



## Research paper

## Experiences of rural and remote nurses assisting with disasters



Judith C. Kulig<sup>a,\*</sup>, Kelly Penz<sup>b</sup>, Chandima Karunanayake<sup>b</sup>, Martha L.P. MacLeod<sup>c</sup>,  
Sharleen Jahner<sup>b</sup>, Mary Ellen Andrews<sup>b</sup>

<sup>a</sup> University of Lethbridge, Canada

<sup>b</sup> University of Saskatchewan, Canada

<sup>c</sup> University of Northern British Columbia, Canada

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## ABSTRACT

**Background:** Globally, disasters are on the rise. Nurses play a significant role in responding to such events but little is known about rural and remote nurses' experiences.

**Methods:** A national cross-sectional survey of regulated nurses (registered nurses, registered psychiatric nurses, licensed practical nurses and nurse practitioners) in rural and remote Canada provided the data (n = 2465) for the logistic regression of predictors of assisting with a disaster event within the last five years. The types of disaster events were also examined and open-ended responses were explored to reveal nurses' perspectives.

**Results:** Nurse type, age, region of employment, employment status, number of rural communities worked, distance to advanced referral centre, remote community, personal-professional boundaries, burnout and work engagement were significant factors related to assisting with a disaster event. Open-ended data alluded to the importance of pre-disaster preparation, and the difficulties experienced when personal-professional relationships are impacted during a disaster.

**Conclusions:** Nursing education curricula needs to include information about disasters and the nurse's role. Continuing education opportunities and preparation for nurses should be offered in the workplace. Psychosocial supports to assist rural nurses who attend to disasters in their workplace will help them deal with issues such as the blurring of personal-professional relationships.

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Disasters are on the rise worldwide; over the last 20 years, 90% of disasters in the world were caused by floods, storms, heatwaves and other weather-related events [1]. All indications are that natural disasters are increasing inter-related with climate change [1]. Disasters result in significant economic and health consequences and point to the need for well-prepared health personnel to address both individual and community health problems that arise. In general, rural and remote areas (herein referred to as rural) experience specific kinds of natural disasters related to the regional geography and landscape. For example, wildfires are a common threat to the rural environment and the people who live there. It is therefore important that health personnel who live in rural areas are prepared to deal with disasters that may occur. This article focuses on findings from a national survey among rural and remote regulated nurses (Registered Nurses, Nurse Practitioners, Licensed Practical Nurses, Registered Psychiatric Nurses); our analysis focuses on a

sub-group of nurses who responded to questions about experiences with a disaster and includes a discussion of the type of disaster and their role in disaster management. Implications for nursing education and for continuing education for rural and remote nurses are discussed within the International Council of Nurses/World Health Organization (ICN/WHO) Disaster Nursing Competencies framework [2].

## Introduction

*Disasters in Canada*

Natural disasters, which include floods, wildfires (also referred to as bushfires) and earthquakes, are unexpected and often catastrophic events that impact people and their livelihood. The Canadian Disaster Database bases the definition of a disaster on the EM-DAT (Emergency Events Database) from the Centre for Research on the Epidemiology of Disasters (CRED): to be considered a disaster, an event must meet one of the following criteria: 10 or more people killed; 100 or more people affected through injury, evac-

\* Corresponding author.

E-mail address: [Judith.Kulig@gmail.com](mailto:Judith.Kulig@gmail.com) (J.C. Kulig).

uation or being homeless; an appeal for national or international assistance; be of historical significance; and, significant damage or interruption of normal processes preventing the community from recovering on its own [3]. In 2014, 107,000,000 individuals were affected worldwide by disasters [4]. In 2014, a total of more than 12.4 million Canadians 15 years and older noted that they had personally experienced a disaster within their community in their lifetime [5]. In this same year, most Canadians were affected by floods (39.1%), storms (37.7%), wildfires (18.8%) or extreme temperatures (4.3%) [6].

In North America, the intensity and frequency of disasters has changed due to factors such as lower snowfall leading to a drier landscapes, infestation of insects such as the pine beetle making the forests more vulnerable to fire and warmer temperatures in spring and summer [7]. In rural areas of Canada, wildfires are more common disasters and can overwhelm rural areas that are limited in infrastructure, personnel and access to support to assist with response and recovery from a disaster.

### *The roles of nurses in disasters*

Nurses are one of several health professional groups that are expected to be involved with disaster response and recovery; given their workplaces include institutions such as hospitals or community-based [8,9]. It is evident that the critical challenges of disaster response has never been greater. Nurses are in a unique position to take on significant roles during disaster events considering the fundamental front-line and diverse nature of their practice [10]. However, there are limited studies that have addressed nurses' knowledge and preparation in managing disasters. One exception is a study conducted in Saudi Arabia [11] with military and government hospital nurses which found that military nurses had more knowledge about disasters and that both groups gained their knowledge through disaster drills. A review of the literature on disaster preparedness and response of Australian public health nurses highlights numerous concerns including the scant literature on disaster nursing roles, lack of consistent and accessible education programs for health care professionals, and no inclusion of disaster education in undergraduate nursing curriculum [9]. However, none of this literature focused on rural nurses and their role in disasters.

Rural nurses are in a unique position in smaller communities to be instrumental in the management of disasters as they are easily recognized by community members and are familiar with local available infrastructure (such as halls and other buildings useful as evacuation centres), community patterns and events (agricultural and hunting seasons, celebratory events), and the local leadership (elected officials such as mayors and community leaders of volunteer groups and organizations). In addition, nurses in general are trusted by the public [12]. Nurses who practice in rural settings have a higher degree of visibility in their communities and may be heavily relied on for disaster response expertise and educating and supporting community members during disaster events [13]. Although some areas of the literature has focused on the willingness of nurses to attend work in a disaster [14,15]; rural nurses have no such choice. Within the context of rural nursing practice, it is not so much the willingness of nurses to respond and assist during a disaster event, more so the necessity to respond based on the limited number of health personnel qualified and/or available.

Disasters are not just one event in time, but typically follow a series of inter-related phases: pre-incident, incident and post-incident [2]. The ICN Framework of Disaster Nursing Competencies was developed to specifically highlight competencies for nurses within the Disaster Management Continuum, which combines the phases of the disaster with specific objectives [2]. The strength of the ICN/WHO [2] document is the focus on specific competencies for nurses in disaster situations by each of the disaster phases and

within an international context. However, a limitation is that there is no differentiation between urban and rural nurses and the different roles undertaken by nurses within a specific geographic context [13]. For example, the nurse is expected to evaluate health needs and resources and collaborate with the disaster response team. In rural areas, the nurse is often part of the disaster response team and in isolated areas can be the lead for the disaster response. There is some literature that has focused on the willingness of nurses to attend work in a disaster [14], however, rural nurses in Canada commonly do not have a choice. They must attend work during such events because of the limited number of health personnel that are available.

There is limited understanding about the role of nurses in general related to disasters [16] and rural nurses specifically in disasters with most published articles focusing on disaster preparedness in settings such as rural hospitals [8,17,18]. An exception is an application of the ICN/WHO [2] competencies by rural nurses in a wildfire context [13]. These authors emphasize the unique role of rural nurses in their communities and how the nature of these communities can make it challenging to meet the competencies. One example they provided was the difficulties noted with the care of vulnerable populations in the wildfire studies due to the physical isolation of the community itself or where the vulnerable lived, and the decreased availability of local infrastructure including the lack transportation for those who were defined as vulnerable.

Increasingly, inter-relationships are being identified between climate change and disasters; some authors are now focusing on the role of nurses in climate change and automatically subsuming the role of nurses in disasters within this rubric [19]. Although the relationship between climate change and disasters is important, there is a need to better understand disasters themselves in a variety of geographic contexts along with their health related impacts. In order to improve disaster planning and health care responses, nursing research on disaster preparedness and response [9,20] and nurses' roles in disasters [16] are both needed. The aim of this paper is to present the information that was generated about the role and experiences of rural nurses in Canada in regards to assisting with disasters in order to provide direction for nursing education and practice.

## **Methods**

### *Design*

The data analyzed in this article is based on the cross-sectional survey results generated from the Rural and Remote Nursing Practice Study II [21] a replication and extension of a study of rural RNs that took place over 2001–2004 [22]. The current study discussed here is based in a Primary Health Care—Health Human Resource framework which delineates four dimensions: individual, workplace, community and nursing practice to describe rural and remote nursing practice. Our particular focus is nursing practice by rural and remote nurses in regards to disaster response.

### *Setting*

For this study, we applied the Rural and Small Town (RST) definition that refers to residence in communities that are outside the commuting zone of urban areas with 10,000 or more inhabitants [23,p.7].

### *Sample*

The survey, which used a systematic sampling approach, included all regulated nursing professions in Canada; Registered

Nurses (RN), Registered Psychiatric Nurses (RPN), Nurse Practitioners (NP) and Licensed Practice Nurses (LPN) or Registered Practical Nurses who were practicing in communities that met the RST definition. A total of 3822 participants from all ten provinces and three territories in Canada completed the survey questionnaire (April 2014–September 2015), resulting in a 40% response rate. Detailed information regarding the full survey methods and procedures can be elsewhere [21]. The final subset of 2465 participants whose responses were analyzed in this study were selected from those who indicated they had assisted with a disaster event and those who did not assist with a disaster event in the past 5 years, and whose primary work community population was <10,000. The open-ended responses of the 249 participants who had assisted with a disaster event in their community in the past five years was also assessed to identify relevant comments about the type of event and how the nurses had assisted in the response.

### Data collection

National survey participants were asked the following three questions: 1) Have you assisted with a disaster event in your community in the last **five** years (i.e., a disaster is a situation or event that overwhelms local capacity and functioning of a community and may cause human, material, or economic or environmental losses); 2) If yes, what kind of event: (e.g., wildfire, flood) with a request to specify the type of event; and, 3) If yes, what kind of assistance were you involved with: Evacuation, Treatment, and/or Recovery. For the latter, the respondent could mark all that apply. Quantitative data were analyzed using IBM Statistical Package for Social Sciences (SPSS) version 24 [24]. The analysis of the open-ended data was analyzed descriptively with a focus on the type of disaster event and the participant's experience with the disaster.

### Data analysis

According to standard predictor selection in logistic regression analysis, 36 independent variables were chosen for initial bivariate analyses based on their potential relationship with nurses assisting with a community disaster event and grounded in a number of meaningful independent variables as theorized or reported in the literature [25]. In addition, our selection of independent variables from the survey instrument were based upon our conceptual and theoretical expertise in the area of study. For descriptive purposes, categorical variables were summarized in frequencies. Continuous variables were summarized using means and their standard deviations (SDs). Cross-tabulations and independent sample *t*-tests performed on the 36 identified variables revealed a subset of 22 variables that were significantly associated ( $p \leq 0.20$ ) with the outcome of having assisted with a disaster event in the community in the past five years. Logistic regression analysis using stepwise forward selection with likelihood ratio selection was performed. The independent variables were entered in one block, with the contribution of interactions to the fit of the model tested and statistically non-significant interactions removed from the model. Results are presented with odds ratios (ORs) and their 95% confidence intervals (CIs). The final model was tested for goodness of fit applying Hosmer and Lemeshow test [26]. All multivariate statistical testing was two-sided and was performed using a significance (alpha) level of 0.05.

### Ethics

Ethical approval was received from the relevant research ethics boards of the research team members. In addition, approval was successfully negotiated with the participating nursing associations

**Table 1**  
Types of Disasters.

Types of Disasters	Number
Natural Events	
Flood	66
Wildfire (forest & grass)	42
Weather & seismic events (i.e., blizzard, hurricane, tornado, tsunami threat, earthquake, avalanche, ice storm)	25
Other Events	
Building Fires (i.e., house, apartment, facility, factory)	8
Explosion (i.e., natural gas, mill, mine)	14
Plane/helicopter crash	16
Train derailment & explosion	13
Hazardous/chemical spill	1
Crashes (school bus, car)	14
Occupational Accident	2
Illness/human response (H1N1, suicides)	6
Other (transportation shutdown, power outage, electricity shortage, CO2 poisoning of children on school bus)	4
Man-made Events	
Shooting (i.e., in health facility, of community personnel)	3

and the two workplaces to ensure each organization's protocols and processes were met.

## Results

### Type of disaster events

The open-ended data was reviewed for the type of disaster events. Some nurses noted mock disaster events, but these were excluded from the analysis. In some cases the nurse listed more than one disaster in which they had been involved and some nurses mentioned disasters they had been involved with in another rural community and another type of nursing position (i.e., they may be currently working in long-term care but had the disaster experience while working in acute care). Although not frequently noted, nurses did indicate that over their career they had been involved with more than one plane crash or natural events such as a flood or a wildfire. A full list of the responses was developed including: train derailments, power outages, plane or helicopter crashes, floods, wildfires and firearm/shooting incidents. Using the disaster literature as a guide to determine categories, the disaster events noted by the nurses were then collapsed into one of three categories: 1) Natural events; 2) Other events; and 3) Man-made Events (Table 1). The largest category was Natural events ( $n = 133$ ), which included floods, wildfires and other weather events. Interestingly, floods were the largest category that matched the information available about the most frequent type of disaster experienced by Canadians (EM-DAT, 2013). Other events ( $n = 78$ ) included a range of occurrences such as building fires, train derailments, plane crashes, and hazardous spills. Finally, firearm/shooting incidents were designated as a Man-Made Event ( $n = 3$ ).

### Quantitative findings

Table 2 presents the main demographic characteristics and bi-variate associations between the independent variables and dependent variable of the 2465 respondents whose primary work community population consisted of <10,000 people. Approximately 10% ( $n = 249$ ) of the sample indicated that they had assisted with a disaster event in their community in the last five years.

Table 2 outlines the frequencies and mean scores for both those who had assisted with a disaster event within the last five years, and those who had not, the unadjusted odds ratio and the 95% confi-

**Table 2**  
Characteristics of Respondents and Unadjusted Odds Ratios of Factors Associated with Assisting with a Disaster Event in the Last 5-years (n = 2465).

Variable	Total N (%)	Assisted with a disaster event in community in last 5 years		Unadjusted Odds Ratio (95% CI)	P value
		No (%)	Yes (%)		
<b>Nurse Type (n = 2465)</b>					
Nurse Practitioner	113 (4.6)	106 (4.8)	7 (2.8)	0.88 (0.39, 1.98)	0.764
Registered Nurse	1337 (54.2)	1181 (53.3)	156 (62.7)	1.77 (1.30, 2.40)	<0.0001
Registered Psychiatric Nurse	109 (4.4)	86 (3.9)	23 (9.2)	3.58 (2.11, 6.06)	<0.0001
Licensed/Registered Practical Nurse*	906 (36.8)	843 (38.0)	63 (25.3)	1.00	–
<b>Gender (n = 2370)</b>					
Male*	150 (6.3)	130 (6.1)	20 (8.2)	1.00	–
Female	2220 (93.7)	1997 (93.7)	223 (91.8)	0.73 (0.44, 1.19)	0.201
<b>Age groups, in years-NDB (n = 2329)</b>					
<30*	256 (11.0)	241 (11.5)	15 (6.3)	1.00	–
30–34	185 (7.9)	167 (8.0)	18 (7.6)	1.73 (0.85, 3.53)	0.131
35–39	208 (8.9)	189 (9.0)	19 (8.0)	1.61 (0.80, 3.26)	0.181
40–44	251 (10.8)	227 (10.9)	24 (10.1)	1.70 (0.87, 3.32)	0.121
45–49	287 (12.3)	257 (12.3)	30 (12.7)	1.87 (0.98, 3.57)	0.056
50–54	368 (15.8)	323 (15.4)	45 (19.0)	2.34 (1.22, 4.11)	0.009
55–59	404 (17.3)	353 (16.9)	51 (21.5)	2.32 (1.28, 4.22)	0.006
>60	370 (15.9)	335 (16.0)	35 (14.8)	1.68 (0.90, 3.14)	0.105
<b>Province/Territory of primary nursing employment (n = 2465)</b>					
Atlantic*	623 (25.3)	582 (26.3)	41 (16.5)	1.00	–
Quebec	182 (7.4)	158 (7.1)	24 (9.6)	2.16 (1.26, 3.68)	0.005
Ontario	277 (11.2)	245 (11.1)	32 (12.9)	1.85 (1.14, 3.01)	0.013
Territories	317 (12.9)	282 (12.7)	35 (14.1)	1.76 (1.10, 2.83)	0.019
Manitoba/Saskatchewan	608 (24.7)	538 (24.3)	70 (28.1)	1.85 (1.23, 2.76)	0.003
Alberta/British Columbia	458 (18.6)	411 (18.5)	47 (18.9)	1.62 (1.05, 2.51)	0.030
<b>Current Marital Status (n = 2419)</b>					
Married/Living with partner*	1905 (78.8)	1714 (78.8)	191 (78.6)	1.00	–
Single	235 (9.7)	212 (9.7)	23 (9.5)	0.97 (0.62, 1.53)	0.908
Divorced/Separated/Widowed	279 (11.5)	250 (11.5)	29 (11.9)	1.04 (0.69, 1.57)	0.849
<b>Dependent Child live with you (n = 2419)</b>					
Yes	1020 (42.2)	914 (42.0)	106 (43.8)	1.08 (0.82, 1.41)	0.587
No*	1399 (57.8)	1263 (58.0)	136 (56.2)	1.00	–
<b>Care for dependent adult in your home (n = 2427)</b>					
Yes	134 (5.5)	118 (5.4)	16 (6.6)	1.23 (0.72, 2.11)	0.456
No*	2293 (94.5)	2065 (94.6)	228 (93.4)	1.00	–
<b>Primary Place of Employment (n = 2441)</b>					
Hospital & Integrated Facility*	1039 (42.6)	926 (42.2)	113 (45.6)	1.00	–
Community Health Centre	361 (14.8)	307 (14.0)	54 (21.8)	1.08 (0.56, 2.07)	0.826
Nursing home/Long-term Care facility	548 (22.4)	512 (23.3)	36 (14.5)	1.55 (0.78, 3.08)	0.211
Community-focused Facility	385 (15.8)	351 (16.0)	34 (13.7)	0.62 (0.31, 1.26)	0.187
Other	108 (4.4)	97 (4.4)	11 (4.4)	0.85 (0.42, 1.75)	0.666
<b>Nursing Employment Status-Full-time/Permanent (n = 2447)</b>					
Yes	1281 (52.3)	1137 (51.7)	144 (57.3)	1.28 (0.98, 1.67)	0.068
No*	1166 (47.7)	1061 (48.3)	105 (42.2)	1.00	–
<b>Nursing Employment Status-Part-time/Permanent (n = 2447)</b>					
Yes	738 (30.2)	672 (30.6)	66 (26.5)	0.82 (0.61, 1.10)	0.186
No*	1709 (69.8)	1526 (69.4)	183 (73.5)	1.00	–
<b>Nursing Employment Status-Job Share (n = 2447)</b>					
Yes	32 (1.3)	27 (1.2)	5 (2.0)	1.65 (0.63, 4.32)	0.310
No*	2415 (98.7)	2171 (98.8)	244 (98.0)	1.00	–
<b>Nursing Employment Status-Casual (n = 2447)</b>					
Yes	416 (17.0)	388 (17.7)	28 (11.2)	0.59 (0.39, 0.89)	0.012
No*	2031 (83.0)	1810 (82.3)	221 (88.8)	1.00	–
<b>Nursing Employment Status-Contract/Term (n = 2447)</b>					
Yes	121 (4.9)	106 (4.8)	15 (6.0)	1.26 (0.72, 2.21)	0.408
No*	2326 (95.1)	2092 (95.2)	234 (94.0)	1.00	–
<b>Primary Work Position-Advanced Practice Nursing Group (n = 2403)</b>					
Yes	115 (4.8)	108 (5.0)	7 (2.8)	0.55 (0.25, 1.20)	0.135
No*	2288 (95.2)	2048 (95.0)	240 (97.2)	1.00	–
<b>Number of Rural/Remote Communities Worked in 3 Months or Longer (n = 2385)</b>					
1–3 communities*	2043 (85.7)	1852 (86.4)	191 (78.9)	1.00	–
4–6 communities	234 (9.8)	201 (9.4)	33 (13.6)	1.59 (1.07, 2.37)	0.022
7 or more communities	108 (4.5)	90 (4.2)	18 (7.4)	1.94 (1.14, 3.29)	0.014

Table 2 (Continued)

Variable	Total N (%)	Assisted with a disaster event in community in last 5 years		Unadjusted Odds Ratio (95% CI)	P value
		No (%)	Yes (%)		
Population of Primary Work Community (n = 2495)					
1000 or less	490 (19.9)	437 (19.7)	53 (21.3)	1.13 (0.79, 1.61)	0.509
1000–2499	493 (20.0)	439 (19.8)	54 (21.7)	1.14 (0.80, 1.63)	0.457
2500–4999	494 (20.0)	448 (20.2)	46 (18.5)	0.95 (0.66, 1.38)	0.803
5000–9999*	988 (40.1)	892 (40.3)	96 (38.6)	1.00	–
Primary work community be (n = 2437)					
Rural	1536 (63.0)	1385 (63.2)	151 (61.1)	1.28 (0.88, 1.87)	0.191
Remote	428 (17.6)	369 (16.8)	59 (23.9)	1.88 (1.22, 2.91)	0.004
Rurban/other*	473 (19.4)	436 (19.9)	37 (15.0)	1.00	–
Lives in primary work community (n = 2455)					
Yes	1365 (55.6)	1231 (55.8)	134 (53.8)	0.92 (0.71, 1.20)	0.923
No*	1090 (44.4)	975 (44.2)	115 (46.2)	1.00	–
Distance from primary work community of centre of 10,000–49,999 population (n = 2332)					
0–99 km	904 (38.8)	818 (39.0)	86 (36.3)	1.01 (0.65, 1.56)	0.967
100–199 km	649 (27.8)	588 (28.1)	61 (25.7)	0.99 (0.63, 1.58)	0.986
200–499 km	461 (19.8)	401 (19.1)	60 (25.3)	1.44 (0.90, 2.28)	0.126
500 or more km*	318 (13.6)	288 (13.7)	30 (12.7)	1.00	–
Distance from primary work community of centre of 50,000+ population (n = 2254)					
0–99 km	361 (16.0)	333 (16.4)	28 (12.3)	0.82 (0.48, 1.39)	0.463
100–199 km	562 (24.9)	506 (25.0)	56 (24.6)	1.08 (0.68, 1.70)	0.744
200–499 km	717 (31.8)	636 (31.4)	81 (35.5)	1.24 (0.81, 1.91)	0.325
500–999 km	270 (12.0)	239 (11.8)	31 (13.6)	1.26 (0.75, 2.13)	0.378
1000 or more km*	344 (15.3)	312 (15.4)	32 (14.0)	1.00	–
Distance from primary work community to closest basic referral centre (n = 2409)					
0–99 km	1231 (51.1)	1124 (51.9)	107 (44.2)	0.78 (0.50, 1.21)	0.264
100–199 km	578 (24.0)	521 (24.0)	57 (23.6)	0.89 (0.55, 1.44)	0.649
200–499 km	343 (14.2)	293 (13.5)	50 (20.7)	1.40 (0.85, 2.29)	0.186
500 or more km*	257 (10.7)	229 (10.6)	28 (11.6)	1.00	–
Distance from primary work community to closest advanced referral centre (n = 2401)					
0–99 km	309 (12.9)	281 (13.0)	28 (11.5)	1.04 (0.61, 1.76)	0.888
100–199 km	616 (25.7)	544 (25.2)	72 (29.5)	1.38 (0.89, 2.13)	0.146
200–499 km	818 (34.1)	734 (34.0)	84 (34.4)	1.19 (0.78, 1.82)	0.413
500–999 km	281 (11.7)	254 (11.8)	27 (11.1)	1.11 (0.65, 1.89)	0.706
1000 or more km*	377 (15.7)	344 (15.9)	33 (13.5)	1.00	–
ISVS comfort in working with others-I am able to share and exchange ideas in a team discussion (n = 2380)					
Not at all- to a small extent	293 (12.3)	274 (12.8)	19 (8.1)	0.58 (0.33, 1.04)	0.068
To a moderate extent	477 (20.0)	431 (20.1)	46 (19.5)	0.90 (0.57, 1.42)	0.651
To a fairly great extent	541 (22.7)	491 (22.9)	50 (21.2)	0.86 (0.55, 1.34)	0.505
To a great extent	720 (30.3)	636 (29.7)	84 (35.6)	1.11 (0.74, 1.68)	0.606
To a very great extent*	349 (14.7)	312 (14.6)	37 (15.7)	1.00	–
In general, health (n = 2431)					
Poor/Fair*	129 (5.3)	114 (5.2)	15 (6.2)	1.00	–
Good	681 (28.0)	603 (27.6)	78 (32.1)	0.98 (0.55, 1.77)	0.955
Very Good	1173 (48.3)	1065 (48.7)	108 (44.4)	0.77 (0.43, 1.37)	0.373
Excellent	448 (18.4)	406 (18.6)	42 (17.3)	0.79 (0.42, 1.47)	0.451
In general, mental health (n = 2429)					
Poor/Fair*	169 (7.0)	156 (7.1)	13 (5.4)	1.00	–
Good	651 (26.8)	586 (26.8)	65 (26.9)	1.33 (0.71, 2.48)	0.367
Very Good	1133 (46.6)	1009 (46.1)	124 (51.2)	1.47 (0.81, 2.68)	0.201
Excellent	476 (19.6)	436 (19.9)	40 (16.5)	1.10 (0.57, 2.11)	0.773
Work overall-I feel burned out from work (n = 2407)					
Never/Almost Never*	398 (16.5)	366 (16.9)	32 (13.4)	1.00	–
Rarely	349 (14.5)	318 (14.7)	31 (13.0)	1.11 (0.66, 1.87)	0.679
Sometimes	1100 (45.7)	978 (45.1)	122 (51.0)	1.43 (0.95, 2.14)	0.087
Often	331 (13.8)	295 (13.6)	36 (15.1)	1.40 (0.85, 2.30)	0.191
Very often/Always	229 (9.5)	211 (9.7)	18 (7.5)	0.98 (0.53, 1.78)	0.936
Ever taken a sick day due to stressors experienced as a part of work (n = 2418)					
Yes	861 (35.6)	780 (35.8)	81 (33.5)	0.90 (0.68, 1.19)	0.464
No*	1557 (64.4)	1396 (64.2)	161 (66.5)	1.00	–
Ever taken a formal stress leave (n = 2404)					
Yes	394 (16.4)	351 (16.2)	43 (18.0)	1.13 (0.80, 1.61)	0.481
No*	2010 (83.6)	1814 (83.8)	196 (82.0)	1.00	–
Respond/Lead emergency calls as a first responder (n = 2465)					
Yes	425 (17.2)	367 (16.6)	58 (23.3)	1.53 (1.12, 2.09)	0.008
No*	2040 (82.8)	1849 (83.4)	191 (76.7)	1.00	–
Total		No	Yes	Odds Ratio (95% CI)	P value
Mean ± SD		Mean ± SD	Mean ± SD		
Years since highest attained nursing credential† (n = 2348)	19.5 ± 13.5	19.4 ± 13.6	20.9 ± 12.6	1.01 (0.99, 1.02)	0.090
Personal-Professional Boundaries‡ (n = 2358)	9.5 ± 2.4	9.6 ± 2.4	9.1 ± 2.7	0.93 (0.88, 0.98)	0.008

Table 2 (Continued)

Variable	Total N (%)	Assisted with a disaster event in community in last 5 years		Unadjusted Odds Ratio (95% CI)	P value
		No (%)	Yes (%)		
Organizational commitment† (n = 2429)	51.8 ± 10.9	51.8 ± 10.9	52.8 ± 11.2	1.01 (0.99, 1.02)	0.217
Work Engagement† (n = 2410)	38.4 ± 9.3	38.2 ± 9.4	40.1 ± 8.6	1.02 (1.01, 1.04)	0.004
Perceived Stress Scale† (n = 2422)	8.9 ± 2.9	8.9 ± 2.9	8.9 ± 2.9	0.99 (0.95, 1.04)	0.743
IPCR engagement† (n = 2458)	18.9 ± 2.8	18.9 ± 2.7	18.8 ± 3.1	0.99 (0.94, 1.04)	0.694
Psychological sense of community† (n = 2415)	34.1 ± 5.9	33.9 ± 5.9	34.8 ± 6.6	1.02 (1.00, 1.05)	0.053

\*Reference category.

† Continuous variable measured using a standardized scale, a higher score indicating a higher degree of that characteristic. The odds ratio is the odds of assisting with a disaster that corresponds to 1-unit change in the score on the continuous variable.

dence interval for variables in the logistic regression model. Nurses who assisted with a disaster event within the last five years were more likely to be between the ages of 50 – 59, working as RNs or Registered Psychiatric Nurses within provinces and territories other than the Quebec, working in non-casual employment, and defined their primary work community as ‘remote.’ There was a dose-response relationship between the number of rural communities worked for a duration of 3 months or longer and odds of having assisted with a disaster event (4–6 communities: OR = 1.59; 7 or more communities: OR = 1.94, compared to 1–3 communities). Mean scores for personal-professional boundaries (e.g., personal privacy respected in the community, able to separate nurse role from other roles) were significantly lower for those nurses who had assisted with a disaster within the last 5-years, and level of work engagement was significantly higher for those who had assisted. As well, the psychological sense of community or sense of belonging and community cohesion was significantly higher for those who had assisted in the past five years.

The adjusted odds ratio for each of the ten independent variables and the outcome of having assisted with a disaster event within the last five years, while controlling for the effects of all variables within the model, are reported in Table 3. The final model for the probability of having assisted with a disaster event in the community in the last five years shows that nurse type, age, region of employment, employment status, number of rural communities worked in 3-months or longer, distance to advanced referral centre, definition of work community as ‘remote,’ burnout, personal-professional boundaries, and work engagement were significant factors related to assisting with a disaster. Registered Psychiatric Nurses were over three times as likely to have assisted with a disaster event, with RNs being over one-and-a-half times as likely when compared to Licensed/Registered Practical Nurses. The odds of assisting with a disaster were also significantly greater for nurses working in Ontario compared to the Atlantic Provinces, and for nurses who had worked in 4–6 rural communities for a duration of 3 months or longer. In addition, those who considered their primary work community to be ‘remote’ compared to ‘rurban/other’ (e.g., having elements of both urban and rural settings), were almost two and a half times as likely to assist with a disaster event.

Perceived burnout was also a significant predictor, with nurses who indicated that they were ‘sometimes’ or ‘often’ feeling burned out were more likely to assist, compared to those who were ‘never/almost never’ feeling burned out from their work. The likelihood of assisting was inversely related to personal-professional boundaries; as when the mean score related to boundaries increased, respondents were less likely to assist. Also, with every one-unit increase in mean work engagement score (range 0–54), an expected increase in odds of assisting with a disaster event was

3% (OR = 1.03, 95% CI (1.01, 1.05)). Overall, 89.8% of the cases were predicted correctly, with minimal collinearity among variables, and no significant interactions observed. The Hosmer and Lemeshow test ( $\chi^2 = 11.83$ , degrees of freedom = 8,  $p$ -value = 0.159) shows a good model fit indicating that numbers of those assisting with a disaster event are not significantly different from those predicted by the model. Overall the logistic regression model has a proper explanatory power and the model fit was good.

#### Open-ended findings

The open-ended comments from the 249 nurse participants who indicated that they had responded to a disaster were reviewed to identify if they made any specific comments about their experiences. The French responses were translated into English and included in the review. There were limited comments made about disasters, but when they were discussed, the comments were poignant in nature and noted that being in a rural setting and having personal and professional relationships with individuals who experienced the disaster was difficult. The responses were also viewed from the perspective of the phases of disasters (pre-disaster; evacuation; treatment; and recovery).

The nurses acknowledged that pre-disaster preparation was important for the health facility where they were employed. A RN from the territories stated: “We do regularly practice code orange (Possible Plane crash) within 5–10 min everyone arrives at the health center and resumes their responsibilities.” Regarding the evacuation phase, one RN noted that care plans needed to have evacuation protocols in place for each client, whereas another RN talked about accepting evacuees from other nearby communities that were experiencing wildfires.

Nurses also discussed their role in the treatment of disaster victims. As one RN related:

There was this one situation where I experienced working through a Helicopter Crash. Many of our staff were called in (nursing, housekeeping, administrative, etc.) Everyone worked together really well to ship out 4 wounded men via ground ambulances. We tended to their immediate needs (wound care, etc.). That night was a real eye opener of how everyone just knew their role and worked very well together (communication etc.) At the end of the night there was a big debriefing with all of the staff present and we were commended on a job well done.

Finally, the nurses did not speak about assisting their community in the recovery following a disaster but did talk about the challenges for their own recovery when there are professional and personal relationships between staff resulting from a tragedy. In one instance, a medevac plane crash occurred in which the pilot

**Table 3**  
Adjusted Odds Ratios of Factors Associated with Assisting with a Disaster Event (n = 2465).

Variable	Assisted with a disaster event in community in last 5 years Adjusted Odds Ratio (95% CI)	P value
<b>Nurse Type</b>		
Nurse Practitioner	0.46 (0.17, 1.22)	0.120
Registered Nurse	1.68 (1.16, 2.40)	<b>0.006</b>
Registered Psychiatric Nurse	<b>3.37 (1.83, 6.21)</b>	<b>&lt;0.0001</b>
Licensed/Registered Practical Nurse*	1.00	–
<b>Age groups, in years-NDB</b>		
<30*	1.00	–
30–34	1.39 (0.63, 3.08)	0.412
35–39	1.39 (0.62, 3.15)	0.429
40–44	1.57 (0.72, 3.42)	0.257
45–49	1.64 (0.78, 3.52)	0.202
50–54	<b>2.14 (1.05, 4.38)</b>	<b>0.037</b>
55–59	<b>2.21 (1.09, 4.48)</b>	<b>0.029</b>
>60	1.59 (0.75, 3.38)	0.227
<b>Province/Territory of primary nursing employment</b>		
Atlantic*	1.00	–
Quebec	1.58 (0.81, 3.05)	0.179
Ontario	<b>1.74 (0.99, 3.05)</b>	<b>0.053</b>
Territories	1.78 (0.79, 4.01)	0.161
Manitoba/Saskatchewan	1.36 (0.85, 2.17)	0.198
Alberta/British Columbia	1.45 (0.88, 2.38)	0.141
<b>Nursing Employment Status-Casual</b>		
Yes	<b>0.61 (0.38, 0.98)</b>	<b>0.043</b>
No*	1.00	–
<b>Number of Rural/Remote Communities Worked in 3 Months or Longer</b>		
1–3 communities*	1.00	–
4–6 communities	<b>1.73 (1.09, 2.73)</b>	<b>0.020</b>
7 or more communities	1.40 (0.73, 2.71)	0.313
<b>Distance from primary work community to closest advanced referral centre</b>		
0–99 km	2.16 (0.91, 5.12)	0.082
100–199 km	<b>3.09 (1.41, 6.74)</b>	<b>0.005</b>
200–499 km	<b>2.54 (1.18, 5.46)</b>	<b>0.017</b>
500–999 km	1.84 (0.89, 3.83)	0.102
1000 or more km*	1.00	–
<b>Primary work community be</b>		
Rural	1.33 (0.85, 2.07)	0.210
Remote	<b>2.45 (1.33, 4.51)</b>	<b>0.004</b>
Rurban/other*	1.00	–
<b>Burnout</b>		
Never/Almost Never*	1.00	–
Rarely	1.37 (0.77, 2.44)	0.292
Sometimes	<b>1.87 (2.26, 3.02)</b>	<b>0.011</b>
Often	<b>1.92 (1.05, 3.50)</b>	<b>0.034</b>
Very often/Always	1.34 (0.65, 2.75)	0.433
<b>Personal-Professional boundaries †</b>	<b>0.92 (0.87, 0.98)</b>	<b>0.011</b>
<b>Work Engagement †</b>	<b>1.03 (1.01, 1.05)</b>	<b>0.006</b>

Hosmer and Lemeshow test:  $\chi^2 = 11.83$ ,  $df = 8$ ,  $p$ -value = 0.159.

\*Reference category.

†Continuous variable measured using a standardized scale, a higher score indicating a higher degree of that characteristic. The adjusted odds ratio is the odds of assisting with a disaster that corresponds to 1-unit change in the score on the continuous variable.

and paramedic were both killed. The participant noted that, “Our workplace will never be the same after such a significant loss.”

### Study limitations

One limitation of this study is that although disaster was specifically defined in the survey questions some respondents chose to include events that did not match the definition. For example, nurses included mock-disaster events, which do not match the definition. Although mock-disaster events were not as useful in understanding nurses' experiences with disasters, it does point to a fruitful area of investigation in relation to the training and preparation of nurses and health care teams for disasters in rural areas. The current survey did not include questions about disaster preparation or training.

The nurses' responses about plane crashes highlights a unique event in the rural communities that has the potential to overwhelm local resources while also highlighting the gravity of circumstances

that nurses in rural areas of Canada need to be prepared to address. Finally, some responses about the kind of disaster were not clear and difficult to interpret: for example the word “fire” was provided but was not clearly identified as related to a building fire, wildfire or another type of fire.

### Discussion

The analysis of the quantitative and open-ended responses data about rural nurses' experiences with disasters informs us about the type of nurse who has been involved with a disaster and the kind of events to which they have responded. Although, compared to the NPs and LPNs, RNs were over one and a half times more likely to assist during a disaster; with the RPNs more than three times as likely to have assisted and indicating a psychosocial supportive nature of assistance more often displayed during the recovery phase of a disaster event. The lack of involvement by NPs may be due to the small sample size in our study; it would seem unlikely

that they are not involved in disaster response given their work settings being more often located in remote areas. The limited involvement of LPNs may be due to their work setting, for instance the placement of LPNs in long-term care facilities. Further investigation would be worthwhile because of the changing role of LPNs in rural health care delivery. This group may require additional continuing education to help prepare them for disaster situations.

As may be expected, indicators of rural work experience and time worked in the profession were significantly related to assisting. Older nurses (aged 50–59) were more likely to assist during a disaster compared to those nurses who were less than 30 years of age, as well as those who had worked in 4–6 rural communities for three months or longer. This may suggest that longer duration of work in remote settings increases the nurses' exposure to an increased number of disaster events. These findings also suggest that the youngest nurses, and those with less experience working in a diversity of rural settings may feel less inclined to respond to a call for assistance possibly due to perceived inexperience, or limited training both during their basic nursing education program and continuing education through participation in mock disaster events. There is some indication in the literature that overall nurses are poorly prepared for responding during a disaster [8,27] and that this is a barrier to nurses to report to work during a disaster [28]. In addition, a study of Australian nurses who responded to the Sumatra-Andaman earthquake and tsunami found that over 80% of nurses who volunteered to help in this disaster had no prior disaster response or military experience [29].

Degree of community remoteness and distance to a referral centre were also indicated as significant predictors of experience with a disaster event. Importantly, those nurses who perceived their community to be 'remote' were almost 2.5 times more likely to have responded to a disaster event, which coincides with those who were, between 100 and 499 km from an advanced referral centre, being 2.5–3 times more likely to have assisted. Having a higher sense of work engagement (e.g., feelings of enthusiasm, inspiration, and pride in your work) was significantly linked to assisting with a disaster event, indicating the importance of fostering work engagement in more remote and underserved areas. The results also highlight a concern that nurses who had lower personal-professional boundaries, (e.g., less personal privacy, difficulty their separating roles in the community) were more likely to assist, and more likely to 'often' or 'sometimes' feel burned out from their work. Even with the protective factor of higher work engagement, there is concern that these same nurses may be at a higher risk for negative personal and professional outcomes such as disengagement from the organization or poor personal health [30].

There was a full range of types of disasters to which nurses were involved; more than one nurse noted that they had responded to more than one disaster over their career. In addition, their comments indicate that they were involved in almost all phases of disasters. The only phase that was not specifically noted was the Recovery phase; this is likely because fewer community nurses responded with comments and identification with recovery efforts. In addition, depending upon the provincial mandate and the severity of the disaster, recovery may be carried out by a specialized team of experts.

One final trend noted in the findings was that nurses who responded to disasters were more often from Manitoba/Saskatchewan, Alberta/British Columbia, the Atlantic Region and the Territories; our finding may be related to the representativeness of the sample because the occurrence of disasters is even across the country [3]. Notwithstanding, it is important that nurses be well prepared to respond to disasters regardless of where they live and work.

Our findings point to a number of implications about rural nurses and involvement in disaster management. The first is whether or not rural nurses have received sufficient preparation in their undergraduate education to attend to disasters. A recently developed tool [31] to assess disaster nursing core competencies [2] may be useful to better prepare newly hired nurses who will be working in rural locations. Although nursing education programs currently may teach this topic area, most of the nurses in our sample who responded to disasters were over the age of 50 years. There has been some discussion in the literature about the development of undergraduate nursing training courses based upon the ICN Framework for Nursing Competencies [32] as well as short training programs for nurses in the workplace to fill this educational gap [27]. Other authors also support these recommendations stating the need for formal educational preparation in nursing programs as well as the need for ongoing continuing education [9,11]. The role of the nursing professional development educator in disaster preparation planning for rural hospitals has also been outlined in the literature [17,33]. It is not known how many Canadian nursing education programs currently use the ICN Framework of Disaster Nursing Competencies [2] within their program curriculum, and/or whether the framework has been adapted to the unique circumstances of Canadian rural nursing practice. A review of disaster nursing education in countries such as Canada, Australia and the United States would be a worthwhile activity to assess current nursing education practice and offer recommendations. This would also contribute to the need for the development of competencies specific to rural nursing practice and disaster management.

The second issue that this study brings to light is the role of health care organizations in ensuring that nurses are fully prepared to address disasters within their work duties. The information we generated points to the need for ongoing education to help nurses prepare for a range of circumstances affiliated with disasters. This is compounded by the variety of disasters that the nurses indicate they have had to address. As nurses who are in more remote locations were more likely to have responded to a disaster, ensuring this group feels competent to address disasters is essential. We wondered how often health care organizations provided updated information about addressing disasters and how often local health care institutions hold mock disaster events. Although there was indication by some respondents that some of the nurses in our survey had been involved in such events, generating information about these events (frequency and type of disaster) would be worthwhile in order to offer recommendations and suggestions to health care organizations about annual updates and continuing educational opportunities. Of interest would be an exploration with rural nurses to determine whether mock-simulation events match the types of disasters that the nurses noted in their responses. It would be important to identify whether new nursing staff in rural locations receive sufficient orientation to disaster policies and practices within their health care organization. Rural and remote nurses are often members of the communities within which they work; it would be interesting to find out if their involvement in disaster preparation exercises reflects their involvement as a resident and not just a professional nurse. Furthermore, understanding the connection between the inter-relationship between the role as a nurse and as a community resident in the prevention, response and recovery of disasters would be a fruitful investigation in order to more fully understand how disasters are addressed in rural areas. In other words, does the community respond to nurses based upon their professional role or their commitment to the community as a resident?

A final issue concerns the support that rural nurses are afforded after a disaster event. Our findings showed that nurses who felt 'sometimes or often' burned out were more likely to have responded to a disaster. As well, nurses who responded had signifi-



cantly lower personal-professional boundaries, suggesting blurring of their personal and professional roles, and perceptions of having difficulty separating their roles within their work communities. The rural/remote nature of their practice may place these nurses in a challenging position where the obligation to take the lead during different phases of a disaster event may conflict with their personal motivation to attend to the individual needs of their own family members or friends who may also be at risk. Some of the open-ended comments made by the nurses support these concerns, with a focus on the personal relationships they had with those who were affected by the disaster. In situations that were recalled by nurses dealing with helicopter crashes that involved individuals with whom they had such relationships, more than one of the nurses had dealt with such a crash event in their nursing career. Helping nurses deal with these circumstances post-disaster is an issue that needs to be addressed by rural health care organizations.

## Conclusions

This national profile of regulated nurses (RNs, NPs, LPNs, RPNs) includes information about the nurses who most often assisted with a disaster event in rural settings and provides much needed evidence for stakeholders and policy makers interested in developing educational resources and psychosocial supports to mitigate the aftermath of such events. The evidence presented in this analysis suggests that nurses play a significant role in responding to disasters. However, there is a need for disaster response mentorship and support for younger nurses and nurses with less rural nursing experience. Developing nursing competencies for disasters that differentiate urban and rural environments would also be useful for program and policy development. Such differentiation would benefit nurses and nursing practice in settings that are considered 'remote' or at a significant distance from an advanced referral centre. Research that focuses on the role and experience of rural nurses in disaster management is in its infancy. Developing a research program that compliments the ICN competencies would generate information that further supports nursing education and practice.

## Authorship

The authors contributed equally to the manuscript. JCK and MLPM designed the study and secured the funding; JCK, MLPM, KP, CK, MEA all contributed to the design of the study instrument. KP & CK conducted the data analysis. JCK, KP & CK drafted the article and all authors helped to refine the manuscript.

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## References

- [1] Wahlstrom M, Guha-Sapir D. *The Human Cost of Weather Related Disasters, 1995–2015*. Geneva: Centre for Research on the Epidemiology of Disasters (CRED); UNISDR; 2015.
- [2] World Health Organization & International Council of Nursing. *ICN Framework of Disaster Nursing Competencies*; 2017. Available at <http://myweb.polyu.edu.hk/~hswhoc/resource/D/2009DisasterNursingCompetencies.pdf>. Accessed: August 1, 2015.
- [3] The Canadian Disaster Database; 2017. Available at <https://www.publicsafety.gc.ca/cnt/rsrscs/cndn-dsstr-dtbs/index-eng.aspx>. Accessed November 15, 2016.
- [4] International Federation of Red Cross & Red Crescent Societies. *World Disasters Report: Focus on Local Actors, the Key to Humanitarian Effectiveness*. Geneva: IFRC; 2015.
- [5] Ibrahim D. *Canadians' experiences with emergencies and disasters, 2014*. Ottawa: Statistics Canada; 2016.
- [6] Index for Risk Management 2015 (INFORM 2015). Inter-Agency Standing Committee Task Team for Preparedness and Resilience and the European Commission; 2015. Available at <http://www.inform-index.org> Accessed December 1.
- [7] Jenkins MJ, Runyon JB, Fettig CJ, Page WG, Bentz BJ. Interactions among the mountain pine beetle, fires, and fuels. *For Sci* 2014;60:489–501.
- [8] Hanes P. Wildfire disasters and nursing. *Nurs Clin N Am* 2016;51:625–45.
- [9] Rokkas P, Steenkamp M. Disaster preparedness and response: challenges for Australian public health nurses – a literature review. *Nurs Health Sci* 2014;16:60–6.
- [10] Usher K. Editorial: are we ready Preparing nurses to respond to disasters and emerging infectious diseases. *J Clin Nurs* 2010;19:1483–4.
- [11] Thobaity A, Plummer V, Innes K, Copnell B. Perceptions of knowledge of disaster management among military and civilian nurses in Saudi Arabia. *AENJ* 2015;18:156–64.
- [12] Ipsos Life-savers, medical professionals top the list of most trusted professionals; 2016. <http://www.ipsos-na.com/news-polls/pressrelease.aspx?id=5663> Accessed November 29.
- [13] Kulig J, Edge D, Smolenski S. Wildfire disasters: Implications for rural nurses. *Australasian Emerg Nurs J* 2014;17:126–34. <http://dx.doi.org/10.1016/j.aenj.2014.04.003>.
- [14] Arbon P, Ransie J, Cusack L, Considine J, Shaban R, Woodman R, et al. Australasian emergency nurses' willingness to attend work in a disaster: a survey. *AENJ* 2013;16:52–7.
- [15] Goodhue CJ, Burke RV, Ferrer RR, Chokshi NK, Dorey F, Upperman JS. Willingness to respond in a disaster: a pediatric nurse practitioner national survey. *J Pediatric Health Care* 2016;26(4):e7–20.
- [16] Ransie J, Lenson S. Beyond a clinical role: nurses were psychosocial supports, coordinators and problem solvers in the Black Saturday and Victorian bushfires in 2009. *AENJ* 2012;15:156–63.
- [17] Anderson DA. Using disaster exercises to determine staff educational needs and improve disaster outcomes in rural hospitals: the role of the nursing professional development educator. *J Continuing Educ Nurs* 2012;43(6):284–8.
- [18] Manley W, Furbee P, Coben J, Smyth S, Summers D, Althouse R, et al. Realities of disaster preparedness in rural hospitals. *DMR* 2006;4(3):80–7.
- [19] Allen P. Climate change: it's our problem. *Pediatr Nurs* 2015;41(1):42–6.
- [20] Giarratano G, Savage J, Barcelona-deMendoza V, Harville E. Disaster research: a nursing opportunity. *Nurs Inq* 2015;21(3):259–68.
- [21] MacLeod M, Kulig J, Stewart N, Anguish P, Banner D, Garraway L, Hanlon N, Karunanayake C, Kilpatrick K, Koren I, Kosteniuk J, Martin-Misener R, Moffitt P, Olynick J, Penz K, Wilson E, Zimmer L, Van Pelt L. Who are the nurses that work in rural and remote communities in Canada and why do they stay? Results from a national survey. *Human Resour Health* 2017.
- [22] MacLeod M, Kulig J, Stewart N, Pitblado R, Knock M. The Nature of Nursing Practice in Rural and Remote Canada. *Canad Nurse* 2004;100(6):27–31.
- [23] duPlessis V, Beshiri R, Bollman R. Definitions of Rural Rural and Small Town Canada. *Analysis Bulletin* 2001;3(3):1–17. <http://www.statcan.gc.ca/pub/21-006-x/21-006-x2001003-eng.pdf> Accessed January 5 2016.
- [24] IBM SPSS Statistics for Windows. Armonk, NY: IBM Corp.; 2015.
- [25] Kleinbaum DG, Klein M. *Logistic regression: A self-learning text*. 3rd ed. New York: Springer; 2010.
- [26] Hosmer DW, Lemeshow S. *Applied logistic regression*. 3rd ed. New York: John Wiley and Sons; 2005.
- [27] Conlon L, Wiechula R. Preparing nurses for future disasters—the Sichuan experience. *Australas Emerg Nurs J* 2011;14:246–50.
- [28] Melnikov S, Itzhaki M, Kagan I. Israeli nurses' intention to report for work in an emergency or disaster. *J Nurs Scholarsh* 2014;46(2):134–42.
- [29] Arbon P, Bobrowski C, Zeitz K, Hooper C, Williams J, Thitchener J. Australian nurses volunteering for the Sumatra-Andaman earthquake and tsunami of 2004: a review of experience and analysis of data collected by the Tsunami Volunteer Hotline. *Australas Emerg Nurs J* 2006;9:171–8.
- [30] Bakker AB, Demerouti E, Sanz-Vergel AI. Burnout and work engagement: the JD-R approach. *Ann Rev Organiz Psychol Organiz Behav* 2014;1:389–411.
- [31] Thobaity A, Williams B, Plummer V. A new scale for disaster nursing core competencies: development and psychometric testing. *AENJ* 2016;19:11–9.
- [32] Chan S, Chan W, Chen Y, Fung O, Lai T, Leung A, et al. Development and evaluation of an undergraduate training course for developing International Council of Nurses Disaster Competencies in China. *J Nurs Scholarsh* 2010;42(4):405–13.
- [33] Veenema T, Griffin A, Gable A, MacIntyre L, Simons N, Couig MP, et al. Nurses as leaders in disaster preparation and response—a call to action. *J Nurs Scholarsh* 2016;48(2):1–14.