


Association Between Home Visit Programs and Emergency Preparedness Among Elderly Vulnerable People in New South Wales, Australia

Gerontology & Geriatric Medicine
Volume 3: 1–8
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DOI: 10.1177/2333721417700758
journals.sagepub.com/home/ggm


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Abstract

Objective: The purpose of this study is to examine the association between home visit programs and emergency preparedness among elderly vulnerable people in New South Wales, Australia. **Method:** The study used data acquired from an intervention program run by emergency agencies and consisted of 370 older people. Seven emergency outcome measures were examined by adjusting for key demographic factors, using a generalized estimating equation model, to examine the association between home visit programs and emergency preparedness. **Results:** The study revealed that knowledge demonstrated by participants during visits and post home visits showed significant improvements in the seven emergency outcome measures. The odds of finding out what emergencies might affect one's area were significantly lower among older participants who were born outside Australia and those who were women. **Discussion:** The findings suggest that the intervention via home visits and periodic reminders post these visits may be a useful intervention in improving emergency preparedness among older people, especially among men and those who were born outside of Australia. In addition, other reminders such as safety messaging via mobile or landline telephone calls may also be a supplementary and useful intervention to improve emergency preparedness among older people.

Keywords

emergency, older people, preparedness, fire alarms

Manuscript received: August 25, 2016; **final revision received:** January 15, 2017; **accepted:** February 8, 2017.

Introduction

Residential fires, which may not only cause property damage but also lead to injury and death, are still a very real problem in modern communities. Past research has identified the very young and very old to be the groups in society that have the highest risk of being victims of a residential fire (Harvey, Mitchell, Brodaty, Draper, & Close, 2016; Istre, McCoy, Carlin, & McClain, 2002). Available records reveal that home fires pose considerable danger, particularly to older adults. For example, records from Canada, the United Kingdom, and the United States show that people aged 65 years and older are highly represented by percentage in fatalities from accidental home fires (Gielen, McDonald, & Shields, 2015; Lowton, Laybourne, Whiting, & Martin, 2010). In New South Wales (NSW), Australia, where this study was conducted, yearly records also show that, compared with the general population, people aged 65 years and older are

represented in approximately one third of residential fire-related fatalities (Tengs & Graham, 1996). According to a Fire & Rescue NSW (FRNSW) report, in 2013–2014, 61.5% of fire-related fatalities were people aged 60 years and above (Bray, 2004; FRNSW, 2015). In addition, a number of associated factors identified in relation to age make the older population vulnerable and increase their risk of experiencing home fires. These include mobility, social isolation and loneliness, and health and medication (X. Zhang, Li, & Hadjisophocleous, 2013).

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In Australia, there has been some research on fire safety among the elderly in Western Australia (G. Zhang, Lee, Lee, & Clinton, 2006), epidemiology of ambulance responses older people who had fallen in NSW (Simpson et al., 2013), and household disaster preparedness and information sources, also in NSW (Cretikos et al., 2008). However, these studies were not solely fire related (Cretikos et al., 2008) or did not examine different fire preparedness emergency outcome measures. To improve the emergency preparedness of older people, it is important to explore the relationship between key demographic factors and specific emergency outcome measures.

Therefore, the current study examined the relationship between relevant sociodemographic factors of older people and various categories of emergency preparedness. The findings from this study may also enable policy makers and public health researchers to direct resources to the elderly vulnerable population at risk of experiencing higher frequency of fires and also to design effective home visit program intervention that are intended to improve the emergency preparedness of older people in Australia.

Method

Study Sample

The study involved 370 older people, with a mean age of 82.3 years and standard deviation of 9.0, who participated in the home visit program, Home Fire Resilience Project (HFRP; Tannous & Williams Tetteh, 2016). This program was delivered between May 2015 and April 2016. The target population in the HFRP was the most vulnerable and highly isolated members of the community—residents aged 65 years and above, 96% of whom received daily telephone calls from a community agency because they lived by themselves. The sample population has two of the identifiable risks of age: requiring assistance with core activities as a result of impaired mobility, and being in the bracket population of older people who experience higher frequency and severity of fires compared with the overall population.

Sample Size

The sample size for this study was calculated based on previous research that showed that approximate 59% of vulnerable households are prepared for emergencies. We reduced this preparedness figure to an assumed proportion of 50% of the population, and then the calculation of total sample size was based on 90% power, at 5% significance level for a two-sided test (Figure 1). This gives a sample of 351 participants. Taking into account the drop-out rate of 39% based on earlier research, a total sample of approximately 487 participants was required, which in turn gives this study sufficient statistical power to examine differences in emergency preparedness among elderly vulnerable people that would be of public health significance.

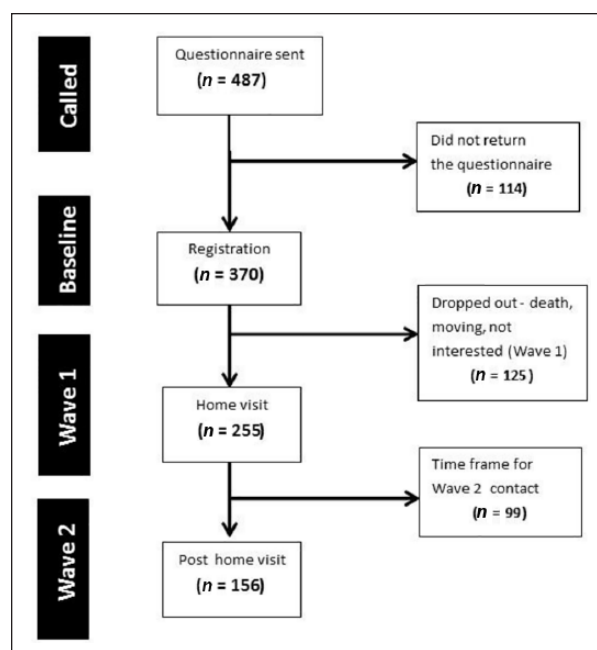


Figure 1. Sample sizes at baseline, Wave 1, and Wave 2.

Data Collection

Information on the participants was collected in three different stages: First, data were collected from registration forms which were completed by either the participants themselves or their carers, to indicate their interest and consent to participate in the survey. Second, data were collected from program evaluation forms which were completed by an agency member or volunteer who visited the program recipient to deliver the actual program. Finally, data were collected from a post visit evaluation survey conducted by telephone with the program recipients by an agency member or volunteer. To facilitate comparison over the three different stages, some of the questions were maintained and posed for all three stages of contact with the residents. For instance, on emergency preparedness, participants were asked the same question on emergency preparedness at each stage of contact: “Do you feel prepared to deal with an emergency?” On each occasion, participants were provided with a 5-point Likert-type scale to respond as 1 = “not prepared” to 5 = “very prepared.” In addition, residents were asked a number of questions about what they had done to prepare for an emergency in the emergency preparedness registration form. For the post home visit survey, the same questions were asked again but phrased differently to ask whether participants had taken any of the seven steps for an emergency as a result of the visit. All these data were made available by the agency to the research team for analysis. Information on sociodemographic factors was obtained from 370 residents of various households, who expressed interest in taking part in the program. We then examined the association of these sociodemographic factors with different categories of emergency preparedness.

Dependent Variables

The dependent variables in this study were the categories of emergency preparedness: (a) participants finding out what emergencies might affect their area, (b) participants' knowledge of where to find out information during major emergencies, (c) participants' knowledge of how to pack an emergency bag, (d) whether participants were taught how to arrange for transport during an emergency, (e) whether participants prepared a list of people to call during an emergency, (f) whether participants swapped phone numbers with their neighbors, and (g) whether participants had conversations with someone about their emergency plan.

Independent Variables

Our choice of independent variables (the sociodemographic variables) was based on previous research on various factors which relate to home fire emergencies. These variables included (a) age of a resident (Istre, McCoy, Osborn, Barnard, & Bolton, 2001; G. Zhang et al., 2006; X. Zhang et al., 2013), (b) country of origin (Duncanson, Woodward, & Reid, 2002; Edelman, 2007; Istre et al., 2001), (c) gender of resident (Istre et al., 2001; X. Zhang et al., 2013), (d) type of accommodation (Duncanson et al., 2002; Edelman, 2007), (e) language spoken at home (Shai, 2006), and (f) ethnicity (Duncanson et al., 2002; Edelman, 2007).

Statistical Analyses

All analyses were performed using Stata, Version 14.1 (StataCorp, College Station, TX, USA). Descriptive analyses were carried out for all 370 participants at registration, and the preliminary analyses involved frequency tabulations and summary statistics of all variables. Outcome measures for a given participant are repeated measures over the program period (i.e., at registration, during the visit, and post home visit). Hence, a generalized estimating equation (GEE) model that adjusts for repeated measures was used. For binary outcomes, we used a logit link with a binomial distribution for the outcome. A multivariate GEE was used to adjust for potential confounders, and the GEE estimates were translated into an odds ratio. All tests were two-sided, and all estimates with p values $<.05$ were considered statistically significant.

Results

Table 1 shows characteristics of the 370 participants. The majority of participants (97%) spoke English at home. More than three quarters of the participants were females. Less than 50% of the participants were born in Australia, and only a very small proportion (1.4%) was of Aboriginal background. More participants lived in private dwellings than in public dwellings.

Table 1. Characteristics of Participants at Registration ($n = 370$).

Variables	n	%
Gender		
Male	49	24.5
Female	151	75.5
Age, M (SD)	82.3 (9.0)	
Country of birth		
Australia	153	41.4
Others	217	58.7
Aboriginality		
Aboriginal	5	1.4
Others	365	98.7
Living conditions		
Private	191	95.5
Public	9	4.5
Language spoken at home		
English	360	97.3
Others	10	2.7

Table 2 displays the adjusted odds ratio (AOR) for the association between the independent variables and three categories of emergency preparedness. The odds of knowing where to find out what emergencies might affect their areas, AOR = 1.99, 95% confidence interval (CI) = [1.83, 2.15], $p < .001$; where to find out information during a major emergency, AOR = 2.07, 95% CI = [1.92, 2.22], $p < .001$; and knowing how to pack an emergency bag, AOR = 1.91, 95% CI = [1.76, 2.07], $p < .001$, during current visits were significantly higher compared with during registration. Participants not born in Australia, AOR = 0.88, 95% CI = [0.81, 0.96], $p = .004$, and females, AOR = 0.92, 95% CI = [0.84, 0.99], $p = .037$, were significantly less likely to find out what emergencies might affect their area compared with participants born in Australia and males, respectively. Female participants were 1.12 times more likely to pack an emergency bag than male participants, AOR = 1.12, 95% CI = [1.04, 1.22], $p = .005$.

Table 3 shows the AOR for association between the various covariates and four categories that constitute emergency preparedness. Compared with the time of registration, the odds for all four categories were significantly higher during current visits—AORs at 95% CI were 1.94 [1.79, 2.09], 1.46 [1.35, 1.57], 1.32 [1.23, 1.43], and 1.92 [1.78, 2.07] for *taught to arrange transport during emergency*, *prepared a list of people to call during an emergency*, *swapped phone numbers with neighbors*, and *had conversation with someone about their emergency plan*, respectively. Participants born outside Australia were significantly less likely, AOR = 0.90, 95% CI = [0.83, 0.98], $p = .018$, to arrange transport during an emergency compared with those who were born in Australia. The odds of *swapped phone numbers with neighbors* decreased as the age of the participants

Table 2. AOR and 95% CI for Participants Who Found Out What Emergencies Might Affect Their Area, Where to Find Out Information During an Emergency, and How to Pack an Emergency Bag.

Variables	Found out what emergencies might affect their area			Where to find out information during an emergency			Know how to pack an emergency bag		
	AOR	95% CI	p value	AOR	95% CI	p value	AOR	95% CI	p value
Visits									
Registration	1.00			1.00			1.00		
During visit	1.99	[1.83, 2.15]	<.001	2.07	[1.92, 2.22]	<.001	1.91	[1.76, 2.07]	<.001
Post home visit	1.27	[1.15, 1.41]	<.001	1.45	[1.31, 1.60]	<.001	1.44	[1.32, 1.57]	<.001
Age in years	1.00	[0.99, 1.01]	.687	1.00	[0.99, 1.01]	.879	1.00	[0.99, 1.01]	.968
Country of birth									
Australia	1.00			1.00			1.00		
Others	0.88	[0.81, 0.96]	.004	0.93	[0.85, 1.02]	.131	0.92	[0.84, 1.18]	.080
Gender									
Male	1.00			1.00			1.00		
Female	0.92	[0.84, 0.99]	.037	0.94	[0.87, 1.02]	.131	1.12	[1.04, 1.22]	.005
Living conditions									
Private	1.00			1.00			1.00		
Public	0.98	[0.83, 1.17]	.837	1.01	[0.84, 1.21]	.919	0.89	[0.75, 1.07]	.221
Language spoken at home									
English	1.00			1.00			1.00		
Others	0.92	[0.68, 1.47]	.611	0.88	[0.66, 1.16]	.352	0.93	[0.68, 1.27]	.651

Note. AOR = adjusted odds ratio; CI = confidence interval.

Table 3. AOR and 95% CI for Emergency Preparedness.

Variables	Taught to arrange transport during emergency			Prepared list of people to call during an emergency			Swapped phone numbers with neighbors			Had conversation with someone about their emergency plan		
	AOR	95% CI	p value	AOR	95% CI	p value	AOR	95% CI	p value	AOR	95% CI	p value
Visits												
Registration	1.00			1.00			1.00			1.00		
During visit	1.94	[1.79, 2.09]	<.001	1.46	[1.35, 1.57]	<.001	1.32	[1.23, 1.43]	<.001	1.92	[1.78, 2.07]	<.001
Post home visit	1.44	[1.32, 1.58]	<.001	1.27	[1.17, 1.39]	<.001	1.11	[1.02, 1.21]	.015	1.66	[1.52, 1.80]	<.001
Age in years	1.00	[0.99, 1.01]	.981	1.00	[0.99, 1.01]	.570	0.98	[0.98, 0.99]	.040	1.00	[0.99, 1.01]	.470
Country of birth												
Australia	1.00			1.00			1.00			1.00		
Others	0.90	[0.83, 0.98]	.018	0.95	[0.88, 1.04]	.267	0.96	[0.89, 1.05]	.445	0.93	[0.86, 1.01]	.054
Gender												
Male	1.00			1.00			1.00			1.00		
Female	0.99	[0.91, 1.07]	.785	1.03	[0.95, 1.11]	.478	0.97	[0.89, 1.05]	.393	0.98	[0.94, 1.10]	.626
Living conditions												
Private	1.00			1.00			1.00			1.00		
Public	1.01	[0.85, 1.19]	.924	1.10	[0.93, 1.12]	.256	1.01	[0.86, 1.20]	.865	0.99	[0.85, 1.17]	.985
Language spoken at home												
English	1.00			1.00			1.00			1.00		
Others	0.88	[0.66, 1.18]	.389	0.84	[0.63, 1.12]	.225	0.71	[0.53, 0.97]	.029	0.84	[0.64, 1.57]	.239

Note. AOR = adjusted odds ratio; CI = confidence interval.

decreased, AOR = 0.98, 95% CI = [0.98, 0.99], $p = .040$. Participants who spoke a language other than English at home were significantly less likely, AOR = 0.71, 95% CI = [0.53, 0.97], $p = .029$, to swap phone numbers with neighbors compared with those participants who spoke only English at home.

Effects of Home Visit Program

Figure 2 shows the variation of the adjusted prevalence rates for the periods of registration, during visit, and post home visit, for the seven dependent variables (covariates). After adjusting for all the covariates, we

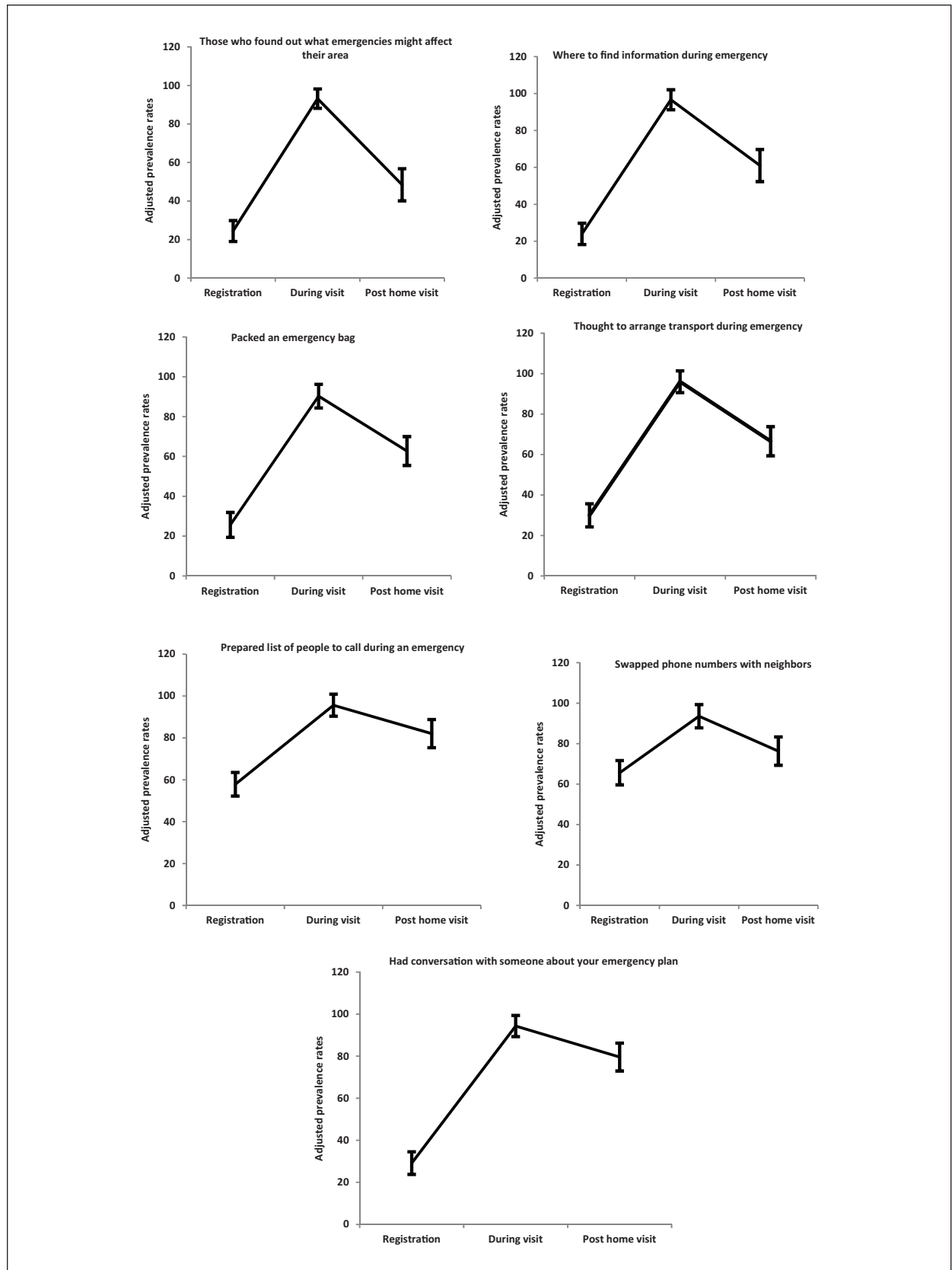


Figure 2. Plots of adjusted prevalence rates for those who found out what emergencies might affect their area, where to find out information during big emergencies, those who packed an emergency bag, those who thought to arrange transport during an emergency, those who prepared a list of people to call during an emergency, those who swapped phone numbers with neighbors, and those who had conversations with someone about their emergency plan.

found significant differences between registration and during visit, and registration and post home visit, except for *swapped phone numbers with neighbors*, due to overlap of the CIs for the AOR.

Discussion

The findings of this study demonstrate that the emergency preparedness home visits program, as an intervention, resulted in increased resilience and level of awareness about emergency preparedness for the targeted at-risk group of vulnerable and mostly homebound older residents in often geographically isolated areas of NSW, Australia. The delivery of the home visits by volunteers included the distribution of a client preparation kit that contained information on home fire safety, smoke alarms, batteries, and preparation documentation. In addition, the focus of discussion with residents during visits was on home fire emergency preparedness.

Post home visit survey forms were included to highlight client engagement with the local community and the establishment of supportive relationships. The three common questions on community engagement were whether participants had prepared a list of people to call during an emergency, whether they had swapped phone numbers with neighbors, and whether they had conversations with someone about their preparedness plan. In terms of social connectedness, we found that residents had prepared lists of people to call during an emergency, swapped phone numbers with neighbors, and had conversations with someone about their plan. This increased strongly during the visit compared with during registration and after the visit. It is worthwhile noting that there appeared to be a gender difference in engagement with communities. This is consistent with past research (Istre et al., 2001; X. Zhang et al., 2013).

The results of our study show that the home visit preparedness program helped to increase the capacity and resilience of participants as vulnerable older members of the community living on their own. The comparisons of registration and post home visit survey responses were key indicators of this. Upon completion of the program, the majority of participants felt prepared or very prepared in case of an emergency. Residents who declared their unpreparedness for an emergency after the home visit cited a lack of mobility as the main restrictive factor for them.

The results show that the HFRP program may have helped the target group of vulnerable and isolated older people to engage with local communities and establish supportive relationships.

In terms of whether the HFRP and visits have led to reduced fire-related injuries and fire-related deaths for this group of older people living at home, this is not easy to tell from the data. However, none of the clients indicated that they had been involved in a fire-related incident during the period of the study. Nor did any of the

comments from agency representatives show any record of injury or fatality during the project. This may suggest that the installation and checking of smoke alarms by the agencies, as part of the HFRP program, and information provided by volunteers during visits may have had a positive impact.

Our findings show that vulnerable people with no mobility are at higher risk compared with those who had mobility. In the United Kingdom, programs similar to the one in this study and which also targeted populations including elderly people were conducted with a smoke alarm “give away” approach, rather than taking the installation and education approach of the HFRP (DiGuseppi et al., 2002). Give-away programs were found to yield outcomes that were not totally positive. For example, in their study of one such program in the United Kingdom, DiGuseppi and colleagues (2002) found that installation and maintenance were vital to project success because findings from their research suggested that “that simply giving alarms to poor, urban households (including elderly people) is unlikely to reduce injuries related to fire” (p. 998).

Our study revealed some community awareness among residents regarding emergency preparedness. This is evident in statements from agency members or volunteers such as the following:

Limited mobility . . . Really needs someone local as well to check his welfare and transport in emergency. (ID202)

Lived in their home for a long time. Well known to emergency services. Good neighbors and others in . . . who care for them. (ID196)

Is much more aware of what can be done to be safer and better prepared. (ID284)

In an Australian first research on elderly fire safety conducted in Western Australia, a study showed that while a majority of older people in the study had fire equipment installed, nearly a quarter of the participants had no safety escape plan in place (G. Zhang et al., 2006). It was noted in the same study that the elderly people who had home and contents insurance tended to have functional smoke alarms and a keen awareness of fire risks (G. Zhang et al., 2006).

As Guicheng Zhang and colleagues (2006) pointed out, investigating other factors such as economic status and other behavioral factors such as smoking, alcohol consumption, and drug use, which are considered at-risk behaviors and closely related to the prevalence of home fires, constitutes areas of sensitivity in an Australian context. They identified the notion of “blaming the victims” and an Australian cultural ethos of avoiding this as a key issue that prevents the collection and analysis of such data. Likewise, in the current study, we found that the survey data that were gathered and available for analysis did not include such economic and behavioral factors. Therefore, the implications that these other

factors may have for the fire safety of elderly people have not been studied. Similar to research by Guicheng Zhang and colleagues (2006), we intend to investigate this in a follow-up study.

Strength and Limitations

One main strength of our study was that the home visit program provided face-to-face contact, providing a connectedness for clients and agencies, and something that did not exist previously. Our study, however, was limited in a number of ways. First, even though the sample was big enough to yield statistically significant results, nevertheless it was still relatively small given the relevant population of older people in NSW. Second, the sample was restricted to existing agency clients. This potential bias may mean that the researched population was not representative of all frail and elderly people in NSW, where the study was conducted. Third, relying on self-reported data has been questioned in previous studies (Douglas, Mallonee, & Istre, 1999; Gielen et al., 2015) and therefore, as our study relied on self-reported data, there might have been some overestimation or even underestimation of participant awareness and of their fire preparedness.

Implications and Conclusions

The home visits to 370 residents in geographically dispersed areas of NSW is commendable given the time frame, including the need to recruit and train volunteers, the requirement to develop program systems, and a final evaluation within 12 months. The entire program was carried out by volunteers to a very diverse population base.

The impact of the personal visits by volunteers to residents' homes and the time spent talking to them and discussing preparedness is beyond the expected output of the program. Findings from our study show that the HFRP was able to achieve the delivery of home visits to a highly isolated and vulnerable group of NSW residents with positive results.

Our study revealed that participants' emergency preparedness awareness was significantly higher for during visits and post home visits compared with the registration phase of the program. The findings suggest that the intervention via home visits and periodic reminders post these visits may be a useful intervention in improving emergency preparedness among older people, especially among men and those who were born outside of Australia. In addition, other reminders such as safety messaging via mobile or landline telephone calls may also be a supplementary and useful intervention to improve emergency preparedness among older people.

Acknowledgments

The authors would like to acknowledge the support from Fire & Rescue New South Wales personnel (Susan Broomhall,

Michael Ollernshaw, Melanie Rebane, and Chris Lewis), Rural Fire Service (Heidi Jackel), and Australian Red Cross (Anna Zelenko and Nicky Bekker) for their support. In addition, we would also like to acknowledge the anonymous reviewers for their feedback and input.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The authors disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: The authors received financial support from Fire & Rescue New South Wales for the research only, authorship, and/or publication of this article.

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