



Inclusive Disaster Risk Reduction with Beppu-Model: Assessment by comparison of 36 municipalities in Hyogo Prefecture

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Abstract

Older and/or disabled people have been known to suffer more serious damages to disasters. After the Great East Japan Earthquake, Tatsuki (2014) pointed out that the root cause of the proportionately heavier damages is due to the siloed approaches taken by social service and disaster management organizations and to the lack of coordination between normalcy and disaster time responses. One solution is to involve social workers who make plans for everyday living needs during normalcy and to ask them to prepare disaster care plans simultaneously.

This paper reports a Research, Development, and Utilization project that interlinks normal time social services and disaster time local responses to persons with disabilities (PWD). This perspective is based on inclusive disaster risk reduction, which is the main point of Sendai Framework for Disaster Risk Reduction 2015-2030 (SFDRR). A three-year project was launched in Beppu City in 2016 that led to the standard operation procedure (SOP) for assessment, informal human resources matching, and disaster response simulation during disaster drills. At the end of the project, a quasi-experimental, propensity score-matched impact evaluation demonstrated a significant increase in DRR literacy scores only among the experimental group PWDs. In 2018, Hyogo prefecture initiated the Beppu-model SOP utilization grant program. Based on the preliminary results in Harima township, one of the two initial municipalities, Hyogo prefecture, decided to expand the grant program to all Hyogo municipalities.

As a result, 36 out of 41 local governments applied for the project as of 2019. Through this Hyogo project, we can compare 37 municipalities and reveal the functional factors to conduct inclusive disaster risk reduction with the Beppu-model. This paper concludes with the preliminary impact evaluation of inclusive disaster risk reduction with the Beppu-model SOP implementation/utilization project in Hyogo.

Keywords: inclusive disaster risk reduction, impact evaluation, persons with disabilities, Beppu-model.



1. Introduction

1.1 Background

Use the decimal system of headings with no more than three levels. Older and/or disabled people have been known to suffer more serious damages to disasters. For example, in the Mabi town, which severely damaged by the 2018 Japan floods, 42 people out of 51 deaths were listed on the people need functional support to evacuation. This kind of problem is not new. In 2005, the Japanese Cabinet Office established a committee on “Communicating Disaster Information and Evacuation/Sheltering Assistance for the Elderly and Other Population during Heavy Meteorological and Other Disasters” to find the solution to this problem. The committee published the first edition of the “Evacuation/Sheltering Assistance Guideline for People with Special Needs in Times of Disaster” in March 2005. However, this guideline was not enough to solve the problem. Since that, the people with functional needs (PFND) mortality rates in 2011, the Great East Japan Earthquake was approximate twice the overall mortality rate. From the casualty analysis among people with disabilities (PWD) by the data from Mainichi Shimbun newspaper and Japan Broadcasting Corporation (NHK), Tatsuki (2013) found that there was the casualty gap between the total and PWD for each of the three prefecture municipalities, Iwate, Miyagi and Fukushima prefecture [1]. The regression coefficient of the casualty gap for Miyagi Municipalities was 1.92. This means the PWD mortality rate was 1.92 times as many as that of the total mortality rate in Miyagi prefecture. By contrast, the regression coefficient for Iwate was 1.16, and Fukushima was 1.19. Tatsuki (2018) pointed to decades-long normalization practices as a cause for the casualty gap for Miyagi [2]. In other words, the siloed approaches taken by everyday social service and crisis time disaster management organizations and to the lack of coordination between normal and disaster time responses were mentioned as the “root cause,” creating a dynamic pressure that pushes the disabled into a more vulnerable presence in a disaster [3, 4]. One solution is to involve social workers who make plans for everyday living needs during normalcy and to ask them to prepare disaster care plans simultaneously.

1.2 Previous Research

The basic theory to think about social service is the social model of disability. Japan ratified the Convention on the Rights of Persons with Disabilities in 2014. Since the convention reflected the concept of the social model of disability, the social model became the primary interpretation of disabilities in the Japanese system. This theory takes responsibility for barriers to social systems, structures, designs, and values, and asks the society itself for their social and institutional solution (Oliver 1990) [5]. “The intersection of social vulnerability theory and the social model of disability emphasizes both that disaster vulnerability is socially constructed and that disability arises from barriers and inequities constructed by society.” [6, p.236].

“Nothing About Us Without Us” is the world banner and slogan for the Convention on the Rights of Persons with Disabilities, and also the philosophical construct of Sendai Framework for Disaster Risk Reduction 2015-2030 (SFDRR). Based on that, SFDRR clearly stated the necessity for inclusive disaster reduction. In Japan, the “Disability Discrimination Act for People with Disabilities” was enacted to support this, and the prohibition against the provision of reasonable accommodation was clearly stated. PWD raised their voices, and society as a whole was required to make efforts to provide reasonable accommodation even in the time of disasters.

To practice approaches to disability-inclusive disaster risk reduction (DiDRR), the empowerment of PWD is necessary. The workshop and interview researches to PWD about their image of capacity for DiDRR revealed that their vision of DiDRR capacity was DRR literacy, which was an essential DRR capacity for everyone. The DRR literacy has consisted of three factors such as 1) understanding of hazard and risk, 2) awareness of preparedness, and 3) confidence in the action. DRR literacy is could certainly be expected the improve the preparation and responses since it starts with the personalizing risk, which links knowing about a hazard and taking self-protective action [7]. The most critical problem is Japanese society still excludes PWD from the opportunities to improve DRR literacy.



1.3 Purpose

This paper reports a Research, Development, and Utilization project that interlinks normal time social services and disaster time local responses to persons with disabilities (PWD). A three-year project was launched in Beppu City in 2016 that led to the standard operation procedure (SOP) for assessment, informal human resources matching, and disaster response simulation during disaster drills. At the end of the project, a quasi-experimental, propensity score-matched impact evaluation demonstrated a significant increase in DRR literacy scores only among the experimental group PWDs. These results supported the utilization project in Hyogo prefecture, and this would contribute to improving Japanese DiDRR.

2. Method

2.1 Target Area

Beppu city in Oita prefecture is one of the famous tourist resort for hot spring. The population is about 120,000 and about 8.8 million tourists visit every year. In the event of a massive Nankai Trough earthquake that is predicted to occur shortly, it is assumed that a tsunami of about 5 meters will hit Beppu city. Historically some many PWDs live as independently as possible within one's community since there were large sanatoriums for wounded soldiers. This situation enhanced the cooperative structure of PWD. The Welfare Forum, which is the association beyond types of disabilities, and this association worked hard to the enforcement of the regulations “People with and/or without Disabilities can Live Safely and Secure.” This regulation is the key driver for Beppu city DiDRR since this regulation focused on two significant challenges, 1) the problem about parents’ death for children with disabilities, and 2) DiDRR.

From 2017 through 2018, six field studies (7th through 9th Nov. 2017, 17th Nov. 2017, 10th Dec. 2017, 15th Sep. 2018, and 25th Nov. 2018) were conducted to develop standard operating procedures (SOP) of planning a disaster care plan.

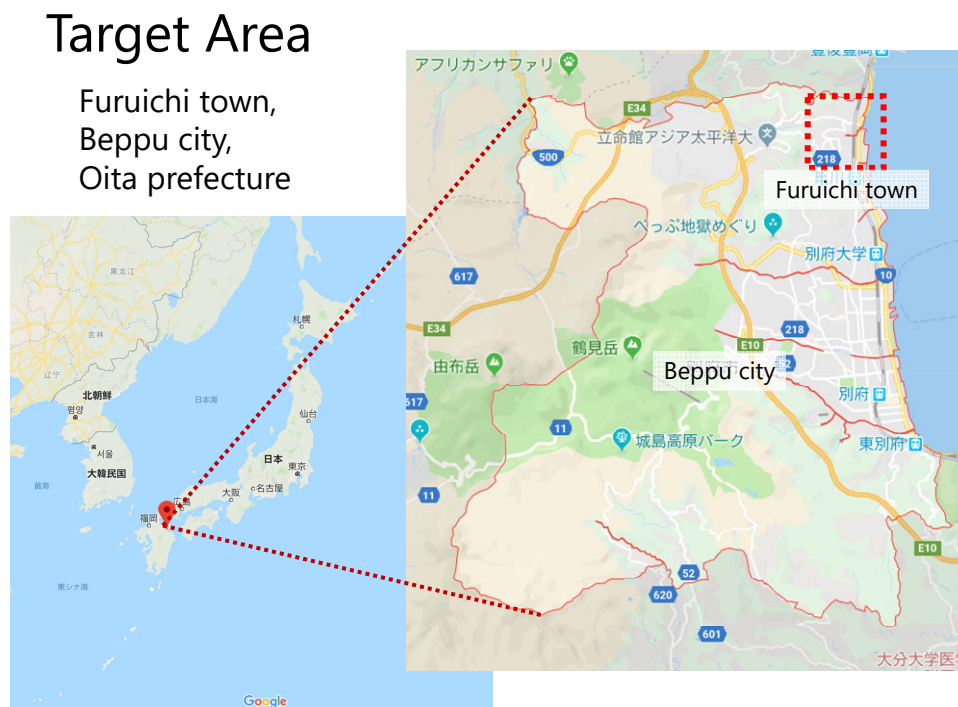


Fig. 1 – Map of Target Area

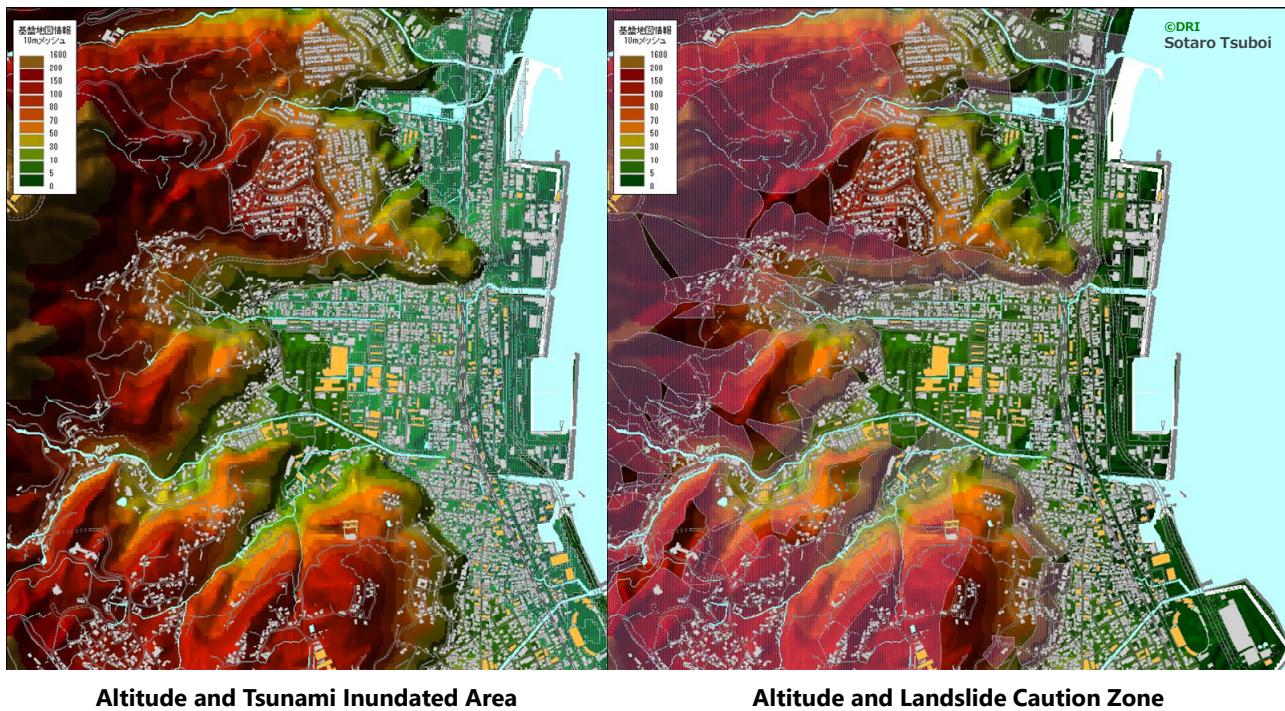


Fig.2 – Altitude and Hazard of Target Area

2.2 Experimental Design

This study aims to clarify whether creating a disaster care plan will improve the DRR literacy of PWD, and to provide a scientific basis for the need and the process of creating a disaster care plan. Therefore, we want to measure the DRR literacy before and after creating a disaster care plan and find the difference between the scores. Table 1 [8] is used as an index to measure DRR literacy. This is an index created using concepts derived from workshops and interviews conducted with PDWs in Beppu City.

Since there were only nine PWD planed their disaster care plan, and that was not enough cases to conduct evaluation analysis, the quasi-experimental outcome evaluation of participation in an inclusive disaster drill was conducted. In the used data, there were 23 PWD in experimental and 19 in control groups (table 2).

Propensity score matching analysis used for outcome evaluation of quasi-experiment in this paper [9, 10]. This analysis evaluates the impact of specific intervention by creating two comparable sample groups. In this study, participation in an inclusive disaster drill was the intervention, so the 'participated' group is the treatment group, and the 'not-participated' group is the control group. The DRR literacy used as the evaluation scale. To conduct propensity score matching analysis, inverse probability weighting (IPW) used. IPW wrights by the inverse of the propensity score. This method permits a more precise estimate of a causal effect. It is assumed that people who are originally interested in disasters and have high DRR literacy tend to participate in evacuation drills more easily. By using IPW, the causal effect after removing the selection bias can be estimated, so that the effect of participating in a purer evacuation drill can be measured.



Table 1 – Disaster Risk Reduction Literacy Index

understanding risk	1. Questions about your understanding and knowledge of disasters
	1) I know about previous disasters that happened in my region.
	2) I know where the faults (= a large crack in the rocks that form the Earth's surface) are which may cause earthquakes.
	3) I can say where the dangerous places are based on a hazard map.
	4) I know what level of seismic performance my house has.
	5) I know the area having potential threats of building collapse.
	6) I think that people who have disabilities would not be extremely vulnerable if they have a support from their family and friends.
	2. Questions about your interest toward disasters
	1) I have enough knowledge about earthquakes, floods, and sediment disasters.
	2) I know the densely built-up area are susceptible to the high risk of spreading fire from house to house.
	3) I have strong interest in the measures against earthquakes, floods and sediment disasters.
	4) I often check the information about disaster prevention.
5) I have discussed the danger of earthquakes with my family and friends.	
6) I feel earthquakes are relevant to my daily life.	
the preparedness	3. Questions about the preparation by yourself for the disaster
	1) I spent money in disaster prevention measures.
	2) I fixed the furniture in case of disaster.
	3) I live in a quake-proof house.
	4) I try not to place burnable stuff around my house.
	5) I try not to place unstable furniture near the bedroom or the entrance.
	6) I usually store emergency foods and water.
	7) I prepare the emergency bag containing various tools and foods.
	8) I discuss what we should do in case of a disaster with my family and close friends.
	9) I check and discuss how to contact each other with my family and friends.
	10) I know what to do if evacuation preparation information is provided.
	4. Questions about your knowledge of government's plans
	1) I know what kind of disaster prevention plan the city has.
	2) I know what kind of support we can get from the government.
	3) I know the evacuation areas in my region.
	5. Questions about neighborhood relations
	1) I usually say hi to my neighbor.
	2) I usually say hi to the social workers.
	3) I have a friend near my house who can help me in case of disaster.
	4) I have a friend near my house who can go find the shelter with me.
	5) I usually think how to get the information in case of disaster.
	6. Questions about your preparedness to receive appropriate and reasonable accommodation.
	1) I usually bring the "Bousai Card*" with me. (*a card containing the following information: emergency contact information, medical history, etc.)
	2) I generally tell my neighbor about the support I personally need.
	3) I usually have a meeting on the evacuation for people with disabilities in my region.
	4) I prepare the extra stuff I need to live e.g. a battery of wheelchair, medicines
	5) I know about the welfare evacuation.
	6) I feel hesitant to share my personal information with my neighbor.
prompt action	7. Questions about your actions and decisions in case of disaster
	1) I can use the Disaster Emergency Message Dial.
	2) I can ask a help to others if it's difficult to evacuate by myself.
	3) I can ask a help to others during the evacuation.
	4) I can evacuate smoothly when a disaster happens.
	5) I can tell my safety information to my family and friends.
	6) I can take actions to save my own life.
	7) I think we should protect ourselves in case of disaster.
	8) I can make an accurate judgement whether I should evacuate or not.
	9) I can act on my own judgement to evacuate even if others stay home.
	8. Questions about the life at the evacuation shelter
	1) I can express what I need concretely to the staff at the shelter.
	2) I can raise my voice when I need a help with care.
	3) I can explain what kind of help I need at the evacuation shelter.
	4) I would like to do volunteering at the evacuation shelter.
	5) I would like to make a greeting with people actively at the evacuation shelter.
	6) I would like to play various roles at the evacuation shelter.
	7) When someone decides about the measure against disasters, I think "don't decide matters about us ourselves."



Table 3 – Results of IPW Analysis

		Disaster Care Plan		
		with	without	Total
Drill	participation	1	22	23
	non-participation	8	16	24
Total		9	38	47

3. Results

3.1 Beppu Model's Standard Operational Procedure (SOP)

The biggest difference between support during normal times and disasters is that all welfare services and establishments that can be used during normal times are suspended during disasters. In other words, supports in disaster time must use resources other than public welfare services. Specialist organizations such as firefighting, police, the SDF, and DMAT are the most active during the initial response (the day of the disaster) in the event of a disaster, but they have a role in rescuing. The most reliant on evacuation and shelters are those who are physically close at the same distance. In other words, it is necessary to substitute the support provided by public welfare services during normal times with informal resources during disasters. However, for non-professional residents to provide support and take immediate action in the event of a disaster, it is necessary to make a preliminary plan. For this reason, the Beppu City project created a process for a disaster care plan, which creates a disaster care plan in the following six steps during normal time and continuously checks and improves the plan (Fig. 3).

In Step 1, DRR literacy is assessed. This is a renewal of the physical condition and living environment of PDW and the support services used by welfare professionals who are regularly involved with PWD in the creation and operation of care plans, together with PDW and their families during normal time. This allows the PDW and/or the family to be aware of the provisions needed in the event of a disaster. The concrete method is first to explain the damage assumption published by Beppu City and confirm how much the lifeline will be damaged by the assumed earthquake and how it affects their own life. After that, PWD objectively confirms his / her ability and present preparations and becomes aware of the preparations to be performed in the future. The main issue is that they are not connected to informal resources, such as connections with neighbors. Through this step, PWD and the supporter can be aware of the issues that PWD should solve.

Step 2 comprehensively checks the social resources in the area where you live. Specifically, we will analyze the current state of the region using statistical data such as census data, and confirm the human and material resources that can be used even in the event of a disaster. Social resources that can be used in the event of a disaster, such as residents' associations or voluntary disaster prevention organizations, are mediated by inclusion managers and relevant administrative departments (such as crisis management and self-government promotion).

In step 3, the actors involved (PDW, welfare professions, inclusion managers, residents, government-related departments, etc.) gather together based on the party powers identified in step 1, and form a disaster care plan. With the help of a welfare profession, the voice of the PDW is reliably delivered to the residents, and a bridge between the PDW and the residents is provided. At the coordination meeting, the welfare professions mainly share the normal time situation of the PWD with the local supporters, explain the contents of the support from neighbors required in the event of a disaster, and provide concrete instructions to enable the support. Discuss measures and securing and coordinating resources. At that time, the resources



used during normal times and the support and resources required in the event of a disaster are visualized using an ecomap.

In step 4, a draft of a disaster care plan is created while confirming the contents discussed at the coordination meeting with the PDW. This draft should be added to a part of the normal care plan style.

Step 5 documents this draft. Includes information about possible disasters and their consequences, preparations for PDW's efforts, raising voices if needed, and self-determination and consent to share their information locally.

Step 6 verifies the disaster care plan by actually participating in inclusive evacuation drills throughout the region. Inclusive evacuation drills are those in which PDWs participate in evacuation drills for the entire community that is conducted by residents. Participation in this inclusive evacuation drill can be a debut in the local community for PDWs who often complete their lives in the PDW community during normal time. With this opportunity, mutual understanding with residents is promoted, and both self-help and mutual help can be expected to improve.



Fig. 3 – Disaster Care Plan Flow Diagram

3.2 Results of Quasi-Experimental Outcome Evaluation of an Inclusive Disaster Drill

The results of the IPW analysis (Table 3, Fig. 4 - 6), the C statistic calculated by the model in this study was .778, which means that this model was good. Fig. 4-6 is a scatter plot showing the possibility of participating in evacuation drills on the X-axis and the difference in DRR literacy score growth on the Y-axis. Looking at these scatterplots, orange (participants) and blue (non-participants) dots are sparsely scattered for understanding hazards (fig. 4), but for preparedness and prompt action, orange is above the X-axis and blue is at the bottom (fig. 5 & 6). This indicates that participants improved their DRR literacy scores before and after evacuation drills. Also, in Table 3, participation in the disaster drill showed a statistically significant impact to improve preparedness and prompt action but did not show a statistically significant impact on the



understanding risk. This result was understandable because the disaster drill contained only the opportunity to check the preparedness and action.

3.3 Results of Utilization Project

From this fiscal year, Hyogo prefecture started a model project, which is the utilization project of the Beppu model. 36 out of 41 local municipalities become enrolled in this project. For the training of care managers and social workers, the training program was developed and conducted. Also, the e-learning courses are under construction right now. Hyogo prefecture planned to pay additional incentives to care managers and social workers who coordinate disaster care plans.

Table 3 – Results of IPW Analysis

	Coefficient	S.E.	Z-value	P value
Understanding Hazard	1.731	1.307	1.33	0.185
Preparedness	5.776	2.499	2.31	0.021
Prompt Action	7.253	1.849	3.92	0.000
Total	11.456	3.430	3.34	0.001

C=0.778

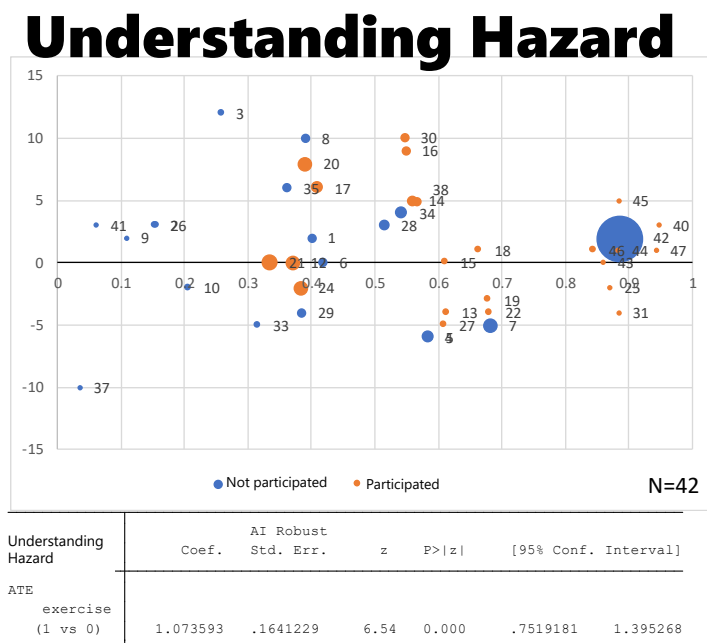


Fig.4 – Scatter Plot of Understanding Hazard



Preparedness

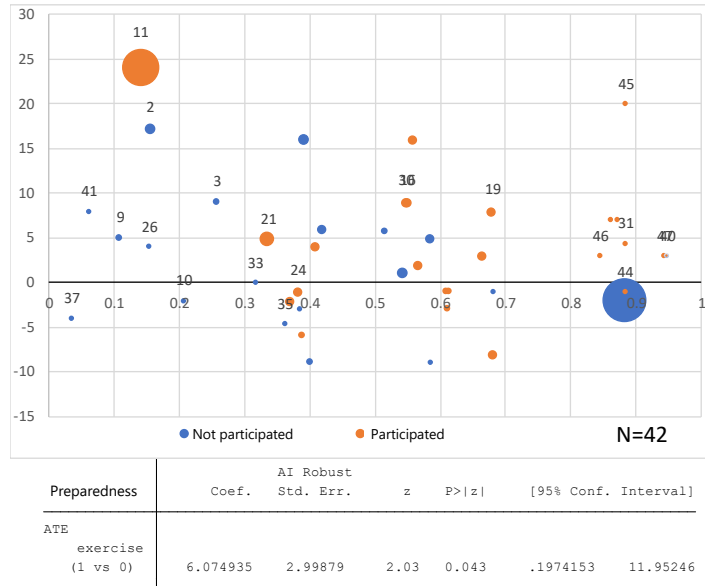


Fig.5 – Scatter Plot of Preparedness

Prompt Action

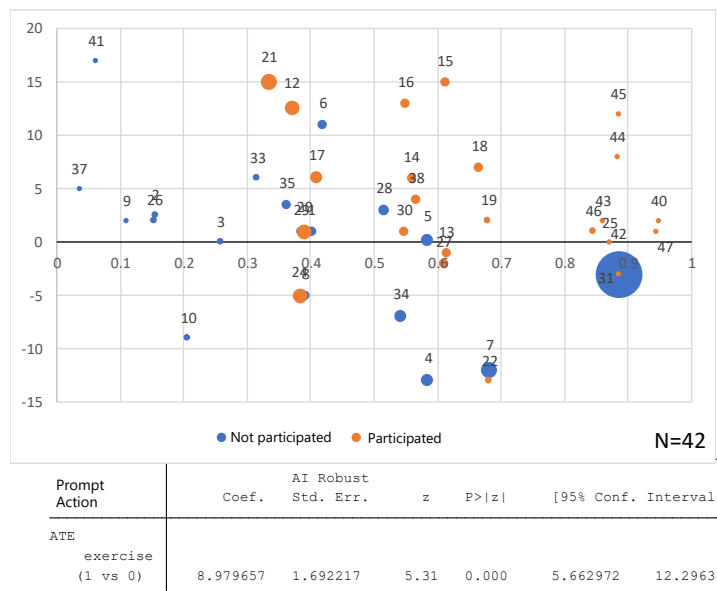


Fig.6 – Scatter Plot of Prompt Action



4. Conclusion

The Beppu model was successfully standardized and utilized in many cities and prefectures. The authors will continue to correct the data by utilization project to find the evidence to enforce the Beppu model.

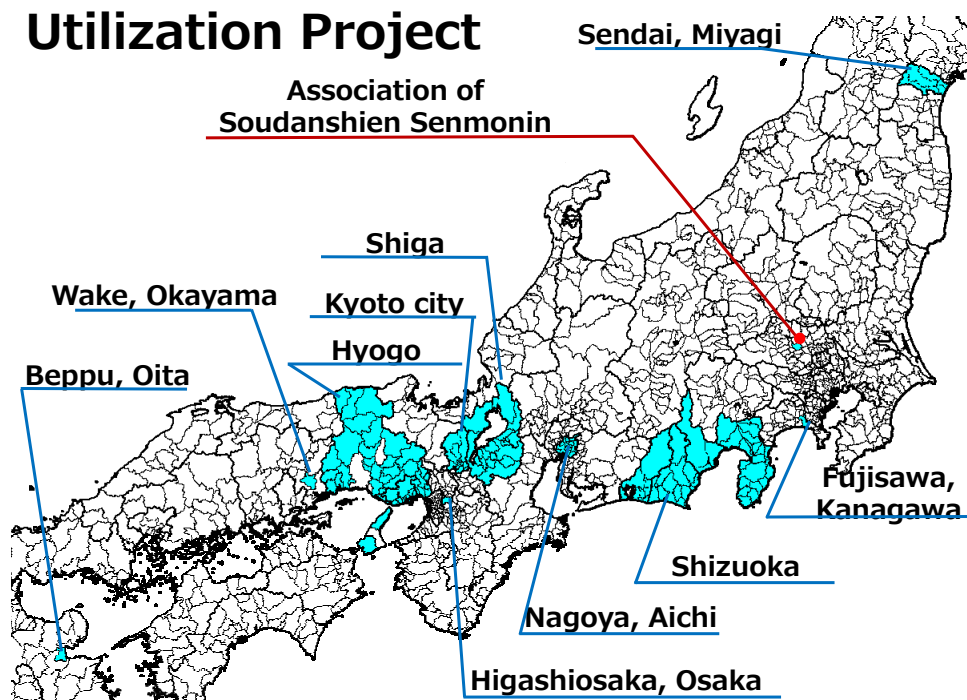


Fig.7 – Picture of Utilization Project

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