

Housing Recovery Patterns of the 1995 Kobe Earthquake victims: results from 1999 Hyogo random sampled

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Abstract

Based on a Random sampling Survey on the “Individual Recovery Processes from the 1995 Kobe earthquake disaster”, people in the impacted area can be divided into four subgroups depending on the severity of housing damage and their life stages. An 80% of the victims whose own housing were severely damaged or collapsed were forced to relocate to various kinds of temporary housing arrangements before they could eventually come home. At 10th hour, about half of those who lost their houses evacuated to emergency shelters, then asked their family and relatives for the provision of temporary housing arrangements at the 100th hour. At the 1,000th hour, company own housing facilities (In-Hyogo) and private rental housing units(Out-Hyogo) became more popular housing arrangements. and the usage of government-supplied free temporary housing was as low as just 3 %. The need for information regarding housing damage peaked at the first one week after the earthquake, and nearly half of the victims made up their minds with regards to where they live within one month after the earthquake.

Introduction

In Japan, mitigation has traditionally been the major focus of disaster reduction until the 1995 Kobe earthquake disaster. Mitigation is a strategy that prevents damages by means of forecasting natural hazard, elucidating its mechanism, and constructing disaster-resistant structures. However, the Kobe earthquake disaster revealed that Japanese mitigation programs were not good enough to prevent the society from severe damages. As a result, Preparedness has been receiving increasing attention since the 1995 Kobe Earthquake

Disaster for effective emergency response, relief, and recovery. Preparedness is a strategy that minimizes the resulting damages by increasing community resilience.

In order to improve preparedness, disaster researchers, management practitioners and policy makers need to shed light on the nature of societal vulnerability and resilience along the course of disaster process.

To make human behavior under the extreme conditions more intelligible, researchers need to start with accumulating tacit knowledge about disaster processes among the people in the impacted area after disaster. Then we analyzed and synthesized these accumulated tacit knowledge to transform them into explicit knowledge in a form of coherent theoretical framework concerning human behavior and societal reactions following disaster. This approach is *Disaster Ethnography* (Hayashi and Shigekawa, 1997).

As a result obtained from ethnographic researches of the 1995 Kobe earthquake, it was found that the people would experience several qualitatively different phases along with the chronological development after the event (Aono *et al.*, 1998; Tanaka *et al.*, 1999).

The first phase may be characterized as "Disorientation" phase, where the people in the impacted area could barely grasp what happened to them right after the event, which lasted for the first 10 hours. The second phase may be called as the phase where the systematic response and recovery processes start, which lasted for the first 100 hours after the event. The fourth phase may be characterized as "Reconstruction" phase.

It should be noted that there are phase boundaries at the 10th, 100th, and 1,000th hour after the event. In summary, the People would experience qualitatively different phases along with the logarithmic time development.

purpose

This questionnaire was designed to be a test of those hypotheses derived from ethnographic study of the 1995 Kobe earthquake to provide the quantitative estimates for next major disaster.

In particular, this paper deals with four major questions with regard to factors determining the patterns of changes in residence among the victims of the 1995 Kobe earthquake. Those are 1) what factors, such as demography, housing, economic, and occupational damages, played a major role in determining changes of residence; 2) when, to where and how many people change their residence; 3) when people needed the information about the safety for dwelling and/or about repair or reconstruction options; and 4) when people actually make decisions with regard to repair or reconstruction plans. In order to answer the above questions, a random sample mail survey was conducted in March of 1999.

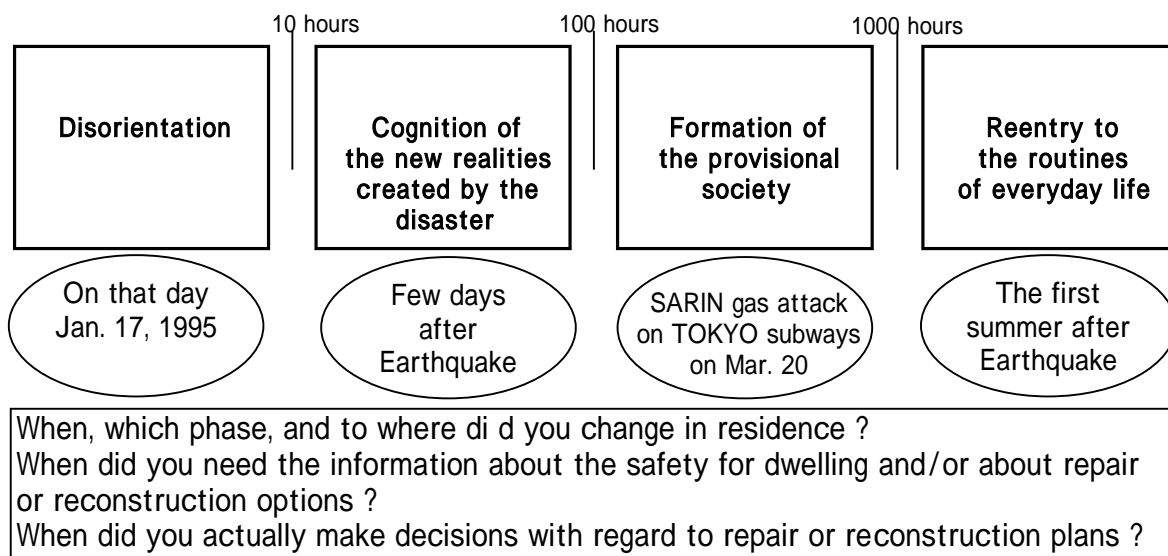
Method

subjects

Table 1. Sample subjects

Building Damage	In-Hyogo-Prefecture Residence (N=2,500, or 0.3% of total population, 741,261 households)	Out-of-Hyogo-Prefecture Residence (N=800, or 13.6% of total population, 5,866 subscribers)
Fully Damaged-Burned Half Damaged-Burned	Random Sampling from 250 points with a seismic intensity of 7 and with a more than two month cut-off from the city gas supply	Random Sampling from the subscriber's list for a newsletter aimed for Out-of-Hyogo residing earthquake disaster victims
Partially Damaged		
No Damage		

Table 2. Flame of the questionnaire



A random sample mail survey was conducted with 3,300 earthquake disaster victims (the head of a household) who experienced severe life difficulties due to the 1995 Kobe earthquake. We sampled our subjects as widely as possible from the 1995 Kobe Earthquake Disaster victims to obtain scientifically valid knowledge about the patterns of changes in residence and socio-economic rehabilitation of individual disaster victims.

The sample consisted of two groups, as Table 1 shows. One group consisted of those who stayed within Hyogo prefecture after disaster (In-Hyogo Group): A total of 2,500 In-Hyogo residents were sampled based on two-step stratified random sampling method from those residents of the areas with JMA(Japanese seismic intensity scale) 7 or those with the cut-off of city gas supply for more than two months.

The another group consisted of those who left Hyogo prefecture after the earthquake (Out-of-Hyogo Group): A total of 800 Out-of-Hyogo sample were randomly selected from the subscribers' list for the Hyogo Government newsletter targeted for Out-of-Hyogo earthquake victims.

The data from the In-Hyogo group can provide quantitative estimates about the volumes of emergency management services because this group is a representative sample of the all

heavily damaged areas due to the earthquake and its secondary influence.

In contrast, the data from the Out-of-Hyogo group should be interpreted with caution because of the possible biases that we could get the access only to those newsletter subscribers who tend to keep their wishes to come back to Hyogo prefecture if possible.

Questionnaire

This questionnaire was designed to be a test of those hypotheses derived from ethnographic study of the 1995 Kobe earthquake to provide the quantitative estimates for next major disaster. These time points were found to correspond with critical boundaries, which segmented phases of the disaster victims' behavior.

Based on the findings from ethnographic study of the 1995 Kobe earthquake victims, this questionnaire was designed to inquire about how the people in the impacted area chose their place and type residence in their recovery at each of phases segmented by the 10th, 100th, and 1000th hour as well as at the six months after the event. Table 2 shows the framework of this questionnaire.

On March 3 in 1996, we mailed a questionnaire, and accepted the responses by March 23 in 1996. A total of 993 (683 In-Hyogo and 313 Out-of-Hyogo) responses were returned, and 623 In-Hyogo (25.7%) and 292 Out-of-Hyogo residents (37.1%) were used for further analysis.

Results and Discussion

Three different types of subjects

As shown in Table 3, the demographic characteristics of In-Hyogo group are significantly different from that of Out-of-Hyogo group in the following three aspects.

First, the majority of In-Hyogo subjects were male in their 40's and 50's living with more than 2 family members. On the other hand, Out-of-Hyogo tends to reflect single female in their 20's, or 60's and more. Second, a 54.8% of In-Hyogo group lived in own land and own housing or government-owned housing, while a 59.6% of Out-of-Hyogo group lived in rental land and own/rental housing or private rental housing apartment. Third, residential damage was much severer for Out-of-Hyogo group than In-Hyogo group.

A correspondence analysis revealed the existence of three different types of subjects as shown in Figure 1. These three groups can be characterized by two factors: 1) priority of decision, and 2) selection of residential location.

In the first quadrant, it revealed that young people tended to relocate to out of impacted area based on their job requirement. Those respondents in their 20's who lost their employment with less than 3 year job seniority and were pulled out of Hyogo prefecture. In the second quadrant, it revealed that middle aged people tended to remain in the impacted area even though they were severely damaged mainly because their job requirement. Those subjects who kept their jobs and their 30's, 40's and 50's living with three to five family members tended to stay in Hyogo prefecture. In the fourth quadrant, those elderly inner-city single dwellers and elderly couples, who lost houses, were eventually pushed out from Hyogo.

In summary, depending on both the life stage at which the people experiences disaster and

Table 3. Sample Characteristics

	Total	In-Hyogo	Out-of-Hyogo	²
Sample size	915	623 (100)	292 (100)	
Sex				
Male	687	510 (81.9)	177 (60.6)	11.95 **
Female	226	112 (18.0)	114 (39.0)	7.06 **
Sex & Age				
Male & under 30	19	10 (1.6)	9 (3.1)	
Male & 30-39	72	52 (8.3)	20 (6.8)	
Male & 40-49	122	101 (16.2)	21 (7.2)	12.13 **
Male & 50-59	176	148 (23.8)	28 (9.6)	20.74 **
Male & 60-69	187	133 (21.3)	54 (18.5)	
Male & 70 and over	111	66 (10.6)	45 (15.4)	
Female & under 30	5	1 (0.2)	4 (1.4)	5.32 *
Female & 30-39	20	11 (1.8)	9 (3.1)	
Female & 40-49	30	19 (3.0)	11 (3.8)	
Female & 50-59	49	28 (4.5)	21 (7.2)	
Female & 60-69	55	25 (4.0)	30 (10.3)	12.97 **
Female & 70 and over	67	28 (4.5)	39 (13.4)	21.32 **
The number of family members				
Single	154	68 (10.9)	86 (29.5)	40.59 **
2	262	167 (26.8)	95 (32.5)	
3-5	451	352 (56.5)	99 (33.9)	20.60 **
6 and over	39	34 (5.5)	5 (1.7)	6.54 *
Kinds of pre-disaster housing				
Own land and housing	352	282 (45.3)	70 (24.0)	23.43 **
Condominium	95	70 (11.2)	25 (8.6)	
Crown corporation housing	32	28 (4.5)	4 (1.4)	5.55 *
Public housing	41	38 (5.0)	3 (1.0)	11.41 **
Company housing	37	21 (6.1)	16 (5.5)	
Rental land and own housing	50	26 (4.2)	24 (8.2)	5.96 *
Rental land and housing	108	43 (6.9)	65 (22.3)	39.73 **
Private rental housing (apartment)	198	113 (18.1)	85 (29.1)	11.06 **
Housing damage				
Fully damaged	291	92 (14.8)	199 (68.2)	178.15 **
Fully burned	19	6 (1.0)	13 (4.5)	11.66 **
Half damaged	192	130 (20.9)	62 (21.2)	
Half burned	2	1 (0.2)	1 (0.3)	
Partially damaged	320	306 (49.1)	14 (4.8)	111.68 **
No damage	89	86 (13.8)	3 (1.0)	33.37 **
Safety of family members				
Dead	21	10 (1.6)	11 (3.8)	4.05 *
Critical injured and illness	32	15 (2.4)	17 (5.8)	6.63 *
Little injured and illness	187	102 (16.4)	85 (29.1)	15.78 **
No member of family was injured	665	492 (79.0)	173 (79.0)	10.64 **

Note: Number (Percentages: N/623*100, In-Hyogo and N/292*100, Out-of-Hyogo)

Only significant coefficients are shown: ** p<.01, * p<.05 (test of goodness of fit, Chi-square test)

the degree of housing damage, people tends to respond differently, and accordingly different considerations might be needed for each of these different sub-groups.

Item	Explanation	Item	Explanation
IN Pref.	In-Hyogo prefecture	RedTagHs	Fully damaged
OUT of Pref.	Out-of-Hyogo	YelTagHs	Half damaged
Male	Male	GrnTagHs	Partially damaged
Female	Female	FullyBurned	Fully burned
20's ~ 80's	Age 20's ~ 80's	HalfBurned	Half burned
Death	Dead person	NoPhyDmg	No damage
Crtcl Injr	Critical injured and illness person	House demolition	Tearred down housing
Lite Injr	Little injured and illness person	No demolition	Not tearred down housing
All safe	No member of the family was injured	Evacuated	Evacuated on that day that the EQ occurred
1Fam ~ 6+Fam	The number of the family members	NoEvactn	Not evacuated on that day
OwnLnd+Hs	Own land and housing	WishToMove	Wish to move from here
RentLndOwHs	Rental land and own housing	WishToStay	Wish to stay here
RentHs	Rental land and housing	ToTheSame	Wish to move to the same place before the EQ
CrwnCrpHs	Crown corporation housing	ToTheSouth	to the south of Hyogo: seriously impacted area
CompHs	Company housing	ToHyogoOSH	to Hyogo except the south area
PublicHs	Public housing	ToKansai	to Kansai area except Hyogo
PriRentHs	Private rental housing	ToOutKNSI	out of Kansai area
Detached	Detached housing	NotSameJob	Not same job before the EQ
SemiDtchd	Semi-detached housing	Retired	Retired
LowRiseHs	Low-rise housing	SameJob	Same job before the EQ
Mid+HiRise	Middle-and-High-rise housing	ChngJobErthq	Changed job because of the EQ
<¥100K	the amount of damage (¥) less than 100,000	ChngJobNEQ	Changed job not because of the EQ
<¥1Mil	less than 1,000,000	Work30y+	Work for more than 30 years before the EQ
<¥3Mil	less than 3,000,000	Work 29y	for less than 30 years
<¥5Mil	less than 5,000,000	Work 9y	for less than 9 years
<¥10Mil	less than 10,000,000	Work 3y	for less than 3 years
<¥30Mil	less than 30,000,000	WrkPlcAffctd	Work place affected by the EQ
¥30Mil+	30,000,000 and over	WrkPlcNotAff	Work place not affected by the EQ
<10%Incm	the percentages of annual income less than 10%	Note1: there are two points in the figure near "No Financial Damage". Because one is item of the amount of damage(¥) and the other is that of the percentages of annual income. Note2: there are two points in the figure near "No Jobs". Because one is item of jobs after the EQ and the other is before the EQ.	
<30%Incm	less than 30%		
<50%Incm	less than 50%		
<70%Incm	less than 70%		
<99%Incm	less than 100%		
<2*Incm	less than 200%		
<3*Incm	less than 300%		
3*Incm+	300% and over		

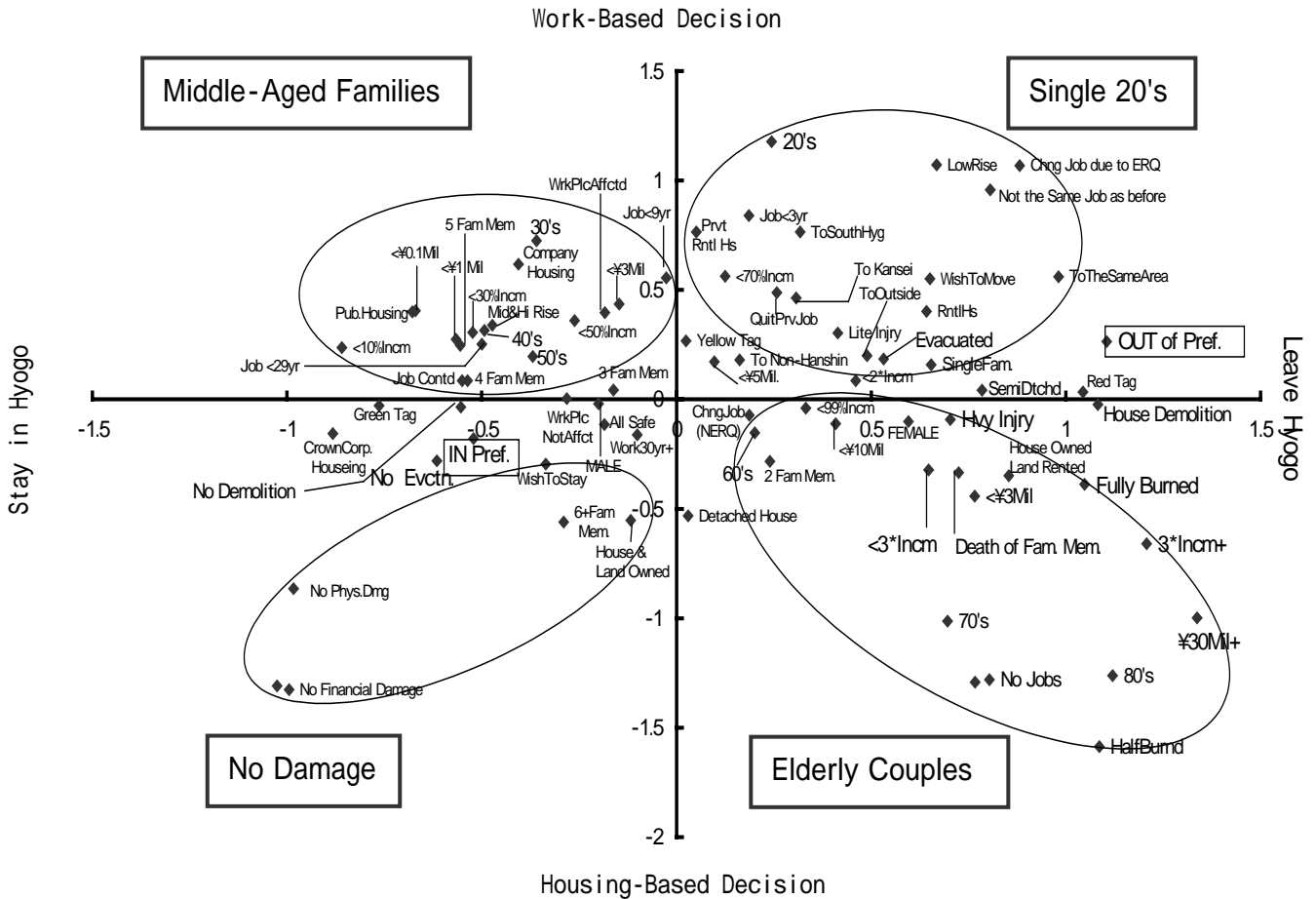


Figure1. Classification of Respondents Characteristics & Dimensions of Residence Decisions

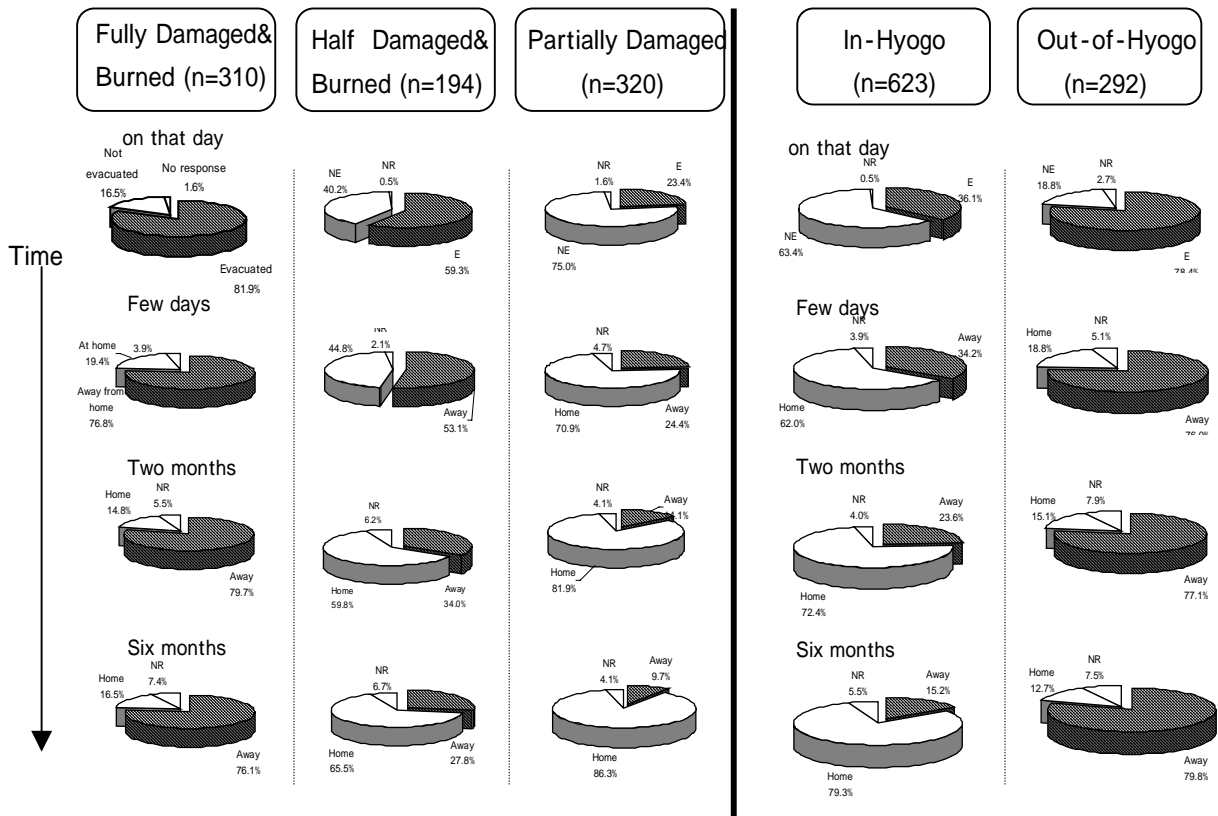


Figure 2. Changes in Residence among Housing Damage & In/Out-of-Hyogo Prefecture

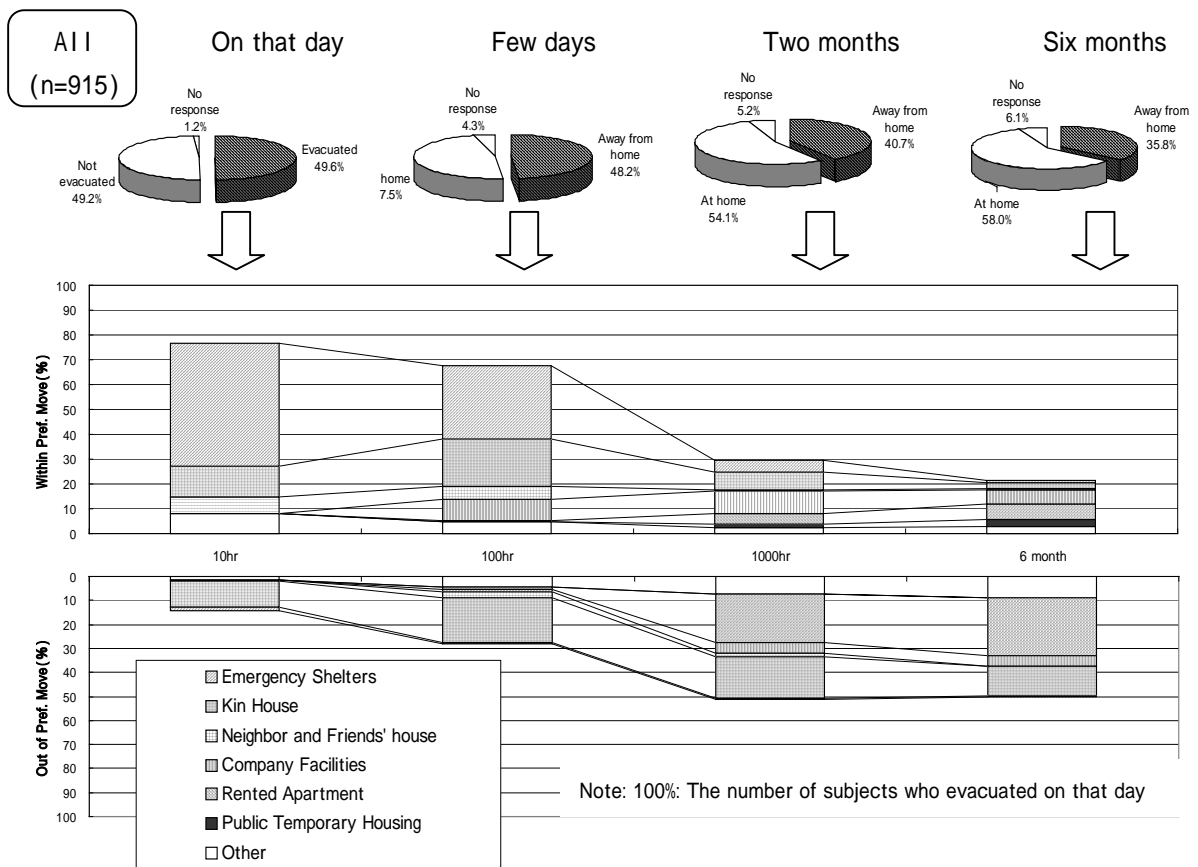


Figure 3. Changes in Residence (when, to where and how many people change their residence)

Patterns of Changes in residence caused by disaster

Patterns of residence location change were drastically different between those with severe house damage and with light damage as shown in Figure 2. About 80% of those who lost houses evacuated to shelters at the 10th hour, and remained to stay at shelters at the 100th hour, and moves to temporary residential arrangement by the 1000th hour and stayed at the 6th month after the earthquake.

In comparison, only 24 % of whose houses were lightly damaged evacuated to shelters at the 10th and 100th hour, but gradually returned to their home to 14% at the 1000th hour and to 10 % at 6 months after the earthquake. Obviously, the pattern of residence change of Out-of-Hyogo group were quite similar to those with heavy house damage.

Selection of residential accommodations

Figure 3 reports that when, to where and how many people actually change their residence.

At 10th hour period, about half of those who left their houses rushed to emergency shelters. At 100th hours, still 30% of them stayed in shelters. Asking help for temporary dwelling through their families and relatives peaked at the 100th hours, then declined thereafter. Provision of housing arrangements by the companies they worked for became prevalent at the 1,000th hours, especially for In-Hyogo group.

In contrast, renting new housing arrangement outside though their own expenses outside the impacted area for Out-of-Hyogo group after the 1,000th became. It should be noted that a strikingly small proportion of victims (2.8% all subjects, 3.6 % In- and 2.1 % of Out-of-Hyogo residents) relied upon the publicly supplied temporary housing units 6 months after the event.

The point here is that disaster researchers, management practitioners and policy makers should pay more attention not only to those who chose public temporary housing but also to those who reconstruct their life by renting apartments. To realize distributive fairness among the people in the impacted area, local governments make more use of commercial housing stocks by alleviating the costs needed for relocation.

Information needs for housing damage

We addressed the timing when people needed the information about the safety of their housing by ascertaining that their house was either repairable or to be demolished.

As shown in the left side of Figure 4, more than 50% of those who suffered housing damage to some degree needed for the information regarding the degree of housing damage within the first week after the event except for No housing damage residents. Furthermore, such need was highest for those who suffered seemingly light damages to their houses during the first several days after the earthquake. On the other hand, as to the information need for housing reconstruction policy adopted by the local government, those who suffered the severest housing damage was the highest.

As shown in the right side of Figure 4, nearly half of the victims made up their minds with regard to the recovery policy about their own housing within the first month after the event.

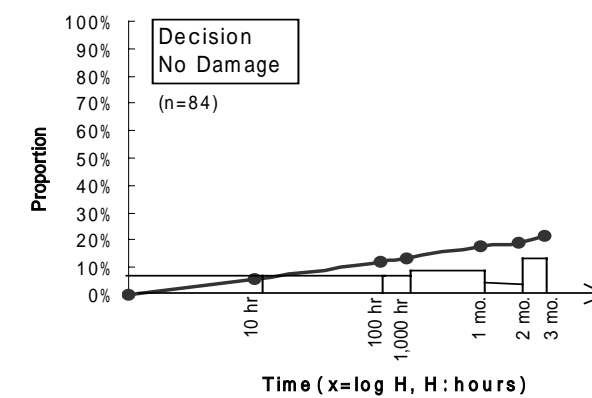
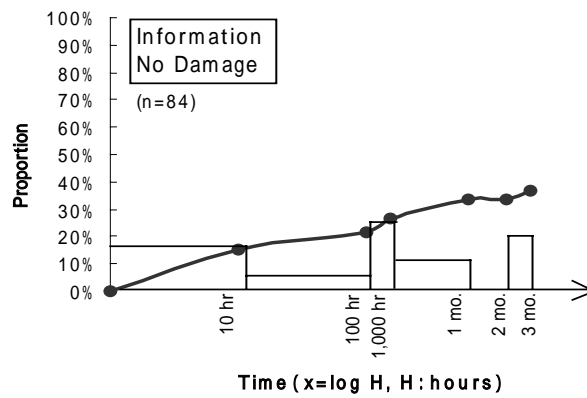
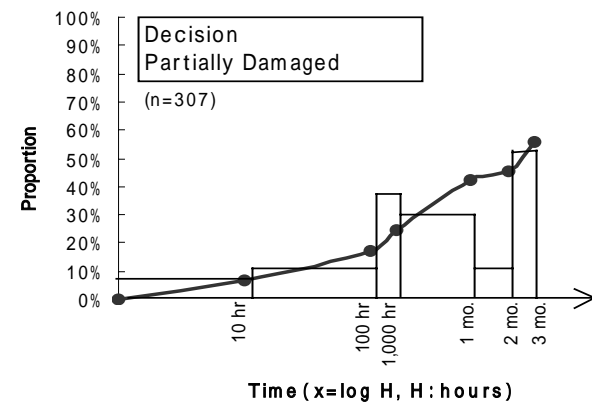
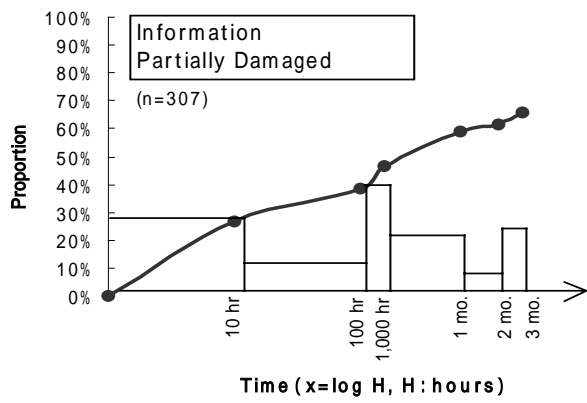
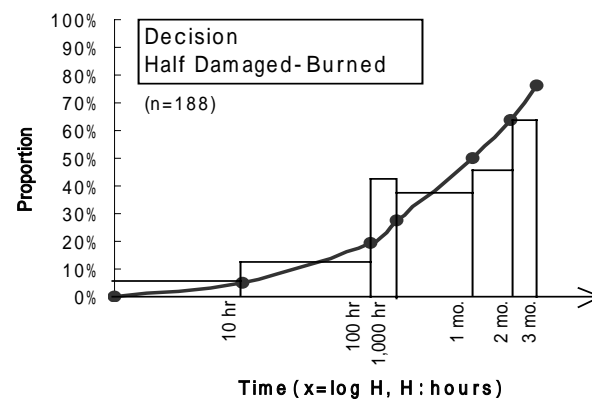
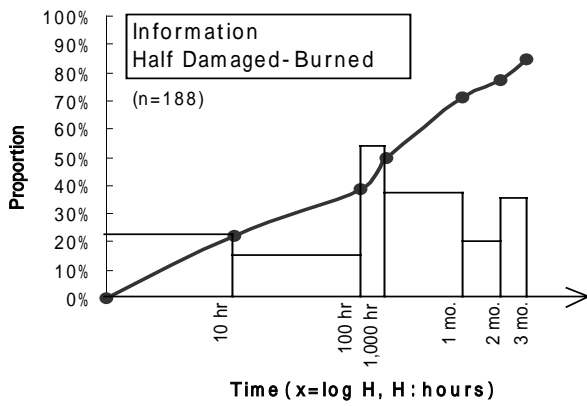
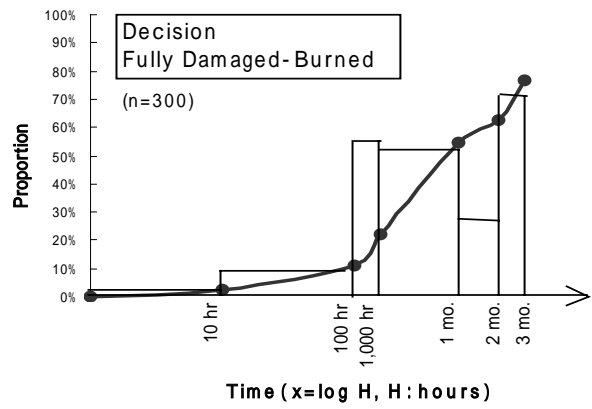
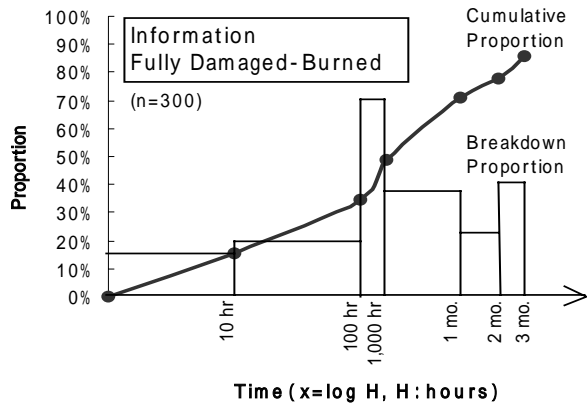


Figure 4. Information Needs and Decisions Regarding Dwelling

Conclusion

In summary, it is found that setting the policy for their own housing was a quite urgent business for those who suffered housing damages to some extent. It is suggested that there may exist two kinds of crucial time limits for effective housing recovery program: 1) the evaluation as to the degree of housing damage, or what would be the most cost-effective way to deal with their damaged houses, should be provided within the first week after the event as the basis for planning the individual recovery plan, and 2) the whole picture of housing recovery program provided by local government should be made available for those who suffered the severest housing damage within the first month after the event before the majority of them would make up their own policy for their own housing.

Obviously, the provision of abovementioned services by the local government at the time of the 1995 Kobe earthquake disaster was much later in time than the ideal timing described above. This, these results suggest that there would be lots to be upgraded for disaster response and relief activities to be effective from the victims' point of view.

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