

Community and Psychological Barriers to Tsunami Preparation

Zahra Asgarizadeh Lamjiry

University of Victoria

Robert Gifford (✉ rgifford@uvic.ca)

University of Victoria <https://orcid.org/0000-0002-2764-3810>

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Abstract

Tsunami risk was investigated as a platform for helping to understand the impact of community and psychological factors in natural disaster preparedness. Residents who lived within four meters of sea level in high and moderate tsunami risk areas of Vancouver Island were queried about possible influences on their preparation. Both community-level and psychological factors played significant roles. More community participation and fewer justifications used for not preparing (the dragons of inaction) directly predicted their reported preparation. The relation between sense of community and preparation was mediated by level of community participation, and the relation between the psychological factor, positive outcome expectancy, and preparation was mediated by the dragons of inaction. Together, these influences accounted for 21 percent of the variance in reported tsunami preparation. Policy implications are discussed.

1 Introduction

Eighty percent of tsunamis occur around the Pacific Ocean "ring of fire," mainly as a result of shifts in the earth's tectonic plates. Although the tsunami risk at Pacific-wide and regional scales is relatively low, they have great destructive potential. The last historical tsunami to cause significant damage on the west coast of North America occurred on March 27, 1964 from a great (magnitude 9.2) earthquake in southern Alaska. It was the strongest earthquake recorded in North American history, and the second-strongest recorded in world history (Clague, Bobrowsky, and Hutchinson 2000, Clague and Orwin 2005).

The destructive effects of a local tsunami generated from a large earthquake along the Cascadia subduction zone should not be overlooked. In the event of a tsunami, very little can be done to provide warnings for the coastal areas because of their often short travel time. This highlights the importance of effective education initiatives to improve residents' level of tsunami preparedness.

Preparation is the most important phase of the emergency management cycle. Gaining knowledge about typical householders' levels of preparedness, and the factors that influence it, are crucial for emergency management organizations. Obviously, greater levels of awareness and preparedness before the occurrence of a natural hazard will result in significant reductions of human and financial losses. However, despite the existence of numerous education programs, levels of residents' participation and disaster preparedness remain low (Ballantyne et al. 2000, Lindell and Hwang 2008, Paton 2006, Paton, Smith and Johnston 2005, Paton, Kelly, Bürgelt and Doherty 2006).

An important reason that these programs have not been more effective is that they have not been sufficiently grounded in resident attitudes and behaviors toward natural disasters. The ineffectiveness of traditional public education programs that are primarily focused on disseminating hazard information through websites and pamphlets have been identified in many studies (Lindell and Whitney 2000, Paton, McClure, and Bürgelt 2006, Paton, Smith, and Johnston 2000, 2005). We are unaware of any published research on tsunami preparedness in southwestern British Columbia, and therefore one purpose of the

present study was to understand tsunami preparedness in that region so as to assist in regional preparedness planning, which of course may well be useful in other tsunami-threatened regions around the globe.

However, at a more theoretical and general level, the main objective of this study was to examine the roles that community- and psychological-level factors might play in a useful disaster preparedness model. To do so, the present study began with Paton, Bürgelt and Prior's (2008) model, but considered possible enhancements to it, so as to better understand who prepares, who does not, and why. Besides providing useful guidance to organizations mandated with disaster emergency management, an expanded model should also aid in the organizing and implementation of programs aimed at increasing community participation and encouraging residents to engage in more behavioral risk mitigation.

2 Literature Review

Several broader theories of attitude-behavior relations, such as social cognitive theory (SCT, Bandura 1986, McIvor, Paton, and Johnston 2009, Paton, Smith, and Johnson 2005), the protective action decision model (PADM, Paton and McClure 2013), protective motivation theory (PMT, Bandura 1977, Rogers 1975, 1983, Rogers and Prentice-Dunn 1997, Paton and McClure 2013), the health belief model (HBM, Becker 1974, Rosenstock 1974, Akompab Williams, Grant, Walker, and Augoustinos 2013), the person-relative-to-event (PrE) model (Duval and Duval 1985, Duval and Mulilis 1989), the theory of planned behavior (TPB, Ajzen 1985), and critical awareness theory (Paton 2005) have been applied to predict natural hazard preparedness. These theories have investigated individual-level factors such as coping, self-efficacy, response-efficacy and control beliefs to explain decision-making and behavior under various conditions of risk and uncertainty in order to predict both individuals' intentions to prepare and actual preparedness. Several studies (e.g., Duval and Mulilis 1999, Lindell and Whitney 2000, Paton, Smith and Johnston 2005, Perry and Lindell 2008) have also identified the role played by intra-individual factors on levels of preparedness.

One early comprehensive social-cognitive model of natural hazard preparedness was proposed by Paton (2003), who based it on studies of the adoption of health risk behaviors (e.g., Abraham et al. 1998, Bennett and Murphy 1997, Duval and Mulilis 1999). The model includes three phases, each influenced by a specific set of variables. The first contains antecedent factors that motivate individuals including critical risk awareness, risk perception, and hazard anxiety. The second includes variables that link the initial motivation to intention formation, such as outcome expectancy, self efficacy, response-efficacy, and problem-focused coping. The third focuses on the relation between intentions and preparation, including perceived responsibility, time of hazard activity, sense of community, response-efficacy, normative factors such as trust and empowerment.

Paton et al (2005) adopted his 2003 model to examine tsunami preparedness in coastal Washington state and found that preparedness levels were low-to-moderate despite reasonable success in disseminating hazard information. The authors conclude that different strategies should be used for

each of the three stages of the model, motivating individuals to prepare (that is, precursor variables), facilitating the formation of intentions (that is, intention formation variables), and promoting the conversion of intentions to preparedness (that is, moderator variables).

Other studies have focused on the role of community context factors as predictors of natural disaster preparedness (e.g., Lindell and Perry 2004, Paton 2013, Paton, Bürgelt, and Prior 2008, Paton et al. 2005, Paton, Houghton, Gregg, Gill et al. 2008). One such model (Paton, Houghton, Gregg, Gill et al. 2008) describes how beliefs and their social context influence levels of hazard preparedness. In it, individuals' interpretations under uncertainty in natural hazards commence with their beliefs about the efficacy of protective actions and interact with social context factors including community participation, collective efficacy, empowerment, and trust to influence levels of tsunami preparedness.

The present study adopted Paton, Bürgelt and Prior's (2008) model as a starting point because it is most clearly relevant to our objectives, but it includes, in particular, psychological barriers to action as a potentially important influence. The variables in the present study's model are described next.

2.1 Sense of community

The sense of belonging to one's community and attachment for local individuals and places can be an important factor (e.g., Bishop, Paton, Syme, and Nanearrow 2000, Carver et al. 1989, Duval and Mulilis, 1999). Few studies have investigated the influence of sense of community on community participation, although their connection appears to be relatively strong (e.g., Paton, Bürgelt, and Prior 2008). This connection might be expected to strengthen the relation between public participation and intention to prepare or actual preparation.

2.2 Community participation

Individuals tend to share their interests, values and expectations with others when they are dealing with uncertain events and when they lack information they need (Earle 2004, Lion et al. 2002, Paton and Bishop 1996, Poortinga and Pidgeon 2004). Involvement in community activities provides individuals with a broader range of information and collective knowledge from other community members while sharing their interests, values and expectations with others.

Some studies report a significant relation between community participation and the intention to prepare (Paton, Smith, Daly, and Johnston 2008, Paton, Bürgelt, and Prior 2009) and preparation (Paton, Houghton, Gregg, Gill et al. 2008, Paton et al. 2009), which supports the hypothesis that interacting with other community members fosters preparation.

2.3 Positive outcome expectancy

Outcome expectancy is an intra-individual variable that concerns how cost and benefit beliefs influence levels of preparedness when faced with complex and uncertain events (Bennett and Murphy 1997). Individuals who hold negative outcome expectancy (NOE) beliefs are expected to take precautionary

actions (Paton, Bürgelt, and Prior 2008, Paton, Houghton, Gregg, Gill et al. 2008, Paton, Houghton, Gregg, McIvor et al. 2008, Paton and Tedim 2014).

In contrast, those who believe that preparing for a disaster can have beneficial consequences are expected to be more likely to prepare (Paton, Bürgelt, and Prior 2008, Paton, Houghton, Gregg, Gill et al. 2008). In addition, some results have supported the positive role of POE on the intention to prepare (Paton, Bürgelt, and Prior 2008, Paton et al. 2009, Paton, Houghton, Gregg, Gill et al. 2008, Paton, Frandsen, and Johnston 2010, Sagala et al. 2009, Ejeta, Ardalan, Paton, and Yaseri 2018).

2.4 Psychological barriers: The dragons of inaction

Preparation for hazards often does not occur, or is inadequate, even with good intentions to do so, it may be hindered by psychological obstacles such as rationalizations and justifications for not preparing. Therefore, the “dragons of inaction” (Gifford 2011) were considered as possible hindrances to residents’ intention to prepare and preparations.

Evidence from other disasters supports this possibility. For example, the relation between negative outcome expectancy beliefs and bushfire preparation was mediated by preparation inhibitors, social conflict, and resource constraints (e.g., not prepared to work with others, time, financial, Paton, Bürgelt, & Prior 2008). The notion of investigating barriers to action was noted by Paton (2019) in describing his preparedness theory. However, to the best of our knowledge, the role of psychological barriers on intentions to prepare for disaster and individuals’ levels of preparedness has not yet been investigated.

3 The Present Study

One objective of this study was to enhance knowledge about at-risk residents’ tsunami preparation by investigating the influence of community-based antecedent factors on resident preparedness levels. A second objective was to examine the usefulness of the dragons of inactions, which are hypothesized to be located between antecedent influences on preparation and residents’ levels of preparedness. This is a proposed enhancement to Paton, Bürgelt and Prior’s (2008) model (see Figure 1). The findings should be useful to civic agencies that are charged with encouraging threatened residents to prepare for natural hazards, and assist understanding of disaster preparation at the theory level.

The present model includes two community-level factors, sense of community and community participation. Sense of community is hypothesized to have a direct and positive influence on community participation. In addition, in accordance with Paton et al (2008) model, residents with a greater sense of community were expected to form stronger intentions to prepare and to have greater levels of preparedness.

Community participation was also expected to lead to more preparation. The model also hypothesizes that community participation mediates the relation between sense of community and the intention to

prepare. It also hypothesizes that the relation between community participation and preparation is mediated by the intention to prepare.

In addition, the model proposes that preparedness is the outcome of a process that commences with a personal-level factor, positive outcome expectancy. Individuals who hold positive outcome expectancy beliefs are predicted to take more actions and to engage in more preparation. If individuals think that they need more guidance about how to prepare, they first turn to other community members. Individuals are thought to be influenced by other community members to manage disasters by sharing their interests, values, and expectations.

Finally, the dragons of inaction are hypothesized to directly predict reported preparation (more rationalizations lead to fewer preparations), but also to mediate the relation between positive outcome expectancy beliefs, sense of community, community participation, the intention to prepare and the preparations.

Reported preparedness is the ultimate element in the model, that is, as the endogenous (dependent) latent variable.

Apart from the model, the study also considered the role of ten demographic variables (age, gender, education, religion, ethnic origin, marital status, having children or not, household type, car and home ownership) on preparation and its predictors. Several earlier studies have concluded that demographic characteristics have small but statistically significant correlations with preparedness levels, in very large samples, that is, that demographics have small effect sizes (Baker 1991, Jackson 1977, 1981, Lindell and Perry 2000, Lindell 2013). Therefore, we expected that most of the demographic characteristics would be unrelated or only weakly correlated with preparation and its antecedents. These demographic variables and their coding are shown in Table 1.

4 Method

4.1 Participants

Adult residents who lived in high- and moderate- tsunami risk areas (i.e., a residence within 4 vertical meters of sea level) of southern Vancouver Island were invited to participate. About 40 percent ($n = 101$) of those approached agreed to complete a survey online, of which 55 were female and 46 were male. Their age ranged from 25 to 93 years ($m = 57.95$, $sd = 15.53$). Some (13.9 %) had a high school degree, 16.8 percent had completed a diploma or college, 22.8 percent had completed a bachelor's degree, 38.6 percent had a postgraduate or professional degree, and about 7.9 percent did not state their educational level. Three-quarters (75.2 %) were homeowners, 15.8 percent were tenants, and 8.9 percent did not state their tenure. The mean length of living in their neighborhood was 13.35 years, they had lived about 11 years, on average, in their current residence. More than three-quarters (77.2 %), were European in heritage, one percent were First Nations, four percent were Asian, 7.9 percent stated "Other," and ten percent did not state a heritage. Almost none reported having experienced a tsunami.

4.2 Procedure and materials

Volunteers went door to door to residences that were within 4 m of mean high tide and asked residents over 18 years old to complete the survey online by giving them a card with the survey link printed on it. The survey included questions which were derived from Paton, Bürgelt, and Prior's (2008) study and the dragons of inaction (Gifford 2011). The scales, measurement items, and scoring ranges are in Tables 2 to 4.

The survey had five sections. The first included questions about positive outcome expectancy beliefs (e.g., "Preparing for tsunamis will significantly reduce damage to my home, should a tsunami occur" on a 7-point agreement scale). The second contained questions about sense of community (e.g., "I feel like I belong in this community" on a 7-point agreement scale). The third queried community participation (e.g., "I participate in local activities or events (e.g., festivals, fetes, fairs)," on a 7-point agreement scale). The fourth included the dragons of inaction items (e.g., "It's too difficult for me to prepare for tsunamis" on a 7-point agreement scale). The fifth was about preparations (e.g., "Does your household have an emergency plan for a tsunami?" (no or yes). A sixth section was about the resident's intention to prepare, which was later discarded.[1] The final section contained the demographic questions.

The analyses were conducted using structural equation modeling (SEM, using AMOS 24). It was chosen because it allows the simultaneous estimation of multiple and inter-related dependence relations (Byrne 2001, Cheng 2001, Kline 1998) and because SEM can test the model as a whole to determine how accurately a given model reflects the data, using several goodness of fit indices.

[1] Intentions to take future precautionary actions were excluded at the analysis stage because we realized that they were posed *after* the preparation questions in the survey. Thus, the responses to the intention questions presumably were differentially dependent on what the householder had already done—that is, no preparations, to some, to many—which rendered intention, as a variable, too muddled to be useful as a clear measure.

5 Results

5.1 Means, standard deviations, and scale reliabilities

The respondents reported middling levels of positive outcome expectancy ($m = 4.15$, $sd = 1.13$) and higher levels of community participation ($m = 4.84$, $sd = 1.20$) and sense of community ($m = 5.25$, $sd = .96$). Their mean responses were relatively low for the dragons of inaction ($m = 2.89$, $sd = .82$). They reported having undertaken slightly less than half of the possible preparations ($m = 10.19$ out of total 24 items, $sd = 5.08$). The multi-item scales had Cronbach alpha reliabilities ranging from $\alpha = .69$ to $.88$ (see Table 5 for details).

5.2 Modelling the antecedents of preparation

A few changes were made to the original model because some of the hypothesized connections in it were not significant and therefore were excluded from the analyses. The revised model fit to the data well. Its goodness-of-fit statistics were: $\chi^2 = 3.5$, $df = 5$, $p = .62$, $RMSEA = 0.00 < 0.05$, $NFI = 0.95 > 0.95$, $CFI = 1.00 > 0.95$, $GFI = 0.98 > 0.90$, and $AGFI = 0.95$. The model (see Figure 3) accounted for 21% of the variance in tsunami preparation.

In particular, the hypothesized direct relations between the predictors positive outcome expectancy and sense of community with reported preparation were not confirmed. However, the relation between each of the two and preparation was mediated. That is, the analyses supported the hypothesis that sense of community directly and significantly influences community participation ($\beta = .41$, $p < .001$) and that community participation then directly and positively predicts level of preparation ($\beta = .37$, $p < .001$). Second, the hypothesis that the relation between positive outcome expectancy and level of preparation would be mediated by the dragons of inaction was supported ($\beta = -.38$, $p < .001$), as was the hypothesis that the dragons of inaction would then directly—negatively—predict level of preparation ($\beta = -.27$, $p < .001$).

5.3 Demographic influences

Residents' level of preparation and its predictors were examined in relation to the ten demographic variables. However, as predicted, not many were significant. Females did report more positive outcome expectancy beliefs than males ($\beta = 0.36$, $p < .001$) and older individuals reported participating in more community activities ($\beta = 0.23$, $p < .04$). Owning a car was negatively correlated with level of preparedness ($\beta = -0.28$, $p < .01$). Tenants were less likely to be involved in community activities than homeowners ($\beta = -0.43$, $p < .01$), reported a weaker sense of community ($\beta = -0.25$, $p < .01$) and fewer preparations ($\beta = -0.44$, $p < .01$). Those who adhered to (any) religion reported a greater sense of community than those who did not ($\beta = -0.22$, $p < .03$). Finally, married respondents and those who had a domestic partner had completed more preparations ($\beta = 0.24$, $p < .01$). Because over three-quarters of the sample were of European origin, the relation of heritage to other variables was not pursued because too few residents came from other heritages.

6 Discussion

In a tsunami-threatened region, an enhanced version of an existing model for predicting disaster preparation that includes psychological barriers was proposed and supported. Overall, the fit indices for the model were very good. The present model demonstrates that community-level factors play a vital role, both directly and indirectly, in residents' reported level of preparedness. Meanwhile, the individual-level variable, positive outcome expectancy, was not directly related to preparation, which differs from the results of some earlier studies (Jang, Wang, Paton, and Tsai 2016, Paton, Houghton, Gregg, Gill et al. 2008, Paton, Bürgelt, and Prior 2008, Paton, Frandsen, and Johnston 2010, Paton, Smith, Daly, and Johnston 2008, Sagala et al. 2009, Ejeta, Ardalan, Paton, and Yaseri 2018), but it was indirectly related to preparation via the dragons of inaction. Stronger positive outcome expectancy beliefs led to perceiving

fewer dragons of inaction, and the perception of fewer dragons led to undertaking more preparations. In sum, individual-level factors seem to act as mediated and direct influences on preparation.

The present results provide support for the hypothesis that residents with a stronger sense of community and who are more involved in community activities are more likely to prepare for a possible natural disaster. In accordance with the results of Paton, Bürgelt, and Prior's (2008), this relation was relatively strong. Sense of community also appears to lead to more community participation, which in turn was the most important predictor of preparation in this study. This confirms the idea that attitudes toward environmental risk mitigation are heavily influenced by social factors (Lion, Meertens, and Bot 2002, McGee and Russell 2003, Earle 2004).

The role of ten demographic variables was examined, and relatively few significant correlations were found, which (a) confirms the results of earlier studies that the influence of demographic characteristics is moderately or weakly correlated with reported preparation behaviors (Lindell and Perry 2000, Lindell 2013), and (b) suggests that the present model has good generalizability.

That being said, some demographic findings are worth noting for theoretical and practical policy reasons. Males reported weaker positive outcome expectancy beliefs and reported fewer preparations. Younger individuals participate less in their community, this might lead younger residents toward lower levels of preparedness.

House and car ownership play a role. Not having a car was associated with lower levels of preparation, presumably this is a marker of some more direct influence, rather than a cause. Tenants, perhaps not surprisingly, were less likely to be involved in community activities and had a weaker sense of community, but more importantly they had completed fewer preparations. Individuals who were married or were living with their partners reported greater levels of preparedness than unmarried ones. Being part of a religion was associated with greater preparation, perhaps partly as a result of being part of a community. In sum, efforts to increase risk-reduction behaviors might well focus on males, younger residents, tenants, single people, and residents with no religious affiliation.

In order to facilitate at-risk residents' preparedness, strategies that emphasize strengthening community factors and removing psychological barriers to residents' preparations should be considered by emergency management organizations. First, sense of community might be enhanced by encouraging at-risk residents to volunteer in community activities and events. This should increase their level of preparedness indirectly.

Second, public education strategies that encourage at-risk community members to discuss their risk from tsunamis, share their emergency plans, and talk about how to reduce tsunami impacts could be adopted by local emergency planners.

Third, planners in tsunami-threatened communities could gather community members together to educate them in skills such as tsunami evacuation drills, survival techniques in the face of a tsunami,

and first aid. Lack of knowledge and required skills were two obstacles that hindered people from preparations. At the same time, these efforts should be wary of frightening residents.

Fourth, programs designed to facilitate preparedness by eliminating the common dragons of inaction (Gifford 2011) should be targeted by emergency management agencies. Although the respondents did not report very large levels of these justifications, managers might pay most attention to those most agreed with: "I'm satisfied with my current level of preparedness" (3.79/7), "I'm content with the extent to which my current preparation level reflects who I am as a person" (3.65/7), and "I have already prepared enough for a tsunami" (3.37/7). Thus, participants in the present study were, on average, relatively content with their current levels of preparedness. However, the correlations between these statements and their own reported preparation were not impressive: the correlation between an index of these three measures and reported preparation was .35. That is, the relation between "I'm fine, thanks" and reported preparation is quite weak. This means that "contented with my existing preparation" is a serious challenge for emergency management officials to overcome.

Apart from the usual limitation that the study was conducted in a single region, albeit a threatened one, its inclusion of the dragons of inaction might usefully be investigated as part of models other than the one with which the present study began (Paton et al. 2008). Second, again as with most other studies, discrepancies between reported and observed levels of preparedness (Paton et al. 2005, Ejeta, Ardalan, Paton, and Yaseri 2018) must be considered. Nevertheless, the present study helps to highlight the importance for disaster preparation of community factors and the dragons of inaction.

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Tables

Table 1 Demographic variables

	Response Range
Age	-
Gender	Male (1), Female (2)
Level of education	Elementary school (1), High school (2), Diploma/college (3), Bachelor (4), Postgraduate or professional (5)
Ethnic origin	European (1), Hispanic or Latino (2), Black or African origin (3), First nations (4), Asian (South) (5), Middle-eastern (6), Other (7)
Religion	Have a religion (1), No religion (2)
Marital status	Not married (1), Married or domestic partnership (2)
Household type	Single person household(1), Group household (i.e., shared) (2), Couple with no children (3), Couple with children (4), Single-parent family (5)
House ownership	Owner (1), Tenant (2)
Age of building	-
Does someone in your home own a car?	Yes (1), No (2)
Having children or not	No children live here (0), Have children around (1)

Table 2 Scales, items, and scoring range for personal and community-level predictors

		Scoring Range
Positive Outcome Expectancy	1- Preparing for tsunamis will significantly reduce damage to my home, should a tsunami occur	Strongly disagree (1) to Strongly agree (7)
	2- Preparing for a tsunami will improve the value of my house or property.	
	3- Preparing for tsunamis will improve my ability to deal with disruption to family life following a tsunami.	
	4- Preparing for tsunamis will improve my ability to deal with disruption to community life following a tsunami.	
Sense of Community	1- I feel like I belong in this community.	Strongly disagree (1) to Strongly agree (7)
	2- I believe my neighbors would help me in an emergency.	
	3- Even if I had the opportunity, I would not move out of this community.	
	4- I feel loyal to the people in my community.	
	5- I often have friends from this area over to my house.	
	6- I plan to remain a resident of this community for years.	
Community Participation	1- I have worked with others in this area on something to improve community life.	Strongly disagree (1) to Strongly agree (7)
	2- I participate in local activities or events (e.g., festivals, fetes, fairs).	
	3- I have contributed money, food or clothing to local causes, charities, or to others in my community.	
	4- I have attended a public meeting on a community issue.	
	5- I have been involved in volunteer activities intended to benefit my community (e.g., fundraising, clean-up days, local groups, Scouts/Brownies, sports teams).	

Table 3 Scale items and means for the dragons of inaction[2]

	M	SD
1- It's too difficult for me to prepare for tsunamis.	3.34	1.45
2- There's no need to prepare because a serious tsunami is unlikely to occur during my lifetime.	3.07	1.57
3- Preparing for a tsunami would be criticized by those around me.	2.20	1.31
4- Even if I decided to make these preparations, there would be too many obstacles to overcome.	3.00	1.55
5- There is no need to prepare because the current "tsunami crisis" has been exaggerated.	2.52	1.41
6- I'm worried that others will criticize me for preparing.	2.04	1.29
7- I have not prepared because doing that would be a hassle for me.	3.14	1.64
8- I can't prepare because I'm invested in my current lifestyle.	2.45	1.33
9- I'm satisfied with my current level of preparedness.	3.79	1.62
10- I haven't heard a convincing argument for why I should prepare.	2.98	1.63
11- I have already prepared enough for a tsunami.	3.37	1.47
12- My tsunami actions already make enough of a difference.	3.16	1.38
13- I have not prepared for a tsunami because of the expense.	2.97	1.26
14- I have not prepared because I don't have the skill or knowledge required.	3.12	1.67
15- The tsunami risk-reduction behaviors that I currently engage in make further preparations unnecessary.	2.95	1.38
16- I haven't prepared mainly because preparing also involves some risk.	2.32	1.18
17- I'm content with the extent to which my current preparation level reflects who I am as a person.	3.65	1.50
18- If I made the necessary preparations, I probably would be embarrassed when others noticed what I was doing.	2.15	1.20
19- I have not prepared because I don't have time to do it.	3.27	1.86

Table 4 Percent reported adoption of preparedness items

	Percent who reported each preparation ^[3]
1- Do you have a portable family emergency kit with supplies for at least 72 hours for your home, work, and vehicle?	51.5
2- Do you have a radio to keep informed of local tsunami watches and warnings?	70.3
3- Do you have flood insurance for your home?	70.3
4- Do you have an emergency contact card (a list of emergency numbers)?	46.5
5- Have you learned how to turn off your gas and electricity?	73.3
6- Do you have a first aid kit?	80.0
7- Do you have a pet emergency kit?	12.9
8- Do you have a family emergency plan?	46.5
9- Have you ever checked your house and land for any potential dangers related to flooding?	52.3
10- Does your household have an emergency plan for a tsunami?	42.6
11- Have you ever shared your emergency plans with your neighbors?	11.9
12- Have you ever identified a place for your family to reunite quickly after a tsunami?	52.5
13- Have you talked in your household about what to do if a tsunami occurs?	54.5
14- Have you taken or updated emergency first aid courses that included learning cardio-pulmonary resuscitation (CPR)?	51.5
15- Have you taken a course that teaches survival techniques in the water?	26.7
16- Have you learned the tsunami alert terminology?	11.9
17- Have you ever participated in any initiatives or activities for tsunami preparedness and risk reduction?	15.8
18- Do you have a plan for evacuation?	61.4
19- Have you conducted an earthquake drills (Duck, Cover & Hold) in your residence?	37.6
20- Have you conducted a tsunami evacuation drill?	6.9
21- Have you ever called your local Red Cross or Office of Emergency Services for tsunami information?	5.0

22- Do you have an out-of-town contact with whom to communicate?	69.3
23- Do you know your community-designated shelter?	20.1
24- I considered the risk of a major tsunami when deciding to live in the residence that I now live in.	25.7

Table 5 Means, standard deviations, and internal consistency reliabilities for the model variables (N = 101)

	Range	M	SD	α
Positive outcome (PO)	1-7	4.15	1.13	.69
Sense of community (SC)	1-7	5.25	.96	.78
Community participation (CP)	1-7	4.84	1.20	.76
Dragons of inaction	1-7	2.89	.82	.87
Preparation	0/1	10.19	5.08	.84

[2] Response range: Strongly disagree (1) to Strongly agree (7)

[3] Response Range: No (0), Yes (1)

Figures

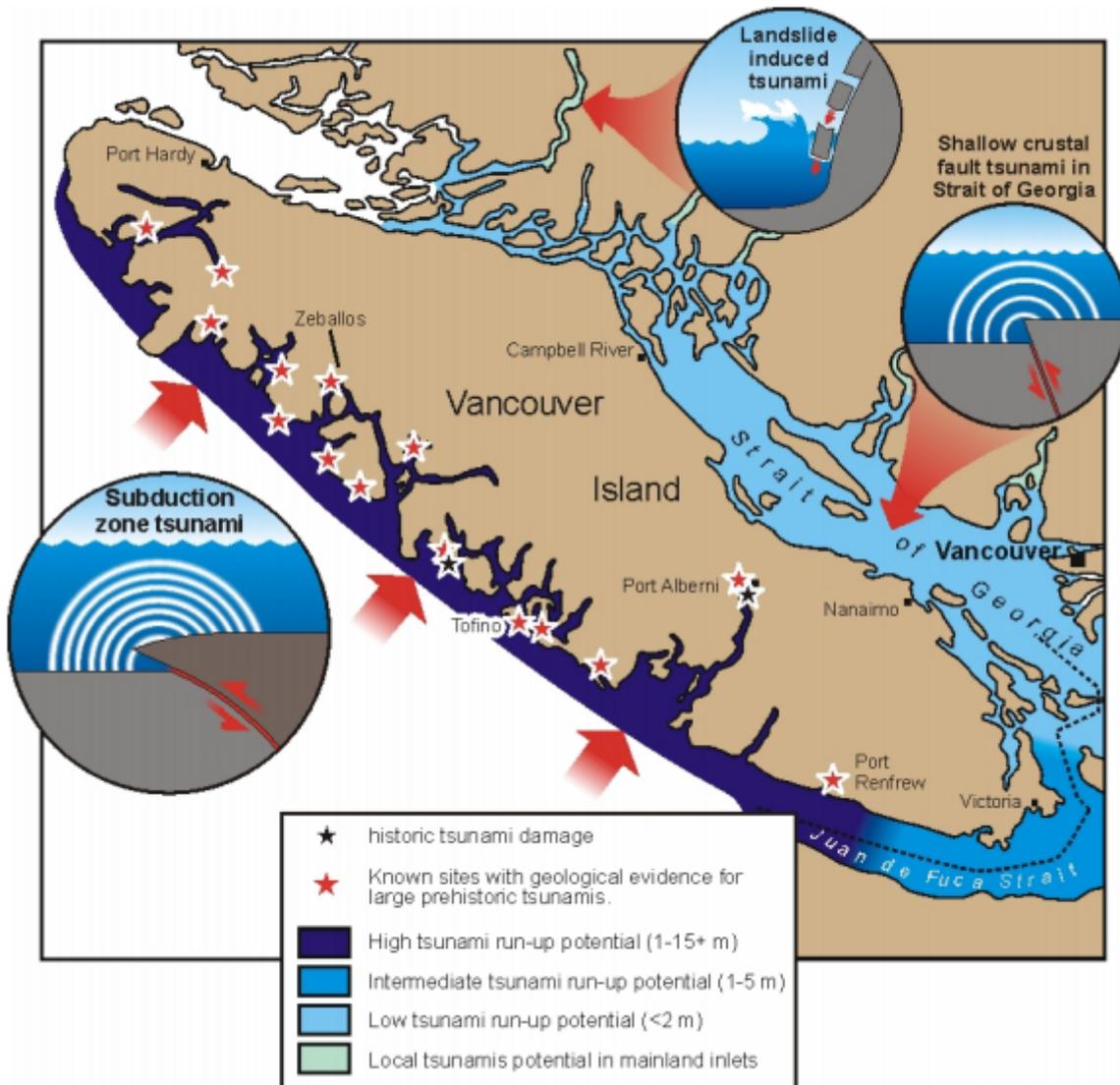


Figure 1

Tsunami risk in southwestern British Columbia (Clague and Orwin 2005)

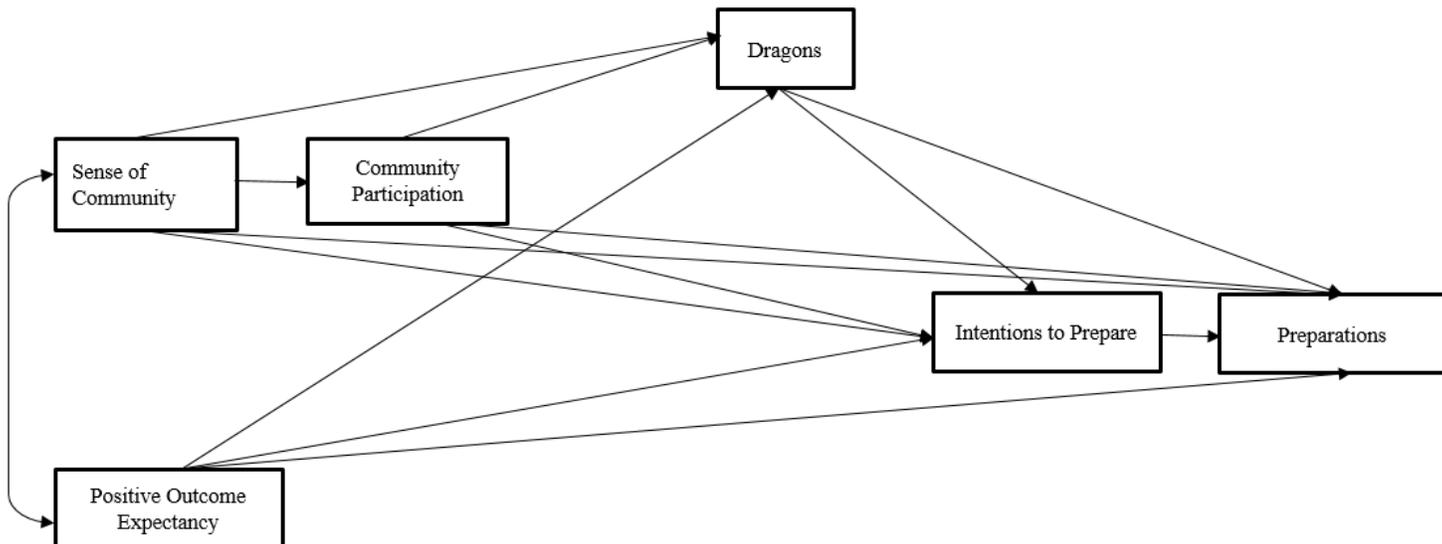


Figure 2

The hypothesized model, as adapted from Paton et al (2008)

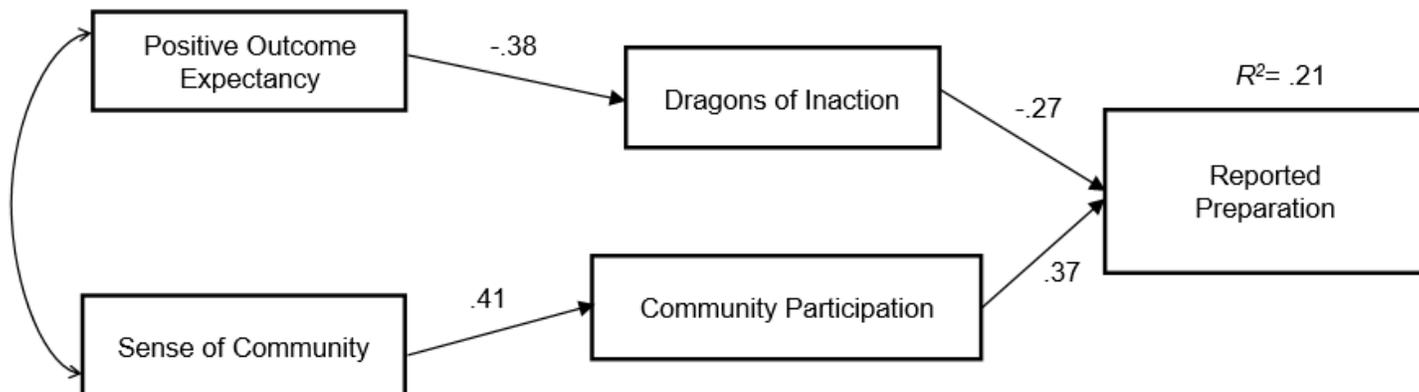


Figure 3

The structural equation model for the prediction of preparation