FIRE SAFETY MESSAGING RESEARCH

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Interventions for Preventing Residential Fires in Vulnerable Neighbourhoods and Indigenous Communities: A Systematic Review of the Evidence

National Indigenous Fire Safety Council Project
Projet du conseil national autochtone de la sécurité-incendie

BC INJURY research and prevention unit

The British Columbia Injury Research and Prevention Unit (BCIRPU) was established by the Ministry of Health and the Minister's Injury Prevention Advisory Committee in August 1997. BCIRPU is housed within the Evidence to Innovation research theme at BC Children's Hospital and supported by the Provincial Health Services Authority and the University of British Columbia. BCIRPU's vision is to be a leader in the production and transfer of injury prevention knowledge and the integration of evidence-based injury prevention practices into the daily lives of those at risk, those who care for them, and those with a mandate for public health and safety in British Columbia.

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UBC BC Children's Hospital Research Institute

This report draws on data that is currently in place that was available for First Nations Populations on Reserve. There is a goal in moving beyond this current state and wherever possible by implementing new forms of data collection, drawing upon different data sources, and framing research questions that include Inuit and Metis populations and communities and First Nations residents off reserve.

List of Abbreviations

UK	United Kingdom
USA	United States of America
GBD	Global Burden of Disease
TEPHINET	Training Programs in Epidemiology and Public Health Interventions Network
KAB	Knowledge Attitude and Behaviour
Edu	Education
Env	Environmental Modifications
Enf	Enforcement
Eng	Engagement

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1. Background and Scope of Work

Residential fires constitute a global health problem, causing fire-related injuries including burns and smoke inhalation and threatening the lives of many individuals particularly children and the elderly [1,2]. From the early 1990s, many initiatives have attempted to address the problem and have demonstrated positive impacts on the reduction of residential fires. An extensive review of existing public health strategies conducted during the Tri Data Corporation (Tri Data) study, *Proving that Fire Education Works*[3],synthesized evidence from the analysis of 77 public-education strategies including school-based programs, comprehensive community-wide programs, programs targeting a specific cause of fire or audience, juvenile fire-setter programs, smoke-detector programs, and national strategies to demonstrate the effectiveness of fire prevention strategies. More recently, a 2009 Tri-Data review of best practices in residential fire prevention highlighted the impact of home visitation programs in the United Kingdom (UK) that targeted fire-safety inspections and risk reduction, which emphasized the importance of functioning smoke alarms.

Similar initiatives have become crucial components of Canadian residential fire-prevention efforts, often implemented by community-based volunteers or by acquiring additional prevention funds. Home visitation programs in Canada have focused on the presence and functionality of smoke alarms, the development of fire-escape plans, and public education on common causes of preventable house fires, with the aim to increase the presence of working smoke alarms, and reduce rates of fires and associated injury and death. However, many of these initiatives have lacked conclusive, formal evaluation and have often become victims of their own success, with funding and focus redirected after the problems were perceived to have been solved.

Motivated by these indications that data-driven approaches are better able to reduce the frequency of residential fires, this study undertook a systematic review to determine the effect of residential fire interventions on the prevention of residential fires incidents, and their associated injuries and deaths. The ultimate aim of this review is to adopt the synthesized evidence to support decisions and actions by the Canadian National Indigenous Fire Safety Council (NIFSC) that will lead to the reduction of preventable residential house fires, and associated fire-related injuries and deaths.

2. Introduction

Residential fires account for a sizable proportion of fire incidents globally, highlighting its significance as a major public health problem[4]. Fire-associated morbidity and mortality represent the fourth most common cause of unintentional injuries, affecting millions of lives worldwide[5]. Estimates from the Global Burden of Disease report (GBD 2019) reported nearly 110,000 fire-related deaths globally in 2019[6]. Further to its mortality burden, fire-related injuries are associated with prolonged hospitalization and lifelong disfigurements that equally impact the injured persons' physical and emotional well-being[5]. The high costs of residential fires exceed the damage to residential properties and are estimated to be nearly 10 times higher than the actual reported costs[7].

Residential fires disproportionally affect vulnerable communities owing to their complex relationship with their surrounding environment and the underlying socioeconomic characteristics of households[8]. Several studies examined the increased risk of residential fires particularly among clustered and overpopulated communities, underprivileged occupants of older houses, residents of buildings with sub-standard fire safety measures, and displaced individuals[9-14]. Available research clearly demonstrates the linkage between community characteristics and higher frequency of residential fires. Indigenous communities are particularly prone to heightened risks of various types of unintentional injuries including fire-related morbidity and mortality[15,16] due to multiple factors such as socioeconomic status, overcrowded living conditions and limited access to healthcare services in rural locations[8,15,16].

Numerous preventive strategies and interventions have been developed and implemented to protect individuals against residential fires. These interventions include fire education programs (knowledge on common causes of preventable fires), home visitations and inspections (fire-safety hazard, smoke alarms and sprinklers installation) and fire prevention legislations[3,17]. Specific interventions have targeted high-risk groups such as vulnerable individuals, young children, the elderly and youth (e.g. juvenile fire setter programs). The longitudinal effectiveness of existing fire prevention interventions varies considerably in terms of enhanced residential fire safety, reduced frequency of fire incidents, and more importantly, decreased fire related injuries and casualties. Nonetheless, existing fire prevention initiatives lack conclusive and formal evaluation as to their effectiveness and success, particularly in the longer term.

This review aims to systematically examine the fire prevention literature and identify existing evidence-based interventions and practices designed and developed to reduce the risk and frequency of residential fires and associated injuries and deaths. The study seeks to evaluate and synthesize the findings, making them available to the NIFSC membership for the uptake of relevant interventions in Indigenous communities and neighbourhoods in Canada. Evidence from this review will improve understanding and provide insights into the effectiveness of existing fire prevention initiatives, stimulate improvements of public health policies in residential fire prevention efforts and guide the implementation of data-driven, research-based approaches to reduce fires in Indigenous communities and across similar settings.

3. Method

3.1. Search Strategy

We examined the fire prevention literature and compiled evidence-based fire prevention initiatives demonstrating effectiveness, with particular attention to Indigenous communities, based on the '4 E's of injury prevention' (4E's) approach:

1. Education (e.g. educating individuals about changing behaviours)
2. Enforcement (e.g. safety legislation and policies, including passing, strengthening and enforcing voluntary standards, regulations, and laws to suppress residential fire)
3. Engineering (e.g. making the design, development, and manufacturing of products and the built environment safer)
4. Engagement (e.g. engaging stakeholders in the process of systemic change and safety promotion)

We included all types of interventions that were designed and developed to reduce the risk and frequency of residential fires and fire related injuries. All reports published after 1990 were included in the study.

The research question addressed in this review is:

> *"What existing fire safety prevention interventions have proven effective in preventing residential fires and associated injuries and deaths among vulnerable populations including Indigenous communities, based on the 4E's approach (Education, Engineering, Enforcement, Engagement)?"*

Outcomes included:

1. Improving Knowledge/Attitude/Behaviours (KAB)
2. Reducing risk/incidence/frequency of residential fires
3. Lowering rates of injuries/hospitalizations/deaths
4. Enhancing safety for infrastructure damage/extent/magnitude/fire suppression
5. Lowering costs for healthcare needs/health response

3.2. Eligibility Criteria

A literature search strategy was developed with the support of a health sciences librarian. Electronic databases searched included MEDLINE, Embase, CENTRAL, Web of Science Core Collection, Trials Register of Promoting Health Interventions (TRoPHI), PAIS Index, ERIC, FireDOC (National Institute of Standards and Technology), and IEEE Xplore. Unpublished studies and reports, together with a search of the grey literature was conducted through the following sources: Theses and dissertations (ProQuest Dissertations & Theses Global, The Networked Digital library of Theses and Dissertations -NDLTD), Conference proceedings (Papers First and Proceedings via WorldCat FirstSearch), government reports (OpenGrey, Grey Literature Report) and indigenous organizational websites (Training Programs in Epidemiology and Public Health Interventions Network – TEPHINET)(refer to Appendix A for the search strategy).

Relevant systematic reviews were included[18-22] to provide additional studies identified through recursive searches of their reference lists. Furthermore, Google Scholar was used to review the citing references for

all included studies and reports and any missed literature was added by the adopted search strategy. In addition, relevant fire safety related to Indigenous organization web sites were searched for published and unpublished literature. A consultation with experts in the field of injury and fire prevention was sought through regular meetings. These consultations served to advise on the appropriate MESH terms to use and retrieve eligible studies, to formulate and refine the research question and construct the research strategy, to confirm the inclusion of relevant literature and to obtain information on published and unpublished reports and policy papers.

3.3. Data Screening, Selection and Extraction

References from the searches were exported and added to the Covidence software platform[23]. Duplicates were removed and screening of titles and abstracts, followed by full-text reviews, was performed. We adopted the PICOS framework (Population, Intervention, Comparators, Outcomes, Study Design) as a systematic review approach to screen and select eligible studies and include them accordingly. We used the following description to retrieve eligible reports: 'Fire prevention', 'Residential fire', 'intervention', 'Indigenous'. All identified citations were evaluated by two authors based on the inclusion criteria.

A transparent selection process was documented in a Microsoft Excel spreadsheet (with a separate column for each reviewer and the third column for any required reconciliation). Appended information was included in the spreadsheet, including details about all abstracts retrieved (author, journal, abstract, year), and abstract screening and full-text screening results with the decision to include/exclude, comments and reasons for exclusion.

Screening of titles and abstract was performed independently and in duplicate by 2 authors to select potentially eligible studies using the Covidence tool. Disagreements between authors were resolved by discussing with a third reviewer so as to reach consensus. After the identification of the eligible studies, two authors independently evaluated the full texts of relevant articles based on the predetermined eligibility criteria. Disagreements were resolved by consensus, with consultation of other study team members when resolution could not be achieved. The study selection process was documented according to the PRISMA statement, and articles were deemed relevant to be included in the review if the study evaluated a fire intervention and demonstrated its impact on the study suggested outcomes.

A data abstraction sheet was designed on Redcap to collect data on study authors, year of publication, country, fire intervention adopted, behavior addressed, participants, setting, and the intervention outcome. Quantitative and qualitative data were extracted from eligible studies using the Redcap data extraction tool. Two authors extracted data and disagreements were resolved by discussion or by consultation with a third reviewer. Reported studies published after 1990 we added to the review through hand searching and examination of the reference list of existing reviews[20-22].

Studies were assessed for methodological quality using the Downs and Black tool[24]. This quality checklist contains twenty-seven items that evaluate the quality of reporting, the external validity, the internal validity (bias and confounding), and the power of the study with a maximal quality index (QI) of thirty-two. The QI correlates well with previously established instruments used for the quality assessment of both randomized and non-randomized studies[25]. The Downs and Black checklist has been used previously in several systematic reviews for the purposes of quality assessment[26,27].

3.4 Data Analysis and Synthesis

All results were subject to double data entry by two authors. The effectiveness of existing fire prevention initiatives was investigated based on the 4E's intervention approaches. Subgroup analyses were performed for the various measures of fire prevention (Education, Engineering, Enforcement and Engagement) and their level of effectiveness in reducing risks of fires incidents and fire related injuries and deaths.

Methodological quality of systematic reviews was assessed using the critical appraisal tool, AMSTAR 2. AMSTAR 2 is an empirically derived, reliable, validated 16-item critical appraisal tool used to assess the methodological quality of systematic reviews of RCTs and epidemiological studies. (https://amstar.ca/index.php). Quality of the reviews was calculated using the checklist form (https://amstar.ca/Amstar_Checklist.php). We considered an AMSTAR score: high (none or one non-critical weakness), moderate (more than one non-critical weakness), low (one critical flaw with or without non-critical weaknesses) and critically low (more than one critical flaw with or without non-critical weaknesses) respectively.

Covidence was used to manage the retrieved studies, review abstracts, screen for inclusion/exclusion, extract data, and perform the risk of bias assessment. Tableau software was adopted to visualize the studies outcomes data.

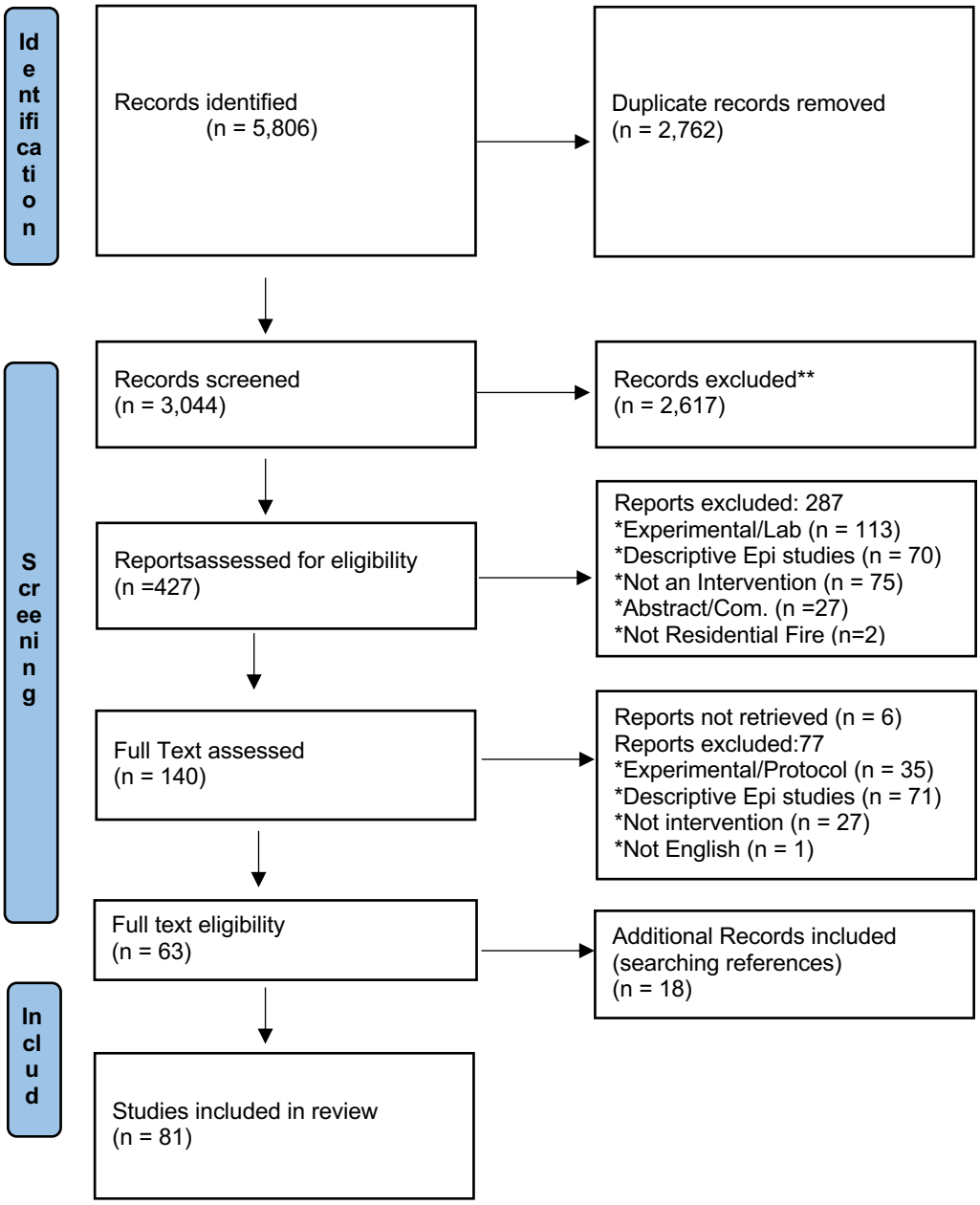
4. Results

4.1. Study Characteristics

The search yielded a total of 5,806 records. After duplicates were identified and removed, the search yielded 3,044 unique records. Titles and abstracts of 3,044 records were screened, resulting in the exclusion of 2,617 records, leaving 427 articles that were assessed for eligibility based upon the outcomes of interest to this review. A further 287 articles were excluded resulting in 140 articles as candidates for full text review. Six articles could not be retrieved, and 71 articles were excluded for multiple reasons such as being only epidemiological and descriptive studies, theoretical studies with no population, and only protocols, not a fire intervention, not a residential fire, and only theoretical outcome. We included 63 articles in the review[17,18,20-22,28-70], and an additional 18 articles resulting from reference reviews of included articles, resulting in a total of 81 articles included in the study.

Forty-two of the 81 included articles originated in the USA (51.8%), 14 (17.2%) in the UK, 8 (9.8%) in Canada, 7 (8.6%) in Australia, 4 (4.9%) in Sweden, 2 (2.4%) in New Zealand, one article each from Japan, Germany, France and Iran.

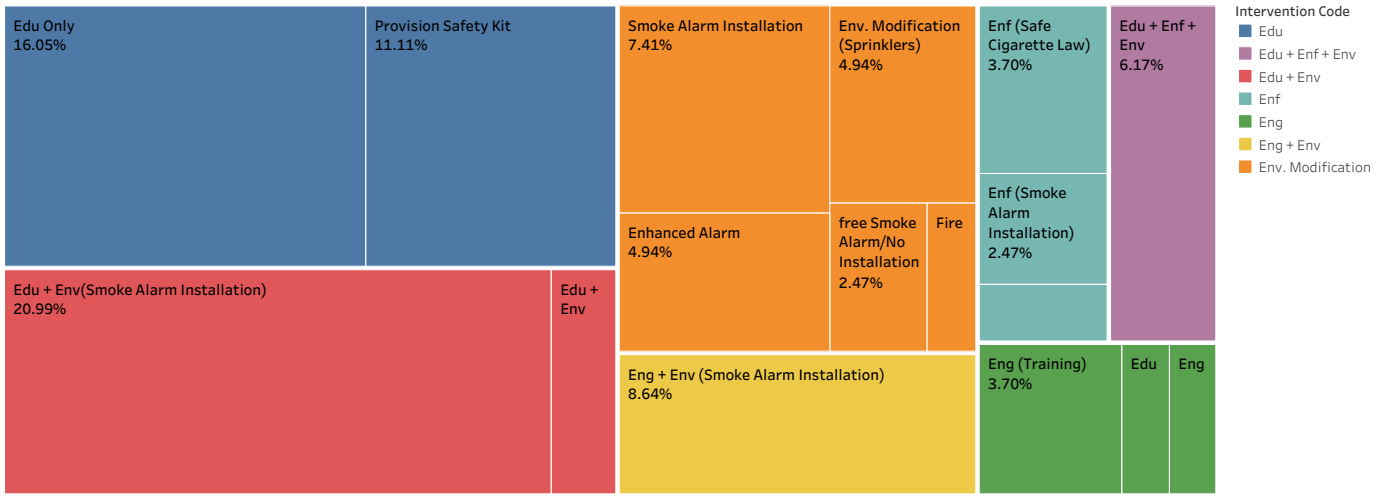
Figure 1. PRISMA flow diagram



Most studies retrieved revealed fire intervention research designs were Randomized Control Trials (RCTs) (32%), followed by systematic review (16%), qualitative research (12%), non-randomized experimental studies (10%), cohort studies (8%), cross sectional (6%), and others (16%).

4.2. Interventions Sub-Analysis

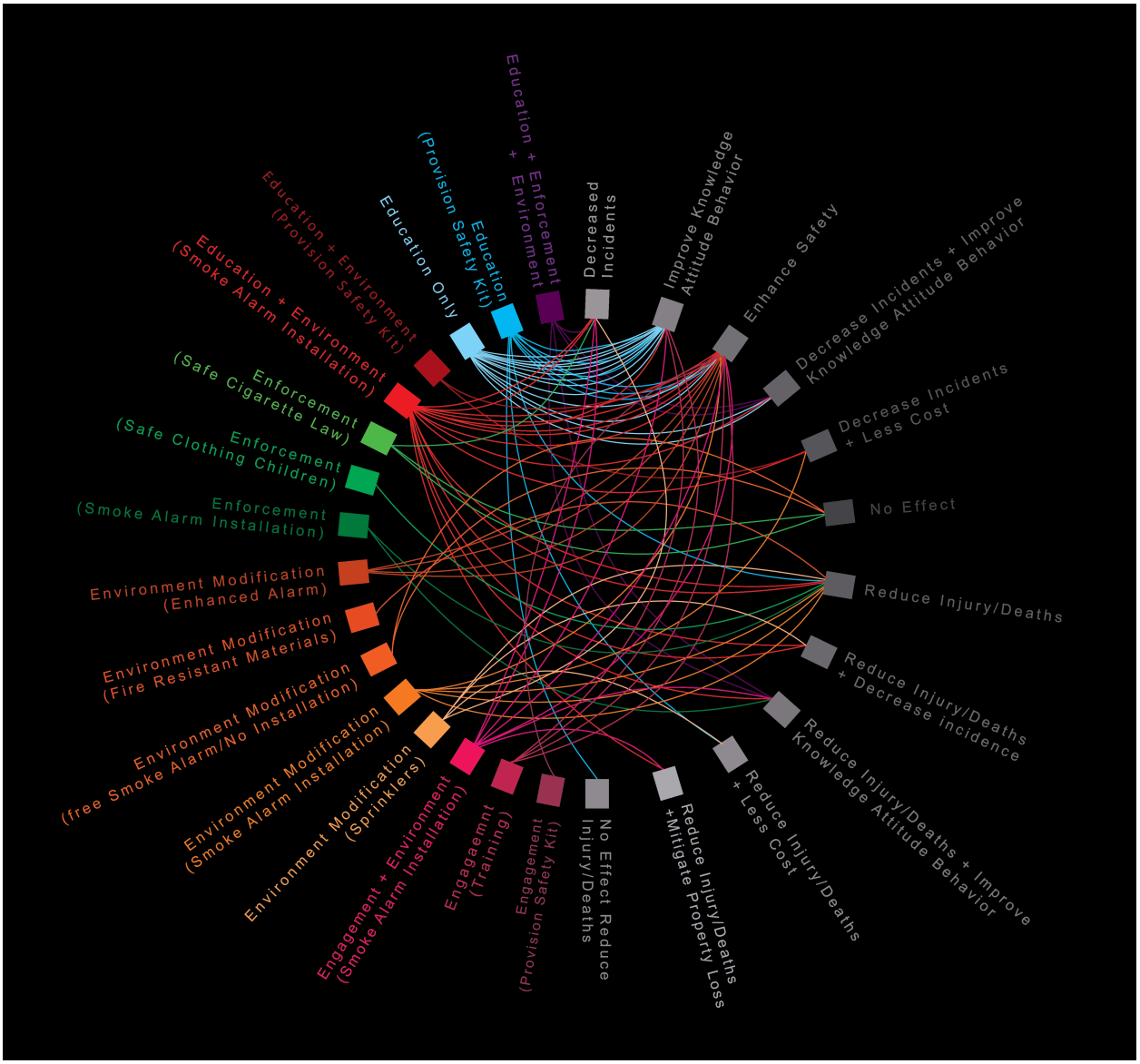
The retrieved studies were classified based on one or more of the adopted 4E's intervention: Education, Engineering/Environmental changes, Enforcement and Engagement. The majority of the interventions (n= 23, 29.1%) adopted educational measures to prevent residential fires, while n=16 (20.2%) adopted Environmental modifications, 17 (21.5%) Environmental modifications and Education, 5 (6.3%) Engagement, 7 (8.8%) Engagement and Environmental modifications, 6 (7.5%) Enforcement and 5(6.3%) combined Education, Environment and Enforcement.



Intervention Sub-Code and % of Total Count of Sheet1. Color shows details about Intervention Code. Size shows % of Total Count of Sheet1. The marks are labeled by Intervention Sub-Code and % of Total Count of Sheet1.

These interventions were implemented within a variety of settings, including schools, homes, community centers, nursing homes and clinics. The vast majority of the included studies initiated a preliminary needs assessment to address a local residential fire problem, identify high-risk populations and map community households prior to the implementation of the proposed fire intervention and the collection of field data. In some cases, data were directly retrieved from hospital medical records, government databases or fire department data repositories, and then compiled and mapped so as to target high risk populations, where the fire interventions were subsequently implemented.

The chord chart below illustrates each intervention study included according to its 4E's intervention on the left side of the chart. In turn, each intervention is linked with the measured outcomes, illustrated on the right side of the chart. Each of these studies is summarized below, commencing on page 30.



4.2.1. Educational Fire Intervention

Educational interventions designed to prevent residential fires represented the leading approach adopted by the majority of the included studies (n=23, 29.1%). These studies relied on the intervention to enhance individuals' knowledge and acquisition of fire safety skills and consequently prevent fire and its associated injuries[18,40,45,50,52,54,55,60,68,69,71-73].

The primary outcome of the educational interventions was improvement of individuals' fire safety knowledge and skills reflected in the enhancement of safety behaviors and practices[18,28,39,40,45,50,54,58,60,68]. These studies were successful in advancing safety knowledge and the acquisition of fire safety skills, which was mainly assessed by the changes in individuals' fire safety behaviors and practices, such as the installation and maintenance of functioning smoke alarms, the development of fire escape plans, and the utilization of fire guards.

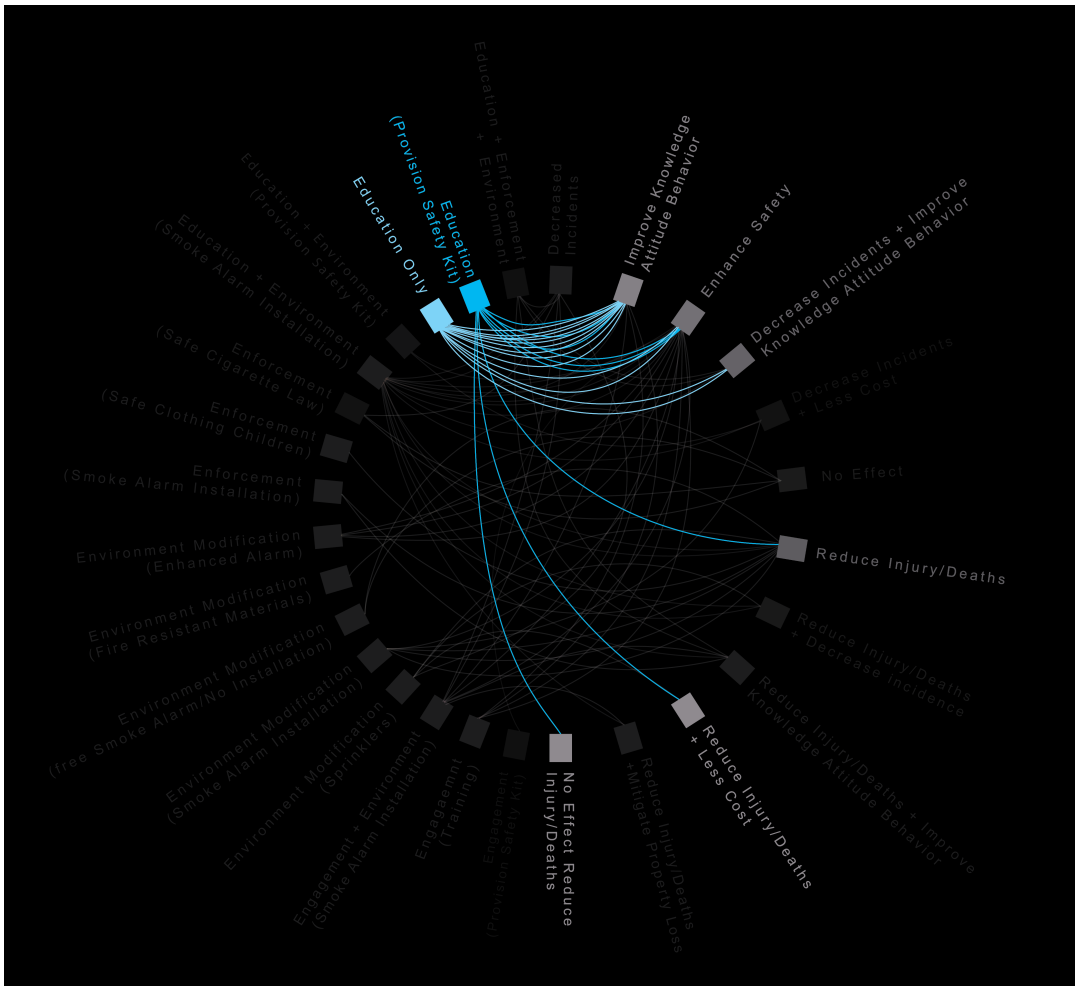
A large number of educational interventions relied upon the dissemination of educational materials (e.g. fire safety brochures and pamphlets) delivered through door-to-door fire safety campaigns within higher risk neighbourhoods[34,74]. A smaller number of interventions were delivered through programs offered at schools and nursing homes, or through group presentation at local community centers, or posted on social media platforms[47,54,55,68,75]. Several studies examined the implementation of fire education interventions counseling within the context of clinical settings and showed their effectiveness in enhancing parents' knowledge and safety practices[57,71,76]. Integrating fire safety education as part of counseling for child healthcare, demonstrated an increase in smoke alarm installation and safety behaviour, substantially impacting parents' decision to acquire, install and maintain an operating smoke alarm[21,76].

Educational interventions mainly targeted vulnerable populations and at-risk groups including parents of young children, elderly, and low socio-economic households[50,52,54,55,60,68,69,71,77-79]. Trained firefighters, community leaders and volunteers were recruited to support the implementation of such interventions[64]. One study indicated that the involvement of healthcare workers markedly increased access to households by nearly 21%, with a higher uptake of the delivered educational programs by household members and an ultimate increase in the prevalence of smoke alarm installation[42].

Two educational interventions involved firefighter educators who provided training to youth fire setters in an attempt to instill fire safety skills and foster positive safety attitudes among youths[52,72]. These studies showed that the combination of education, psychological counselling and psychosocial intervention - Cognitive Behaviour Therapy (CBT), were largely successful in increasing awareness and knowledge among youth fire-setters, imparting in them the essential safety skills required to identify safety hazards and to learn and practice evacuation plans with the aim to reduce the frequency of fires and save lives among the youth population.

Although educational interventions were effective in improving knowledge and changing behaviors, limited evidence was reported as to their influence on the eventual reduction of fire incidents[52,72]. A number of studies implemented educational interventions and attempted to reduce fire morbidity and mortality, nonetheless, this review revealed their limited association with the reduction of fire injuries[20,80]. A study conducted by Kendrick et al. showed no observed effects on the proportion of medically attended fire injuries (hospitalized or admitted cases) following the implementation of the fire educational interventions[81]. This review confirmed the limited evidence on the sufficiency and impact of educational and counselling interventions alone on fire related injuries, indicating a less substantial effect on individuals long-term safety practices and ultimately on injury outcomes[82]. Some studies reported the

diminished effect of fire education over time, hence the need for follow up and enforcement of safety concepts. This fact was confirmed by a fire education intervention introduced among older adults[55] and the elderly[54] population in Wales, indicating a decline in safety knowledge retention over time despite the initial increase in participants knowledge compared to baseline.



4.2.2. Engineering and Environmental Modifications

The second most adopted intervention to address residential fire was 'Engineering and Environmental Modifications'. Sixteen studies (20.2%) adopted safety measures aimed at altering and adapting the existing hazardous environment in an attempt to reduce the risk, frequency and severity of fire incidents and to prevent fire related injuries and fatalities[33,35,43,49,57,59,62,80,83-89]. Smoke alarm installation represented the leading environmental modification adopted by the majority of the included studies, mainly to enhance the safety of households and their surrounding environment[49,57,80,86,89]. In the event of a residential fire outbreak, smoke alarms are considered the primary intervention and the most effective strategies in reducing fire-related injuries among residents in higher-income countries. This review clearly shows that working smoke alarms reduce the risk of death in the event of a house fire by 50%[56]. Having a working smoke alarm with a long-lasting lithium-ion battery on every level of the home is the recommended best practice according to the Centers for Disease Control and Prevention.

The distribution and installation of smoke alarms was often accompanied by home visits and inspections, and in many cases amplified by the provision of educational materials delivered by local firefighters or community volunteers to enrolled households. Liaising with community leaders and fire safety inspectors was particularly effective among vulnerable communities with a significant impact on households knowledge and fire safety practices[78]. Door-to-door canvassing and in-home installation of smoke alarms have been found to be the most effective methods for increasing the number of homes protected.

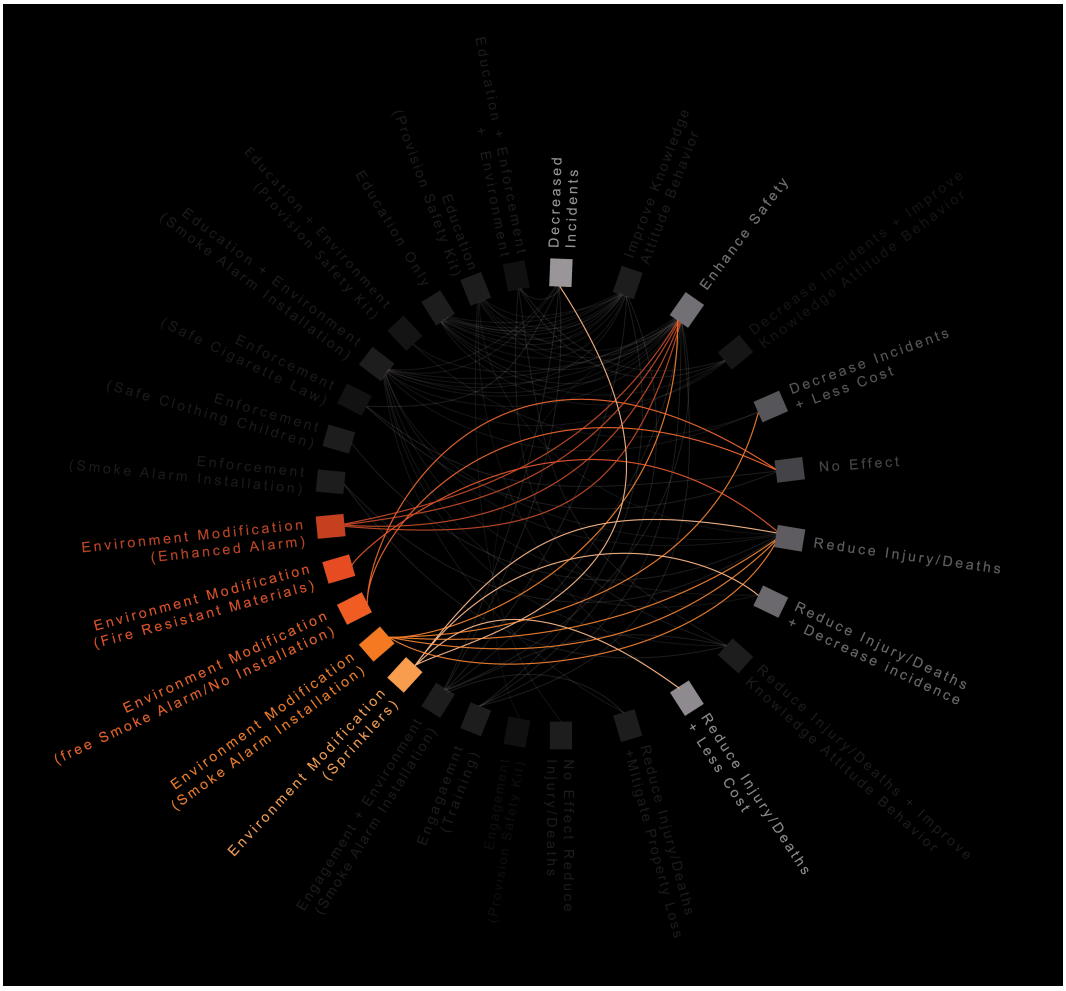
The primary desired outcome for installing smoke alarms was enhanced fire safety, decreased fire incidents and more importantly, reduced fire related injuries. Smoke alarm ownership was associated with a reduced risk of fire death and appeared particularly effective in households with young children. Households with operational smoke alarms reported up to 50% reduction in fire fatalities[29,37,49,56,80,86]. Regular fire alarm inspection and battery checks are required steps to ensure sustained safety and protection against residential fires. Maintaining a functioning smoke alarm is considered the most prominent challenge for securing household fire safety over time, and this indicator was commonly investigated in many studies as a measurable outcome for sustainable safety practices among households. Modifications of the design and features of existing products such as personalized smoke alarms using parent voice tones was explored by Smith et al. and was successful in increasing the effectiveness of the alarms in awakening children faster (96%) and prompting them to a successful and timely execution of fire escape plans (83%), ultimately enhancing their safety[62,63].

Sprinkler inspection represented another major environmental modification (n= 4) that served to enhance fire safety among households[33,83-85]. Similar to smoke alarms, households with sprinklers have been linked to substantial decreases in fire related morbidity and mortality, particularly with the ability of sprinklers to keep the fire contained to its origin of ignition in up to 97% of cases[33,56,80,84,85]. Sprinklers significantly reduce fire-related injuries and deaths compared to the benefit provided exclusively by functioning smoke alarms. Moreover, data have shown that sprinklers reduce fire fatalities by 100% and property damage by 72%[33,83-85].

Environmental modifications (i.e. smoke alarms and sprinklers) demonstrated effectiveness in enhancing safety practices and behaviors such as well-maintained smoke alarms, fire escape plans, in addition to decreasing incidents and frequency of residential fires[84,89], mitigating property damage costs[33,85] and more importantly, reducing injuries and deaths using[33,49,59,85,86]. One study reported the effectiveness of various measures of environmental modifications including fire resistant clothing, beds and sofas that was confirmed to be effective in reducing fire related injuries[59]. Equally important is the need to tailor

proposed interventions to the population age groups, types of residential homes and setting for more successful outcomes[59]. Smoke alarm giveaway programs showed null effect on improving residential fire safety, reducing fire incidents, or mitigating fire related injuries[35,43]. This may be due to the fact that homes may have not necessarily installed the received free smoke alarm or failed to maintain the functioning of the smoke alarm with annual battery check-ups. In contrast, direct home visits and installation of smoke alarms were most effective compared to the distribution of free alarms without installation visits within vulnerable populations.

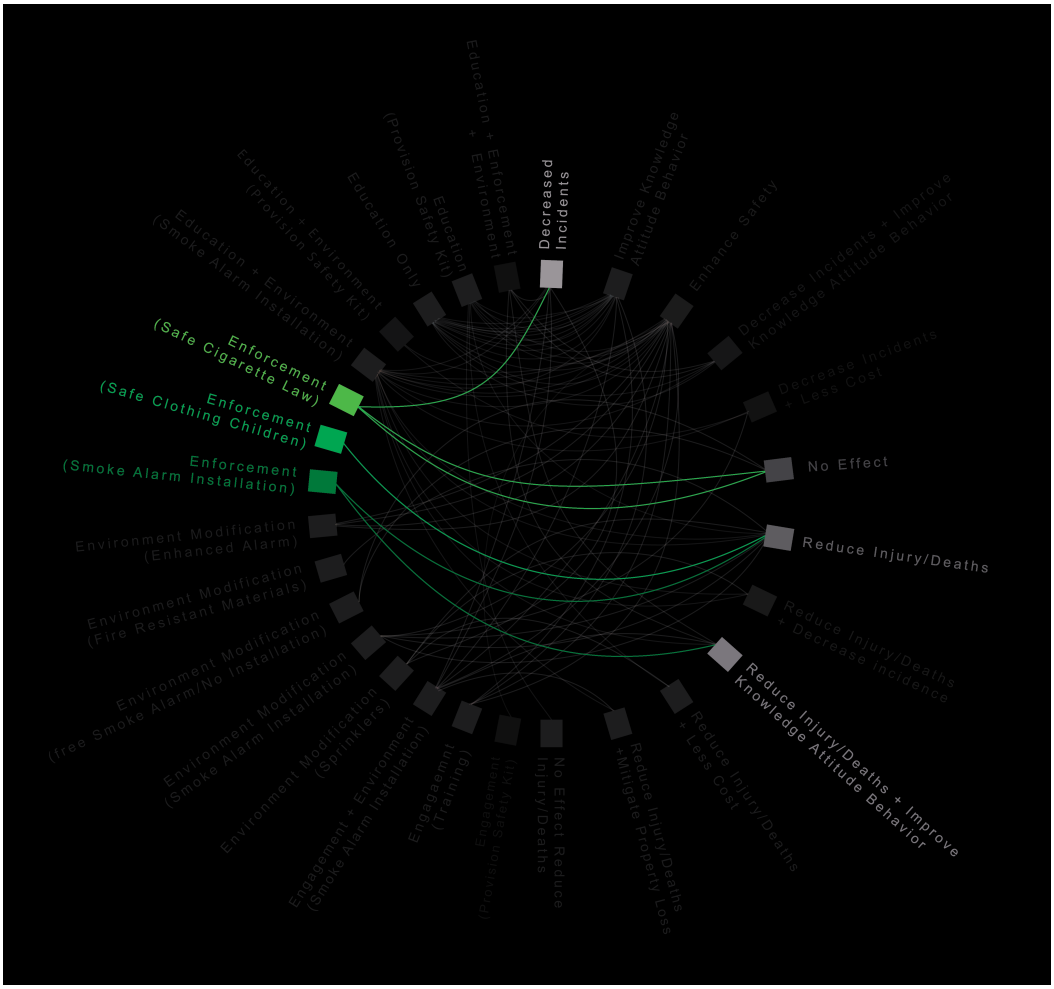
Similar to educational interventions, a single home visit and environmental modification were effective in improving the extent to which families utilized passive and active measures to decrease the overall occurrence of injuries. However, these efforts proved to be insufficient at impacting the long-term adoption of home safety measures. Evidence from this review showed that environmental modifications manifested in home visits and inspections, and alterations to the environment were more effective on individuals' short-term integration and adoption of safety behaviors, with a limited long-term effect[77].



4.2.3. Enforcement

A limited number of studies (n=6 ,7.5%) reported the assessment of existing fire safety laws and regulations implemented to prevent residential fires and their associated injuries[28,30,31,38,46,53]. The most prevalent outcome of enforcement was strongly manifested in the reduction of fire injuries and deaths. A study conducted by Festag et al. implied that mandatory smoke alarm installation across German federal states led to a substantial reduction in fire incidents and fire related mortality and morbidity[38]. A similar study carried out in Australia showed the association between enforced smoke alarm installation and the reduction of fire injury, hospitalization and deaths rates[46]. Moreover, Laing and Bryant confirmed in a study conducted in New Zealand the reduction of child injury rates following the 'safe clothing' legislation that served to prevent risk of nightwear fire incidents and protect children from fire[53].

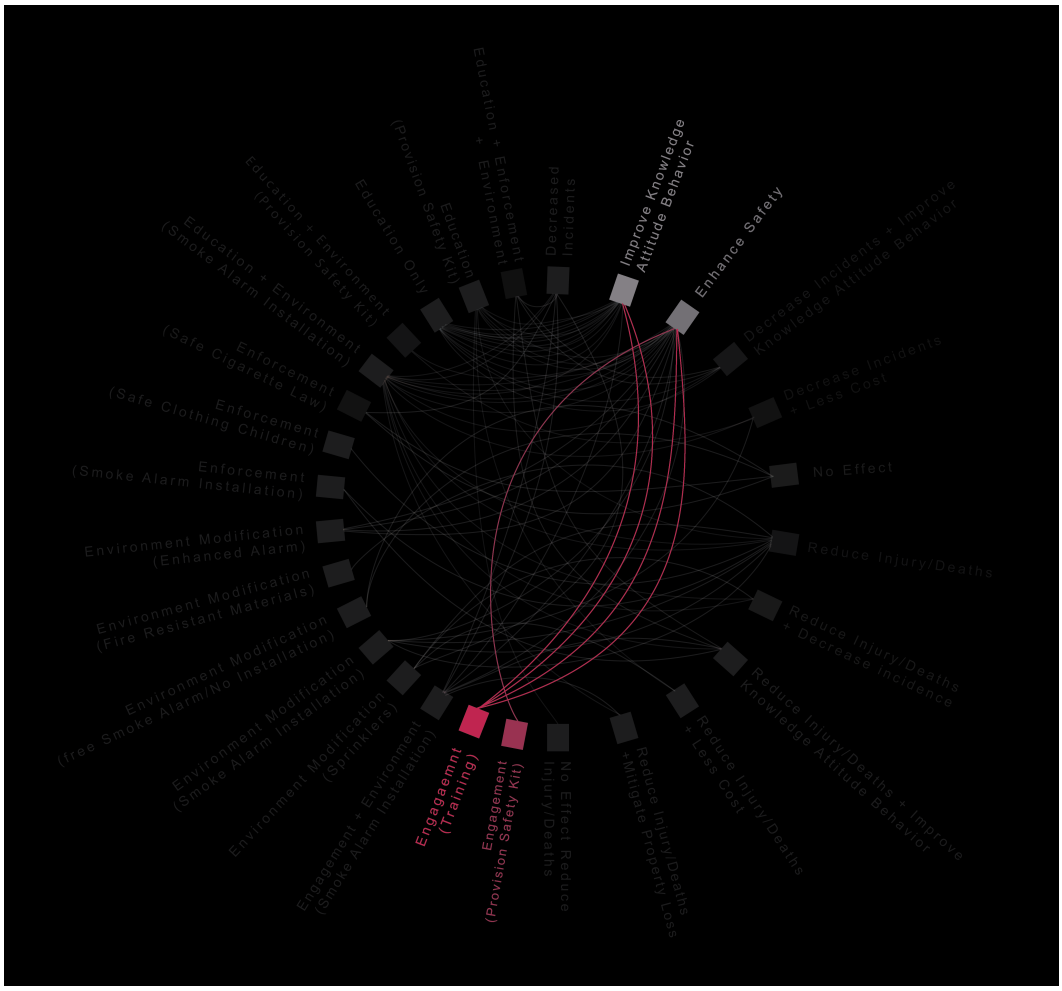
While some enforced fire regulations had strong impacts on the reduction of fire related injuries, others reported little evidence of their success in achieving any intended fire prevention outcomes. Bonander et al. examined the outcome of the Fire Safe Cigarette Law (FSCL) enforcement and the banning of all Non-Reduced Ignition Propensity (Non-RIP) cigarettes, showing minimal to null effect of the law on decreasing fire occurrences or reducing fire mortality and morbidity[30,31]. On the other hand, Alpert et al (2014) demonstrated the potential impact of the FSCL on the reduction of residential fires, with a small sample size study[28] - a larger sample size is required to confirm a definitive conclusion.



4.2.4. Engagement

A small number of studies (n =5 , 6.3%) proposed fire interventions that engaged participants in fire safety discussions[67], narrative simulation of emergency fire emergency situation[90] or hands-on training on fire safety skills[75,91,92]. Engaging individuals and initiating a cognitive interaction and discussion on the relevance of specific fire safety practices and the rationale for the safe behaviors was shown to be successful in improving participants' safety knowledge and enhancing their ability to identify hazardous behaviors and address fire safety deficiency in their surrounding environment[48,66,75,90,92,93].

Enhancing safety infrastructure was most effective when individuals were engaged in face-to-face interactions. Engagement with a fire safety trainer through door-to-door home visits or hands-on-training were effective in imparting the necessary safety skills needed to help individuals adopt the appropriate fire safety measures and emergency responses to mitigate the risks of fire. Receiving explanation and tailored instructions and recommendations were important to guide household members in selecting and adopting the most effective approach to enhance their home safety[93] - one study solicited fire safety pledges from participants to ensure sustainable safety behavior practices[91,92,94]. Involving fire service personnel in the implementation and dissemination of fire prevention messaging was beneficial for supporting individuals in making safer decisions, increasing their safety practices and reducing the risk of fire occurrence by nearly 5 times[92]. The participation of firefighters, volunteers, social workers, and community leaders led to increased participant engagement, acquisition of knowledge and adoption of safety measures in door-to-door home visits[41,94]. Home visits and engagement of household members in a face-to-face interactive discussion on fire safety helped to promote culturally sensitive and tailored fire prevention programs that would ultimately have effective impact on enhanced fire safety, particularly among vulnerable populations[50,66,81,95]. One study indicated that the intervention cohort that received educational materials and hands-on safety training were 16% more likely to install and maintain a functioning smoke alarm compared to those who only received educational interventions[91].



4.2.5. Combined Interventions

A large number of studies adopted multiple fire safety interventions. These combined interventions tended to amplify the impact of the implemented fire safety measures and led to enhanced prevention outcomes.

> *Educational Intervention and the Provision of Safety Equipment (n=10, %):* Fire educational interventions strengthened by the provision of a free or reduced-cost fire safety equipment, had a positive impact on enhanced safety behaviors andpractices[22,37,39,58,69,74,76,77,81,95], though a limited effect on fire incidence[21]. Two studies provided educational counselling by health professionals or pediatricians in a clinical setting to parents as part of their children's primary care, along with the provision of free or discounted fire safety kits[71,76]. These studies proved the effectiveness of the educational intervention when amplified by easy access to affordable fire safety kits and showed evidence of enhanced household acquisitions and installation of smoke alarms, use of fire guards and improved fireplace safety practices among families of young children. Counseling of parents on home fire safety and informing them of the importance of having a functioning smoke alarm, coupled with the provision of low-cost safety equipment, led to added installation and maintenance of operational smoke alarms among the intervention groups[76,81,96].

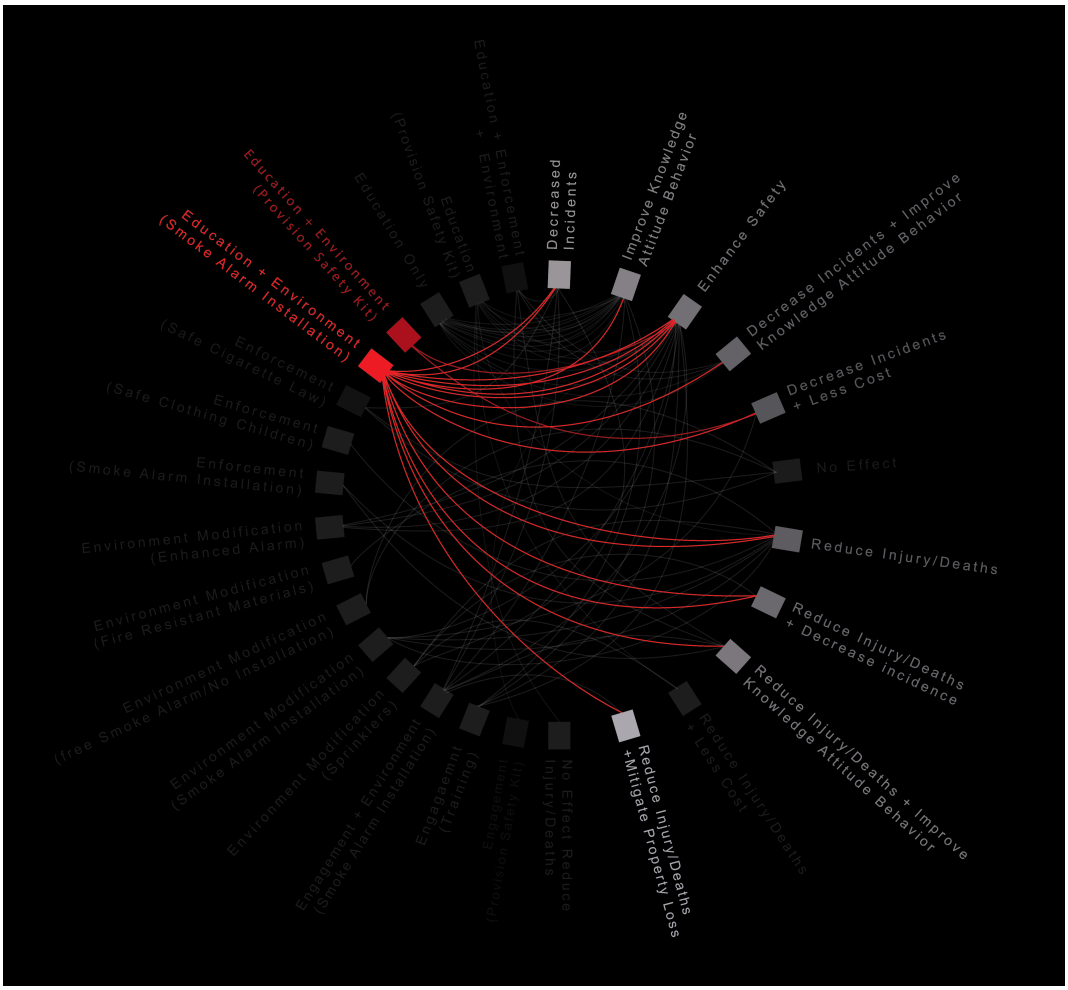
Although small in numbers, there was existing evidence that educational interventions along with access to safety equipment led to a significant reduction in fire incidence and fire related injuries and deaths. King et al. documented that home visits prevented 1 injury clinical visit for each 12 families participating in the fire prevention program with an economic saving equivalent to $372 CAN per prevented injury[77]. One community-based volunteer intervention study combined educational intervention with the provision of a safety kit and confirmed a substantial reduction in injury rates (59%) among the intervention group compared to a 6% increase in the control group[37]. Improved awareness of the fire problem, as well as ownership and utilization of safety equipment, were successful in enhancing individual safety practices which manifested in the installation and testing of smoke alarms and use of fire guards[22].

Environmental Modification Intervention and Education materials(n=17, %): Multi-faceted fire intervention programs and protocols that integrated multiple aspects of the E's interventions, such as education and environmental modifications showed substantial impact and greater benefits in reducing fires and preventing injuries[20,21,29,32,34,42,44,47,64,65,78,91,94,97,98]. The primary outcome for the combined environmental modification and educational interventions was the reduction in fire incidents and associated injuries and deaths, and the mitigation of costs on the healthcare systems.

Many studies confirmed the value of educating individuals on the relevance of maintaining functioning smoke alarms, offering recommendations on ways to install and maintain these safety devices, along with providing support on the physical installation of the smoke alarm. Smoke alarm installation coupled with fire safety education and supported by community members led to increased effectiveness in the acquisition and adoption of the safety changes[42]. Home visits and the provision of free smoke alarms were effective in increasing the prevalence of smoke alarm installation among targeted households. Smoke alarm distribution programs strengthened with a combination of education, low cost or free equipment and direct installations, and those programs that installed lithium-ion battery alarms reported the highest rates of coverage[29,36,67,94,97,98].

A Swedish study[64] and a Canadian study[34] confirmed the effectiveness of Home Fire and Safety Check (HFSC) intervention programs in the reduction in fire incidence of up to 49.3%, compared to the control group[34,64]. This environmental modification intervention indicated persistent positive effect during the follow up period with well-maintained and functioning smoke alarms within targeted communities. One study demonstrated that enhanced home visits in collaboration with community partners and a public health academic center succeeded in increasing access to homes by nearly 20%, ultimately leading to an enhanced acquisition of smoke alarms[42]. Canadian studies indicated that the presence of firefighters when implementing a neighborhood fire education campaign was valuable for enhancing environmental safety and changing behaviors in the community, and consequently leading to reduced fire incidence particularly among vulnerable populations and those at increased risks of residential fire[34,97]. Three studies described that hiring community liaisons and a recognized community representative was effective in engaging community members while providing advance notice of door-to-door safety inspections resulted in increased access to homes[42,77,78]. Another study confirmed the impact of home visits combined with the provision of a safety kit on reducing injuries, but highlighted the diminished retention of acquired safety knowledge over time post intervention, and consequently the overall effectiveness of the intervention[82].

Moreover, environmental modifications and education intervention programs are proven to be cost-effective[89] and may lead to a more prominent outcome in terms of improving knowledge, changing behaviors, and more importantly, preventing fire related injuries and deaths. A systematic review and meta-analysis revealed that the death rate per fire incident approximately doubled with the lack of an installed and functioning smoke alarm[86]. A study conducted among an indigenous community in New Zealand, demonstrated the substantial impact of education and smoke alarm installation in reducing injury hospitalization rates[32]. This emerging evidence affirms that environmental modification augmented by education interventions such as fire prevention information pamphlets and brochures were largely successful in decreasing fire incidents and reducing fire related hospitalizations and deaths.



Environmental Modification and Engagement (n=7): A number of studies confirmed that combining environmental modification interventions and participant engagement, resulted in a higher impact on various outcomes including enhanced safety and the reduction of fire injury[36,41,56,67,82,91]. Interacting with participants and engaging with community leaders, firefighters, healthcare workers and social workers led to higher acceptance and commitment to fire safety behaviors and practices[74]. In a UK study implemented by the Fire Rescue Service, households were engaged in a tailored home visit program that offer smoke alarm installation accompanied by context sensitive advice and recommendations. The intervention was effective in reducing fire incidence and fire related morbidity and mortality[29]. A combination of tailored and culturally appropriate intervention programs and strategies were successful and well received by the targeted population with a clear impact on their knowledge improvement, fire safety changing behaviors and the reduction of fire injuries[82,95].

Education, Environmental Modifications and Enforcement (n=5): Five reviews examined several risk factors associated with residential fires and thoroughly described effective interventions implemented in different countries[17,61,99-101]. These reviews included multiple studies conducted in the UK, USA, Canada, Europe and Japan with the aim to assess universal and distinctive resident, property and fire related factors that were associated with the increased risk of sustaining unintentional house fire incidents, injuries, and deaths. These reviews showed that households with young children, older adults, individuals with physical and mental disabilities, alcohol and drug addiction, smokers, single-family households, and low-income families were at a particularly heightened risk of fire-related injuries and deaths. Moreover, these reviews synthesized preventive strategies, methods and best practices to prevent residential fires including environmental modification, promotion of safety regulations and changes in risk behaviour among individuals. Proven best practices can be used as examples of successes to stimulate improvements in prevention practices in high-risk communities to help reduce fire incidence and casualties, with further adaptation to communities' unique environmental, cultural and social factors[17,59,60,65,100,101].

4.2.6. Others

Some interventions were primarily proposed as enhanced methods that can be adopted for fire injury prevention. These were theoretical in nature, modeling through computer simulation and mathematical models, or in some cases through laboratory experiments[102-116]. The use of technology was markedly integrated into the measures of fire prevention in recent years. Utilizing automated systems, artificial intelligence, fuzzy logic and machine learning were successful in detecting fire and sending alert messages such as a fire-fighting robot, electronic smoke detector nose (PEN3), etc.[113,117]. Using a Geospatial Information System (GIS) application was also successful in mapping and targeting high risk populations for more impactful interventions[118]. Using wireless sensors and networks to detect and extinguish residential fires represent a critical step towards enhancing home fire safety and preventing hazardous fires[79,111,115,119-124]. These studies have demonstrated hypothetically successful outcomes in reducing potential fires based on modeling of multiple safety measures simulating the actual fire context and setting. Adopting the Internet-of-Things (IoT), automated fire detection systems and advanced modeling all present an opportunity to enhance residential fire safety and a potential area of research to advance the field of fire prevention going forward.

5. Articles Summary

Synthesized knowledge from each eligible article is summarized in terms of the proposed type of fire intervention, its target population, the behavior it addresses and the associated outcome. It further highlights the potential relevance of previous fire safety program research and evidence to the indigenous community context.

1. **Volunteer driven home safety intervention results in significant reduction in pediatric injuries: A model for community-based injury reduction**
   Falcone RA.

A. Type of Intervention: Evidence-based safety interventions delivered in the home with installation of safety equipment

B. Target Population: Community with high injury rates for children between 1 and 5 years old

C. Study Period: 2012-2014

D. Setting/Location: High risk households with children younger than 5 years, Hamilton County, Norwood, OH, U.S.

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Reduction of emergency room attended injuries in a high risk, inner-city community.

G. Study Quality (Low, Medium, High) = Medium (16)

H. Applicability to Indigenous Community: The correlated characteristics of education, poverty and people from certain ethnic backgrounds are associated with an increased risk for fire-related death. Some Indigenous communities have higher fire death rates than other communities in Canada. Available studies clearly show relative statistical strength of ethnicity, education and poverty and risk of fire related deaths. High-risk groups defined by ethnicity and socioeconomic characteristics are also slightly less likely to have smoke alarms than other community groups. Moreover, poor households with smoke alarms are less likely to have working smoke alarms . Available literature clearly shows that the working smoke alarms greatly reduce the likelihood of a residential fire-related fatal injury by providing occupants with early warning and giving them additional time to escape. The smoke alarm strategy, therefore, is to achieve universal home use of effective, reliable fire detection/alarm equipment. This article provides up-to-date evidence suggesting that the selected smoke alarm promotion programs are effective. As highlighted in this research, several important issues must be addressed to maximize the impact of the smoke alarm strategy on residential fire deaths and injuries. Further reports articulate the best evidence to ensure that any successful program should incorporate a combination of interventions including installation, periodical home inspection to ensure its functionality and education to establish fire escape plan. Even though many homes have smoke alarms present but none that are working mainly due to dead or missing batteries, as opposed to problems with AC power. Research also highlights that households with non-operational smoke alarms that gave a reason cited nuisance alarms or continuous alarming as the reason for disabling the smoke alarm. Safe options for dealing with nuisance alarms without sacrificing smoke alarm protection is utmost important. Most importantly, development of tailored education programs in collaboration with these communities and incentives including installation of smoke detectors with lithium batteries can be effective.

2. Comparison of community-based smoke detector distribution methods in an urban community
Douglas MR.

A. Type of Intervention: Various methods of soliciting participation for a large smoke detector giveaway program

B. Target Population: Community dwellings at high risk for fires and injuries.

C. Study Period: 1990

D. Setting/Location: Households located Oklahoma City U.S.

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Enhanced safety increasing number of functional smoke alarms in high-risk households

G. Study Quality (Low, Medium, High) = Medium (15)

H. Applicability to Indigenous Community: Main limitation of this study is that the findings contradict most updated evidence-based research information that suggest distribution alone is not sufficient to enhance fire safety in the high-risk community dwellings. In fact, a 2012 Cochrane systematic review demonstrated a clear increase in safety product use and a reduction in injuries when the products were installed in the home. These interventions were further effective in increasing the proper usage of functional smoke alarms and fire escape plans as well. (Further information can be obtained from, Kendrick D, Young B, Mason-Jones AJ, et al. Home safety education and provision of safety equipment for injury prevention. Cochrane Database Syst Rev 2012;9, CD005014). Furthermore, most up to date evidence suggests that the smoke alarm promotion programs should ensure that they provide the combination of interventions including installation, periodical home inspection to ensure its functionality and tailored education to establish fire escape plan. Communities could create similar projects to address their own array of environmental health/home safety issues in a culturally appropriate and sensitive manner. Most importantly, the above tailored education program reinforced by incentives such as installation of smoke detectors with lithium batteries can be effective.

3. Evaluated Community Fire Safety Interventions in the United States: a Review of Current Literature
Ta VM.

A. Type of Intervention: All evaluations of U.S. based fire prevention interventions

B. Target Population: Review of all evaluations of U.S. based fire prevention interventions

C. Study Period: 1998-2004

D. Setting/Location: Center for Injury Research and Policy- Johns Hopkins Bloomberg School of Public Health, Baltimore, USA

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Enhanced safety knowledge and impact behavioural changes

G. Study Quality (Low, Medium, High) = Low (0)

H. Applicability to Indigenous Community: Best evidence in the literature suggests that more than half of residential fire injuries can be prevented if the homes had working smoke alarms and a practiced home escape plan in place. We can utilize evidence derived from this cohort study to tailor targeted interventions to prevent fire related problems unique to these communities. In addition, the fire personnel/community member partnerships combine experts (ex. Indigenous community liaison), legitimate, and referent power to make their communications about smoke alarms effective. Fire departments may be interested to serve as advocates for the use of such systems, especially if community programs partner with them in the design, implementation, and evaluation phases of their programs.

4. Sustainability of an In-Home Fire Prevention Intervention
Duchossois GP.

A. Type of Intervention: Implementation of an in-home visit to educate parents of third- and fourth-grade students on escape planning coupled with the installation of lithium smoke alarms.

B. Target Population: High risk multi-ethnic community -low-income neighbourhoods in West Philadelphia, Pennsylvania USA

C. Study Period: 2002

D. Setting/Location: Households located in high-risk sections of the income neighbourhoods in West Philadelphia, Pennsylvania USA

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Enhanced safety knowledge and impact behavioural changes

G. Study Quality (Low, Medium, High) = Medium (18)

H. Applicability to Indigenous Community: Best evidence in the literature suggests that more than half of residential fire injuries can be prevented if homes had working smoke alarms and a practiced home escape plan in place. We can utilize evidence derived from this cohort study to tailor targeted interventions to prevent fire related problems unique to these communities.

5. Increasing smoke alarm operability through theory-based health education: a randomised trial
Miller T.

A. Type of Intervention: Theory-based education to increase alarm operability.

B. Target Population: High risk multi-ethnic community -low-income neighbourhoods in Maryland, USA

C. Study Period: 2005-2008

D. Setting/Location: Households located in high-risk sections of the community in Maryland, USA

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Enhanced safety knowledge and impact behavioural changes

G. Study Quality (Low, Medium, High) = High (19.5)

H. Applicability to Indigenous Community: this study attempted to estimate the life-saving potential and cost-effectiveness of smoke alarms. Randomized controlled trials (RCT) based evidence are gold standard and less prone to bias in contrast to observational studies. Therefore, this RCT evidence shows that types of public education, targeted home visits can produce promising results including reduction in rates of fires and fire-related casualty through increased presence of working smoke alarms when residences were frequently audited. We can utilize evidence derived from this trial to tailor targeted interventions to prevent fire related problems unique to the Indigenous communities.

6. The effectiveness of specific fire prevention measures for different population groups
Runefors M.

A. Type of Intervention: Effectiveness of different fire preventive measures

B. Target Population: Higher risk households

C. Study Period: 2016

D. Setting/Location: Division of Fire Safety Engineering, Lund University, Lund, Sweden

E. Behaviour Addressed: Improve safety of home environment by enhancing behaviour around risk minimization related to different fire prevention interventions

F. Outcome: Enhanced and tailored fire safety interventions to address different high-risk groups.

G. Study Quality (Low, Medium, High) = Medium (14.5)

H. Applicability to Indigenous Community: Although the growing use of installed smoke detectors has decreased incidents of accidental fires in some areas, Indigenous dwelling fires remain a major health burden. Operational smoke alarms prevent or reduce many fires and the associated injuries or fatalities. Intervention containing all components presented in this study may be applicable to Indigenous communities (i.e., smokers 85+ years old, flame-resistant clothes are highly effective (64%), for smokers between 50 and 84 years old, both female and male equally benefits from flame resistant beds (43% and 42% respectively) while male benefits more from flame resistant sofa (38% compared to 19%). Study results empirically showed that the effectiveness of smoke alarms decreases significantly with age, particularly among smokers, but the benefit per installation still increases due to higher fire risk levels among the elderly.

7. **Home fire safety intervention pilot with urban older adults living in Wales**
   Lehna C.

A. **Type of Intervention:** Educational home fire safety (HFS) intervention

B. **Target Population:** Elderly in Wales-UK

C. **Study Period:** 2016

D. **Setting/Location:** Households located on the Swansea, Wales-UK

E. **Behaviour Addressed:** Improve safety of home environment

F. **Outcome:** Enhanced safety knowledge and impact behavioural changes

G. **Study Quality (Low, Medium, High) = Low (13.5)**

H. **Applicability to Indigenous Community:** This is a growing vulnerable population with a high risk for potential fires related exposure, within all communities regardless of the country of origin. However, with this new development, it is imperative that home fire safety education and resources such as the installation of free smoke alarms for those considered vulnerable are provided to reduce the risk of fire morbidity or mortality. In Canada, the focus of health promotion in terms of burns and scalds injuries has primarily targeted families with young children with limited attention directed at indigenous older people. There is a lack of resources specifically focusing on burns and scalds injuries tailored to address the learning needs of older people.

8. Intervention study for changes in home fire safety knowledge in urban older adults
Lehna C.

A. Type of Intervention: Educational home fire safety (HFS) intervention

B. Target Population: Elderly in the state of central Kentucky U.S.

C. Study Period: 2016

D. Setting/Location: Households located on the state of central Kentucky U.S.

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Enhanced safety knowledge and impact behavioural changes

G. Study Quality (Low, Medium, High) = Medium (14.5)

H. Applicability to Indigenous Community: The majority of the fire prevention programs in Canadian Indigenous communities exclusively focused on smoke alarm interventions and improving children's fire safety knowledge. Fire safety best evidence to prevent fire hazards specific to older adults have not been widely disseminated. Though few studies were found directed toward older adults, none have combined an education intervention component built to measure retention of fire prevention knowledge over time. We need to design similar studies targeting indigenous elders living in the community to address this gap in the literature. Furthermore, this study results can be replicated to enhance fire safety in particular targeting older individuals in indigenous communities. This is a growing population in the indigenous communities. Available literature and data show that the older adults have also been shown to be at higher risk for fire and burn-related injuries and deaths. The risk was even higher for older adults aged 85 year and older. Other factors impacting older adults' risk of fire-related death are physical and mental limitations, increased number of medications, and poverty status. As individuals age, cognitive and sensory function naturally decline, mobility lessens, and the number of chronic illnesses increases. These situations directly increase older adults' risk for fire and burn related injuries and deaths. With decreased cognitive and sensory function, older adults may be unable to recognize fire hazards and may unknowingly participate in riskier behaviours. Furthermore, decreased mobility can cause fall-related incidents and inhibit a person's ability to escape in the case of a fire. Finally, older adults tend to take more medications as they experience more chronic illnesses. Medications increase fire risk through side effects such as drowsiness, impaired judgment, and hypotension. Previous data also reported that Indigenous older adults living in poverty, are at higher risk of fire death due to substandard living conditions such as compromised building structures and faulty electrical systems.

9. **The Use of a Narrative Simulation in Rural Residential Fire Prevention: a Preliminary Study of Changes in Behavioural Intention**
   Goetz WC.

A. **Type of Intervention:** Story simulation Uncle Charlie's Christmas was developed to provide an instructional intervention to prevent injury and fatality from rural residential fires.

B. **Target Population:** Rural Kentucky residents U.S.

C. **Study Period:** 2012

D. **Setting/Location:** Households located in Rural Kentucky

E. **Behaviour Addressed:** Improve safety of home environment

F. **Outcome:** Enhanced safety knowledge and impact behavioural changes

G. **Study Quality (Low, Medium, High) = Poor (13.5)**

H. **Applicability to Indigenous Community:** Rural communities have disproportionately higher fire related fatalities. Even though this educational intervention has limited success partly due to its small sample size, it can be replicated with a larger sample size with modification to intervention, specifically to the unique cultural and needs of Indigenous communities in Canada.

10. The Environmental Health/Home Safety Education Project: A Successful and Practical U.S.–Mexico Border Initiative
Forster-Cox S.

A. Type of Intervention: Fire safety education and distribution of smoke alarms in homes at high risk for fires and injuries.

B. Target Population: Community dwellings at high risk for fires and injuries.

C. Study Period: 2002-2005

D. Setting/Location: Households located along the U.S.–Mexico border

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Enhanced safety knowledge and impact behavioural changes and smoke alarms present.

G. Study Quality (Low, Medium, High) = Medium (14.5)

H. Applicability to Indigenous Community: Culturally sensitive outreach is very important when designing prevention programs with these communities. Smoke alarm promotion programs should ensure that they provide the combination of interventions including home inspection and education for them to be effective. The Environmental Health/Home Safety Education Project uses well-trained individuals, who represent the community's linguistic, cultural, educational, and economic characteristics. As health promoter enters homes, assesses potential environmental hazards, and provides support and assistance in the resolution of many of the identified hazards, a large number of participants made their homes safer. Using the Environmental Health/Home Safety Tool Kit, which was developed collaboratively taking into consideration the unique cultural context to promote fire safety enhancement initiatives for indigenous and rural communities. Communities could create similar projects to address their own array of environmental health/home safety issues in culturally appropriate and sensitive manners. Most importantly, the education program was reinforced by incentives and distributions of smoke detectors, fire extinguishers, electrical safety caps and fire safety related educational materials.

11. Analysis of the effectiveness of the smoke alarm obligation – Experiences from practice
Festag S.

A. Type of Intervention: Germany -different state legislations on smoke alarms –(The smoke alarm obligation (SAO)

B. Target Population: Population living in different states in Germany

C. Study Period: 1998-2016

D. Setting/Location: Households located in different states in Germany.

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Presence of working smoke alarms and the reduction of fire deaths.

G. Study Quality (Low, Medium, High)= Poor (14)

H. Applicability to Indigenous Community: This study rightly addresses smoke alarm effectiveness focusing on the right denominator for the intervention evaluation "Presence of working smoke alarms and the reduction of fire deaths". Also as shown in this study legislation has been the least effective in increasing smoke alarm ownership among households where smoking is allowed. Injuries have become an increasingly important contributor to Indigenous communities and their morbidity and mortality. Moreover, injuries caused by fire and flame are relatively more serious than other types of home injuries. In addition, fire injuries show the steepest social class gradient among all injuries. Because of their severity and their contribution to health inequalities, and because potentially effective interventions exist, fire related injuries in these communities should be targeted for prevention efforts. Available evidence shows that smoke alarm giveaway programs may be effective in reducing fire related injuries, this study further affirm that smoke alarm legislation requiring smoke alarm installation. However, the problem of alarm maintenance (for example, battery replacement), especially among impoverished households, must also be built into the overall intervention. Well-designed periodical home visits to help maintain a functional smoke alarm may be a worthwhile endeavor. Because of the varied causes of fire injuries, it is likely that diverse interventions targeting those at highest risk such as the elderly, families with young children, may be required to address this important public health problem. Targeted campaigns are needed to reach these high-risk groups and to ensure that smoke alarms are functional.

12. Evidence-based practices of effective fire safety education programming for children
Pooley K.

A. Type of Intervention: Fire education for school children

B. Target Population: School children from all over the world.

C. Study Period: 2021

D. Setting/Location: Australia

E. Behaviour Addressed: Enhancement of the school children fire safety behaviour

F. Outcome: Decline the risk of fire in the community and enhance children's knowledge and behaviour regarding fire safety.

G. Study Quality (Low, Medium, High) = Poor (0)

H. Applicability to Indigenous Community: Factors that increase a child's risk of fire-related injury and death have been shown to include a range of environmental, behavioural, and social conditions. Available studies have identified maternal education, socioeconomic status, being from a single-parent household, housing regulations, lack of fire escape plans, smoke alarm functionality, and adequate adult supervision as important risk determinants. These conditions are highly prevalent in Indigenous communities. It's worth noting that not all children learn the same way. What works for some children will not work for others. Moreover, not all children experience the same risks, where culture, race, ethnicity and socio-economic disparities influence risk of fire and child injury. To ensure fire safety is targeted towards the needs of participants (and the risks experienced by unique communities, and their unique needs) the 'multiple messages-multiple methods' approach should be employed. In this aspect, this evidence-based information is important, because it contributes to the body of knowledge concerning fire safety education. Fire safety education that is culturally sensitive and strictly evidence-based focuses on stimulating and interactive can be effective in transferring knowledge and skill. Simplified messages such as 'get down low and go, go, go' to safely exit a room with a smoke layer and 'stop, drop, cover, and roll' when clothing catches alight help teach children how to respond appropriately to fire. Moreover, overall fire safety education should strictly involve skill development such as fire escape. Furthermore, the use of an overarching, evidence-based framework will enhance the capacity of Indigenous community-based fire services organizations to reduce the risk of fire among children.

13. Network Meta-analysis to evaluate the Effectiveness of Interventions to Increase the Uptake of Smoke Alarms
Cooper NJ.

A. Type of Intervention: Interventions to Increase the Uptake of Smoke Alarms /Interventions to increase the prevalence of functioning smoke alarms in households with children

B. Target Population: Higher risk household

C. Study Period: 2012

D. Setting/Location: Centre for Health Economics, University of York, York, United Kingdom

E. Behaviour Addressed: Improve safety of home environment by enhancing behaviour around risk minimization related to fire Interventions to increase the prevalence of functioning smoke alarms in households with children

F. Outcome: Enhanced safety knowledge and impact behavioural changes (attitudes to home fire safety, behaviour around risk minimization related to fire)

G. Study Quality (Low, Medium, High) = Poor (0)

H. Applicability to Indigenous Community: Although the growing use of installed smoke detectors has decreased incidents of fires in some areas, Indigenous dwelling fires remain a major health burden. Operational smoke alarms prevent or reduce many fires and the associated injuries or fatalities. Intervention containing all components (i.e., education + low cost/free equipment + fitting + home inspection to) was identified as being the most likely to be the most effective (probability best = 0.66, with an estimated odds ratio versus usual care of 7.15 (95% credible interval: 2.40, 22.73) to increase prevalence of functional smoke alarms. Ionization alarms with lithium batteries are the ‘‘best’’ type in terms of increasing the prevalence of functional smoke alarms.

14. Home Fire Safety Checks in New South Wales: an economic evaluation of the pilot program
Tannous WK.

A. Type of Intervention: Fire safety home visits (safety checks, including having smoke alarms installed, having batteries changed in smoke alarms, and being provided with fire blankets and fire safety information)

B. Target Population: Higher risk households in state of NSW, Australia

C. Study Period: 2014

D. Setting/Location: Households located on the state of NSW, Australia

E. Behaviour Addressed: Improve safety of home environment by enhancing behaviour around risk minimization related to fire.

F. Outcome: Enhanced safety knowledge and impact behavioural changes (attitudes to home fire safety, and behaviour around risk minimization related to fire)

G. Study Quality (Low, Medium, High) = Poor (14)

H. Applicability to Indigenous Community: Individuals in remote or rural areas and those with low incomes show a significantly higher risk of fatality from house fires. In addition, other individual risk factors are psychotropic and sedative drug intake, discarded cigarette material, and alcohol consumption. These factors are highly prevalent in these vulnerable communities. Although the growing use of installed smoke detectors has decreased incidents of accidental fires in some areas, Indigenous dwelling fires remain a major health burden. Operational smoke alarms prevent or reduce many fires and the associated injuries or fatalities. We need to be proactive and target high-risk Indigenous households to promote installing smoke alarms and ensure their functionality, as well as provide fire safety education. Targeted interventions based on the identification of households most at risk of fire incidents have been increasingly recognized in the literature as best evidence to prevent house fires.

15. Domestic fire emergency escape plans among the aged in NSW, Australia: the impact of a fire safety home visit program
Tannous WK.

A. Type of Intervention: Fire safety home visits carried out by trained community members to assess home fire escape plans

B. Target Population: Elderly in the state of NSW, Australia

C. Study Period: 2016

D. Setting/Location: Households located on the state of NSW, Australia

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Enhanced safety knowledge and impact behavioural changes

G. Study Quality (Low, Medium, High) = Medium (17)

H. Applicability to Indigenous Community: Evidence based interventions to prevent fire related injuries mainly include the five-fire emergency escape plan outcome measures (participants having a working smoke alarm, identify measures to adopt if there was a fire at home, making a plan to escape home in the event of a fire, finding out how to escape home in an emergency and finding out how to maintain installed smoke alarm). This comprehensive model if adjusted to incorporated cultural sensitivity of these specific communities can be highly effective in controlling and preventing residential fires. According to available literature, the limitation of fire alarm systems is that most households have no fire escape plan when fire alarm sounds. This needs to be an important aspect of residential fire prevention work and should be widely implemented into smoke alarm installation and related educational intervention.

16. Surveillance and Prevention of Residential-Fire Injuries
Mallonee S.

A. Type of Intervention: Distribution of smoke alarms and surveyed alarm use and function

B. Target Population: High risk community

C. Study Period: 1987-1990

D. Setting/Location: Households located in Oklahoma City- U.S

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Enhanced safety knowledge and impact behavioural changes/public health importance of enhanced surveillance data on fire prevention

G. Study Quality (Low, Medium, High) = Medium (16)

H. Applicability to Indigenous Community: Surveillance data are the foundation of the public health approach to the prevention of diseases and injuries. These data are frequently used to conduct epidemiologic studies and to identify high-risk populations, activities, or behaviour that prevention programs could target. It is known that fire related surveillance data is not available- specifically among most indigenous communities. Therefore, it is difficult to understand prevalence and how specific interventions can be used to prevent fire incidents. Although the absence of functional smoke alarms in residential dwellings is a risk factor for subsequent injury or death, surveillance data is not available to estimate true prevalence in these high-risk communities. The purpose of setting up the surveillance system in these high-risk communities is to guide the development and evaluation of prevention efforts by defining groups at potentially high risk for residential fires and related injuries, deaths and the circumstances resulting in such injury.

17. Reduced frequency and severity of residential fires following delivery of fire prevention education by on-duty fire fighters: Cluster randomized controlled study
Clare J.

A. Type of Intervention: Home visits carried out by firefighter-to deliver fire-prevention education and smoke alarm examination/installation

B. Target Population: High risk multi-ethnic community

C. Study Period: 2008

D. Setting/Location: Households located in high-risk sections of the community in City of Surrey BC Canada.

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Enhanced safety knowledge and impact behavioural changes

G. Study Quality (Low, Medium, High) = Medium (16)

H. Applicability to Indigenous Community: Randomized controlled trials (RCT) based evidence are gold standard and less prone to bias. Therefore, this RCT evidence shows that types of public education, targeted home visits can produce promising results including reduction in rates of fires and fire-related casualty through increased presence of working smoke alarms when residences were frequently audited. We can utilize evidence derived from this trial to tailor targeted interventions to prevent fire related problems unique to Indigenous communities.

18. How to increase earthquake and home fire preparedness: the fix-it intervention
Joffe H.

A. Type of Intervention: Home visits carried out by trained community members to assess home fire safety hazards to increase household preparedness for earthquakes and home fires in Seattle (USA) and Izmir (Turkey). The intervention consisted of two 3-h interactive, face-to-face workshop aims to improve earthquake and home fire preparedness at the household level.

B. Target Population: High risk communities in Seattle (USA) and Izmir (Turkey)

C. Study Period: 2015

D. Setting/Location: Households Seattle (USA) and Izmir (Turkey)

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Enhanced safety knowledge and impact behavioural changes

G. Study Quality (Low, Medium, High) = Medium (15)

H. Applicability to Indigenous Community: Based on additional evidence, other factors must also be built into the intervention to make it effective. Socio-cultural factors also need to be considered in order to improve earthquake and home fire preparedness at the household level. Overall, the findings suggest that empowered, cohesive communities, who have trust in their social systems might put more effort into self-preparation, rather than relying on "corrupt" governmental authorities to protect them.

19. A Randomized, Clinical Trial of a Home Safety Intervention Based in an Emergency Department Setting
Posner JC.

A. Type of Intervention: Education and safety device disbursement (smoke and carbon monoxide alarms, stair gates, and gun locking devices.)

B. Target Population: Parents and caregivers of children who were younger than 5 years

C. Study Period: 2001

D. Setting/Location: Emergency Department, Children's Hospital of Philadelphia U.S.

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Enhanced safety knowledge, impact behavioural changes and improvement in safety practices

G. Study Quality (Low, Medium, High) = High (20)

H. Applicability to Indigenous Community: This study found that the disbursement of educational materials and/or inexpensive safety equipment to increase parental safety knowledge and device use. The implication and applicability to Indigenous community is that the simple and targeted interventions might be more effective.

20. Partnership working between the Fire Service and NHS: delivering a cost-saving service to improve the safety of high-risk people
Craig JA.

A. Type of Intervention: Home visits carried out by trained community member (FIRE SAFETY LINK WORKER) to assess home fire safety hazards

B. Target Population: Adults at high risk of fires

C. Study Period: 2002-2005

D. Setting/Location: The setting was community care. The economic study was carried out in the UK.

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Enhanced community partnership and cost effectiveness of this intervention

G. Study Quality (Low, Medium, High) = Medium (15)

H. Applicability to Indigenous Community: A Community Fire Safety Link Worker provided Risk Assessments to adults, identified by community health teams, at high risk of fires, with the aim of reducing fires. An existing evaluation shows the Service developed a culture of 'high trust' between partners and had high client satisfaction. Cross-referring clients, using clear protocols and efficient information-sharing systems, combined with the effective delivery of well-validated Risk Assessments has been demonstrated to enhance the safety of high-risk individuals and deliver net cost savings for society. Higher rates of deprivation, smoking and alcohol abuse are important risk factors for fire and similar risk factors apply to Indigenous communities as well.

21. Teaching Severely Self-Abusive and Aggressive Autistic Residents to Exit to Fire Alarms
Israel ML.

A. Type of Intervention: Fire escape training (trained to exit their residences, without the presence or assistance of staff, when a fire alarm sounded at night.)

B. Target Population: Self-abusive and aggressive autistic residents

C. Study Period: 1989-1990

D. Setting/Location: Six different community residences, children of special need –U.S.

E. Behaviour Addressed: Improve safety and behaviour

F. Outcome: Enhanced safety and impact behavioural changes

G. Study Quality (Low, Medium, High) = Medium (15)

H. Applicability to Indigenous Community: Special needs children and adults often have sensory losses, making them less likely to hear a smoke alarm, find the evacuation route, or smell smoke. Further, substance abuse problems can aggravate these conditions. These interventions can be highly applicable to homes with one or more residents with alcohol abuse problems and residents with drug abuse problems. Alcohol and drug use can impair a resident's ability to respond to the alarm or evacuate without assistance.

22. Impact of a community-based fire prevention intervention on fire safety knowledge and behaviour in elementary school children
Hwang V.

A. Type of Intervention: Community based fire prevention intervention on fire safety knowledge and behaviour in elementary school children.

B. Target Population: Elementary school children.

C. Study Period: 2003 March through June 2003.

D. Setting/Location: Two elementary schools in an urban, poor, minority community around-Children's Hospital of Philadelphia- U.S.

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Enhanced safety knowledge and impact behavioural changes

G. Study Quality (Low, Medium, High) = Medium (17)

H. Applicability to Indigenous Community: Young children, in particular those under 5-years old, have 2.5 times higher risk of dying in a fire compared to any other childhood age group. Similar culturally sensitive targeted educational efforts can be effective among Indigenous children and their households.

23. The Impact of Recent Changes in Smoke Alarm Legislation on Residential Fire Injuries and Smoke Alarm Ownership in New South Wales, Australia
Harvey LA.

A. Type of Intervention: New South Wales (NSW) state legislation on smoke alarms

B. Target Population: New South Wales (NSW) community in Australia

C. Study Period: 2002-2010

D. Setting/Location: Households located on NSW Australia.

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Residential fire-related hospitalizations and smoke alarm ownership.

G. Study Quality (Low, Medium, High) = Medium (15)

H. Applicability to Indigenous Community: Legislation has been the least effective in increasing smoke alarm ownership among non-English-speaking households, in households where smoking is allowed, in low socioeconomic households, and in households with a high proportion that lack regular testing of smoke alarms. Targeted campaigns are needed to reach these high-risk groups and to ensure that smoke alarms are functional.

24. The Effects of Computer-Based Fire Safety Training on the Knowledge, Attitudes, and Practices of Caregivers
Harrington SS.

A. Type of Intervention: Computer-based instruction as a way to teach fire emergency planning for older adults in small residential board and care facilities (e-Learning has been utilized as an alternative to instructor-led training to meet the fire safety training needs of owners, operators, with awareness, attitudes)

B. Target Population: Owners, operators, and staff of small residential care facilities for the elderly.

C. Study Period: 2009

D. Setting/Location: Selected residential care facilities in Maryland- U.S.

E. Behaviour Addressed: Improve safety of residential care facility environment

F. Outcome: Enhanced safety knowledge and impact behavioural changes

G. Study Quality (Low, Medium, High) = Medium (15)

H. Applicability to Indigenous Community: E learning can be feasible to allow caregivers to complete the training at their own convenience. They can complete the training at the facility or at their own homes. CBT is not dependent on time of day or availability of instructors and so it is easier to schedule, according to need of any community including Indigenous communities living in rural and remote areas.

25. Cost effectiveness analysis of a smoke alarm giveaway program in Oklahoma City, Oklahoma
Haddix AC.

A. Type of Intervention: Smoke alarm distribution and program also included fire prevention education and battery replacement components.

B. Target Population: Oklahoma City Population

C. Study Period: 1987-1995(The effectiveness data and resource use were gathered between 1990 and 1995. Medical costs were obtained from chart reviews during the pre-intervention period (1987 to 1990). (The price year was 1990).

D. Setting/Location: The setting was community care. The economic study was carried out in the U.S.

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Enhanced safety knowledge and impact behavioural changes

G. Study Quality (Low, Medium, High) = Medium (15)

H. Applicability to Indigenous Community: The study population comprised residents of Oklahoma City U.S., who were living in an area with a residential fire injury rate 2.6 times higher than the rest of the city, similar to increased rates in most Indigenous communities. Furthermore, this study area also had a lower median house income, lower property values, and poorer quality of housing. These conditions are also highly prevalent in Indigenous communities in Canada. The number of persons per occupied dwelling was also higher as in most indigenous communities. Therefore, applicability of these interventions and practicality of applying them to reduce and prevent residential fire injuries can be recommended.

26. Determining the cost effectiveness of a smoke alarm give-away program using data from a randomized controlled trial
Ginnelly L.

A. Type of Intervention: Primary prevention

B. Target Population: The study population comprised households located in administrative units with above average material deprivation, defined as a Jarman Under Privileged Area score of 20 or higher

C. Study Period: 1998-2002 (The effectiveness and resource use data were derived from a study published in 2002. A unique price year was not reported, but the unit costs were taken from sources published in 1998, 1999 and 2000).

D. Setting/Location: The setting was the community. The economic study was carried out in the UK.

E. Behaviour Addressed: Improve safety of home environment (Free smoke alarms, batteries and fire safety brochures)

F. Outcome: Enhanced safety knowledge and impact behavioural changes –reducing emergency department (AED) attendance, hospitalization or death.

G. Study Quality (Low, Medium, High): = Medium (17)

H. Applicability to Indigenous Community: The study examined a smoke alarm give-away program, called the 'Let's Get alarmed!' Initiative, which distributed smoke alarms, batteries, and fire safety brochures, (highly cost effective) can be applied to Indigenous households, if designed to match to their needs and unique cultural and economic circumstances.

27. Enhancing Fire Department Home Visiting Programs: Results of a Community Intervention Trial
Gielen AC.

A. Type of Intervention: Home visits carried out by trained community members to assess home fire safety hazards and baseline survey to collect base line data

B. Target Population: Baltimore Maryland City residents including Black or African American

C. Study Period: Between July and December 2009

D. Setting/Location: Households located on Baltimore City U.S.

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Enhanced safety knowledge and impact behavioural changes

G. Study Quality (Low, Medium, High) = Medium (17)

H. Applicability to Indigenous Community: This study shows intervention containing all components (i.e., education + low cost/free equipment + fitting + home inspection) as being the most effective best evidence in the literature. These interventions can be highly effective Indigenous communities as well. Researchers designing community interventions will need to consider how best fit these interventions to communities' unique and underline SES cultural and social factors. Further, this study is similar to the earlier work by Schwarz et al, who hired community liaisons to engage community members at the block level in advance of having safety inspectors go door-to-door. Like Schwarz's work, this study also found that advance notice provided by a recognized community representative resulted in increased access to homes.

28. Evaluation of Fire-Safety Programs that use 10-Year Smoke Alarms
Jackson M.

A. Type of Intervention: Installation of lithium-powered "10-year" smoke alarms in homes at high risk for fires and injuries.

B. Target Population: Community dwellings at high risk for fires and injuries.

C. Study Period: 1998-2008

D. Setting/Location: Households located on the Georgia, Kentucky, Oklahoma, Virginia and Washington) –U.S.

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Key outcomes of interest were: (1) the alarms being functional; and (2) a home having any original alarms missing. Evaluation and follow-up are essential to smoke alarm installation programs. Because alarms can become non-functional for reasons other than battery failure, fire departments and organizations that do installation programs should plan to revisit homes 6–8 months after the initial installation to assess alarm functionality. This is particularly important for areas with high occupancy turnover. This study found that only 33% of the original alarms were still functioning at follow-up. In a large proportion of homes, the original alarm was physically removed. Other homes had alarms present but not functional.

G. Study Quality (Low, Medium, High) = Poor (14)

H. Applicability to Indigenous Community: Several risk factors have been associated with fire related deaths at Indigenous communities including socioeconomic status, the non-functional smoke alarms in homes and older housing. In this study, numerous interventions and programs have been implemented to address these interwoven problems. Most of these interventions can be implemented collaboratively including provision of low cost or free smoke alarms (with lithium batteries to increase functioning possession) reinforced by education and awareness programs highlighting life-saving effects on these low-cost interventions. Culturally sensitive outreach is very important when designing prevention programs with these communities. Smoke alarm promotion programs should ensure that they provide the combination of interventions including periodical home inspection and education to support sustainable operational smoke detectors at home.

29. Preventing deaths and injuries from house fires: an outcome evaluation of a community-based smoke alarm installation programme
Istre GR.

A. Type of Intervention: Community-based smoke alarm (SA) distribution program

B. Target Population:

C. Study Period: 1999-2011

D. Setting/Location: Households located in the high-risk census tracts in Dallas TX U.S.

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Enhanced safety by preventing deaths and injuries from house fires

G. Study Quality (Low, Medium, High) = Medium (16)

H. Applicability to Indigenous Community: The correlated characteristics of education, poverty and people from certain ethnic backgrounds are associated with an increased risk for fire-related deaths. Indigenous have higher fire death rates compared to other communities in Canada. Available studies clearly show relative statistical strength of ethnicity, education and poverty and risk of fire related deaths. High-risk groups defined by ethnicity and socioeconomic characteristics are also slightly less likely to have smoke alarms than other community groups. Moreover, poor households with smoke alarms are less likely to have their smoke alarms working. Culturally appropriate Indigenous community smoke alarm installation and culturally sensitive educational and awareness initiatives can produce remarkable results that may be significant in helping to further reduce fire-related deaths across different Indigenous communities on reserve and off reserve.

30. Reaching an underserved population with a randomly assigned home safety intervention
Hendrickson SG.

A. Type of Intervention: Home visits included counseling, assessment of maternal safety practices, and provision of safety items.

B. Target Population: Texas (non-urban area) where low income, largely migrant Hispanics represent the majority of residents.

C. Study Period: 1998-1999

D. Setting/Location: Eighty-two mothers of 1–4-year-old children living in Texas US.

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Improved self-efficacy for home safety behaviours.

G. Study Quality (Low, Medium, High) = Medium (17)

H. Applicability to Indigenous Community: According to Cochrane systematic review (2013) home safety interventions (home visit with a culturally sensitive education interventions) should be delivered as one-to-one, face-to-face education. This should be also strengthened by a provision of safety equipment. There is some evidence that such interventions may reduce injury rates, particularly where interventions are provided at home. This study reiterated that safety items coupled with a home visit tailored to match child age and maternal culture was an effective intervention in a hard-to-reach population. This study contributes to designing research for a monolingual population with limited local language proficiency and community residency. Increasing a mother's self-efficacy for safety behaviours, together with modification of the home environment is effective. Creating an intervention in the language of the target population is desirable. Main lesson from this study was that when financial assistance provided to households to buy safety equipment, more often, parents spend this money to buy daily needs of the families, rather buying safety equipment. Conflicting findings regarding interventions providing safety equipment on safety practices and injury outcomes are likely to be explained by this evidence.

31. Home safety education and provision of safety equipment for injury prevention (Review)
Kendrick D.

A. Type of Intervention: Effectiveness of home safety education, with or without the provision of low cost, discounted or free equipment

B. Target Population: Households with preschool students and children aged 19 years and under

C. Study Period: 2009

D. Setting/Location: Division of Primary Care, University of Nottingham

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Enhanced safety knowledge and impact behavioural changes to reduce child injury rates or increase home safety practices

G. Study Quality (Low, Medium, High) = Poor (0)

H. Applicability to Indigenous Community: Best evidence in the literature suggests that the greater reductions in injury rates were found for interventions delivered in the home (IRR 0.75, 95% CI 0.62 to 0.91), and for those interventions not providing safety equipment (IRR 0.78, 95% CI 0.66 to 0.92). Home safety interventions were effective in increasing the functional smoke alarms (OR 1.81, 95% CI 1.30 to 2.52), a fire escape plan (OR 2.01, 95% CI 1.45 to 2.77). Study has contradictory conclusions and therefore findings need to be interpreted with some cautious. There is a lack of evidence regarding its impact on child injury rates. Interventions providing free, low cost or discounted safety equipment appeared to be more effective in improving some safety practices than those interventions not doing so. However, existing literature suggest that half of residential fire injuries can be prevented if the homes had functioning smoke alarms and a practiced home escape plan in place. We can utilize evidence derived from this review to tailor targeted interventions to enhance both functional smoke alarm prevalence and specifically to have a fire escape plans in high-risk households.

32. Preventing injuries in children: cluster randomized controlled trial in primary care.
Kendrick D.

A. Type of Intervention: A package of safety advice at child health surveillance consultations/ and home safety checks and first aid training by health visitors.

B. Target Population: Families with children aged under age 3.

C. Study Period: 1995-1997

D. Setting/Location: 36 general practices in Nottingham, UK

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Primary outcomes measures were frequency and severity of medically attended injuries. Secondary outcome measures were self-reported safety practices, possession and use of safety equipment, knowledge and confidence in dealing with first aid, and perceptions of risk of injury and risk of hazards.

G. Study Quality (Low, Medium, High) = High (19.5)

H. Applicability to Indigenous Community: Caution should be exercised in adapting the primary outcomes of this study. No significant difference in outcome of injuries was found between the intervention and control groups. Secondary outcome measures owing to the low response rate to the follow up questionnaire. There was no difference in the number of unsafe practices between groups.

33. The Effectiveness of a Home Visit to Prevent Childhood Injury
King WJ.

A. Type of Intervention: Single home visit to assess home injury safety hazards and improve home safety/discount coupons/ including injury awareness and knowledge

B. Target Population: Parents and caregivers of children injured in Montreal, Halifax, Manitoba and Toronto

C. Study Period: 1994-1996

D. Setting/Location: Households located on Montreal, Halifax, Manitoba and Toronto

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Enhanced safety knowledge and impact behavioural changes

G. Study Quality (Low, Medium, High) = High (20)

H. Applicability to Indigenous Community: This study shows intervention containing all components (i.e., education + low cost/free equipment + fitting + home inspection) as being the most likely to be the most effective best evidence in the literature. These interventions can be highly effective Indigenous communities as well. Researchers designing community interventions will need to consider how best fit these interventions to communities' unique and underline SES cultural and social factors. Further, this study is similar the earlier work by Schwarz et al, who hired community liaisons to engage community members at the block level in advance of having safety inspectors go door-to-door. Like Schwarz's work, this study also found that advance notice provided by a recognized community representative resulted in increased access to homes. An intervention using a single home visit to improve the extent to which families use passive and active measures was insufficient to influence the long-term adoption of home safety measures but was effective to decrease the overall occurrence of injuries. The home visit prevented one injury visit to the doctor for each 12 families participating in the program, and the cost of preventing these injuries was small in proportion to the benefits gained by society. Future programs should integrate with other home visitation programs and target a few, well-focused, evidence-based areas including the evaluation of high-risk groups and the effect of repeated visits on outcome. Economic evidence shows the intervention is also cost-effective. A cost effectiveness analysis of the preventive impact of home visits in a multicentre survey in Canada indicates a savings of 372 Canadian dollars per avoided injury.

34. Education and Counselling for Child Fire setters: A comparison of Skills Training Programs with Standard Practice
Kolko DL.

A. Type of Intervention: Tailored community: fire safety education and mental health practitioners psychological counseling

B. Target Population: Juvenile fire setters (5-13 years old)

C. Study Period: Between July and December 2009

D. Setting/Location: Households located on Pittsburgh U.S.

E. Behaviour Addressed: Improve safety reducing fire setting behaviours

F. Outcome: Enhanced safety knowledge and impact behavioural changes

G. Study Quality (Low, Medium, High) = Poor (14)

H. Applicability to Indigenous Community: Primary prevention aims to avoid an undesirable event by reducing the likelihood of it occurring in the first place. Firefighter-delivered fire safety education provided in schools is a form of primary prevention as it aims to reduce the likelihood of youth fire setting occurring in the youth population. Fire safety education programs are implemented to reduce the likelihood of a fire accident occurring and the consequences associated with fire. Findings suggest more attention should be given to the role of family dynamics in relation to youth fire setting. Interventions that incorporate fire safety education and psychosocial interventions are recommended. Further this study shows intervention containing all components (Fire safety professionals involved standard education + home inspection+ psychological counseling+ psychosocial intervention -Cognitive Behaviour Therapy (CBT) as being the most likely to be the most effective best evidence in the literature. CBT was compared with fire safety education or home visit with a firefighter in another study of 38 juvenile fire setters. CBT and fire safety education were reported to be superior to home visits with a firefighter regarding the following outcomes: frequency of fire setting, playing with matches, severity of individualized problems with fire, involvement in fire-related acts, and "other deviant fire activities. CBT is generally regarded as an acceptable and efficacious treatment to prevent future episodes of fire setting. These interventions can be highly effective Indigenous communities as well. It is crucial for family and community professionals to understand fire setting, its implications, and impact upon others. Firefighters are poised to help, ensuring high risk individuals are identified, concerns are communicated through the proper channels, and appropriate strategies are put in motion to assist the high-risk children in obtaining the necessary support to intervene and correct the behaviour. Juvenile fire setting is a problem causing millions of dollars of property loss, many injuries from burns, and even results in deaths. Still, there is little research on youth fire setting in comparison to other child and adolescent behaviours in aboriginal settings. Through collaborative efforts with families and community professionals, intervention considerations can offer safety for community at large. Moreover, fire setting behaviour can be addressed to reduce deviance and promote pro-social child and youth activities which nurture healthy self-esteem, mature cognitive development, and individual responsibility in the community.

35. Home delivery of an injury prevention kit for children in four French cities: a controlled randomized trial
Sznajder MS.

A. Type of Intervention: One hundred families from four towns in the Paris suburbs were visited at home by nurses or doctors when their child reached 6-9 months. Fifty families (group 1) received counseling and a kit including preventive devices (smoke alarm) and pamphlets about indoor injuries and ways to avoid them. The other 50 families (group 2) received counseling but not the kit.

B. Target Population: One hundred families from four towns in the Paris (France) suburbs and the selection criteria were: primipara, medical problem, psychological, and/or socioeconomic difficulties.

C. Study Period: 2001-2002

D. Setting/Location: Low SES high risk households located on four towns in the Paris suburbs-Boulogne in France.

E. Behaviour Address: Improve safety of home environment

F. Study Outcomes: Enhanced safety knowledge and impact behavioural changes

G. Study Quality (Low, Medium, High) = High (19.5)

H. Applicability to Indigenous Community: The randomized controlled trial (RCT) is considered the "gold standard" study design for evaluating the effectiveness. This RCT evidence further reaffirms systematic review findings on child injury prevention. A systematic review of 22 randomized studies targeting child safety practices indicates that most efficient interventions are those combining health education, behaviour change strategies, and "reinforcement" (DiGuiseppi C, Roberts I. Individual-level injury prevention strategies in the clinical setting. The Future of Children 2000; 10:53–8) This study shows intervention containing all components (i.e., education/counseling + low cost/free equipment + fitting + multiple home inspection) as being the most likely to be the most effective best evidence in the literature. These interventions can be highly effective Indigenous communities as well. Researchers designing community interventions will need to consider how best fit these interventions to communities' unique and underline SES cultural and social factors.

36. Home safety education and provision of safety equipment for injury prevention (2012)
Kendrick D.

A. Type of Intervention: Home safety education and safety equipment with or without the provision of low cost, discounted or free equipment

B. Target Population: Families with children aged under age 0-19

C. Study Period: 2012

D. Setting/Location: Division of Primary Care, University Park, Nottingham, UK; Nottingham UK.

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Child injury rates or increasing home safety practices

G. Study Quality (Low, Medium, High) = Poor (0)

H. **Applicability to Indigenous Community:** Greater reductions in injury rates were found for interventions delivered in the home (IRR 0.75, 95% CI 0.62 to 0.91), and for those interventions not providing safety equipment (IRR 0.78, 95% CI 0.66 to 0.92). Home safety interventions were effective in increasing the proportion of families with functional smoke alarms (OR 1.81, 95% CI 1.30 to 2.52), a fire escape plan (OR 2.01, 95% CI 1.45 to 2.77). Further, this study found a lack of evidence that home safety interventions were effective in increasing possession of fire extinguishers. There was a lack of evidence that home safety interventions were effective in helping parents keep matches or lighters out of reach of children. There was no significant difference in number of overall injuries between the intervention and control groups. Limitation and strength of this systematic review design, and outcomes, can be utilized to tailor the specific fire safety interventions applicable to Indigenous communities. Home safety interventions most commonly provided as one-to-one, face-to-face education, especially with the provision of safety equipment, are effective in increasing a range of safety practices. There is some evidence that such interventions may reduce injury rates, particularly where interventions are provided at home.

37. An analysis of well-child parenting classes: The extent of parent compliance with health care recommendations to decrease potential injury of their toddlers
Barone VJ.

A. Type of Intervention: Home safety continuing education and safety equipment distribution.

B. Target Population: Families with toddlers

C. Study Period: 1988

D. Setting/Location: University of Kansas USA

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Possession of functional smoke alarm

G. Study Quality (Low, Medium, High) = Medium (18.5)

H. Applicability to Indigenous Community: These results show no statistical differences between groups in any of the dependent measures. These results suggest that this form of health-education was not sufficient to influence safety-related behaviours. Thus, the efficacy of health-education remains inconclusive.

38. Evaluation of a mobile safety center's impact on pediatric home safety behaviours
Furman L.

A. Type of Intervention: Home safety education and safety equipment with or without the provision of low cost, discounted or free equipment

B. Target Population: Families with children aged under age 0-18

C. Study Period: 2018

D. Setting/Location: University of Pittsburgh School of Medicine, Pittsburgh, PA, USA

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Home safety knowledge and spurred home safety device use

G. Study Quality (Low, Medium, High) = Poor (14)

H. Applicability to Indigenous Community: Mobile Safety Center (MSC) provides safety resources to families to prevent pediatric injury. This strategy may be feasible to reach most Indigenous communities living remote areas. Home safety education was effective in increasing the proportion of families with functional smoke alarms and a fire escape plan. Of our 50 participants, 29 (58%) completed follow-up 1, 30 (60%) completed follow-up 2, and 26 (52%) completed both. While 44.4% reported more than two smoke detectors during the pre-test, 88.9% reported this at both follow-ups. Participants were more likely to have a fire-escape plan at follow-up 1 than on the pre-test (p=0.014). Limitation and strength of this study design, and outcomes, can be utilized to tailor the specific fire safety interventions applicable to Indigenous communities. Home safety interventions most commonly provided as one-to-one, face-to-face education, especially with the provision of safety equipment, are effective in increasing a range of safety practices. There is some evidence that such interventions may reduce injury rates, particularly where interventions are provided at home. Further intervention study, preferably RCTs, to evaluate the effectiveness and cost-effectiveness of home safety interventions in specific to indigenous communities are useful and practical. This proposed study needs to provide detailed descriptions of intervention and control arm treatments, and measure and report injury outcomes, home safety equipment use and safety behaviours. This study also should explicitly report how they address potential barriers and facilitators in the design of their intervention and explore barriers to and facilitators of implementing interventions from a range of indigenous cultural perspectives.

39. Perspectives on effectiveness: What works in a juvenile fire awareness and intervention program?
McDonald K.

A. Type of Intervention: Juvenile fire setting behaviour primary prevention intervention (delivered through schools) and the secondary prevention awareness programs delivered by firefighters in the homes of young people and their families.

B. Target Population: Juvenile fire setters (7-13 years old)

C. Study Period: 2009

D. Setting/Location: Fire Rescue Victoria Australia/ Juvenile justice system, Victoria Australia

E. Behaviour Addressed: Improve safety reducing fire setting behaviours

F. Outcome: Pre and post findings shows boys benefited from the intervention. From the parent's perspective, lower fire-specific risk factors were reported after the intervention, but as expected psychosocial risks remained unchanged. From the child's perspective, some fire-specific risk variables had improved. Of the 29 children in the sample, nine participants were identified as recidivists. Thus, a third of the sample, although receiving an intervention, continued to light fires.

G. Study Quality (Low, Medium, High) = = Medium (15)

H. Applicability to Indigenous Community: Primary and secondary prevention programs evaluated in this study has practical implications. These interventions can be highly effective Indigenous communities as well. It is crucial for family and community professionals to understand fire setting, its implications, and impact upon others. Firefighters are poised to help, ensuring high risk individuals are identified, concerns are communicated through the proper channels, and appropriate strategies are put in motion to assist the high-risk children in obtaining the necessary support to intervene and correct the behaviour. Juvenile fire setting is a problem causing millions of dollars of property loss, many injuries from burns, and even results in deaths. Still, there is little research on youth fire setting in comparison to other child and adolescent behaviours in aboriginal settings. Through collaborative efforts with families and community professionals, intervention considerations can offer safety for community at large. Moreover, fire setting behaviour can be addressed to reduce deviance and promote pro-social child and youth activities which nurture healthy self-esteem, mature cognitive development, and individual responsibility in the community.

40. Effectiveness of home fire safety interventions. A systematic review and metanalysis
Senthilkumaran M.

A. Type of Intervention: Interventions to Increase Home Fire Safety (HFS) /Interventions to increase the knowledge and behaviour at short-, intermediate- and long-term follow ups.

B. Target Population: Toddlers, children (primary or secondary school), teenagers or adults.

C. Study Period: 2017

D. Setting/Location: Burlington Fire Department, Burlington, ON, Canada.

E. Behaviour Addressed: Improve safety of home environment by enhancing Knowledge and behaviour around risk minimization related to home fire hazards

F. Outcome: Enhanced safety knowledge and impact behavioural changes

G. Study Quality (Low, Medium, High) = Poor (0)

H. **Applicability to Indigenous Community:** Statistically and clinically important improvements in HFS knowledge were found between different interventions vs. control or no intervention groups, in primary school children and families with children at up to 4 months follow up. All eight trials identified in this review were rated at high risk of bias. The rating of very low-quality evidence per outcome across trials was based on the judgment of serious limitations (risk of bias), very serious imprecision and likely publication bias in all the outcomes across trials. Large-scale well-designed randomized controlled trials that consider the unique nature of prevention research and look at behavioural or fire rates as outcomes in larger scale implementation are needed to further assess the effectiveness of HFS interventions.

41. Does Injury Prevention Education Initiate Household Changes in a Spanish-Speaking Minority Population?

Setien MA.

A. Type of Intervention: Interventions to Increase Home Fire Safety knowledge and behaviour

B. Target Population: Eighty-eight Hispanic parents selected from a low income community

C. Study Period: 2012-2013

D. Setting/Location: Eighty-eight households Hidalgo County within the RGV Texas US.

E. Behaviour Addressed: Improve safety of home environment by enhancing Knowledge and behaviour around risk minimization related to home fire hazards

F. Outcome: Enhanced safety knowledge and impact behavioural changes

G. Study Quality (Low, Medium, High) = Poor (14)

H. Applicability to Indigenous Community: Raising mothers' consciousness to potentially dangerous situations provides an opportunity to provide recommendations on how to better protect the home environment and reduce fire related hazards and injuries. For instance, a brief intervention directed to 88 low-income Hispanic parents was successful at improving home safety. Community health workers delivered the program and educated parents on safety issues during a home visit. Utilizing language-specific programs as well as trusted community workers (e.g., Promotoras), Mexican mothers may be more likely to respond favorably to new safety regimens for the home environment. Future programs to improve home safety in indigenous communities in Canada may include conducting home visits, brief interventions, and community-based classes which emphasize cultural practices and beliefs. While all children may be at risk for home fire hazards, special attention to prevent fire related injuries common in children is necessary given the unique challenges that these families face. For instance, Indigenous parents often have less educational attainment, are underemployed without easy access to health care, and often face discrimination and prejudice.

42. The Short-Term Effects of a Fire Safety Education Program for the Elderly
Walker BL.

A. Type of Intervention: Educational home fire safety intervention

B. Target Population: Elderly People Who Live Independently in the Community/elderly living in health care facilities, the educational workshop training was aimed at the staff/elderly living in board and care/ Individuals who were responsible for providing care to residents of the home or facility/ Maryland US

C. Study Period: 1988-1989

D. Setting/Location: Research, Safety Education Center, University of Maryland, College Park, Maryland, U.S.

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Enhanced safety knowledge and impact behaviour/attitude changes

G. Study Quality (Low, Medium, High) = Poor (14)

H. Applicability to Indigenous Community: The majority of the fire prevention programs in Canadian Indigenous communities are exclusively focused on smoke alarm interventions and improving children's fire safety knowledge. Fire safety best evidence to prevent fire hazards specific to older adults have not widely disseminated. A fire safety education curriculum was developed by a group of experts in a variety of related fields including fire safety, gerontology, health care industry, developmental disabilities, research, and instructional design. Older adults were included in each planning session. Based on that curriculum, workshops and workshop materials were developed for each of the three targeted populations: staff of health care facilities, staff and owners of board and care homes, and elderly people living independently in their homes. An educational program for professional staff must include information on fire emergency planning, human behaviour in fires, fire prevention, fire behaviour, and fire safety devices. Special precautions that might not be required in an average residence is important in any facility or home for people at a high risk. Visual impairments are a particularly important physical disability to consider when planning for fire emergencies. Though few studies were found directed toward older adults, none have combined an education intervention component built to measure retention of fire prevention knowledge over time. We need to design similar studies targeting indigenous elders living in the community to address this gap in the literature. Furthermore, this study results can be replicated to enhance fire safety targeting the older indigenous communities. This is a growing population in the indigenous communities. Available literature and data show that the older adults have also been shown to be at higher risk for fire and burn-related injuries and death. The risk was even higher for older adults' aged 85 year and older. Other factors impacting older adults' risk of fire-related deaths are physical and mental limitations, increased number of medications, and poverty status. As individuals age, cognitive and sensory function naturally decline, mobility lessens, and the number of chronic illnesses increases. These situations directly increase older adults' risk for fire and burn related injuries and death. With decreased cognitive and sensory function, older adults may be unable to recognize fire hazards and may unknowingly participate in riskier behaviours. Furthermore, decreased mobility can cause fall-related accidents and inhibit a person's ability to escape in the case of a fire. Finally, older adults tend to take more medications as they experience more chronic illnesses. Medications increase fire risk through side effects such as drowsiness, impaired judgment, and hypotension. Previous data also reported that Indigenous older adults living in poverty, often due to fixed incomes, are at higher risk of fire death due to substandard living conditions such as compromised building structures and faulty electrical systems.

43. A randomized safety promotion intervention trial among low-income families with toddlers
Wang Y.

A. Type of Intervention: Educational home fire safety intervention

B. Target Population: Parents and caregivers of toddlers in the community

C. Study Period: 2007-2010

D. Setting/Location: Department of Pediatrics, University of Maryland School of Medicine, 737 W. College Park, Maryland U.S

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Enhanced safety knowledge and impact behaviour/attitude changes

G. Study Quality (Low, Medium, High) = Medium (18)

H. Applicability to Indigenous Community: Most safety promotion trials for young children focused on distribution of safety aids or improving parent knowledge and had mixed effects. Toddler-aged children are vulnerable to unintentional injuries, especially those in low-income families. There has been limited attention to goal setting and social support applied to safety promotion interventions for young children. An eight-session, group-delivered, randomized, parallel group safety promotion intervention trial for low-income mothers with toddlers, grounded in social cognitive theory with goal setting and social support, is effective in reducing home safety problems. Eight-session, group-delivered, randomized, parallel group safety promotion intervention trial for low-income mothers with toddlers, grounded in social cognitive theory with goal setting and social support, is effective in reducing home safety problems. In a 12-month follow-up, intervention group members reduced the number of safety problems, compared to the control group.

44. A randomised controlled trial of general practitioner safety advice for families with children under 5 years
Clamp M.

A. Type of Intervention: General practitioner safety advice/access to safety equipment at low cost. Control families received usual care.

B. Target Population: Hundred and sixty-nine (n=169) families with children aged ⩽5 years that were registered with a single handed general practice in an urban area of Nottingham

C. Study Period: 1996-1997

D. Setting/Location: General practices in Nottingham UK

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Possession and use of safety equipment and safe practices at home.

G. Study Quality (Low, Medium, High) = High (19.5)

H. Applicability to Indigenous Community: General practitioner advice, coupled with access to low-cost equipment for low-income families, increased use of safety equipment and other safe practices. These findings are encouraging for provision of injury prevention in primary care. After intervention, significantly more families in intervention group used fireguards (relative risk 1.89, 95% confidence interval 1.18 to 2.94), smoke alarms (1.14, 1.04 to 1.25), Also, significantly more families in intervention group showed very safe practice in fireplace safety (1.84, 1.34 to 2.54), smoke alarm safety (1.11, 1.01 to 1.22). Health care providers' advice, coupled with access to low-cost equipment for low-income families, increased use of safety equipment and other safe practices. These findings are encouraging for provision of injury prevention in primary care. The high response rate to the baseline questionnaire suggests the results of this study can be applied to the Indigenous population.

45. An assessment of the impact of home safety assessments on fires and fire-related injuries: a case study of Cheshire Fire and Rescue Service
Arch B.

A. Type of Intervention: Home safety assessments (HSAs). Fitting/testing of a smoke alarm and the delivery of key fire safety messages

B. Target Population: North-west England, nonmetropolitan residents

C. Study Period: 2002-2006

D. Setting/Location: The setting for the research was Cheshire Fire and Rescue Service (CFRS), a nonmetropolitan fire service in north-west England.

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: accidental dwelling fires, accidental dwelling fires contained, and injuries arising from accidental dwelling fires

G. Study Quality (Low, Medium, High) = Poor (14)

H. Applicability to Indigenous Community: This fire safety program is targeted to address multifaceted fire risk and needs assessment tailored to each specific household. This included, for example, the identification of principal hazards on a room-by-room basis, as well as taking appropriate action and giving specific advice in respect of all identified hazards. Previous literature clearly shows that working smoke alarms reduce the risk of death in the event of a house fire by 50%. Having a working smoke alarm with a long-lasting lithium battery on every level of the home is the recommended best practice according to the Centers for Disease Control and Prevention. An estimated 20-50% of smoke alarms in homes are non-functional, and many residents do not know if their smoke alarms are working. The percentage of homes with functioning smoke alarms ranges from 34%-93% among high-risk communities. These interventions can be highly effective Indigenous communities as well. Researchers designing community interventions will need to consider how best fit these interventions to communities' unique and underline SES cultural and social factors. To provide information and encouragement to maintain working smoke alarms, we could also educate the resident about the smoke alarms' long- lasting batteries, their hush feature, how to use alarm, fire prevention (cooking, electrical, heating issues), fire escape planning, and CO safety. The additional education on carbon monoxide and hot water scald burns can be provided by the fire safety educator as a part of home visit.

46. Systematic review of controlled trials of interventions to promote smoke alarms
DiGuiseppi C.

A. Type of Intervention: Primary prevention

B. Target Population: The study population comprised households

C. Study Period: 1969-1999

D. Setting/Location: The setting was the community. The systematic review study was carried out in the UK.

E. Behaviour Addressed: Improve safety of home environment (smoke alarm acquisition, ownership and function)

F. Outcome

G. Study Quality (Low, Medium, High): High-This was a rigorously done systematic review using RCTs. However, overall qualities included RCTs are low.

H. Applicability to Indigenous Community: The study systematically examined best evidence for smoke alarm acquisition, ownership, and function; fires; burns; and fire related injuries. Results were sensitive to trial quality, however, and effects on fire related injuries were not reported. Particularly, counseling as part of child health surveillance may increase smoke alarm ownership and function, but its effects on injuries are unevaluated. Community smoke alarm give away programs apparently reduce fire-related injuries, but these trials were not randomized, and results must be interpreted cautiously. Further efforts to promote smoke alarms in primary care or through give away programs should be evaluated by adequately designed randomized controlled trials measuring injury outcomes. In two non-randomized trials, direct provision of free alarms significantly increased functioning alarms and reduced fire related injuries. Media and community education showed little benefit in non-randomized trials. Two trials collected injury outcomes, but fire related injury data were unavailable. None of the trials reported fire incidence. Even though strong evidence derived from this review is lacking, old and outdated fires detected by smoke alarms are associated with more rapid discovery, lower casualty rates, and less property damage. Smoke alarm ownership is associated with a reduced risk of fire death and appears particularly effective in households with young children. Children involved, unintentional injuries are particularly higher among indigenous populations, and working smoke alarms can be a viable primary prevention effort to reduce these injuries. Any interventions designed (either wholly or in part) to increase the prevalence of owned or properly functioning smoke alarms in the Indigenous communities must reinforced by taking into consideration of mass media campaigns, education, home visits or inspections, clinician counseling, installation and timely battery change reminders and legislation.

47. Interventions for promoting smoke alarm ownership and function
DiGuiseppi C.

A. Type of Intervention: Primary prevention

B. Target Population: The study population comprised households

C. Study Period: 2000

D. Setting/Location: The setting was the community. The systematic review study was carried out in the UK.

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Enhanced safety—Interventions for promoting smoke alarm ownership and function

G. Study Quality (Low, Medium, High): High-This was a rigorously done systematic review using RCTs. However, overall qualities of included RCTs are low.

H. Applicability to Indigenous Community: According to Canadian Mortgage and Housing Corporation 2007 report, Indigenous per capita fire incidence rate is 2.4 times higher than rest of Canada. The death rate is 10.4 times greater; the fire injury rate is 2.5 times greater; and the fire damage per unit is 2.1 times greater. It was also noted that many Aboriginal communities tend to have a low number of functioning smoke detectors. This study evaluated interventions to promote residential smoke alarms, to assess their effect on smoke alarm ownership, smoke alarm function, fires and burns and other fire-related injuries. Overall, counseling, and educational interventions had only a modest effect on the likelihood of owning an alarm or having a functional alarm. Counseling as part of primary care child health surveillance had greater effects on ownership and function. However, these results must be interpreted with cautious. In fact, the results were sensitive to trial quality, however, and effects on fire-related injuries were not reported. In two non-randomized trials (higher risk of bias), direct provision of free alarms significantly increased functioning alarms and reduced fire-related injuries. Media and community education showed little benefit in non-randomized trials. Smoke alarm ownership is associated with a reduced risk of fire death and appears particularly effective in households with young children. Children involved, unintentional injuries are particularly higher among indigenous populations, and working smoke alarms can be a viable primary prevention effort to reduce these injuries. Any interventions designed (either wholly or in part) to increase the prevalence of owned or properly functioning smoke alarms in the Indigenous communities tailored taking into consideration of mass media campaigns, education, home visits or inspections, clinician counseling, installation and timely battery change reminders and legislation.

48. Targeted Residential Fire Risk Reduction: A Summary of At-Risk Aboriginal Areas in Canada
Garis L.

A. Type of Intervention: Installation of 1000 smoke alarms in homes at high risk for fires and injuries.

B. Target Population: Community dwellings at high risk for fires and injuries.

C. Study Period: 2008-2015

D. Setting/Location: Households located on the Surrey British Columbia, Canada

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Functional smoke alarms present/reduction and fire rates/reduction of fire related injuries

G. Study Quality (Low, Medium, High) = Poor (13)

H. Applicability to Indigenous Community: The purpose of this report is to highlight communities within Canada that are at the highest risk for residential fires based on the risk factors identified by research and adopted by the Home Safe program in Surrey, B.C. Several risk factors have been associated with fire related deaths at Indigenous communities including socioeconomic status, the non-functional smoke alarms in homes and older housing. In this study, numerous interventions and programs have been implemented to address these interwoven problems. Most of these interventions can be implemented collaboratively including provision of low cost or free smoke alarms (with lithium batteries to increase functioning possession) reinforced by education and awareness programs highlighting life-saving effects on these low-cost interventions. Culturally sensitive outreach is very important when designing prevention programs with these communities. Smoke alarm promotion programs should ensure that they provide the combination of interventions including periodical home inspection and education to support sustainable operational smoke detectors at home. To address residential fires and related injuries, the Centers for Disease Control and Prevention funds state health departments to deliver a Smoke Alarm Installation and Fire Safety Education (SAIFE) program in high-risk homes. This program involves recruiting local communities and community partners, hiring a local coordinator, canvassing neighbourhood homes, installing long-lasting lithium-powered smoke alarms, and providing general fire safety education and 6-month follow-up to determine alarm functionality. The proposed program to enhance fire safety prevention efforts in Indigenous communities could adapt this model.

49. Evaluating injury prevention programs: the Oklahoma City smoke alarm project
Mallonee S.

A. Type of Intervention: Community intervention trial was instituted to distribute smoke alarms, written educational pamphlets and home-based follow-up to test whether the alarms were functioning correctly.

B. Target Population: Community dwellings at high risk for fires and injuries.

C. Study Period: 1998 – 2001

D. Setting/Location: Households located on Oklahoma City, USA

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Functional smoke alarms present/reduction and fire rates/reduction of fire related injuries

G. Study Quality (Low, Medium, High) = Medium (15)

H. Applicability to Indigenous Community: Several risk factors have been associated with fire-related deaths at Indigenous communities including socioeconomic status, the non-functional smoke alarms in homes and older housing. In this study, numerous interventions and programs have been implemented to address these interwoven problems. Most of these interventions can be implemented collaboratively including provision of low cost or free smoke alarms (with lithium batteries to increase functioning possession) reinforced by education and awareness programs highlighting lifesaving effects on these low-cost interventions. Culturally sensitive outreach is very important when designing prevention programs with these communities. Smoke alarm promotion programs should ensure that they provide the combination of interventions including periodical home inspection and education to support sustainable operational smoke detectors at home. Evaluation of injury prevention programs is critical for measuring program effects on reducing injury related morbidity and mortality or on increasing the adoption of safety practices. During the planning and implementation of injury prevention programs, evaluation data also can be used to test program strategies and to measure the program's penetration among the target population. The availability of this early data enables program managers to refine a program, increasing the likelihood of successful outcomes. To address residential fires and related injuries, the Centers for Disease Control and Prevention funds state health departments to deliver a Smoke Alarm Installation and Fire Safety Education (SAIFE) program in high-risk homes. This program involves recruiting local communities and community partners, hiring a local coordinator, canvassing neighbourhood homes, installing long-lasting lithium-powered smoke alarms, and providing general fire safety education and 6-month follow-up to determine alarm functionality. The proposed program to enhance fire safety prevention efforts in Indigenous communities could adapt this model.

50. Pediatric Counseling and Subsequent Use of Smoke Detectors
Miller RE.

A. Type of Intervention: Education/counseling concerning home fires and distribute smoke detectors by two pediatricians compared to "routine" counseling without such a program using 2 groups each of 120 patients of well children. Home inspection performed 4 to 6 weeks after the office visits.

B. Target Population: Community dwellings middle class/ predominantly white population in Pittsburgh USA

C. Study Period: 1979

D. Setting/Location: Households located on Pittsburgh US

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Correctly installed functional smoke alarms present

G. Study Quality (Low, Medium, High) = Medium (16)

H. Applicability to Indigenous Community: The disparity in percentage of detectors in owned vs rented dwellings suggests reluctance of renters to pay for home safety improvements to homes they do not own. Most efforts by physicians to alter patient safety behaviour in injury prevention and health promotion have shown promising. Additional variables that could adapt to specific to Indigenous fire safety measures are public health clinician initiatives including counseling, short prevention message followed by free distribution of smoke alarms with follow up visit to make sure that the installation is correct, and device is working properly (pamphlet, simple easy to understand safety message and easy access to purchase). However, the middle-class study sample cautions against extrapolation of findings to other socioeconomic groups including Indigenous populations.

51. An Injury Prevention Program in an Urban African-American Community
Schwarz DF.

A. Type of Intervention: The intervention consisted of three components: (1) home modification for simple prevention measures, (2) home inspection to inform residents about hazards and ways of alleviating them, and (3) education about selected injury prevention practices.

B. Target Population: African American and poor (97.2%), with a median family income of $11 810.

C. Study Period: 1990

D. Setting/Location: Households located on the western Philadelphia U.S.

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Enhanced safety knowledge and impact behavioural changes

G. Study Quality (Low, Medium, High) = Medium (17)

H. Applicability to Indigenous Community: Injury is a major Canadian public health problem, particularly in urban minority communities. This paper evaluates the impact of the Safe Block Project, a comprehensive injury prevention trial, on home hazards and injury prevention knowledge in a poor urban African American community. There was a distinct difference between control and intervention homes with respect to safety knowledge and home hazards requiring minimal to moderate effort to correct. The Safe Block Project could serve as a model for future urban injury prevention efforts as intervention homes were found to be safer than control homes, particularly with respect to hazards related to fires and poisonings. However, significant problem in fire prevention programs is that smoke detectors that are given away are often not installed or properly maintained. When designing injury prevention programs specific to indigenous populations, the lessons learned from this study is valuable: Longer-term follow-up at 12 months suggests that this integration may be a key factor, as statistically significant increases in installation rates were reported in the study where this integration occurred. It is notable that the community safety program evaluated by this research, prioritized addressing safety issues identified by the community, including those occurring outside the home such as violence and homicide. This form of community engagement may be particularly important where marginalized communities such as Indigenous communities distrust authority figures, an important barrier to program success identified in the review of qualitative research conducted alongside this effectiveness review. Furthermore, this study has demonstrated that it is feasible to carry out the program in extremely poor, inner-city neighbourhoods. Many of the accomplishments of the safety inspectors, such as helping families to get basic services and desperately needed public assistance, cannot be measured. More importantly, this study has shown that individuals with minimal formal education can be trained to effectively coordinate a large-scale community-based prevention program involving community leaders, block leaders, and individual families. This outcome leads us to believe that the Safe Block Project should serve as a useful model on which to build and expand for future indigenous specific injury prevention efforts. Furthermore, regarding the installation of smoke detector, it is notable that Schwarz et al., physically observed the presence of the equipment at follow-up rather than relying on householders' self-report (many other evaluations on smoke alarm effectiveness has this notable limitation). Finally, our understanding of the mixed effectiveness results for programs supplying smoke detectors is weak. There is a clear role here for Indigenous community specific qualitative research to produce richer understandings of why, and in what contexts, these programs can be effective.

52. Do home fire and safety checks by on-duty firefighters decrease the number of fires? Quasi-experimental evidence from Southern Sweden
Sund B.

A. Type of Intervention: Home safety checks and first aid training by firefighters.

B. Target Population: Target households comprised elderly and young people who have recently moved away from home and those who have difficulties with the Swedish language).

C. Study Period: 2010-2016

D. Setting Location: Southern Sweden that serves approximately 520,000 inhabitants across five municipalities: Burlöv, Eslöv, Kävlinge, Malmö, and Lund

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: The purpose of this study is to estimate the effects of home fire and safety check (HFSC) intervention in southern Sweden on the incidence of residential fires and quantify the economic effectiveness associated with this intervention. Based on the average number of completed visits from 2010 to 2016 (≈ 10,000) and the number of fires from 2010 to 2015 in the region, this result implies a reduction of 17 fires (6%) and 11 developed fires (8%), respectively, per year.

G. Study Quality (Low, Medium, High) = Medium (16)

H. Applicability to Indigenous Community: This study design and outcome are similar to Canadian specific, fire fighter delivered HFSC program (education and smoke alarm installation) in high-risk zones in British Columbia, Canada. Canadian intervention resulted in reduced frequency and severity of residential fires (Clare, Garis, Plecas, & Jennings, 2012); the reduction in the incidence of fires was 49.3%, compared with a control group. Along with above Canadian evidence, the results from Sweden study should be useful for policymakers and fire safety professionals as input in the decision-making process regarding whether to implement HFSC interventions specific to Indigenous populations.

53. Investigating the effect of banning non-reduced ignition propensity cigarettes on fatal residential fires in Sweden
Bonander CM.

A. Type of Intervention: Banning non-reduced ignition propensity cigarettes

B. Target Population : Regular and habitual smokers in Sweden.

C. Study Period: 1999-2013

D. Setting/Location: Households located on jurisdictions impact from the ban of the production and sale of all non-RIP (reduced ignition propensity) cigarettes in Sweden

E. Behaviour Addressed: Improve safety reducing hazardous smoking in home environment

F. Outcome: Fires in on fire mortality and cigarette-related fires in Sweden.

G. Study Quality (Low, Medium, High) = Medium (16.5)

H. Applicability to Indigenous Community: In terms of risk factors for residential fatal fires, smoking is one of the most important and previous studies have shown that over 30% of fatal residential fires have started due to cigarettes. To reduce these types of fatal fires, a development of reduced ignition propensity (RIP) cigarettes has been undertaken. One of the most prominent causes of fatal fires is the ignition of clothing, mattresses, or other furniture by smoking materials. The population that is affected by these types of events is often considered a marginalized group of individuals that are likely hard to target with conventional prevention strategies (such as information campaigns or smoking bans). Fire safe cigarettes are a universal intervention to prevent cigarette-related fire losses. Previous empirical evidence is based mainly on single-country studies and is mixed. Similarly, this study also found no statistically significant effects on all-cause fire mortality, residential fire mortality or cigarette-caused fire rates. The estimates for cigarette-caused fire deaths were significant under some specifications but were not robust to the inclusion of state-specific trends or comparisons to effects on other cause-determined fires. Given the mixed state of the results, Authors have concluded that previous claims regarding the effects of fire safe cigarette laws may be premature. Cigarette manufacturers are responsible for the consequences of their products and voluntarily adopt reduced ignition propensity standards in Canada. Cigarettes remain an important, preventable cause of residential fires and associated morbidity and mortality in Indigenous communities. They have comparatively higher smoking rates compared to the general Canadian population. Continued surveillance and monitoring of fires and fire losses caused by cigarettes is essential to evaluate the success of existing policies and the potential need for adjusting the standards adopted. Targeted health promotion campaigns are needed to reach these high-risk groups and to enhance awareness of cigarette related house fire hazards unique to these vulnerable communities.

54. Prevention of burn injuries to children involving nightwear
Laing RM.

A. Type of Intervention: Legislative intervention in the New Zealand market for children's nightclothes as an injury prevention strategy

B. Target Population: Children and their parents and caregivers.

C. Study Period: 1985-1988

D. Setting/Location: Households located on jurisdictions impact from the New Zealand market for children's nightclothes as an injury prevention strategy

E. Behaviour Addressed: Improve safety reducing hazardous children's nightclothes in home environment

F. Outcome: Hospital admissions for child burn injuries

G. Study Quality (Low, Medium, High) = Medium (15)

H. Applicability to Indigenous Community: Burns resulting from clothing ignition, both daywear and nightwear, is a real fire hazard. Targeted health promotion campaigns are needed to reach these high-risk groups and to enhance awareness of nightwear related house fire hazards unique to these vulnerable communities.

55. The Acquisition and Maintenance of Fire Emergency Skills: Effects of Rationale and Behavioural Practice
Hillman HS.
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A. Type of Intervention: Fire escape emergency planning for preschool -instructor-led training to meet the fire safety training needs. The four groups were rationale/behavioural practice, rationale/verbal practice, no-rationale/behavioural practice and no-rational/verbal practice. Within this 2×2 factorial design all subjects were taught to respond correctly in three simulated fire emergency situations.

B. Target Population: Preschool children

C. Study Period: 1984

D. Setting/Location: Public elementary school children lived in a low-middle SES section of Pittsburgh, Pennsylvania, USA.

E. Behaviour Addressed: Respond correctly/appropriately in three simulated fire emergency situations

F. Outcome: Enhanced safety practice and impact behavioural changes

G. Study Quality (Low, Medium, High) = Medium (15)

H. Applicability to Indigenous Community: A related benefit of this study over past efforts is its implications for cost-effectiveness. In summary, these findings add to previous literature which attests to the effectiveness of behavioural approaches in enhancing safety skills. In addition, this study specifically addresses the major problem confronting such efforts namely, maintenance of acquired skills. While previous studies in this area have often shown significant gains at post-test, maintenance data have often been much less impressive. It is hoped that the inclusion of rationale for a particular skill will enhance the quality of maintenance in future investigations. Although some traditional educational programs have attempted to reduce the incidents of child injuries, only minimal amounts of success have been reported and rapidly expanding literature has emerged targeting a variety of safety skill. These efforts have employed a behavioural training approach to enhance functioning in several home emergency situations.

56. Evaluation of a fire-safety training program for preschool children
McConnell CF.

A. Type of Intervention: Children in six centers received an 18-week fire-safety training program called Kid Safe. Children in four other centers were assigned to the delayed-treatment condition and constituted the comparison group. All children were pretested using a comprehensive measure of fire-safety knowledge before the start of the study.

B. Target Population: Preschool children

C. Study Period: 1993

D. Setting/Location: Selected child-care centers in the City of Memphis, USA.

E. Behaviour Addressed: Improve fire safety/safe departure from burning house/safe fire escape behaviour

F. Outcome: Enhanced safety knowledge and impact behavioural changes

G. Study Quality (Low, Medium, High) = Medium (18)

H. Applicability to Indigenous Community: One obvious question concerns retention of fire-safety knowledge by very young children. Previous literature has looked at the problem of maintenance of fire-safety knowledge and skills in older children, and it appears as though periodic retraining may be necessary. Undoubtedly, this retention issue is also present with preschoolers and techniques need to be developed to maintain the positive effects of programs such as Kid Safe. Based on this project, we recommended to the Indigenous communities launch similar fire prevention educational programs targeting vulnerable children and their parents. Children who continue in the childcare system should provide similar exposes and opportunities to receive additional exposure to practice of life-saving strategies.

57. Changes in smoke alarm coverage following two fire department home visiting programs: what predicts success?
Gielen AC.

A. Type of Intervention: Door-to-door canvassing and in-home installation of smoke alarms-(fire fighters installed lithium battery smoke alarms and the safety educator delivered home safety education and the checklist). Residents in the Enhanced program received tailored education about fire safety.

B. Target Population: Baltimore, Maryland City residents including Black or African American

C. Study Period: 2010-2012

D. Setting/Location: Households located in Baltimore City, USA.

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Enhanced safety knowledge and impact behavioural changes

G. Study Quality (Low, Medium, High) = Medium (16)

H. Applicability to Indigenous Community: Previous literature clearly shows that working smoke alarms reduce the risk of death in the event of a house fire by 50%. Having a working smoke alarm with a long-lasting lithium battery on every level of the home is the recommended best practice according to the Centers for Disease Control and Prevention. An estimated 20-50% of smoke alarms in homes are non-functional, and many residents do not know if their smoke alarms are working. The percentage of homes with functioning smoke alarms ranges from 34%-93% among high-risk communities. Door-to-door canvassing, and in-home installation of smoke alarms have been found to be the most effective method for increasing the number of homes protected. In a meta-analysis, the most intensive smoke alarm programs, those with a combination of education, low cost or free equipment and direct installations, and those programs that installed lithium battery alarms reported the highest rates of coverage. These interventions can be highly effective Indigenous communities as well. Researchers designing community interventions will need to consider how best fit these interventions to communities' unique and underline SES cultural and social factors. To provide information and encouragement to maintain working smoke alarms, we could also educate the resident about the smoke alarms' long-lasting batteries, their hush feature, how to use alarm, fire prevention (cooking, electrical, heating issues), fire escape planning, and CO safety. The extra education on carbon monoxide and hot water scald burns can be provided by the safety educator as a part of home visit and the Enhanced and Standard programs.

58. Long term effects of a home visit to prevent childhood injury: three year follow up of a randomized trial
King WJ.

A. Type of Intervention: Single home safety visit to assess home injury safety hazards and improve home safety/discount coupons/ including injury awareness and knowledge.

B. Target Population: Parents and care givers of children injured in Montreal, Halifax, Manitoba and Toronto

C. Study Period: 1994-1996

D. Setting/Location: Five pediatric teaching hospitals in four Canadian urban centers.

E. Behaviour Addressed: Improve safety of home environment/knowledge/belief

F. Outcome: Enhanced safety knowledge and impact behavioural changes including improving home safety and reducing injury.

G. Study Quality (Low, Medium, High) = High (20.5)

H. Applicability to Indigenous Community: A home safety visit was able to demonstrate sustained, but modest, effectiveness of an intervention aimed at improving home safety and reducing injury. This study reinforces the need of home safety programs to focus on passive intervention and a simple well-defined message. Further, this study shows intervention containing all components (i.e., education + low cost/free equipment + fitting + home inspection) as being the most likely to be effective and even effects can be sustained even long term. These interventions can be highly effective Indigenous communities as well. Researchers designing community interventions will need to consider how best fit these interventions to communities' unique and underline SES cultural and social factors. Further, this study resembles earlier work by Schwarz et al, who hired community liaisons to engage community members at the block level in advance of having safety inspectors go door-to-door. Like Schwarz's work, this study also found that advance notice provided by a recognized community representative resulted in increased access to homes.

59. A Behavioural Approach to Reducing Fires in Public Housing
McConnell CF.

A. Type of Intervention: Thirty five-minute fire-safety training program was developed and presented to every new head-of-household during his or her initial orientation session. The program also contained a component where trainees made a formal, written commitment to engage in self-selected fire-safety behaviours.

B. Target Population: Low-income residents of the Memphis Housing Authority (MHA),

C. Study Period: 1994-1995

D. Setting/Location: Memphis, Tennessee - U.S.

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Enhanced safety knowledge, impact behavioural changes and improvement in safety practices

G. Study Quality (Low, Medium, High) = Medium (15)

H. Applicability to Indigenous Community: This research is unique from a behavioural perspective, the application of action-research paradigms to address specific community problems consists of the systematic attempt to (1) clearly identify a problem behaviour and the context in which it occurs, (2) employ this understanding to select one or more antecedents and or consequences to alter the behaviour, and (3) evaluate the efficacy of the intervention. This study found thirty five-minute fire-safety training programs presented to every new household during his or her initial orientation session and program contained a component where trainees made a formal, written commitment to engage in self-selected fire-safety behaviours are effective fire prevention strategies. The implication and applicability to Indigenous community is that the interventions might be more effective if they are simpler, culturally appropriate, and more targeted to suit their lower SES related home safety injury risk factors. Individuals living at or below the poverty level have a much greater risk than the more affluent of experiencing a fire.

60. Study on Measures for Mitigating the Risk of Residential Fires and Fire Fatalities
Notake H.

A. Type of Intervention: Fire extinguishers and smoke alarm

B. Target Population: High risk population in Japan.

C. Study Period: 1995-2001

D. Setting/Location: Japan

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Residential fire incidents and fatalities

G. Study Quality (Low, Medium, High) = Medium (15)

H. Applicability to Indigenous Community: Intervention, like this intervention can be applied to Indigenous households. Injury prevention interventions are more effective, when applying and including the passive prevention strategies rather than the active ones. This study suggests a continued role for public health practitioners in advocating for policy changes such as affordable, safe housing, and passive interventions, like smoke alarm systems and appropriate building code regulations can be applied to Indigenous residential fire prevention efforts in Canada.

61. Using a cluster randomized controlled trial to determine the effects of intervention of battery and hardwired smoke alarms in New South Wales, Australia: Home fire safety checks pilot program
Tannous WK.

A. Type of Intervention: Fire & Rescue New South Wales piloted the delivery of its home fire safety checks program (HFSC) aimed at engaging and educating targeted top "at risk" groups to prevent and prepare for fire.

B. Target Population: Urban at risk households in New South Wales

C. Study Period: 2012

D. Setting/Location: Households located in New South Wales Australia

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Battery and hardwired smoking alarm usage

G. Study Quality (Low, Medium, High) = Medium (16)

H. **Applicability to Indigenous Community:** According to this study findings, fire safety intervention programs, like HFSC, need to be targeted to male adults with lower level of schooling even when they are aware of their risks. Also need to be targeted are the people who have a greater risk of dying as a result of being involved in a residential fire are adults aged 65 years and over, children aged 0-4 years, and adults affected by alcohol consumption. The groups at a higher risk of being injured in such a fire include males, young children aged 0-4 years, adults aged 22-40 years, older adults (65 + years), low socio-economic status, poor educational background, individuals who smoke, and individuals who drink excessively. In the event of a residential fire outbreak, smoke alarms are normally the primary life safety strategy for residents. Smoke alarms have been considered as one of the most effective interventions in reducing fire-related injuries among residents in higher-income countries. Previous literature clearly shows that working smoke alarms reduce the risk of death in the event of a house fire by 50%. Having a working smoke alarm with a long-lasting lithium battery on every level of the home is the recommended best practice according to the Centers for Disease Control and Prevention. An estimated 20-50% of smoke alarms in homes are non-functional, and many residents do not know if their smoke alarms are working. The percentage of homes with functioning smoke alarms ranges from 34%-93% among high-risk communities. Door-to-door canvassing, and in-home installation of smoke alarms have been found to be the most effective method for increasing the number of homes protected. In a meta-analysis, the most intensive smoke alarm programs, those with a combination of education, low cost or free equipment and direct installations, and those programs that installed lithium battery alarms reported the highest rates of coverage. These interventions can be highly effective Indigenous communities as well. Researchers designing community interventions will need to consider how best fit these interventions to communities' unique and underline SES cultural and social factors. To provide information and encouragement to maintain working smoke alarms, we could also educate the resident about the smoke alarms' long-lasting batteries, their hush feature, how to use alarm, fire prevention (cooking, electrical, heating issues), fire escape planning, and CO safety. The extra education on carbon monoxide and hot water scald burns can be provided by the safety educator/fire safety experts as a part of home visit and the enhanced and standard programs.

62. Comparison of a Personalized Parent Voice Smoke Alarm with a Conventional Residential Tone Smoke Alarm for Awakening Children
Smith G.

A. Type of Intervention: Voice vs tone smoke alarm-Enabling technology enhancement to maximize the residential fire prevention effects of smoke alarms- Personalized smoke alarms featuring the voice of a parent telling the child to wake up and leave their bedroom

B. Target Population: Community dwellings children at high risk for impact of accidental residential fires

C. Study Period: 2005

D. Setting/Location: Columbus Children's Research Institute -Columbus, OH-U.S.

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Waking and escaping rates.

G. Study Quality (Low, Medium, High) = Medium (18)

H. Applicability to Indigenous Community: A number of risk factors have been associated with fire related deaths at Indigenous communities including socioeconomic status, the non-functional smoke alarms in homes and older and crowded homes with vulnerable children. This is the first study to compare the ability of two different types of smoke alarms to awaken sleeping children. The results suggest that the development of more effective smoke alarms for use in Indigenous homes and other places where children sleep may provide a way to reduce fire-related deaths and injuries among children. The personalized smoke alarms are commercially available but generally cost more than standard smoke alarms.

63. Effectiveness of a Voice Smoke Alarm Using the Child's Name for Sleeping Children: A Randomized Trial
Smith G.

A. Type of Intervention: Voice vs tone smoke alarm-Enabling technology enhancement to maximize the residential fire prevention effects of smoke alarms- Personalized smoke alarms featuring the voice of a parent telling the child to wake up and leave their bedroom

B. Target Population: Community dwellings children at high risk for impact of accidental residential fire

C. Study Period: 2017

D. Setting/Location: Columbus Children's Research Institute -Columbus, OH-U.S.

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Waking and escaping rates.

G. Study Quality (Low, Medium, High) = Medium (18)

H. Applicability to Indigenous Community: A number of risk factors have been associated with fire related deaths at Indigenous communities including socioeconomic status, the non-functional smoke alarms in homes and older and crowded homes with vulnerable children. This is the first study to compare the ability of two different types of smoke alarms to awaken sleeping children. The results suggest that the development of more effective smoke alarms for use in Indigenous homes and other places where children sleep may provide a way to reduce fire-related deaths and injuries among children. The personalized smoke alarms are commercially available but generally cost more than standard smoke alarms.

64. Comparison of the effectiveness of female voice, male voice, and hybrid voice-tone smoke alarms for sleeping children
Smith G.

A. Type of Intervention: Voice (female, male and hybrid) vs tone smoke alarm-

B. Target Population: Community dwellings children at high risk for impact of accidental residential fires

C. Study Period: 2019

D. Setting/Location: Columbus Children's Research Institute -Columbus, OH-U.S.

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Waking and escaping rates.

G. Study Quality (Low, Medium, High) = Medium (18)

H. Applicability to Indigenous Community: A number of risk factors have been associated with fire related deaths at Indigenous communities including socioeconomic status, the non-functional smoke alarms in homes and older and crowded homes with vulnerable children. This is the first study to compare the ability of four different types of voice tones smoke alarms to awaken sleeping children. Although there were no significant differences in the effectiveness of the male voice, female voice, and hybrid alarms when compared with each other. Use of these alarms in children's sleep areas may reduce residential fire-related injuries and deaths among children old enough to perform self-rescue. The results suggest that the development of more effective smoke alarms for use in Indigenous homes and other places where children sleep may provide a way to reduce fire-related deaths and injuries among children. The personalized smoke alarms are commercially available but generally cost more than standard smoke alarms.

65. Optimizing Smoke Alarm Signals for Those at Highest Risk for Residential Fire-Related Death: Testing the Effectiveness of Children's Smoke Alarms for Sleeping Older Adults
Smith G.

A. Type of Intervention: Voice (female, male and hybrid) vs tone smoke alarm-

B. Target Population: Community dwellings children at high risk for impact of accidental residential fires

C. Study Period: 2019

D. Setting/Location: Columbus Children's Research Institute -Columbus, OH-U.S.

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Waking and escaping rates.

G. Study Quality (Low, Medium, High) = Medium (18)

H. Applicability to Indigenous Community: A number of risk factors have been associated with fire related deaths at Indigenous communities including socioeconomic status, the non-functional smoke alarms in homes and older and crowded homes with vulnerable children. This is the first study to compare the ability of four different types of voice tones smoke alarms to awaken sleeping children. Although pairwise comparisons between the high-frequency tone alarm and each of the other three alarms were statistically significant for the probability functions for time-to-awaken and time-to-escape. There were no significant differences in these outcome measures between the latter three alarms, except for female voice versus low-frequency tone alarms for time-to-escape. Use of these alarms in children's sleep areas may reduce residential fire-related injuries and deaths among older people and perform self-rescue. The results suggest that the development of more effective smoke alarms for use in Indigenous homes and other places where children sleep may provide a way to reduce fire-related deaths and injuries among children. The personalized smoke alarms are commercially available but generally cost more than standard smoke alarms.

66. Incidence of fires and related injuries after giving out free smoke alarms: cluster randomised controlled trial
DiGuiseppi C.

A. Type of Intervention: Smoke alarm distribution and program (20 050 smoke alarms, fittings, and educational brochures distributed free and installed on request/ community members and government and voluntary agencies in the distribution process

B. Target Population: Deprived multiethnic urban population.

C. Study Period: 1998

D. Setting/Location: Forty electoral wards in two boroughs of inner London, United Kingdom.

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Rates of fires and related injuries during two years after the distribution; alarm ownership, installation, and function

G. Study Quality (Low, Medium, High): = Medium (18.5). Primary prevention trial of personal safety so well designed and conducted although the results were negative, the rigor of the cluster randomized design clearly mirror in this study.

H. Applicability to Indigenous Community: Primarily households including elderly people or children and households that are in housing rented from the borough council. Giving out free smoke alarms in a deprived, multiethnic, urban community did not reduce injuries related to fire, mostly because few alarms had been installed [35] or were maintained-[35]. Furthermore, this study area also had a lower median house income, lower property values, and poorer quality of housing. These conditions are also highly prevalent in Indigenous communities in Canada. The number of persons per occupied dwelling was also higher as in most indigenous communities. Modified culturally appropriate intervention, specifically addressing the shortcomings of this intervention can be applied to Indigenous households. Injury prevention interventions are more effective, when applying and including the passive prevention strategies rather than the active ones. This study suggests a continued role for public health practitioners in advocating for policy changes such as affordable, safe housing, and passive interventions, like sprinkler systems and appropriate building code regulations can be applied to Indigenous residential fire prevention efforts in Canada.

67. Lessons learned from an emergency medical services fire safety intervention
Pirrallo RG.

A. Type of Intervention: Smoke alarm or batteries distribution program

B. Target Population: Convenience sample of at-risk households located in Milwaukee Wisconsin- US

C. Study Period: 1999-2001

D. Setting/Location: The Milwaukee Fire Department, Wisconsin-US.

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Enhanced safety increasing the number of operational smoke alarm; reduce property dollar loss, and decreased morbidity and mortality at the time of a subsequent fire.

G. Study Quality (Low, Medium, High) = Medium (15)

H. Applicability to Indigenous Community: Only 35% of the dwellings had an operational smoke alarm at the time of the fire. His finding is similar to what DiGuiseppi et al. found in their UK study. Smoke alarm operation rate of 17% after a giveaway program. The even lower operational rate in this study could be explained because the majority of the smoke alarms were only given to the occupants of the household, and few were actually installed. It appears that the power source and type of alarm contribute greatly to the likelihood of sustaining an operational home smoke alarm. Mounting evidence suggests that smoke alarms play a key role in reducing the number of deaths and injuries associated with household fires each year. The implication and applicability to Indigenous community is that the interventions might be more effective if they are designed according to lessons learned from both studies conducted in UK and US.

68. The association between smoke alarm presence and injury and death rates: A systematic review and meta-analysis
Rohde D.

A. Type of Intervention: Primary prevention

B. Target Population: The study population comprised households

C. Study Period: 1997-2013

D. Setting/Location: The setting was the community. The systematic review study was carried out in Queensland Australia

E. Behaviour Addressed: Improve safety of home environment (smoke alarm acquisition, ownership and function)

F. Outcome

G. Study Quality (Low, Medium, High): High-This was a rigorously done systematic review using RCTs. However, overall qualities of included RCTs are low.

H. Applicability to Indigenous Community: The results of this meta-analysis indicate that the death rate per incident approximately doubles when a functioning smoke alarm is not installed; the estimate odds ratio is 2.03 and the 95% confidence interval on the odds ratio is (1.88, 2.22). This result shows that using every public health measure to enhance functioning smoke alarms in the Indigenous households are utmost important priority. Smoke alarm ownership is associated with a reduced risk of fire death and appears particularly effective in households with young children. Children involved, unintentional injuries are particularly higher among indigenous populations, and working smoke alarms can be a viable primary prevention effort to reduce these injuries. Any interventions designed (either wholly or in part) to increase the prevalence of owned or properly functioning smoke alarms in the Indigenous communities tailored should be taking into consideration of mass media campaigns, education, home visits or inspections, clinician counseling, installation and timely battery change reminders and legislation.

69. Preventing deaths and injuries from house fires: a cost-benefit analysis of a community-based smoke alarm installation program
Yellman MA.

A. Type of Intervention: Smoke alarm installation program

B. Target Population: Houses in high-risk urban census tracts

C. Target Population: 2001-2011

D. Setting/Location: The setting was community care. The economic study was carried out in Dallas, Texas U.S.

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Cost benefit of smoke alarm installation program

G. Study Quality (Low, Medium, High) = Medium (15)

H. Applicability to Indigenous Community: Community smoke alarm installation programs could be cost-beneficial in high-fire-risk neighbourhoods. The study population living in the areas in high-risk urban census tracts. This population living in an area with a residential fire injury higher than the rest of the city similar to most Indigenous communities. Furthermore, this study area also had a lower median house income, lower property values, and poorer quality of housing. These conditions are also highly prevalent in Indigenous communities in Canada. The number of persons per occupied dwelling was also higher as in most indigenous communities. Therefore, applicability of these interventions and practicality of applying them to reduce and prevent residential fire injuries can be recommended.

70. Comparing the performance of residential fire sprinklers with other life-safety technologies
Butry DT.

A. Type of Intervention: Adaptation and installation of residential sprinkler technology/ Propensity score matching was used to evaluate the performance of fire sprinklers.

B. Target Population: Urban and rural population.

C. Study Period: 2012

D. Setting/Location: National Institute of Standards and Technology, Gaithersburg, MD 20899-8603, USA.

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Protection to occupant, property damage, and firefighter health and safety.

G. Study Quality (Low, Medium, High) = Medium (15)

H. Applicability to Indigenous Community: This study attempted to compare fire outcomes for sprinkler-protected buildings with outcomes in comparable buildings that lacked sprinkler protection. The study also evaluated the performance of fire sprinklers on civilian fatalities, civilian and firefighter injuries, and property damage. Data have shown that sprinklers reduce fire fatalities by 100% and property damage by 72%. Sprinklers significantly reduce fire-related casualties (injuries and deaths) per 1,000 fires, more than the benefit provided exclusively by functioning smoke alarms. Injury prevention interventions are more effective, when applying and including the passive prevention strategies rather than the active ones. This study suggests a continued role for public health practitioners in advocating for policy changes such as affordable, safe housing, and passive interventions, like sprinkler systems and appropriate building code regulations can be applied to Indigenous residential fire prevention efforts in Canada.

71. Sprinklers Systems and Residential Structure Fires
Garis L.

A. Type of Intervention: Performance of residential sprinkler technology

B. Target Population: Urban and rural population

C. Study Period: 2013

D. Setting/Location: University of Fraser Valley-British Columbia Canada.

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Fire-related casualties, extent and the control of fire spread, and the demand placed on fire department resources.

G. Study Quality (Low, Medium, High) = Medium (15)

H. Applicability to Indigenous Community: The performance of fire sprinklers on civilian fatalities, civilian and firefighter injuries, and property damage. Data have shown that sprinklers reduce fire fatalities by 100% and property damage by 72%. Injury prevention interventions are more effective, when applying and including passive prevention strategies rather than the active ones. This study suggests a continued role for public health practitioners in advocating for policy changes such as affordable, safe housing, and passive interventions, like sprinkler systems and appropriate building code regulations can be applied to Indigenous residential fire prevention efforts in Canada.

72. Sprinkler Systems and Fire Outcomes in Multi-Level Residential Buildings
Garis L.

A. Type of Intervention: Performance of residential sprinkler technology

B. Target Population: Urban and rural population

C. Study Period: 2006-2011

D. Setting/Location: University of Fraser Valley-British Columbia Canada.

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Number of fires injuries and deaths

G. Study Quality (Low, Medium, High) = Medium (15)

H. Applicability to Indigenous Community: The performance of fire sprinklers on civilian fatalities, civilian and firefighter injuries, and property damage. Data have shown that sprinklers reduce fire fatalities by 100% and property damage by 72%. Injury prevention interventions are more effective, when applying and including the passive prevention strategies rather than the active ones. This study suggests a continued role for public health practitioners in advocating for policy changes such as affordable, safe housing, and passive interventions, like sprinkler systems and appropriate building code regulations can be applied to Indigenous residential fire prevention efforts in Canada.

73. Sprinkler Systems and Residential Structure Fires - Revisited: Exploring the Impact of Sprinklers for Life Safety and Fire Spread
Garis L.

A. Type of Intervention: Performance of residential sprinkler technology

B. Target Population: Urban and rural population

C. Study Period: 2017

D. Setting/Location: University of Fraser Valley-British Columbia Canada.

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Number of fires injuries and deaths

G. Study Quality (Low, Medium, High) = Medium (15)

H. Applicability to Indigenous Community: The performance of fire sprinklers on civilian fatalities, civilian and firefighter injuries, and property damage. Data have shown that sprinklers reduce fire fatalities by 100% and property damage by 72%. Injury prevention interventions are more effective, when applying and including the passive prevention strategies rather than the active ones. This study suggests a continued role for public health practitioners in advocating for policy changes such as affordable, safe housing, and passive interventions, like sprinkler systems and appropriate building code regulations can be applied to Indigenous residential fire prevention efforts in Canada.

74. Global Concepts In Residential Fire Safety Part 1 - Best Practices from England, Scotland, Sweden, and Norway
Schaenman P.

A. Type of Intervention: Global strategies to prevent residential fires

B. Target Population: Population world wide

C. Study Period: 2007

D. Setting/Location: National Center for Injury Prevention and Control (U.S.), Division of Unintentional Injury Prevention.

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Number of fires injuries and deaths

G. Study Quality (Low, Medium, High) = Medium (15)

H. Applicability to Indigenous Community: While the observed downward trend in residential fires in high-income countries may be attributed to several factors, including improved fire safety regulations, practices and technologies and these reductions in part to the growing preventative role of the Fire and Rescue Services (FRS) and other partner organizations within local communities. Effective global community fire safety programs-best practices-that could be used in the benefit of indigenous communities in Canada. Furthermore, proven best practices can be used as examples of successes to stimulate improvements in prevention practices in the high-risk communities, though they sometimes require adaptation to their unique environmental, cultural and social factors. It is sometimes difficult to transfer good practices from one culture to another; Indigenous fire prevention leaders need to figure out how to apply best practices in their own communities. Adapting these best practices may help continue reduction in the fire injury and death rates in American homes, especially those at highest risk: Community safety specialists called “advocates” join firefighters in visiting ethnic or high-risk households. Their specialties include foreign languages, problems of the elderly, problems of alcoholics, and problems of the hearing or mobility impaired. Norway requires extinguishers or hose lines attached to faucets in every home, in addition to smoke alarms. Home occupants are trained to extinguish small fires because the fire service cannot arrive within the 2-4 minutes it takes for many fires to reach flashover. To reduce fires from unattended cooking, timers are being built into stoves in Norway or, less expensively, stoves are plugged into timers. The timers shut the stoves off if the person cooking forgets to do so or falls asleep. The use of timers is advocated especially for households with elderly people. To reduce fire casualties in the home, the British fire service is visiting large numbers of high-risk households to do fire safety inspections and risk reductions, especially to ensure they have a functioning smoke detector. While the observed downward trend in residential fires in high-income countries may be attributed to several factors, including improved fire safety regulations, practices and technologies and these reductions in part to the growing preventative role of the Fire and Rescue Services (FRS) and other partner organizations within local communities.

75. Global Concepts in Residential Fire Safety Part 2–Best Practices from Australia, New Zealand and Japan.
Mailstop F.

A. Type of Intervention: Global strategies to prevent residential fires

B. Target population: Population world wide

C. Study Period: 2008

D. Setting/Location: National Center for Injury Prevention and Control (U.S.), Division of Unintentional Injury Prevention.

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Number of fires injuries and deaths

G. Study Quality (Low, Medium, High) = Medium (15)

H. Applicability to Indigenous Community: Effective global community fire safety programs-best practices-that could be used in the benefit of indigenous communities in Canada. Furthermore, proven best practices can be used as examples of successes to stimulate improvements in existing prevention practices in the high-risk communities, though they sometimes require adaptation to their unique environmental, cultural, and social factors. It is sometimes difficult to transfer good practices from one culture to another; Indigenous fire prevention leaders need to identify best evidence-based practices and adapt them to their own communities. Adapting these best practices may help continue reduction in the fire injury and death rates in Canadian Indigenous high risk home environment. Japan has perhaps the most extensive public fire safety education programs among developed nations. The result is a relatively low accidental fire death rate despite having a disproportionately large elderly population, the age group with the highest fire death rate. Japan has increasingly tied fire safety education to disaster education and training because earthquakes lead to many fires and is of a high public concern. A special battery replacement program in Australia and New Zealand is directed to the elderly who do not have friends or family that visit them. This program is widely advertised to reach vulnerable communities. Community assistance personnel identify the elderly to participate. The community assistance personnel inform the fire service if the caregivers themselves cannot check the smoke alarms on a regular basis. The program installs special smoke alarms for the hard-of-hearing. Indigenous Caretaker Training program in Australia and New Zealand often train indigenous caretakers to pass on safety information and check smoke alarms for their indigenous clients.

76. Global Concepts In Residential Fire Safety Part 3 Best Practices from Canada, Puerto Rico, Mexico, and Dominican Republic

System Planning Corporation, TriData Division; National Center for Injury Prevention and Control (U.S.), Division of Unintentional Injury Prevention.
Mailstop F.

A. Type of Intervention: Global strategies to prevent residential fires

B. Target Population: Population worldwide

C. Study Period: 2009

D. Setting/Location: National Center for Injury Prevention and Control (U.S.), Division of Unintentional Injury Prevention.

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Number of fires injuries and deaths

G. Study Quality (Low, Medium, High) = Medium (15)

H. Applicability to Indigenous Community: While the observed downward trend in residential fires in high-income countries may be attributed to several factors, including improved fire safety regulations, practices and technologies and these reductions in part to the growing preventative role of the Fire and Rescue Services (FRS) and other partner organizations within local communities. Effective global community fire safety programs-best practices-that could be used in the benefit of indigenous communities in Canada. Furthermore, proven best practices can be used as examples of successes to stimulate improvements in prevention practices in the high-risk communities, though they sometimes require adaptation to their unique environmental, cultural, and social factors. It is sometimes difficult to transfer good practices from one culture to another; Indigenous fire prevention leaders need to figure out how to apply best practices in their own communities. Adapting these best practices may help continue reduction in the fire injury and death rates in American homes, especially those at highest risk: The ultimate long-term solution to most of the residential fire problem is fitting and maintaining functional sprinkler systems in all residences including the single-family dwellings. Tailored fire prevention programs specific for low-income and immigrant households including efforts to maintain functional smoke alarms. In some Indigenous Canadian cultures, the tribal council plays a major role in safety issues, so the fire department provides safety information for the council to pass on, instead of approaching individual tribal members directly. Use of music: Music is an integral part of Puerto Rican culture, and songs have been incorporated into the school fire safety program. The fire service created its own music for the NFPA curriculum, with lyrics set to rap and hip-hop styles to increase children's interest. The "Bombero Rapero" (rapping firefighter) raps about fire safety and how to escape. Youngsters love it and sing along. The music has been recorded and available to United States fire departments. This is an excellent example of customizing programs in light of the local culture.

77. Preventive measures for fire-related injuries and their risk factors in residential buildings: a systematic review.
Shokouhi M.

A. Type of Intervention: This best evidence synthesis to highlight unique resident and property characteristics - associated with risk of experiencing house fire incidents, injuries or death. This systematic review evidence has implication for future injury prevention and safety promotions initiatives.

B. Target population: Households with unique resident and property characteristics - associated with potential higher risk of experiencing house fires.

C. Study Period: 2018

D. Setting/Location: Safety Promotion and Injury Prevention Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Enhance home safety practices by preventing and addressing potential risk factors.

G. Study Quality (Low, Medium, High)

H. Applicability to Indigenous Community: Included studies in this review showed that areas with many young children, older people, people with physical and mental disabilities, alcohol and drug addicts, smokers, single-family households, and low-income families were particularly at risk of fire-related injuries and deaths. There are features in residential buildings and attributes among residents that can be related to fire hazard and fire-related injuries and deaths. The most important point of this study is to focus on preventive strategies including environmental modification, promotion of safety rules and changes in risk behaviour among residents. Policy makers should pay more attention to these important issues to promote safety and injury prevention in relation to building fires. We can utilize evidence derived from this review to tailor targeted interventions to address these risk factors and enhance safety in high-risk Indigenous households.

78. Risk factors associated with unintentional house fire incidents, injuries and deaths in high-income countries: a systematic review
Turner SL.

A. Type of Intervention: This best evidence synthesis to highlight house fire risk factors associated with incident, injury or death.

B. Target population: Households with unique resident and property characteristics - associated with potential higher risk of experiencing house fires.

C. Study Period: 2017

D. Setting/Location: Farr Institute, Swansea University Medical School, Swansea SA2 8PP, UK

E. Behaviour Addressed: Improve safety of home environment

F. Outcome: Enhance home safety practices by preventing and addressing potential risk factors.

G. Study Quality (Low, Medium, High)

H. Applicability to Indigenous Community: Several universal and distinctive resident, property and fire related factors are associated with risk of experiencing unintentional house fire incidents, injuries, and deaths. Included studies in this review showed that areas with many young children, older people, people with physical and mental disabilities, alcohol and drug addicts, smokers, single-family households, and low-income families were particularly at risk of fire-related injuries and deaths. There are features in residential buildings and attributes among residents that can be related to fire hazard and fire-related injuries and deaths. The most important point of this study is to focus on preventive strategies including environmental modification, promotion of safety rules and changes in risk behaviour among residents. Policy makers should pay more attention to these important issues to promote safety and injury prevention in relation to building fires. We can utilize evidence derived from this review to design targeted interventions to address these risk factors and enhance safety in high-risk Indigenous households.

79. Effectiveness of the Cigarette Ignition Propensity Standard in Preventing Unintentional Residential Fires in Massachusetts
Alpert

A. Type of Intervention: Massachusetts Fire Safe Cigarette Law's (FSCL's) to prevent residential fire hazards

B. Target population: Regular and habitual smokers in Massachusetts

C. Study Period: 2004 to 2010

D. Setting/Location: Massachusetts USA

E. Behaviour Addressed: Improve safety reducing hazardous smoking in home environment

F. Outcome: The FSCL was associated with a 28% (95% confidence interval = 12%, 41%) reduction in the odds of cigarette- versus non-cigarette-caused fires

G. Study Quality (Low, Medium, High) = Medium (16)

H. Applicability to Indigenous Community: Study authors have concluded that previous claims regarding the effects of fire safe cigarette laws may be premature. Cigarette manufacturers are responsible for the consequences of their products and voluntarily adopt reduced ignition propensity standards in Canada. Nevertheless, cigarettes remain an important, preventable cause of residential fires and associated morbidity and mortality in Indigenous communities. Tobacco has been used traditionally by most Aboriginal cultures for thousands of years. First Nations and Métis use tobacco for ceremony, healing and giving thanks, while commercial cigarettes serve an entirely different purpose. In fact, they've been designed to be highly addictive and will make you sick. They have comparatively higher smoking rates compared to the general Canadian population. Continued surveillance and monitoring of fires and fire losses caused by cigarettes is essential to evaluate the success of existing policies and the potential need for adjusting the standards adopted. Culturally sensitive targeted health promotion campaigns are needed to reach these high-risk groups and to enhance awareness of cigarette related house fire hazards unique to these vulnerable communities

80. **Are fire safe cigarettes actually fire safe? Evidence from changes in US state laws**
Bonander

A. Type of Intervention: Fire safe cigarette laws

B. Target population: Regular and habitual smokers in all 50 states and the District of Columbia.

C. Study Period: 1999 to 2014

D. **Setting Location:** Division of Risk Management, Department of Environmental and Life Sciences, Karlstad University, Karlstad, Sweden

E. Behaviour Addressed: Improve safety reducing hazardous smoking in home environment

F. Outcome: The study found no statistically significant effects on all-cause fire mortality, residential fire mortality or cigarette-caused fire rates after enactment of legislative policy changes related to safety of tobacco products. The results show only weak and inconsistent evidence of a population-level impact and further echoed the conclusions drawn in a report by the US Consumer Product Safety Commission. "After finding that fire safe cigarettes appear to be similar to conventional cigarettes in terms of ignition propensity when tested on mattresses, they wrote that'... it is premature to conclude that the use of the [fire safe] cigarette alone will greatly reduce the threat of unintentional fires ignited by cigarettes involving mattresses and soft furnishings"

G. Study Quality (Low, Medium, High) = Medium (16)

H. Applicability to Indigenous Community: Cigarettes remain an important, preventable cause of residential fires and associated morbidity and mortality in Indigenous communities. Tobacco has been used traditionally by most Aboriginal cultures for thousands of years. First Nations and Métis use tobacco for ceremony, healing and giving thanks, while commercial cigarettes serve an entirely different purpose. In fact, they've been designed to be highly addictive and will make you sick. They have comparatively higher smoking rates compared to the general Canadian population. Continued surveillance and monitoring of fires and fire losses caused by cigarettes is essential to evaluate the success of existing policies and the potential need for adjusting the standards adopted. Culturally sensitive targeted health promotion campaigns are needed to reach these high-risk groups and to enhance awareness of cigarette related house fire hazards unique to these vulnerable communities. Fire-related mortality among Indigenous people is a preventable public health concern. In this population, fire safety and prevention programs should consider improving the overall quality of the housing environment, promoting the safe use of heat sources, and decreasing smoking behaviors and the use of alcohol.

81. Evaluation of a New Zealand indigenous community injury prevention project
Brewin

A. Type of Intervention: Turanganui-a-kiwa Community Injury Prevention Project and the three main areas of activities were: child road safety; safer alcohol use in the road, sporting and home environments for young people and adults; and fire safety for older people.

B. Target population : Extensive Indigenous population (Maori).

C. Study Period: 1999-2001

D. Setting/Location: New Zealand

E. Behavior Addressed: Injury prevention and safety promotion F

F. Outcome: The results of the fire safety initiative was that 120 kaumatua homes now have correctly installed smoke alarms and there is now a commitment from the Fire Service to maintain these alarms. Outcome evaluation findings showed that there was a significant decrease in hospitalization injury rates across the lifespan in Turanganui-a-kiwa ($p < 0.05$).

G. Study Quality (Low, Medium, High) = Medium (15)

H. Applicability to Indigenous Community: Māori, the indigenous population of New Zealand, experience numerous and consistent health disparities when compared to non- Māori. These disparities are somewhat similar to the Canadian Indigenous population. Injury is no exception, yet there is a paucity of published literature that examines outcomes following a wide variety of injury types and severities for this population. According to this study results, significant increases in awareness of injury prevention initiatives were found among Turanganui-a-kiwa whanau (families) ($p < 0.001$). A large increase in the take-up of car restraints among Māori young children was demonstrated (pre 10%, post 74%). This evidence further reiterated that culturally sensitive injury prevention programs can be highly successful in these vulnerable communities. This study reiterated that safety items coupled with sensible involvement of community injury prevention partners-tailored to match Indigenous culture was an effective intervention in a hard-to-reach population.

6. Relevance to Indigenous Communities

Multiple factors including environmental, behavioural, and social aspects contribute to individuals' increased risk of fire-related injury and death. Available studies have identified maternal education, socioeconomic status, being from a single-parent household, housing regulations, lack of fire escape plans, smoke alarm functionality, and adequate adult supervision as important risk determinants. According to the Canadian Mortgage and Housing Corporation 2007 report, Indigenous fire incidence rate per capita is 2.4 times higher than the rest of Canada. The death rate is 10.4 times greater; the fire injury rate is 2.5 times greater; and the fire damage per unit is 2.1 times greater. It was also noted that many Aboriginal communities tend to have a low number of functioning smoke alarms.

Although a considerable amount of fire prevention research has targeted vulnerable communities and at risk populations, there is a dearth of literature on fire prevention intervention programs and strategies implemented and evaluated specifically among Indigenous communities globally[32,97]. Existing research on Indigenous populations to date are mainly epidemiological studies that described and examined the burden and etiology of residential fire related injuries.

Given the higher prevalence of residential fire among vulnerable populations, the number of single-headed households, individuals living in lower socioeconomic strata, homes with non-functioning smoke alarms and older housing construction, indigenous communities with similar profiles and characteristics might also be considered at high risk of residential fires and related injuries. Moreover, the correlated characteristics of lower education and poverty are typically associated with an increased risk for fire-related death. Other individual risk factors include psychotropic and sedative substance use, cigarette smoking material and alcohol consumption. These factors are more prevalent among vulnerable communities, including some Indigenous communities. Although the growing use of installed smoke alarms has decreased the incidents of unintentional fires globally, residential fires remain a major health burden that claims the lives of many Indigenous peoples in Canada and worldwide.

Proactive engagement of Indigenous communities in the design, implementation and adoption of safety measures is essential to achieve successful intervention. The unique characteristics of Indigenous communities warrant the need to tailor existing fire prevention strategies and programs synthesized from this review to the context of the particular Indigenous population being considered. There is a need to adapt proven-effective fire interventions to the Indigenous context to address existing disparities and prevent the occurrence of residential fires and reduce fire related morbidity and mortality. Culturally sensitive and targeted interventions are needed to reach high-risk groups among Indigenous communities and to reduce fire-related injury and death among Indigenous children and youth. As shown in this review, culturally appropriate educational and awareness initiatives can produce effective results within Indigenous communities, promoting safe fire behaviour, and enhancing environmental safety practices (e.g. smoke alarm installation). These initiatives may be significant in helping to further reduce fire-related deaths across other Indigenous communities.

Evidence from this review suggests that residential fire injuries can be prevented when households have functioning and well-maintained smoke alarms, and a practiced home fire escape plan in place. Moreover, education, coupled with the provision of safety materials and/or safety kits and the installation of smoke alarms, have proved effective in terms of improving knowledge, changing behaviours and enhancing the adoption of various safety practices. Adapting and utilizing the evidence revealed in this review to tailor interventions that address the unique contexts of Indigenous communities in Canada that can prevent fire incidents and related injuries and deaths, is strongly encouraged.

The studies included in this review proposed a combination of effective interventions (i.e. educational, engagement, enforcement and environmental modifications) that can be concurrently implemented to achieve successful and impactful outcomes. Culturally sensitive outreach should make every effort to ensure a combination of interventions to achieve the greatest impact, including periodic household inspections, smoke alarm installation, hands-on-training and educational materials to support sustainable fire intervention strategies, such as household fire-escape plans. The provision of low cost or free smoke alarms (with lithium-ion batteries to increase functionality and longevity), reinforced by education and awareness programs can be adapted to address Indigenous community priorities and needs, highlighting the lifesaving effects of these interventions[29,36,67,94,97,98]. Researchers and programmers designing community interventions should consider how best these interventions fit with the particular and unique socio-economic, cultural, and social factors of each Indigenous community, as well as the existing health and well-being priorities and goals, in order to maximize benefits through a comprehensive, holistic approach.

7. Conclusion and Recommendations

This report presents a comprehensive review of the fire intervention literature and synthesized evidence of the effectiveness of various interventions in preventing residential fires and reducing their associated injuries and deaths.

Consistent with previous research, this review confirmed a lack of evidence specific to the effect of educational interventions alone on the reduction of fire related injuries and deaths compared to environmental modification (smoke alarm installation and maintenance) and enforcement. Moreover, this review confirms that combining multiple interventions including education, the provision of safety equipment, home inspection and proactive engagement of household members yielded the most effective outcomes and represented and best fire safety prevention practices in the current research literature.

We offer a series of recommendations that can be considered when developing and implementing specific fire safety interventions for Indigenous communities:

Operationalized fire prevention research

This review demonstrated the clear dearth of evidence on fire prevention programs and initiatives, particularly among Indigenous communities. The increased risk of fire related injuries and deaths among Indigenous populations highlight the significant need for evidence-based programs that reduce the risk of fire and fire-related injury and death. Although some Indigenous communities are at greater risk than others, evidence from this research offers solutions that can be implemented by Indigenous communities to lead initiatives that will mitigate the burden of fire related injuries and deaths.

Combination of multiple E approaches for an impactful intervention

This review confirmed that fire interventions that combine multiple measures (e.g., providing free, low cost or discounted safety equipment, education, etc.) appeared to be more effective at improving safety practices and reducing fire injuries. Smoke alarm installation coupled with fire safety education and supported by community members showed increased effectiveness in the number of houses adopting the safety changes, especially when using neighborhood door-to-door canvassing as one of the most effective in accessing the largest numbers of residents. The design of future fire interventions should consider the adoption of multiple approaches including mass communications campaigns, education, clinician counseling, home visits or inspections, fire alarm installation and timely battery change reminders and legislation.

Tailored intervention is essential to lead a significant impact

Synthesized findings demonstrated the importance of culturally sensitive and context specific interventions and their effectiveness when tailored to the unique characteristics of a population, particularly higher-risk communities. The provision of safety items coupled with a home visit tailored to child age and maternal culture was shown to be an effective intervention in a hard-to-reach population. Creating interventions in the language of the target population is desirable to engaging individuals and to increaseself-efficacy for safety behaviours. Evidence synthesized from this review emphasized the relevance of community culture, setting, and context of the targeted population.

Long term assessment of intervention outcomes

Evaluation of injury prevention programs is critical for assessing the program strategies and measuring effects on reducing injury related morbidity and mortality or on increasing the adoption of safety practices among the target population. The availability of evaluation data enables program managers to refine a program and increases the likelihood of achieving successful outcomes. A multidimensional approach and long-term post intervention evaluation should be adopted to assess the expected fire injury outcome.

Few educational intervention studies have reported success in the reduction in fire related injuries and death post interventions. However, one common pattern among many of these studies is the lack of long-term evaluation. When a long term evaluation of the educational programs over subsequent months and years, with access to health surveillance data that enable the accurate long term evaluation of such educational programs and its impact on fire morbidity and mortality (i.e. King et al. evaluated the intervention for 12-36 through access to Emergency department injury surveillance system[77]), then educational programs are more likely associated with positive fire safety outcomes. When implementing community fire safety programs, it is important to evaluate the long-term outcome so as to gain insight into their effectiveness and impacts on preventing residential fires and injuries, which may not be apparent with only short-term evaluation efforts.

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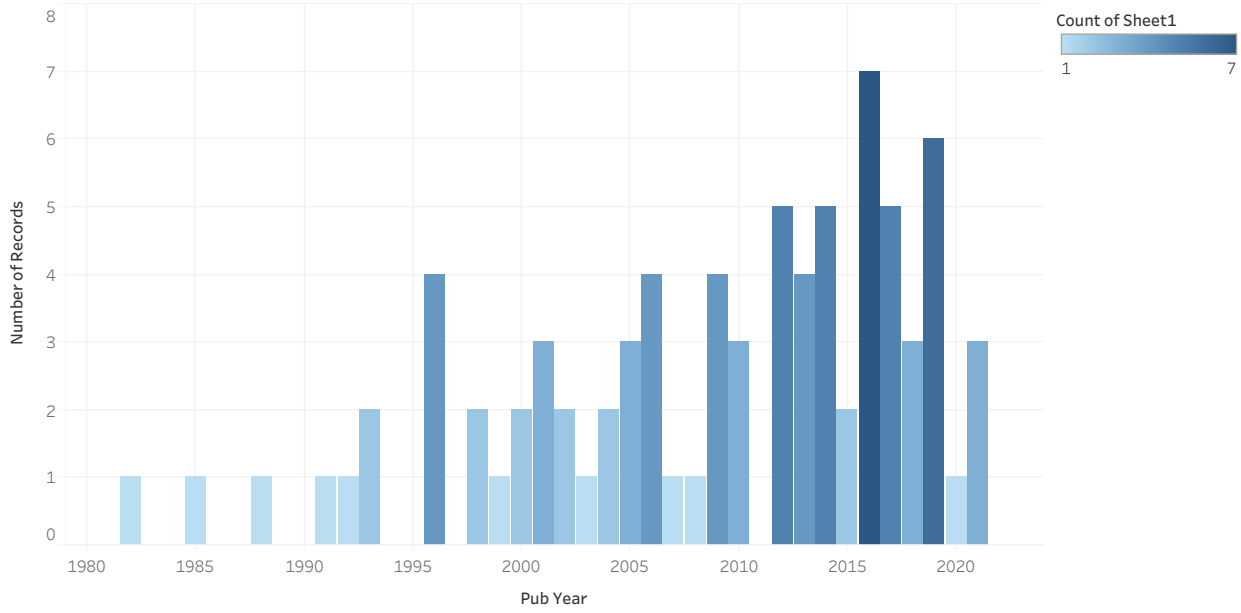
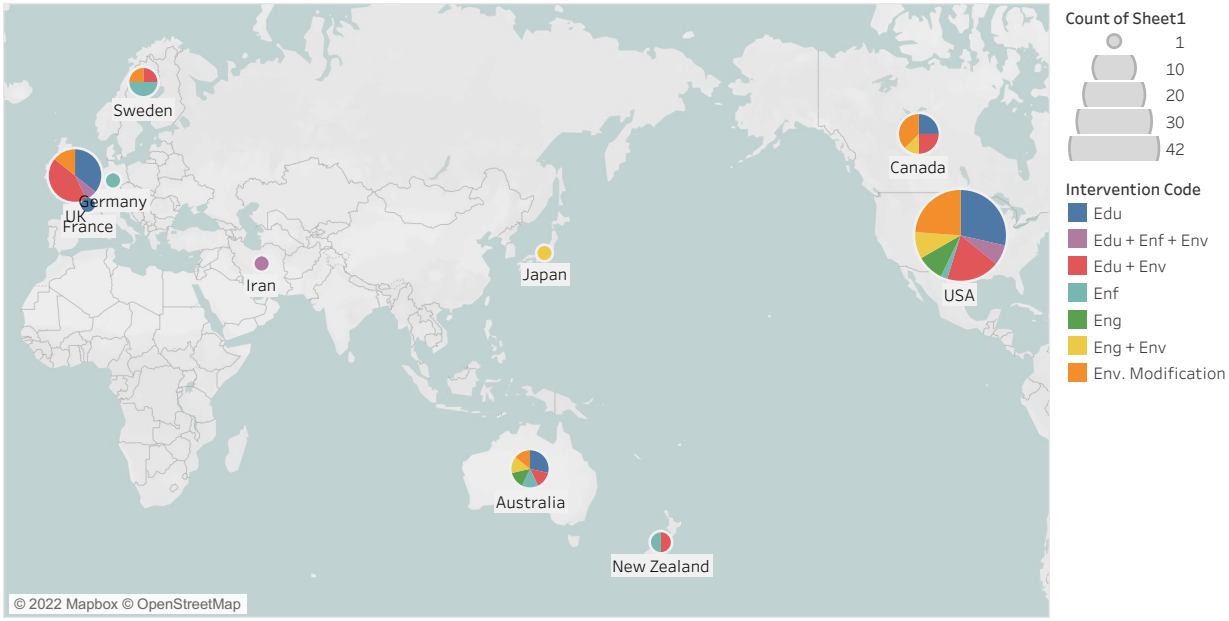
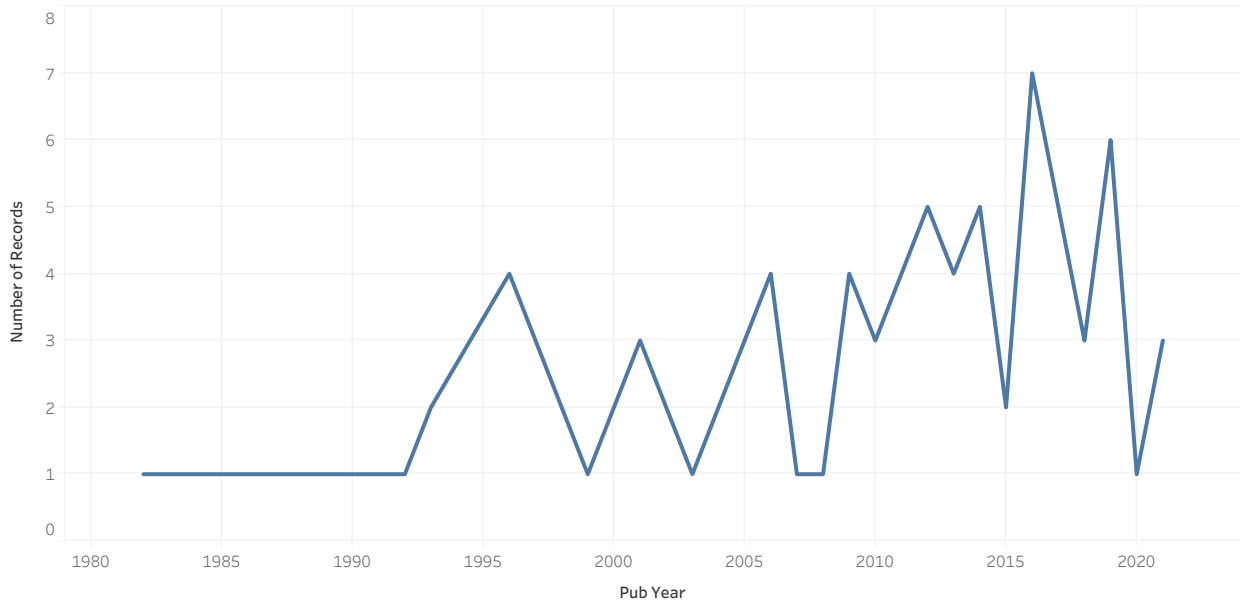
Appendix A



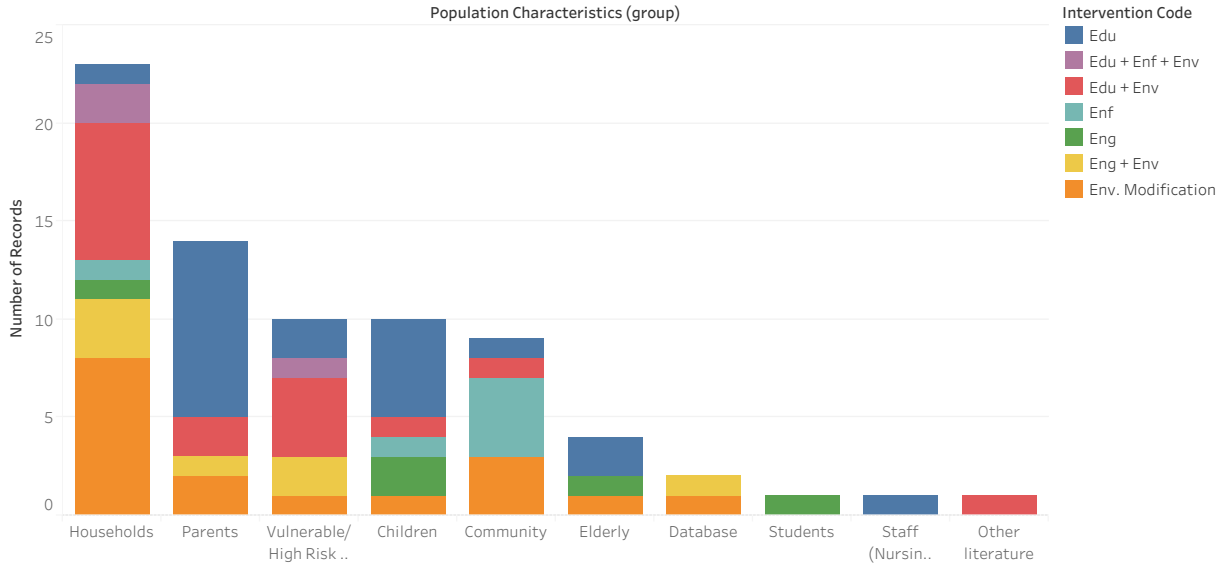
The plot of count of Sheet1 for Pub Year. Color shows count of Sheet1.



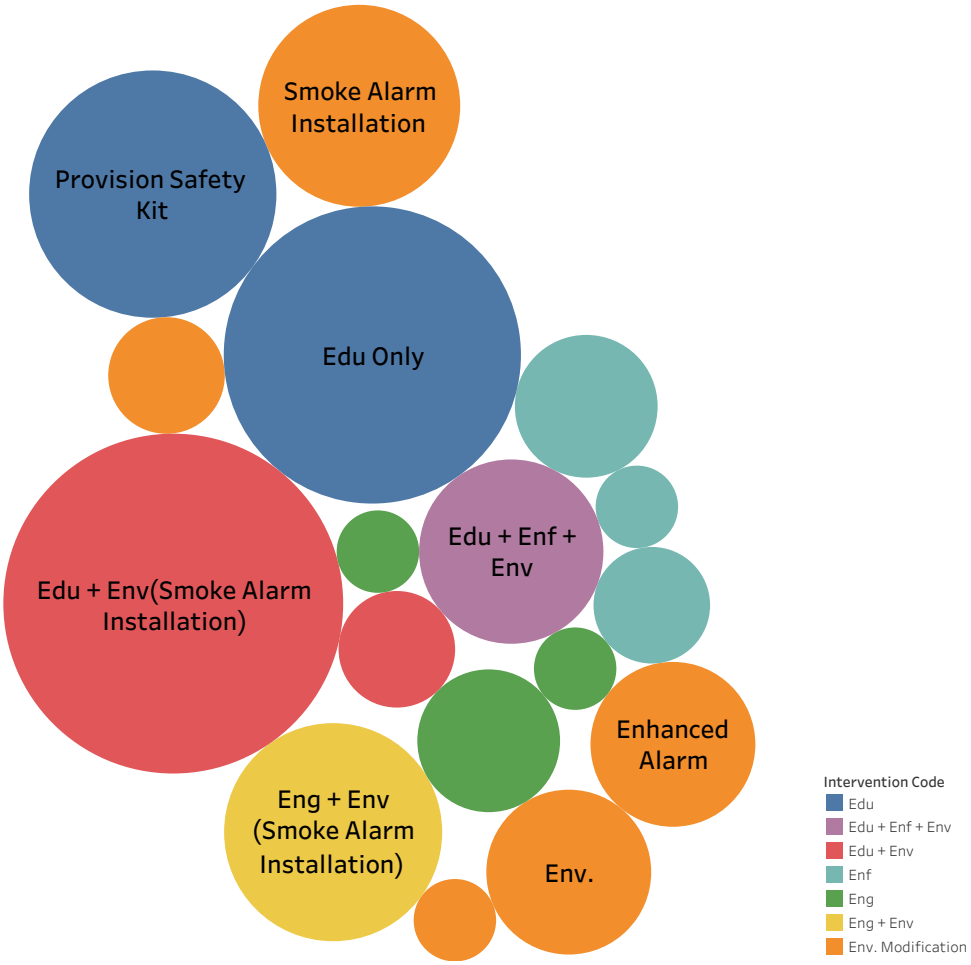
Map based on Longitude (generated) and Latitude (generated). Color shows details about Intervention Code. Size shows count of Sheet1. The marks are labeled by Country. Details are shown for Country.

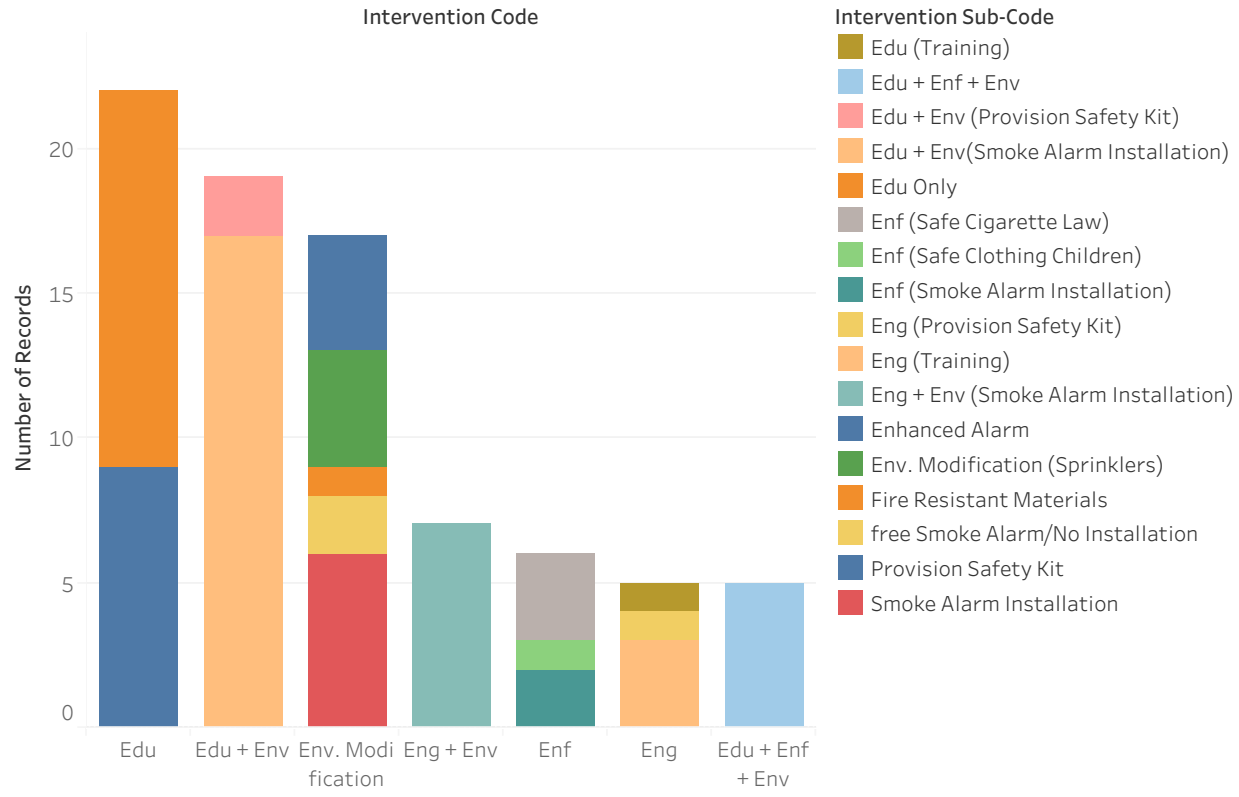


The trend of count of Sheet1 for Pub Year.

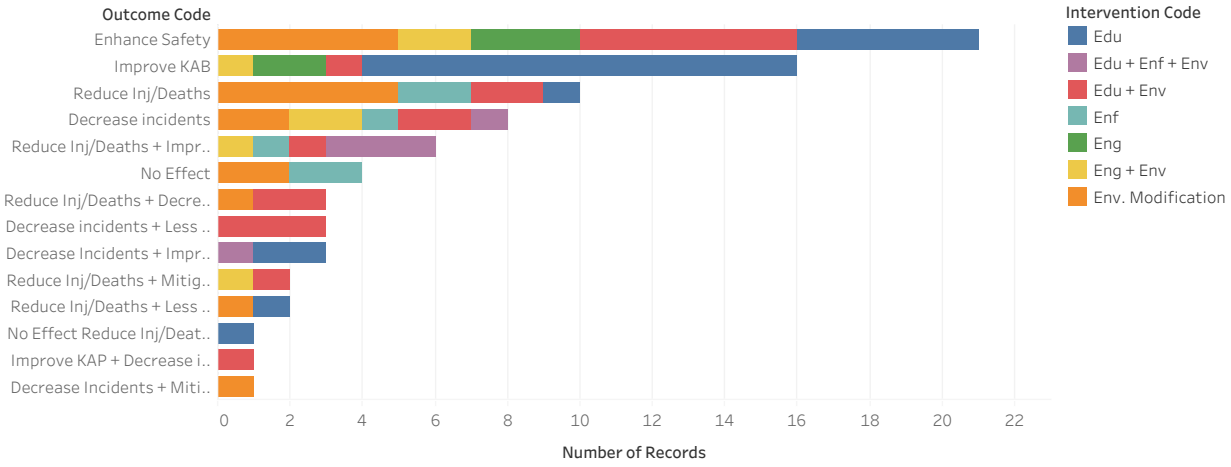


Count of Sheet1 for each Population Characteristics (group). Color shows details about Intervention Code. The data is filtered on Population Characteristics, which excludes Null.

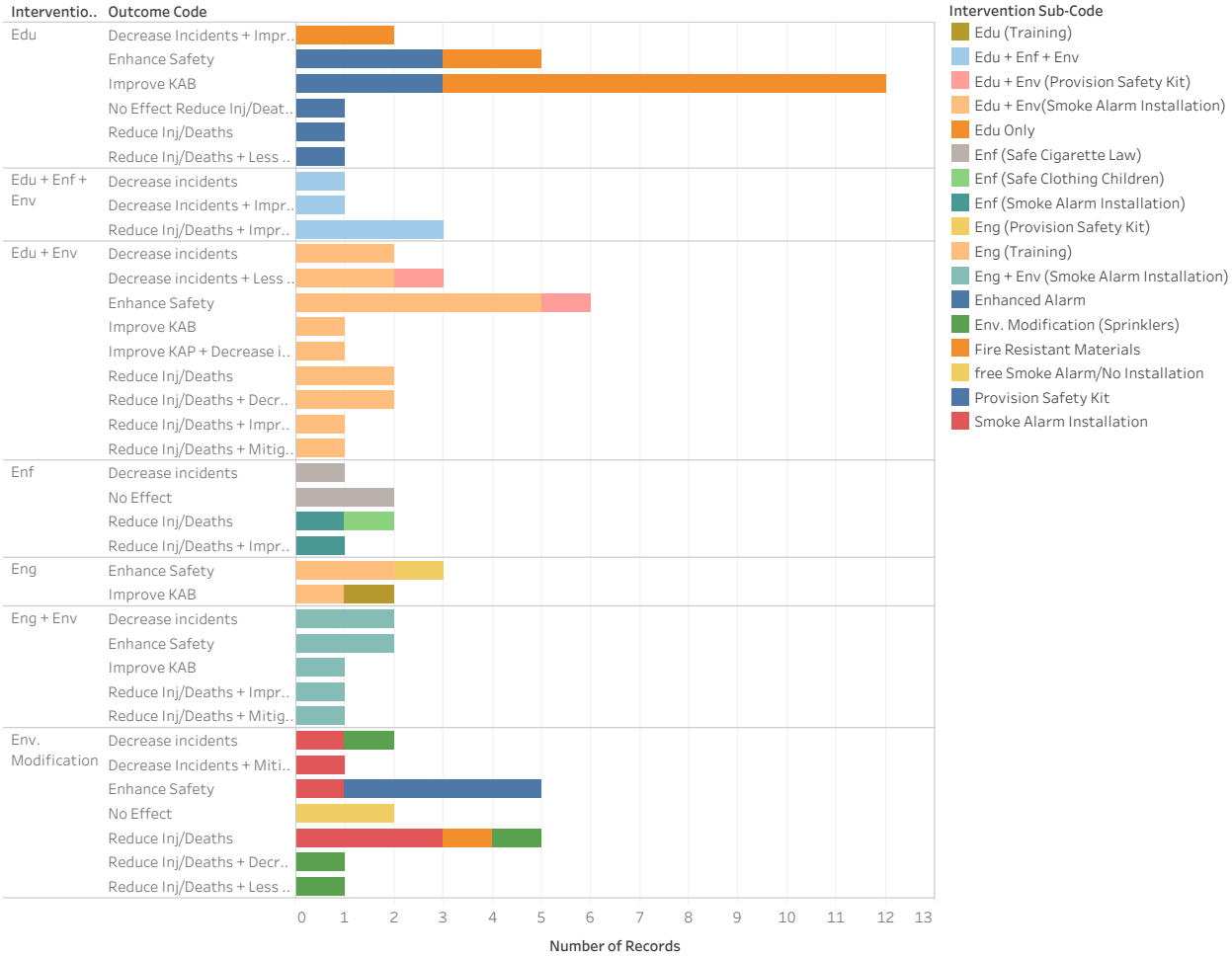

Smoke Alarm Installation
Provision Safety Kit
Edu Only
Edu + Enf + Env
Edu + Env(Smoke Alarm Installation)
Enhanced Alarm
Eng + Env (Smoke Alarm Installation)
Env.
Intervention Code
Edu
Edu + Enf + Env
Edu + Env
Enf
Eng
Eng + Env
Env. Modification



Count of Sheet1 for each Intervention Code. Color shows details about Intervention Sub-Code.



Count of Sheet1 for each Outcome Code. Color shows details about Intervention Code.



Count of Sheet1 for each Outcome Code broken down by Intervention Code. Color shows details about Intervention Sub-Code.

Appendix B

Residential Fires Systematic Review Search Report
Search Results

Database/ Source	Date Searched	# of Results
MEDLINE (Ovid)	August 4, 2021	700
Embase (Ovid)	August 4, 2021	892
CENTRAL (Ovid)	August 4, 2021	94
Web of Science Core Collection	August 4, 2021	1511
Trophy	August 4, 2021	2
PAIS Index (ProQuest)	August 4, 2021	61
ERIC (EBSCO)	August 4, 2021	123
FireDOC	August 4, 2021	86
IEEE Xplore	August 4, 2021	23
Native Health Database	August 4, 2021	15
Google Scholar	August 4, 2021	221
Database search total	---	3,727
ProQuest Dissertations & Theses Global	August 5, 2021	22
The Networked Digital library of Theses and Dissertations (NDLTD)	August 5, 2021	57
PapersFirst (via WorldCat FirstSearch)	August 5, 2021	13
Proceedings (via WorldCat FirstSearch)	August 5, 2021	105
OpenGrey	August 5, 2021	2
Grey Literature Report	August 5, 2021	0

DesLibris	August 6, 2021	26
Australian Institute of Health and Welfare (https://www.aihw.gov.au/reports-data/)		0
New Zealand Ministry of Health Library (https://www.health.govt.nz/about-ministry/ministry-health-library)		1
Govinfo (https://www.govinfo.gov/)		0
Training Programs in Epidemiology and Public Health Interventions Network (TEPHINET)		0
Google Search targeted to organizations in Australia, New Zealand, US and Canada		394
Total Grey Literature	---	620

Search Strategies
MEDLINE

Link:
Click to run search
The above Jumpstart will only work for users who have access to this specific database.

Database:
Ovid MEDLINE(R) and Epub Ahead of Print, In-Process, In-Data-Review & Other Non-Indexed Citations, Daily and Versions(R) <1946 to August 03, 2021>

#	Query	Results from 4 Aug 2021
1	Fires/	9,812

2	housing/ or housing for the elderly/ or public housing/ or refugee camps/ or independent living/	29,509
3	Accidents, Home/	4,595
4	2 or 3	33,958
5	1 and 4	361
6	(fire? adj10 (hous* or home? or residen*)).tw,kw.	1,091
7	5 or 6	1,305
8	Accident prevention/	9,224
9	Health Promotion/	77,129
10	Health education/	62,060
11	pc.fs.	1,355,349
12	(prevent* or reduc* or decrease? or intervention? or promot* or improve? or program* or educat*).tw,kf.	9,526,161
13	or/8-12	10,125,853
14	7 and 13	800
15	limit 14 to yr="1990 -Current"	700

Embase

Link:
Click to run search
The above Jumpstart will only work for users who have access to this specific database.

Database:
Embase <1974 to 2021 August 03>

#	Query	Results from 4 Aug 2021
1	fire/	12,671
2	housing/	26,468
3	home for the aged/	11,195
4	refugee camp/	834
5	independent living/	5,509
6	home accident/	3,141
7	or/2-6	46,586
8	1 and 7	294
9	(fire? adj10 (hous* or home? or residen*)).tw,kw.	1,454
10	8 or 9	1,625
11	accident prevention/	15,837

12	health promotion/ or health education/	190,148
13	public health campaign/ or public health message/	3,443
14	pc.fs.	1,168,364
15	(prevent* or reduc* or decrease? or intervention? or promot* or improve? or program* or educat*).tw,kw.	12,257,839
16	or/11-15	12,810,115
17	10 and 16	999
18	limit 17 to yr="1990 -Current"	892

CENTRAL

Link:
Click to run search
The above Jumpstart will only work for users who have access to this specific database.

Database:
EBM Reviews - Cochrane Central Register of Controlled Trials <June 2021>

#	Query	Results from 4 Aug 2021
1	Fires/	87

2	housing/ or housing for the elderly/ or public housing/ or refugee camps/ or independent living/	950
3	Accidents, Home/	74
4	2 or 3	1,019
5	1 and 4	16
6	(fire? adj10 (hous* or home? or residen*)).tw,kw.	94
7	5 or 6	100
8	Accident prevention/	121
9	Health Promotion/	6,061
10	Health education/	4,033
11	pc.fs.	94,473
12	(prevent* or reduc* or decrease? or intervention? or promot* or improve? or program* or educat*).tw,kw.	1,083,734
13	or/8-12	1,102,459
14	7 and 13	97
15	limit 14 to yr="1990 -Current"	94

Web of Science Core Collection

4 #1 AND #2 limit to 1990-2021 1,511
3 #1 AND #2 1,516
2 TS=(prevent* or reduc* or decrease$ or intervention$ or promot* or improve$ or program* or educat*) 17,035,187
1 TS=((fire$ NEAR/10 hous*) OR (fire$ NEAR/10 home$) OR (fire$ NEAR/10 residen*)) 3,223

TRoPHI
Freetext (All but Authors): "residential fire*"

PAIS Index
((MAINSUBJECT.EXACT("Fire") AND MAINSUBJECT.EXACT.EXPLODE("Housing")) OR AB(fire NEAR/10 hous*) OR AB(fire NEAR/10 home?) OR AB(fire? NEAR/10 residen*)) AND (MAINSUBJECT.EXACT("Fire Prevention") OR AB(prevent* OR reduc* OR decrease OR intervention OR promot* OR improve? OR program* OR educat*))

Additional limits - Date: After January 01 1990

ERIC

#	Query	Limiters/Expanders	Last Run Via	Results
S7	S1 AND S5	Limiters - Published Date: 19000101-20201231 Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen	123

			- Advanced Search Database - ERIC	
S6	S1 AND S5	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search	125

			Database - ERIC	
S5	S2 OR S3 OR S4	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search	1,05 1,771

			Database - ERIC	
S4	TI ((prevent* or reduc* or decrease# or intervention# or promot* or improve# or program* or educat*)) OR AB ((prevent* or reduc* or decrease# or intervention# or promot* or improve# or program* or educat*))	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database	1,049,084

			- ERIC	
S3	(DE "Health Promotion") OR (DE "Health Education")	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database	18,919

			- ERIC	
S2	DE "Fire Protection"	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database	697

			- ERIC	
S1	TI ((fire$ N10 hous*) OR (fire$ N10 home#) OR (fire$ N10 residen*)) OR AB ((fire$ N10 hous*) OR (fire$ N10 home#) OR (fire$ N10 residen*))	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database	158

			- ERIC	

FireDOC
Title: residential fire AND publication date: 1990-2021

IEEE Xplore
("All Metadata":"residential fire" OR "All Metadata":"residential fires") OR ("All Metadata":"house fire" OR "All Metadata":"house fires") OR ("All Metadata":"home fire" OR "All Metadata":"home fires")
Filters Applied: 1990 - 2022

Native Health Database
Keywords: residential fire OR house fire OR home fire
Range Start: 1990
Range End: 2021
Google Scholar
"Residential|house|home+fire+prevention|intervention"
Publication date: 1990-2021

ProQuest Dissertations & Theses Global
(TI(residential NEAR/10 fire*) OR TI(hous* NEAR/10 fire*) OR TI(home NEAR/10 fire*)) AND (NOFT(prevent* OR reduc* OR decrease* OR intervention* OR promot* OR improve* OR program* OR educat*))
Additional limits - Date: From January 01 1990 to December 31 2021

Networked Digital library of Theses and Dissertations (NDLTD)
title:"residential fire" OR title:"residential fires"

PapersFirst (via WorldCat FirstSearch)
(kw: residential w10 fire*) OR (kw: hous* w10 fire*) OR (kw: home w10 fire*) AND (kw: prevent* OR kw: reduc* OR kw: decrease* OR kw: intervention* OR kw: promot* OR kw: improve* OR kw: program* OR kw: educat*) and yr: 1990-2021

Proceedings (via WorldCat FirstSearch)
(kw: residential w10 fire*) OR (kw: hous* w10 fire*) OR (kw: home w10 fire*) AND (kw: prevent* OR kw: reduc* OR kw: decrease* OR kw: intervention* OR kw: promot* OR kw: improve* OR kw: program* OR kw: educat*) and yr: 1990-2021

OpenGrey
"residential fire" OR "residential fires"

Grey Literature Report
"residential fire" OR "residential fires"

DesLibris
Residential fire
Limit to public documents

Australian Institute of Health and Welfare
“Residential fire”
“Residential fires”

New Zealand Ministry of Health Library
Residential fire

Govinfo
collection:(GPO OR BUDGET OR CZIC OR CFR OR CPD OR BILLS OR CCAL OR CPRT OR CDIR OR CDOC OR CHRG OR CREC OR CRECB OR CRI OR CRPT OR SERIALSET OR ECONI OR ERP OR ERIC OR FR OR GAOREPORTS OR HOB OR HMAN OR HJOURNAL OR LSA OR GOVPUB OR PAI OR PPP OR PLAW OR SMAN OR COMPS OR STATUTE OR USCODE OR USCOURTS OR GOVMAN) AND null AND title:(residential fire)
Training Programs in Epidemiology and Public Health Interventions Network (TEPHINET)
Residential fire
Google Search
residential fire+intervention|program|educationfiletype:pdf

Narrowed to each geographical area identified

First 100 results taken for each when >100 results available