Preventive Medicine Reports 7 (2017) 50–57

Contents lists available at ScienceDirect

Preventive Medicine Reports

journal homepage: http://ees.elsevier.com/pmedr

Socio-demographic predictors of residential fire and unwillingness to call the fire service in New South Wales

W. Kathy Tannous [a,c,d,*], Kingsley Agho [b]

[a] Western Sydney University, School of Business, Locked Bag 1797, Penrith NSW 2751, Australia
[b] Western Sydney University, School of Science and Health, Locked Bag 1797, Penrith NSW 2751, Australia
[c] Western Sydney University, Centre for Health Research, Australia
[d] Capital Markets Co-operative Research Centre, Level 3, 55 Harrington Street, Sydney NSW 2000, Australia

ARTICLE INFO

Article history:
Received 13 August 2016
Received in revised form 4 May 2017
Accepted 15 May 2017
Available online 24 May 2017

Keywords:
Unreported fires
Australia
Socio-demographic factors
Multivariate analysis
Public policy

ABSTRACT

In most industrialised countries, the majority of fire-related deaths and injuries occur in the home. Australia has implemented fire prevention programs and strategies, including the use of smoke alarms, to minimise this burden. The number of reported house fires has declined over the past decade. However, there is a growing recognition that unreported fires are important in the estimation of total fire hazards and their associated injuries. This current study used data from the 2014 New South Wales (NSW) Population Health Survey, a yearly telephone survey, consisting of 14,732 survey respondents. Univariate and multiple binary logistic regression models were conducted to examine predictors of residential fire and (un)willingness to call the fire service in the event of a residential fire. The proportion of respondents who experienced residential fires in NSW was 10% (95% confidence interval [CI]: 9.3, 10.8). The proportion of respondents who were willing to call the fire service was 3.1% (95% CI: 2.7%, 3.6%) and that of respondents unwilling to call was 6.9% (95% CI: 6.3%, 7.6%). Multivariate analyses revealed that respondents spoke another language in addition to English were significantly less likely to have experienced a home fire (odds ratio [OR] = 0.46; 95% CI: 0.32, 0.65, $p < 0.001$) and significantly less likely to call the fire service (OR = 0.34; 95% CI: 0.21, 0.54, $p < 0.001$), compared with those who only spoke English at home. The results in this study will inform Fire & Rescue NSW's ongoing development of appropriate interventions and awareness-raising programs about residential fire prevention.

1. Introduction

In most industrialised countries, the majority of fire-related deaths and injuries occur in the home (World Health Organisation, 2011; TriData Division, 2009; TriData Division, 2008; TriData Division, 2007; Haynes, 2015). Globally, fire prevention programs that promote the use of smoke alarms are among the leading strategies adopted to minimise this burden (World Health Organisation, 2011; Haynes, 2015; Ahrens, 2013; Senate Legal and Constitutional Affairs Committee, 2016). Australia is among the countries that have implemented strategies and best practices in fire prevention programs. Prevention programs are in place at state and national levels including the passage of legislation that requires one or more functioning smoke alarms in every home (TriData Division, 2008; Senate Legal and Constitutional Affairs Committee, 2016). Yet residential fires remain a significant public health problem in the country. Across NSW, available records reveal that residential fires account for an estimated 94% of all fire-related deaths (Fire and Rescue New South Wales, 2016) and more than half of these may have been prevented if the homes had working smoke alarms and perhaps a practised home escape plan in place (Ahrens, 2013; Fire and Rescue New South Wales, 2015a). Between 2010 and 2015, there were 23,766 residential fires in NSW, with 115 deaths and 3311 injuries (Fire and Rescue New South Wales, 2015b).

The importance of functional smoke alarms in homes, as a key prevention strategy, cannot be overemphasised. The extant literature reveals that most home fire-related injuries and deaths result from smoke inhalation and toxic fumes rather than burns (NSW Fire Brigades, 2009; Ahrens, 2009; Atiyeh et al., 2009; Edelman, 2007; Hsiung et al., 2007; Harpur et al., 2013). International research has established that the majority of residential fires and associated injuries are preventable, and that the use of functional smoke alarms is a crucial and inexpensive prevention method (Haynes, 2015; Ahrens, 2009; Ballesteros and Kresnow, 2007; Parmer et al., 2006; Tannous et al., 2016; Chubb, 2003; Thomas and Bruck, 2015). Studies in Australia have found that occupants in homes without smoke alarms face more than five times the risk of fire-related injury or death compared to homes with smoke alarms (Parmer et al., 2006; Tannous et al., 2016; Wright, 2013). While there is compelling international and Australian

* Corresponding author at: School of Business & Centre for Health Research School of Medicine, Western Sydney University, Penrith, New South Wales 2751, Australia.
E-mail address: k.tannous@westernsydney.edu.au (W.K. Tannous).

http://dx.doi.org/10.1016/j.pmedr.2017.05.004

evidence that demonstrates that functional smoke alarms are an effective house fire prevention strategy, house fires and fire-related deaths and injuries still occur, and may even go unrecorded (Tannous et al., 2016; Wright, 2013; Ballesteros et al., 2005; Frattaroli et al., 2012). In NSW, the annual fire death rate was 2.9 deaths per million people in 2015 (22 deaths) with a three year average of 4.0 deaths per million people between 2013 and 2015 (Productivity Commission, 2016). Yet, due to limited data in Australia, this decline only represents cases when the fire service (Fire & Rescue NSW (FRNSW)) attended the residential fire. Any residential fire incidents where the fire brigade did not attend, and which may have resulted in injuries or fatalities, were not included in FRNSW's reported statistics on incidents, injuries or fatalities (Senate Legal and Constitutional Affairs Committee, 2016; Barnett, 2008; Flora et al., 1977).

Information and statistics on fires incidents, such as that collected by FRNSW, are entered into the Australian Incident Reporting System (AIRS). However, as noted above, this data may only be inclusive of fires reported to the fire brigade and may not include small fires, such as kitchen fires, that were suppressed by individuals, even if property damage or injury was involved. AIRS does also collect data from a range of different organisations in Australian states and territories including emergency services, hospitals and insurance companies (Senate Legal and Constitutional Affairs Committee, 2016; Fire and Rescue New South Wales, 2015b). While this additional data may contain associated information about incidents that were not reported to fire services, it has been noted in Australia that it is likely to be incomplete.

Regarding unreported fires, the 2015 Australian Senate's inquiry into the use of smoke alarms in the prevention of smoke and fire-related deaths noted that there was a "paucity of data on unreported fires" ((Senate Legal and Constitutional Affairs Committee, 2016):16). In its submission to the Senate inquiry, FNSW stated that statistics on fires that are unreported, and therefore unattended, or that had been reported to another agency, such as the NSW Rural Fire Service, do not exist. In addition, there is no data on people with fire-related injuries that do not seek medical attention or property damage that is not reported to any general insurance company (Senate Legal and Constitutional Affairs Committee, 2016; Fire and Rescue New South Wales, 2015b).

These unreported fires are important to note in the estimation of total fire hazards as they could have developed into potentially dangerous fires if they had not been detected or controlled early (Butry and Thomas, 2012). These fires may or may not have involved insurance claims and therefore insurance company data. In addition, they may or may not have involved injuries that involved emergency department presentation and therefore hospital data (Flora et al., 1977). To capture this additional information, some jurisdictions are now using surveys asking households if they have had a fire in the recent past and whether they had reported the incident or contacted the fire brigade (Haynes, 2015; Flora et al., 1977; Greene and Andres, 2009).

In the United States (US), the Consumer Product Safety Commission (CPSC) conducted national telephone probability sample surveys of unreported (and non-fire department attended) residential fires in 1974, 1984, and 2004–05. All three surveys demonstrated that the majority of fire incidents in residential homes were not attended by the fire department (Chubb, 2003; Greene and Andres, 2009). In the 2004–05 study, the rate of unreported fires in the US was determined at 6.3 fires per 100 households with the combined estimate of unreported and reported fires at 6.6 per 100 households (Greene and Andres, 2009). The total number of fires, both attended and unattended, was determined to have not decreased over the 20 years since the 1984 survey. However, the earlier warnings of incidents provided by smoke alarms may have resulted in residents extinguishing fires before they got out of control and required fire department assistance (Chubb, 2003; Greene and Andres, 2009). The small size of fires and the early warning system via smoke alarm have been identified by researchers as reasons for the higher rates of unattended fires and self-management by residents (Ahrens, 2013; Chubb, 2003; Greene and Andres, 2009). People may feel confident in dealing with small fires without needing tools or special knowledge. In addition, smoke alarms alert householders before the fire gets too big to handle (Chubb, 2003).

The number of fires in the US requiring fire service intervention has been estimated at one in 25 (Chubb, 2003). In New Zealand, around one in ten fires require fire service intervention while the rest are managed by residents (Chubb, 2003). To the best of our knowledge there is no study that examines trends for underreported and unattended home fires leading to deaths in NSW. In the report by the Australian Senate (2016) on the use of smoke alarms to prevent smoke and fire-related deaths, the authors recommended that Australian governments consider establishing a national residential fire reporting and recording mechanism to capture statistics of currently unreported residential fire incidents (Senate Legal and Constitutional Affairs Committee, 2016).

This study seeks to address some of these gaps in data and knowledge by examining factors related to individuals' unwillingness to call the fire brigade. The study used data from the annual NSW Population Health Survey on households' (un)willingness to call the fire brigade and report residential fire incidents. The objective of the study is to identify socio-demographic and other factors associated with individuals' unwillingness to call their local fire service.

The findings from this study should be useful to fire services, other incident response agencies and policymakers in understanding the behaviour of households following residential fire incidents. The findings could also inform the review and design of intervention and management strategies aimed at reduction in fire incidents and associated injuries and fatalities.

1.1. Ethical consideration

The data set used in this study was sourced from the NSW Population Health Survey, the methods and questions of which were approved by the NSW Population Health and Health Services Ethics Committee.

2. Methods

2.1. Data source

The data examined in this study was extracted from the NSW Population Health Survey (2014). The NSW Population Health Survey is an annual cross-sectional computer-assisted telephone survey, stratified by geographical regions. The target population is all residents of the state of NSW, through the use of overlapping dual-frame design, with three types of phone use: landline only, mobile only and dual-phone users (people with a mobile phone living in a household with a landline phone). Participants were selected through either the landline or mobile phone number sampling frames (Barr et al., 2014). The survey has a yearly target of 1500 persons in each of the state's 15 area health services and a total sample of about 15,000 persons a year (Barr et al., 2008a). The dataset analysed for this study consisted of 14,732 survey respondents. It comprised self-reported information about respondents' socio-demographic characteristics, including household size, respondent's age, gender, level of education, employment status, income, ethnicity, socioeconomic status and smoker status. The sample, including the demographic profile of the weighted survey population, was comparable with the Australian population, and is described in detail elsewhere (Barr et al., 2008b). Of those people contacted to participate, about 65% completed a full interview and thus form part of the dataset (Centre for Epidemiology and Research, 2010). In the 2014 survey, additional questions were asked of households about fire incidents. These were "Have you ever experienced an unintentional or accidental fire in your home?"; and "Was the fire brigade called to put out the fire?"