

# ***Life recovery models: Cross overs between Kobe and Great East Japan Earthquake recovery stories***

Shigeo TATSUKI<sup>1</sup>

<sup>1</sup> Professor, Department of Sociology, Doshisha University, Kyoto, Japan  
[statsuki@mail.doshisha.ac.jp](mailto:statsuki@mail.doshisha.ac.jp)

## ***ABSTRACT***

*Recovery of individual lives has never been a major post-recovery agenda until the 1995 Kobe Earthquake. The author has been involved in social research projects that aimed to identify life recovery facilitating factors and its mechanism, and in the advocacy of individual life recovery policy and programs. Based on these activities, the Seven Critical Element Model (SCEM) of life recovery was formed. The seven facilitating factors consist of housing, social ties, community involvement, physical/mental stress management, preparedness, livelihood, and relations to government. After the 2011 Great East Japan Earthquake, the author has been closely working with the life recovery department of Natori city, Miyagi prefecture. This paper reports the results of the 2015 population survey of Natori survivors (1,533 households, 3,513 individuals) and compares these results with Kobe Earthquake life recovery surveys. It discusses the cross over between the two mega-disaster recovery findings, and examines what can be utilized in order to formulate life recovery policies and programs for future disasters.*

***Keywords:*** *life recovery, Kobe Earthquake, Great East Japan Earthquake, Seven Critical Elements model*

## **1. INTRODUCTION**

*Life recovery* as opposed to livelihood recovery is a relatively new and more holistic construct. Although livelihood has been promoted by income assistance programs of the 1998 Act Concerning Support for Reconstructing Livelihood of Disaster Victims, *life recovery* has been interpreted in more vague terms. It had not been clearly spelled out until Kobe city conducted the fifth year review on 1995 Kobe Earthquake recovery. As a part of the review, a series of grass-roots recovery assessment workshops with impacted citizens were held in order to identify factors that would help each participant to feel that “I am no longer a disaster victim.” Out of this review, the Seven Critical Elements Model (SCEM) of life recovery was formed. The seven facilitating elements consist of *housing, social ties, community involvement, physical/mental stress management, preparedness, livelihood, and relations to government* (Tatsuki, 2007). After the 2011 Great East Japan Earthquake (GEJE), the author’s team has been closely working with the life recovery support department of Natori city, Miyagi prefecture. Our team collaborated with the Natori city administration to conduct the 2013 Natori

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grass-roots assessment workshops on life recovery, which later confirmed that SCEM was also applicable to Natori people's life recovery (Tatsuki, 2015a). The team and the city then jointly designed the questionnaire and the city administered a population survey on life recovery to all impacted citizens. The first purpose of this paper is to examine if SCEM is empirically capable of predicting a large proportion of life recovery variance as reported by Natori people. Second, it aims to identify the similarities and differences between the 1995 Kobe Earthquake and the 2011 GEJE in terms of which critical elements were relatively more important to determine life recovery in each respective event. Third, it tries to portray the unique aspects of life recovery processes of the 2011 GEJE impacted citizens that were not found or reported before.

## 2. METHOD

### 2.1 Subjects

The research subjects of the survey were all 1,533 households and their 3,513 members over the age of 18 that were registered by Natori city as temporary housing residents. The subject households included 1) those who were residing in Natori city prior to the GEJE and 2) those who were residing outside (mostly in Fukushima) and had moved to Natori after the 311 Fukushima disaster. They were residing in two types of temporary housing accommodation: conventional prefabricated temporary housing (PTH) complex units or newly introduced designated temporary housing (DTH) units, which were nothing but private rental units paid for by the prefectural government. Provision of DTH has become mainstream national policy since the GEJE, with 57,825 apartment/housing units rented and 47,839 prefabricated temporary housing units were newly constructed in East Japan prefectures. As of December 2014, 55 % of temporary housing households resided in DTH and 45 % in PTH in Natori city.

### 2.2 Instrument

The life recovery scale measures the degree to which one feels that he/she is no longer a disaster victim. The scale is a 5 point Likert scale consisting of 6 life readjustment/fulfillment, 7 life satisfaction and 1 future prospect items whose unidimensionality and reliability (i.e., Cronbach's  $\alpha > .80$ ) have been established in Hyogo Life Recovery Surveys in 1999, 2001, 2003 and 2005 (Tatsuki, 2007). Demographic variables included age, gender, family size, disability/vulnerability status, and house damage. With regard to SCEM, *housing* was measured by temporary housing type (PTH or DTH) and concerns/worries about current and future housing issues, *social ties* by the number of people having social conversation/contact pre and post disaster, *community involvement* by a community outlook scale that measures the degree of neighbors' engagement in community affairs, *physical/mental stress management* by a physical and psychological stress scale, *preparedness* by concerns for future disaster risk, *livelihood* by financial impact and leeway scales as well as occupation pre and post disaster, *relations to government* by a communitarian/liberal attitude scale as well as levels of awareness on and attention to local government PR information. In addition, 1 *impact alleviation* and 2 *event evaluation* items were used to measure *life recovery process* variables which were known to intervene between SCEM and life recovery outcomes (Tatsuki, 2007).

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## 2.3 Procedures

The survey questionnaire package consisted of a 2-page household questionnaire and 6 sets of a 4-page household member questionnaire. Both household and its member questionnaires were included in an official Natori city envelope and were sent to all registered temporary housing households during the second week of January in 2015. Each household was asked to answer one household questionnaire and each household member was asked to respond to an individual member questionnaire. A return envelope addressed to Natori city office was included in each package. Postcards reminding the return of questionnaires were sent on January 26<sup>th</sup>. Furthermore, new sets of questionnaires were mailed again on February 19<sup>th</sup> to those households that had not returned the questionnaires by February 5<sup>th</sup>. All those responses that arrived at the city by the first week of March in 2015 were used for the analysis.

In order to compare the current study results with 2001 Hyogo Life Recovery Survey results, a general linear model (GLM) was used to test and estimate the effects of demographic, SCEM and life recovery process variables on life recovery. SPSS version 23 was used for the statistical analyses.

## 3. RESULTS AND DISCUSSION

### 3.1 Demographics and house damage

1,107 (702 PTH and 831 DTH) households returned the household questionnaire (72.2 % response rate) and 1,971 (820 PTH and 1,151 DTH) residents returned the household member questionnaire (56.1 % response rate). The average ages of the respondents were 54.4 and 56.1 for males and females, respectively. The average ages by temporary housing type was 59.8 and 52.1 for PTH and DTH, respectively suggesting that nearly half of PTH residents were over the age of 60 while the majority of DTH residents were working age, possibly with school age children.

Table 1: House damage by 2015 Natori and 2001 Hyogo Life Recovery Survey

	2015 Natori Life Recovery Survey		2001 Hyogo Life Recovery Survey	
	N		N	
Full Damage	1503	( 76.3% )	195	( 16.2% )
Large Scale Half Damage	58	( 2.9% )		
Half Damage	80	( 4.1% )	231	( 19.2% )
Partial Damage			554	( 46.1% )
No Damage			223	( 18.5% )
Missing	330	( 16.7% )		
Total	1971	( 100.0% )	1203	( 100.0% )

Table 1 compares proportions of house damage categories between the two life recovery surveys. While 2001 Hyogo Life Recovery Survey sampled those who were residing in the most severely earthquake-hit areas and therefore their house damages varied widely from no damage to full damage, 2015 Natori Survey subjects were heavily (almost 5 times higher) concentrated in the full damage category (those who did not answer house damage were mainly those who moved from Fukushima) because Natori survey specifically focused on those who lost their houses due to the 311 tsunami and following Fukushima nuclear power plant disaster and were residing in temporary housing units at the time of the survey. The damage comparison suggests that house

damage effects need to be partialled out before comparing SCEM effects on life recovery between the two surveys.

Table 2: Multiple regression (GLM) analysis of house damage and SCEM effects on life recovery

Hazard Exposure and Seven Critical Elements for Life Recovery		Parameter	Model 1	Model 2	Model 3
			B	B	B
		Model Intercept	51.438 ***	51.454 ***	48.161 ***
<b>HOUSE DAMAGE</b>					
		Full House Damage	.544 **	1.384 **	1.305 ***
		Large Scale Half House Damage	-0.166	-0.008	.067
		Half House Damage	2.058 *	2.173 **	2.039 *
		No Answer	0 <sup>a</sup>	0 <sup>a</sup>	0 <sup>a</sup>
<b>HOUSING</b>					
		Temporal Housing Type Prefabricated Temporary Housing (PTH)	-0.870 *	-0.746 (p=.107)	5.014 *
		Designated Temporary Housing (DTH)	0 <sup>a</sup>	0 <sup>a</sup>	0 <sup>a</sup>
		Temporal Housing Type by Person with Disability PTH*No Disability	0 <sup>a</sup>	0 <sup>a</sup>	-765
		PTH*Disability	0 <sup>a</sup>	0 <sup>a</sup>	0 <sup>a</sup>
		DTH*No Disability	0 <sup>a</sup>	0 <sup>a</sup>	4.136 **
		DTH*Disability	0 <sup>a</sup>	0 <sup>a</sup>	0 <sup>a</sup>
		Temporal Housing Type by Single Elderly Household PTH*Any Household Other Than Single Elderly Person Household	0 <sup>a</sup>	0 <sup>a</sup>	-3.492 **
		PTH*Single Elderly Person Household	0 <sup>a</sup>	0 <sup>a</sup>	0 <sup>a</sup>
		DTH*Any Other Than Single Elderly Person Household	0 <sup>a</sup>	0 <sup>a</sup>	-1.029
		DTH*Single Elderly Person Household	0 <sup>a</sup>	0 <sup>a</sup>	0 <sup>a</sup>
		Temporal Housing Type by Household with/without Physically Vulnerable Person PTH*Household with Physically Vulnerable Person	0 <sup>a</sup>	0 <sup>a</sup>	1.303
		PTH*Household without Physically Vulnerable Person	0 <sup>a</sup>	0 <sup>a</sup>	1.772 **
		PTH*Household with or without Physically Vulnerable Person Unknown	0 <sup>a</sup>	0 <sup>a</sup>	0 <sup>a</sup>
		DTH*Household with Physically Vulnerable Person	0 <sup>a</sup>	0 <sup>a</sup>	-1.252 *
		DTH*Household without Physically Vulnerable Person	0 <sup>a</sup>	0 <sup>a</sup>	.084
		DTH*Household with or without Physically Vulnerable Person Unknown	0 <sup>a</sup>	0 <sup>a</sup>	0 <sup>a</sup>
		Concerns about Housing Issues Scale Concerns/Worries about Public Housing (factor score)	0 <sup>a</sup>	-0.420 *	-406 **
		Concerns/Worries about Current Temporary Living Arrangements (factor score)	0 <sup>a</sup>	-0.337 *	-338 *
<b>SOCIAL TIES</b>					
		Number of Neighbors/Relatives/Friends having social conversation with before 311 None	1.819 **	1.532 *	1.516 *
		1 to 4	2.728 ***	2.650 ***	2.812 ***
		5 to 9	0.873	0.759	.830
		more than 10	0 <sup>a</sup>	0 <sup>a</sup>	0 <sup>a</sup>
		Number of Neighbors/Relatives/Friends having social conversation with after 311 None	-1.759 **	-1.555 **	-1.600 **
		1 to 4	-2.979 ***	-2.834 ***	-3.024 ***
		5 to 9	-1.626 ***	-1.593 ***	-1.522 ***
		more than 10	0 <sup>a</sup>	0 <sup>a</sup>	0 <sup>a</sup>
		Number of People meeting in hobby/circle/social gatherings before 311 None	2.832 ***	2.980 ***	2.908 ***
		1 to 4	1.471	1.472	1.310
		5 to 9	0.870	0.936	1.182
		more than 10	0 <sup>a</sup>	0 <sup>a</sup>	0 <sup>a</sup>
		Number of People meeting in hobby/circle/social gatherings after 311 None	-3.430 ***	-3.588 ***	-3.309 ***
		1 to 4	-0.737	-0.849	-.840
		5 to 9	-0.433	-0.457	-.742
		more than 10	0 <sup>a</sup>	0 <sup>a</sup>	0 <sup>a</sup>
<b>COMMUNITY INVOLVEMENT</b>					
		Residents do not socialize with each other and live by themselves	-3.133 ***	-3.212 ***	-3.425 ***
		Residents do not socialize but neighborhood representatives seem to be more or less active	-3.320 ***	-3.403 ***	-3.632 ***
		Residents socialize to a certain degree and some greet each other	-1.968 ***	-1.966 ***	-2.201 ***
		Residents socialize very often and participate well in community events	0 <sup>a</sup>	0 <sup>a</sup>	0 <sup>a</sup>
<b>PHYSICAL/MENTAL STRESS MANAGEMENT</b>					
		Subjective Evaluation on one's health condition Good	4.886 ***	4.739 ***	4.373 ***
		OK	2.463 ***	2.299 ***	2.231 ***
		Bad	0 <sup>a</sup>	0 <sup>a</sup>	0 <sup>a</sup>
		Physical and Mental Stress Scale Physical and Mental Stress (factor score)	-2.656 ***	-2.621 ***	-2.598 ***
<b>PREPAREDNESS</b>					
		Concerns for Future Disaster Risks Low concerns for future disaster risk (optimal scaling score)	0.513 ***	0.496 **	.474 **
<b>LIVELIHOOD</b>					
		Financial Impact Score Household Financial Impact (optimal scaling score)	-0.819 ***	-0.849 ***	-.720 ***
		Financial Leeway Score Household financial Leeway (optimal scaling score)	0.934 *	0.909 (p=.103)	.988 *
		Financial Leeway Score by Age Financial Leeway by Age less than 18	1.775	1.891	1.826
		Financial Leeway by Age between 19 and 64	0.077	0.100	-.025
		Financial Leeway by Age between 65 and 74	-1.945 **	-1.673 **	-1.724 **
		Financial Leeway by Age 75 and over	0 <sup>a</sup>	0 <sup>a</sup>	0 <sup>a</sup>
		Occupation Proprietor (before)	-3.582 ***	-3.547 ***	-1.991 ***
		Proprietor (present)	3.076 ***	3.074 ***	-4.402 ***
		Retired (before)	1.907 **	1.808 **	-1.008 *
		Retired (present)	-2.966 ***	-2.807 ***	-1.100 ***
		Unemployed (before)	2.316 ***	2.168 ***	.099 ***
		Unemployed (present)	-3.475 ***	-3.306 ***	-5.060 ***
<b>RELATION TO GOVERNMENT</b>					
		Relation to Government Scale Communication vs. Liberal Attitude Score (optimal scaling score)	-0.316	-0.327 (p=.103)	-.362 *
		Attention to Local Government Public Relation Information Scale Low Attention to Local Government Public Relation Information (optimal scaling score)	0.541 ***	0.535 ***	.332 ***
<b>RECOVERY PROCESS</b>					
		Recovery Process Score (factor score)	4.004 ***	3.944 ***	3.882 ***
		R <sup>2</sup> (df/ adjusted R <sup>2</sup> )	.547 (.534)	.548 (.534)	.555 (.538)

\*\*\*  $p < .01$ , \*\*  $p < .05$ , \*  $p < .10$

### 3.2 Effects of seven critical elements on life recovery

#### 3.2.1 Model fit

Table 2 summarizes multiple regression (GLM) analysis results. It compares results of 3 models where varying degree of housing parameters were successively added. In Model 1, only temporary housing type (PTH or DTH) was entered. Concerns and worries about current and future housing issues were entered in Model 2, and finally temporary housing type by social vulnerability (e.g., household with person with disability, single elderly, or physically vulnerable person) interactions were added in Model 3. Although the interpretation of the housing variable parameters will be discussed in the later section, it should be noted that the final Model 3 predicted highest 55.5 % of the total variance in observed life recovery scores ( $R^2=.555$ , adjusted

$R^2=.538$ ) compared with Model 1 ( $R^2=.547$ , adjusted  $R^2=.534$ ) and Model 2 ( $R^2=.548$ , adjusted  $R^2=.534$ ). Figure 1 illustrates an observed by Model 3 predicted values plot at

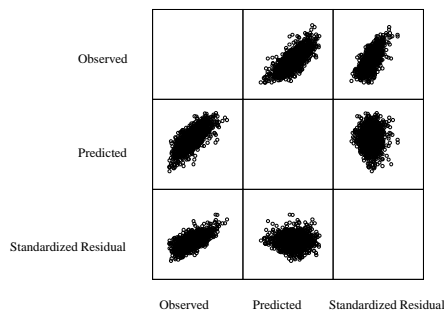


Figure 1: Observed by Model 3 predicted (top center) by standardized residuals (bottom center) plot.

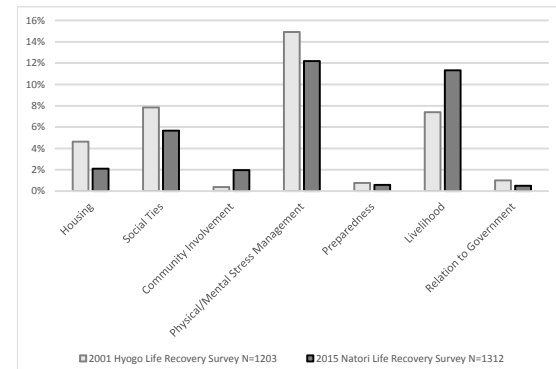


Figure 2: Comparisons of each SCEM parameter effect size (partial  $\eta^2$ ) on life recovery between 2015 Natori and 2001 Hyogo Life Recovery Surveys.

the top center which shows a linear fit. At the bottom center of Figure 1, standardized residuals by predicted values were plotted, which showed that residuals were evenly scattered against low to high predicted values without any particular patterns. Those two plots displayed that the final Model 3 showed a good fit ( $R^2=.555$ ), which is comparable to 2001 Hyogo Life Recovery Survey ( $R^2=.470$  (Tatsuki and Hayashi, 2001) or  $R^2=.593$  (Tatsuki and Hayashi, 2002)), to the observed life recovery scores and therefore affirmed the first research question – whether SCEM is capable of a large proportion of life recovery score variance among Natori impacted people – of the current paper.

### 3.2.2 Parameter effects on life recovery

Partial regression parameter estimates for house damage and each of SCEM were listed at the last 3 columns of Table 2. Because the effects of other parameters were partialled out when interpreting a given parameter, the effects of other parameters such as house damage categories were controlled. This made it possible to compare SCEM parameters between Natori and Hyogo Life Recovery Survey results despite that Natori study subjects were heavily skewed toward heavy house damages.

With regard to effects of *housing* parameter, Model 1 and 2 demonstrated that PTH on average tended to have negative impacts on life recovery in comparison to DTH. This seems to support the validity of the newly introduced DTH policy for prefecture government's renting privately owned housing units and designating them for disaster survivors' use as temporary housing units. It should be noted that Model 3 PTH parameter became positive suggesting PTH rather than DTH tended to positively promote life recovery. This reversal of effect direction from negative to positive could be interpreted as the result of multicollinearity that were caused by entering 14 additional housing parameters (social vulnerability and temporary housing type interactions) into Model 3.

For such SCEM parameters as *social ties*, *community involvement*, *physical/mental stress management*, *preparedness* and *livelihood* as well as intervening *life recovery process*, their effect directions were similar to 2001 Hyogo Life Recovery Survey results. With regard to *social ties*, those who used to socialize with more than 5 neighbors/relatives/friends in daily conversations or in social gatherings before the

disaster showed better life recovery. However, this threshold value increased to more than 10 in order for socialization or social gathering to have positive impacts on better recovery after the disaster. While *social ties* are an ego-centric and personal social capital indicator, *community involvement* measures levels of communal social capital that are shared by a network of people in a community as a whole. On this ground, better life recovery was predicted only by those who reported that one lived in a community where “residents socialize very often and participate well in community events.” With regard to a subjective evaluation of one’s own health, a measure of *physical/mental stress management*, those who reported “Good” or “OK” showed significant positive impacts on life recovery in comparison with those who answered “Bad.” These findings were further supported by more reliable measures of the 6 item physical and mental stress scale scores. *Preparedness* was measured by how optimistic one was to future disaster losses and the better recovery was predicted by the optimistic attitudes to disaster risks. The similar effect was also observed in 2001 Hyogo Life Recovery Survey. These results seem to support an old saying “danger past and God forgotten.” Disaster’s impacts on household finance and the current financial leeway were very strong *livelihood* predictors of life recovery. Those “younger” elderly between 65 and 74 years old who showed less financial leeway were the least recovered among all ages. With regard to occupation, the proprietors, the retired and the unemployed on average showed significantly lower life recovery scores. Finally, an intervening life recovery process measure, a composite of 1 *impact alleviation* and 2 *event evaluation* items, showed significant positive impacts upon life recovery as has been demonstrated in 2003 and 2005 Hyogo Surveys (Tatsuki, 2007).

The 2015 Natori Life Recovery Survey like the 2001 Hyogo Life Recovery Survey showed the tendency that the respondent’s attitude toward government (*relation to government*) mattered. Unlike the Hyogo Survey, however, the less communitarian and more self-reliance (liberal) oriented Natori temporary housing residents tended to show better recovery. Nature of pre-disaster government-people relationships seems being different between Natori and Hyogo areas and this difference needs to be further examined in future studies.

The second research question of the current paper was to identify the similarities and differences between the 1995 Kobe Earthquake and the 2011 GEJE in terms of which critical elements were relatively more important to determine life recovery in each respective event. Figure 2 directly answers to this question. It compares effect sizes of the seven critical elements upon life recovery as measured by partial  $\eta^2$  between 2015 Natori and 2001 Hyogo Life Recovery Surveys. The direct comparison of  $\eta^2$  values in two surveys should be supported because goodness-of-fit estimates were comparable in 2 studies ( $R^2=.555$  for Natori and  $R^2=.470$  (Tatsuki and Hayashi, 2001) or  $R^2=.593$  (Tatsuki and Hayashi, 2002) for Hyogo surveys). Figure 2 illustrates that the top 3 most powerful influences upon life recovery were *physical/mental stress management*, *livelihood*, and *social ties* in both surveys. Between-comparisons of effect sizes for each parameter, however, indicated that *livelihood* as well as *community involvement* mattered more in Natori survey while *physical/mental stress management*, *social ties* and *housing* (*housing* variance was much smaller in Natori Survey because all subjects lived in temporary housing units) were more valued in Hyogo survey. This may suggest relative importance of livelihood assistance programs for Natori impacted citizens.

### 3.3 Designated versus prefabricated temporary housing

At the onset of the GEJE, National government needed to provide more than hundred

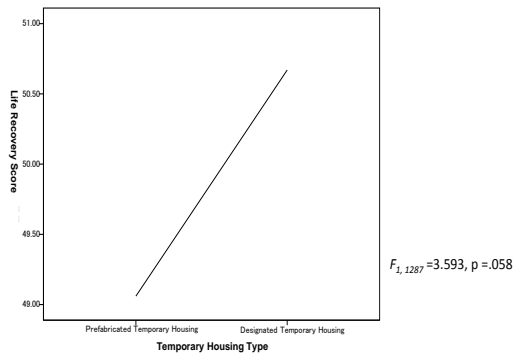


Figure 3: Life recovery score by temporary housing type

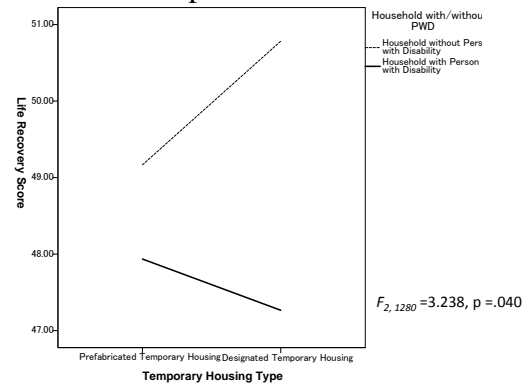


Figure 4: Life recovery score by temporary housing type by household with/without person with disability

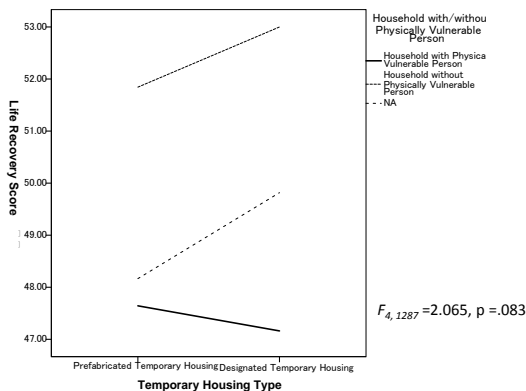


Figure 5: Life recovery score by temporary housing type by household with/without physically vulnerable person

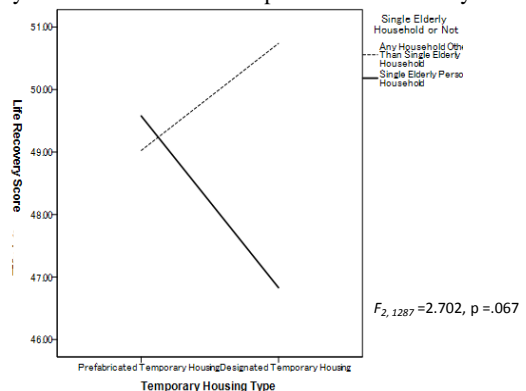


Figure 6: Life recovery score by temporary housing type by single elderly household or not

thousand temporary housing units urgently nearby the disaster area. Because it was impossible to construct such a large number of prefabricated temporary housings in a limited time, National government allowed prefectural governments to rent out privately owned housings and to use them as temporary housing units to the disaster victims. For the first time in Japanese disaster management history, the impacted citizens had to make decisions whether to dwell in conventional prefabricated temporary housing complex units or in designated private rental housing units that were situated in widely dispersed locations. Japanese disaster research has been mainly focusing on life recovery assistance for prefabricated temporary housing inhabitants who live in a close proximity and not much is known about “diaspora” survivors. The third research question of the present paper was to portray the unique aspects of life recovery processes of DTH residents in comparison with those who were residing in PTH units.

Our research team decided to work with the life recovery support department of Natori city in early May of 2011 with the concerns that DTH dwellers would have much harder time for them to form mutual support networks, and to obtain necessary public information and assistance, due to the fact that they resided in widely dispersed areas inside and outside of the city/township of their original residence. As was briefly discussed in the previous section and also shown in Figure 3, however, life recovery scores of DTH residents on average tended to be higher than PTH residents ( $F_{1, 1287} = 3.593, p = .058$ ). This seems to support in general the validity of the newly introduced DTH policy. Geographical dispersion seemed not to matter much among the surveyed average Natori impacted citizens. This finding partly supported earlier findings made by

ethnographic interviews with impacted Natori DTH residents (Tanaka and Shigekawa, 2014, 2015; Tatsuki, 2015a) which identified 3 groups of DTH households (Tatsuki, 2015a, p. 943):

- 1) Younger, self-reliant and upward mobile families, 2) families with individuals such as PWD and frail elderly that required reasonable accommodations in their everyday functioning, and 3) vulnerable households that would have been benefited from group living conditions in prefabricated housing complexes but failed to submit applications in time.

Figure 3 seems to imply that DTH was a better choice for “1) younger, self-reliant and upward mobile families” according to the classification made by Tanaka and Shigekawa (2014).

In order to examine life recovery situations among the next two categories of “households with persons with disability” and/or “vulnerable households”, Model 3 tested temporary housing type by social vulnerability (PWD, physically vulnerable and single elderly household) interactions. Figure 4 and 5 showed that those households with PWD or physically vulnerable members respectively were better recovered at PTH while any other households’ showed higher life recovery average at DTH. Similarly, Figure 6 demonstrates that such vulnerable households as single elderly households seemed to “have been benefited from group living conditions” in PTH showed better recovery at PTH than at DTH.

In conclusion, the current study affirmed 1) that SCEM was capable of a large proportion of life recovery measure variance among Natori impacted people; 2) that the top 3 most powerful influences upon life recovery were *physical/mental stress management*, *livelihood*, and *social ties* in both 2015 Natori and 2001 Hyogo Life Recovery Surveys while *livelihood* as well as *community involvement* mattered more in Natori survey; and that 3) DTH was better suited to “younger, self-reliant and upward mobile families” while those households with social vulnerabilities were benefited from PTH group living conditions.

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## REFERENCES

- Tanaka, S. and Shigekawa, K., 2014, Housing recovery processes of the temporary housing dwellers for the 2011 great east japan earthquake: Natori city case study, *Proc. of the 3rd Int. Conf. on Urban Disaster Reduction*, 2014.
- Tanaka, S. and Shigekawa, K., 2015, Life Recovery Process Analysis of Designated Temporary Housing Dwellers, (Japanese), *Proc. of the 36th Institute of Social Safety Science Meeting*, 55-56.
- Tatsuki, S. and Hayashi, H., 2001, General Linear Model analyses of life recovery factors in the 2001 Kobe Panel Survey data. *Proceedings of U.S.- Japan Cooperative Research in Urban Earthquake Disaster Mitigation Third Grantees’ Meeting*, 557-574.
- Tatsuki, S. and Hayashi, H., 2002, Seven Critical Element Model of Life Recovery: General Linear Model Analysis of the 2001 Kobe Panel Survey data. *Proceedings of 2nd Workshop for Comparative Study on Urban Earthquake Disaster Management*, 27-46.



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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.  
Tatsuki, S., 2015a, Optimal life recovery assistance for those who are residing in designated temporary housing in widely dispersed locations, *Journal of Disaster Research*, 10(5), 939-947.