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Interventions for promoting smoke alarm ownership and function (Review)

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[Intervention Review]

Interventions for promoting smoke alarm ownership and function

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ABSTRACT

Background

Globally, fire-related burns and smoke inhalation accounted for 238,000 deaths in 2000, a rate of 3.9 deaths/100,000, with children and young persons aged less than 44 years accounting for the highest proportion of deaths. Smoke alarm ownership has been associated with a reduced risk of residential fire death.

Objectives

We evaluated interventions to promote residential smoke alarms, to assess their effect on the prevalence of owned and working smoke alarms, and the incidence of fires and burns and other fire-related injuries.

Search methods

We searched the Cochrane Injuries Group's specialised register, CENTRAL, MEDLINE, EMBASE, PsycINFO, CINAHL, ERIC, Dissertation Abstracts, IBSS, ISTP, FIREDOC, LRC, conference proceedings, published case studies, and bibliographies, and contacted investigators and relevant organisations to identify trials. Most of the searches were last updated in September 2007.

Selection criteria

Randomised or non-randomised controlled trials completed or published after 1969 evaluating interventions to promote residential smoke alarms.

Data collection and analysis

Two authors independently extracted data and assessed trial quality. We performed meta-analysis of randomised controlled trials to combine odds ratios (OR) between intervention and control groups, using a random effects model. A chi-square test for heterogeneity used a significance level of 10%. Non-randomised trial results are described narratively.

Main results

We identified 26 completed trials, of which 17 were randomised. Overall, counselling and educational interventions, with or without provision of free or discounted smoke alarms, modestly increased the likelihood of owning an alarm (OR = 1.21; 95% CI 0.89 to 1.64) and having an installed, functional alarm (OR = 1.33; 95% CI 0.98 to 1.80). Whether or not the intervention programme provided free or discounted smoke alarms in addition to education did not influence these results. The results were sensitive to trial quality, however. Counselling as part of primary care child health surveillance had somewhat greater effects on alarm ownership (OR = 1.96; 95% CI 1.03 to 3.72) and function (OR = 1.46; 95% CI 1.15 to 1.85), results that were generally supported by non-randomised trials evaluating similar interventions. Injury outcomes were reported in only one randomised controlled trial, which found no effect of a smoke alarm give-away programme on total injuries (rate ratio 1.3; 95% CI 0.9 to 1.9) or on hospitalizations and deaths (rate ratio 1.3; 95% CI 0.7 to 2.3), in contrast

to the substantial reduction in serious injuries reported in a non-randomised trial that evaluated a similar give-away programme. Neither trial showed a beneficial effect on fires. Mass media and community education showed little benefit in multiple non-randomised trials. Two trials, one of which was randomised, showed that smoke alarm installation programmes increase the likelihood of having a working smoke alarm, and the non-randomised trial reported reductions in fire-related injuries.

Authors' conclusions

This review found that programmes to promote smoke alarms have at most modest beneficial effects on smoke alarm ownership and function, and no demonstrated beneficial effect on fires or fire-related injuries. Counselling as part of child health surveillance has a somewhat greater effect on smoke alarm ownership and function, but its effects on injuries are unevaluated. Community smoke alarm give-away programmes have not been demonstrated to increase smoke alarm prevalence or to reduce fires or fire-related injuries. Community-based education programmes have not been shown to reduce burns or fire-related injuries. Community smoke alarm installation programmes may increase the prevalence of working alarms and reduce fire-related injuries, but these results require confirmation, and the cost-effectiveness of such programmes has not been evaluated. Efforts to promote smoke alarms through installation programmes should be evaluated by adequately designed randomised controlled trials measuring injury outcomes and cost-effectiveness.

PLAIN LANGUAGE SUMMARY

Interventions for promoting smoke alarm ownership and function

Many people are killed or injured by house fires each year. Fires detected with smoke alarms are associated with lower death rates. This review found that programmes to promote smoke alarms increased smoke alarm ownership and function modestly, if at all, and have not demonstrated a beneficial effect on fires or fire-related injuries. Counselling by health care workers, as part of child health care, may increase ownership and use of smoke alarms in homes but effects on injuries have not been examined. There is little evidence to support community-wide mass media or educational programmes or programmes to give away free smoke alarms as effective methods to promote smoke alarms or reduce injuries from fire. More research is needed to examine community-wide smoke alarm installation programmes.

BACKGROUND

Globally, fire-related burns and smoke inhalation accounted for 238,000 deaths in 2000, a rate of 3.9 deaths/100,000, with children and young persons aged less than 44 years accounting for the highest proportion of deaths (Peden 2002). Residential fires caused 491 deaths and 14,100 non-fatal injuries in the United Kingdom in 2005 (Fire Statistics UK). In the United States in 2005, fires caused 3,675 deaths and 17,925 non-fatal injuries (NFPA 2006).

Fires detected by smoke alarms are associated with more rapid discovery, lower casualty rates and less property damage (Watson 1999). Smoke alarm ownership is associated with a reduced risk of fire death (DiGuiseppi 1998a; Marshall 1998; Runyan 1992) and appears particularly effective in households with young children (DiGuiseppi 1998a; Runyan 1992). We systematically reviewed trials evaluating interventions to promote residential smoke alarms, to assess their effect on smoke alarm ownership and function, fires and fire-related injuries.

OBJECTIVES

To evaluate interventions to promote residential smoke alarms in order to assess their effect on smoke alarm ownership and function, fires, and fire-related injuries.

METHODS

Criteria for considering studies for this review

Types of studies

Controlled trials (randomised, quasi-randomised or non-randomised), where participants were prospectively assigned to study groups and where control group outcomes are measured concurrently with intervention group outcomes. Only studies completed or published after 1969 were included, as residential smoke alarms did not become widely available and affordable until the mid-1970s.

Types of participants

People who were not institutionalised (that is, community-dwelling individuals).

Types of interventions

Any interventions designed (either wholly or in part) to increase the prevalence of owned or properly functioning smoke alarms - for example, mass media, education, home visits or inspections, clinician counselling, give-away programmes, discount coupons, legislation. Interventions included programmes to increase ownership, maintenance, proper use, testing, battery changing, etc.

Types of outcome measures

Fire-related injuries or burns (self-reported injuries, GP visits, Accident & Emergency visits, hospitalisations, disabilities or deaths); fires; owned or installed and functioning smoke alarms (self-reported or observed).

Search methods for identification of studies

Searches were not restricted by language, date or publication status.

Electronic searches

We searched the following electronic databases:

- Cochrane Injuries Group's specialised register (September 2007),
- Cochrane Controlled Trials Register (*The Cochrane Library* issue 3, 2007),
- MEDLINE (1970 to week 1, September 2007),
- EMBASE (1970 to 2007 week 37),
- PsycLIT (1974 to January 1998),
- PsycINFO (1998 to week 3, September 2007),
- Cumulative Index to Nursing and Allied Health (CINAHL) (1982 to week 2, September 2007),
- Educational Resource Information Center (ERIC) (1989 through September 2007),
- Dissertation Abstracts (1970 to September 2007),
- International Bibliography of the Social Sciences (IBSS) (1970 to August 2007),
- Index of Scientific and Technical Proceedings (ISTP) (1970 to May 2003),
- FIREDOC (Fire Research Information Service, http://firedoc.cfr.nist.gov/) (1970 to May 2003),
- LRC, the US Fire Administration's online database (http://www.usfa.fema.gov/lrc/) (1970 to March 1998),
- Science Citation Index Expanded (2003 to September 2007).

Details of the search strategies can be found in Appendix 1.

Searching other resources

We examined reference lists of reviews (Bass 1993; Ciliska 1996; Harborview MC 1997; Munro 1995; Towner 1996; US Task Force 1996, Towner 2001a, Towner 2001b, Warda 1999), conference proceedings (First World Cf 1989, Second World Cf 1993, Third I Cf 1996, Fourth World Cf 1998), case study collections (Kulenkamp 1994; National Center 1996; Schaenman 1990; US Fire 1993), and included trials. To find internal or unpublished documents, we contacted national and international organisations involved in fire and injury prevention, such as the Home Office (United Kingdom), National Fire Protection Association (United States), Centers for Disease Control and Prevention (United States), Centre d'Information et de Rencontre pour la Prévention des Accidents d'Enfants (France), and International Society for Child and Adolescent Injury Prevention. We contacted the investigators of eligible trials and asked them to identify additional relevant trials. We searched the Internet by author to find completed versions of previously ongoing trials.

Data collection and analysis

Selection of studies

Title, abstract and keywords of all citations were examined and studies that were ineligible based on type of study, participants, intervention, or date of completion, were excluded. The full texts of remaining citations were reviewed and those that failed to meet these same inclusion criteria were excluded. We contacted corresponding authors of all remaining studies to determine eligibility, request outcome data or other details, and identify additional trials. When the corresponding author was deceased or untraceable, we contacted additional authors.

Data extraction and management

Two investigators (CD and CG or CD and Dr. Ian Roberts) independently extracted data on participants, interventions, outcomes, loss to follow-up, and methods of allocation concealment and outcomes assessment (as quality indicators (Schulz 1995)).

Assessment of risk of bias in included studies

Allocation concealment was rated as adequate if methods convincing of concealment were used (for example, sequentially numbered, sealed, opaque, envelopes) and otherwise as inadequate (for example, alternation) (Schulz 1995). Outcomes assessment was rated as (single) blinded if data were collected either by researchers blinded to intervention status or by postal survey. Subjects were not blinded in any trial. Differences were resolved by discussion.

Assessment of heterogeneity

A chi-square test for heterogeneity, that is, whether observed differences among the results of included trials are greater than could be expected by chance, used a significance level of 10%. Except where specifically noted, there was no significant heterogeneity for smoke alarm outcomes. To explore heterogeneity, we planned the following subgroup analyses:

- safety advice implemented as part of routine child health surveillance ('well child care')
- providing discounted / free smoke alarms to participants
- adequate allocation concealment
- blinded outcomes assessment.

Data synthesis

Primary outcome measures included post-intervention proportions with owned, functional (that is, installed and working based on button or smoke test), newly acquired, and newly functional smoke alarms, and incidences of fires and fire-related injuries. When data on acquisition of alarms or of functional alarms were unavailable, we estimated these data by subtracting pre- from post-intervention prevalence for each group, if possible.

We performed meta-analysis to combine odds ratios (OR) between intervention and control groups, using a random effects model (DerSimonian 1986) because of the substantial variability in populations and interventions. For cluster randomised trials, we reduced subject numbers to 'effective sample sizes' (Hauck 1991) using published estimates for the intraclass correlation coefficient: 0.017 for medical practices (Kendrick 1999), 0.02 for school classes (Murray 1994), and 0.0003 for geographic areas (DiGuiseppi 2002). As sensitivity analyses we alternatively (i) ignored clusters and (ii) used intraclass correlation coefficients five times larger than the above. Neither alternative materially affected the results (data not shown). For DiGuiseppi 2002, which accounted for cluster randomization in its analysis, we entered numerical data into RevMan to produce the same OR and 95% CI as published. Harvey 2004 did not specify the number of clusters in two of the states. For Maryland, we counted 26 census tracts within Baltimore City. For Arkansas, for which no information was provided, we conservatively assumed one intervention and one control area.

Results from non-randomised trials were not quantitatively combined.

RESULTS

Description of studies

In the initial searches, we found 4,486 unduplicated citations in electronic databases. From these, we identified 118 potentially relevant citations. We found an additional 28 potentially relevant citations from other sources. We could not retrieve the full text of two studies (Botruff 1992; Linyear 1982) and nine were available only in abstract. Of 135 studies reviewed in full, 15 trials met all inclusion criteria (Barone 1988; Clamp 1998; Davis 1987; Kelly 1987; Kendrick 1999; Mallonee 1996; Mathews 1988; McConnell 1996; Miller 1982; Ozanne-Smith 2002; Project Burn 1979; Schwarz 1993; SCIPP 1989; Thomas 1984; Williams 1988), the eligibility of 16 could not be determined, and the remainder were excluded. To determine the eligibility of the nine abstracts and remaining 16 trials, we contacted all 24 authors. From 22 (92%) responses, we identified six additional eligible trials (Gielen 2001; Jenkins 1996; King 2001; LeBailly 1990; Ploeg 1994; Smithson 1998). We also found one multi-site trial in progress through organisational contacts (written communication, P Harvey, Centers for Disease Control and Prevention, 2 July 1998). Thus, our initial review included 22 trials, of which three were ongoing (Smithson 1998; Gielen 2001; Harvey 2004).

From our updated electronic searches, we identified 33 potentially relevant citations which were retrieved in full-text. From these reports and from investigator contacts, we identified four new randomised controlled trials (DiGuiseppi 2002; Gielen 2002; Hendrickson 2000; Watson 2005), one new non-randomised controlled trial (Johnston 2000), reports from two randomised controlled trials that had been ongoing in our initial review (Harvey 2004; Gielen 2001), and the final reports from two completed trials already included in the initial review (King 2001; Ozanne-Smith 2002).

The characteristics of each included trial are listed in the table 'characteristics of included studies'.

Studies identified after August 2007 are listed as 'studies awaiting assessment'.

Randomised controlled trials

We identified a total of 18 randomised controlled trials, of which 17 are known to have been completed. The status of one trial (Smithson 1998) previously identified as ongoing could not be determined.

All 17 completed trials targeted populations at high risk for fire injury and death, that is, young children, elderly adults, or low-income households. Nine were cluster randomised trials, which enrolled prenatal, parenting, or school classes, general clinical practices, high-risk or deprived communities, or physicians in training. Seven individual randomised controlled trials enrolled parents of young children, while one enrolled elderly public health clients.

Ten interventions were delivered in the clinical context (Barone 1988, Clamp 1998, Gielen 2001, Gielen 2002, Jenkins 1996, Kelly 1987, Kendrick 1999, Thomas 1984, Watson 2005, Williams 1988),

six interventions were delivered in the home (DiGuiseppi 2002, Harvey 2004; Hendrickson 2000, King 2001, Mathews 1988, Ploeg 1994), and one was delivered in primary school classes (Davis 1987). All of the trials included an educational component, ranging from delivery of a single fire safety brochure to multiple educational sessions including hazard assessment and behavioral change techniques. Seven trial interventions combined discounted or free smoke alarms with education (Clamp 1998; DiGuiseppi 2002; Hendrickson 2000; Kendrick 1999; King 2001; Thomas 1984; Watson 2005).

Non-randomised controlled trials

We identified nine completed non-randomised controlled trials. The study populations included cities or areas within cities (for example, census tracts), parents with children enrolled in clinical practices or government-funded preschool enrichment centers, and residents in government owned housing.

Two of the studies evaluated safety advice during routine child health surveillance visits (LeBailly 1990; Miller 1982), one evaluated education during mandatory tenants' meetings (McConnell 1996), and one evaluated home safety interventions for parents of children enrolled in preschool enrichment programs. The other five evaluated community programs involving mass media, school or community education, clinical counselling, free smoke alarms, and / or alarm installation (Mallonee 1996, Ozanne-Smith 2002, Project Burn 1979; Schwarz 1993; SCIPP 1989).

Further information on the non-randomised studies is presented in Table 1.

Risk of bias in included studies

Randomised controlled trials

Allocation concealment was judged to be adequate in nine trials (53%), including eight trials that used random numbers tables read by an independent person or computerised randomisation by an independent person (Clamp 1998; DiGuiseppi 2002; Gielen 2001; Jenkins 1996; Kendrick 1999; Ploeg 1994; Watson 2005; Williams 1988), and one that used sequentially numbered, sealed opaque envelopes (King 2001). Allocation concealment was either inadequate or unspecified in the remaining eight completed trials (Barone 1988; Davis 1987; Gielen 2002; Harvey 2004; Hendrickson 2000; Kelly 1987; Mathews 1988; Thomas 1984).

Blinded outcome assessment was reported in eight (47%) of the trials (DiGuiseppi 2002; Gielen 2001; Jenkins 1996; Kelly 1987; Kendrick 1999; King 2001; Ploeg 1994; Watson 2005).

The majority of trials (n = 10; 59%) reported loss to follow-up or survey non-response rates of less than 25% (Clamp 1998; Davis 1987; DiGuiseppi 2002; Hendrickson 2000; Jenkins 1996; King 2001; Mathews 1988; Ploeg 1994; Thomas 1984; Watson 2005). Loss to follow-up is not applicable to population-based surveillance of fires or injuries.

Non-randomised controlled trials

Allocation concealment was rated inadequate for all non-randomised trials. None of the trials reported blinded outcome assessment. Studies that collected smoke alarm data reported loss to follow-up or survey non-response rates of 28% or less, although one study did not report this information (Ozanne-Smith 2002). Loss to follow-up is not applicable to population-based surveillance of fires or injuries.

Effects of interventions

Smoke alarms

Randomised controlled trials

Eleven completed trials collected data on smoke alarm ownership. We were unable to obtain these data from one trial (Williams 1988), which reported "no significant difference" in alarm ownership between study groups. Combining the other ten trials, smoke alarm ownership at follow-up appeared slightly more likely with intervention, a difference that may have been due to chance (OR = 1.21; 95% CI 0.89 to 1.64). A somewhat larger positive effect on new acquisitions of smoke alarms, with a wide confidence interval, was found among the five trials reporting this outcome (OR = 1.63; 95% CI 0.72 to 3.67).

Eleven trials collected data on prevalence of working smoke alarms, and information on whether working alarms were acquired during the trial was available for five of these. Among the ten trials comparing intervention subjects to no intervention controls, there was evidence of a modestly increased likelihood of having installed, functioning alarms with intervention (OR = 1.33; 0.98 to 1.80), possibly due to chance. There was significant heterogeneity (P = 0.09; I^2 = 40%), with several trials reporting no benefit or a reduction in ownership with intervention. Similar results were reported for acquisition of functioning alarms, an effect which may have been due to chance (OR = 1.42; 95% CI 0.99 to 2.03).

The randomised trial by Harvey 2004 compared installation of free smoke alarms to provision of vouchers for free alarms. This study reported a significantly greater likelihood of having an installed, functioning smoke alarm when the intervention included installation (OR = 4.82; 95% CI 3.97 to 5.85) compared to provision of vouchers. Re-analysis of these data accounting for cluster randomisation did not substantially change these results.

Subgroup analysis of randomised controlled trials

Seven of eight completed trials that evaluated provision of advice promoting smoke alarms as part of routine child health surveillance showed positive effects on smoke alarm ownership, function and acquisition (Barone 1988; Clamp 1998; Gielen 2001; Kelly 1987; Kendrick 1999; Thomas 1984; Watson 2005). Overall, intervention families were significantly more likely than control families to own an alarm (OR = 1.96; 1.03 to 3.72) and to have a functioning alarm (OR = 1.46; 1.15 to 1.85). There were also positive effects on acquiring an alarm (with significant heterogeneity) and acquiring a functioning alarm, but these results were based on only two trials.

Seven trial interventions combined discounted or free smoke alarms with education (Clamp 1998; DiGuiseppi 2002; Hendrickson 2000; Kendrick 1999; King 2001; Thomas 1984; Watson 2005). For all four outcomes, offering discounted/free alarms and education resulted in modest, beneficial effects compared to no intervention, results possibly due to chance alone. There was significant heterogeneity among the trials reporting smoke alarm ownership (P = 0.03; I^2 = 63.4%) and functioning smoke alarms (P = 0.02; I^2 = 63.7%), however, with several of these trials reporting little or no benefit from intervention (DiGuiseppi 2002; Kendrick 1999; King 2001). Compared to providing education alone, offering

discounted/free alarms showed slightly greater positive effects on smoke alarm acquisition and ownership, although all confidence intervals overlapped. For ownership and acquisition of functioning alarms, results for trials education alone were based on data from only one trial, with wide confidence intervals, making comparisons between the two types of interventions for these outcomes problematic.

Among five trials with inadequate or unspecified allocation concealment (Barone 1988; Davis 1987; Kelly 1987; Mathews 1988; Thomas 1984), the combined effect of intervention on smoke alarm ownership (OR = 1.33; 95% CI 0.97 to 1.82) was somewhat higher than that in the five trials with adequate concealment (Clamp 1998; DiGuiseppi 2002; Jenkins 1996; Kendrick 1999; King 2001) (OR = 1.12; 95% CI 0.65 to 1.94, with significant heterogeneity, P = 0.05). For functioning smoke alarms, four studies with inadequate or unclear concealment (Barone 1988; Gielen 2002; Hendrickson 2000; Mathews 1988) showed a larger positive effect on functioning smoke alarms than did six studies with adequate concealment (Clamp 1998; DiGuiseppi 2002; Gielen 2001; Kendrick 1999; King 2001; Watson 2005) but the number of trials was small and all differences may have been due to chance.

There were seven trials with unblinded (or unspecified) outcomes assessment that compared intervention and control groups and reported outcomes. Effects of intervention were substantially stronger for all outcomes among these trials than were the effects seen among eight trials with blinded outcomes assessment. For example, for smoke alarm ownership, OR = 2.13 (95% CI 0.94 to 4.82) among trials with unblinded outcomes assessment, versus OR = 1.03 (95% CI 0.75 to 1.42) for trials with blinded outcomes assessment. Trials with unblinded assessment showed a much larger positive effect on functioning smoke alarms (OR = 2.25; 95% CI 0.78 to 6.51) than did trials with blinded assessment (OR = 1.27; 95% CI 1.02 to 1.59). For both smoke alarm ownership and functioning smoke alarms, there was more heterogeneity among trials with unblinded (or unspecified) outcomes assessment than among trials with blinded outcomes assessment.

Non-randomised controlled trials

Six completed non-randomised trials reported smoke alarm outcomes (Johnston 2000; LeBailly 1990; Miller 1982; Ozanne-Smith 2002; Schwarz 1993; SCIPP 1989), see Table 1.

Two involved safety advice during routine child health surveillance (LeBailly 1990; Miller 1982), and included free or discounted smoke alarms. Both showed modest beneficial effects of intervention consistent with randomised trials in similar settings. LeBailly 1990 did not see any effect in the group offered injury prevention counselling alone, but the study did not control for significant differences among groups in home ownership, education, and income, all of which are associated with alarm ownership (Roberts 1996). In addition, ownership was greater than 90% in all groups after intervention.

A trial offering education and free smoke alarms in the home (Johnston 2000) showed a modest increase in functioning alarms with intervention (100% versus 95%; adjusted RR = 1.06; 95% CI 1.00 to 1.12). A greater effect was seen on acquisition of functioning alarms (6.0% versus 2.1%; RR = 2.37; 95% CI 0.52 to 10.86) although this effect may have been due to chance. Results were not inconsistent with the widely varying results of home interventions reported among randomised trials.

Two trials of community-wide injury prevention education reported no effects on alarm ownership (SCIPP 1989) or installation (Ozanne-Smith 2002). In contrast, installation of free smoke alarms by study staff increased the prevalence of functioning smoke alarms by 19% in one trial (adjusted OR = 7.14; 95% CI 5.0 to 10.0) (Schwarz 1993). In the latter trial, efforts were made to match intervention and control areas on injury rates, socio-demographic characteristics, and geographic location, to reduce the likelihood of selection bias.

Fires

Two trials that evaluated door-to-door smoke alarm give-away programs found no evidence of a reduction in fire incidence with intervention (DiGuiseppi 2002; Mallonee 1996). Harvey 2004, which compared smoke alarm installation with distribution of vouchers for free alarms, collected data on self-reported fires but did not report these data.

In a non-randomised trial comparing a mandatory lecture and video targeting fire safety and prevention to no intervention, fire incidence in intervention (new tenant) households was one fifth that in control (existing tenant) homes, even though, before intervention, fire incidence was higher in new tenancies than in existing ones (McConnell 1996).

Fire-related injuries

Five randomised trials collected injury outcomes (DiGuiseppi 2002; Kelly 1987; Kendrick 1999; King 2001; Watson 2005) but only DiGuiseppi 2002, a community-based trial, reported effects of intervention on fire-related injuries. In addition, five non-randomised community trials measured injury outcomes (Mallonee 1996, Ozanne-Smith 2002, Project Burn 1979, Schwarz 1993, SCIPP 1989), of which all but Ozanne-Smith 2002 reported effects of intervention on burns or fire-related injuries.

After direct provision (with or without installation) of free alarms, fire-related injury rates fell significantly in intervention communities but not in control communities in two non-randomised trials (Mallonee 1996; Schwarz 1993). In one of these trials, however, the intervention area was selected because it had the highest baseline injury rate, hence regression to the mean may explain some of the decline (Mallonee 1996). In contrast, a randomised controlled trial that evaluated a door-to-door smoke alarm give-away programme found no evidence of a reduction in fire-related injuries, either total injuries (rate ratio 1.3; 95% CI 0.9 to 1.9) or serious injuries (that is, hospitalization or death) alone (rate ratio 1.3; 95% CI 0.7 to 2.3) (DiGuiseppi 2002).

Community injury prevention education produced a modest, non-significant effect on burn injuries (SCIPP 1989) and there was no apparent benefit from community burn prevention education (Project Burn 1979). Because these trials assessed all types of burns, but excluded smoke inhalation, results are not directly comparable to those from the trials of alarm give-away programmes, which specifically assessed fire-related injuries, including smoke inhalation.

DISCUSSION

Principal findings

Evidence from randomised and non-randomised controlled trials indicates that existing interventions to promote smoke alarms are likely to have at most a modest effect, if any, on smoke alarm ownership, function, or acquisition. The results were sensitive to type of intervention and study quality. In particular, trials with blinded outcome assessment showed little or no apparent effect from such interventions, suggesting that lack of blinding may have positively biased results in some studies. Few trials have evaluated the effect of interventions promoting smoke alarms on fires or fire-related injuries, and these have yielded inconsistent results.

Clinical counselling and education in the context of routine child health surveillance

Modest, statistically significant beneficial effects on smoke alarm outcomes were seen among trials evaluating counselling and education in the context of routine child health surveillance. Based on our results, the estimated number of families that clinicians would have to counsel to influence one additional family to have an installed, working smoke alarm varies with baseline prevalence in the clinical practice: 14 families if 20% have working alarms, 10 families if 50% have working alarms, and 32 families if 90% own alarms. It should be noted that about half of the trials involving smoke alarm promotion in the context of child health surveillance did not report blinded outcomes assessment, which may have positively biased their results. Although observational studies support a substantial beneficial effect of smoke alarm ownership on fire-related injuries (DiGuiseppi 1998a; Marshall 1998; Runyan 1992), there were no data from randomised controlled trials on the effects of counselling or education in the clinical setting on fire-related injuries. Because fire-related injuries are a leading cause of injury death in childhood, the net benefit of educational or counselling interventions in the clinical setting may be important. However, its effectiveness and cost-effectiveness in relation to fire injuries prevented has not been adequately evaluated.

Home, school, and community-based education

Results from randomised controlled trials do not support a strong beneficial effect of home- or school-based education on smoke alarm outcomes, and there were no data from these trials on the effects of education at home or in school on fire-related injuries. One non-randomised trial found a beneficial effect on fires of mandatory tenant education on fire safety (McConnell 1996), but this result has not been confirmed in other studies.

No randomised trials have evaluated the effect of mass media and community-based injury prevention education programmes on smoke alarms or fire-related injuries, and non-randomised trials do not support a beneficial effect of such programmes on either smoke alarm ownership or burn incidence. One study author attributed this to attenuation in the numbers who hear, then understand, then act on such information (Project Burn 1979).

Distribution of free or discounted smoke alarms

Providing free or discounted smoke alarms did appear to have a modestly greater effect on smoke alarm ownership and functioning alarms than did education alone, but differences were small and may have been due to chance. Although one might expect that giving an alarm to the family would increase owned and functioning alarms, the lack of an effect might be expected if families or households who are given an alarm lacked interest in or awareness of the value of having a working alarm, or lacked the skills, capacity or tools required to install and maintain it.

Effects of the door-to-door distribution of free smoke alarms on fire-related injuries were examined in two community trials (DiGuiseppi 2002; Mallonee 1996). The trial by Mallonee 1996, which showed a strong beneficial effect on injuries, was not randomised, so selection bias or regression to the mean may have exaggerated its effects. In contrast, in a randomised controlled trial, DiGuiseppi 2002 found no evidence of a beneficial effect on fire-related injuries. In addition, neither trial demonstrated a reduction in fires. Mallonee 1996 did not evaluate smoke alarm outcomes in the control population, and DiGuiseppi 2002 found no increase in installed and working alarms after intervention.

Installation of free smoke alarms

Harvey 2004 demonstrated a substantially greater beneficial effect on having a working smoke alarm when free alarms were installed compared to providing vouchers for free alarms, suggesting this may be a more effective intervention. Schwarz 1993 also demonstrated a strong beneficial effect on the prevalence of working smoke alarms when free alarms were installed in the homes. This study reported significant reductions in the incidence of fire-related injuries in the intervention areas. However, Schwarz 1993 was not a randomised trial, hence selection bias or regression to the mean may have exaggerated its effects. In addition, the cost-effectiveness of installation programmes has not been evaluated.

Exploring heterogeneity

There was statistically significant heterogeneity in the main analysis regarding smoke alarm ownership. Subgroup analyses suggest that some of this heterogeneity may be accounted for by differences in setting, intervention, and study quality. For example, there was no heterogeneity when analyses were restricted to smoke alarm promotion as part of routine child health surveillance, programmes involving education alone, or trials with blinded outcomes assessment. There was little evidence of heterogeneity in analyses involving other outcomes, in particular prevalence of working smoke alarms, suggesting such outcomes may be more consistently measured or more consistently affected by alarm promotion programmes.

Post hoc examination of results suggests that variations in other factors may also influence results. In the only two trials (Jenkins 1996; King 2001) involving families of injured children, ownership and acquisition were equally high in control and intervention families, so there was no apparent effect of intervention. Having an injured child may lead to safety behaviour changes so large that they obscure any safety education effects. Exclusion of these two trials results in stronger intervention effects on alarm ownership (OR = 1.35; 95% CI 1.04 to 1.74), functioning smoke alarms (OR = 1.42; 95% CI 1.00 to 2.02), and other alarm outcomes, with reduced heterogeneity.

King 2001 and DiGuiseppi 2002 were the only randomised trials in which the intervention was delivered by research assistants rather than a health professional, teacher, community worker, or other trained professional. When these trials are excluded, there is a

stronger positive effect of intervention on smoke alarm ownership (OR = 1.37; 95% CI 1.02 to 1.84), functioning smoke alarms (OR=1.53; 95% CI 1.05 to 2.23), and other alarm outcomes, with reduced heterogeneity. The relationship established between the family and their doctor, nurse, teacher or community worker may be an important aspect of effective intervention, a hypothesis supported by the subgroup analysis of routine child health surveillance.

Finally, in one trial (Kendrick 1999) the response rate was notably poor and there was systematic response bias, in that control responders were more likely than intervention responders to live in rental accommodation, have lower socioeconomic status and live in deprived areas (written communication, D Kendrick, University of Nottingham, 2 September 1999). Because these factors are associated with reduced smoke alarm ownership (Roberts 1996), the estimate of the effect of the intervention might have been biased upward. However, results were not materially affected by exclusion of this trial, except that a stronger effect was seen on acquisition of alarms, which may have been due to chance.

Limitations

Publication bias, which threatens the validity of systematic reviews, may arise if research is unpublished or if outcome data are selectively omitted from published reports, which often occurs because the results fail to reach statistical significance (Dickersin 1993; Easterbrook 1991). To minimise this, we searched for unpublished trials and wrote to the authors of any trials in which the methods and intervention were eligible to ask if relevant outcomes were measured. Eight trials were identified after author and organisational contacts, including seven completed trials (Gielen 2001; Harvey 2004; Jenkins 1996; Kendrick 1999; King 2001; LeBailly 1990, Ploeg 1994). Many investigators also provided unpublished data on smoke alarm or injury outcomes (Clamp 1998; Hendrickson 2000; Jenkins 1996; Kendrick 1999; King 2001; Ploeg 1994; Schwarz 1993, SCIPP 1989; Smithson 1998; Watson 2005).

The authors of three potentially eligible trials did not respond, so we were unable to determine their eligibility. We could not locate the text or authors for two further citations. Four of these were known to be non-randomised, and the fifth (Botruff 1992), as a community intervention, was probably not randomised. Hence, their omission is unlikely to have biased our meta-analyses.

AUTHORS' CONCLUSIONS

Implications for practice

Our review suggests that at best, only modest increases in the prevalence of working smoke alarms result from educational interventions promoting smoke alarms, whether or not free or discounted smoke alarms are also provided. Smoke alarm promotion delivered as part of child health surveillance appears to be effective in increasing the prevalence of owned and functioning smoke alarms, although several studies on which these conclusions are based suffered from methodological weaknesses, and injury outcomes have not been evaluated in these settings. Nevertheless, such interventions may be considered, particularly among high risk populations with a low prevalence of smoke alarms. Existing evidence does not support the implementation of community-based programmes, including smoke alarm give-away programmes, mass media, or injury prevention education, to increase the prevalence of installed and functioning smoke alarms or reduce the incidence of fires or fire-related injuries.

Implications for research

While community programmes that provide and install smoke alarms appear to increase the prevalence of working alarms and reduce fire-related injuries, the quality of that evidence is limited and such interventions are likely to be costly. The evidence in support of smoke alarm promotion delivered as part of routine child health surveillance has methodological limitations, and injury outcomes have not been evaluated in these settings. Further trials to evaluate community smoke alarm installation programmes or smoke alarm promotion as part of child health surveillance in primary care should assess their impact on fire-related injuries, using randomisation, adequate allocation concealment and blinded outcomes assessment, and should incorporate cost-effectiveness analyses.

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* Indicates the major publication for the study

CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

Barone 1988

Methods	Cluster randomised controlled trial. Allocation by coin toss within paired classes. Outcomes assessment not blinded.
Participants	5 parenting classes (108 parents of toddlers).
Interventions	I: Slides, handouts on burn prevention; motor vehicle safety education and video; bath water thermometer; hot water gauge. C: Usual safety education.
Outcomes	Home inspection 6 months after class: 1) Final alarm ownership. 2) Final functioning alarms.
Notes	27% of parents attending randomly allocated classes did not enrol in trial.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	High risk	C - Inadequate

Clamp 1998

Methods	Randomised controlled trial. Allocation by random numbers table numbered 1-165, the first 83 numbers on the list were allocated to the intervention group; allocation by researcher blinded to number given to each family at time of allocation. Outcome assessment not blinded.
Participants	165 families of children <5 years on GP list.
Interventions	I: Safety advice by health visitors and practice nurses, leaflets, discount safety devices for low income families. C: Usual care.
Outcomes	Telephone / mail survey 6 weeks after visit: 1) Final alarm ownership. 2) Final functioning alarms. 3) Alarms acquired. 4) Functioning alarms acquired.
Notes	Unpublished data provided by investigators. No loss to follow-up.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Low risk	A - Adequate

Davis 1987

Methods	Cluster randomised controlled trial. Allocation methods not stated. Outcomes assessment not blinded.
Participants	41 Grade 4-6 classes (861 children).
Interventions	I: Six 1-hour fire safety lessons with workbook, demonstrations, teacher training, materials, take-home materials for parents. C: Usual lessons.
Outcomes	In-school survey immediately after last class: Final alarm ownership.
Notes	Loss to follow-up: I: 1% of children; C: 0% of children.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

DiGuiseppi 2002

Methods	Cluster randomised controlled trial.

DiGuiseppi 2002 *(Continued)*

	Allocation by independent statistician using computer-generated random numbers. Blinded outcome assessment.
Participants	40 socio-economically deprived electoral wards in central London (~147,444 households).
Interventions	I: Door-to-door alarm give-away, fire prevention brochures, limited alarm installation; reminder post-cards to change battery at 1 year. C: No intervention.
Outcomes	Population fire & fire-related injury surveillance 13 months before to 24 months after program. Home inspection 12-18 months after program in sample of council homes: 1) Final alarm ownership. 2) Final functioning alarms.
Notes	No loss to follow-up. Response rate for home inspection: I: 75%; C: 70%.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Low risk	A - Adequate

Gielen 2001

Methods	Cluster randomised controlled trial. Allocation by random numbers table by independent person (per investigator). Blinded outcomes assessment (per investigator).
Participants	31 doctors in training (196 parents of children aged 0-6 mo).
Interventions	I: 5 hours of special training in injury prevention counseling. C: Usual training.
Outcomes	Home inspection, interview after 12 months, health surveillance visit: Final functioning alarms.
Notes	Loss to follow-up: I: 33% of families; C: 26% of families.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Low risk	A - Adequate

Gielen 2002

Methods	Cluster randomised controlled trial. Allocation by project director using random numbers table. Blinding not specified.
Participants	39 doctors in training (187 parents of children aged 0-6 months).

Gielen 2002 *(Continued)*

Interventions	I: Offer to parents of home safety visit by community health worker for hazard assessment and safety education, and referral to safety center; 5 hours of special training for doctors in injury prevention counseling. C: Referral of parents to safety center; 5 hours of special training for doctors in injury prevention counseling.
Outcomes	Home inspection, interview after 12 months health surveillance visit: Final functioning alarms.
Notes	Loss to follow-up: I: 34% of families; C: 35% of families.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	High risk	C - Inadequate

Harvey 2004

Methods	Cluster randomised controlled trial. Allocation method & blinding of outcome assessment not specified.
Participants	Areas, counties or census tracts in 5 US states (4455 households with resident <5 or >64, without any working smoke alarms, located in high-risk area [based on high prevalence of fire deaths, non functioning alarms, low income, or rental units]).
Interventions	I1: Installation of smoke alarm(s) by study staff, fire safety education. I2: Voucher for free smoke alarm(s), fire safety education.
Outcomes	Home visit & inspection 6-12 months after visit: 1) Self-reported fires. 2) Final functioning alarms.
Notes	Loss to follow-up: I1: 28%; I2: 31%. Fire rates not reported by investigator.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Hendrickson 2000

Methods	Randomised controlled trial. Allocation by coin toss. Unblinded outcomes assessment.
Participants	82 low-income mothers (87% Hispanic) with children aged 10-47 months.
Interventions	I: Home visit, with safety teaching, brochure, free smoke alarms, involving mother in installation and maintenance of alarms. C: No intervention.

Hendrickson 2000 *(Continued)*

Outcomes	Home inspection 1 month after intervention: 1) Final functioning alarms. 2) Functioning alarms acquired.
Notes	Loss to follow-up: I: 7.3%; C: 2.0%.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	High risk	C - Inadequate

Jenkins 1996

Methods	Randomised controlled trial. Allocation by random numbers table read by independent person. Outcomes assessment blinded.
Participants	141 families of children <17 years in burn unit.
Interventions	I: Discharge teaching book about burn care and prevention; routine discharge teaching. C: Routine discharge teaching.
Outcomes	Interview in clinic at first follow-up visit: Final alarm ownership.
Notes	Unpublished data provided by investigators. Loss to follow-up 13%.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Low risk	A - Adequate

Johnston 2000

Methods	Non randomised controlled trial. Two groups assigned by coin toss. Unblinded outcome assessment.
Participants	418 families of children aged 4-5 yrs enrolled in 9 government funded preschool enrichment centers for high-risk children.
Interventions	I: Written safety information at home visit; alarms or batteries if needed, other safety devices. C: Written safety information at home visit.
Outcomes	Home inspection 3 months after visit: 1) Final functioning alarms. 2) Functioning alarms acquired.
Notes	Loss to follow-up: I: 17.5%; C: 6.9%.

Johnston 2000 *(Continued)*

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	High risk	C - Inadequate

Kelly 1987

Methods	Randomised controlled trial. Allocation methods not stated. Outcomes assessment blinded.
Participants	171 parents of children aged 6 months seen for child health surveillance.
Interventions	I: Developmentally oriented child safety education, hazard assessment, and handout, at 6, 9, 12 month visits. C: Usual well child care.
Outcomes	Home inspection, medical chart review 1 month after 12-month visit: 1) Final smoke alarm ownership. 2) Total injuries.
Notes	Loss to follow-up: I: 35%; C: 37%.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Kendrick 1999

Methods	Cluster randomised controlled trial. Allocation by random numbers table by investigator blind to identity of practices. Outcomes assessment blinded.
Participants	36 general practices (2052 registered children aged 3-13 months).
Interventions	I: Safety advice by health visitors and practice nurses, safety literature, discount safety devices for low income families, home safety checks and first aid training by health visitors. C: Usual care.
Outcomes	Medical record review; postal survey at 25 month follow-up: 1) Smoke alarms acquired. 2) Functioning smoke alarms acquired. 3) Final smoke alarm ownership. 4) Final functioning smoke alarms. 5) Medically attended injuries.
Notes	Unpublished data provided by investigators. Loss to follow-up: For record review: 0%; for survey of safety practices, I: 67%; C: 64%.

Risk of bias

Kendrick 1999 *(Continued)*

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Low risk	A - Adequate

King 2001

Methods	Randomised controlled trial. Allocation by opening sealed, serially numbered, opaque envelopes. Outcomes assessment blinded.
Participants	1172 families of children aged <8 yrs presenting to ED with a targeted injury.
Interventions	I: Home safety inspection, education, safety device coupons; telephone reinforcement at 4 and 8 months; follow-up letter. C: Home safety inspection and safety pamphlet only.
Outcomes	Survey and home inspection at 1 year follow-up: 1) Final alarm ownership. 2) Final functioning alarms. 3) Smoke alarms acquired. 4) Functioning smoke alarms acquired. 5) Self-reported injury visits to physician.
Notes	Unpublished data provided by investigators. Loss to follow-up: I: 20%; C: 18%.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Low risk	A - Adequate

LeBailly 1990

Methods	Non-randomised controlled trial. Allocation sequentially in groups of ˜100. Unblinded outcomes assessment.
Participants	407 families with children aged <5 years seen for routine health surveillance (groups differed on socio- economic status, home ownership).
Interventions	I1: Free alarm and other safety devices. I2: Free alarm and other safety devices, injury prevention counseling. I3: Injury prevention counseling. C: No intervention.
Outcomes	Home interviews and inspections 9 months after intervention: Final alarm ownership.
Notes	Response rate: ˜75%.

Risk of bias

LeBailly 1990 *(Continued)*

Bias	Authors' judgement	Support for judgement
Allocation concealment?	High risk	C - Inadequate

Mallonee 1996

Methods	Non-randomised controlled trial.
Participants	I: City area with highest risk of fire-related hospitalisations and deaths. C: Rest of city (lower risk of fire injury, death).
Interventions	I: Door-to-door alarm give-away, fire prevention brochures, limited alarm installation. C: No intervention.
Outcomes	Population injury surveillance 2.5 years before to 4 years after program, 1) Fires. 2) Fire-related injuries. 3) Final functioning alarms in intervention group only.
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	High risk	C - Inadequate

Mathews 1988

Methods	Quasi-randomised controlled trial. First eight participants allocated by odd-even, rest assigned using open random numbers table. Blinding not stated.
Participants	26 mothers of toddlers recruited from clinics, day care centres.
Interventions	I: Home safety inspection, video, handouts, modelling re: safety and managing dangerous child behaviour; hot water thermometers; choke tube. C: Home visit with video, hand-outs, modelling on language stimulation.
Outcomes	Home inspection 2 weeks after home visit: 1) Final alarm ownership. 2) Final functioning alarms. 3) Smoke alarms acquired. 4) Functioning alarms acquired.
Notes	Loss to follow-up: 8%.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	High risk	C - Inadequate

McConnell 1996

Methods	Non-randomised controlled trial.
Participants	I: All 2350 new residents of subsidised housing. C: All existing residents (lower baseline fire risk, similar socio-demo-graphics).
Interventions	I: 35-minute mandatory lecture and video on fire safety and prevention; reminder card. C: No intervention.
Outcomes	Population surveillance during 15 month study period: Fires.
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	High risk	C - Inadequate

Miller 1982

Methods	Non-randomised controlled trial.
Participants	I: 120 consecutive parents of children seen for routine health surveillance in middle class suburban practice. C: Preceding 120 consecutive, similar parents.
Interventions	I: Pamphlet, brief education, discount alarms, usual care. C: Usual care.
Outcomes	Home inspection 4-6 weeks after intervention: 1) Final alarm ownership. 2) Final functioning alarms.
Notes	Response rate to inspection: I: 90%, C: 88%.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	High risk	C - Inadequate

Ozanne-Smith 2002

Methods	Non-randomised controlled trial.
Participants	I: Municipality. C: Demographically similar municipality (with higher baseline injury hospitalisation rate).
Interventions	I: 6-year community injury prevention program: mass media, education, training, promotion and action for hazard reduction and environmental change.

Ozanne-Smith 2002 *(Continued)*

	C: No intervention.
Outcomes	Population injury surveillance; telephone survey pre-, interim, and post-intervention of 250 randomly selected households in each group: 1) Injuries. 2) Final alarm ownership.
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	High risk	C - Inadequate

Ploeg 1994

Methods	Randomised controlled trial. Allocation by random numbers table read by independent person. Outcome assessment blinded.
Participants	359 public health clients aged 65+ years.
Interventions	I: Home safety inspection, safety promotion. C: Home visit for influenza vaccine promotion.
Outcomes	Telephone survey 2-3 months after home visit: Smoke alarms acquired.
Notes	Unpublished data provided by investigators. Loss to follow-up: I: 1%; C: 7%.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Low risk	A - Adequate

Project Burn 1979

Methods	Non-randomised controlled trial.
Participants	I: 3 cities in east of state. C: 2 cities in west of state (with lower baseline burn incidence).
Interventions	I1: Mass media. I2: I1 + school program. I3: I1+ community outreach. C: No intervention.
Outcomes	Population injury surveillance 4 years before to 12 months after. Telephone surveys. Incidence of burns seen in emergency dept.

Project Burn 1979 *(Continued)*

Notes	Smoke alarm ownership not reported.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	High risk	C - Inadequate

Schwarz 1993

Methods	Non-randomised controlled trial.
Participants	I: 5 contiguous census tracts [3004 households (51%) participated]. C: 4 bordering, contiguous census tracts (similar socio-demographics, baseline injury rates).
Interventions	I: Free alarms installed; home safety inspection, education, modification; community education. C: No intervention.
Outcomes	Population injury surveillance 2 years before to 1 year after program; inspection of random sample of homes at 1-year follow-up: 1) Fire-related injuries. 2) Final functioning alarms.
Notes	Unpublished data provided by investigators. Inspection response rate: I: 72%; C: 72%.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	High risk	C - Inadequate

SCIPP 1989

Methods	Non-randomised controlled trial.
Participants	I: 9 communities (total pop. 139,807). C: 5 demographically similar communities (total pop. 146,866).
Interventions	I: Injury prevention program in communities, schools, homes, and clinical settings. C: No intervention.
Outcomes	Population injury surveillance 1 year before to 2 months after; telephone survey pre- and post-intervention. 1) Burn incidence. 2) Final alarm ownership. 3) Smoke alarms acquired.
Notes	Unpublished data provided by investigators. Phone survey response rate: pre 59%, post 85% ("similar in the two groups").

SCIPP 1989 *(Continued)*

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	High risk	C - Inadequate

Thomas 1984

Methods	Cluster randomised controlled trial. Allocation by coin toss. Blinding of outcomes assessment not stated.
Participants	16 well-baby classes (55 parents).
Interventions	I: Burn prevention lecture, pamphlets, handouts, coupon for alarm; usual safety education. C: Usual safety education.
Outcomes	Home inspection 4-6 weeks after class. Final alarm ownership.
Notes	No loss to follow-up.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	High risk	C - Inadequate

Watson 2005

Methods	Randomised controlled trial. Allocation by independent researcher using computer generated random numbers, in blocks of 8. Blinded outcomes assessment.
Participants	3428 families with children aged <5 years, recruited from caseloads of 62 health visitors.
Interventions	I: Structured, individualized 20-minute safety consultation; free or discounted alarms; alarm installation for low income families. C: Usual care.
Outcomes	Medical record review; postal questionnaire to 1000 subjects per group at 12 & 24 months: 1) Medically attended injuries. 2) Injury hospitalization. 3) Final functioning alarms.
Notes	No loss to follow-up for injury outcomes. Response rates at 12 months: I=78%; C=76%. Response rates at 24 months: I=82%; C=76%. Fire-related injury rates not reported.

Risk of bias

Bias	Authors' judgement	Support for judgement

Watson 2005 *(Continued)*

Allocation concealment?	Low risk	A - Adequate

Williams 1988

Methods	Cluster randomised controlled trial. Classes allocated by random numbers table by independent statistician. Unblinded outcomes assessment.
Participants	12 prenatal classes (165 pregnant women).
Interventions	I: 1-hour lecture, handouts on burn prevention; motor vehicle safety education and video; usual safety education. C: 1-hour lecture, handouts & video on infant stimulation, feeding; usual safety education.
Outcomes	Home inspection 2-4 weeks after live birth: Final alarm ownership.
Notes	55% of women attending randomly allocated classes did not enrol in trial. Outcome data not available.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Low risk	A - Adequate

I = Intervention
C = Control
I1 = Intervention Group 1
I2 = Intervention Group 2

Characteristics of excluded studies *[ordered by study ID]*

Study	Reason for exclusion
Botruff 1992	Unable to obtain full paper or contact author, so unable to assess if met the inclusion criteria.
Culp 1999	Not an intervention trial.
Kendrick 2001	Not designed to increase smoke alarms.
Linyear 1982	Unable to obtain full paper or contact author, so unable to assess if met the inclusion criteria.
Nunn 1998	Not designed to increase smoke alarms.
Petridou 1997	Not designed to increase smoke alarms.
Rowland 2002	Not designed to increase smoke alarms; compared different types of smoke alarms to assess function over time.
Shults 1998	Not a controlled trial.
Sundelin 1996	Not designed to increase smoke alarms.

Study	Reason for exclusion
Treadwell 2000	Not a controlled trial.
Ytterstad 1998	Not designed to increase smoke alarms.

Characteristics of ongoing studies *[ordered by study ID]*

Smithson 1998

Trial name or title	Smithson et al.
Methods	
Participants	8 paired areas in 4 deprived communities (˜240 families of children aged 2 yrs or less in each area).
Interventions	I: Home visits every 2 months for 2 years by trained lay worker, teaching child development, safety, first aid; low cost safety devices; home safety inspection. C: Home safety inspection.
Outcomes	In progress. Home inspection, survey at 2 years.
Starting date	1997
Contact information	Dr. R. Smithson Consultant in Communicable Disease Western Health and Social Services Board 15 Gransha Park Clooney Road Londonderry, N. Ireland BT47 1TG UK
Notes	Preliminary results available from 1 pair: Alarm ownership I: 287/312 (92%) C: 271/302 (90%)

DATA AND ANALYSES

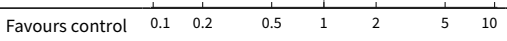
Comparison 1. Smoke alarm promotion versus control

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Final smoke alarm ownership	10	2829	Odds Ratio (M-H, Random, 95% CI)	1.21 [0.89, 1.64]
2 Final functioning smoke alarms	10	3773	Odds Ratio (M-H, Random, 95% CI)	1.33 [0.98, 1.80]
3 Smoke alarms acquired	5	2023	Odds Ratio (M-H, Random, 95% CI)	1.63 [0.72, 3.67]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
4 Functioning smoke alarms acquired	5	1693	Odds Ratio (M-H, Random, 95% CI)	1.42 [0.99, 2.03]

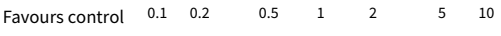
Analysis 1.1. Comparison 1 Smoke alarm promotion versus control, Outcome 1 Final smoke alarm ownership.

Study or subgroup	Intervention n/N	Control n/N	Odds Ratio M-H, Random, 95% CI	Weight	Odds Ratio M-H, Random, 95% CI
Barone 1988	32/34	26/29		2.53%	1.85[0.29,11.89]
Clamp 1998	82/83	71/82		2.07%	12.7[1.6,100.84]
Davis 1987	221/314	195/299		29.01%	1.27[0.9,1.78]
DiGuiseppi 2002	37/95	34/89		16.67%	1.03[0.57,1.87]
Jenkins 1996	45/62	46/61		10.87%	0.86[0.39,1.93]
Kelly 1987	8/55	6/54		6.26%	1.36[0.44,4.23]
Kendrick 1999	254/274	248/277		16.6%	1.49[0.82,2.7]
King 2001	460/479	454/465		12.03%	0.59[0.28,1.25]
Mathews 1988	10/12	9/12		2.21%	1.67[0.22,12.35]
Thomas 1984	27/28	21/25		1.75%	5.14[0.53,49.5]
Total (95% CI)	**1436**	**1393**		**100%**	**1.21[0.89,1.64]**
Total events: 1176 (Intervention), 1110 (Control)					
Heterogeneity: Tau^2=0.05; Chi^2=11.95, df=9(P=0.22); I^2=24.67%					
Test for overall effect: Z=1.2(P=0.23)					

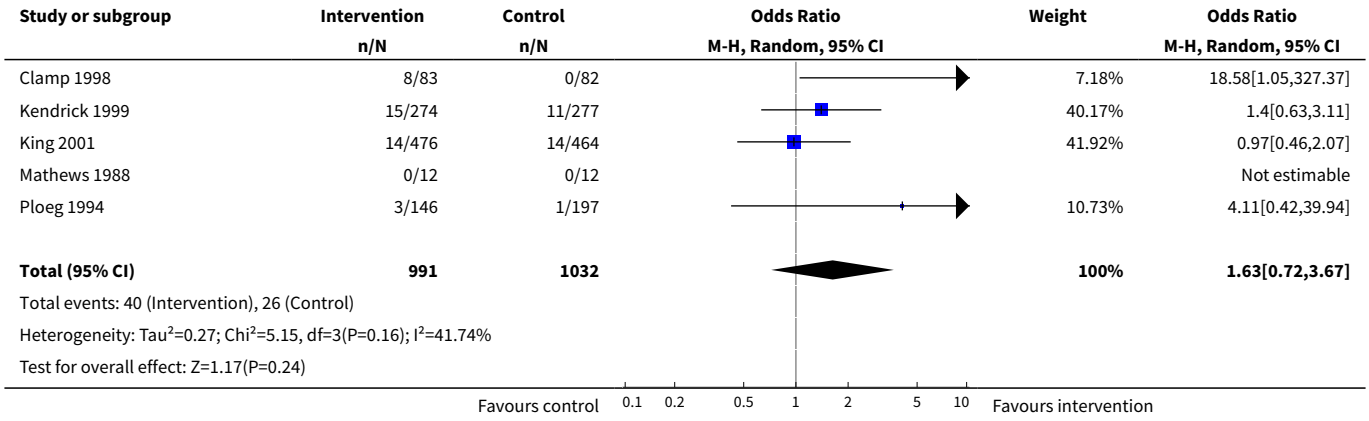


Analysis 1.2. Comparison 1 Smoke alarm promotion versus control, Outcome 2 Final functioning smoke alarms.

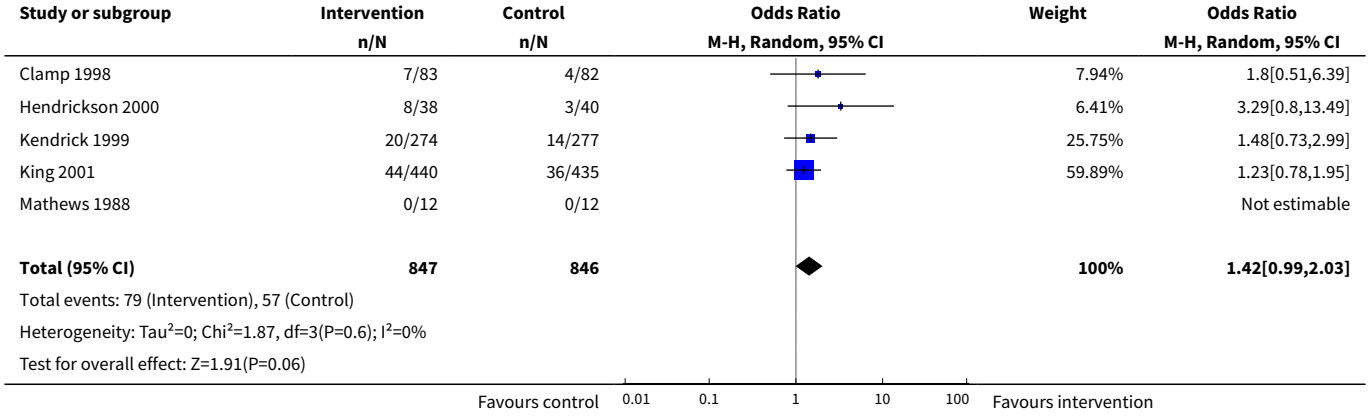
Study or subgroup	Intervention n/N	Control n/N	Odds Ratio M-H, Random, 95% CI	Weight	Odds Ratio M-H, Random, 95% CI
Barone 1988	32/34	26/29		2.47%	1.85[0.29,11.89]
Clamp 1998	80/83	71/82		4.57%	4.13[1.11,15.4]
DiGuiseppi 2002	16/103	16/91		10.57%	0.86[0.4,1.84]
Gielen 2001	43/73	26/52		11.37%	1.43[0.7,2.93]
Gielen 2002	45/56	45/54		7.44%	0.82[0.31,2.16]
Hendrickson 2000	37/38	26/40		2%	19.92[2.46,161.05]
Kendrick 1999	243/274	241/277		16.37%	1.17[0.7,1.95]
King 2001	412/459	401/447		18.98%	1.01[0.65,1.54]
Mathews 1988	6/12	6/12		3.25%	1[0.2,4.95]
Watson 2005	728/803	648/754		22.98%	1.59[1.16,2.17]
Total (95% CI)	**1935**	**1838**		**100%**	**1.33[0.98,1.8]**
Total events: 1642 (Intervention), 1506 (Control)					
Heterogeneity: Tau^2=0.08; Chi^2=15, df=9(P=0.09); I^2=40.01%					
Test for overall effect: Z=1.82(P=0.07)					



Analysis 1.3. Comparison 1 Smoke alarm promotion versus control, Outcome 3 Smoke alarms acquired.



Analysis 1.4. Comparison 1 Smoke alarm promotion versus control, Outcome 4 Functioning smoke alarms acquired.



Comparison 2. Smoke alarm promotion as part of routine child health surveillance versus control (subgroup analysis)

Outcome or subgroup title	No. of studies	No. of partici-pants	Statistical method	Effect size
1 Final smoke alarm ownership	5	941	Odds Ratio (M-H, Random, 95% CI)	1.96 [1.03, 3.72]
2 Final functioning smoke alarms	6	2571	Odds Ratio (M-H, Random, 95% CI)	1.46 [1.15, 1.85]
3 Smoke alarms acquired	2	716	Odds Ratio (M-H, Random, 95% CI)	3.62 [0.27, 48.01]
4 Functioning smoke alarms acquired	2	716	Odds Ratio (M-H, Random, 95% CI)	1.55 [0.84, 2.87]

Analysis 2.1. Comparison 2 Smoke alarm promotion as part of routine child health surveillance versus control (subgroup analysis), Outcome 1 Final smoke alarm ownership.

Study or subgroup	Intervention n/N	Control n/N	Odds Ratio M-H, Random, 95% CI	Weight	Odds Ratio M-H, Random, 95% CI
Barone 1988	32/34	26/29		10.41%	1.85[0.29,11.89]
Clamp 1998	82/83	71/82		8.61%	12.7[1.6,100.84]
Kelly 1987	8/55	6/54		23.48%	1.36[0.44,4.23]
Kendrick 1999	254/274	248/277		50.18%	1.49[0.82,2.7]
Thomas 1984	27/28	21/25		7.32%	5.14[0.53,49.5]
Total (95% CI)	**474**	**467**		**100%**	**1.96[1.03,3.72]**
Total events: 403 (Intervention), 372 (Control)					
Heterogeneity: Tau^2=0.12; Chi^2=5.05, df=4(P=0.28); I^2=20.85%					
Test for overall effect: Z=2.06(P=0.04)					

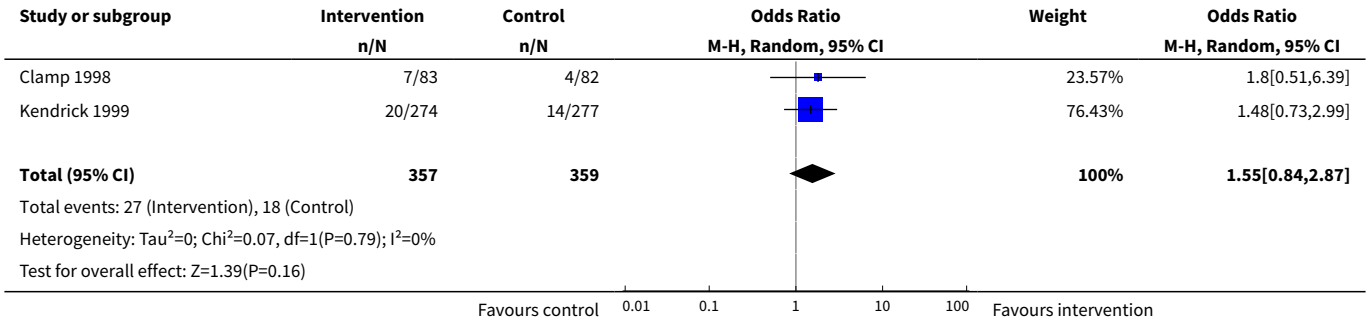
Analysis 2.2. Comparison 2 Smoke alarm promotion as part of routine child health surveillance versus control (subgroup analysis), Outcome 2 Final functioning smoke alarms.

Study or subgroup	Intervention n/N	Control n/N	Odds Ratio M-H, Random, 95% CI	Weight	Odds Ratio M-H, Random, 95% CI
Barone 1988	32/34	26/29		1.62%	1.85[0.29,11.89]
Clamp 1998	80/83	71/82		3.24%	4.13[1.11,15.4]
Gielen 2001	43/73	26/52		10.94%	1.43[0.7,2.93]
Gielen 2002	45/56	45/54		5.93%	0.82[0.31,2.16]
Kendrick 1999	243/274	241/277		21.39%	1.17[0.7,1.95]
Watson 2005	728/803	648/754		56.88%	1.59[1.16,2.17]
Total (95% CI)	**1323**	**1248**		**100%**	**1.46[1.15,1.85]**
Total events: 1171 (Intervention), 1057 (Control)					
Heterogeneity: Tau^2=0; Chi^2=4.81, df=5(P=0.44); I^2=0%					
Test for overall effect: Z=3.15(P=0)					

Analysis 2.3. Comparison 2 Smoke alarm promotion as part of routine child health surveillance versus control (subgroup analysis), Outcome 3 Smoke alarms acquired.

Study or subgroup	Intervention n/N	Control n/N	Odds Ratio M-H, Random, 95% CI	Weight	Odds Ratio M-H, Random, 95% CI
Clamp 1998	8/83	0/82		36.77%	18.58[1.05,327.37]
Kendrick 1999	15/274	11/277		63.23%	1.4[0.63,3.11]
Total (95% CI)	**357**	**359**		**100%**	**3.62[0.27,48.01]**
Total events: 23 (Intervention), 11 (Control)					
Heterogeneity: Tau^2=2.58; Chi^2=3.24, df=1(P=0.07); I^2=69.12%					
Test for overall effect: Z=0.98(P=0.33)					

Analysis 2.4. Comparison 2 Smoke alarm promotion as part of routine child health surveillance versus control (subgroup analysis), Outcome 4 Functioning smoke alarms acquired.

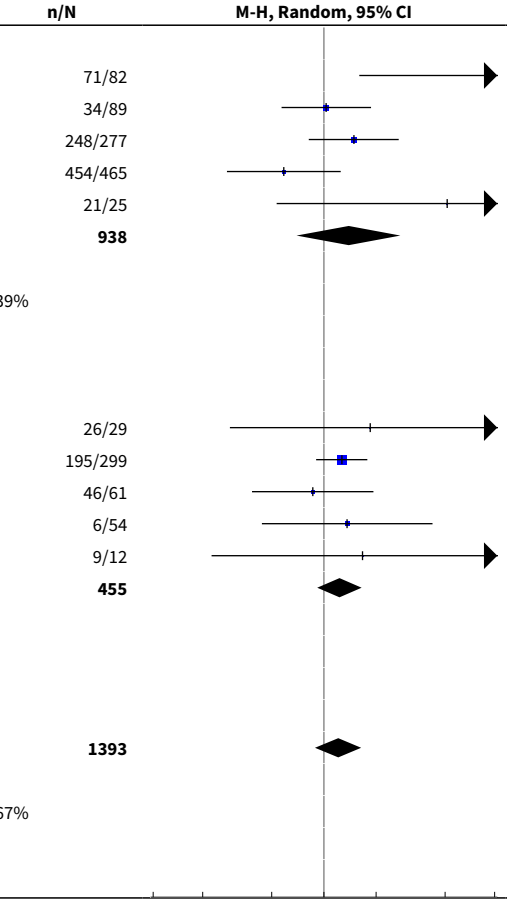


Comparison 3. Discounted or free smoke alarms versus control (subgroup analysis)

Outcome or subgroup title	No. of studies	No. of partici-pants	Statistical method	Effect size
1 Final smoke alarm ownership	10	2829	Odds Ratio (M-H, Random, 95% CI)	1.21 [0.89, 1.64]
1.1 Discounted or free alarms	5	1897	Odds Ratio (M-H, Random, 95% CI)	1.39 [0.69, 2.76]
1.2 Education only	5	932	Odds Ratio (M-H, Random, 95% CI)	1.23 [0.92, 1.65]
2 Final functioning smoke alarms	10	3773	Odds Ratio (M-H, Random, 95% CI)	1.33 [0.98, 1.80]
2.1 Discounted or free alarms	6	3451	Odds Ratio (M-H, Random, 95% CI)	1.43 [0.93, 2.20]
2.2 Education only	4	322	Odds Ratio (M-H, Random, 95% CI)	1.20 [0.71, 2.02]
3 Smoke alarms acquired	5	2023	Odds Ratio (M-H, Fixed, 95% CI)	1.56 [0.95, 2.57]
3.1 Discounted or free alarms	3	1656	Odds Ratio (M-H, Fixed, 95% CI)	1.48 [0.89, 2.46]
3.2 Education only	2	367	Odds Ratio (M-H, Fixed, 95% CI)	4.11 [0.42, 39.94]
4 Functioning smoke alarms acquired	5	1693	Odds Ratio (M-H, Random, 95% CI)	1.42 [0.99, 2.03]
4.1 Discounted or free alarms	4	1669	Odds Ratio (M-H, Random, 95% CI)	1.42 [0.99, 2.03]
4.2 Education only	1	24	Odds Ratio (M-H, Random, 95% CI)	0.0 [0.0, 0.0]

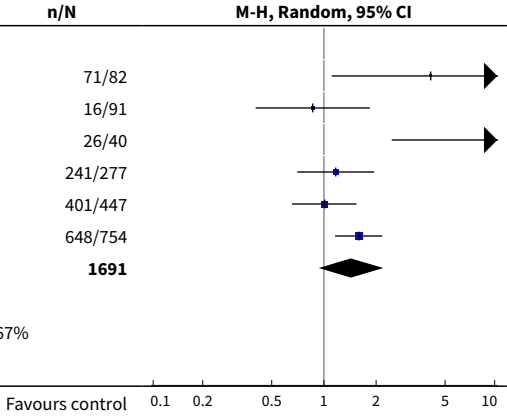
Analysis 3.1. Comparison 3 Discounted or free smoke alarms versus control (subgroup analysis), Outcome 1 Final smoke alarm ownership.

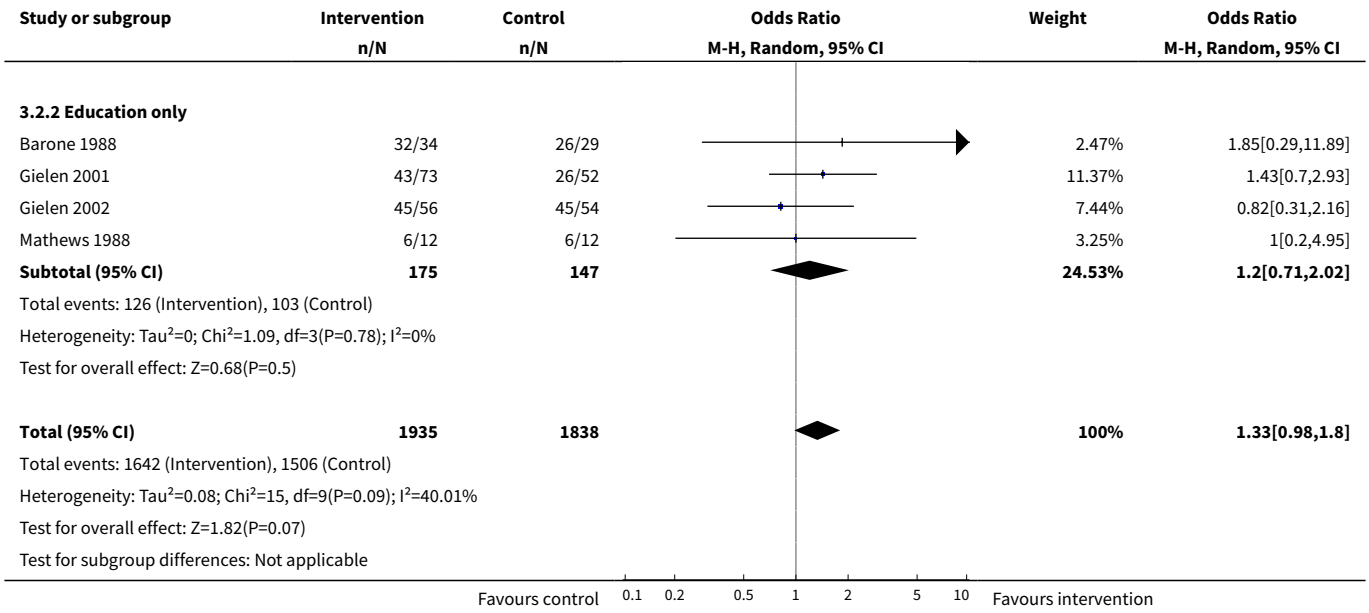
Study or subgroup	Intervention n/N	Control n/N	Odds Ratio M-H, Random, 95% CI	Weight	Odds Ratio M-H, Random, 95% CI
3.1.1 Discounted or free alarms					
Clamp 1998	82/83	71/82		2.07%	12.7[1.6,100.84]
DiGuiseppi 2002	37/95	34/89		16.67%	1.03[0.57,1.87]
Kendrick 1999	254/274	248/277		16.6%	1.49[0.82,2.7]
King 2001	460/479	454/465		12.03%	0.59[0.28,1.25]
Thomas 1984	27/28	21/25		1.75%	5.14[0.53,49.5]
Subtotal (95% CI)	**959**	**938**		**49.12%**	**1.39[0.69,2.76]**
Total events: 860 (Intervention), 828 (Control)					
Heterogeneity: Tau^2=0.33; Chi^2=10.93, df=4(P=0.03); I^2=63.39%					
Test for overall effect: Z=0.93(P=0.35)					
3.1.2 Education only					
Barone 1988	32/34	26/29		2.53%	1.85[0.29,11.89]
Davis 1987	221/314	195/299		29.01%	1.27[0.9,1.78]
Jenkins 1996	45/62	46/61		10.87%	0.86[0.39,1.93]
Kelly 1987	8/55	6/54		6.26%	1.36[0.44,4.23]
Mathews 1988	10/12	9/12		2.21%	1.67[0.22,12.35]
Subtotal (95% CI)	**477**	**455**		**50.88%**	**1.23[0.92,1.65]**
Total events: 316 (Intervention), 282 (Control)					
Heterogeneity: Tau^2=0; Chi^2=1.07, df=4(P=0.9); I^2=0%					
Test for overall effect: Z=1.37(P=0.17)					
Total (95% CI)	**1436**	**1393**		**100%**	**1.21[0.89,1.64]**
Total events: 1176 (Intervention), 1110 (Control)					
Heterogeneity: Tau^2=0.05; Chi^2=11.95, df=9(P=0.22); I^2=24.67%					
Test for overall effect: Z=1.2(P=0.23)					
Test for subgroup differences: Not applicable					



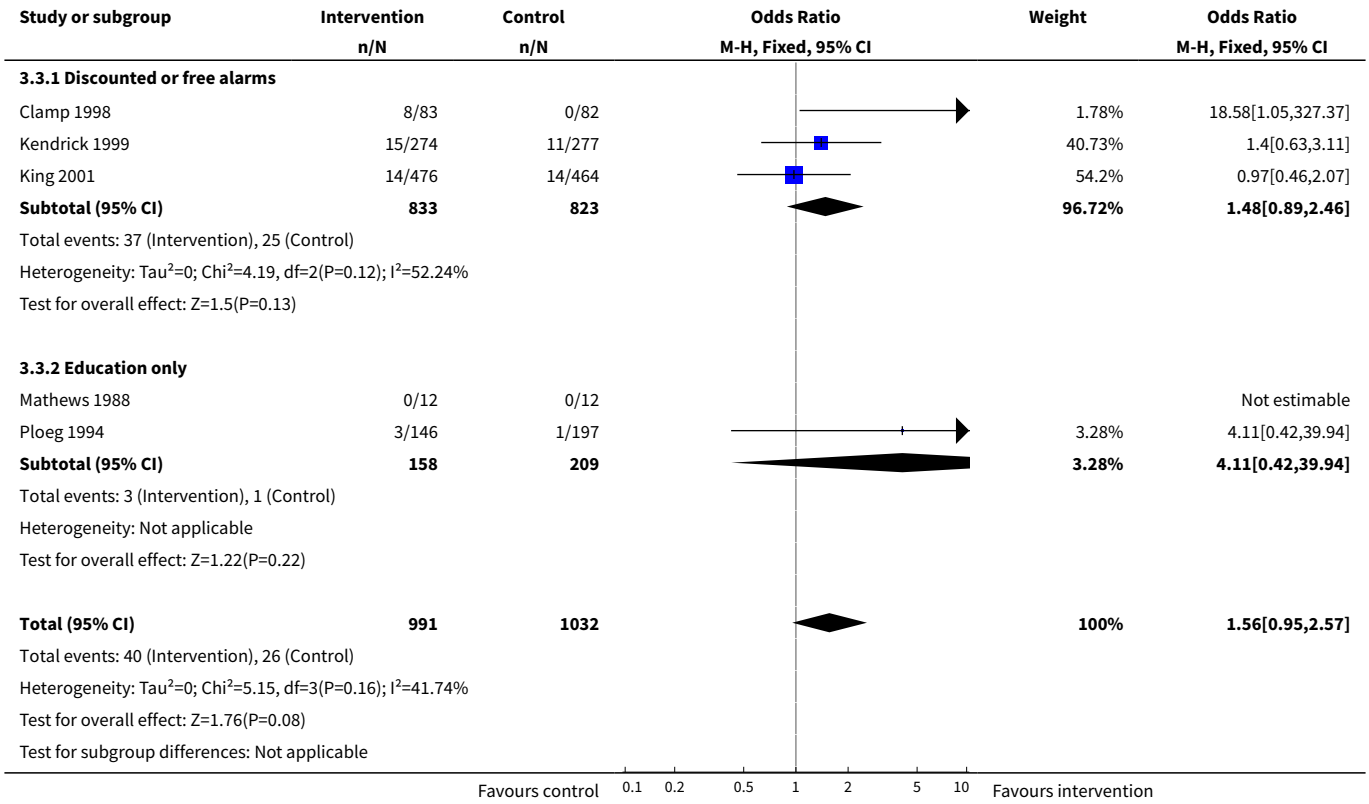
Analysis 3.2. Comparison 3 Discounted or free smoke alarms versus control (subgroup analysis), Outcome 2 Final functioning smoke alarms.

Study or subgroup	Intervention n/N	Control n/N	Odds Ratio M-H, Random, 95% CI	Weight	Odds Ratio M-H, Random, 95% CI
3.2.1 Discounted or free alarms					
Clamp 1998	80/83	71/82		4.57%	4.13[1.11,15.4]
DiGuiseppi 2002	16/103	16/91		10.57%	0.86[0.4,1.84]
Hendrickson 2000	37/38	26/40		2%	19.92[2.46,161.05]
Kendrick 1999	243/274	241/277		16.37%	1.17[0.7,1.95]
King 2001	412/459	401/447		18.98%	1.01[0.65,1.54]
Watson 2005	728/803	648/754		22.98%	1.59[1.16,2.17]
Subtotal (95% CI)	**1760**	**1691**		**75.47%**	**1.43[0.93,2.2]**
Total events: 1516 (Intervention), 1403 (Control)					
Heterogeneity: Tau^2=0.15; Chi^2=13.76, df=5(P=0.02); I^2=63.67%					
Test for overall effect: Z=1.65(P=0.1)					

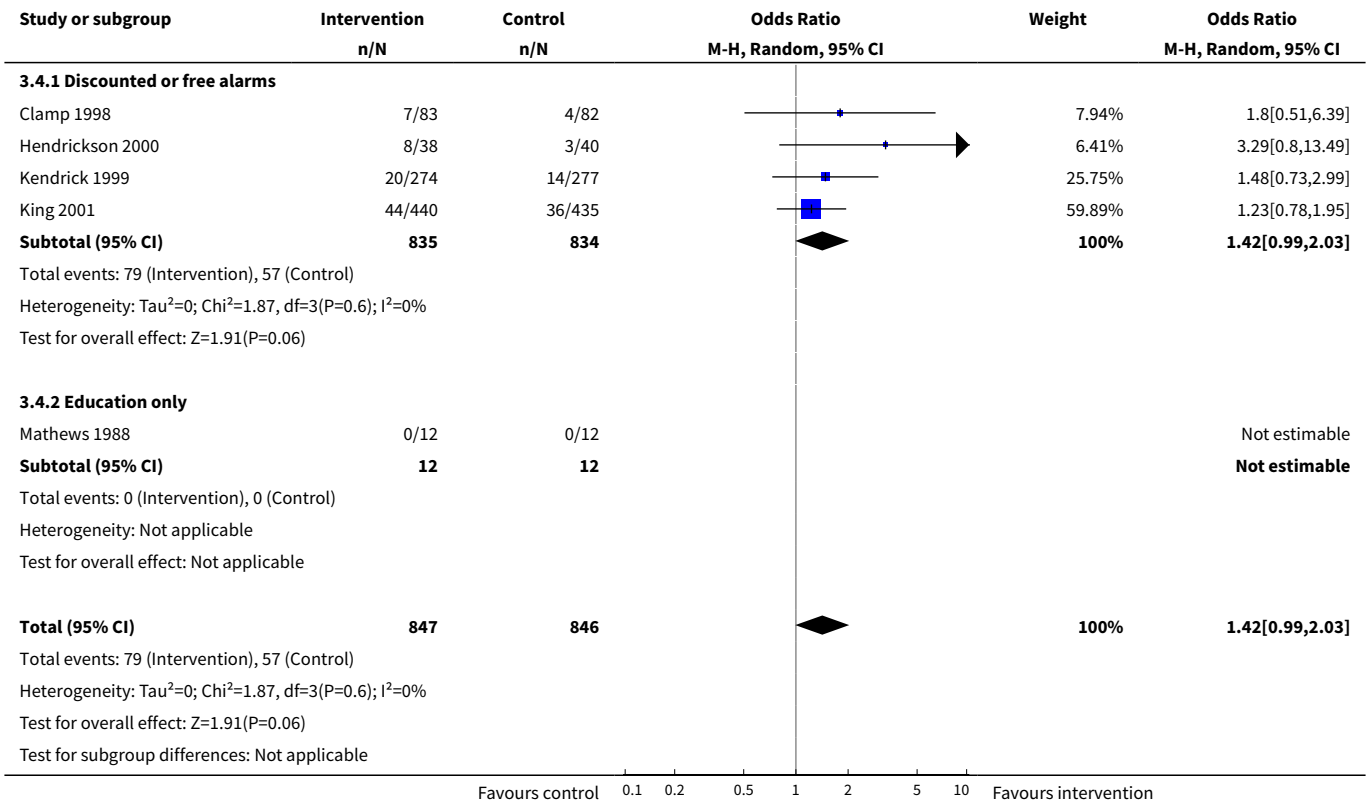




Analysis 3.3. Comparison 3 Discounted or free smoke alarms versus control (subgroup analysis), Outcome 3 Smoke alarms acquired.



Analysis 3.4. Comparison 3 Discounted or free smoke alarms versus control (subgroup analysis), Outcome 4 Functioning smoke alarms acquired.



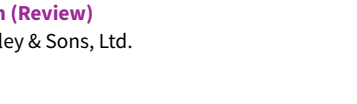
Comparison 4. Smoke alarm promotion versus control by allocation concealment (subgroup analysis)

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Final smoke alarm ownership	10	2829	Odds Ratio (M-H, Random, 95% CI)	1.21 [0.89, 1.64]
1.1 Inadequate or unclear allocation concealment	5	862	Odds Ratio (M-H, Random, 95% CI)	1.33 [0.97, 1.82]
1.2 Adequate allocation concealment	5	1967	Odds Ratio (M-H, Random, 95% CI)	1.12 [0.65, 1.94]
2 Final functioning smoke alarm	10	3773	Odds Ratio (M-H, Random, 95% CI)	1.33 [0.98, 1.80]
2.1 Inadequate or unclear allocation concealment	4	275	Odds Ratio (M-H, Random, 95% CI)	1.94 [0.53, 7.15]
2.2 Adequate allocation concealment	6	3498	Odds Ratio (M-H, Random, 95% CI)	1.30 [0.99, 1.70]
3 Smoke alarms acquired	5	2023	Odds Ratio (M-H, Random, 95% CI)	1.63 [0.72, 3.67]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
3.1 Inadequate or unclear allocation concealment	1	24	Odds Ratio (M-H, Random, 95% CI)	0.0 [0.0, 0.0]
3.2 Adequate allocation concealment	4	1999	Odds Ratio (M-H, Random, 95% CI)	1.63 [0.72, 3.67]
4 Functioning smoke alarms acquired	5	1693	Odds Ratio (M-H, Random, 95% CI)	1.42 [0.99, 2.03]
4.1 Inadequate or unclear allocation concealment	2	102	Odds Ratio (M-H, Random, 95% CI)	3.29 [0.80, 13.49]
4.2 Adequate allocation concealment	3	1591	Odds Ratio (M-H, Random, 95% CI)	1.34 [0.92, 1.94]

Analysis 4.1. Comparison 4 Smoke alarm promotion versus control by allocation concealment (subgroup analysis), Outcome 1 Final smoke alarm ownership.

Study or subgroup	Intervention n/N	Control n/N	Odds Ratio M-H, Random, 95% CI	Weight	Odds Ratio M-H, Random, 95% CI
4.1.1 Inadequate or unclear allocation concealment					
Barone 1988	32/34	26/29		2.53%	1.85[0.29,11.89]
Davis 1987	221/314	195/299		29.01%	1.27[0.9,1.78]
Kelly 1987	8/55	6/54		6.26%	1.36[0.44,4.23]
Mathews 1988	10/12	9/12		2.21%	1.67[0.22,12.35]
Thomas 1984	27/28	21/25		1.75%	5.14[0.53,49.5]
Subtotal (95% CI)	**443**	**419**		**41.75%**	**1.33[0.97,1.82]**
Total events: 298 (Intervention), 257 (Control)					
Heterogeneity: Tau^2=0; Chi^2=1.62, df=4(P=0.81); I^2=0%					
Test for overall effect: Z=1.79(P=0.07)					
4.1.2 Adequate allocation concealment					
Clamp 1998	82/83	71/82		2.07%	12.7[1.6,100.84]
DiGuiseppi 2002	37/95	34/89		16.67%	1.03[0.57,1.87]
Jenkins 1996	45/62	46/61		10.87%	0.86[0.39,1.93]
Kendrick 1999	254/274	248/277		16.6%	1.49[0.82,2.7]
King 2001	460/479	454/465		12.03%	0.59[0.28,1.25]
Subtotal (95% CI)	**993**	**974**		**58.25%**	**1.12[0.65,1.94]**
Total events: 878 (Intervention), 853 (Control)					
Heterogeneity: Tau^2=0.21; Chi^2=9.52, df=4(P=0.05); I^2=57.98%					
Test for overall effect: Z=0.4(P=0.69)					
Total (95% CI)	**1436**	**1393**		**100%**	**1.21[0.89,1.64]**
Total events: 1176 (Intervention), 1110 (Control)					
Heterogeneity: Tau^2=0.05; Chi^2=11.95, df=9(P=0.22); I^2=24.67%					
Test for overall effect: Z=1.2(P=0.23)					
Test for subgroup differences: Not applicable					



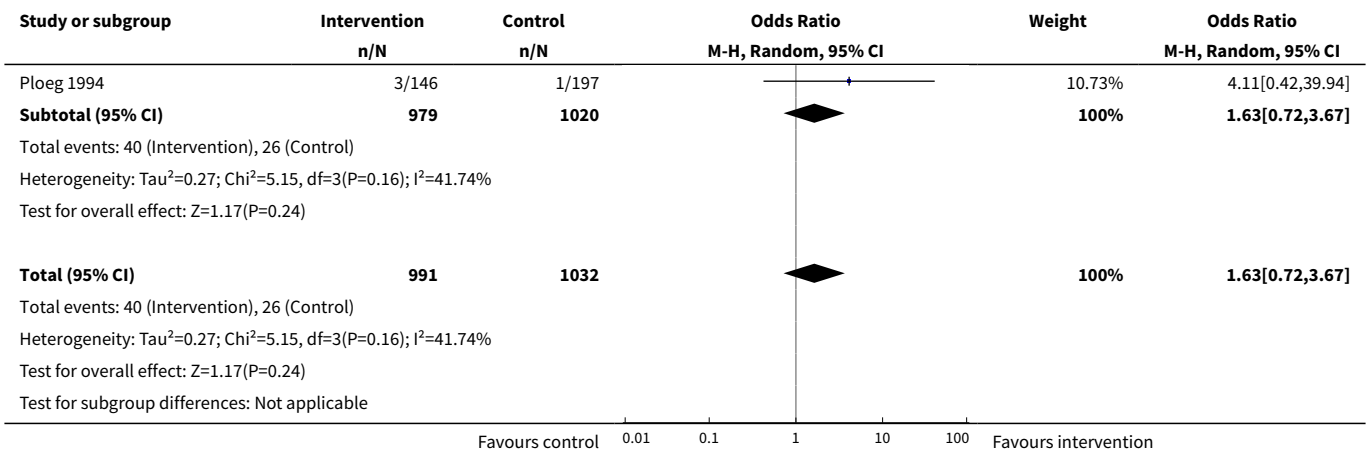
Favours control — Favours intervention

Analysis 4.2. Comparison 4 Smoke alarm promotion versus control by allocation concealment (subgroup analysis), Outcome 2 Final functioning smoke alarm.

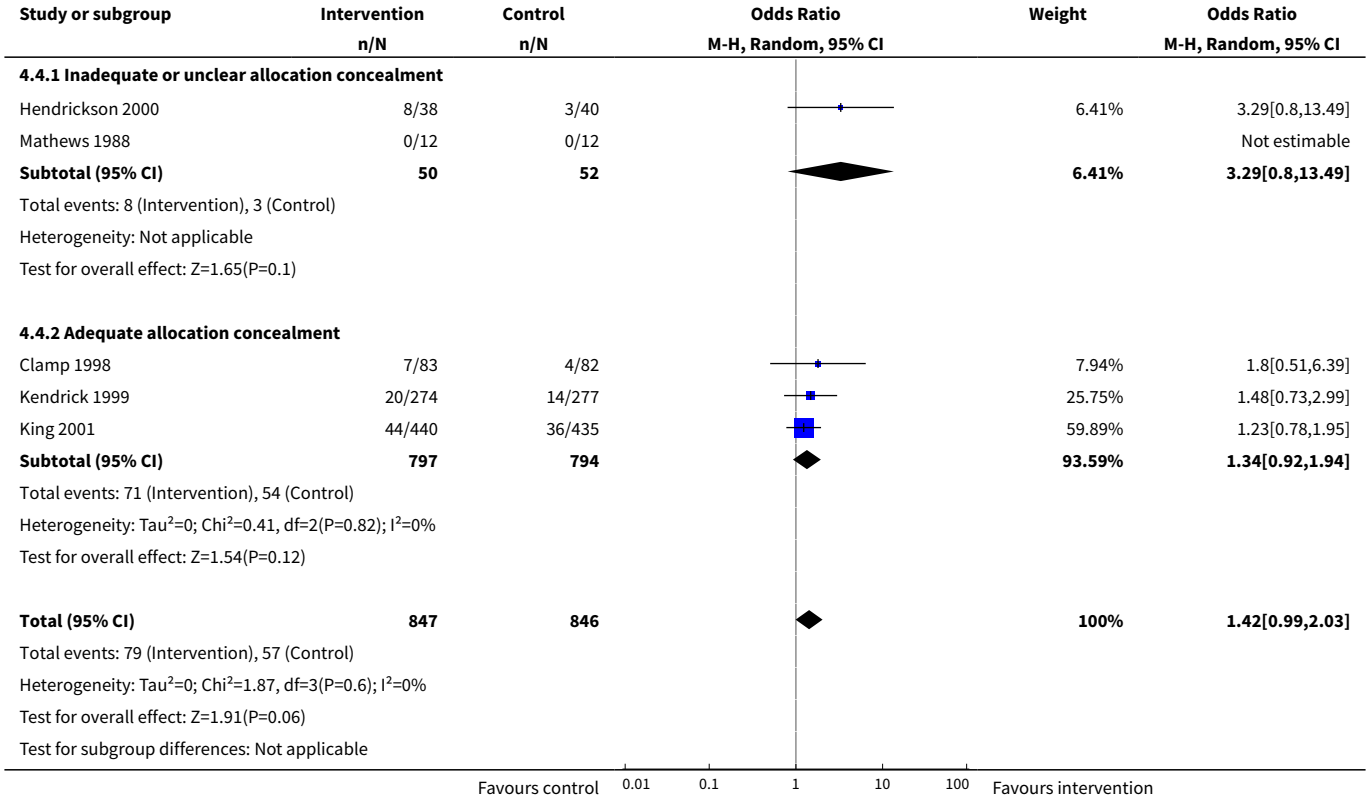
Study or subgroup	Intervention n/N	Control n/N	Odds Ratio M-H, Random, 95% CI	Weight	Odds Ratio M-H, Random, 95% CI
4.2.1 Inadequate or unclear allocation concealment					
Barone 1988	32/34	26/29		2.47%	1.85[0.29,11.89]
Gielen 2002	45/56	45/54		7.44%	0.82[0.31,2.16]
Hendrickson 2000	37/38	26/40		2%	19.92[2.46,161.05]
Mathews 1988	6/12	6/12		3.25%	1[0.2,4.95]
Subtotal (95% CI)	**140**	**135**		**15.15%**	**1.94[0.53,7.15]**
Total events: 120 (Intervention), 103 (Control)					
Heterogeneity: Tau^2=1.1; Chi^2=8.27, df=3(P=0.04); I^2=63.73%					
Test for overall effect: Z=1(P=0.32)					
4.2.2 Adequate allocation concealment					
Clamp 1998	80/83	71/82		4.57%	4.13[1.11,15.4]
DiGuiseppi 2002	16/103	16/91		10.57%	0.86[0.4,1.84]
Gielen 2001	43/73	26/52		11.37%	1.43[0.7,2.93]
Kendrick 1999	243/274	241/277		16.37%	1.17[0.7,1.95]
King 2001	412/459	401/447		18.98%	1.01[0.65,1.54]
Watson 2005	728/803	648/754		22.98%	1.59[1.16,2.17]
Subtotal (95% CI)	**1795**	**1703**		**84.85%**	**1.3[0.99,1.7]**
Total events: 1522 (Intervention), 1403 (Control)					
Heterogeneity: Tau^2=0.03; Chi^2=7.24, df=5(P=0.2); I^2=30.92%					
Test for overall effect: Z=1.89(P=0.06)					
Total (95% CI)	**1935**	**1838**		**100%**	**1.33[0.98,1.8]**
Total events: 1642 (Intervention), 1506 (Control)					
Heterogeneity: Tau^2=0.08; Chi^2=15, df=9(P=0.09); I^2=40.01%					
Test for overall effect: Z=1.82(P=0.07)					
Test for subgroup differences: Not applicable					

Analysis 4.3. Comparison 4 Smoke alarm promotion versus control by allocation concealment (subgroup analysis), Outcome 3 Smoke alarms acquired.

Study or subgroup	Intervention n/N	Control n/N	Odds Ratio M-H, Random, 95% CI	Weight	Odds Ratio M-H, Random, 95% CI
4.3.1 Inadequate or unclear allocation concealment					
Mathews 1988	0/12	0/12			Not estimable
Subtotal (95% CI)	**12**	**12**			**Not estimable**
Total events: 0 (Intervention), 0 (Control)					
Heterogeneity: Not applicable					
Test for overall effect: Not applicable					
4.3.2 Adequate allocation concealment					
Clamp 1998	8/83	0/82		7.18%	18.58[1.05,327.37]
Kendrick 1999	15/274	11/277		40.17%	1.4[0.63,3.11]
King 2001	14/476	14/464		41.92%	0.97[0.46,2.07]



Analysis 4.4. Comparison 4 Smoke alarm promotion versus control by allocation concealment (subgroup analysis), Outcome 4 Functioning smoke alarms acquired.

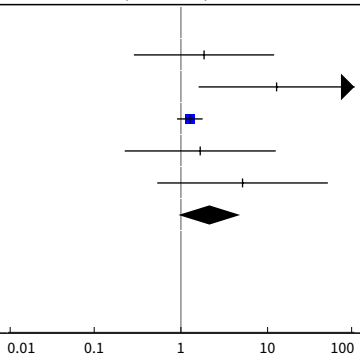


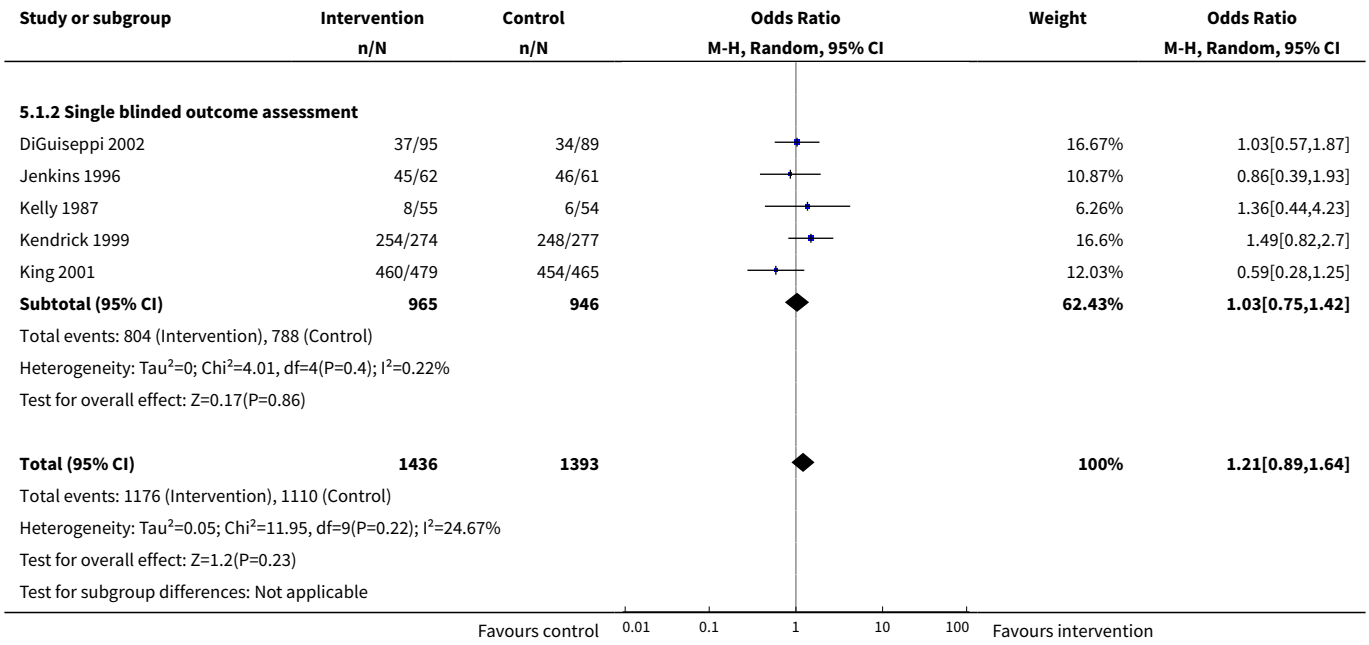
Comparison 5. Smoke alarm promotion versus control by blinding of outcome assessment (subgroup analysis)

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Final smoke alarm ownership	10	2829	Odds Ratio (M-H, Random, 95% CI)	1.21 [0.89, 1.64]
1.1 Unblinded outcome assessment	5	918	Odds Ratio (M-H, Random, 95% CI)	2.13 [0.94, 4.82]
1.2 Single blinded outcome assessment	5	1911	Odds Ratio (M-H, Random, 95% CI)	1.03 [0.75, 1.42]
2 Final functioning smoke alarm	10	3773	Odds Ratio (M-H, Random, 95% CI)	1.33 [0.98, 1.80]
2.1 Unblinded or unspecified outcome assessment	5	440	Odds Ratio (M-H, Random, 95% CI)	2.25 [0.78, 6.51]
2.2 Single blinded outcome assessment	5	3333	Odds Ratio (M-H, Random, 95% CI)	1.27 [1.02, 1.59]
3 Smoke alarms acquired	5	2023	Odds Ratio (M-H, Random, 95% CI)	1.63 [0.72, 3.67]
3.1 Unblinded outcome assessment	2	189	Odds Ratio (M-H, Random, 95% CI)	18.58 [1.05, 327.37]
3.2 Single-blinded outcome assessment	3	1834	Odds Ratio (M-H, Random, 95% CI)	1.24 [0.73, 2.11]
4 Functioning smoke alarms acquired	5	1693	Odds Ratio (M-H, Random, 95% CI)	1.42 [0.99, 2.03]
4.1 Unblinded outcome assessment	3	267	Odds Ratio (M-H, Random, 95% CI)	2.35 [0.92, 6.05]
4.2 Single blinded outcome assessment	2	1426	Odds Ratio (M-H, Random, 95% CI)	1.30 [0.88, 1.91]

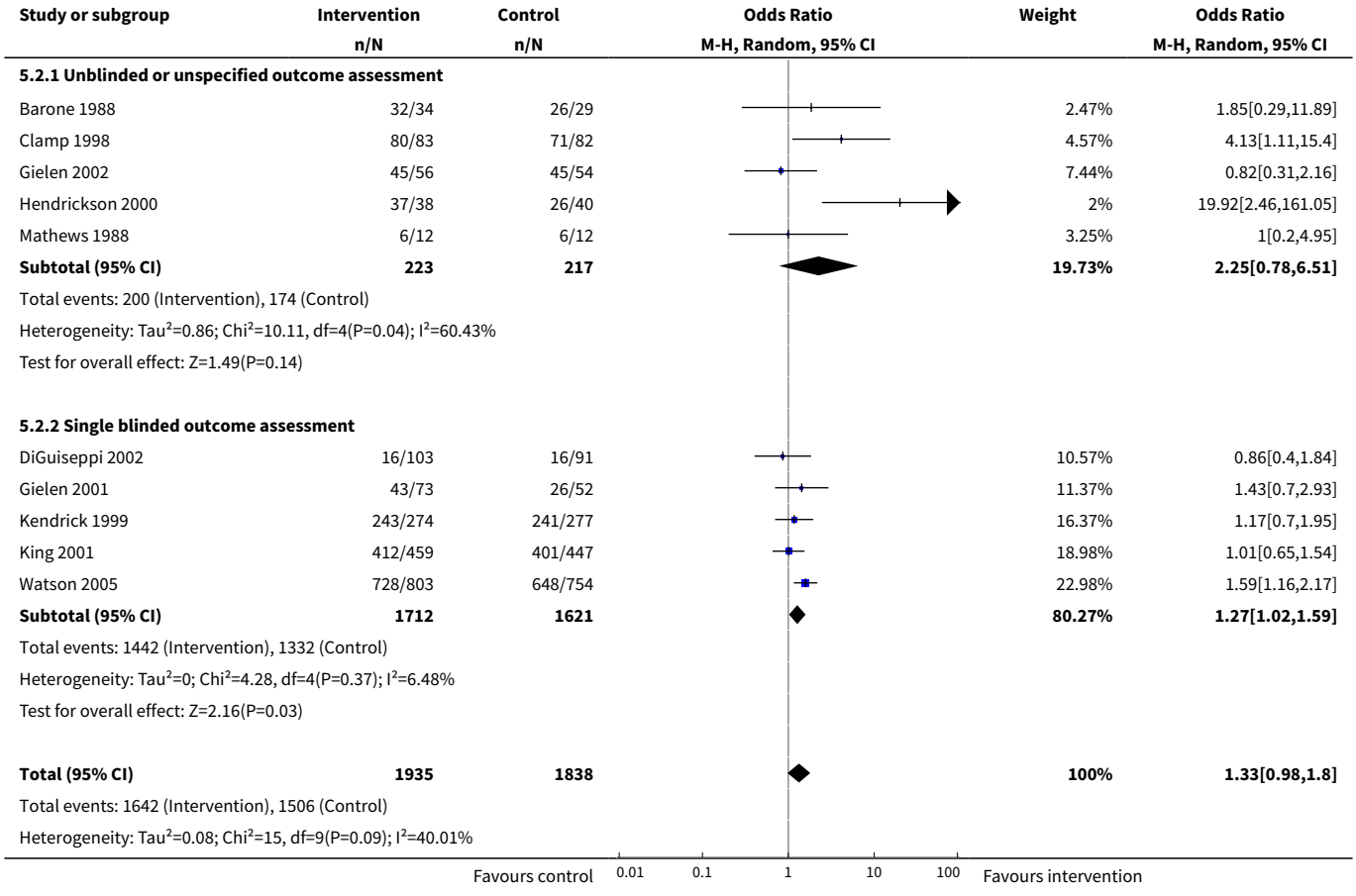
Analysis 5.1. Comparison 5 Smoke alarm promotion versus control by blinding of outcome assessment (subgroup analysis), Outcome 1 Final smoke alarm ownership.

Study or subgroup	Intervention n/N	Control n/N	Odds Ratio M-H, Random, 95% CI	Weight	Odds Ratio M-H, Random, 95% CI
5.1.1 Unblinded outcome assessment					
Barone 1988	32/34	26/29		2.53%	1.85[0.29,11.89]
Clamp 1998	82/83	71/82		2.07%	12.7[1.6,100.84]
Davis 1987	221/314	195/299		29.01%	1.27[0.9,1.78]
Mathews 1988	10/12	9/12		2.21%	1.67[0.22,12.35]
Thomas 1984	27/28	21/25		1.75%	5.14[0.53,49.5]
Subtotal (95% CI)	**471**	**447**		**37.57%**	**2.13[0.94,4.82]**
Total events: 372 (Intervention), 322 (Control)					
Heterogeneity: Tau^2=0.32; Chi^2=6.21, df=4(P=0.18); I^2=35.56%					
Test for overall effect: Z=1.81(P=0.07)					

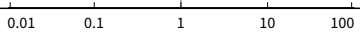




Analysis 5.2. Comparison 5 Smoke alarm promotion versus control by blinding of outcome assessment (subgroup analysis), Outcome 2 Final functioning smoke alarm.

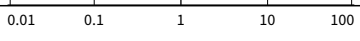


Study or subgroup	Intervention n/N	Control n/N	Odds Ratio M-H, Random, 95% CI	Weight	Odds Ratio M-H, Random, 95% CI
Test for overall effect: Z=1.82(P=0.07)					
Test for subgroup differences: Not applicable					



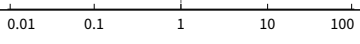
Analysis 5.3. Comparison 5 Smoke alarm promotion versus control by blinding of outcome assessment (subgroup analysis), Outcome 3 Smoke alarms acquired.

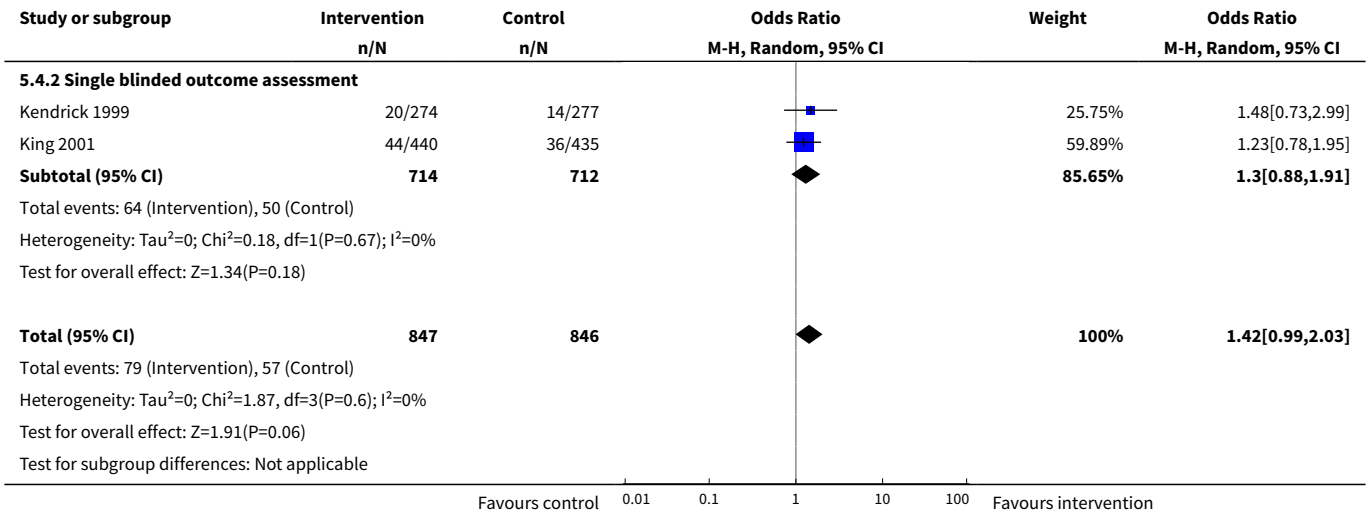
Study or subgroup	Intervention n/N	Control n/N	Odds Ratio M-H, Random, 95% CI	Weight	Odds Ratio M-H, Random, 95% CI
5.3.1 Unblinded outcome assessment					
Clamp 1998	8/83	0/82		7.18%	18.58[1.05,327.37]
Mathews 1988	0/12	0/12			Not estimable
Subtotal (95% CI)	**95**	**94**		**7.18%**	**18.58[1.05,327.37]**
Total events: 8 (Intervention), 0 (Control)					
Heterogeneity: Not applicable					
Test for overall effect: Z=2(P=0.05)					
5.3.2 Single-blinded outcome assessment					
Kendrick 1999	15/274	11/277		40.17%	1.4[0.63,3.11]
King 2001	14/476	14/464		41.92%	0.97[0.46,2.07]
Ploeg 1994	3/146	1/197		10.73%	4.11[0.42,39.94]
Subtotal (95% CI)	**896**	**938**		**92.82%**	**1.24[0.73,2.11]**
Total events: 32 (Intervention), 26 (Control)					
Heterogeneity: Tau^2=0; Chi^2=1.56, df=2(P=0.46); I^2=0%					
Test for overall effect: Z=0.79(P=0.43)					
Total (95% CI)	**991**	**1032**		**100%**	**1.63[0.72,3.67]**
Total events: 40 (Intervention), 26 (Control)					
Heterogeneity: Tau^2=0.27; Chi^2=5.15, df=3(P=0.16); I^2=41.74%					
Test for overall effect: Z=1.17(P=0.24)					
Test for subgroup differences: Not applicable					



Analysis 5.4. Comparison 5 Smoke alarm promotion versus control by blinding of outcome assessment (subgroup analysis), Outcome 4 Functioning smoke alarms acquired.

Study or subgroup	Intervention n/N	Control n/N	Odds Ratio M-H, Random, 95% CI	Weight	Odds Ratio M-H, Random, 95% CI
5.4.1 Unblinded outcome assessment					
Clamp 1998	7/83	4/82		7.94%	1.8[0.51,6.39]
Hendrickson 2000	8/38	3/40		6.41%	3.29[0.8,13.49]
Mathews 1988	0/12	0/12			Not estimable
Subtotal (95% CI)	**133**	**134**		**14.35%**	**2.35[0.92,6.05]**
Total events: 15 (Intervention), 7 (Control)					
Heterogeneity: Tau^2=0; Chi^2=0.39, df=1(P=0.53); I^2=0%					
Test for overall effect: Z=1.78(P=0.08)					

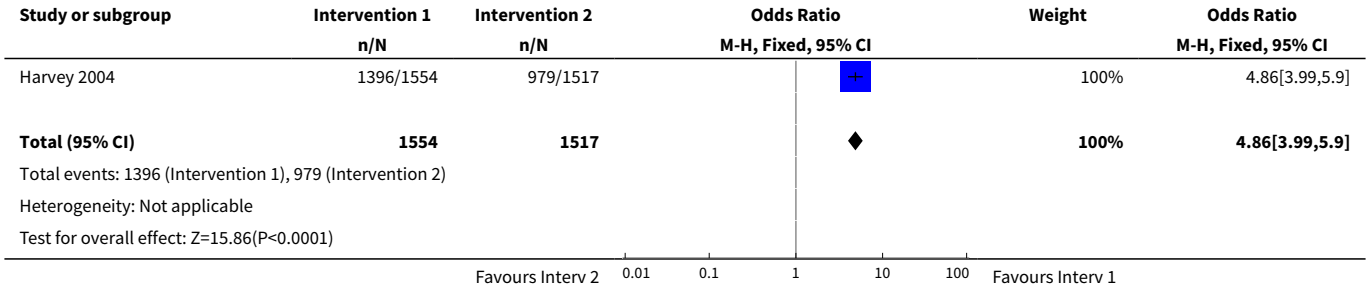




Comparison 6. Smoke alarm installation versus vouchers for free alarms

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Final functioning smoke alarms	1	3071	Odds Ratio (M-H, Fixed, 95% CI)	4.86 [3.99, 5.90]

Analysis 6.1. Comparison 6 Smoke alarm installation versus vouchers for free alarms, Outcome 1 Final functioning smoke alarms.



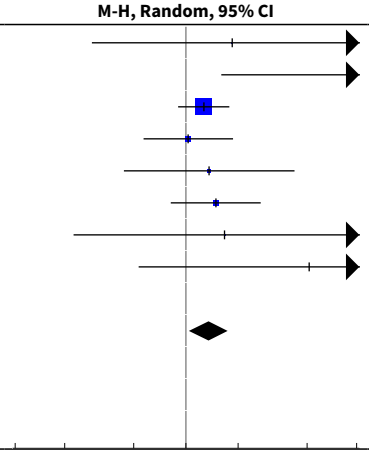
Comparison 7. Smoke alarm promotion versus control excluding families with injured children

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Final smoke alarm ownership	8	1762	Odds Ratio (M-H, Random, 95% CI)	1.35 [1.04, 1.74]
2 Final functioning smoke alarms	9	2867	Odds Ratio (M-H, Random, 95% CI)	1.42 [1.00, 2.02]

Outcome or subgroup title	No. of studies	No. of partici-pants	Statistical method	Effect size
3 Smoke alarms acquired	4	1083	Odds Ratio (M-H, Random, 95% CI)	2.98 [0.70, 12.74]
4 Functioning smoke alarms acquired	4	818	Odds Ratio (M-H, Random, 95% CI)	1.75 [0.99, 3.07]

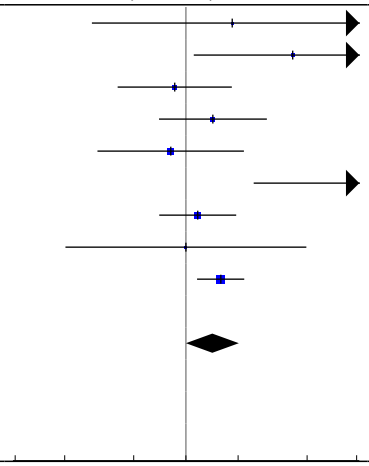
Analysis 7.1. Comparison 7 Smoke alarm promotion versus control excluding families with injured children, Outcome 1 Final smoke alarm ownership.

Study or subgroup	Intervention n/N	Control n/N	Odds Ratio M-H, Random, 95% CI	Weight	Odds Ratio M-H, Random, 95% CI
Barone 1988	32/34	26/29		1.89%	1.85[0.29,11.89]
Clamp 1998	82/83	71/82		1.53%	12.7[1.6,100.84]
Davis 1987	221/314	195/299		52.51%	1.27[0.9,1.78]
DiGuiseppi 2002	37/95	34/89		18.1%	1.03[0.57,1.87]
Kelly 1987	8/55	6/54		5.08%	1.36[0.44,4.23]
Kendrick 1999	254/274	248/277		17.99%	1.49[0.82,2.7]
Mathews 1988	10/12	9/12		1.63%	1.67[0.22,12.35]
Thomas 1984	27/28	21/25		1.28%	5.14[0.53,49.5]
Total (95% CI)	**895**	**867**		**100%**	**1.35[1.04,1.74]**
Total events: 671 (Intervention), 610 (Control)					
Heterogeneity: Tau^2=0; Chi^2=7.1, df=7(P=0.42); I^2=1.4%					
Test for overall effect: Z=2.27(P=0.02)					

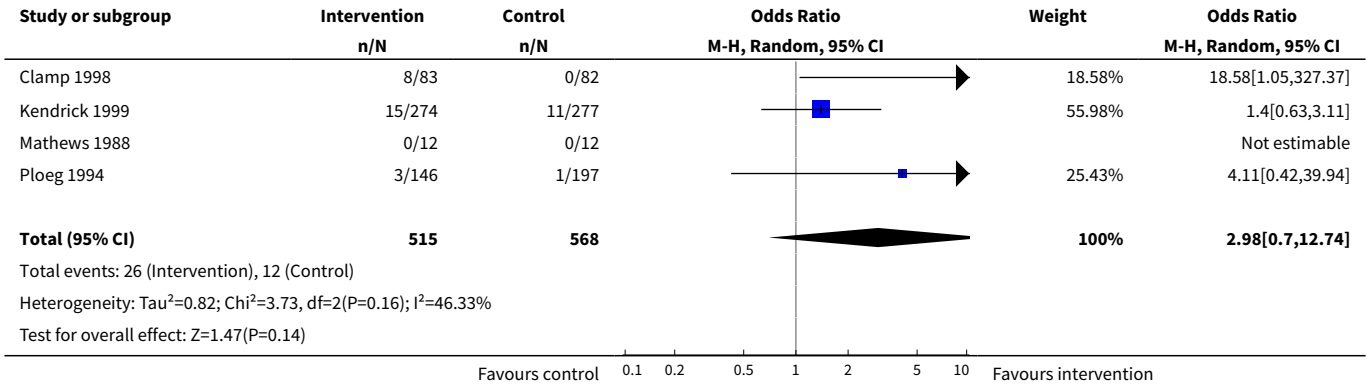


Analysis 7.2. Comparison 7 Smoke alarm promotion versus control excluding families with injured children, Outcome 2 Final functioning smoke alarms.

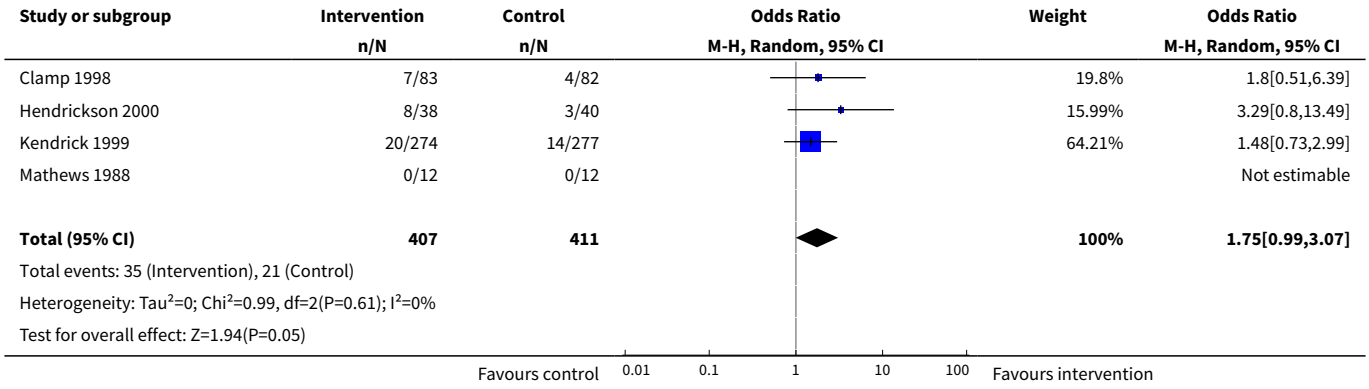
Study or subgroup	Intervention n/N	Control n/N	Odds Ratio M-H, Random, 95% CI	Weight	Odds Ratio M-H, Random, 95% CI
Barone 1988	32/34	26/29		3.23%	1.85[0.29,11.89]
Clamp 1998	80/83	71/82		5.92%	4.13[1.11,15.4]
DiGuiseppi 2002	16/103	16/91		13.25%	0.86[0.4,1.84]
Gielen 2001	43/73	26/52		14.21%	1.43[0.7,2.93]
Gielen 2002	45/56	45/54		9.48%	0.82[0.31,2.16]
Hendrickson 2000	37/38	26/40		2.62%	19.92[2.46,161.05]
Kendrick 1999	243/274	241/277		19.95%	1.17[0.7,1.95]
Mathews 1988	6/12	6/12		4.24%	1[0.2,4.95]
Watson 2005	728/803	648/754		27.11%	1.59[1.16,2.17]
Total (95% CI)	**1476**	**1391**		**100%**	**1.42[1,2.02]**
Total events: 1230 (Intervention), 1105 (Control)					
Heterogeneity: Tau^2=0.09; Chi^2=12.98, df=8(P=0.11); I^2=38.38%					
Test for overall effect: Z=1.96(P=0.05)					



Analysis 7.3. Comparison 7 Smoke alarm promotion versus control excluding families with injured children, Outcome 3 Smoke alarms acquired.



Analysis 7.4. Comparison 7 Smoke alarm promotion versus control excluding families with injured children, Outcome 4 Functioning smoke alarms acquired.



Comparison 8. Smoke alarm promotion versus control excluding interventions implemented by research assistants

Outcome or subgroup title	No. of studies	No. of partici-pants	Statistical method	Effect size
1 Final smoke alarm ownership	8	1701	Odds Ratio (M-H, Random, 95% CI)	1.37 [1.02, 1.84]
2 Final functioning smoke alarms	8	2673	Odds Ratio (M-H, Random, 95% CI)	1.53 [1.05, 2.23]
3 Smoke alarms acquired	4	1083	Odds Ratio (M-H, Random, 95% CI)	2.98 [0.70, 12.74]
4 Functioning smoke alarms acquired	4	818	Odds Ratio (M-H, Random, 95% CI)	1.75 [0.99, 3.07]

Analysis 8.1. Comparison 8 Smoke alarm promotion versus control excluding interventions implemented by research assistants, Outcome 1 Final smoke alarm ownership.

Study or subgroup	Intervention n/N	Control n/N	Odds Ratio M-H, Random, 95% CI	Weight	Odds Ratio M-H, Random, 95% CI
Barone 1988	32/34	26/29		2.49%	1.85[0.29,11.89]
Clamp 1998	82/83	71/82		2.02%	12.7[1.6,100.84]
Davis 1987	221/314	195/299		51.24%	1.27[0.9,1.78]
Jenkins 1996	45/62	46/61		12.43%	0.86[0.39,1.93]
Kelly 1987	8/55	6/54		6.57%	1.36[0.44,4.23]
Kendrick 1999	254/274	248/277		21.37%	1.49[0.82,2.7]
Mathews 1988	10/12	9/12		2.16%	1.67[0.22,12.35]
Thomas 1984	27/28	21/25		1.7%	5.14[0.53,49.5]
Total (95% CI)	**862**	**839**		**100%**	**1.37[1.02,1.84]**
Total events: 679 (Intervention), 622 (Control)					
Heterogeneity: Tau^2=0.01; Chi^2=7.5, df=7(P=0.38); I^2=6.7%					
Test for overall effect: Z=2.07(P=0.04)					

Favours control — Favours intervention

Analysis 8.2. Comparison 8 Smoke alarm promotion versus control excluding interventions implemented by research assistants, Outcome 2 Final functioning smoke alarms.

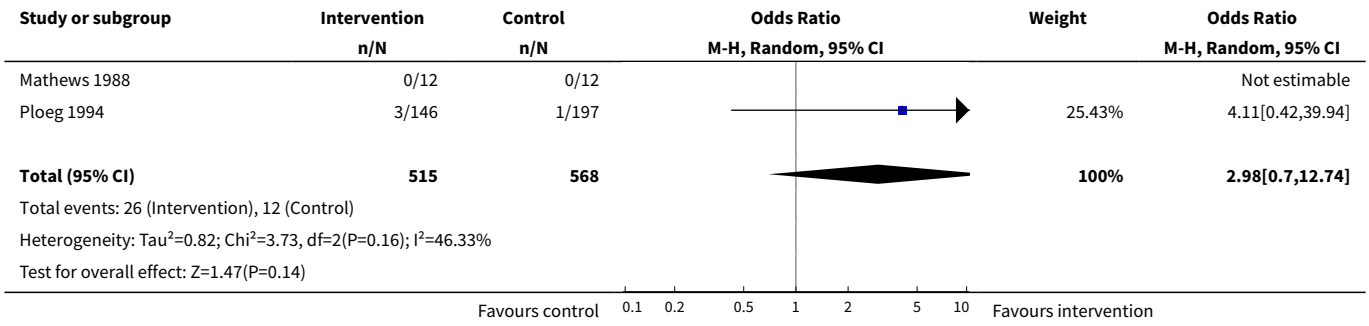
Study or subgroup	Intervention n/N	Control n/N	Odds Ratio M-H, Random, 95% CI	Weight	Odds Ratio M-H, Random, 95% CI
Barone 1988	32/34	26/29		3.69%	1.85[0.29,11.89]
Clamp 1998	80/83	71/82		6.77%	4.13[1.11,15.4]
Gielen 2001	43/73	26/52		16.35%	1.43[0.7,2.93]
Gielen 2002	45/56	45/54		10.88%	0.82[0.31,2.16]
Hendrickson 2000	37/38	26/40		2.99%	19.92[2.46,161.05]
Kendrick 1999	243/274	241/277		23.04%	1.17[0.7,1.95]
Mathews 1988	6/12	6/12		4.84%	1[0.2,4.95]
Watson 2005	728/803	648/754		31.45%	1.59[1.16,2.17]
Total (95% CI)	**1373**	**1300**		**100%**	**1.53[1.05,2.23]**
Total events: 1214 (Intervention), 1089 (Control)					
Heterogeneity: Tau^2=0.09; Chi^2=11.12, df=7(P=0.13); I^2=37.04%					
Test for overall effect: Z=2.23(P=0.03)					

Favours control — Favours intervention

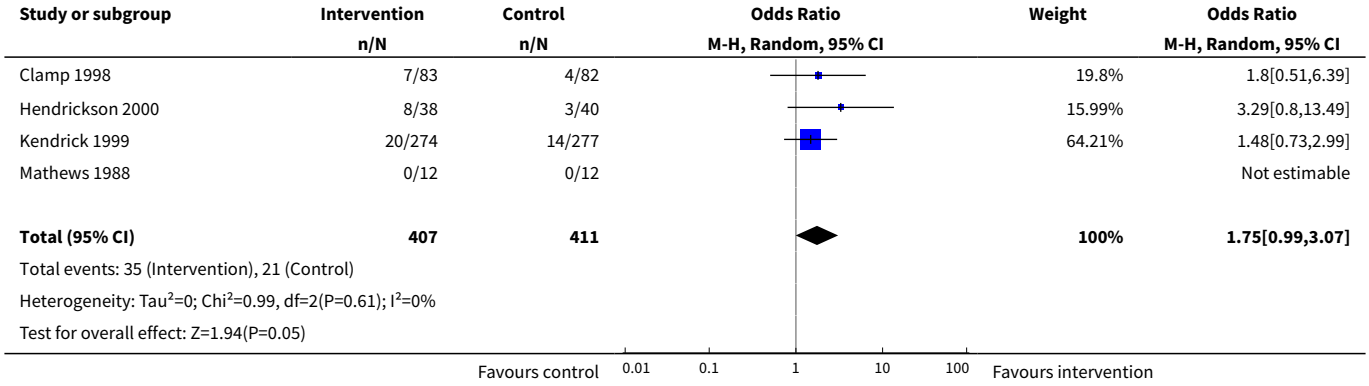
Analysis 8.3. Comparison 8 Smoke alarm promotion versus control excluding interventions implemented by research assistants, Outcome 3 Smoke alarms acquired.

Study or subgroup	Intervention n/N	Control n/N	Odds Ratio M-H, Random, 95% CI	Weight	Odds Ratio M-H, Random, 95% CI
Clamp 1998	8/83	0/82		18.58%	18.58[1.05,327.37]
Kendrick 1999	15/274	11/277		55.98%	1.4[0.63,3.11]

Favours control — Favours intervention



Analysis 8.4. Comparison 8 Smoke alarm promotion versus control excluding interventions implemented by research assistants, Outcome 4 Functioning smoke alarms acquired.

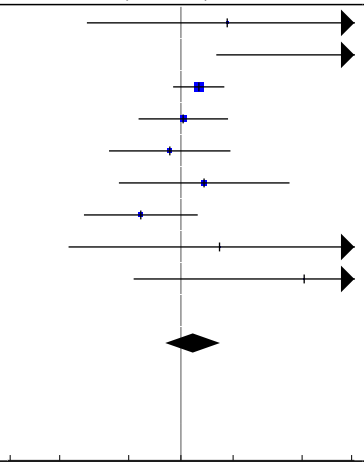


Comparison 9. Smoke alarm promotion versus control excluding Kendrick 1999

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Final smoke alarm ownership	9	2278	Odds Ratio (M-H, Random, 95% CI)	1.17 [0.81, 1.68]
2 Final functioning smoke alarms	9	3222	Odds Ratio (M-H, Random, 95% CI)	1.38 [0.95, 1.98]
3 Smoke alarms acquired	4	1472	Odds Ratio (M-H, Random, 95% CI)	2.85 [0.48, 16.94]
4 Functioning smoke alarms acquired	4	1142	Odds Ratio (M-H, Random, 95% CI)	1.40 [0.92, 2.11]

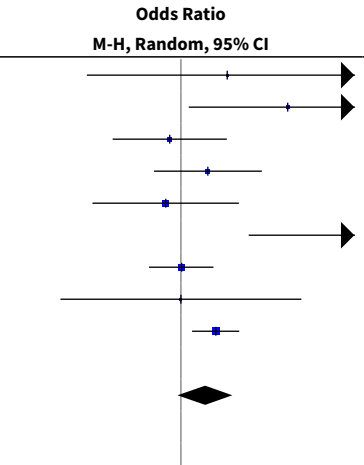
Analysis 9.1. Comparison 9 Smoke alarm promotion versus control excluding Kendrick 1999, Outcome 1 Final smoke alarm ownership.

Study or subgroup	Intervention n/N	Control n/N	Odds Ratio M-H, Random, 95% CI	Weight	Odds Ratio M-H, Random, 95% CI
Barone 1988	32/34	26/29		3.48%	1.85[0.29,11.89]
Clamp 1998	82/83	71/82		2.86%	12.7[1.6,100.84]
Davis 1987	221/314	195/299		31.23%	1.27[0.9,1.78]
DiGuiseppi 2002	37/95	34/89		19.95%	1.03[0.57,1.87]
Jenkins 1996	45/62	46/61		13.73%	0.86[0.39,1.93]
Kelly 1987	8/55	6/54		8.27%	1.36[0.44,4.23]
King 2001	460/479	454/465		15.03%	0.59[0.28,1.25]
Mathews 1988	10/12	9/12		3.04%	1.67[0.22,12.35]
Thomas 1984	27/28	21/25		2.42%	5.14[0.53,49.5]
Total (95% CI)	**1162**	**1116**		**100%**	**1.17[0.81,1.68]**
Total events: 922 (Intervention), 862 (Control)					
Heterogeneity: Tau^2=0.08; Chi^2=11.4, df=8(P=0.18); I^2=29.79%					
Test for overall effect: Z=0.84(P=0.4)					



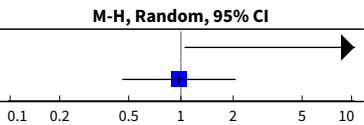
Analysis 9.2. Comparison 9 Smoke alarm promotion versus control excluding Kendrick 1999, Outcome 2 Final functioning smoke alarms.

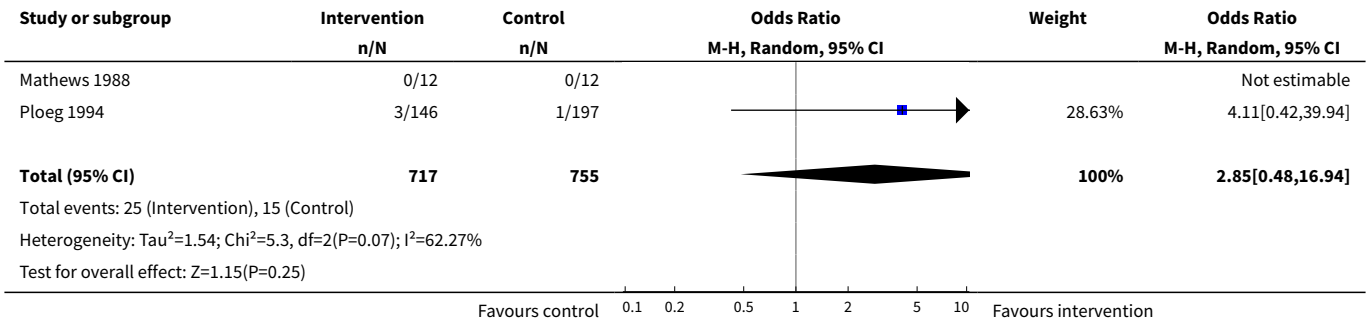
Study or subgroup	Intervention n/N	Control n/N	Odds Ratio M-H, Random, 95% CI	Weight	Odds Ratio M-H, Random, 95% CI
Barone 1988	32/34	26/29		3.42%	1.85[0.29,11.89]
Clamp 1998	80/83	71/82		6.16%	4.13[1.11,15.4]
DiGuiseppi 2002	16/103	16/91		13.18%	0.86[0.4,1.84]
Gielen 2001	43/73	26/52		14.05%	1.43[0.7,2.93]
Gielen 2002	45/56	45/54		9.65%	0.82[0.31,2.16]
Hendrickson 2000	37/38	26/40		2.78%	19.92[2.46,161.05]
King 2001	412/459	401/447		21.44%	1.01[0.65,1.54]
Mathews 1988	6/12	6/12		4.46%	1[0.2,4.95]
Watson 2005	728/803	648/754		24.84%	1.59[1.16,2.17]
Total (95% CI)	**1661**	**1561**		**100%**	**1.38[0.95,1.98]**
Total events: 1399 (Intervention), 1265 (Control)					
Heterogeneity: Tau^2=0.11; Chi^2=14.75, df=8(P=0.06); I^2=45.76%					
Test for overall effect: Z=1.71(P=0.09)					



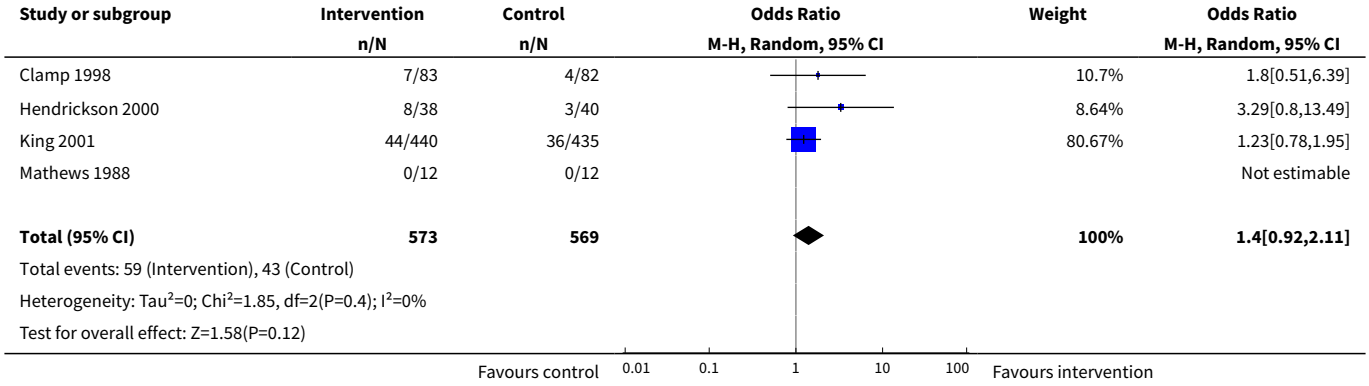
Analysis 9.3. Comparison 9 Smoke alarm promotion versus control excluding Kendrick 1999, Outcome 3 Smoke alarms acquired.

Study or subgroup	Intervention n/N	Control n/N	Odds Ratio M-H, Random, 95% CI	Weight	Odds Ratio M-H, Random, 95% CI
Clamp 1998	8/83	0/82		22.43%	18.58[1.05,327.37]
King 2001	14/476	14/464		48.94%	0.97[0.46,2.07]





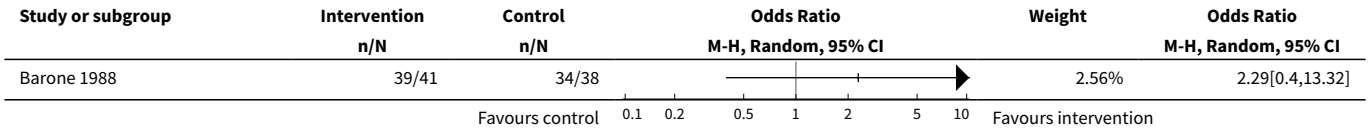
Analysis 9.4. Comparison 9 Smoke alarm promotion versus control excluding Kendrick 1999, Outcome 4 Functioning smoke alarms acquired.

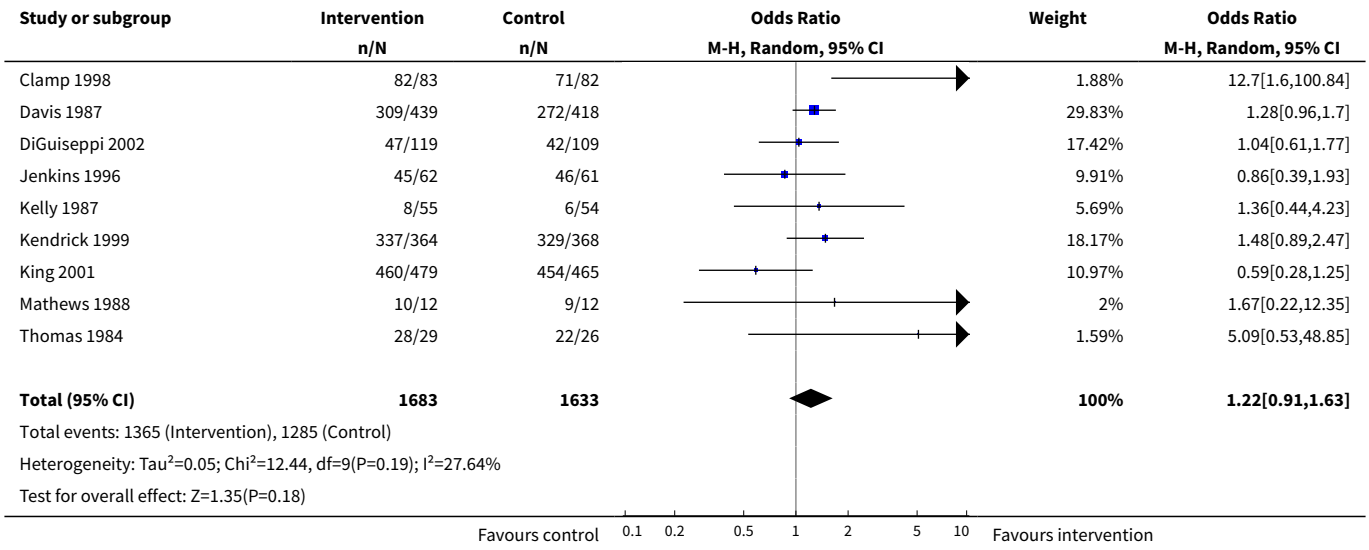


Comparison 10. Smoke alarm promotion versus control without cluster adjustment

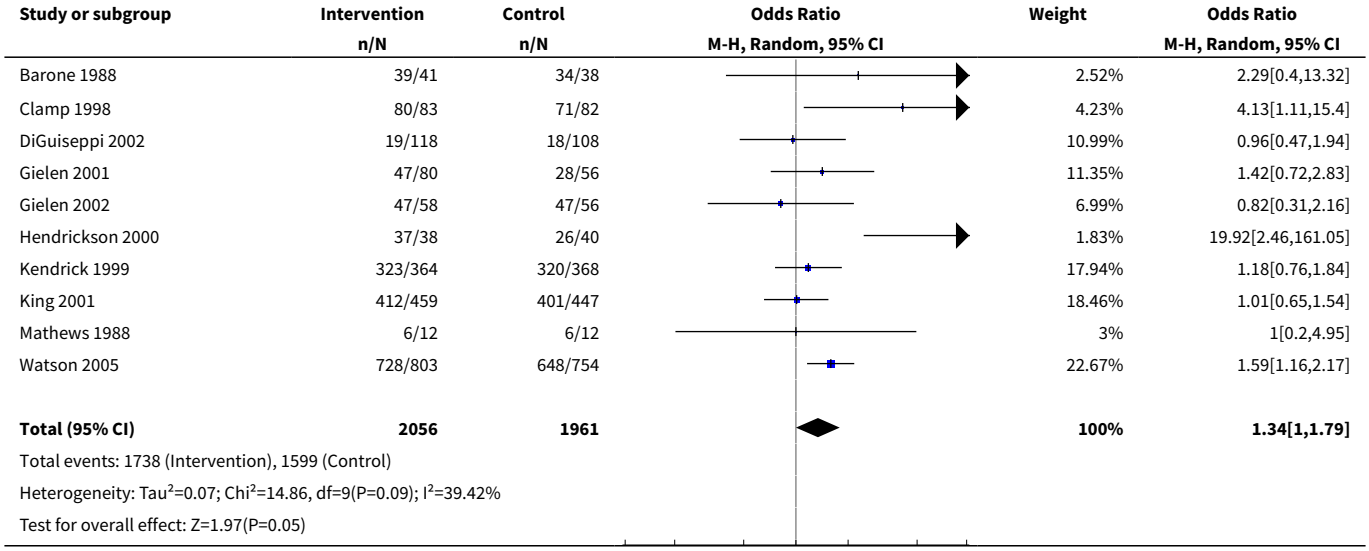
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Final smoke alarm ownership	10	3316	Odds Ratio (M-H, Random, 95% CI)	1.22 [0.91, 1.63]
2 Final functioning smoke alarms	10	4017	Odds Ratio (M-H, Random, 95% CI)	1.34 [1.00, 1.79]
3 Smoke alarms acquired	5	2204	Odds Ratio (M-H, Random, 95% CI)	1.57 [0.73, 3.38]
4 Functioning smoke alarms acquired	5	1874	Odds Ratio (M-H, Random, 95% CI)	1.42 [1.01, 2.00]

Analysis 10.1. Comparison 10 Smoke alarm promotion versus control without cluster adjustment, Outcome 1 Final smoke alarm ownership.

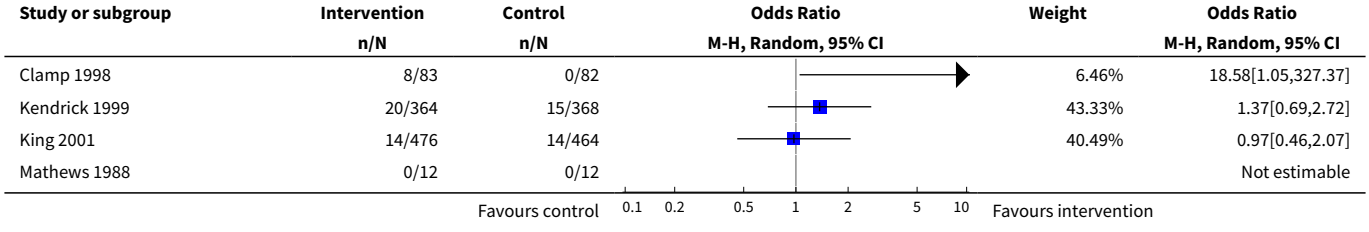


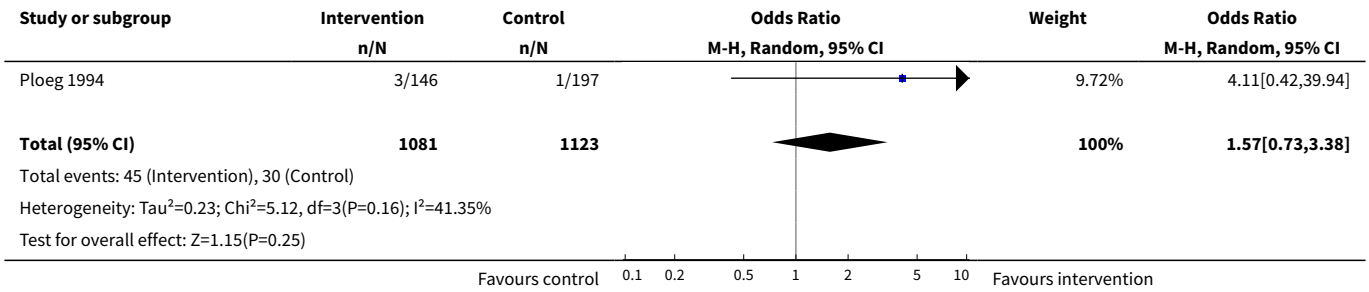


Analysis 10.2. Comparison 10 Smoke alarm promotion versus control without cluster adjustment, Outcome 2 Final functioning smoke alarms.

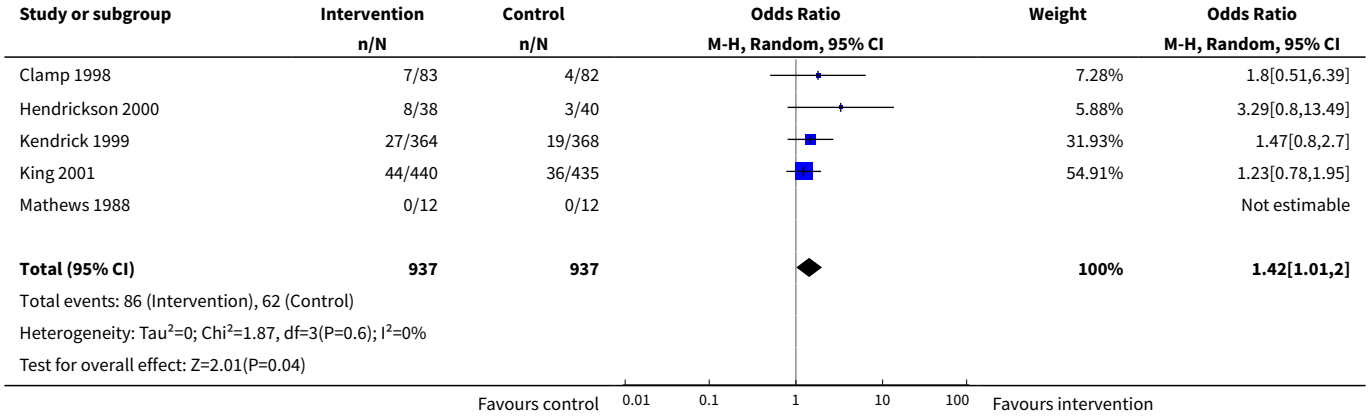


Analysis 10.3. Comparison 10 Smoke alarm promotion versus control without cluster adjustment, Outcome 3 Smoke alarms acquired.





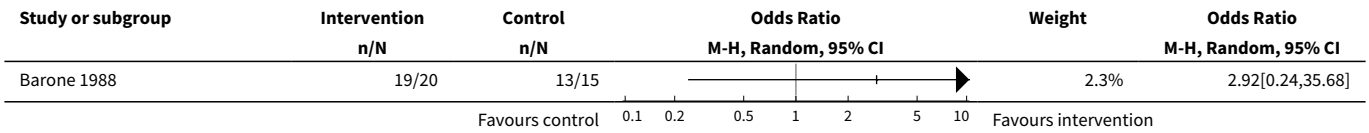
Analysis 10.4. Comparison 10 Smoke alarm promotion versus control without cluster adjustment, Outcome 4 Functioning smoke alarms acquired.

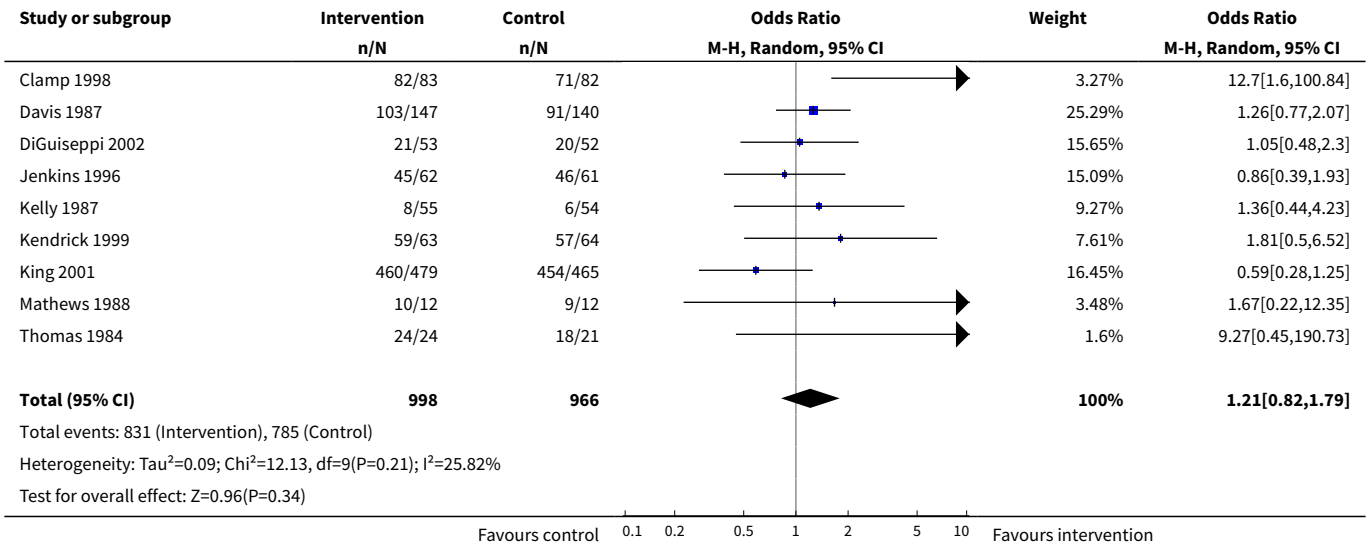


Comparison 11. Smoke alarm promotion versus control using greater ICC for cluster adjustment

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Final smoke alarm ownership	10	1964	Odds Ratio (M-H, Random, 95% CI)	1.21 [0.82, 1.79]
2 Final functioning smoke alarms	10	3217	Odds Ratio (M-H, Random, 95% CI)	1.38 [0.97, 1.95]
3 Smoke alarms acquired	5	1599	Odds Ratio (M-H, Random, 95% CI)	1.78 [0.59, 5.42]
4 Functioning smoke alarms acquired	5	1269	Odds Ratio (M-H, Random, 95% CI)	1.42 [0.95, 2.12]

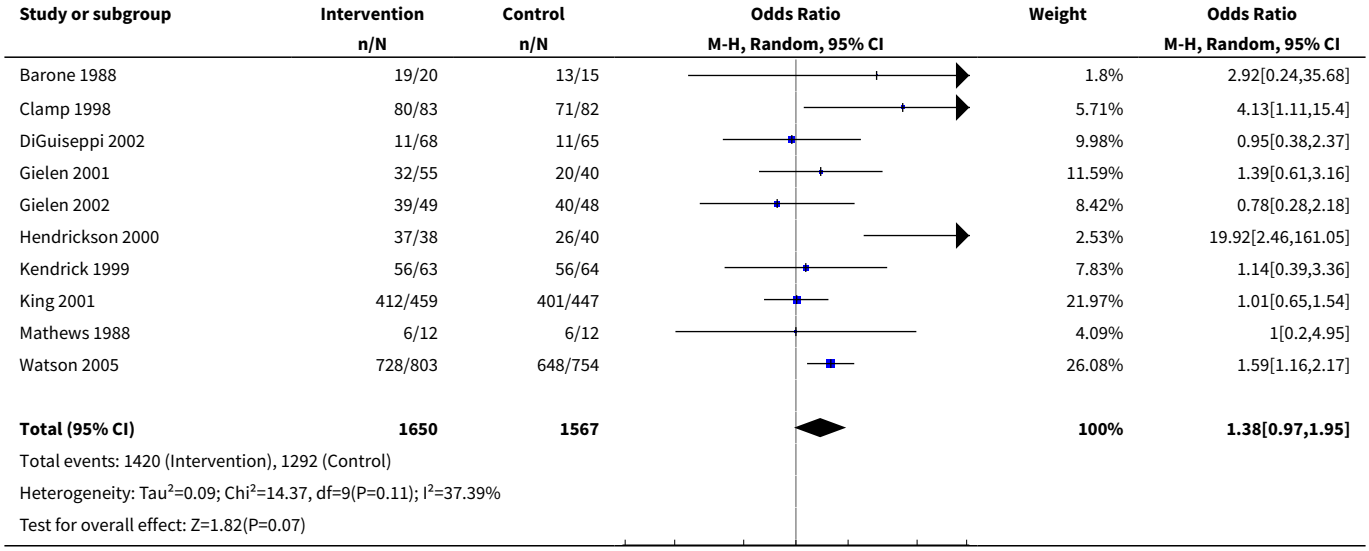
Analysis 11.1. Comparison 11 Smoke alarm promotion versus control using greater ICC for cluster adjustment, Outcome 1 Final smoke alarm ownership.





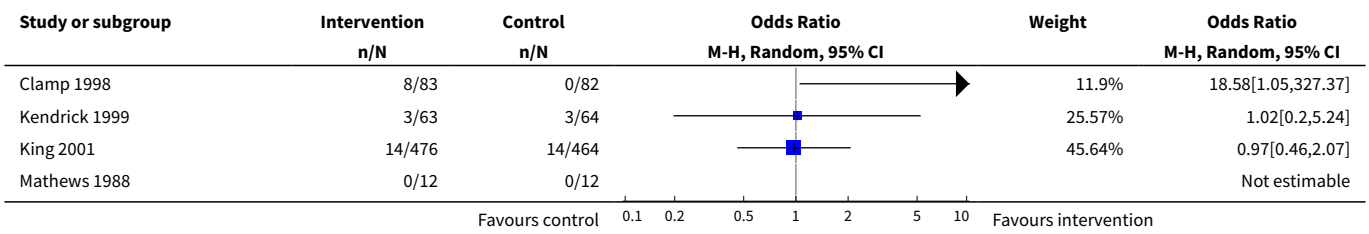
Study or subgroup	Intervention n/N	Control n/N	Odds Ratio M-H, Random, 95% CI	Weight	Odds Ratio M-H, Random, 95% CI
Clamp 1998	82/83	71/82		3.27%	12.7[1.6,100.84]
Davis 1987	103/147	91/140		25.29%	1.26[0.77,2.07]
DiGuiseppi 2002	21/53	20/52		15.65%	1.05[0.48,2.3]
Jenkins 1996	45/62	46/61		15.09%	0.86[0.39,1.93]
Kelly 1987	8/55	6/54		9.27%	1.36[0.44,4.23]
Kendrick 1999	59/63	57/64		7.61%	1.81[0.5,6.52]
King 2001	460/479	454/465		16.45%	0.59[0.28,1.25]
Mathews 1988	10/12	9/12		3.48%	1.67[0.22,12.35]
Thomas 1984	24/24	18/21		1.6%	9.27[0.45,190.73]
Total (95% CI)	**998**	**966**		**100%**	**1.21[0.82,1.79]**
Total events: 831 (Intervention), 785 (Control)					
Heterogeneity: Tau^2=0.09; Chi^2=12.13, df=9(P=0.21); I^2=25.82%					
Test for overall effect: Z=0.96(P=0.34)					

Analysis 11.2. Comparison 11 Smoke alarm promotion versus control using greater ICC for cluster adjustment, Outcome 2 Final functioning smoke alarms.

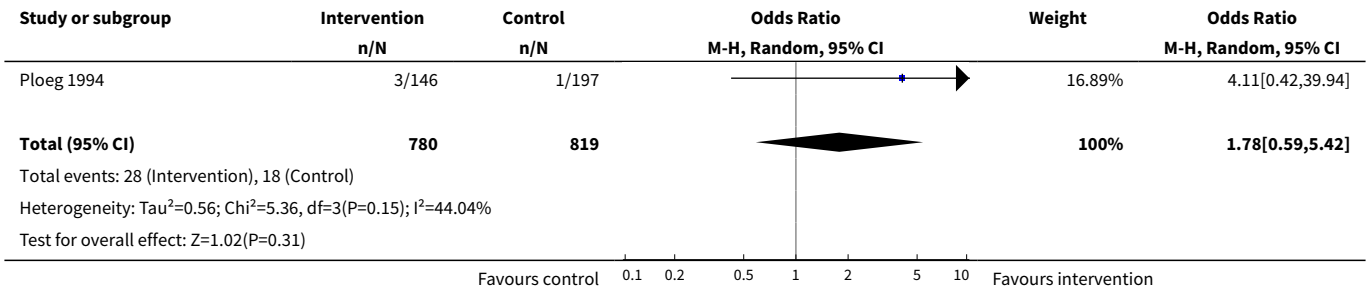


Study or subgroup	Intervention n/N	Control n/N	Odds Ratio M-H, Random, 95% CI	Weight	Odds Ratio M-H, Random, 95% CI
Barone 1988	19/20	13/15		1.8%	2.92[0.24,35.68]
Clamp 1998	80/83	71/82		5.71%	4.13[1.11,15.4]
DiGuiseppi 2002	11/68	11/65		9.98%	0.95[0.38,2.37]
Gielen 2001	32/55	20/40		11.59%	1.39[0.61,3.16]
Gielen 2002	39/49	40/48		8.42%	0.78[0.28,2.18]
Hendrickson 2000	37/38	26/40		2.53%	19.92[2.46,161.05]
Kendrick 1999	56/63	56/64		7.83%	1.14[0.39,3.36]
King 2001	412/459	401/447		21.97%	1.01[0.65,1.54]
Mathews 1988	6/12	6/12		4.09%	1[0.2,4.95]
Watson 2005	728/803	648/754		26.08%	1.59[1.16,2.17]
Total (95% CI)	**1650**	**1567**		**100%**	**1.38[0.97,1.95]**
Total events: 1420 (Intervention), 1292 (Control)					
Heterogeneity: Tau^2=0.09; Chi^2=14.37, df=9(P=0.11); I^2=37.39%					
Test for overall effect: Z=1.82(P=0.07)					

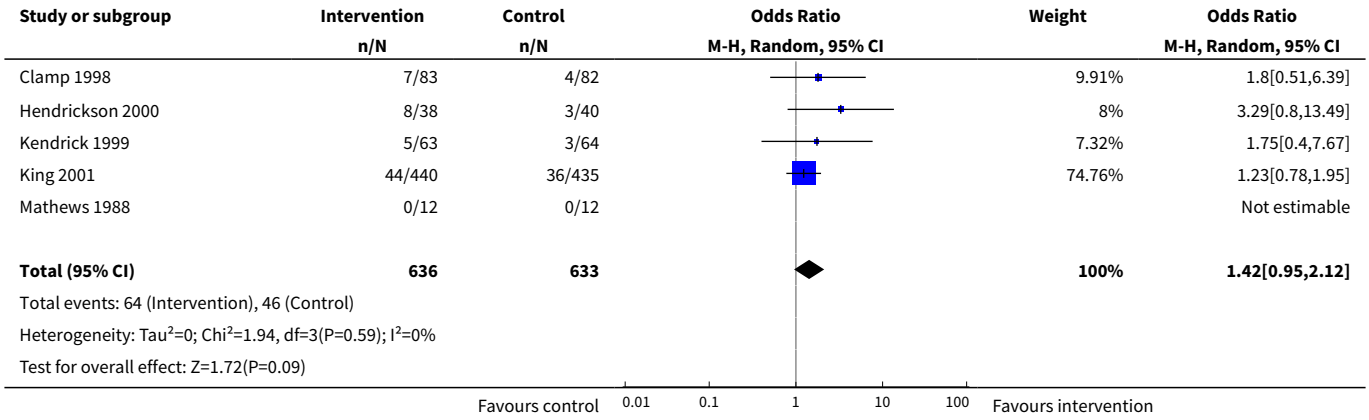
Analysis 11.3. Comparison 11 Smoke alarm promotion versus control using greater ICC for cluster adjustment, Outcome 3 Smoke alarms acquired.



Study or subgroup	Intervention n/N	Control n/N	Odds Ratio M-H, Random, 95% CI	Weight	Odds Ratio M-H, Random, 95% CI
Clamp 1998	8/83	0/82		11.9%	18.58[1.05,327.37]
Kendrick 1999	3/63	3/64		25.57%	1.02[0.2,5.24]
King 2001	14/476	14/464		45.64%	0.97[0.46,2.07]
Mathews 1988	0/12	0/12			Not estimable



Analysis 11.4. Comparison 11 Smoke alarm promotion versus control using greater ICC for cluster adjustment, Outcome 4 Functioning smoke alarms acquired.



ADDITIONAL TABLES

Table 1. Data from non-randomised controlled trials

Study	Participants (I/C)	Intervention	Assessment	Smoke alarms	Other outcomes	Notes
Project Burn Prevention (McLoughlin 1979, MacKay 1982, McLoughlin 1982)	I: 3 cities in east of state C: 2 cities in west of state (with lower baseline burn incidence)	I1: Mass media I2: I1 + school program I3: I1+ community outreach C: No intervention	Population surveillance for ER injury visits, 4 years before to 12 months after; telephone surveys	Not reported for both groups	Adjusted burn incidence rate ratio, during vs before: Intervention: I1) 1.4 (1.1, 1.6) I2) 0.8 (0.5, 1.1) I3) 1.2 (0.8, 1.7) Control: 1.0 (0.6, 1.5)	
Miller 1982	I: 120 consecutive parents of children seen for well child care in middle class suburban practice	I: Pamphlet, brief education, discount alarms in office; usual well child care C: Usual well child care	Home inspection 4-6 weeks after intervention. Response rate: I: 108/120 (90%) C: 105/120 (88%)	Intervention: Owned: 79/108 (73%) Installed: 72/108 (67%) Functioning: 61/108 (56%) Control:	Not reported	

Table 1. Data from non-randomised controlled trials *(Continued)*

	C: Preceding 120 consecutive, similar parents			Owned: 64/105 (61%) Installed: 64/105 (61%) Functioning: 46/105 (44%)		
LeBailly 1990	407 families with children <5 yrs seen for well child care in suburban practice or urban clinic, allocated sequentially in groups of ˜100 (differed on home ownership, socio-economic status)	I1: Free alarm and other safety devices, usual well child care I2: Free alarm and other safety devices, injury prevention counselling, usual well child care I3: Injury prevention counselling, usual well child care C: Usual well child care	Non-blinded home interviews and inspections 9 months after intervention. Response rate: ˜75%	Intervention: Owned: I1: 100% I2: 99% I3: 92% (numerators, denominators not reported) Control: Owned: 96% (numerators, denominators not reported)	Not collected	
SCIPP (Guyer 1989, Bass 1991)	I: 9 communities (total pop. 139,807) C: 5 demographically similar communities (total pop. 146,866)	I: Injury prevention program in communities, schools, homes, and clinical settings C: No intervention	Population injury surveillance 1 yr before to 2 mos after. Phone survey response: pre- 59%, post- 85% (similar in 2 groups)	Intervention: Owned: 418/508 (82.3%) Change: +9.4% Control: Owned: 339/409 (83.9%) Change: +14.9%	Adjusted odds ratio for burns (during vs before), in intervention vs control communities: OR=0.8 (0.5, 1.2)	Unpublished data provided by investigators
Schwarz 1993	I: 5 contiguous census tracts [3004 households (51%) participated] C: 4 bordering, contiguous census tracts (similar socio-demographics, baseline injury rates)	I: Free alarms and installation; home inspection, education, modification; community education C: No intervention	Population injury surveillance 2 yrs before to 1 yr after program. 1-yr post-intervention inspection of randomly selected households. Response rate: I: 902/1250 (72%) C: 1060/1472 (72%)	Intervention: Functioning: 866/902 (96%) Control: Functioning: 816/1060 (77%) Adjusted odds ratio: 7.14 (5.0 to 10.0)	Intervention: Fire-related injuries/1,000: Before: 1.83 During: 1.14 After: 0.86 Incidence change (after vs before): 0.5 (0.4, 0.6) Control: Fire-related injuries/1,000: Before: 1.34 During: 2.68 After: 1.11 Incidence change (after vs before): 0.8 (0.6, 1.1)	Unpublished data provided by investigators
Mallonee 1996	I: City area with highest risk of fire-related hospitalisations and deaths C: Rest of city	I: Door-to-door alarm give-away, fire prevention brochures, limited alarm installation C: No intervention	Population fire and fire-related injury surveillance 2.5 years before to 4 years after program	Intervention: Functioning at 4 years: 45% Control: Not collected	Intervention: After vs before: Fire-related injuries/100k: 0.2 (0.1, 0.4) Fire-related injuries/100 fires: 0.3 (0.1, 0.6) Fires/1000 homes: 0.75 (0.5, 1.1)	

Table 1. Data from non-randomised controlled trials *(Continued)*

					Control: After vs before: Fire-related injuries/100k: 1.1 (0.7, 1.7) Fire-related injuries/100 fires: 1.3 (0.9, 2.0) Fires/1000 homes: 0.8 (0.5, 1.3)
McConell 1996	I: All 2350 new residents of subsidised housing C: All existing residents (lower baseline fire risk, similar socio-demographics)	I: 35-minute mandatory lecture and video on fire safety and prevention; reminder card C: No intervention	Population fire surveillance during 15 month study period	Not collected for either group	Intervention: 278 fires/100k person years Control: 1538 fires/100k person years Relative risk (Intervention vs. Control) 0.18 (0.16, 0.21)
Johnston 2000	I: 6 preschool enrichment centers C: 3 preschool enrichment centers (213 families) C: 3 preschool enrichment centers (149 families)	I: Written safety information and free alarms or batteries if needed C: Written safety information only	Home inspection 3 months after intervention	Functioning alarms: Intervention: 211/211 (100%) Control: 136/143 (95%) Adjusted RR: 1.06 (95% CI: 1.00, 1.12); Fisher Exact 2-tailed: P=0.018; Functioning alarms acquired: Intervention: 13/211 (6.0%) Control: 3/143 (2.1%) Adjusted RR: 2.37 (95% CI: 0.52, 10.86); Fisher Exact 2-tailed: P=0.33	Not collected
Ozanne-Smith 2002	I: Municipality C: Demographically similar municipality (with higher baseline injury hospitalisation rate)	I: 6-year community injury prevention program: mass media, education, training, promotion and action for hazard reduction and environmental change C: No intervention	Population injury surveillance; telephone survey post-intervention of 250 randomly selected households each group	Intervention: Installed: 166/248 (67%) Installed since program began: 158/248 (64%) Control: Installed: 166/250 (66%) Installed since program began: 156/248 (63%)	Fire-related injury data not reported.

APPENDICES

Appendix 1. Search strategy

Injuries Specialised Register; searched 20th September 2007
(((detector* or alarm*) and (fire* or smoke)) or ((fire or fires or burn or burns) and (prevent* or control* or avoid* or stop*))) and (home* or house or resident* or domestic)

MEDLINE 1966 to Sept (week 1) 2007
1. burns/pc [Prevention & Control]
2. fires/pc [Prevention & Control]
3. exp Accident Prevention/
4. (fire or fires or burn or burns or smoke).ab,ti.
5. 3 and 4
6. ((detector$ or alarm$) adj5 (fire$ or smoke)).ab,ti.
7. ((fire or fires or burn or burns) adj3 (prevent$ or control$ or avoid$ or stop$)).ab,ti.
8. ((home$ or house) adj3 (safety or accident$ or fire or fires)).ab,ti.
9. 1 or 2 or 5 or 6 or 7 or 8
10. exp Protective Devices/
11. exp Burns/
12. exp Fires/
13. (fire or fires or burn or burns).ab,ti.
14. or/11-13
15. 10 and 14
16. 9 or 15
17. exp "Wounds and Injuries"/
18. 14 and 17
19. exp Smoke Inhalation Injury/
20. 18 or 19
21. 16 and 20
22. clinical trial.pt.
23. randomized.ti,ab.
24. randomised.ti,ab.
25. placebo.ti,ab.
26. program$.ti,ab.
27. randomly.ti,ab.
28. (trial or study).ti,ab.
29. groups.ti,ab.
30. or/22-29
31. exp animals/
32. exp humans/
33. 31 not (31 and 32)
34. 30 not 33
35. 16 and 20 and 34

CENTRAL 2007, issue 3
#1 MeSH descriptor Burns explode all trees with qualifier: PC
#2 MeSH descriptor Fires explode all trees with qualifier: PC
#3 MeSH descriptor Accident Prevention explode all trees
#4 fire or fires or burn or burns or smoke
#5 (#3 AND #4)
#6 (detector* or alarm*) near5 (fire* or smoke)
#7 (fire or fires or burn or burns) near3 (prevent* or control* or avoid* or stop*)
#8 (home* or house) near3 (safety or accident* or fire or fires)
#9 (#1 OR #2 OR #5 OR #6 OR #7 OR #8)
#10 MeSH descriptor Protective Devices explode all trees
#11 MeSH descriptor Burns explode all trees
#12 MeSH descriptor Fires explode all trees
#13 fire or fires or burn or burns
#14 (#11 OR #12 OR #13)
#15 (#10 AND #14)
#16 (#9 OR #15)

#17 MeSH descriptor Wounds and Injuries explode all trees
#18 (#14 AND #17)
#19 MeSH descriptor Smoke Inhalation Injury explode all trees
#20 (#18 OR #19)
#21 #6 OR (#16 AND #20), from 2003 to 2007

EMBASE 1980 to Sept (week 37) 2007
1. exp Burn/pc [Prevention]
2. exp Fire protection/
3. exp Accident Prevention/
4. (fire or fires or burn or burns or smoke).ab,ti.
5. 3 and 4
6. ((detector$ or alarm$) adj5 (fire$ or smoke)).ab,ti.
7. ((fire or fires or burn or burns) adj3 (prevent$ or control$ or avoid$ or stop$)).ab,ti.
8. ((home$ or house) adj3 (safety or accident$ or fire or fires)).ab,ti.
9. 1 or 2 or 5 or 6 or 7 or 8
10. exp Protective Devices/
11. exp Burn/
12. exp Fire/
13. (fire or fires or burn or burns).ab,ti.
14. or/11-13
15. 10 and 14
16. 9 or 15
17. exp "Wounds and Injuries"/
18. 14 and 17
19. exp Smoke Inhalation Injury/
20. 18 or 19
21. 16 and 20
22. exp clinical study/
23. exp Clinical Trial/
24. randomized.ab,ti.
25. randomised.ab,ti.
26. placebo.ti,ab.
27. randomly.ab,ti.
28. (trial or study or program$).ab,ti.
29. groups.ti,ab.
30. or/22-29
31. exp animal/
32. exp human/
33. 31 not (31 and 32)
34. 30 not 33
35. (6 or 21) and 34

National Research Register 2007, issue 3
#1 (detector* or alarm*) and (fire* or smoke)
#2 (fire or fires or burn or burns) and (prevent* or control* or avoid* or stop*)
#3 home* or house or resident* or domestic
#4 #1 or #2
#5 #3 and #4

Zetoc; (searched 24th Sept 2007)
Fire alarm* trial* OR Fire alarm* program* OR Smoke alarm* trial* OR Smoke alarm* program* OR Fire detector* trial* OR Fire detector* program* OR Smoke detector* trial* OR Smoke detector* program*

IBSS to 2007/08; searched 24th September 2007
#1 (fire or fires or burn or burns) near (prevent* or control* or avoid* or stop*)
#2 (detector* or alarm*) near (fire* or smoke)
#3 #1 or #2

All other searches were carried out using terms included in these strategies and adapted as appropriate to the specifications of each database.

WHAT'S NEW

Date	Event	Description
14 December 2009	Amended	The odds ratios and confidence intervals in the abstract have been corrected, and are now consistent with the analyses.

HISTORY

Protocol first published: Issue 3, 2000
Review first published: Issue 2, 2001

Date	Event	Description
11 July 2008	Amended	Converted to new review format.
19 September 2007	New search has been performed	Updated searches for new trials were completed in September 2007. Studies identified after August 2007 are listed as 'studies awaiting assessment'. Five completed randomised controlled trials (four new and one that was previously ongoing) (DiGuiseppi 2002; Gielen 2002; Hendrickson 2000; Watson 2005; Gielen 2001), two non-randomised controlled trials (one new and one now completed) (Johnston 2000; Harvey 2004), and final reports from two trials already in the review (King 2001; Ozanne-Smith 2002) are included. The analyses, the results and discussion sections, and the conclusions, have been revised accordingly.

CONTRIBUTIONS OF AUTHORS

CD designed the protocol, designed and ran searches, examined search results, applied inclusion criteria, extracted data, analysed data, interpreted results, and wrote the review.
JH performed data analyses and interpreted results for, and assisted with writing of, the original review.
CG collected data, examined search results, applied inclusion criteria, extracted data, interpreted results, and critically reviewed the manuscript.

DECLARATIONS OF INTEREST

None known.

SOURCES OF SUPPORT

Internal sources

- Institute of Child Health, University College London, UK.

External sources

- Colorado Injury Control Research Center, Colorado State University, USA.
- National Center for Injury Prevention and Control, Centers for Disease Control and Prevention (CDC), USA.
- Camden & Islington Health Authority, UK.
- National Health Service Research & Development Directorate, UK.

INDEX TERMS

Medical Subject Headings (MeSH)

*Ownership; *Protective Devices; Burns [prevention & control]; Fires [*prevention & control]; Health Education [methods]; Randomized Controlled Trials as Topic

MeSH check words

Humans