ENHANCEMENT OF DISASTER PREPAREDNESS AMONG ELDERLY PEOPLE BY STRENGTHENING ENVIRONMENTAL RISK COMMUNICATION

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ABSTRACT: Disasters potentially generate devastating consequences to our society, particularly in communities contained with various elements at risk such as poorly constructed buildings as well as poverty. Since most of disaster victims were old people, it has been pointed that an increase in elderly population has also enhanced levels of vulnerabilities in potentially impacted areas. This study attempts to enhance old people's capacity to tackle with fire disaster by strengthening environmental risk communication. Three objectives are contained in this study. The first objective is to analyze elderly people's risk perception and motivation to perform self-preventative measures. The second is to describe how old people are educated with risk information and to reveal a wide range of elderly people's awareness and protective motivation influenced by each information source. The last objective is to identify factors associated with an effective risk communication. Regarding the last objective, based on the concept of environmental risk communication and disaster preparedness, influence of socioeconomic factors of elderly people and particular roles of risk communicators were analyzed on elderly people's motivation to perform risk reduction measures. The validity of the proposed model was explored by means of representative quantitative surveys in three vulnerable communities in Bangkok metropolitan region. The results demonstrated that elderly people living in the city tend to have much awareness than others living in rural and dense communities. In addition, there are significant factors relatively influencing on an effective risk communication such as disaster experiences, conflicts and relationship among community members as well as educational background of elderly people.

KEYWORDS: disaster preparedness of elderly people, environmental risk communication, capacity building for disaster management

1. INTRODUCTION

1.1 Effects of Disasters on Senior Citizens

Disasters, both natural and man-made disasters, may, at first glance, seem to strike all victims without regard to the common characteristics by which people are classified, such as age, culture, nationality, health status, or economic status [25].

However, several literatures suggest that disasters have had a disproportionately negative effect on the poor and the elderly versus other groups. Older adults and the poor are distinctly disadvantaged with regard to being prepared for and recovering from disasters [48]. Apparently, in 2004, after the tsunami ravaged India, Indonesia, Sri-Lanka, and Thailand, 92,000 people over the age of 60 were adversely

effected [2,30]. The study on characteristics of victims affected by heavy rainfall in Japan during 2004-2007 has shown that 65% of all victims were over 65 years old [49]. In the case of USA, a study released in August 2008 found that among 986 people who died as a result of Hurricane Katrina, nearly half were aged 75 or older [10]. Similarly, elderly people in Thailand, above 50 years old, were also a major proportion of flood victims caused by NOKTEN typhoon in 2011, counted as 36.8% [46].

1.2 Needs of Preparedness in Senior Citizens

This situation implies that senior citizens are one of the most vulnerable groups to disasters because of various reasons such as physical impairment, mental condition, diminished sensory awareness, chronic health conditions as well as socioeconomic status [11, 41]. However, it does not mean that age is significantly and solely associated with vulnerability, but elderly people need special preparations. As noted by Fernandez, Byard, Lin, Benson, and Barbera (2002), "Age does not make a person vulnerable". Elderly people actually need particular measures to tackle with disasters. To achieve disaster resilience in elderly groups, risk communication and/or risk education carried out before disaster occurrence are immensely important to constitute awareness [15]. Many recent studies on disaster preparedness for senior citizens mostly focused on the analysis of vulnerabilities in elderly groups and then made a conclusion on how to prepare and provide special helps to older adults [11, 25, 42]. These studies are significant for policy makers and other related organizations to provide elderly people with needed risk reduction measures. In an academic perspective as well as recent emphasis by many scholars, however, pre-disaster risk reduction should be operated in the first step of disaster management [27, 21]. For instance, as a result of education campaigns initiated by professor Toshitaka Katada of

Gunma University, 90% of school kids could survive from the massive tsunami striking Japan in March 2011 [40].

1.3 The Studies on Risk Communication

Currently, roles of risk communication become increasingly important to enhance level of awareness and self-preparation [45]. Nevertheless, only a few studies, emphasizing on risk communication for the elderly, were found. Though, some studies had taken risk communication into account [5, 13, 41], most of them still highlighted on risk communication process for general people. With regard to unique characteristics of elderly groups, the ways to communicate with older adults must be different from the others in some extents, and characteristics of elderly people should be specifically considered in risk communication.

1.4 Risk Communication for Elderly People

In this paper, risk communication for fire preparedness among senior citizens in Bangkok metropolitan region will be deeply discussed. Fire disaster is one of the most serious hazards in Thailand, potentially causing many fatalities in elderly citizens. Since people in this group are mostly being poor and have low educational level, they need to be prepared in appropriate ways. *The question raised in this paper is how to convey risk messages to elderly people effectively*. As stated by Breakwell (2000), risk communication depends upon a complex interaction between the characteristics of the audiences (such as age, gender, past experience, educational background, etc.), the sources of the message and its contents. This is similar to the Classical Persuasion Model, proposed by Hovland, C. I., Janis, I. L. and Kelley, H. H. (1953) that gives much importance to the relation between characteristics of receivers and communication modes. In this study, recent concepts pertaining to

risk communications were employed to construct the study model explaining characteristics of risk communication such as communication modes, message contents and styles, frequency of communication that potentially constitute better understating of risks and behavioral changes for fire preparedness. Additionally, the model also explains specific characteristics of elderly people such as educational background, past experiences with fire events, conflicts between elderly people and family members, and the number of family members that are associated with better understanding of fire risks and behavioral changes. The validity of the proposed model was explored by means of representative quantitative surveys in three vulnerable communities in Bangkok metropolitan region such as Sammakorn, Bangpud and Thakhoang communities. Finally, the study will introduce strategic ways to improve risk communication for senior citizens.

2. RESEARCH OBJECTIVES

Three research objectives are contained in this study as follows; 1) To analyze elderly people's fire risk perception and preparedness 2) To explore characteristics of risk communication such as communication modes, frequency of communication and message styles/contents which effectively contribute to elderly people's self-preparedness, and 3) To identify factors associated with elderly people's decision to take preparative measures after they are educated with risk messages.

3. THEORETICAL FRAMEWORK

3.1 Risk Communication

Theoretically, risk communication is a process of informing people about potential hazards to persons, property, or community [1]. Risk communication could be defined as a science-based approach for communicating in situations of high stress, high concern or controversy [6]. Risk communication

must involve multiple messages about the nature of risk and other messages, not strictly about risk, that express concerns, opinions, or reactions to risk messages or to legal and institutional arrangements for risk management" [34, 3]. In return, effective risk communication is expected to constitute better understanding of facing risks, to enhance levels of knowledge, and to give clues on how to tackle with adverse consequences [3]. To communicate effectively, many scholars such as Breakwell (2000), Hovland, Janis, and Kelley, (1953), Fernandez-Bilbao and Twigger-Ross (2009) addressed that characteristics of audiences, the source of the message, and information content must be considered together. As a result of literature reviews, factors potentially associated with effective risk communication for disaster preparedness could be summarized as follows;

3.1.1 Characteristics of Risk Communication

Currently, risk communication can be appeared in various forms. Corina H., Matthias B. and Michael B., (2010) divided risk communication into three types such as a one-way transfer of hazard and risk related information and their management, a two-way exchange of related information, knowledge, attitudes and/or values, and dialogue communication in which all actors should engage with and learn from each other. In another dimension, June Fessenden-Raden, Janet M. Fitchen and Jenifer S. (1987) suggested that communication modes can be divided into two channels such as official channels in which information is disseminated by one organization with precise purposes, and unofficial channels in which message is conveyed through daily activities such as chatting with friends, neighbors etc. Nowadays, there has been much research on which forms of communication are 'best' at building up knowledge as well as awareness and behavioral changes [12, 4, 22]. It is found that it does

not necessarily follow that the better understood communication formats are also better at changing behavior [22] since what represents the 'best' format will vary depending on the precise goal of the communication campaign.

Regarding the way to communicate risk messages, time of communication is vital [39]. One-off campaigns based on printed information are far from sufficient for building up knowledge or for triggering changes in attitudes and behaviors. Additionally, Sorensen (2000) stated that the style and content of a message can have a dramatic effect on public response. As stated by Hassol (2008) and O'Neill and Hulme (2009), the use of metaphors, personal stories, non-expert icons, or art work to transport the message of climate change or natural hazards to wider audiences has recently received more attention from social scientists. In summary, to communicate with elderly people, these elements must be taken into consideration.

3.1.2 Characteristics of Audiences

To convey risk messages to a particular group effectively, characteristics of audiences must be taken into account as well. According to the fact that 'the public' is not a single, uniform entity, instead, there are many different 'publics', all with different experiences, interests and needs, meaning that risk communication approaches must be tailored to their requirements [12]. As stated by Keselman, Slaughter, Patel, (2005); Kools and his colleagues (2004), when new knowledge is presented, the knowledge must resonate with what people already know and how that knowledge is organized and linked to personality, experience, and culture, before it can be assimilated into that individual's working memory. In this way, those who have experienced previous disasters may be more inclined to heed warnings and take effective actions to reduce the damage to their property [12, 35]. Further socio-economic household characteristics

may also play a part in how people respond to hazard related communication. For example, research has shown that families with children may be more inclined to evacuate [36]. However, extended family networks may also act as a hindrance to evacuation as people may wait until the whole family including pets or farm animals can be assembled together before leaving [38]. Additionally, it is found that conflict between information receivers and senders is also vital. As stated in trust determination theory, information would be conveyed effectively and constantly, if relationship between senders and receivers is kept strong, and trust is generated [8]. Mental Noise Theory [9] addressed that whenever a conflict happens, received information will be hardly interpreted correctly. In summary, the literature reviews suggested that potential factors, possibly affecting varying preparative behaviors of elderly people, comprised of three main factors such as individuals' past experiences with disasters, conflicts between receivers and senders, and demographic characteristics such as age, educational background, family structure, etc.

3.2 Disaster Preparedness and Fire Prevention

Joseph (2007) gives the definition of disaster resilience as the capacity of a community or individual to anticipate, prepare for, respond to, and recover quickly from impacts of disaster. Disaster preparedness is a measure contributing to disaster resilience. It is enormously dependent on levels of awareness which must be high enough to influence one individual's decision to take preparative measures. The concept of "stages of change model" explains levels of awareness, motivation and action with regard to a behavioural change [37, 50, 32]. According to the model, people demonstrate varying degrees of readiness to change or varying levels of actual activity. The model places individuals in five stages that indicate their readiness to attempt, make,

or sustain behavior change. The five stages are pre-contemplation, contemplation, preparation, action, and maintenance. In this study, impact of risk communication will be measured by levels of awareness of fire disaster, sometimes called "levels of disaster preparedness". In reality, elderly people can behave against fire disaster differently, starting with ignorance of active preparedness. In the lowest level, people may not realize the possibility of fire occurrence at all, though they are, in fact, living in vulnerable environments; whereas, some may actively prepare some kinds of measures to tackle with fire such as using fire extinguisher, calling fire fighting office, evacuating to a safe place, asking helps from other persons, installing automatic extinguishing systems and installing alarms [43]. This may include mitigation measures such as inspecting electrical devices and turning off electric devices before sleeping or leaving home etc.

3.3 Study Framework

In this study, the analysis can be divided into two major parts (See Figure 1). The first part emphasizes on the analysis of relationship between characteristics of risk communication and levels of disaster preparedness. This will provide answers on which mode and message styles/contents should be used in risk communication, and also how often risk messages should be conveyed to the elderly. According to the result of literature reviews, characteristics of risk communication comprise of three important factors. The first factor is communication modes, divided into three forms such as communication through public sources which are mostly in a form of one way communication, communication through social networks such as chatting with neighbors or family members which are mostly in a form of "face to face communication", and learning about risks from own experiences. The second factor is frequency of communication which regards to how many times risk information is conveyed to elderly people in a particular period. The last factor is style of message such as language and term used in the communication illustrated by each communication mode. Influence of these factors on elderly people's self-preparedness will be analyzed.

The second analysis is relationship between characteristics of audiences and levels of preparedness. According to relevant theories and previous studies, this study selected three factors that may affect elderly people's capability to learn about fire risk such as (1) elderly people's past experience with fire disasters, (2) conflicts between elderly people and family members, and (3) demographic characteristics of elderly people such as educational background, and family structure. These factors may have some implications on capability of elderly people to learn about fire, demonstrated as levels of disaster preparedness.

To explain levels of disaster preparedness, defined as dependent variable, the concept of "stages of change model" is borrowed and adapted to depict varying preparative behaviors of elder people. The study model in Figure 1 shows four levels of disaster preparedness. They start with pre-contemplation when individual is not aware of the threat and
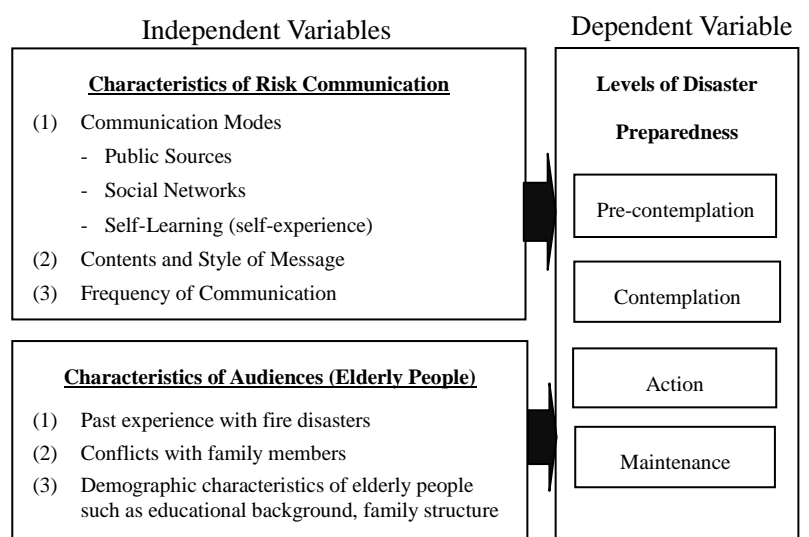

Figure 1 Study framework

behave nothing against fire risk, contemplation, when individual is fully aware of the threat and considering taking action to prevent and to fight against fire, action level, when individual has already taken some action to prevent fire, and eventually maintenance level, when individual keeps behaving in the way of mitigating and fighting against fire. The analysis in both parts will provide an answer on how to convey risk message to elderly people effectively; meaning that elderly people can make use of communicated messages to increase their awareness and to behave against fire disasters.
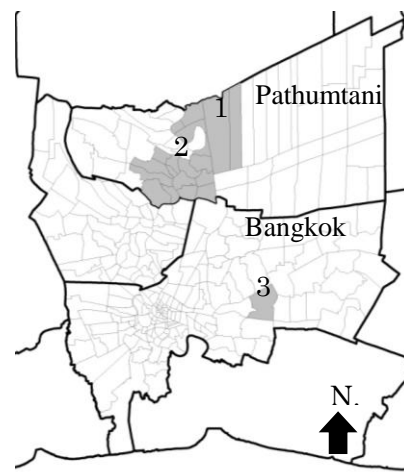
4. RESEARCH METHODOLOGY
4.1 Case Studies and Sampling Groups
This study was conducted in three vulnerable communities to fire disasters. These communities, located in Bangkok Metropolitan Region, Thailand, have their own characteristics (See Figure 2). According to the discussion with residents in each community, a fire usually occurs twice a year in rural and urban community, and those are mostly caused by cooking equipment and electrical systems. In the case of dense community, a fire usually occurs more than three times a year, including both household fires and community fires which are mostly caused by electrical systems, smoking and cooking. In the survey, residents, over 55 year olds, were asked to answer a questionnaire. The number of respondents in three communities with distribution of age groups could be shown in Table 1. More than half of respondents were females, 57 % (n=71); whereas, the ratio of male respondents was 43 % (n=54).

1. Dense Community (Thakhong)

2. Rural Community (Bangpood)

3. Urban Community (Sammakorn)

Figure 2 Study areas

4.2 Data Collection and Analysis
In August 2011, 125 questionnaires were distributed to elderly people in targeted areas. Each respondent was directly asked to fill out the questionnaire by the support of the principal author and staffs. The questionnaire contained with 40 items which were all generated for the purpose of describing characteristics of relevant variables. In addition, focus group discussions with elderly people were also conducted in Sammakorn and Thakhong communities in order to understand styles and message contents in which elderly people were educated. All obtained data were analyzed by both descriptive statistic (such as means and percentage) and inferential statistics (such as ANOVA, Multi-Regression, Chi-square test). The correlative analysis between independent variables such as characteristics of risk communication and audiences and dependent variable, levels of disaster preparedness will be carried out.

5. RESULTS AND DISCUSSCION
5.1 Elderly People's Fire Preparedness
In order to explain elderly people's self preparedness in accordance to the stages of change models, respondents were asked to answer sequent questions

Table 1 Sampling groups

Age Groups	55-64	65-74	Above 74	total
Thakhong	35	16	6	57 (46%)
Bangpood	10	13	10	33(26%)
Sammakorn	16	14	5	35(28%)
total	61(49%)	43(34%)	21(17%)	125

Source: Questionnaire Survey in August 2011

as shown in Figure 3. The answers would be characterized into four levels according to dependent variable. The chi-square analysis, shown in Table 2, revealed that elderly people's self-preparedness are significantly relative with types of communities at sig. 0.05 (Chi-square test = 49.13, P = 0.000). Namely, most of older people in urban community (47.1 %) have shown the highest level of preparedness (level of maintenance); whereas, this rate is only 19.6% and 3.2% in dense community (Thakhong community) and rural community (Bangpood community), respectively. Compared to other communities, rural community occupied a major proportion of elderly people who do not have awareness and self-preparedness at all (67.7%). In the case of the dense community having high possibility of fire occurrence due to its environment, 21.4 % of respondents have awareness, but have not taken any kinds of preparative measures yet.
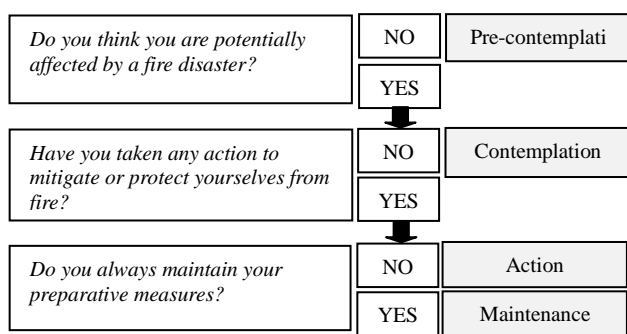
*"not required to answer the next question"

Figure 3 Questions' structure

Table 2 Elderly people's disaster preparedness

Characteristics of Communities	Levels of Disaster Preparedness N (%)				
	Pre-contemplation	Contemplation	Action	Maintenance	total
Dense Community	10 (17.4)	12(21.4)	23(41.4)	11(19.6)	56
Rural Community	21(67.7)	8(25.8)	1(3.2)	1(3.2)	31
Urban Community	3(8.8)	5(14.7)	10(29.4)	16(47.1)	34
Total	34	25	34	28	121
Chi-square test = 49.13, df. = 6, P-value = 0.000 *missing number is 4*					

When, respondents were asked about preparative measures which they have been taking, the results revealed that elderly people have taken various measures. In the case of urban community, mostly lived by high-income residents, older people installed fire extinguisher as well as a fire alarm in their house, and have also prepared their owned ways to survive during fire occurring such as preparing essential medicine, always staying in a room or space that is convenient to evacuate in case of fire occurrence. More than that, they always maintain their measures to ensure their effectiveness. For elderly people in dense and rural communities, most of them have taken a low-cost measure such as putting a tank of water in front of their house, preparing an evacuation route and practicing using a fire extinguisher. However, just a few people intend to maintain their measures or ensure their quality and workability. As a result of physical survey in a dense community, it is found that most of public fire extinguishers are not in a workable condition.

5.2 Risk Communication for Elderly People
Communication Modes and Message Contents

To know which communication mode elderly people are educated with fire risk message and how those risk messages impact on self-preparative behaviors, respondents were asked to answer the question of *"where do you usually learn causes of fire and its potential impact on you?"* As a result of analysis, data on how self-preparedness differs for older people communicating through each communication mode are presented in Table 3. Analysis of variances (One –way ANOVA) was conducted to determine an effect of each communication mode on levels of self-preparedness. The result shows that a level of self-preparedness significantly differs for persons receiving risk message from different sources ($F =12.005$, $Sig. = 0.00$). Because the test of homogeneity of variances had shown equal variances among groups (sig=.314), Post-hoc analyses using LSD (Least - significant) were

conducted to demonstrate multiple comparison. It revealed that elderly people, having no self-preparedness, mostly learned fire risk from neighbors, while the people, receiving risk message from their family as well as learning from their owned experienced, at least, have awareness on fire risks, but still do not perform any preparative measure. Noticeably, communication through public sources-such as TV, newspaper, drills as well as meeting pertaining fire prevention in a community have high influence on elderly people's self-preparedness. The results imply that the mere communication through social networks, including learning fire risks from past experiences is not adequate enough to influence elderly people's decision to perform preparative measures. Public media in several types such as newspaper, TV, and radio mostly showing severe cases of fire events have high influence on elderly people's motivation to take action against fire risks. The most importantly, the result also proved that face to face and/or dialogue communications, like drills and meeting, have high potential to influence older people to behave against fire risks.

Regarding message contents and styles, results of focus-group discussions revealed that most of risk messages conveyed through social networks are pertaining to fire events previously happening in the community. The stories about past events are, many times, diverse and different in details because of a diverse expression of personal feeling existing in risk messages. This may cause confusion and unreliability. Nevertheless, causes of fire in the community were well presented in a form of face to face communication. Older people communicating about fire risk through social networks were therefore understandable easily. Considering risk messages disseminated by public sources-such as TV, radio, newspaper as well as drills and meetings-which, many times, use formal language, it is found that older people have difficulty in understanding entire information. However, because of message contents showing severity of fire disaster, and adverse impacts happening in reality, this makes communication persuasive and impactful on behavioral changes.

Frequency of Communication

Analysis of variances (One –way ANOVA) was conducted to prove whether or not more frequent communication potentially yields higher self-preparedness. The analysis in Table 4 indicates that older people, communicating about risk with different frequency, significantly have different levels of self-preparedness ($F = 20.538$, Sig. = 0.00). After the test of homogeneity of variances had

Table 3 Difference in means of levels of preparedness among older people educated with different modes

Communication Modes		N	Mean*	(Multiple Comparison) Mean Difference				
				Social Networks		Public Sources		Self-experience
				Family Members	Neighbors	TV, Newspaper	Drills, Meeting	
Social Networks	Family Members	29	2.28	-	0.6687**	-0.9384**	-0.9549**	-0.1154
	Neighbors	28	1.61		-	-1.6071**	-1.6236**	-0.7842**
Public Sources	TV, Newspaper	28	3.21			-	-0.0164	0.8229**
	Drills, Meeting	13	3.23				-	0.8394**
Self-experience		23	2.39					-
Total		121	2.46					

(ANOVA analysis)   F = 12.005, Sig. = 0.00 (< 0.05)
* Levels of Disaster Preparedness
1.00-1.75 = Pre-contemplation: 1.76-2.50 = Contemplation: 2.51-3.25 = Action: 3.26-4.00 = Maintenance
** The mean difference is significant at 0.05

Table 4 Difference in means of communication frequency among older people with different levels of preparedness

Levels of Disaster Preparedness	N	Mean*	(Multiple Comparison) Mean Difference			
			Pre-contemplation	Contemplation	Action	Maintenance
Pre-contemplation	34	1.265	-	-1.0953**	-.7059**	-1.2710**
Contemplation	25	2.360		-	.3894**	-.1757
Action	34	1.976			-	-.5651**
Maintenance	28	2.536				-
Total	121	2.000				

(ANOVA analysis) $F = 20.538$, Sig. = 0.00 (< 0.05)
* Frequency of Communication
1-1.66 = Rarely (0-3 times a year) 1.67-2.33= Sometimes (3-6 times a year)
2.34-3= Frequently (more than 6 times a year)
** The mean difference is significant at 0.05

shown equal variances among groups (sig=0.104), multiple comparison analysis by Post-hoc using LSD was conducted to show the difference in means between groups. It is found that communication frequency of elderly people with the level of pre-contemplation is significantly lower than other elderly people at sig 0.05; meaning that rarely educated with risk information, elderly people have no self-awareness on fire risk at all. Noticeably, with medium frequent education of risk information (3-6 times a year), elderly people possibly decide to take preparative measures; whereas, elderly people with the level of contemplation and maintenance have communicated about risk with the same frequency, according to Post-hoc analysis (F = -.1757, Sig. = 0.359). If considering two types of risk information such as fire possibility and fire severity conveyed to elderly people with different self-preparedness levels (See Table 5), the study revealed that information pertaining to possibility of fire occurrence was frequently disseminated to elderly people in the level of contemplation, 68% (n=17); whereas, elderly people in the level of action and maintenance were mostly educated with information of fire severity, 61.76% (n=21) and 64.29% (n=18) respectively. In this way, it could be concluded that frequent communication of information related to fire possibility can merely make elderly people perceive risks. In order to encourage elderly people in the level of contemplation to take a preparative action, information pertaining to fire severity must be conveyed to them. In addition, to encourage elderly people who have already taken an action to maintain their preparative behavior, continuous communications were proved to be essential.

Table 5 Types of communicated risk information

Levels of self-preparedness	N	Types of communicated risk information		
		Fire possibility	Fire severity	Cannot identify
Pre-contemplation	34	20 (58.82%)	10 (29.41%)	4(11.76%)
Contemplation	25	17(68%)	7(28%)	1(0.04%)
Action	34	12(35.29%)	21(61.76%)	1(0.02%)
Maintenance	28	9(32.14%)	18 (64.29%)	1(0.04%)
Total	121	58	56	7

5.3 Factors Associated with Effective Risk Communication for Elderly People

Regression analyses was conducted to examine the relationship between levels of self-preparedness and potential predictors such as past experiences with fire events, conflicts between the elderly and family members, and demographic characteristics of elderly people such as educational background, the number of family members. Table 6 summarizes analysis results. As can be seen, each of potential predictor is positively and significantly correlated with levels of self-preparedness, indicating that elderly people who have high scores of these variables tend to have higher self-preparedness. The multiple regression model with all four predictors produced $R^2= 0.35$ F=12.442, P-value= 0.000 (< 0.05). As can be seen in Table 6, the number of past experiences with fire disasters, levels of education, and conflicts with family members had significant positive regression weights. This indicates that elderly people with

higher scores on these scales were expected to have higher self-preparedness. The number of family members has a significant negative weight (opposite in sign from its correlation with levels of self-preparedness). This indicates that after accounting for other variable scores, those elderly people living with more family members were expected to have lower self-preparedness. The equation for predicting levels of disaster preparedness could be shown below;

$$Y = 2.039 + 0.128X_1 - 1.131X_2 + 0.275X_3 + 0.230X_4$$

$Y = Self\text{-}preparedness$

$X_1 = Levels\ of\ education$

$X_2 = the\ number\ of\ family\ members$

$X_3 = the\ number\ of\ fire\ experiences$

$X_4 = Conflicts\ with\ family\ members$

Table 6 Summary statistics, correlations and results from the regression analysis

Variables	B	Std. Error	β	t	Sig.
Constant	2.039	.423		4.816	.000
Levels of education	.128	.050	.222	2.580	.011
The number of family members	-.131	.052	-.219	-2.537	.013
The number of fire experiences	.275	.104	.216	2.634	.010
Conflicts with family members*	.230	.099	.198	2.318	.022

R = 0.550, R² = 0.35, F=12.442, P-value= 0.000 (< 0.05)
scores of variable : 1=always, 2=sometimes, 3=seldom, 4=not at all

It could be explained that elderly people have performed different levels of self-preparedness which is enormously dependent on four major factors mentioned above. Elderly people with more fire experiences and a higher educational level tend to behave against fire risks more actively than people with lower experiences and educational levels. This implies to high capabilities of elderly people to interpret and accept communicated risk messages. In addition, the study found that conflicts between communicators (family members) and elderly people possibly cause untrustworthiness and misinterpretation of received messages and that eventually elderly people may decide not to change their behaviors. The most interesting finding is that elderly people living with a small number of family members tend to be prepared for fire disasters more actively than who are living with many family members. This is possibly because of the fact that elderly people living with many family members tend to be dependent on other family members' supports, while those who live with a few members may feel unsecured and realize the significance of self-preparedness. When considering characteristics of elderly people in each community (See Table 7), the analysis revealed that when educated with risk information, most of elderly people in rural community tend to be reluctant to behave against fire risks because of influences of those relevant factors. Apparently, they have low educational levels and live in a big family. In contrast, having high scores of these factors relatively contribute to better understanding of fire risks and well preparedness of elderly people in urban community. Additionally, it revealed that the major reason causing low preparedness of elderly people in dense community is low educational levels.

Table 7 Characteristics of elderly people

Communities	Levels of education(Mean)	The number of family members (Mean)	Fire experiences (Mean)	Conflicts with family members (Mean)	Actual frequency of fire occurrence(times)
Dense Community	1.81 (junior high school)	4.09	0.64	2.75 (low)	More than 2
Rural Community	0.94 (primary school)	5.70	0.12	2.06 (moderate)	1-2 a year
Urban Community	3.80 (vocational school)	4.00	0.71	3.00 (low)	1-2 a year
Total	2.14	4.51	0.49	2.65	

6. CONCLUSION

This study has demonstrated the ways to improve risk communication to elderly people. Firstly, the study found that communication through social networks and learning from previous experiences is

not impactful enough to change elderly people's behavior. Since message contents conveyed though this channel is enormously combined with personal estimation and feeling, they have been changing over times. Regarding frequency of communication, to make older people aware of fire risks and maintain their preparative behaviors, frequent communication was proved to be important. In contrast, to make people take action against fire risk, frequent communication is not significantly needed, but the message contents must be persuasive and impactful enough. Secondly, the analysis demonstrated that levels of education, part experiences with fire disasters, conflicts with family members, and the number of family members can predict levels of self-preparedness of elderly people. Noticeably, people in rural community were proved to be less active in behaving against fire risks, particularly because of low educational levels, having a few fire experiences as well as living in a big family; whereas, elderly people in dense community need more education on fire risks to constitute better understanding and well preparedness. In this way, to generate effective risk communication for elderly people, policy makers must realize their differences and provide suitable campaign for each group.

7. ACKNOWLEDGEMENT

REFERENCES

1) Alonzo, Sheldon, 1987. The Emergence of Risk Communication: Studies Social and Political Contexts, Science, Technology, Human, 12(3–4): 4-10.

2) Alzaga, A, Varon, J., & Nanlohy, S., 2005. Natural catastrophes: Disaster management and implications for the acute care practitioner, *Critical Care and Shock*, 8(1): 1-5. Retrieved from www.criticalcareshock.org/files/20050320032245.pdf

3) Andrew Powell, Risk Communication–Getting the Message Across In Situations of High Concern. CS&A Newsletter, Issue 2, autumn 2008. Retrieved from http://www.csa-crisis.com/info/archives/RiskCommDr.Powell.pdf

4) Bier, V. M., 2001. "On the state of the art: risk communication to the public." Reliability Engineering and System Safety 71: 139-150.

5) Bostom, Atman, Fischhoff and Morgan, 1994. Evaluating Risk Communications: Completing and Correcting Mental Models of Hazardous Process, Part II. Risk Analysis, 14(5): 789-798.

6) Christin, 2007. Risk Communication in Action, *the risk communication workbook*, United States Environmental Protection Agency, National Risk Management Research Laboratory

7) Corina H., Matthias B. and Michael B., 2010. Risk Communication and Natural Hazards, C apHaz-Net WP5 REPORT (Risk Communication). Birmensdorf, Switzerland.

8) Covello, V.T., 1992. Trust and Credibility in Risk Communication, *Health and Environment Digest*, 6(1): 1-4.

9) Covello, V.T., et al., 1997. The Determinants of Trust and Credibility in Environmental Risk Communication: An Empirical Study, *Risk Analysis*, 17(1):43-54. Retrieved from http://antipinoy.com/wp-content/uploads/2010/02/crc-p2.pdf

10) Elderly People Require Better Fire Prevention, Report Finds, *Science Daily*, (Nov. 17, 2008), Retrieved from http://www.sciencedaily.com/releases/2008/11/081117082237.htm

11) Fernandez, L. S., Byard, D., Lin, C. C., Benson, S., & Barbera, J., 2002. Frail elderly as disaster victims: Emergency management strategies, *Prehospital and Disaster Medicine*, 17(2), 67-74.

12) Fernandez-Bilbao, A. and C. Twigger-Ross, 2009. Improving Response, Recovery and Resilience, Improving Institutional and Social Responses to Flooding. Science Report SC060019 Work Package 2, Bristol, Environment Agency. Retrieved from http://publications.environment-agency.gov.uk/PDF/SCHO0509BQBO-E-E.pdf

13) Fukuzono & colleagues, 2006. Participatory Flood Risk Communication Support System (Pafrics), A better integrated management of disaster risk: Toward resilient society to emerging disaster risk in mega-cities, pp. 199-211. Retrieved from http://www.terrapub.co.jp/e-library/nied/pdf/199.pdf

14) Glynis M Breakwell, 2000. Risk communication: factors affecting impact. *British Medical Bulletin*, 56 (1): 110-120.

15) Gray-Graves, Turner, Swan, 2010. Sustainability of seniors: Disaster Risk Reduction Management, *Journal of Aging in Emerging Economies (JAEE)*, 2(2): 64-78. Retrieved from http://www.kent.edu/sociology/resources/jaee/upload/article_1.pdf

16) Hager, P. J. and H. J. Scheiber, 1997. Designing and delivering scientific, technical, and managerial Presentations. New York, John Wiley & Sons, Inc.

17) Hassol, S. J., 2008. "Improving how scientists communicate about climate change Eos." *Weekly Journal of the American Geographical Union*, 89: 106-107. Retrieved from http://www.vsp.ucar.edu/cgc/summerinstitute/SI_08/EOS_article.pdf

18) Hovland, C. I., Janis, I. L. and Kelley, H. H., 1953. Communications and persuasion: Psychological studies in opinion change, New Haven, CT: Yale University Press

19) Joseph S., 2007. Understanding and Applying the Concept of Community Disaster Resilience: A capital-based approach, Department of Landscape Architecture and Urban Planning, Hazard Reduction & Recovery Center, Texas A&M University, College Station

20) June Fessenden-Raden, Janet M. Fitchen and Jenifer S., 1987. Providing Risk Information in Communities: Factors Influencing What Is Heard and Accepted. *Science, Technology, & Human Values*, 12(3-4): 94-101.

21) Katayama T., 1993. Integrated management of natural disaster, *Incede Report 4.* Retrieved from http://desastres.usac.edu.gt/documentos/pdf/eng/doc6178/doc6178-contenido.pdf

22) Kashefi and Walker, 2009. How the Public and Professional Partners Make Sense of Information about Risk and Uncertainty - Literature Review. Science Project SC070060. Bristol, Environment Agency.

23) Keselman A, Slaughter L, Patel VL., 2005. Toward a framework for understanding lay public's comprehension of disaster and bioterrorism information. *J. Biomed. Inform.* 38(4):331–44.

24) Kools M, Ruiter RAC, van de Wiel MWJ, Kok G., 2004. Increasing readers' comprehension of health education brochures: a qualitative study into how professional writers make texts coherent, *Health Educ. Behav*, 31(6):720–40.

25) Marshall and Mathews, 2010. Disaster Preparedness for the Elderly: An Analysis of International Literature Using Symbolic Interactionist Perspective, *Journal of Aging in Emerging Economies (JAEE)*, 2(2): 79-92. Retrieved from http://www.kent.edu/sociology/resources/jaee/upload/article_2.pdf

26) McGuire WJ., 1989. Theoretical foundations of campaigns, *In Public Communications Campaigns*, ed. RE Rice, CK Atkins, Newbury Park, CA: Sage. 2nd ed. pp. 22–48.

27) McGuire, L.C., Ford, E.S., & Ajani, U.A., 2006. Cognitive Functioning as a Predictor of Functional Disability in Later Life, *American Journal of Geriatric Psychiatry, 14*(1): 36–42.

28) Mileti DS, Fitzpatrick C., 1991. Communication of public risk: its theory and its application, *Social. Practice Rev*., 2(1):20–28.

29) Moser, 2010. "Communicating climate change: history, challenges, process and future directions." WIREs Climate Change, 1(1): 31-53.

30) Mudur, G., 2005. Aid agencies ignored special needs of elderly people after tsunami, *British Medical Journal*, 331, 422. doi:10.1136/bjm.331.7514.422

31) New Study Confirms Elders Were Most Likely to Die in Katrina Three Years Ago Today. 2008, August 29. *Seniors Journal*, Elder Care News. Retrieved from http://seniorjournal.com/

32) Office of Community Preparedness, 2006. Citizen Corps Personal Behavior Change Model for Disaster Preparedness, *Citizen Preparedness Review*, Washington DC, Retrieved from http://www.citizencorps.gov/downloads/pdf/

33) O'Neill, S. and M. Hulme, 2009. "An iconic approach for presenting climate change." Global Environmental Change.

34) Palenchar, M. J., 2005. Risk communication. In R. L. Heath (Ed.), Encyclopedia of public relations Thousand Oaks, CA: Sage. pp. 752-755.

35) Parker, D. J., S. J. Priest and S. M. Tapsell, 2009. Understanding and enhancing the public's behavioral response to flood warning information, Meteorological Applications, 16: 103- 114.

36) Peek, L. and A. Fothergill, 2006. Reconstructing Childhood: An Exploratory Study of Children in Hurricane Katrina, Quick Response Report #186, Boulder, Natural Hazards Research and Applications Information Center, University of Colorado.

37) Prochaska JO, DiClemente CC., 1992. Stage of Change in the modification of problem behaviors, CV, Sage: Newbury Park

38) Rodriguez, H., J. Trainor and E. L. Quarantelli, 2006. "Rising to the challenges of a catastrophe: The emergent and prosocial behaviour following Hurricane Katrina." Annals of the American Academy of Political and Social Science, 604: 82-101.

39) Rohrmann, B., 1998. "Assessing Hazard Information Communication Programs" Australian Psychologist, 33(2): 105-112.

40) Rubens D., 2011. Great Eastern Japan Earthquake, March 211, London NW6 2EE, Retrieved from http://www.davidrubens-associates.com/PDFS/DRA_Japan%20earthquake%20article_7a_.pdf

41) Sagala, 2007. Risk Communication for Disaster Preparedness of Earthquake and Volcanic Eruption; Case Study of Yogyakatara in Indonesia, *A discussion paper for PhD Summer Academy*, UNH-EHS, July 22-28. Retrieved from http://www.ehs.unu.edu/file/get/3748

42) Salerno, J.A., & Nagy, C., 2002. *Terrorism and aging, Journal of Gerontology*, 57, M552-M554.

43) Elderly People Require Better Fire Prevention, Report Finds, *Science Daily*, (Nov. 17, 2008), Retrieved from http://www.sciencedaily.com/releases/2008/11/081117082237.htm

44) Sorensen, 2000. "Hazard warning systems: Review of 20 years of progress." Natural Hazards Review Natural Hazards Review (May): 119-125. Retrieved from http://www.colorado.edu/geography/class_homepages/geog_4173_f11/Sorensen_warning_systems.pdf

45) Takeuchi, Wei Xu, Kajitani and Okada, 2011. Investigating Risk Communication Process for Community's Disaster Reduction with a Framework of "Communicative Survey Method", *Journal of Natural Disaster Science*, 33(1): 49-58

46) The Report of Flood Victims Caused by NOKTEN typhoon (2011, September 21), Bureau of Epidemiology, Ministry of Public Health, Thailand, Retrieved from http://164.115.5.58/flood/doc/BOE-flood-death-21Sep54.pdf

47) Tafte & Mefalopulus, 2009. Participatory Communication: A Practical Guild, *World Bank Working Paper*, No.170. Retrieved from http://orecomm.net/wp-content/uploads/2009/10/Participatory_Communication.pdf

48) Torgusen, B. L., & Kosberg, J. I., 2006. Assisting older victims of disasters: Roles and responsibilities for social workers, *Journal of Gerontological Social Work*, 47(1/2): 27-44.

49) Usiyama, Takayanagi, and Yokomaku, 2011. Age Specific Characteristics of Victims Caused by Recent Heavy Rainfall Disasters, *Journal of Natural Disaster Science*, 349-357. Retrieved from http://disaster-i.net/notes/2011JSNDS30-3.pdf

50) Weinstein ND., 1988. The precaution adoption process, *Health Psychol*, 7:255-86.