., town residents of San Sebastian) (Table 1). The only inclusion criteria for the

study were 18 years of age or older when interviewed, living in the town of San Sebastian or the surrounding area, and being affected by the January and February 2001 earthquakes. Community members were aware of the study and the presence of the study coordinators in their community through posters, fliers, and word of mouth.

Table 1. Age of study participants

	Rural (n = 361)		Urban (n = 233)		Total (n = 594)	
Years	**No.**	**%**	**No.**	**%**	**No.**	**%**
0 to 4	56	(15.5)	16	(6.9)	72	(12.1)
5 to 12	82	(22.7)	45	(19.3)	147	(24.7)
13 to 18	44	(12.2)	25	(10.7)	69	(11.7)
19 to 30	58	(16.1)	56	(24.0)	114	(19.2)
31 to 45	56	(15.5)	28	(12.0)	84	(14.2)
46 to 55	22	(6.1)	16	(6.9)	38	(6.4)
56 to 75	30	(8.3)	30	(12.9)	60	(10.2)
76 to 90	9	(2.5)	10	(4.3)	19	(3.2)
>90	1	(0.3)	4	(1.7)	5	(0.8)
No response	3	(0.8)	3	(1.3)	6	(1.2)
Total	361	(100)	233	(100)	594	(100)

Damage assessment tool

The assessment tool consisted of a 32-question survey that analyzed pre-earthquake and post-earthquake conditions in five categories: health care, access to care, housing, food and water, and sanitation. The survey also asked for a brief medical history for all members of the household. All research methods, designs, and tools were approved by the University of Virginia's Human Investigational Committee (HIC No. 9606).

The assessment form was created with advice of community health experts in the Charlottesville, Virginia, community and the University of Virginia, along with disaster assessment and management tools of the American Red Cross and the Pan American Health Organization. The physician of the local Red Cross also helped to identify areas of improvement in the tool; suggested linguistical considerations as to how questions were phrased; and redefined relevant cultural standards for housing, illness, and welfare.

Three attempts were made to return to San Sebastian after the earthquakes. They were postponed due to safety risks for travelers until August 2001, about six months after the earthquakes. Due to time constraints and lack of computer and other electronic resources in San Sebastian, a pilot study was not performed before the assessment survey.

Survey process

The principal investigator and a team of subinvestigators reviewed by HIC No. 9606 collected the assessment data. All investigators traveled by foot to homes and were accompanied by one Red Cross member to ensure their safety. All assessment forms used during interviews were translated into Spanish. The study coordinators used interviewing and formal observations as

their data collection approaches. Interviews took 1 to 112 hours to complete. The community assessment was completed in 10 days.

Data analysis

The descriptive statistics were compiled with Statistical Package for the Social Sciences for data collection.[10] A combination of nominal, ordinal, and interval measurements were used to categorize the results. A χ^2 test of independence was calculated comparing variables between participants in towns and farming areas.

Results

Demographics

Interviews were conducted on 100 households; the overall response rate was 99%. The initial demographic analysis evaluated 594 individual family members on the basis of relation to the respondent, age, education, occupation, and a health history. This demographic data pertained to each individual member of the household. Of the entire study sample, the mean age was 27.4 years (SD = 22.7 years) (see Table 1). An equal number of male and female subjects participated in the study. Students (158 [26.6%]) and children younger than school age (111 [18.7%]) comprised the majority of the population (Table 2). Domestic workers, or *alma de la casa*, translated as "soul of the house," represented 21%, and agricultural workers represented 9.9% of the population. Hypertension (6.7%) followed by renal (5.6%) and heart disease (3%), tobacco use (3%), alcohol use (3%), and communicable disease infection (3.4%) were the leading pathologic conditions found in the health history (Table 3).

Table 2. Occupations of Participants

	Rural (n = 233)		**Urban (n = 233)**		**Total (n = 594)**	
Subscale	**No.**	**%**	**No.**	**%**	**No.**	**%**
Agricultural worker	40	(11.1)	19	(8.2)	59	(9.9)
Merchant	1	(0.3)	2	(0.9)	3	(0.5)
Textile worker	1	(0.3)	10	(4.3)	11	(1.9)
Domestic/*alma del la casa*	80	(22.2)	45	(19.3)	125	(21)
Student	102	(28.3)	56	(24.0)	158	(26.6)
Child	74	(20.5)	37	(15.9)	111	(18.7)
Retired	5	(1.4)	3	(1.3)	8	(1.3)
Other	48	(13.3)	51	(21.9)	99	(16.7)
No response	8	(2.2)	10	(4.3)	15	(2.5)
Total	361	(100)	233	(100)	594	(100)

Table 3. Presence of illnesses in health history

	Rural (n = 358)		**Urban (n = 230)**		**Total (n = 585)**	
Subscale	**No.**	**%**	**No.**	**%**	**No.**	**%**
Diabetes	5	(1.4)	11	(4.7)	16	(2.7)
Hypertension	21	(5.8)	19	(8.2)	40	(6.7)
Heart disease	8	(2.2)	10	(4.3)	18	(3)
Autoimmune disorder	1	(0.3)	1	(0.4)	2	(0.3)

	Rural (n = 358)		Urban (n = 230)		Total (n = 585)	
Subscale	**No.**	**%**	**No.**	**%**	**No.**	**%**
Kidney disease	20	(5.5)	13	(5.6)	33	(5.6)
Neurologic disease	12	(3.3)	1	(0.4)	13	(2.2)
Psychiatric disorder	8	(2.2)	6	(2.6)	14	(2.4)
Communicable disease	13	(3.6)	7	(3.0)	20	(3.4)
Domestic violence	4	(1.1)	9	(3.9)	13	(2.2)
Tobacco use	3	(0.8)	15	(6.4)	18	(3)
Alcohol use	12	(3.3)	6	(2.6)	18	(3)
Illicit drugs	3	(0.8)	0	(0)	3	(0.5)

Health care needs

Households were evaluated on the presence and absence of health care problems and recent injury and infection after the earthquakes (Table 4). When asked about the presence of new injury, 38% of households said someone in their household had an injury after the earthquakes. Of the respondents, 79% stated that a member of their household experienced an exacerbation of a chronic illness after the earthquakes.

Table 4. Changes in access to care and illness exacerbation in household

	Rural (n = 59)		Urban (n = 41)		Total (n = 100)	
Subscale	**No.**	**%**	**No.**	**%**	**No.**	**%**
Chronic illness exacerbation	46	(78)	33	(80.5)	79	(79)
New injury	21	(35.6)	17	(41.5)	38	(38)
Healthcare needed	27	(45.8)	21	(51.2)	48	(48)
Change in access	13	(22)	9	(22)	22	(22)
Change in ability to manage chronic illness	14	(23.7)	17	(41.5)	31	(31)
Lost access to healthcare	35	(59.3)	20	(48.8)	55	(55)
Received aid	52	(88.1)	33	(80.5)	85	(85)
Received money	27	(45.8)	12	(29.3)	39	(39)
Received clothing	9	(15.3)	1	(2.4)	10	(10)
Received food	28	(47.5)	17	(41.5)	45	(45)
Received temporary housing	36	(61)	17	(41.5)	53	(53)

Households were assessed for the presence of communicable diseases (Table 5). Skin infections (31%), upper respiratory infections (30%), and gastrointestinal infections (22%) were the most prevalent, and exacerbations of diabetes (19%) were also reported.

Table 5. Households with communicable disease infection and other illness exacerbation

	Rural (n = 59)		Urban (n = 41)		Total (n = 100)	
Subscale	**No.**	**%**	**No.**	**%**	**No.**	**%**
Diarrhea	18	(43.9)	4	(6.8)	22	(22)
Cholera	4	(6.8)	2	(4.9)	6	(6)
Dengue fever	4	(6.8)	1	(2.4)	5	(5)
Malaria	1	(1.7)	1	(2.4)	1	(1)
Tuberculosis	2	(3.4)	1	(2.4)	3	(3)
Typhoid fever			1	(2.4)	1	(1)
Upper respitory infection	14	(23.7)	16	(39)	30	(30)

	Rural (n = 59)		Urban (n = 41)		Total (n = 100)	
Subscale	**No.**	**%**	**No.**	**%**	**No.**	**%**
Pneumonia	8	(13.6)	6	(14.6)	14	(14)
Skin infection	21	(35.6)	10	(24.4)	31	(31)
Exacerbation of diabetes	11	(18.6)	8	(19.5)	19	(19)
Other illness	13	(22)	8	(19.5)	21	(21)

Access to health care

Households were asked about access to health care, management of illnesses, and loss of medical materials after the earthquakes (see Table 4). Forty-eight percent of the households reported that they needed to use health care resources after the earthquakes and 22% believed their access to care had changed after the earthquakes. Only 31% of households reported that they believed they could not effectively manage their illnesses after the earthquakes, and 55% believed they lost access to or supply of medications. Participants in the urban environment were 9% more likely to manage a chronic ailment than were respondents in farming areas ($\chi^2 = 4.85$, $df = 1$, $P = .014$). Respondents were surveyed about any community, national (see Table 4), or international assistance after the earthquake. Of the households surveyed, 85% reported that they received some form of assistance; the largest form of aid was temporary housing (53%). Participants in the rural environment were 35.8% more likely to receive temporary housing than were town residents ($\chi^2 = 3.71$, $df = 1$, $P = .027$).

Housing needs

Families were questioned on the degree of housing damage caused by the earthquakes. Households reported that 51% of homes fell down, 52% of homes were uninhabitable, 76% of homes had vertical cracks on wall partitions, 56% of ceilings collapsed, 8% of homes had stagnant or standing water, and 18% of homes were rebuilt. Participants in the rural environment were 34.6% more likely to have an uninhabitable home than were town residents ($\chi^2 = 4.21$, $df = 1$, $P = .02$).

Households were asked about their living conditions and how they compared with those before the earthquakes (Table 6). Ninety-five percent of respondents stated that they lived in a home before the earthquakes and 56% lived in the same home after the earthquakes. Households reported that 5% used a tent as a form of temporary housing, 21% lived with relatives, 53% used a makeshift hut/temporary housing, 19% used a community-sponsored disaster shelter, and 18% reported no temporary housing.

Table 6. Housing conditions before and after the earthquakes

	Rural (n = 59)		Urban (n = 41)		Total = 100)	
Subscale	**No.**	**%**	**No.**	**%**	**No.**	**%**
Lived in home before earthquake	57	(96.6)	38	(92.7)	95	(95)
Live in same home	28	(47.5)	28	(68.3)	56	(56)
Live in a tent	3	(5.1)	2	(4.9)	5	(5)
Live with relatives	14	(23.7)	7	(17.1)	21	(21)
Temporary housing	35	(59.3)	18	(43.9)	53	(53)
Community sponsored shelter	14	(23.7)	5	(12.2)	19	(19)

	Rural (n = 59)		Urban (n = 41)		Total = 100)	
Subscale	**No.**	**%**	**No.**	**%**	**No.**	**%**
No temporary housing	13	(22)	5	(12.2)	18	(18)

Respondents were asked about the number of people living in their home and the number of rooms in their homes before and after the earthquakes. Responses ranged from 2 to 15 people per home and 1 to 7 rooms per household. The mean number of residents in a home was 6 persons living in an average of 1.98 rooms before the earthquakes. After the earthquakes, respondents reported a mean number of 5.9 persons living in an average of 1.94 rooms in a home. Loss of means of communication (24%) and electricity (20%) were frequently found.

Access to food and water

Participants were asked how the earthquakes affected access to resources. Twenty percent of the respondents reported that they changed the method in which they prepared their food, 18% reported a change in the supply of food, 61% reported a change in or loss of access to fuel used for cooking, and 23% reported a change in the amount of food eaten daily. Sixteen percent of the respondents reported using propane for cooking, 44% reported using wood, and 34% reported using both wood and propane.

The largest source of water reported was a community well (35%), and 54% reported using *cantaros*, or large jugs, for their main water storage system.

Sanitation

Interviewers asked about sanitation and disposal of waste products. Eighty-three percent of households reported using a grounded latrine. When asked about an internal or external garbage system, 36% stated that they used plastic storage bags to contain waste, 37% said that they had a form of community trash collection to remove wastes, 25% said that they burned their garbage, and 44% said they threw it on the ground. Participants in the urban environment were 29.8% more likely to use a community trash collection system ($\chi^2 = 12.95$, $df = 1$, $P = .000$), and farm area residents were 45.4% more likely to throw their garbage on the ground ($\chi^2 = 6.77$, $df = 1$, $P = .005$.) Of households interviewed, 32% reported an increase in rodents or rats after the earthquakes, 66% reported an increase in insects, and 69% reported an increase in mosquitoes.

Summary

This study evaluated 594 individual family members in 100 households. The primary preexisting health concerns were hypertension, renal disease, heart disease, tobacco use and alcohol use. New injuries occurred in 38% of the households with 79% had a member that experienced an exacerbation of a chronic disease. Of the households surveyed, 48% needed to use healthcare resources after the earthquakes with 85% reporting the receipt of some form of assistance. Over 52% of homes were uninhabitable. Changes occurred in access to food, cooking fuel and water. There were significant differences in rural and urban environments such as a greater ability to manage a chronic ailment in the urban environment. Urban residents were more likely to use a comunity trash collection system whereas rural residents were more likely to throw their garbage

on the ground. Participants in the rural environment were more likely to have an uninhabitable home, as well as, receive temporary housing. The implications of these results and recommendations will be addressed in Part II of the Earthquakes in El Salvador Descriptive Study series.

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