Article

Perception to Heat Waves with Social Linkage of Communities As a Moderator in Taiwan.

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Abstract: The research examines the relationship between self-rated health situation and personal perception of heat waves, and how social linkage of communities would be a moderator variable in residents' perception of heat waves in Taiwan. This study uses the questionnaire conducted by Sinica "Responsive Capacity under Heat Wave: The Perspectives of the Locals"(2019), using OLS method for estimating the unknown parameters in multiple regression model. The author finds that the correlation of self-rated health situation and perception toward heat is significantly positive. Also, social linkage in communities affects strongly as a moderator variable: While the satisfaction to with their community could reduce negative reaction to heat, contacts with neighbors could increase possibility people feel uncomfortable in high-temperature situation. This study exhibits the effects of social environment on community, and expects further related researches or practices to strengthen capability to resist heat waves*f* for Taiwanese residents.

Keywords: Heat wave, satisfaction to community, social linkage, global warming, perception to heat wave

1. Introduction

Many past studies emphasize the health-related impact of the heat wave, and reveal the heat wave highly correlates with mortality(Wang et al. 2015). While researchers care about the health impact on the world, few studies discuss about health inequality toward heat wave with different communities.

Although global warming is a widespread phenomenon in society, health inequality still happens, especially for people who have less resistance to prevent harm from heat wave. Lin and Chan (2009) exhibit construction workers have a higher risk of health effects in a high-temperature situation, especially in industrial cities. The factors including mass exposure to heat, and anxiety about working stress.

Why does the harm from heat affect big cities so much? The effect of urban heat islands (UHI) is one theory to explain why urban cities are more dangerous than rural areas in global warming issues (Kleerekoper et al., 2012). When one city is filled with high buildings, the sunlight and high-temperature cannot disperse effectively. As a result, the pedestrians on the streets in urban cities are more vulnerable to harmful effects from heat.

Currently, the harm from heat wave mostly occurs in East-Asia tropical regions, like southern areas in China. When population is highly squeezed to eastern cities due to industrial development, this situation worsens the effect of UHI and heat wave(Li et al. 2019). On the other side, people in temperate countries like the United States are not alert to danger of heat wave and global warming (Maibach et al. 2015). As Guo et al.

(2017) mentions, the perception to heat wave is related to different cultural context and varied by communities.

How can community influence people to feel hot? Wolf et al.(2010) use a case study of two elders' communities in UK. Wolf et al., (2010) explains when the community works as strong bonding network, it would probably exacerbate the vulnerability to heat wave, because individuals have social stress to make self be strong, and try their best to respond to the risk rather than prevent it. In this empirical research, we can find that it is not always good when people are familiar with their neighbors. Moreover, sometimes people are encouraged to deal with problems independently, so they would not call for help to neighbors to prevent or resist harm from climate change and heat wave. However, we can question whether this explanation can be applied to tropical countries.

Taiwan, as a small island next to the east side of the Pacific Ocean and near to equator, severely suffers from heat wave and heat exhaustion accompanied by high temperatures. Meteorological data from Taipei, the major city in Taiwan, has shown hot seasons with an average maximum temperature above 33ºC for two months, and increase continuously by years. Another specialty of Taiwan is, although Taiwan has a high population density , participation in the does not activitie actively. And in most urban areas, self-identity to community of Taiwanese residents is unclear. In Taiwan, the community interaction is not only included sentiment attachment, we need sufficient medical resources and economic conditions to construct as residents' community satisfaction (Liao, 2003).

However, the weakness of social linkage in community impacts practice of social work and public health work in Taiwan a lot. Therefore, it is important to study potential sides of Taiwanese linkage of community to respond to   public issues and provide recommendations to workers in community services in Taiwan to explore community practice to resist universal harm, like climate change in this case, in "Taiwanese own way".

Besides high-quality of medical care, the social support is an another way to prevent vulnerability of heat wave. Liao et al(2016) emphasize the social linkage from community interaction could affect individual's well-being during hot days. Liao et al.'s (2016) study   reveals heat wave indeed has impact to health, not only presents pain to body, also influence the emotional instability. However, the authors also find the community can function as a moderator to mitigate negative well-being in heat.

However, few studies care about whether communities as a social linkage to individual could affect personal perception to heat wave or even resist to this harm, especially in Taiwan, the first line to harm from heat wave. Moreover, this study tries to figure out the correlation between personal health situation and response to heatwave.

2. Materials and Methods

Dataset is drawn from computer-assisted telephone interviews of a large and serious project by Research Center for Humanity and Social Science in Academia Sinica in 2019 A within-household sampling approach developed by Liao (2015) was used to select Taiwanese citizens aged 18 ages or up in Taiwan, and the total population is 6193 responses.

The research aims to examine whether there are similar characteristics of the population in Taiwan. Survey data used is weighted by age, gender, education and employment. Moreover, missing data is replaced with the average values obtained from multiple imputation based on variables with full dataset.

The scale to measure personal feeling to high-temperature situation is by used 5-options Likert scale, range from 1 = always to 5 = never. The respondents are asked how often have they had uncomfortable experiences under high-temperature situation in the past month.

The method to measure social linkage in community includes some parts to assess the social linkage within the community: (1) People are asked whether they are satisfied with their community, ranging from 1 = very satisfied to 5 = never satisfied; (2) Respondents are asked how many neighbors they are well acquainted with, and they can answer with a number; (3) Respondents are asked if they are in emergency, how many neighbors would come to help them, ranging from 1 = no one to 5 = more than or over eight people; (4) Respondents are asked when they have trouble, how many their neighbors would listen and help them to overcome their trouble, ranging from 1 = no one to 5 = over than eight people.

As figure(1) presents, the research aims to examine whether personal health situation could be related to the vulnerability to high-temperature environment, and how much self-assessed health would influence the personal feeling toward uncomfortable heat . Moreover, with community interaction as a moderator, whether people can be affect to respond heatwave in different way.

The research also needs to explain what is correlated to satisfaction of community, and expects to verify whether contacting neighbors would help people have higher perception to heat wave, and whether people are willing to call to neighbors for help when they are in need, it is more possible that people are alert to heat wave.

3. Results

To verify the author's assumption that "the help from neighbors in urgent situation" and "number of neighbors they are familiar with" are correlated to "satisfaction in community", this research uses OLS model to assess the relationship. The exact function would be:

$$Sat_i = helpX_1 + neighborsX_2 + e_i$$

For each respondent i, "the help from neighbors in urgent situation" and "number of neighbors they are familiar with" can be parts of explanation of "satisfaction in community," and e_i means the residual value cannot be explain in OLS model.
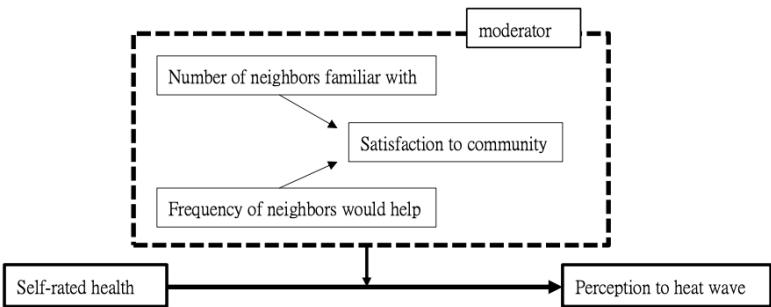
Figure 1. Framework of the research

Table 1. The OLS model of the relationship between "satisfaction in community" and "the help from neighbors in urgent situation," and "number of neighbors they are familiar with" two variable.

	Satisfaction in community

Number of neighbors they are familiar with	-0.0142***
	(-8.55)
The help from neighbors in urgent situation	-0.187***
	(-18.06)
_cons	2.473***
	(102.88)
N	5667

t statistics in parentheses
* *p* < 0.05, ** *p* < 0.01, *** *p* < 0.001

The negative relationship is due to the least value of satisfaction means "very satisfied with my community". On the other side, the least value of frequency of help from neighbors means "No one would help me", and the least value of numbers of neighbors respondents are familiar with means "I am not acquainted with any neighbors". Therefore, a higher frequency of help from neighbors and higher amount of   neighbors keeping in touch with residents could be significantly associated with higher community satisfaction

To sum up, the purpose to construct OLS model is to examine whether   "the help from neighbors in urgent situation," and "number of neighbors they are familiar with" are related to individual's satisfaction to community. This process helps the author to explain "the help from neighbors in urgent situation" and "number of neighbors they are familiar with" as effective variables to be indicators of community when authors conduct further analysis.

The Figure 2. shows that males in Taiwan have more bad feeling in hot situations than females, which is not similar to past studies. The author infers this difference occurs in Taiwan because gender difference of career category is clear. Thus men who feel more uncomfortable are more often exposed to heat wave. On the other hand, women feel less uncomfortable are more often stay in office or room with air-condition devices. Therefore, in this study the gender difference related to perception of heat does not present women are vulnerable, unlike results from past studies.
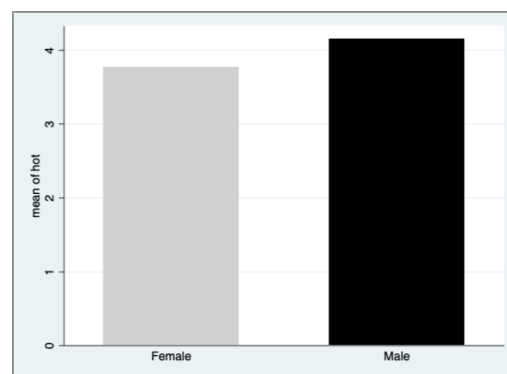

Figure 2. Descriptive bar graph of mean value of perception of heat by different gender group.
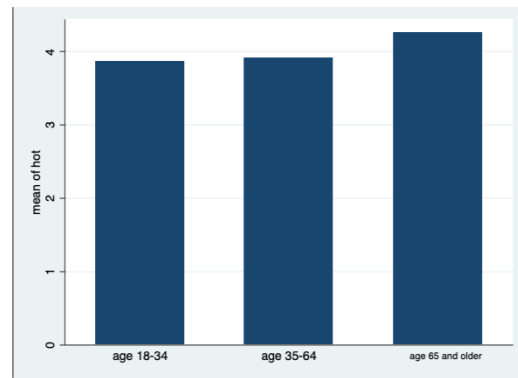
Figure3. Descriptive bar graph of mean value of perception of heat by different age group.

The table 3. reveals elders(the group of age 65 and older people) feel more uncomfortable in hot situations than other age groups. This statistical result coincides with past studies, and the author infers that elders are more vulnerable due to the physical change and because elders are more vulnerable to some symptoms related to harms of heat wave.

Table(2): Linear regression of relationship between perception to heat wave and self-rated health

	Model(1)	Model(2)	Model(3)
Self-rated health	-0.233***	-0.226***	-0.232***
	(-14.32)	(-14.00)	(-13.60)
Satisfaction to community	-0.0566**	-0.0509**	-0.0451*
Female	0	0	0
Male	0.371***	0.387***	0.358***
	(10.93)	(11.40)	(10.06)
Age 18-34	0		0
35-64	0.0790	0.072	0.0723
	(1.76)	(1.16)	(1.57)
Age 65	0.361***	0.407***	0.332***
or older	(5.62)	(6.60)	(4.81)
Number of		0.00506*	0.00219
neighbors familiar with		(2.30)	(0.88)

Number of neighbors would help			0.0329*
			(2.11)
_cons	4.548***	4.639***	4.417***
	(60.17)	(67.54)	(48.12)
N	5939	6035	5511

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

(2)

Author uses linear regression model to figure out the relationship, and. The exact function would be:

$$Perception = Health X_1 + Neighbors X_2 + Help X_3 + Age X_4 + Gender X_5 + Satisfaction X_6 + e_i$$

As table(2) presents, the relationship between self-rated health and individuals' perception to heat wave is significant (P-value<0.001), when self-rated health situation is better, the respondents have less bad feeling in the hot temperature. In model(1), the author only assess the relationship between self-rated health situation and perception to heat wave, with personal structural variable like gender and age group controlled. We can discover that gender difference is significantly related to the personal perception of heat wave, which means when respondent's gender is male, he would be more likely to have bad feeling in the hot situation. The authors of this study divided people into three age groups: ages 18-34, ages 35-64, and ages 65 and older. As the result, people who age 65 and older more easily have bad feelings in the hot situation, and satisfaction to community works as a significant moderator variable.

Model(2) adds "Number of neighbors the respondents are familiar with" as moderator variable, and the author finds the number of neighbors people contact can be a significant variable. To extend the previous discussion, "number of neighbors people contact" can be included as a part of community variable.

However, the author also finds that when adding "Number of neighbors would help" in Model(3), the variable "Number of neighbors the respondents are familiar with" is not significant anymore. This means the degree of how much people feel uncomfortable is more related to the situation they would like to call for help for neighbor than to the "number of neighbors the respondents are familiar with". Also, the reason why people contacttheir neighbors may be because they hope their neighbors would come help them when they are in need, at least in the heat wave correlated issues.

4. Discussion

From the table(2) presents, we can realize the personal perception to heat waves is highly related to self-rated health situation. Moreover, when residents' satisfaction to community is added to moderator, it affects the relation significantly. In conclusion, we can find (1) feeling to heat is related to personal health situation ; (2) community is a potential factor to prevent people suffer from the harm from heat waves.

In addition, the author finds even though we control community related variable into regression model, the gender and age difference still have a significant effect. This result shows even though the community could potentially increase people's resilience against harm from heat waves, we still find some people in same community are more vulnerable to heat wave and need more care when it comes to global warming and heat wave issues.

But the author also finds that in model(3), even though the author include "Number of neighbors would help" and "Number of neighbors the respondents are familiar with" as community related variable, the variable "satisfaction to community" is still significant, which reveals that the factors of satisfaction to community are not completed. Therefore, the author recommends further researchers could make more intact factor analysis to assess community as an important social phenomenon.

5. Conclusions

In this research, the author tries to figure out the relationship between heat wave effect and sociability in community. With linear regression analysis, we find that the community can   moderate the personal perception to heat wave or uncomfortable feelings in hot-temperature situations.

However, the researcher also realizes although the community can moderate the harm from heat wave phenomenon, some personal characteristic such as gender, and age would make people more vulnerable to heat wave effect. Thus, he author can consider how broader social inequalities impact harm and risk from heat wave

The limitations of this research include: (1) The research cannot analyze the difference between urban and rural areas and further interaction of sociability and geological effect because of the limitation of questionnaire; (2) The research cannot make inclusive factor analysis of community, so the author recommends further research can conduct completed factor analysis to figure out what constructs community, which let community bring influence to people if there are dataset included more variables related to sociability of community.

The implication of this research is to verify whether community can affect personal perception of heat wave. Although many people think community have little power to Taiwanese society, this research proves community can still be a potential empowerment to individual to resist the harm of climate change. Furthermore, this study present females are not always more vulnerable to heat wave than males. The gender difference may be controlled by other factors, like career difference or others. The author expects this research could have contribution to community workers' practice in Taiwanese society, by bearing witness to the potential power of community to individuals.

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