

**Fighting the raging beasts' blaze: Examining the effect of message framing in  
wildfire news reports on risk perception**

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## 1.0 Introduction

Climate change and climate variability are expected to result in more frequent fires in Canada's northwestern boreal region, with severe health, environmental and economic consequences (Dale et al., 2001; Flannigan et al., 2005; McMichael et al., 2006; Searle & Chen, 2017). Consequently, research on wildfire risk perceptions and communicating risks to different populations have become increasingly relevant. In news reports, metaphors dominate headlines concerning wildfires (Matlock et al., 2017). These metaphors are often used to describe wildfires as “monsters” to be “battle[d]” or as a fire “chok[ing]” a population (Dornin, 2020; Paddock & Suhartono, 2019). These metaphors are often employed as a conceptual tactic for the public to interpret the event as more concrete than an abstract weather event. However, absent from current research is a practical examination of wildfire metaphoric framings in the media – among other wildfire communication tactics – and how such framings influence risk perceptions and planned coping behaviours. In this study, we explore risk perceptions related to wildfire severity, concerns about the wildfire's consequences, and intentions to engage in health-protective behaviours as a function of wildfire message framing.

## 2.0 Study Area

The study was conducted in the Kamloops Fire Centre area. The Kamloops Fire Centre area has a population of approximately 350,000 and covers a land area of approximately 37,000 km<sup>2</sup> (Statistics Canada, 2016; Figure 1). Recent major fires in this area include the Richter Creek wildfire (burned 507 ha) and Richter Mountain wildfire (burned 403 ha) from 2019, as well as three wildfire complexes in 2018, collectively burning almost 42,000 ha (BC Wildfire Service, n.d.).

### Figure 1

*Map of British Columbia's fire centres (BC Wildfire Service, n.d.)*



### 3.0 Research Objectives and Hypotheses

The main objective for this study was to examine the effects of wildfire framings in news media on community risk perceptions. Specifically, we examine whether framing wildfires with metaphors, statistics, and health risks influence wildfire severity perceptions, concerns about wildfires' consequences, and intentions to engage in health-protective behaviours.

Since a) people who read antagonistic metaphors perceive wildfires as more severe (Matlock et al., 2017); and b) antagonistic metaphors evoke greater urgency to act on environmental issues (Flusberg et al., 2017; Matlock et al., 2017), we hypothesized that:

- a) reading antagonistic messages will lead community members to perceive the wildfire as more severe than reading messages with statistics about the wildfire and reading messages that emphasize health risks associated with the wildfire;
- b) reading antagonistic messages will lead community members to be more concerned about the wildfire's consequences than reading messages with statistics about the wildfire and reading messages that emphasize health risks associated with the wildfire.

There is very limited literature on the effects of health risk framings on peoples' risk perceptions. However, there is reason to believe that those reading health risk framings will plan to engage in health-protective behaviours, particularly if the message emphasizes prevention and preparedness in an explicit, consistent, and straightforward manner that avoids technicalities and jargon (Sugerman et al., 2012; Barnes et al., 2008). As such, we also hypothesized that:

- c) reading messages that emphasize wildfire associated health risks will lead community members to intend to engage in health-protective behaviours to a greater extent than reading messages with statistics about the wildfire and reading antagonistic messages.

### 4.0 Methods

We used preliminary results from a media analysis<sup>1</sup> to develop wildfire scenario vignettes:

#### *Metaphor framing*

No relief in sight as wildfire rages.

Province in a state of emergency as thousands are forced from their homes.

#### *Statistical framing*

No relief in sight as wildfire burns at 10,900 ha.

Province in a state of emergency as up to 24,000 residents unsure when they will be able to return to their homes.

#### *Health risk framing*

No relief in sight as special air quality statement released due to wildfires.

Province in a state of emergency as those with pre-existing health conditions, infants, and the elderly are at greater risk.

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<sup>1</sup> The search was restricted to articles published between April 2017 and October 2019, in line with British Columbia's typical spring (April) wildfire season onset and taking into account various local, prominent wildfire cases affecting vulnerable groups in the recent past. 417 articles including the word "wildfire" were available from Castanet.net, CBC, CJFC Today, Kamloops This Week, and Kelowna Now. These sources were chosen based on recommendations from research leads at IHA-BC.

These vignettes were added to a survey that had questions to capture measures of wildfire severity (Appendix A; Matlock et al., 2017), concerns about wildfires' consequences (Flusberg et al., 2017; Kujawa et al., 2015), and intentions to engage in health-protective behaviours (Sugerman et al., 2012). This questionnaire was developed with guidance from two Interior Health Authority (IHA) Regional Practice Leads from the IHA Research Department to enhance the relevancy, necessity, and appropriateness of the survey instrument.

#### ***4.1 Data Collection***

We recruited 218 participants through social media and news advertisements. The questionnaire initially assessed eligibility regarding location (Kamloops Fire Centre area [KFCA]; Figure 1), age (18-65) and English language fluency (since non-native English speakers may not interpret the metaphor vignette the same way as a native English speaker). A quota was added to ensure approximately equal participation of men and women and that participants were equally divided into each vignette group. Eligible participants proceeded to read one of the three wildfire scenario vignettes. After reading the vignette, they then answered questions related to the wildfire's severity, their concerns about the wildfire's consequences, and their intentions to engage in health-protective behaviours.

#### ***4.2 Data Analysis***

Three one-way between-groups analyses of covariance (ANCOVA) were conducted to assess wildfire severity perceptions, concerns about wildfires' consequences, and intentions to engage in health-protective behaviours as a function of wildfire message framing. The first analysis compared perceived severity of the hypothetical wildfire by vignette type. The independent variable was the type of vignette (metaphor, statistical, health risk), and the dependent variable was perceived severity. Covariates included age, length of stay, ethnicity, English as first language, previous experience with wildfires, transportation, mobility, and social networks.

A second ANCOVA was conducted to compare concerns about the wildfire's consequences as a function of vignette type. In this case, the dependent variable is an index of the concerns about wildfires' consequences questions (e.g., personal health and/or health of a loved one, difficulty finding food/shelter/gasoline, threats to personal safety, and damage to property).

The third ANCOVA compared participants' intentions to engage in health-protective behaviours as a function of vignette type. The dependent variable was an index of participants' intentions to engage in health-protective behaviours (e.g., keeping windows closed in the home and vehicle, running air conditioners on re-circulate, limiting activities to what is necessary, wearing a mask outdoors). Gender and mobility were included as covariates, among the other covariates.

### **5.0 Preliminary Findings**

A total of 226 participants met the eligibility criteria. Before conducting the analyses, all participants who did not complete the survey's essential components (e.g., the outcome variable questions) were removed from the sample. Following this, 218 participants remained for the

analyses. Assumption checks (e.g., normality, linearity, homogeneity of variances, homogeneity of regression slopes, and reliable measurement of the covariate) were conducted. In any cases where assumptions were violated, appropriate adjustments were made.

### 5.1 Manipulation Check

Most of the participants within the metaphor framing group did not pass the manipulation check (only 21% of participants correctly identified that they were in the metaphor framing group). This was expected as it can be challenging to notice linguistic nuances in vignettes, even though the antagonistic message may still affect participants' subconscious perspectives. For the statistical and health risk framing groups, most participants passed the manipulation check (53% of participants correctly identified that they were in the statistical framing group, and 88% correctly identified that they were in the health risk framing group).

### 5.2 Demographic Characteristics

The various demographic characteristics of the participants are shown in Table 1. Most participants were between the ages of 55-65 (30.7%) and had lived within the KFCA for more than five years (82.6%). English was the first language of 97% of the participants.

**Table 1**

*Descriptive statistics for demographic characteristics/covariates*

Measure	n	<i>M</i>	<i>SD</i>
Gender		1.56	.61
Man (1)	103 (47.2)		
Woman (2)	112 (51.4)		
Non-binary (3)	1 (.5)		
Prefer to specify (5)	2 (.9)		
Age		5.10	1.45
18-24 (2)	8 (3.7)		
25-34 (3)	33 (15.1)		
35-44 (4)	33 (15.1)		
45-54 (5)	38 (17.4)		
55-65 (6)	67 (30.7)		
Over 65 (7)	39 (17.9)		
Length of stay within the KFCA		4.76	.63
Less than 6 months (1)	2 (.9)		
6 to 12 months (2)	3 (1.4)		
1 to 2 years (3)	2 (.9)		
2 to 5 years (4)	31 (14.2)		
More than 5 years (5)	180 (82.6)		
English as first language		1.03	.18
Yes (1)	211 (96.8)		
No (2)	7 (3.2)		
Previous experience with evacuation		1.68	.47

Yes (1)	69 (31.7)		
No (2)	149 (68.3)		
Reliable transportation for emergency		1.01	.10
Yes (1)	216 (99.1)		
No (2)	2 (.9)		
Disability/condition limiting mobility		1.94	.25
Yes (1)	14 (6.4)		
No (2)	204 (93.6)		
Social network index		1.20	.28
1.00	118 (54.1)		
1.25	61 (28.0)		
1.50	18 (8.3)		
1.75	10 (4.6)		
2.00	11 (5.0)		
Ethnicity		1.90	.30
Other (1)	22 (10.1)		
White (2)	196 (89.9)		

*Note.*

**Social network index:** Questions 48 to 51 were averaged together to create the social network index. Higher scores refer to having more people to turn to for support in the event of a wildfire. **Ethnicity:** “White” refers to those who only identify as white (e.g., someone identifying as white AND indigenous would rather be considered as “Other” or “1”). This measure was used for most analyses as a covariate to assess the “white-male effect,” though more race-based data was collected as follows, referring to anyone identifying with the following races, regardless of whether or not they identify with other races as well: White = 93.6%; Black = 0.9%; East/Southeast Asian = 1.4%; Indigenous = 6.9%; Latino = 1.4%; Middle Eastern = 1.4%; South Asian = 1.8%; prefer to specify = 0.9%.

### 5.3 ANCOVA Analyses

A summary of the ANCOVA analyses is shown in Table 2.

**Table 2**

*Tests of between-subjects effects for each outcome measure*

Source	<i>df</i>	<i>F</i>	<i>p</i>	$\eta_p^2$
<b>Severity perceptions</b>				
Age	1	.185	.667	.001
Length of stay within the KFCA	1	.150	.699	.001
Ethnicity	1	.770	.381	.004
English as first language	1	3.156	.077	.015
Previous experience with evacuation	1	.694	.406	.003
Reliable transportation for emergency	1	1.935	.166	.009
Social network index	1	.204	.652	.001
Disability/condition limiting mobility	1	2.200	.139	.011
Vignette	2	6.556	.002**	.060

<b>Concerns about wildfires' consequences</b>				
Age	1	0.15	.904	
Gender	1	27.510	.000***	
Length of stay within the KFCA	1	1.308	.254	
Ethnicity	1	1.034	.310	
English as first language	1	.756	.386	
Previous experience with evacuation	1	.713	.399	
Reliable transportation for emergency	1	1.549	.215	
Social network index	1	1.258	.263	
Vignette	2	3.886	.022*	
<b>Intentions to engage in health-protective behaviours</b>				
Age	1	7.328	.007**	.034
Gender	1	14.188	.000***	.064
Length of stay within the KFCA	1	.885	.348	.004
Ethnicity	1	.866	.353	.004
English as first language	1	.852	.357	.004
Previous experience with evacuation	1	1.702	.194	.008
Reliable transportation for emergency	1	.401	.527	.002
Social network index	1	.838	.361	.004
Disability/condition limiting mobility	1	2.805	.095	.013
Vignette	2	.709	.493	.007

Note. \* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

**5.3.1 Hypothesis A: Severity perceptions.** Does reading antagonistic messages lead community members to perceive the wildfire as more severe? After adjusting for the covariates, there was a significant difference between the vignette groups on the severity measure,  $F(1, 206) = 6.56$ ,  $p < 0.01$ ,  $r_{\text{metaphor}} = 0.21$ ,  $r_{\text{statistical}} = 0.21$ . The associated ANCOVA test for this question revealed that participants who read the metaphor vignette felt the wildfire would cause greater damage ( $M = 3.23$ ,  $SD = .13$ ) compared to participants who read the statistical vignette ( $M = 3.19$ ,  $SD = .12$ ) and the health risks vignette ( $M = 2.65$ ,  $SD = .13$ ). However, the metaphor framing group and the statistical framing group have any statistical difference ( $p = .86$ ); only the health risk framing group significantly differed from the metaphor framing group ( $p < .01$ ) and the statistical framing group ( $p = .01$ ).

**5.3.2 Hypothesis B: Concerns about wildfires' consequences.** Does reading antagonistic messages lead community members to be more concerned about the wildfire's consequences? After adjusting for the covariates, concerns about the wildfire's consequences significantly differed between the vignette groups,  $F(1, 206) = 3.89$ ,  $p = .01$ ,  $r_{\text{health}} = .19$ . However, there was no significant difference between the metaphor framing group and both the statistical and health risk framing groups,  $F(1, 206) = 3.89$ ,  $p = .14$ . Further, concerns appeared to be lowest for the health risk framing group ( $M = 2.44$ ,  $SD = .11$ ) and highest for the statistical framing group ( $M = 2.86$ ,  $SD = .10$ ), with the metaphor framing group sitting in between ( $M = 2.68$ ,  $SD = .11$ ). In this case, gender also significantly predicted participants' concerns,  $F(1, 206) = 27.51$ ,  $p > .01$ ,  $r = 0.34$ . That is, women were more likely to express greater concerns about the wildfire's consequences than men.

**5.3.3 Hypothesis C: Intentions to engage in health-protective behaviours.** Does reading health risk messages lead community members to form intentions to engage in health-protective behaviours? After adjusting for the covariates, there was no significant difference between any of the groups,  $F(1, 206) = .709, p = .493$ . However, age,  $F(1, 206) = 7.33, p = 0.01, r = 0.19$ , and gender,  $F(1, 206) = 14.19, p < 0.01, r = 0.25$ , were significant predictors of intentions to engage in health-protective behaviours. A unit increase in age lead to a 0.12 ( $p = .01$ ) unit increase in intentions to engage in health-protective behaviours. Being female was associated with increased intentions to engage in health-protective behaviours, indicated by a  $b$ -value of .37 ( $p < .01$ ).

## 6.0 Discussion and Conclusion

This research shows that different wildfire framings have effects on people's severity perceptions, concerns about wildfires' consequences, and intentions to engage in health-protective behaviours. Hypothesis A was not necessarily rejected since the metaphor framing group perceived the wildfire as more severe than the health risk framing group. However, the metaphor framing group's score is not significantly different from the statistical framing group's score. This suggests that, in terms of severity, wildfires that are framed with antagonistic metaphors in news headlines are generally perceived to be as severe as those framed with detailed statistics (e.g., hectares burned). Thus, when public health and/or media professionals want the public to perceive a wildfire as severe and likely to cause a lot of damage, metaphor and statistical framings may be sufficient tools to use.

Hypothesis B was rejected since the metaphor framing group did not experience greater concerns about the consequences of the wildfire than the other two groups. Instead, the statistical framing group experienced the greatest concern over and above the health risk framing group, with no significant difference between the statistical and metaphor framing groups. That being said, gender was a significant predictor of concerns about the wildfire's consequences. This is in line with previous literature that argue that women express more general environmental concern than men, especially when these measures are in the context of risk perceptions and when they are local concerns (for reviews, see Davidson & Freudenburg, 1996; Mohai, 1992).

Hypothesis C was rejected since the health risk framing did not lead to significant differences in intentions to engage in health-protective behaviours among the three vignette groups. That being said, gender and age were strongly associated with these aforementioned intentions. Gender may play a role in participants' intentions to engage in health-protective behaviours due to the "white-male effect." This effect posits that white men typically rate hazards as lower in risk than white women and women generally and men of other ethnicities, since white males typically hold positions of power (Eriksen, 2013). Although ethnicity did not affect this measure, women were significantly more likely to intend to engage in health-protective behaviours than men.

The preliminary results of this study can contribute to health and emergency communication literature. These findings can also be used by local public health units, media organizations and emergency services to design adaptive wildfire communication strategies. We intend to share the findings with local health authorities in the coming months. This project will also contribute to the growing body of research concerning climate change and natural disasters and how natural events influence human behaviour.

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## Appendix A

### *Questionnaire*

**\*\*participant to read letter of information\*\***

Please answer these three initial questions to check your eligibility for this survey.

1. How do you self-identify in terms of gender? This does not directly impact survey eligibility.  
 Man  
 Woman  
 Non-binary  
 Prefer not to disclose  
 Prefer to specify: \_\_\_\_\_
  
2. What is your age?  
 Under 18  
 18-24  
 25-34  
 35-44  
 45-54  
 55-65  
 Over 65
  
3. Are you fluent in English?  
 Yes / No
  
4. Do you live within the Kamloops Fire Centre area? If you are unsure if you live in this area, check [this map](#).  
 Yes / No

Please read the imaginary news report's headline and opening statement on the next page closely. The scenario is similar to those found in news reports about wildfires in B.C. The questions that follow will be about your perceptions and actions related to the scenario on the next page. Please answer these questions carefully as you can only progress forwards in the survey (there is no back button).

We also ask that you complete this questionnaire in one sitting - it should only take approximately 10 minutes. Thank you for your time.

**\*\*participants receive one of three vignettes from Appendix C\*\***

### ***Magnitude and Evacuation***

Keeping the scenario in mind, please answer these questions about damage and your choice to evacuate.

5. How much damage do you think will result from the wildfire?  
*1 (no damage – constructions are mostly unaffected) to 5 (considerable damage – most constructions will be destroyed)*
  6. How likely would you be to choose to evacuate in this situation?  
*1 (very unlikely) to 5 (very likely)*
- 

### ***Health Risks***

Keeping the scenario in mind, please answer these questions about your health risk perceptions. What is the likelihood that you would engage in these behaviours because of the wildfire scenario (not as a result of COVID-19 or any other public health crisis)?

*1 (very unlikely) to 5 (very likely)*

7. Keep windows closed in the home and in vehicle
  8. Run air conditioners on re-circulate (*can respond N/A*)
  9. Limit activities to what is absolutely necessary
  10. Wear a mask when outdoors
- 

### ***Stress***

Keeping the scenario in mind, please answer these questions about your stress levels.

*1 (not at all) to 5 (very much)*

11. Would you be upset if this had happened unexpectedly?
12. Would you feel like you are unable to control the important things in your life?
13. Would you feel nervous or stressed about the wildfire?
14. Would you be able to deal with irritating life hassles successfully?
15. Would you feel like you are effectively coping with important changes occurring in your life?
16.
  - a. Would you feel confident in your ability to handle your personal tasks or problems in the midst of this event (e.g., getting children home from school/daycare, looking after elderly parents, neighbours, pets, etc.)?
  - b. Please specify any of these particular personal tasks or problems that may limit your confidence in the midst of a wildfire: \_\_\_\_\_
17. Would you feel as though things are going your way?
18. Would you be unable to cope with all of the things you have to do?
19. Would you be able to control irritations in your life?
20. Would you feel on top of things?

21. Would you be angered because of things happening outside of your control?
22. Would you find yourself thinking about things that you have to accomplish?
23. Would you be able to control the way you spend your time?
24. Would you feel as though difficulties are piling up so high that you cannot overcome them?

### ***Concerns about Consequences of Wildfires***

Please answer these questions about your concerns about the consequences of wildfires.

How concerned are you with these potential consequences of wildfires?

*1 = not at all concerned, 2 = somewhat concerned, 3 = neutral, 4 = concerned, 5 = extremely concerned*

25. Personal health and/or health of a loved one
26. Difficulty finding food
27. Difficulty finding shelter
28. Difficulty finding gasoline
29. Threats to personal safety
30. Damage to property

31. How confident do you feel that your city will help you get through this event?

*1 = not at all confident, 2 = somewhat confident, 3 = neutral, 4 = confident, 5 = extremely confident*

32. What help do you expect from your city to help you get through this event?

*TEXT BOX*

### ***News Sources***

Please answer this question related to your news-watching.

33. Which of the following news sources do you turn to for updates on wildfire status? Select all that apply.

Facebook

Twitter

Other social media

Castanet.net

Other local news sources (e.g., Kelowna Now, CFJC)

Television

Radio

Government webpages

Other: *please specify*

### *Demographic Questions*

Finally, we just have a few demographic questions for you.

34. What is your current employment status?
- Employed full-time
  - Employed part-time
  - Unemployed and currently seeking opportunities
  - Unemployed and not currently seeking opportunities
  - Student
  - Retired
  - Homemaker
  - Self-employed
  - Other: *please specify*
35. Please select the highest level of formal education you have completed.
- No schooling
  - Up to high school
  - High school
  - College/University (BA, BSc)
  - Masters
  - Doctorate
  - Trades and/or apprenticeship certificate
36. Please select your household income bracket.
- Less than \$25K
  - \$25K to \$50K
  - \$51K to \$75K
  - \$76K to \$100K
  - \$101K to \$150K
  - Greater than \$151K
37. Which of these ethnicities do you identify with? Select all that apply.
- Black (e.g., African, Caribbean, African-Canadian descent)
  - East/Southeast Asian (e.g., Cambodian, Chinese, Filipino, Indonesian, Japanese, Korean, Taiwanese, Thai, Vietnamese descent)
  - Indigenous (e.g., First Nations, Inuk/Inuit, Métis descent)
  - Latino (e.g., Hispanic, Latin American descent)
  - Middle Eastern (e.g., Afghan, Arab, Egyptian, Iranian, Kurdish, Lebanese, Persian, Turkish descent)
  - South Asian (e.g., Bangladeshi, Indian, Indo-Caribbean, Pakistani, Sri Lankan descent)
  - White (e.g., British, European, Scandinavian descent)
  - Prefer to specify: \_\_\_\_\_
38. Please specify your town/city of residence.

*TEXT BOX*

39. Is English your first language?

Yes / No

40. Please list any other languages you speak.

*TEXT BOX*

41.

c. Have you ever had to evacuate as a result of a wildfire?

Yes / No

d. If Yes, what year did it take place?

42. Do you have any means of reliable transportation (e.g., you or a member of your immediate family has a vehicle, public transportation is close-by, etc.)? Please specify.

*TEXT BOX*

43.

e. Do you have a disability or condition which limits your ability to be mobile in a time of emergency?

Yes / No

f. If Yes, please specify if comfortable (e.g., particular disability or condition, older age, etc.)

### ***Social Networks***

The following questions are related to your social networks.

44. Aside from those you live with, how many of your relatives (e.g., aunts, uncles, cousins, in-laws) live in the same community (e.g., town, suburb, borough, village) as you?

None

Some

About half

Most

All

45. How many of your friends live in your community?

None

Some

About half

Most

All

46. How many people do you know in your neighbourhood?

None  
 A few  
 Many  
 Most  
 All

47. Would you say that your neighbourhood is a place in which neighbours would help each other in an emergency?  
 Yes / No / Unsure

In the event of a wildfire, do you have many people you could turn to or seek (e.g., family, friends, co-workers, community supports, etc.) ...

48. ... for emotional support?  
 Yes / No
49. ... if you were physically injured?  
 Yes / No
50. ... if you needed to evacuate your home?  
 Yes / No
51. ... if you needed financial support?  
 Yes / No

### Manipulation Check

These last few questions are to check your overall understanding of this study.

*\*\*participant will see their vignette that they received at the beginning of the survey\*\**

52. What do you think was the main theme (e.g., context, information) of the headline and opening statement from your scenario at the beginning of the survey?  
 Wildfire-related metaphors  
 Wildfire-related statistics  
 Wildfire-related health risks  
 Unsure
53. How did you hear about this survey?  
 Facebook group  
 Local news source  
 Family, friend or colleague  
 Other, please specify: \_\_\_\_\_

After reading the debriefing letter, please click the arrow to complete the survey. You will also have the opportunity to enter your e-mail address to receive a lay summary of the survey results.

*\*\*participant to read debriefing letter\*\**

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We thank you for your time spent taking this survey. Your response has been recorded.

To receive a lay summary of the results of this study, please click [this link](#) to enter your e-mail address. It will not be associated with your unique ID.

If you are viewing this message after completing the eligibility questions, we regret to inform you that you are ineligible for our study at this time. Please e-mail [megan.fleming@queensu.ca](mailto:megan.fleming@queensu.ca) if you have any questions or concerns. Thank you for your time.