Family and carer smoking control programmes for reducing children's exposure to environmental tobacco smoke (Review)

Priest N, Roseby R, Waters E, Polnay A, Campbell R, Spencer N, Webster P, Ferguson-Thorne G

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[Intervention Review]

Family and carer smoking control programmes for reducing children's exposure to environmental tobacco smoke

Naomi Priest[1], Rob Roseby[2], Elizabeth Waters[3], Adam Polnay[4], Rona Campbell[5], Nick Spencer[6], Premila Webster[7], Grace Ferguson-Thorne[1]

[1]The McCaughey Centre, Melbourne School of Population Health, University of Melbourne, Parkville, Australia. [2]Department of Paediatrics, Alice Springs Hospital and Flinders University NT Clinical School, Alice Springs, Australia. [3]The McCaughey Centre, Melbourne School of Population Health, University of Melbourne, Parkville , Australia. [4]Royal Edinburgh Hospital, Edinburgh, UK. [5]Health Services Research, Department of Social Medicine, University of Bristol, Bristol, UK. [6]School of Health and Social Studies, University of Warwick, Coventry, UK. [7]Health Services Research Unit, Department of Public Health, University of Oxford, Oxford, UK

Contact address: Naomi Priest, The McCaughey Centre, Melbourne School of Population Health, University of Melbourne, 5/207 Bouverie St, Parkville, VIC, 3052, Australia. npriest@unimelb.edu.au.

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ABSTRACT

Background

Children's exposure to other people's cigarette smoke (environmental tobacco smoke, or ETS) is associated with a range of adverse health outcomes for children. Parental smoking is a common source of children's exposure to ETS. Preventing exposure to cigarette smoke in infancy and childhood has significant potential to improve children's health worldwide.

Objectives

To determine the effectiveness of interventions aiming to reduce exposure of children to ETS.

Search strategy

We searched the Cochrane Tobacco Addiction Group trials register and conducted additional searches of two health and education databases not included in this specialised register. Date of the most recent search: October 2007.

Selection criteria

Interventions tested using controlled trials with or without random allocation were included in this review if the interventions addressed participants (parents and other family members, child care workers and teachers) involved with the care and education of infants and young children (aged 0-12 years). All mechanisms for reduction of children's environmental tobacco smoke exposure, and smoking prevention, cessation, and control programmes were included. These include smoke-free policies and legislation, health promotion, social-behavioural therapies, technology, education and clinical interventions.

Data collection and analysis

Two authors independently assessed studies and extracted data. Due to heterogeneity of methodologies and outcomes, no summary measures were possible and results were synthesised using narrative summaries.

Main results

Thirty-six studies met the inclusion criteria. Four interventions were targeted at populations or community settings, 16 studies were conducted in the 'well child' healthcare setting and 13 in the 'ill child' healthcare setting. Two further studies conducted in paediatric clinics do not make clear whether the visits are to well or ill children, and another includes both well and ill child visits. Nineteen of these studies are from North America and 12 in other high income countries. Five studies are from low- or middle-income countries. In 17 of the 36 studies there was reduction of ETS exposure for children in both intervention and comparison groups. In only 11 of the 36 studies was there a statistically significant intervention effect. Four of these successful studies employed intensive counselling interventions targeted to smoking parents. We found little evidence of difference in effectiveness of interventions between the well infant, child respiratory illness and other child illness settings as contexts for parental smoking cessation interventions. One successful intervention was in the school setting, targeting the ETS exposure of children from smoking fathers.

Authors' conclusions

While brief counselling interventions have been identified as successful ifor adults when delivered by physicians, this cannot be extrapolated to adults as parents in child health settings. However, there is limited support for more intensive counselling interventions for parents in such contexts. There is no clear evidence of differences between the respiratory, non-respiratory ill child, well child and peripartum settings as contexts for reduction of children's ETS exposure.

PLAIN LANGUAGE SUMMARY

Can interventions for parents and people caring for children reduce children's exposure to tobacco smoke

Currently the evidence does not determine which interventions are most effective for decreasing parental smoking and preventing exposure to tobacco smoke in childhood. Children exposed to cigarette smoke are at greater risk of lung problems, infections and serious complications including sudden infant death syndrome. Preventing exposure to cigarette smoke in infancy and childhood might therefore significantly improve children's health worldwide. Although several interventions, including parental education and counselling programmes, have been used to try to reduce children's tobacco smoke exposure, their effectiveness has not been clearly demonstrated. The review was unable to determine that one intervention reduced parental smoking and child exposure more effectively than others, although four studies were identified that reported intensive counselling provided in clinical settings was effective.

BACKGROUND

Active smoking has been recognised as harmful to the smoker for over five decades, since the landmark Doll and Hill publication (Doll 1950), but it was not until 1974 that the medical literature first discussed parental smoking, exposure to environmental tobacco smoke (ETS) and its effect on the child (Harlap 1974). There is now overwhelming evidence that parental smoking is associated with a range of adverse health effects for children (NHMRC 1997). Perhaps its most obvious association is with increased risk, increased severity and greater likelihood of admission to hospital with lower (Strachan 1997) and upper (Strachan 1998) respiratory tract disease. An increasing body of evidence describes an association between parental smoking and children's increased risk of serious bacterial infections such as meningitis (Iles 2001). In addition, ETS exposure increases health service use and costs (Lam 2001).

Furthermore, parental smoking confers a significantly increased risk for sudden infant death syndrome (SIDS) (Golding 1997). This effect is present regardless of which parent is the smoker (Blair 1999), and is the strongest modifiable risk factor for SIDS. In addition, research across several continents over the last two decades has found children of smokers to have an increased risk of uptake in adolescence, perhaps as a result of role modeling and/or increased access to cigarettes.

Parental smoking is a common but preventable source of infant and childhood morbidity. The World Health Organization (WHO) has identified the need to reduce parental smoking as a key element of action to encourage health and development in early childhood, particularly among those living in difficult social and economic circumstances (WHO 1999). In some countries strong relationships between socio-economic status and environmental

quality are evident, with strategies to reduce smoking and improve child health outcomes needing to be underpinned by recognition of the limited resources and control some individuals and families have over environmental and social situations.

Infants' and toddlers' exposure to smoking primarily occurs within the home environment, as this is where they spend most of their time. Older children may also be exposed to smoking in a variety of child care and educational settings in which they spend their time. As children increase their time spent in commercial and informal child care settings, the importance of child care workers' behaviours increases. Similarly, the environments in which young children are exposed extend beyond the home to include shopping centres, meeting places, and other social environments.

Tobacco cessation strategies and interventions to reduce environmental tobacco smoke have had mixed success. Systematic reviews have previously demonstrated that individual counselling increases cessation rates (Lancaster 2005) and that simple advice from a physician has a positive effect in triggering quit attempts (Stead 2008). In relation to children's exposure in utero and in the early years, smoking cessation interventions for pregnant women can be effective in terms of reducing smoking (Lumley 2004). Legislation for smoking bans in public places is increasingly being introduced in North America, Australia and in some European countries, and has been associated with reduced incidence of acute myocardial infarctions in adults, lower smoking prevalence and high levels of public support (Lemstra 2008), and reduced exposure to ETS in the workplace and in bars and restaurants (CDC 2007; Galan 2008). However, inconsistent effects of such bans on exposure to ETS in the home have been reported, with some detecting minimal change (Galan 2008) and others a significant change in reported exposure (Edwards 2008).

OBJECTIVES

The objectives of this review are:

1. To evaluate the effectiveness of programmes for both the prevention and cessation of smoking by those who interact with children, including parents and other family members, child care workers, and teachers, and the effect on health outcomes in infants, toddlers and young children.

2. To examine and detail the indicators of intervention processes and to identify outcomes of importance to those involved in the care of children and young people.

A priori hypotheses:

1. Smoking cessation and prevention programmes are able to improve carers' knowledge and awareness of the effects of tobacco smoking on the health of children.

2. Smoking cessation and prevention programmes can produce behaviour change in carers, leading to a reduction in children's exposure to environmental tobacco smoke (ETS).

3. Smoking cessation and prevention programmes are able to reduce the short-term illnesses experienced by young children exposed to tobacco smoke (though attribution to a particular type of intervention may be difficult to determine).

4. There is a difference in the effectiveness of interventions aiming simply to change knowledge (and thereby expecting behaviour change to occur) compared with those explicitly aiming to change behaviours by effecting change in attitude or skills.

METHODS

Criteria for considering studies for this review

Types of studies

Controlled trials with or without random allocation.
In this updated review we have not evaluated the effects and impacts of recent legislative changes on smoking and ETS exposure, as this will be addressed in a forthcoming review (Callinan 2006 [protocol]). We have therefore decided against including a greater diversity of study designs, such as before and after studies, interrupted time series studies and other methods appropriate to evaluating population level interventions.

Types of participants

People (parents and other family members, child care workers and teachers) involved with care and education of infants and young children (aged 0-12 years).

Types of interventions

We included all mechanisms for reduction of children's ETS exposure, and smoking prevention, cessation, and any other tobacco control programmes targeting the participants described above. These included smoke-free policies and legislation, health promotion, social-behavioural therapy, technology, and educational and clinical interventions.
We included studies where the primary aim was to reduce children's exposure to ETS (thereby preventing adverse health outcomes), but where secondary outcomes included reduction or cessation of familial/parental/carer smoking, or changes in infant and child health measures. We also included studies where the primary outcome was reduction or cessation of familial/ parental/ carer smoking resulting in reduced exposure for children.
We excluded studies of uptake of smoking by minors.

There was no restriction on who delivered the programmes. These could include researchers, general practitioners, midwives, paediatricians, community and hospital nurses, health promotion agencies, tobacco control and anti-cancer organisations, and health departments.

Types of outcome measures

The primary outcome measures were children's exposure to tobacco smoke, child illness and health service utilisation, and the smoking behaviours of children's parents and carers. We included studies where the outcome was only parental or carer's smoking status.

We used biological verification of exposure to or absorption of ETS as the 'gold standard', but did not require it as an inclusion criterion. Where biological verification of exposure/absorption conflicted with parental report of exposure, we have taken the biologically verified result as correct.

Outcomes for children

- Exposure to environmental tobacco smoke (ETS): biochemical measures of children's exposure to ETS using air monitoring for levels of nicotine; other measures of ETS (including parent-reported behaviour change noted in next section).
- Absorption of ETS: biochemical measures of children's absorption of ETS through cotinine in urine, blood, saliva or hair.
- Frequency of childhood illness events, respiratory problems (changes in lung function or symptom scores).
- Use of health services: admission to hospital, frequency of use of general practitioners, frequency of medication use.

Outcomes for parents and carers

- Behaviour change in relation to children's exposure to ETS: we noted any reported bans or restrictions on smoking at home or in other environments or designated smoking areas outside the home.
- Knowledge, attitudes and beliefs of carers about the effects of passive smoking or ETS for self or children. Smoking behaviour; cessation, reduction or uptake. Biochemically validated measures of smoking behaviour (for example thiocyanates, cotinine levels in blood, urine or saliva), or self report.
- Participants' views of the intervention.
- Maternal smoking status at postpartum.
- Measures of anxiety, depression, guilt, stress/locus of control, health and wellbeing/health-related quality of life.
- Measures of family functioning.
- Costs and cost-effectiveness associated with interventions and outcomes.

We report biochemical confirmation of parental self-reported quit status or changes in behaviour such as moves to smoke outside, but did not exclude studies without this measurement. Biochemical validation was not used in the majority of these studies; however, there is conflicting evidence regarding the validity of self report of smoking status. Some authors suggest it is reasonably accurate in community settings (Dwyer 1986; Velicer 1992; Patrick 1994) whereas others suggest parental self reports of smoke consumption and ETS are frequently under-estimated (Jarvis 1987; Ford 1997; Matthews 1999); for example, in clinical situations where a clinician is the interviewer, social bias may influence the report towards the socially desired response.

Levels of nicotine or its breakdown products, by contrast, are often preferred as a measure of real reductions in smoking or ETS. Smoke exposure can be detected by hair cotinine (Zahlsen 1994; Nafstad 1997; Al-Delaimy 2002a; Al-Delaimy 2002b) and absorption by urinary cotinine (Jarvis 1984; Bakoula 1995). Long-term exposure is best estimated by hair nicotine, whereas urinary cotinine is more informative of short-term exposure. Cotinine is a metabolic breakdown product of nicotine with a half-life of about one day (Haley 1983). The half-life is longer in nonsmokers such as infants and young children (Idle 1990). Cotinine is concentrated in the urine by the kidney and so becomes a sensitive indicator of ETS exposure over the last few days. Urine creatinine measurements may be used to adjust for urine concentration (Thompson 1990); the urinary cotinine creatinine ratio (CCR) measurement has become a common method for measuring the levels of short-term ETS exposure. Saliva cotinine approximates to blood cotinine concentrations and collection is simple and non-invasive.

Where possible we examined outcomes by gender, age and socioeconomic status.

We were particularly interested in aspects of intervention development that may have contributed to a stronger, more appropriate or sustained intervention. We extracted information on the theory underlying the intervention development and content, process indicators and descriptions of community consultation and/or participation in the planning and implementation of the intervention, incentives (if present) and concerns of intervention programmes. We also recorded any information about costs, either in terms of evaluations of cost-effectiveness, or simply where costs were mentioned.

Search methods for identification of studies

The original search was updated in October 2007 by the Cochrane Tobacco Addiction Group trial search coordinator, using the Group's specialised register. This includes controlled trials of interventions to change long-term smoking habits in individuals and reduce the prevalence of smoking in the population. The studies are identified through regular searches of MEDLINE, PsycINFO, EMBASE, Web of Science, and handsearching of relevant sources. We also conducted additional searches of CINAHL and ERIC.

HEALTHSTAR was no longer available at the time of the review update.

For the original review we searched the Tobacco Addiction Group's specialised register for trials of environmental tobacco smoke pollution and child health. We searched the Cochrane Central Register of Controlled Trials (CENTRAL) for studies referring to families or children in relation to smoking cessation or smoking prevention. We conducted additional searches of the following electronic databases: MEDLINE; PsycINFO; EMBASE; CINAHL; ERIC; HEALTHSTAR. Databases were originally searched in October 2001.

The reports of all references identified as randomized controlled trials (RCTs) or controlled trials (CTs) or unclear were obtained and reviewed. Secondly, reference lists of all identified RCTs or CTs were checked to identify potentially relevant citations. We made enquiries regarding other known published or unpublished studies so that these results could be included in our review.

Search strategies for the key databases are shown in additional tables: Table 1; Table 2; Table 3; Table 4 .

Table 1. MEDLINE and CINAHL search strategy

1. randomized controlled trial.pt.
2. randomized controlled trials/
3. random allocation/
4. controlled clinical trial.pt.
5. clinical trial.pt.
6. exp clinical trials/
7. (clin$ adj5 trial$).tw.
8. double blind method/
9. single blind method/
10. ((singl$ or doubl$ or trebl$ or tripl$) adj5 (blind$ or mask$)).tw.
11. placebos/
12. placebo$.tw.
13. random$.tw.
14. research design/
15. follow up studies/
16. exp evaluation studies/
17. prospective studies/
18. retrospective studies/
19. comparative study/
20. Cross-Sectional Studies/
21. (control$ or prospectiv$ or volunteer$).tw.
22. or/1-21
23. exp Smoking/
24. Tobacco Smoke Pollution/
25. 23 or 24
26. Smoking Cessation/
27. Environmental Medicine/
28. exp Environmental Pollution/
29. Public Health/
30. Health Education/
31. Health Promotion/
32. Psychotherapy/
33. or/26-32
34. exp Family/
35. Schools, Nursery/
36. Child Day Care Centers/
37. Child Care/
38. (child$ or carer$ or caregiver$ or parent$ or famil$ or brother or sister or sib$ or nanny).tw.
39. or/34-38
40. 22 and 25 and 33 and 39
41. limit 40 to (newborn infant or infant <1 to 23 months> or preschool child <2 to 5 years> or child <6 to 12 years>)

Table 2. EMBASE search strategy

Searched Oct 2007
S1 RANDOMIZED CONTROLLED TRIAL
S2 RANDOMIZATION
S3 CONTROLLED STUDY!
S4 EVIDENCE BASED MEDICINE!
S5 CLINICAL TRIAL!
S6 CLIN? (5W) TRIAL?
S7 ((SINGL? OR DOUBL? OR TREBL? OR TRIPL?) (5W) (BLIND? OR MASK?))
S8 PLACEBOS
S9 PLACEBO?
S10 RANDOM?
S11 METHODOLOGY
S12 COMPARATIVE STUDY!
S13 EVALUATION AND FOLLOW UP
S14 PROSPECTIVE STUDY
S15 CONTROL? OR PROSPECTIV? OR VOLUNTEER?
S16 S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10 OR S11 OR S12 OR S13 OR S14 OR S15
S17 SMOKING/maj
S18 SMOKING CESSATION/maj
S19 ENVIRONMENTAL HEALTH/maj
S20 POLLUTION/maj
S21 PUBLIC HEALTH/maj
S22 HEALTH EDUCATION!/maj
S23 PSYCHOTHERAPY/maj
S24 S18 OR S19 OR S20 OR S21 OR S22 OR S23
S25 FAMILY!/maj
S26 SCHOOLS/maj
S27 SCHOOL/maj
S28 NURSERY/maj
S29 NURSERIES/maj
S30 DAY CARE/maj
S31 CHILD CARE/maj
S32 HOUSE/maj
S33 HOME/maj
S34 CARER? OR CAREGIVER? OR PARENT? OR FAMIL? OR BROTHER? OR SISTER? OR SIBLING? OR NANNY OR NANNIES
S35 S25 OR S26 OR S27 OR S28 OR S29 OR S30 OR S31 OR S32 OR S33 OR S34
S36 CHILD!
S37 NEWBORN!
S38 S36 OR S37
S39 S16 AND S17 AND S24 AND S35 AND S38
S1 RANDOMIZED CONTROLLED TRIAL
S2 RANDOMIZATION
S3 CONTROLLED STUDY!
S4 EVIDENCE BASED MEDICINE!
S5 CLINICAL TRIAL!
S6 CLIN? (5W) TRIAL?

Table 2. EMBASE search strategy (*Continued*)

S7 ((SINGL? OR DOUBL? OR TREBL? OR TRIPL?) (5W) (BLIND? OR MASK?))
S8 PLACEBOS
S9 PLACEBO?
S10 RANDOM?
S11 METHODOLOGY
S12 COMPARATIVE STUDY!
S13 EVALUATION AND FOLLOW UP
S14 PROSPECTIVE STUDY
S15 CONTROL? OR PROSPECTIV? OR VOLUNTEER?
S16 S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10 OR S11 OR S12 OR S13 OR S14 OR S15
S17 SMOKING/maj
S18 SMOKING CESSATION/maj
S19 ENVIRONMENTAL HEALTH/maj
S20 POLLUTION/maj
S21 PUBLIC HEALTH/maj
S22 HEALTH EDUCATION!/maj
S23 PSYCHOTHERAPY/maj
S24 S18 OR S19 OR S20 OR S21 OR S22 OR S23
S25 FAMILY!/maj
S26 SCHOOLS/maj
S27 SCHOOL/maj
S28 NURSERY/maj
S29 NURSERIES/maj
S30 DAY CARE/maj
S31 CHILD CARE/maj
S32 HOUSE/maj
S33 HOME/maj
S34 CARER? OR CAREGIVER? OR PARENT? OR FAMIL? OR BROTHER? OR SISTER? OR SIBLING? OR NANNY OR NANNIES
S35 S25 OR S26 OR S27 OR S28 OR S29 OR S30 OR S31 OR S32 OR S33 OR S34
S36 CHILD!
S37 NEWBORN!
S38 S36 OR S37
S39 S16 AND S17 AND S24 AND S35 AND S38

Table 3. HealthStar search strategy

Searched Oct 2001
1. randomized controlled trial.pt.
2. randomized controlled trials/
3. random allocation/
4. controlled clinical trial.pt.
5. clinical trial.pt.
6. exp clinical trials/
7. (clin$ adj5 trial$).tw.
8. double blind method/
9. single blind method/

Table 3. HealthStar search strategy (*Continued*)

10. ((singl$ or doubl$ or trebl$ or tripl$) adj5 (blind$ or mask$)).tw.
11. placebos/
12. placebo$.tw.
13. random$.tw.
14. research design/
15. follow up studies/
16. exp evaluation studies/
17. prospective studies/
18. retrospective studies/
19. comparative study/
20. Cross-Sectional Studies/
21. (control$ or prospectiv$ or volunteer$).tw.
22. or/1-21
23. exp Smoking/
24. Tobacco Smoke Pollution/
25. 23 or 24
26. Smoking Cessation/
27. Environmental Medicine/
28. exp Environmental Pollution/
29. Public Health/
30. exp Health Education/
31. Health Promotion/
32. exp Psychotherapy/
33. or/26-32
34. exp Family/
35. exp schools/
36. child day care centers/
37. child care/
38. home$.mp.
39. house$.mp.
40. (child$ or carer$ or caregiver$ or parent$ or famil$ or brother or sister or sib$ or nanny).tw.
41. or/34-40
42. 22 and 25 and 33 and 41
43. limit 42 to (newborn infant or infant <1 to 23 months> or preschool child <2 to 5 years> or child <6 to 12 years>)

Table 4. PsycINFO search strategy

Searched Oct 2007
1. randomized controlled trial.pt.
2. randomized controlled trials/
3. random allocation/
4. controlled clinical trial.pt.
5. clinical trial.pt.
6. exp clinical trials/
7. (clin$ adj5 trial$).tw.
8. double blind method/
9. single blind method/

Table 4. PsycINFO search strategy (*Continued*)

10. ((singl$ or doubl$ or trebl$ or tripl$) adj5 (blind$ or mask$)).tw.
11. placebos/
12. placebo$.tw.
13. random$.tw.
14. research design/
15. follow up studies/
16. exp evaluation studies/
17. prospective studies/
18. retrospective studies/
19. comparative study/
20. Cross-Sectional Studies/
21. (control$ or prospectiv$ or volunteer$).tw.
22. or/1-21
23. exp Smoking/
24. Tobacco Smoke Pollution/
25. 23 or 24
26. Smoking Cessation/
27. Environmental Medicine/
28. exp Environmental Pollution/
29. Public Health/
30. Health Education/
31. Health Promotion/
32. Psychotherapy/
33. or/26-32
34. exp Family/
35. Schools, Nursery/
36. Child Day Care Centers/
37. Child Care/
38. (child$ or carer$ or caregiver$ or parent$ or famil$ or brother or sister or sib$ or nanny).tw.
39. or/34-38
40. 22 and 25 and 33 and 39
41. limit 40 to (newborn infant or infant <1 to 23 months> or preschool child <2 to 5 years> or child <6 to 12 years>)

Data collection and analysis

Two reviewers independently undertook assessment of quality and extraction of study details and results, based on the methods of Jadad (Jadad 1996). NP and AP reviewed half of the studies; NS, RR, PW, RC and GFT each reviewed a fifth of the remaining studies, and compared results. We created a data extraction spreadsheet in Microsoft Excel.

We resolved differences between reviewers' extraction results by discussion or by consultation with a third reviewer. Given the heterogeneity of study design and characteristics, we considered a quantitative estimate of effect to be inappropriate. The synthesis is therefore narrative, with results presented in tables.

RESULTS

Description of studies

See: Characteristics of included studies; Characteristics of excluded studies; Characteristics of ongoing studies.

Thirty-six studies are included in the review, of which 18 were identified in the most recent update (Armstrong 2000; Ratner 2001 ; Hovell 2002; Curry 2003 ; Conway 2004 ; Fossum 2004 ; Kimata 2004; Zakarian 2004 ; Abdullah 2005 ; Chan 2005; Schonberger 2005; Krieger 2005 ; Wiggins 2005; Chan 2006a; Kallio 2006; Nuesslein 2006; Yilmaz 2006 ; Winickoff 2008).

A further six studies were identified for which the outcome data are not yet available (Borrelli 2004; Sockrider 2003; Wilson 2005;

Chan 2006b; Winickoff 2007b; Wipfli 2008). Information about these ongoing studies is provided in the Characteristics of ongoing studies table.

Intervention setting:

Of the 36 studies reported in this review, only four were targeted at the population or community level. The majority of studies targeted parents within healthcare contexts, with 16 targeting parents in 'well child' settings and 13 reporting interventions in 'ill child' healthcare settings. A further two studies reported on interventions in paediatric clinics but do not designate whether they were in the context of 'well child' or 'ill child' settings, and a further one includes both well and ill child visits. More detailed information about each of the 36 included studies is provided in the Characteristics of included studies table.

Interventions targeted at population or community settings (for example, communities, schools etc):

This review identified four eligible studies that reported interventions targeted at the population or community level. One of them evaluated outcomes for smoking mothers who called a telephone smoking cessation assistance counselling service (Davis 1992). This study recruited participants through an advertising campaign that invited them to call a telephone smoking cessation assistance counselling service run by the National Cancer Institute in the USA. Two studies examined the effectiveness of school-based strategies (Zhang 1993; Elder 1996) but used different approaches to limiting children's exposure to ETS. Zhang 1993 reported a study designed to increase public knowledge of the health consequences of cigarette smoking and to promote healthier attitudes among elementary school students in China, and encouraged these students to help their fathers to quit smoking. Schools in one district used a tobacco control curriculum, and the control group were students in another district. The other school-based study was a cardiovascular health promotion programme that included an intervention designed to limit children's ETS exposure and negative role modeling from staff and visitors smoking at school (Elder 1996). Conducted in the USA, this study used a cluster-randomized design with schools as the unit of allocation. Also from the USA was a community-based intervention in which trained lay bicultural and bilingual community health advisors worked with Latino families to problem-solve and to develop strategies to lower children's exposure to tobacco smoke in the home (Conway 2004). Participants for this study were recruited through advertising at community organisations and venues.

Opportunistic interventions targeted at parents of children in the 'well child' healthcare setting:

Compared to the relatively few community and population level interventions identified by this review, we found far more studies that evaluated interventions within 'well child' healthcare settings. Sixteen included studies examined the effect of interventions delivered to parents in this context, and these recruited participants postnatally, at 'well child' health visits or at infant immunisation clinics. Eight of these studies were peripartum, recruiting participants via maternity hospitals, from their records, or via midwives and general practioners (Woodward 1987; Greenberg 1994; Severson 1997; Armstrong 2000; Emmons 2001; Ratner 2001; Schonberger 2005; Wiggins 2005). 'Well child' health check visits to a doctor or maternal child health nurse were used by Chilmonczyk 1992; Vineis 1993; Eriksen 1996; Fossum 2004; Zakarian 2004; Abdullah 2005; Kallio 2006; Winickoff 2008.

Opportunistic interventions targeted at parents of children with health problems (enhanced educational interventions versus standard care):

Interventions conducted in the 'ill child' health care setting were reported in 13 studies. Of these, seven were interventions targeted at the parents of children with respiratory problems (Hughes 1991; McIntosh 1994; Wahlgren 1997; Irvine 1999; Wilson 2001; Hovell 2002; Krieger 2005). Six studies were conducted in non-respiratory 'ill child' health care settings (Groner 2000; Hovell 2000; Wakefield 2002; Kimata 2004; Chan 2005; Chan 2006a). The intervention reported by Hovell recruited mothers from a Special Supplemental Nutrition Program for Women, Infants and Children, and looked at the effectiveness of counselling on smoking rates and children's ETS exposure among women of low income, high risk and ethnically diverse backgrounds. A further two studies conducted in paediatric clinics do not make clear whether they are in the context of 'well child' or 'ill child' health visits (Curry 2003; Nuesslein 2006), while Yilmaz 2006 recruited children visiting paediatric clinics for either primary conditions or a 'well child' visit.

Main target of intervention:

Reduction of children's ETS exposure can be achieved by encouraging avoidance of children's exposure to cigarettes smoked, such as the child or the smoker moving to a different location, reducing the number of cigarettes smoked by parent or carer, or the smoker ceasing to smoke altogether. The aims of the studies identified by this review were heterogeneous. Only smoking and ETS targets are considered here; other intervention components, such as healthy eating (eg Elder 1996) or asthma management (eg Hughes 1991), are not described.

Of the 36 studies, 13 aimed solely for parental or carer smoking cessation or reduction (Vineis 1993; Zhang 1993; Severson 1997; Groner 2000; Emmons 2001; Ratner 2001; Wakefield 2002; Curry 2003; Kimata 2004; Chan 2005; Wiggins 2005; Kallio 2006; Nuesslein 2006). Six studies, all from the USA, aimed solely for reducing children's exposure to cigarettes smoked (Chilmonczyk 1992; Davis 1992; Elder 1996; Wahlgren 1997;

Hovell 2000; Wilson 2001), while 17 aimed for a combination of parental or carer cessation, reduction or avoidance (Woodward 1987; Hughes 1991; Greenberg 1994; McIntosh 1994; Eriksen 1996; Irvine 1999; Armstrong 2000; Hovell 2000; Conway 2004; Fossum 2004; Zakarian 2004; Abdullah 2005; Krieger 2005; Schonberger 2005; Chan 2006a; Yilmaz 2006; Winickoff 2008). Four interventions used feedback to parents of biological evidence of children's ETS absorption as a stimulus for parental behaviour change (Chilmonczyk 1992; McIntosh 1994; Wilson 2001; Wakefield 2002). Fifteen studies used biological validation of parental smoking cessation, measuring cotinine in urine, saliva or serum (Woodward 1987; Irvine 1999; Hovell 2000; Hovell 2002; Fossum 2004; Zakarian 2004; Abdullah 2005; Nuesslein 2006; Kallio 2006; Winickoff 2008) and/or expired carbon monoxide (Emmons 2001; Ratner 2001; Curry 2003; Abdullah 2005; Schonberger 2005).

Location of studies:

The majority of studies were from high income countries. Nineteen studies were from North America, with 17 from the USA (Chilmonczyk 1992; Davis 1992; Greenberg 1994; McIntosh 1994; Elder 1996; Severson 1997; Wahlgren 1997; Groner 2000; Hovell 2000; Emmons 2001; Wilson 2001; Hovell 2002; Curry 2003; Conway 2004; Zakarian 2004; Krieger 2005; Winickoff 2008), and two from Canada (Hughes 1991; Ratner 2001). Three studies were from Australia (Woodward 1987; Armstrong 2000; Wakefield 2002) and two from the UK (Irvine 1999;Wiggins 2005). There was one study reported from each of Finland (Kallio 2006), Japan (Kimata 2004), Sweden (Fossum 2004), Germany (Nuesslein 2006), Netherlands (Schonberger 2005), Italy (Vineis 1993), and Norway (Eriksen 1996). Seven of the studies in high income countries specifically targeted disadvantaged, low income and/or culturally diverse populations. Armstrong 2000 targeted disadvantaged mothers; Conway 2004 and Hovell 2002 Latino families; Curry 2003 ethnically diverse low income women; Krieger 2005 low income households; Wiggins 2005 mothers living in disadvantaged inner city areas; and Zakarian 2004 low income ethnically diverse population.

Five studies were from low or middle income countries, with four in China (Zhang 1993; Abdullah 2005; Chan 2005; Chan 2006a) and one in Turkey (Yilmaz 2006).

Participants:

Fourteen studies targeted mothers only (Chilmonczyk 1992; Davis 1992; Greenberg 1994; Severson 1997; Armstrong 2000; Groner 2000; Hovell 2000; Ratner 2001; Curry 2003; Fossum 2004; Zakarian 2004; Wiggins 2005; Nuesslein 2006; Yilmaz 2006). One study (Chan 2006a) targeted fathers through educating their non-smoking wives. Seventeen studies targeted both parents (Woodward 1987; Hughes 1991; Vineis 1993; McIntosh 1994; Eriksen 1996 ;Irvine 1999; Emmons 2001; Wilson 2001; Hovell 2002; Wakefield 2002; Conway 2004; Kimata 2004; Abdullah 2005; Chan 2005; Schonberger 2005; Kallio 2006; Winickoff 2008), while Zhang 1993 targeted fathers only, Elder 1996 teachers only, Wahlgren 1997 families and Krieger 2005 households.

Age group:

Studies were stratified according to the age group of the children: infants (less than one year), preschoolers (up to age six), and school age (six to twelve years). Twelve studies examined measures to reduce ETS exclusively for infants (Woodward 1987; Chilmonczyk 1992; Vineis 1993; Greenberg 1994; Severson 1997; Armstrong 2000; Ratner 2001; Fossum 2004; Zakarian 2004; Abdullah 2005; Wiggins 2005; Winickoff 2008. Measures to reduce ETS for children of up to and including preschool age were examined by five studies (Davis 1992; Eriksen 1996; Hovell 2000; Emmons 2001; Schonberger 2005), while measures for children of up to and including school age were considered by 13 studies (Hughes 1991; Zhang 1993; McIntosh 1994; Elder 1996; Wahlgren 1997; Irvine 1999; Groner 2000; Wilson 2001; Wakefield 2002; Conway 2004; Kimata 2004; Krieger 2005; Kallio 2006). Two studies examined interventions to reduce ETS that included older age groups: Hovell 2002 included parents of children aged 3 to 17 years and Chan 2006a included parents of children from birth to 15 years. Three studies did not provide the ages of the children (Curry 2003; Chan 2005; Nuesslein 2006).

Theoretical framework:

Sixteen of the 36 studies expressly employed a theoretical framework in the design and/or development of the intervention. Chronologically, McIntosh 1994 developed the activities for the parent manual based on behaviour modification theory. Groner 2000 employed the health belief model, and Wakefield 2002 used a harm minimisation approach, based on previous research indicating that restrictions produced significantly lower urinary cotinine levels. Ratner 2001 utilised Marlatt's relapse model. Abdullah 2005 based counselling strategies on the stages of change component of Prochaska's transtheoretical model. Krieger 2005 was also guided by the transtheoretical stages of change model, as well as by social cognitive theory. Emmons 2001, Curry 2003 and Chan 2005 used Motivational Interviewing. Chan 2006a used Fishbein's theory of reasoned action and Ajzen's theory of planned behaviour in the development of their educational intervention. Greenberg 1994, Elder 1996 Conway 2004 and Fossum 2004 employed the social learning model. Winickoff 2008 refer to a number of theories as informing the development of their intervention: the transtheoretical stages of change model together with social learning theory, health beliefs model, cognitive behavioural theory, Wagner's chronic care model and behavioural and systems theory.

When considered by intervention setting, the social learning model was used by both the community/population level studies

that explicitly used a theoretical framework (Elder 1996; Conway 2004). A range of theories were applied in the 'well child' setting, including Prochaska's transtheoretical model (Abdullah 2005), motivational interviewing (Emmons 2001), the social learning model (Greenberg 1994; Fossum 2004) and the multiple theories utilised by Winickoff 2008 as listed above. Similarly, within the 'ill child' setting there was a diversity of theories utilised, including the health belief model (Groner 2000), harm minimisation (Wakefield 2002), relapse prevention (Krieger 2005), motivational interviewing (Chan 2005) and Fishbein's theory of reasoned action and Azjen's theory of planned behaviour (Chan 2006a). Motivational interviewing was also used in a clinical setting where the study did not describe whether children were well or ill (Curry 2003).

Acceptability of intervention to participants:

Three studies appeared to have involved consultation with potential participants as part of the development of the intervention (Hughes 1991; Davis 1992; Hovell 2000). Davis 1992 employed focus groups with smokers and nonsmokers to understand their beliefs and attitudes towards smoking and cessation in order to develop improved self-help materials.

Process indicators:

Process indicators provide important information regarding the integrity of the way in which interventions were implemented. However, they were well described in only 15 of the 36 studies (Chilmonczyk 1992; Davis 1992; Greenberg 1994; McIntosh 1994; Eriksen 1996; Severson 1997; Hughes 1991; Hovell 2000; Emmons 2001; Hovell 2002; Wakefield 2002; Fossum 2004; Zakarian 2004; Abdullah 2005; Wiggins 2005). More specifically, three studies reported that they maintained regular monitoring and support with those responsible for providing the intervention (Hughes 1991; Greenberg 1994; Emmons 2001), and eight reported that they evaluated the extent to which participants received, read, undertook or adhered to the intervention as intended (Davis 1992; McIntosh 1994; Severson 1997; Hovell 2002; Wakefield 2002; Zakarian 2004; Abdullah 2005; Wiggins 2005). Among those that commented on the monitoring of study implementation, one study (Severson 1997) recommended the need to prompt the providers over the course of the study to ensure appropriate implementation. One study (Fossum 2004) reported the collection of qualitative data on the opinions of the nurses delivering the intervention.

Biological verification of children's exposure:

Thirteen studies used biological evidence of children's ETS absorption, measuring cotinine in urine or saliva (Woodward 1987; Chilmonczyk 1992; Greenberg 1994; McIntosh 1994; Irvine 1999; Hovell 2000; Wilson 2001; Hovell 2002; Wakefield 2002; Conway 2004; Kimata 2004; Zakarian 2004; Kallio 2006), and five used environmental monitors of children's exposure to ETS (Wahlgren 1997; Hovell 2000; Emmons 2001; Hovell 2002; Zakarian 2004). One of the five used passive sampling nicotine monitors as the primary study outcome, and measured nicotine levels at the household level in two rooms of participants' homes (Emmons 2001). The remaining four used air nicotine monitors to either promote or verify the accuracy of parent report of smoking behaviours. Wahlgren 1997 reported using air nicotine monitors in a room where greatest exposure to ETS was reported for two weeks prior to clinic visits to verify parent report of cigarette consumption, while Hovell 2000, Hovell 2002 and Zakarian 2004 all used inactive air nicotine monitors placed in three rooms where children's greatest ETS exposure was reported, to promote accurate self report of smoking behaviours by mothers. These studies also placed active air monitors in a selected proportion of the total sample: Hovell 2000 in a randomly selected half of the sample; both Hovell 2002 and Zakarian 2004 in 20% of the sample. Zakarian 2004 reported randomly selecting these homes and placing the monitors one week before data collection, while Hovell 2002 did not report how the 20% of homes were selected but reported that they were used only for baseline and post-test measures. Cost is given by both studies as a reason for not using active air nicotine monitors across the whole sample.

Length of follow-up:

In this review we determined length of follow up as being from completion of intervention to time of data collection. Length of follow up is important to determine, as it affects the extent to which sustainability and long-term outcomes can be assessed. While short-term reductions in children's ETS exposure have some benefit to children's health outcomes, the ultimate goal is for long-term and sustained change in order to maximise the positive impact on children's health and wellbeing as they grow and develop.

Twelve months or more

Fourteen studies included in this review reported a follow up of at least 12 months (Hughes 1991; Vineis 1993; Elder 1996; Severson 1997; Irvine 1999; Ratner 2001; Hovell 2002; Curry 2003; Conway 2004; Krieger 2005; Schonberger 2005; Wiggins 2005; Chan 2006a; Kallio 2006). Kallio 2006 reported outcomes 36 months after the targeted ETS component of their intervention while two of these studies reported outcomes 24 months after the intervention (Vineis 1993; Elder 1996) and another reported child health outcomes at 24 months and ETS outcomes at 12 months (Schonberger 2005). Wiggins 2005 reported outcomes at 18 months.

Six to twelve months

Shorter follow-up periods of between six and twelve months were reported by three studies (Greenberg 1994; Hovell 2000; Wilson 2001). The intervention reported in Greenberg 1994 was delivered to children between 18 days and seven months of age, with follow up at 12 months of age, so follow up varied between five and eleven months. The interventions in Hovell 2000 and Wilson 2001 lasted three months and five weeks respectively, with follow up at 12 months from baseline. Seven studies used a follow up of six months (Davis 1992; Zhang 1993; Wahlgren 1997; Groner 2000; Emmons 2001; Wakefield 2002; Abdullah 2005). Wahlgren 1997 debriefed participants at the six-month follow up, and reported ongoing follow up eight and 18 months after that.

Less than six months

Long-term outcomes were particularly difficult to assess in nine studies with follow-up periods of six months or less. McIntosh 1994 reported follow-up periods that varied between four and six months and eight studies used a follow-up time of less than six months (Woodward 1987; Chilmonczyk 1992; Eriksen 1996; Armstrong 2000; Fossum 2004; Kimata 2004; Chan 2005; Winickoff 2008).

Sample Size

Fifteen of the thirty six studies mention conducting a power calculation in the design of their studies (Woodward 1987;Greenberg 1994;McIntosh 1994 Severson 1997; Wahlgren 1997; Irvine 1999;Armstrong 2000;Groner 2000;Hovell 2000; Emmons 2001; Wakefield 2002; Conway 2004;Krieger 2005;Schonberger 2005; Wiggins 2005). Of these McIntosh 1994 and Wahlgren 1997 explicitly mention that the statistical power of their study was limited by the small sample size.

Risk of bias in included studies

To meet inclusion criteria for this review, studies had to be controlled trials. Thirty trials used randomization to allocate participants to study groups (Hughes 1991; Chilmonczyk 1992; Davis 1992; Greenberg 1994; McIntosh 1994; Elder 1996; Eriksen 1996; Severson 1997; Wahlgren 1997; Irvine 1999; Armstrong 2000; Groner 2000; Hovell 2000; Emmons 2001; Ratner 2001; Wilson 2001; Hovell 2002; Curry 2003; Conway 2004; Kimata 2004; Zakarian 2004; Abdullah 2005; Chan 2005; Krieger 2005; Schonberger 2005; Wiggins 2005; Chan 2006a; Kallio 2006; Nuesslein 2006; Yilmaz 2006). In ten of these there appeared to be adequate concealment of group allocation (Davis 1992; Greenberg 1994; Armstrong 2000; Hovell 2000; Emmons 2001; Ratner 2001; Zakarian 2004; Abdullah 2005; Krieger 2005; Wiggins 2005). In the remainder allocation concealment was either unclear or inadequate.

Six studies did not use randomization. Fossum 2004 conducted a cluster-randomized controlled trial of child health centres for implementation of a nurse-led counselling programme. Two studies (Vineis 1993; Zhang 1993) compared an intervention community with a control community. One study (Woodward 1987) alternated intervention by birth month of the infant, and another (Wakefield 2002) alternated intervention by week of clinic attendance. Winickoff 2008 alternated intervention by day of admission to postpartum ward.

Effects of interventions

Tobacco Smoke Exposure Outcomes

Of the 36 studies, 11 reported success in achieving reduced children's ETS exposure between intervention and control groups (with or without biochemical validation) (Zhang 1993; Wahlgren 1997; Armstrong 2000; Hovell 2000; Emmons 2001; Curry 2003; Kimata 2004; Abdullah 2005; Schonberger 2005; Chan 2006a; Yilmaz 2006).Zhang 1993 achieved a reduction in fathers' reported smoking rates in the intervention group, but no change in the control group eight months after a school-based intervention in which children wrote letters to their fathers urging them to quit.

Wahlgren 1997 achieved a statistically significant reduction in parent-reported cigarettes smoked per day in the presence of children at 12 months following a three-month intensive counselling intervention. The effect size was small, however, and curiously, the largest fall in this measure occurred in the period after recruitment but before the intervention. After the intervention, parents reported a reduction of 1.1 cigarettes per day smoked in the presence of the children for the control group, and 2.2 cigarettes per day for the intervention group. There was no validation by measurement of children's exposure or absorption via cotinine, or validation of the parental reports, and the clinical significance of such a fall is unclear.

Armstrong 2000 report a significant difference in mothers reporting smoking in the house around their infant four months after receiving a home visiting programme compared to those who did not. This was not biologically verified.

Hovell 2000 achieved a reduction in the number of parent-reported cigarettes smoked in the presence of children per day at 12 months, following a three-month intensive counselling intervention. There was, however, no change in cigarette smoke absorption as measured by children's urinary cotinine (ng/ml) for the intervention group over the 12 months (with measures collected at 3, 6 and 12 months). Cigarette smoke absorption for the control group increased from 9.4 ng/ml to 17.5 ng/ml over this time period, whereas there was almost no change in the intervention group (10.9 at baseline and 10.5 at 12 months). This increase in absorption observed for children in the control group appears to

account for the apparent benefit of the intervention group. However the argument that this is solely due to reduced exposure in the home is uncertain, as the mothers in both the intervention and control groups reported falls in mothers' cigarettes smoked in the presence of the child from 3.9 to 0.5 (intervention) and 3.5 to 1.2 (control) cigarettes per day. In addition, they reported falls in total exposure to any source of cigarettes per day from 7.3 to 1.2 (intervention) and 7.2 to 2.8 (control). As the cotinine indicates a minimal fall for the intervention group and almost a doubling in urinary cotinine for the control group, either the cotinine measurement is unreliable or, more probably, that the parental report of cigarette exposure is not reliable.

Emmons 2001 achieved reduced household air nicotine measurements six months after a half hour motivational interviewing intervention plus four follow-up telephone calls, as measured by passive sampling diffusion monitors in the kitchen and in one other room of the home.

Curry 2003 achieved a statistically significant difference in self-reported smoking abstinence rates amongst women 12 months after they received a brief motivational message, a guide to quitting smoking and a 10 minute motivational interview, compared to those who did not. However, validation of smoking cessation through carbon monoxide expiration was completed by only a small subsample (13/156 in the intervention group and 5/147 in the control group).

Kimata 2004 achieved a reduction in urinary cotinine levels in children in the cessation group compared to the controls. However, as the intervention in this study is explained only as parents agreeing to stop smoking, more information is needed to determine the applicability and transferability of the study to other settings.

Abdullah 2005 achieved significantly more parents reporting quitting smoking for at least a day and biologically confirmed as quitting for seven days six months after receiving smoking cessation telephone counselling than those in the control group. There was no measure of children's exposure or absorption via cotinine.

Schonberger 2005 provided educational advice on measures to prevent asthma in high risk children from asthmatic families. They found a significant difference in maternal postnatal smoking rates at 6 month follow up between intervention and control groups but no significant different in partner smoking or smoking by others.

Chan 2006a achieved a significant difference in mothers in the intervention group who reported always moving their child away when their fathers smoked at three months, but this was not sustained at six- or 12-month follow up. The number of smokers excluding the father living with the child at 12 month follow up was significantly fewer for the intervention group, but the number of smokers who smoked at home (excluding the father) was not significantly different at 12 month follow up. Moreover, maternal-reported child ETS exposure by any smoker was statistically significant at 3-, 6- and12-months follow up.

Yilmaz 2006 achieved a statistically significant difference in those reporting change in location of smoking and maternal self-reported quit rates for both intervention groups compared to control groups. The intervention targeting children's health achieved a significantly higher rate of cessation of smoking and smoking location change than the intervention targeting mother's health. However, an intention-to-treat analysis was not provided, and those with missing data were excluded (12/375). Self-reported quitting was not biological verified.

Six studies demonstrated a trend towards benefit, but the difference between intervention and comparison groups was not statistically significant (Vineis 1993 ; McIntosh 1994 ; Severson 1997 ; Wilson 2001; Wakefield 2002 ; Chan 2005).

Vineis 1993 showed a trend towards smoking cessation for mothers classified as white collar workers in the intervention arm (5/33) versus the control arm (2/36) (Odds Ratio [OR] 3.0; 95% confidence intervals [CI] 0.6 to 16.0). No difference was detected for the other participants, comprising 80 blue collar mothers and a total of 411 men defined as white or blue collar workers.

McIntosh 1994 achieved improvements in the number of attempts to change smoking location in the intervention group, but the number actually moving to smoke outside their homes in the intervention arm, (7/30) compared with those in the control group (4/30) did not achieve statistical significance.

Severson 1997 demonstrated that 59/1073 (5.5%) smokers in the intervention arm had quit 12 months after the intervention, compared with 38/802 (4.7%) in the control group. Interestingly, only 35 of these 97 12-month quitters had quit by six months, with more early quitters in the intervention group (25/59) compared with the control group (10/38).

Wilson 2001 examined the effect of counselling from a nurse related to asthma and ETS, with feedback on the children's urinary cotinine level. They found a reduction in acute asthma visits, although without statistically significant reduction in the children's urinary cotinine. Of the participants who provided a follow-up urine specimen (51/ 87, 59%), urinary cotinine/creatinine ratios for the intervention group fell from 1.82 ng/mg to 1.27, and for the control group from 2.34 to 1.93 [P = 0.26]. The proportion with more than one acute asthma visit per year in the intervention group fell from 50% at baseline to 29.6% at 12 months, compared with an increase in the control group from 37.2 to 46.5% [OR 0.32, P = 0.03].

Wakefield 2002 found parentally regulated home smoking bans in 16/75 (21%) in the intervention group, compared with 10/82 (12%) in the control group. However, this difference was not statistically significant (P = 0.40), and the difference in effect on reducing children's exposure was not confirmed by children's urinary cotinine analysis.

Chan 2005 found a trend towards increased smoking cessation, reduction in number of cigarettes smoked, attempts to quit and readiness to quit amongst parents of sick children receiving an individualised motivational intervention, but these differences were

not statistically significant.

Twenty one studies failed to detect an intervention effect on ETS outcomes (Woodward 1987; Hughes 1991; Chilmonczyk 1992; Davis 1992; Greenberg 1994; Elder 1996; Eriksen 1996; Irvine 1999; Groner 2000; Ratner 2001; Hovell 2002; Conway 2004; Fossum 2004; Zakarian 2004; Chan 2005; Krieger 2005; Wiggins 2005; Chan 2006a; Kallio 2006; Nuesslein 2006; Winickoff 2008).

Woodward 1987 sent information and a letter to mothers with one telephone call. There was an increase in self-reported maternal cessation rates, but the difference in infant cotinine levels at three months was small, and results were not statistically significant.

Hughes 1991 embedded an intervention to reduce child ETS exposure within a study of a comprehensive asthma education programme delivered in the home by a visiting nurse, compared with usual physician care. They found no difference in parent-reported children's exposure to ETS.

Chilmonczyk 1992 studied the effect of providing a personalised letter to mothers from their doctors, reinforced with a telephone call, explaining the infants' urinary cotinine level and ways to reduce their children's ETS exposure. Compared with controls who received usual care, there was no difference two months later in child urinary cotinine levels.

Davis 1992 found no difference in rates of smoking cessation among mothers who called a telephone smoking cessation assistance service, randomized to receive one of three different self-help guides. Participants were women with young children.

Greenberg 1994 conducted a trial of a home-based smoking cessation counselling intervention aimed at reducing children's exposure to ETS and improving health outcomes. This study achieved a statistically significant reduction only in self-reported cigarettes per day smoked in the presence of children, over 12 months following intensive counselling. There was no benefit, however, for the intervention group in terms of prevalence of exposure (ie. proportion of children exposed to cigarettes, or mean number of cigarettes smoked in front of children). Similarly, children's cotinine levels appeared to rise in both groups, and there was no statistically significant difference between the groups. Mean cotinine/creatinine ratios in the intervention arm increasing from 66 to 107 nmol/mmol, and in the control group from 51 to 98 nmol/mmol.

The CATCH study (Elder 1996) examined the effect of school-based health promotion interventions on a number of outcome measures, including an intervention designed to limit children's ETS exposure and negative role modelling from staff and visitors smoking at schools. They found no difference between intervention and control schools.

Eriksen 1996 found no statistically significant difference in smoking behaviours between families who received a brief opportunistic educational intervention plus printed materials at the time of a prolonged 'well child' home visit by a health visitor, compared with a control group who did not receive information unless it was requested.

Irvine 1999 examined the effect of a home visiting nurse-delivered intensive smoking cessation counselling intervention plus printed materials compared with participants who received only the printed materials. This study reports that cotinine levels of parents in the intervention group increased by 3.1 ng/ml compared with the control group increase of 1.3 ng/ml (albeit the confidence intervals were wide, 95% CI: -26.4 to 23.9). This suggests that parents in the intervention group may have increased their smoking more than parents in the control group.

Groner 2000 detected no difference in maternal cessation rates, with quit rates of less than 5% in both intervention groups and in the control group.

Ratner 2001 recruited mothers who had quit smoking during pregnancy and received a relapse prevention intervention at birth and during the first three months post partum. They did not find statistically significant differences between intervention and control groups 12 months smoking rates when comparing those who were continuously abstinent with all others and those who smoked daily with all others. Nor was there a statistically significant difference in self-reported smoke-free homes between intervention and control groups at 12 months.

Hovell 2002 achieved a reduction in the number of children reportedly exposed to any cigarette smoke, but this was not verified by testing child urinary cotinine, with equal proportions in the intervention (32%) and control groups (31%) having levels above the threshold for exposure. Parents reported smoking less around their children (with a mean reduction of 0.34 cigarettes per day, or one cigarette every three days). However, this was not biologically confirmed, with the control children having lower urinary cotinine levels than intervention children.

Conway 2004 trained bicultural and bilingual Latino community health advisors to conduct problem solving with Latino parents, but found no significant intervention effect.

Fossum 2004 provided counselling to mothers attending child health centres in Sweden. They found weak correlations between self-reported smoking status and cotinine levels, with mothers in the intervention group reporting more smoking than those in the control group, but showing reduced cotinine levels at three month follow up.

Zakarian 2004 implemented a behavioural counselling programme for reducing children's ETS exposure as part of 'well child' health care in a community clinic setting. Children's urinary cotinine concentrations did not show a significant change over time in either the intervention or the control group. Mothers' self-reported smoking rates and child's reported exposure to mother's cigarettes declined in both groups, with no significant difference between the intervention and control groups. There was no significant difference between groups in self-reported quitting by mothers, although at 12 months thiocyanate-confirmed seven-day quit status showed eight control versus two intervention mothers had actually quit (P = 0.045).

Krieger 2005 delivered a community home intervention to address

conditions affecting childhood asthma, including ETS and other allergens, and did not achieve a statistically significant intervention effect for carer report of smoking in the home or report of no smoking allowed in the home.

Wiggins 2005 delivered two forms of postnatal social support for disadvantaged inner city mothers, but found that number of mothers who smoked was not significantly reduced for either intervention.

Kallio 2006 investigated the effects of lifestyle counselling aimed at reducing children's exposure to known environmental risk factors for cardiovascular disease, including tobacco smoke exposure. They found no significant difference between the intervention and control groups in reported three-day exposure to ETS or in serum cotinine levels.

Nuesslein 2006 found that self-reported smoking rates reduced across the whole sample (both intervention and control groups) but did not find a significant difference between intervention and control groups in either maternal urinary cotinine levels or self-reported average number of cigarettes smoked.

Winickoff 2008 found a significant difference in self-reported 24hr quit attempts for baseline current smokers between intervention and control groups, although there was not a significant difference in prevalence of self reported 7 day abstinence and cotinine confirmed 7 day abstinence for baseline current smokers between intervention and control groups.

Household Air Quality

Seven studies report other outcome measures that included reduction in household air nicotine and number of cigarettes smoked by parents per day (Greenberg 1994; Severson 1997; Irvine 1999; Armstrong 2000; Groner 2000; Emmons 2001; Abdullah 2005).

Greenberg 1994 found that for children in the intervention group whose mothers did not smoke, there was a statistically significant reduction in number of cigarettes per day to which the child was reportedly exposed. The size of the effect, a difference of 0.5 cigarettes per day, is small.

Severson 1997 aimed to achieve smoking cessation but achieved positive results for self-reported number of cigarettes smoked per day, readiness to quit, likelihood of making a quit attempt, and knowledge of the effect of ETS on children.

Abdullah 2005 achieved significantly more parents in the intervention group at six-month follow up who had reduced cigarette consumption by at least 50%, reported implementing complete restriction of smoking at home and had made improvements in their readiness to quit after receiving smoking cessation telephone counselling, compared with those in the control group.

Armstrong 2000 reported a significant reduction in the number of mothers reporting smoking in the house around their infant four months after receiving a home visiting programme, compared to those who did not. This was not biologically verified.

Groner 2000 aimed to achieve maternal smoking cessation in the child health setting but found no effect on cessation, or on the number of cigarettes smoked per day, or on stage of change. There was a positive effect on knowledge of the effects of ETS in an intervention group receiving education specific to the effects of ETS on child health. Twenty-four of 72 (33%) of mothers in this group reported changing smoking location, compared with 25/160 (16%) in the combined other groups.

Emmons 2001 reported reduced household air nicotine measurements over time in the intervention groups. As there was no change in the number of cigarettes per day smoked, nor in the cessation rate, the implication of the difference was that parents and carers had changed smoking location and had moved outside to smoke

Child Health Outcomes

Eight studies explicitly aimed to improve child health outcomes (Hughes 1991; Greenberg 1994; Armstrong 2000; Wilson 2001; Kimata 2004; Krieger 2005; Schonberger 2005; Wiggins 2005) and a ninth (Wahlgren 1997) measured child health outcomes although they were not a primary outcome variable.

Hughes 1991 embedded an intervention to reduce children's ETS exposure in a study of a comprehensive asthma education intervention. The outcome was improved asthma control but no change in exposure to ETS.

Greenberg 1994 targeted ETS exposure in infants less than six months of age, and aimed to reduce the incidence of lower respiratory tract illness and the prevalence of respiratory symptoms. For infants of smoking mothers it demonstrated a lower prevalence of persistent symptoms in the intervention group (17.8%) compared with control group (30.9%; risk difference 13.1%; 95% CI: 1.0 to 27.0%). There was no difference in the incidence of illness.

Wahlgren 1997 measured child asthma symptoms but found no sustained difference between groups for this measure.

Armstrong 2000 included education about smoking near infants as a Sudden Infant Death Syndrome (SIDS) prevention strategy in a post-natal nurse home visiting programme aimed to improve the quality of maternal-child attachment, maternal health and child health parameters. At four months the intervention group had significantly more completed immunizations than the controls, although both groups had high immunization rates. At 12 months there was no statistically significant difference between the groups for immunization status. There was also no significant difference at four or 12 months for rates of utilisation of community services.

Wilson 2001 examined the effect of an intervention targeting smoking behaviour change and asthma education on health care utilisation and asthma hospitalisations, and explored other measures of asthma control. It demonstrated a reduction in the prevalence of children making more than one acute care asthma visit in the year following the intervention. Given that there was no apparent benefit of the smoking-related counselling on smoking-related outcomes, it is likely that it was the asthma education that achieved the improvement in asthma morbidity, rather than the

smoking behaviour programme.

Kimata 2004 found that cessation of smoking had no effect on the skin wheal responses or plasma neurotrophins in normal children, but achieved a significant reduction in skin wheal response, responses to house dust mite, cat dander and lower neutrophil levels for those with atopic eczema/dermatitis syndrome. Neurotrophins are a subset of growth factors with a range of functions throughout the body and includes nerve growth factor and brain-derived neurotrophic factor (Lackie 1999). This was the only study identified by this review to consider neurotophin levels, and it does not specific which particular neurotrophins were measured.

Krieger 2005 reported that the high-intensity intervention group had a clinically significant improvement in paediatric caregiver asthma quality-of-life score and a decline in urgent health service utilisation, but no significant difference in symptom-free days, compared to the low-intensity intervention group. However, they did not achieve a statistically significant intervention effect for carer report of smoking in the home or report of no smoking allowed in the home, so child health intervention effect is probably due to other aspects of the intervention.

Schonberger 2005 reported associations of exposure to passive smoking with parentally reported asthma symptoms without group allocation. It is therefore not possible to determine an intervention effect on child health outcomes.

Wiggins 2005 reported no notable differences in child health outcomes for children receiving either post-natal support intervention.

Results according to child age

One of the thirteen studies which examined measures to reduce ETS exclusively for infants detected an intervention effect (Abdullah 2005). Three of the six studies examining measures to reduce ETS for children up to and including preschool age demonstrated an intervention effect (Hovell 2000; Emmons 2001; Schonberger 2005). Five of the twelve studies examining measures to reduce ETS for children up to and including school age demonstrated an intervention effect (Zhang 1993; Greenberg 1994; Wahlgren 1997; Kimata 2004; Krieger 2005).

Results according to setting

In the clinical respiratory setting, only two of seven studies demonstrated an intervention effect. One of these was small (Wahlgren 1997) and one showed a significant effect on child health outcomes but not on tobacco smoke exposure outcomes (Krieger 2005).

In the clinical non-respiratory setting, two of six studies showed an intervention effect (Hovell 2000; Kimata 2004).

In the clinical setting (not designated 'well child' or 'ill child') one study out of two demonstrated an intervention effect (Curry 2003).

In the clinical setting (both 'well child' and 'ill child') Yilmaz 2006 demonstrated an intervention effect.

In the 'well child' clinical setting, three of the seventeen studies demonstrated an intervention effect (Armstrong 2000; Abdullah 2005; Schonberger 2005).

In the community setting, one of the four studies showed an intervention effect (Zhang 1993). This was one of two studies in the school setting.

Benefit among participants in comparison groups: A possible 'study effect'

In 23 of the 36 studies, there was reduced children's ETS exposure for study participants regardless of assignment to intervention or control groups (Woodward 1987; Hughes 1991; Davis 1992; Vineis 1993; Elder 1996; Eriksen 1996; Severson 1997; Wahlgren 1997; Irvine 1999; Groner 2000; Ratner 2001; Wilson 2001; Hovell 2002; Wakefield 2002; Curry 2003; Fossum 2004; Abdullah 2005; Chan 2005; Krieger 2005; Chan 2006a; Kallio 2006; Nuesslein 2006; Winickoff 2008).

Lack of influence of methodological quality on intervention effect

Ten of the 30 studies which randomly allocated participants to intervention or control groups achieved a significant intervention effect (Wahlgren 1997; Hovell 2000; Emmons 2001; Abdullah 2005; Armstrong 2000; Curry 2003; Kimata 2004; Schonberger 2005; Yilmaz 2006; Chan 2006a). Four of the ten studies where there was apparent concealment of group allocation achieved a significant intervention effect (Armstrong 2000; Abdullah 2005; Hovell 2000; Emmons 2001). The other six studies with apparent concealment of group allocation (Davis 1992; Greenberg 1994; Ratner 2001; Zakarian 2004; Krieger 2005; Wiggins 2005) were among the studies which demonstrated no intervention effect.

Biological validation of parents' report

Of the 13 studies with biological evidence of child ETS absorption, only nine allowed an assessment of validation of parent-reported change in exposure versus child ETS absorption (Greenberg 1994; McIntosh 1994; Hovell 2000; Wilson 2001; Hovell 2002; Wakefield 2002; Kimata 2004; Zakarian 2004; Kallio 2006). Of these studies, four did not show a discrepancy between reported exposure and an objective measure of absorption (Wilson 2001; Wakefield 2002; Kimata 2004; Kallio 2006). Kallio 2006 reported that parent serum cotinine values showed that parents reported smoking habits accurately but did not provide data. Of the five studies using environmental monitors of child exposure to ETS, only one allowed an assessment of validation of parent-reported change in exposure versus objective measure. In this study (Wahlgren 1997) a correlation between parental report and environmental monitoring was not demonstrated.

Other outcomes

Changes in knowledge, attitude and behaviour

All studies aimed to achieve changes in behaviour in some way in order to reduce child ETS exposure. Eight studies did not expressly include an education or
knowledge-building component in their interventions, but instead targeted change in attitudes and behaviours (Chilmonczyk 1992; Zhang 1993; Wahlgren 1997; Hovell 2000; Curry 2003; Zakarian 2004; Chan 2005; Nuesslein 2006).

Cost data and cost effectiveness

Twelve of the studies made some reference to costs. However this was generally limited to some statement of implementation costs; McIntosh 1994 mentioned the cost of the manual and Severson 1997 mentioned the staff and intervention cost per person of the intervention. Conway 2004 and Wiggins 2005 also mentioned the costs of implementing the intervention but indicated that further analysis of cost effectiveness was not conducted due the lack of intervention effect. Krieger 2005 reported reduced urgent healthcare costs during the two months before the exit interview for those receiving the intervention relative to the comparison group, but did not provide an extensive cost benefit analysis.

DISCUSSION

The evidence for success in reducing children's exposure to tobacco smoke is drawn from eleven studies. Four of these were conducted in or from a clinical setting and employed an intensive counselling-based approach (Wahlgren 1997; Hovell 2000; Emmons 2001; Curry 2003). While individual studies reported evidence of success for the following types of interventions, further research is needed to confirm their findings: a school-based curriculum-based approach (Zhang 1993); intensive home visiting programme for at-risk mothers that included education about preventive child health (Armstrong 2000); smoking cessation telephone counselling to mothers recruited through 'well child' clinics (Abdullah 2005); the provision of brief educational information to parents of sick children in a clinical setting (Schonberger 2005); education provided by nurses to mothers attending 'well child' visits about the impact of smoking on either their own or their child's health (Yilmaz 2006); health advice provided to mothers of sick children (Chan 2006a). A further successful study only reported that parents agreed to stop smoking, and does not describe further detail (Kimata 2004). The remaining studies which demonstrated no evidence of intervention effect were also conducted in clinical and community settings.

There is no clear evidence of success within various clinical settings: respiratory settings (two of the seven were successful), non-respiratory 'ill child' (two of six), 'well child' (three of seventeen) and peripartum (one of eight) settings. In the community setting, one of the four studies was successful (which was one of two school-based interventions).

Strategies which are effective in the adult healthcare setting may not be generalisable to the paediatric setting. Brief education-based counselling for adult smokers when they attend clinical services for their health has a positive effect in triggering quit attempts (Stead 2008). This effect was not detected in the trials of interventions for parents attending clinical paediatric or child health services. However, this finding might also suggest that either a different sort of brief intervention should be employed or that this context should not be used. It is also possible that the studies were underpowered to detect a small effect. Examination of the dynamics of the doctor-child-parent relationship may assist the development of brief strategies with a greater likelihood of success in this clinical setting. Given that there are unknowns about the doctor-child-parent interaction there is potential for interventions in this setting to cause harm. One study found a trend for mothers in the intervention group to smoke more than controls after the intervention (Irvine 1999). Several studies used only one-tailed t tests to look for statistical significance. Where there is potential to cause harm, even if the hypothesis is unidirectional, two-tailed tests of significance should always be employed.

Interventions appeared relatively successful in changing participants' knowledge of the effects of ETS. However, change in smoking behaviours or reductions in children's ETS exposure did not necessarily follow this change in knowledge. Three of the four studies which focused primarily on change in participants' attitudes and behaviours rather than knowledge were among the more successful interventions.

There is insufficient evidence of the effects on child health indicators of efforts to change child exposure to ETS.

There are major differences between those studies which aim to reduce children's exposure to ETS while potentially leaving parental smoking levels unchanged, and those studies which aim to encourage parents to stop or to reduce smoking. A third category may be studies which aim to encourage parents to stop or to reduce smoking, but qualify this with a compromise position of reducing children's exposure to ETS if parents do not cut down or quit. Any interventions which reduce children's exposure are beneficial for the child, although they still expose children to the harm of an increased risk of smoking themselves in adolescence. They also do nothing to improve health outcomes for parents.

There are relatively high rates of smoking cessation in pregnancy, both spontaneously and with clinical interventions (Lumley 2004). With high relapse rates postnatally among women who have quit in pregnancy (Lelong 2001), prevention of relapse for this group is an obvious means of preventing ETS exposure for their children. One study that examined relapse prevention in-

cluded in this review did not show a significant intervention effect although potential risk and protective factors for relapse are identified (Ratner 2001). Risk factors were having a partner who smoked and a higher number of sticks smoked per day prior to quitting and prolonging breast feeding and a higher score on a scale measuring "mental health" were protective. Further work in this area will make an important contribution.

Overall, 23 of the 36 studies demonstrated reduced child exposure to ETS for participants, regardless of assignment to intervention or control groups, which suggests that the studies may be describing the natural history of smoking among parents. Parents may reduce their own smoking or their children's exposure over time, possibly as a result of social pressures. Indeed the prevalent social trend in many developed countries over the last decade has been of increasing community concern about exposing nonsmokers to ETS (although arguably more so among nonsmokers than among active smokers). This is especially true for adults in the workplace and public spaces such as bars and restaurants, particularly in North America, Australia and some countries within the EU, where total smoking bans for these settings are increasingly being legislated. Campaigns and community concern about children's exposure to ETS at home and in cars has also increased. It is possible that these studies have recorded parents responding to this social trend by limiting their children's exposure in the home. This being the case, studies need to aim not just for a reduction in children's ETS exposure, but for a greater than background reduction in ETS exposure. In order for a study to produce a significant effect, the impact of interventions must be greater than the comparison groups' rate of decline. Moreover, this finding also suggests that measurement alone may produce an intervention effect and thus an important component of any intervention. It may also be that as most studies used comparison groups rather than control groups (i.e. no cessation or avoidance advice and no information), the comparison interventions may have been more effective than anticipated. As the studies have generally involved comparison groups receiving a limited intervention rather than being strict control groups, this is certainly possible.

Limitations of methods employed

Parent reports and reliability

Of the 13 studies which used objective measures of children's ETS exposure or absorption, nine allowed correlation with parental reports, and only four showed no discrepancy between parental report of children's exposure and the biological measure. Achieving parental or carer smoking cessation would result in reductions in ETS exposure for the child, in addition to obvious benefits for the ex-smoker. The child harm minimisation approach in this context aims to change adult smoking location or amount, but does not aim for cessation. There is insufficient evidence to comment on whether the parental or carer cessation approach, or the child harm minimisation, is the strategy most likely to lead to reduction of children's ETS exposure. If they were equally effective, adult cessation would be the preferable strategy, because of the benefits to the adult, as well as elimination of the negative role modelling associated with smoking, and would therefore be the preferable strategy.

AUTHORS' CONCLUSIONS

Implications for practice

- There is currently insufficient evidence to recommend one strategy over another to reduce the prevalence or level of children's environmental tobacco smoke exposure.

- There is no clear evidence of success within different settings, including 'well child', ill child and community contexts.

- There is limited support for more intensive counselling interventions delivered to parents.

- There is greater support for interventions concentrating primarily on changing participants' attitudes and behaviours, rather than on changes in knowledge.

Implications for research

- Given the potential for bias in parental report of children's ETS exposure, future studies should use biochemical verification of children's exposure to or absorption of ETS.

- Studies with larger sample sizes are also recommended, to adequately explore the effects of interventions of family and carer interventions to reduce children's exposure to ETS.

- Interventions should ensure that reductions in children's ETS exposure are greater than reductions in ETS exposure in comparison groups and in the wider community.

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CHARACTERISTICS OF STUDIES

Characteristics of included studies *[author-defined order]*

Davis 1992

Methods	Country: USA Setting: Telephone smoking cessation helpline RCT. Randomized by day of week, but counsellors blinded to the guide being used.
Participants	630 smoking mothers with children under the age of 6 years calling helpline
Interventions	Callers to a telephone smoking cessation assistance service were randomized to receive one of 3 self help guides. One was specifically written for the target audience, one from the American Lung Association, one developed by the National Cancer Institute. Callers to the line received individual stage-based counselling and were sent the guide by mail.
Outcomes	6 months later the participant was called and interviewed for 10 mins about the use of guide, opinion of the guide, quit attempts and strategies to quit, and current smoking.
Notes	Retention: 630/ 873 (72%)

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - unclear

Zhang 1993

Methods	Country: China Setting: school CT; schools in one district received intervention, compared with schools in a second district
Participants	20382 children in 44 primary schools. 68.8% of Intervention and 65.5% of Control fathers smoked at baseline
Interventions	Intervention: a tobacco prevention curriculum was introduced comprising social and health consequences of tobacco use, training in refusal skills. Smoking control policies for schools were encouraged. Children in intervention schools wrote letters to their fathers asking them to quit smoking, and monitored their smoking behaviour Control: usual curriculum.
Outcomes	At 8 months:Self report of smoking cessation by smoking fathers, at interview with health educator.
Notes	

Risk of bias

Zhang 1993 (*Continued*)

Item	Authors' judgement	Description
Allocation concealment?	No	C - Inadequate

Elder 1996

Methods	Country: USA Setting: Schools RCT. Cluster randomization by school
Participants	96 elementary schools in 4 states
Interventions	Trial of school-based cardiovascular health promotion, including an intervention designed to limit child ETS exposure: Intervention:consisted of promoting the adoption of a formal tobacco-free policy for the school. In addition, there were classroom and home-based programmes for students. Control: schools participated in the evaluation but received no recommendations for policy, classroom or home-based interventions. Control schools were not restricted from taking up tobacco-free policies.
Outcomes	At 2 years: School principals (or delegates) were surveyed with respect to their school's policy on tobacco and degree to which the policy was observed.
Notes	Retention: 96/96; this is the CATCH study

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Conway 2004

Methods	Country: USA Setting: Community RCT
Participants	143 Latino parents of children aged 1-9 who reported smoking at least 6 cigarettes a week.
Interventions	Intervention: 6 home and telephone sessions over a 4 month period delivered by lay trained bicultural and bilingual Latina community health workers. Focused on problem solving aimed at lowering target child's exposure to ETS in the household. Intervention methods included contracting, shaping, positive reinforcement, problem solving, and social support to assist families in achieving their ETS goals. Control: Survey completion only.
Outcomes	3 and 12 month follow up. Child hair nicotine and cotinine. Parent report of child's past month exposure from all sources in the household over last 30 days as measured

Conway 2004 (*Continued*)

	by number of cigarettes. Confirmed reduction based on both parents' reports and children's hair biomarkers
Notes	Retention: 127/143 (89%)

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	No mention of randomization process

Woodward 1987

Methods	Country: Australia Setting: maternity hospital CT: allocation by month of delivery
Participants	184 parents of newborn babies whose mothers smoked during pregnancy
Interventions	Intervention: mothers in the maternity hospital were given an information kit about the effects of ETS on children, and ways to quit smoking and a letter from the director of the neonatal Intensive Care Unit urging parents to avoid exposing children to ETS. The kit was given to women by a research worker, who explained the material and answered questions. Women were telephoned at 1 month and asked about their progress, use of the kit, and given further information if required. Control and Follow up only: did not receive the above intervention.
Outcomes	At 3 months: Infant urine cotinine levels Maternal quitting, maternal cotinine
Notes	Retention: 157/184 (85%)

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	No	C - Inadequate

Greenberg 1994

Methods	Country: USA Setting: recruited at maternity hospitals, intervention in family home RCT
Participants	933 mothers (141 who smoked) of newborn babies

Greenberg 1994 (*Continued*)

Interventions	Factorial design, 'Full' vs 'reduced' data collection. Full group visited at home when infants approximately 3 weeks old and had 2 weekly telephone questionnaire. Intervention: A study nurse visited homes 4 times for 45mins delivering a programme aimed at developing a mother's skills at maintaining a smoke-free environment for her child: information re child ETS exposure, sources of ETS and required the mother's participation. Written resources were left with the mother. Follow up visits were made 1,3 and 5 months later. Control: the only contact was for data collection.
Outcomes	'Full' subgroup were surveyed and urine collected at baseline Data were collected again in homes when infants were 7 and 12 months old. Data on lower resp symptoms were collected by telephone survey every 2 weeks, in full subgroup
Notes	Full data for 583/933 (62%)

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Yes	A - Adequate

Severson 1997

Methods	Country: USA Setting: Hospital & well baby clinics RCT, randomization by practice
Participants	2901 mothers of newborn babies who had smoked prior to pregnancy (1875 smokers, 1026 nonsmokers at enrollment
Interventions	In the first 1 to 3 days after birth in hospital, mothers received a packet containing a brochure and a letter from the paediatrician about the health affects of passive smoking, and a no-smoking sign. Intervention: Mothers received further materials and brief oral counselling from the paediatrician at the well baby visits at age 2 weeks and 2, 4, and 6 months. Paediatricians received a 45min training session. Control: received the hospital packet only.
Outcomes	Assessment at 6 and 12 months by mailed questionnaire: Quit rates (sustained at 6 and 12months, and point prevalence at 12months) CPD, readiness to quit, likelihood of quit attempt. Secondary outcomes: knowledge of and attitudes towards ETS
Notes	Retention: 2003/2901 (69%) 1-tailed T test employed

Risk of bias

Item	Authors' judgement	Description

Severson 1997 (*Continued*)

Allocation concealment?	No	Not used

Armstrong 2000

Methods	Country: Australia Setting: Community (Child health nurse home visits) Type: RCT
Participants	181 women recruited from a post-natal ward who had given birth to a single live infant, identified as 'at risk' (1or more of identified physical domestic violence, identified childhood abuse of either parent, sole parenthood or ambivalence to pregnancy as well as 3 or more of maternal age <18 years, unstable housing, financial stress, poor maternal education, low family income, social isolation, history of mental health disorder, drug or alcohol abuse and domestic violence other than physical abuse).
Interventions	Intervention: Home-based intervention focused on establishing trust with families, enhancing parenting self esteem and confidence, guidance for child development including crying and sleep behaviour, promoting preventive child health care and facilitating access to child health centres. Weekly home nurse visits for first 6 weeks, fortnightly for 3 months and then monthly until 6 months post partum. Control:Usual care.
Outcomes	At 4 months. Health outcomes only reported at 12 months. Maternal self report of smoking behaviour and observations by research assistants of smoking behaviour in the home Child health questionnaire
Notes	Retention: 160/181 (88%)

Risk of bias

Item	**Authors' judgement**	**Description**
Allocation concealment?	Yes	Computer-generated random number table

Emmons 2001

Methods	Country: USA Setting: family home Type: RCT
Participants	291 smoking parents (or grandparents) living with a child <3 years old, recruited from hospital labour and delivery logs; community health centres and health care providers; self-referral
Interventions	Intervention: received a 30-45min motivational interview at the parent's home with a trained health educator, and 4 follow-up telephone counselling calls (approx. 10min each), aiming to reduce household ETS exposure and increase the smoker's level of readiness for change. Feedback was provided of baseline household air nicotine, parent's CO level and smoking-related respiratory symptoms. Self-help materials targeting ETS reduction and smoking cessation strategies were also provided.

Emmons 2001 (*Continued*)

	Control: self-help materials only; cessation manual, ETS reduction tip sheet, resource guide.
Outcomes	ETS exposure measured by air monitors at baseline and 6 months. Quitting and CPD by parent
Notes	Retention: 247/291 (85%)

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Yes	A - Adequate

Ratner 2001

Methods	Country: Canada Setting: Community Type: RCT
Participants	251 mothers who had quit smoking during pregnancy
Interventions	Intervention: Mothers received nurse-delivered telephone support, relapse prevention training and information resources. Control: Usual care
Outcomes	Self report of smoking status Biological verification with exhaled CO.
Notes	Retention: 238/251 (95%)

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Yes	Random assignment via computer software package

Schonberger 2005

Methods	Country: Netherlands Setting: Community RCT; cluster
Participants	476 children seen to be at high risk of asthma recruited during the prenatal period
Interventions	Intervention: 3 home visits (2 prenatal and 1 post-natal) with recommendations to reduce 4 main environmental exposures of mite allergens, pet allergens, food allergens, and passive smoking pre- and postnatally.

Schonberger 2005 (*Continued*)

	Control: Usual care
Outcomes	Parent report of child ETS exposure Maternal CO Child IgE Tidal airway resistance and lung function Allergen measures
Notes	Retention: 443/ 476 (93%)

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	Clusters by subregional ZIP codes

Wiggins 2005

Methods	Country: UK Setting: Community Type: RCT
Participants	731 mothers who lived in deprived London districts and met the inclusion criteria after answering an information leaflet
Interventions	Intervention Group 1: Support Health Visitor intervention consisting of monthly supportive listening visits to the mother's home, beginning when the baby was 10 weeks old. The primary focus was on the mother rather than her child, as well as providing practical support and information. Intervention Group 2: Assignment to one of eight community groups that offered service for mothers with children less than 5 years in the study area. Control: Usual care
Outcomes	Childhood injury, maternal depression and smoking Uptake and cost of health services, household resources, maternal and child health, experiences of motherhood and infant feeding
Notes	Retention: 601/731

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Yes	Computer generated. Minimisation used for possible confounders.

Chilmonczyk 1992

Methods	Country: USA Setting: Well baby check RCT.
Participants	103 mothers smoking >=10 cigs/day with infants presenting to a well baby check
Interventions	Urine was collected from all infants and analysed for cotinine. Intervention: a report of infants' urinary cotinine level with a personalised letter to the mother to be signed were returned to the child's doctor. The letter outlined ways to reduce child ETS exposure (location of smoking, washing hands after smoking, ensure day care home is smoke-free, ask friends to avoid smoking in the presence of the infant when visiting) but did not discuss cessation. The physician called the mother by telephone to further explain the results. Control: Usual care
Outcomes	At 2 months all participants were contacted to obtain a second urine sample from the infant for analysis.
Notes	Retention: 56/103 (54%)

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Vineis 1993

Methods	Country: Italy Setting: Immunization Clinic CT: Non-random assignment
Participants	1015 parents of newborn babies (all mothers including nonsmokers recruited) recruited when attending the clinic for the 3 month vaccination of the infant
Interventions	Intervention: counselled for 15min by a nurse on the health effects of active smoking and ETS, 3 booklets, one of which was about the health effects of ETS on children. Control: did not receive counselling or booklets.
Outcomes	At 2 and 4 years: self-reported cessation
Notes	Retention: 747/1015 (74%)

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	No	C - Inadequate

Eriksen 1996

Methods	Country: Norway Setting: Health centres RCT
Participants	443 families with one or more smoking parent presenting with a child to a well baby check at 6 weeks, 2 or 4 years
Interventions	Intervention: 5min counselling from health visitor on harmful effects of parent smoking on children and how to prevent it (stop smoking indoors/ in living rooms or quit completely). 3 brochures distributed (harm of passive smoking, measures to prevent passive smoking, self-help cessation manual) and a list of smoking cessation courses. Control: given no information unless participants asked for it, until after the period of study. Physicians were asked to withold their usual advice. Self-completed questionnaires were administered at the visit and 1 month later.
Outcomes	Parent behaviour by self-report at baseline and 1 month.
Notes	Retention 363/443 (82%)

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Fossum 2004

Methods	Country: Sweden Setting: Community, Child Health Centres CT
Participants	41 mothers of newborn infants attending participating child health centres
Interventions	Intervention: 'Smoke free children' counselling provided by nurses Control: Usual care
Outcomes	3 months Self-reported smoking habits (number of cigarettes smoked) Maternal cotinine levels
Notes	Retention: 100% for self-report measures. Cotinine follow-up measures: 85% Intervention, 57% Control.

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	No	Not used

Zakarian 2004

Methods	Country: USA Setting: Community RCT
Participants	150 smoking mothers with children aged 4 or younger
Interventions	Principal investigator and project co-ordinator met with medical directors from each clinic to plan the investigation implentation and then regularly through the study to 'enlist participation and ongoing support' Intervention: 7 behavioural counselling sessions (3 in-person and 4 over the telephone) over 6 months. Mothers were assisted with developing plans to re-shape their and other household members' smoking behaviours. Mothers were asked to use pictorial charts and to self monitor their smoking and exposure. If paraticipant asked counsellor for help with quitting smoking they were issued a 'Quit Kit' from the American Cancer Society. Control: Usual care and 3, 6, and 12 month follow-up measures.
Outcomes	Mother report of smoking status and child's exposure to ETS Child urinary cotinine concentrations Air nicotine monitors
Notes	Retention: 128/150 (85%)

Risk of bias

Item	**Authors' judgement**	**Description**
Allocation concealment?	Yes	Random number generation

Abdullah 2005

Methods	Country: Hong Kong, China Setting: Community (maternal and child health centres) Type: RCT
Participants	952 parents from a birth cohort who were listed as smokers in the '1997 Birth Cohort Study' of the Department of Community Medicine, University of Hong Kong.
Interventions	Intervention: 20-30 minutes of telephone counselling with information basd on the individuals needs; no NRT information given unless asked and even still information given was kept minimal. Stage-based printed self-help materials (based on baseline) provided just once. Control: Recieved stage-based printed self-help material only.
Outcomes	At 6 months. Parental quitting: Self reported 7 day prevalence quit rate, Self reported 24h point prevalence quit rate, Self reported continuous abstinence rate, Bio-chemically validated (either CO or urinine cotinine or both) quit rate. Reported implementation of total or partial smoking ban at home
Notes	Retention: 837/952

Abdullah 2005 (*Continued*)

Risk of bias		
Item	**Authors' judgement**	**Description**
Allocation concealment?	Yes	serially labelled opaque envelopes

Kallio 2006

Methods	Country: Finland Setting: Community, well baby clinics RCT
Participants	1062 families presenting at a well baby clinic in Turku with a child of 5 months old
Interventions	Component of larger prospective intervention trial aimed at decreasing exposure of children to known environmental cardiovascular risk factors. Intervention: Parents received booklet about the adverse effects of smoking at age 5 years. Counselling from paediatrician and dietician about major cardiovascular risk factors including smoking generally discussed with parents. Appointment with paediatrician and dietician at 1-3 monthly intervals until age 2 years, then 6 monthly. Control: Normal health education given to all Finnish families at well baby clinics and through school system. Appointment with paediatrician and dietician at 4-6 monthly intervals until age 2 years, then 6 monthly until age 7, then yearly.
Outcomes	Follow up when child 8 years of age. Parent report of smoking status and habits, reported child exposure to ETS in past 3 days. Parent serum cotinine.
Notes	Retention: 625/1062 (59%)

Risk of bias		
Item	**Authors' judgement**	**Description**
Allocation concealment?	Unclear	Not described

Winickoff 2008

Methods	Country: USA Setting: Hospital and community Quasi-experimental RCT
Participants	101 mothers and fathers of newborns recruited on the post-natal ward who were current smokers or recent quitters

Winickoff 2008 (*Continued*)

Interventions	Intervention: Brief motivational interview, enrolment in a proactive state quitline, follow-up faxes to their health professionals with tailored treatment measures Control: Usual care
Outcomes	3 month follow up where participants enrolment in the state smoking quit line was assessed and the self-reported smoking status was taken with a salivary cotinine level as confirmation of a self-reported 7-day point prevalence cessation.
Notes	Retention: 75% Control and 69% Intervention available for follow up

Risk of bias

Item	**Authors' judgement**	**Description**
Allocation concealment?	No	Each day of the week was assigned to be control or intervention.

Hughes 1991

Methods	Country: Canada Setting: Hospital and home, asthma management programme RCT
Participants	95 children admitted to hospital in the previous 5 years with asthma, and their parents (not all smokers)
Interventions	Intervention: cared for by a paediatric respiratory physician through the 12m study period. In addition, seen at clinic visits and visited at home by a nurse coordinator who provided written information about asthma care and carried out an asthma education session around lung and airway anatomy, asthma episodes and treatment. Patient's home visited at least 3 times. Environmental exposures checklist drawn up; role of cigarette smoke discussed; parents discouraged from smoking in the home and encouraged to participate in a smoking cessation programme. Control: patients managed by their usual primary care physicians and reviewed by the study physician at intervals.
Outcomes	At 12 months: Exposure to ETS at home. (Primary study outcomes were related to asthma management)
Notes	

Risk of bias

Item	**Authors' judgement**	**Description**
Allocation concealment?	Unclear	B - Unclear

McIntosh 1994

Methods	Country: USA Setting: clinic RCT
Participants	92 smoking parents of children with asthma
Interventions	Intervention: child's physician delivered a standardized passive smoking message to parents, consisting of counselling about the effects of passive smoking and advice to quit or smoke outside. Parents given a specifically designed pamphlet that reinforced this message. About 1 month later, parents received a personalized letter from the principal investigator, containing the result and explanation of their child's urine cotinine test. Included was a self-help manual aimed at encouraging smoking outside. Control: Parents received the physician's message and the pamphlet only.
Outcomes	At 4-6 months: Self-reported location of smoking, attempts to quit; Child urine cotinine
Notes	Retention: 72/92 (78%)

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Wahlgren 1997

Methods	Country: USA Setting: Paediatric allergy medical clinics RCT
Participants	91 families with children with asthma
Interventions	Intervention: parent and child attended a series of intensive counselling sessions over 6 months designed to reduce child's exposure to parental smoking. Diaries were used in the 2 weeks preceding visits to record parental smoking, child's ETS exposure, child's peak flow readings and child's symptoms. These data were used for tailored counselling. Control (Monitoring): Used the same monitoring methods but did not receive counselling. Control (Usual Care): Attended the same frequency of clinics but did not maintain records nor receive counselling.
Outcomes	At 6 months from end of intervention: Parent self report of cigs smoked in presence of child. Air nicotine in room with heaviest child exposure measured by environmental monitor. 2 years later, after debriefing about the study, the two comparison groups achieved similar reductions in parent-reported rates of child exposure and the intervention parent-reported child exposure rate was similarly maintained.
Notes	

Wahlgren 1997 (*Continued*)

Risk of bias		
Item	**Authors' judgement**	**Description**
Allocation concealment?	Unclear	B - Unclear

Irvine 1999

Methods	Country: Scotland Setting: home RCT
Participants	501 smoking parents of children with asthma
Interventions	Intervention: brief advice from a nurse visiting the family home; information about passive smoking and asthma, financial and health benefits of quitting; information on how to stop smoking; advised to move to a different room or outside the home if they did not intend to quit; advised not to allow visitors to the home to smoke. Given 2 leaflets at baseline- one commercially available and the other to reinforce the brief advice. Questionnaires were completed. Further leaflets were distributed by mail at 4 and 8months after baseline with a letter encouraging them to stop smoking. Control: participants received the commercial leaflet at baseline but nothing else.
Outcomes	At 12 months: Child's saliva cotinine; Mother's saliva cotinine Self-reported quit attempts
Notes	Retention: 435/501 (87%)

Risk of bias		
Item	**Authors' judgement**	**Description**
Allocation concealment?	Unclear	B - Unclear

Wilson 2001

Methods	Country: USA Setting: Paediatric pulmonary service of a paediatric hospital RCT
Participants	87 parents of children aged 3-12 with asthma and who were ETS exposed. (At baseline 61% of intervention group maternal caregivers smoked vs 42% of controls).
Interventions	All children examined at baseline by a paediatric pulmonary specialist, and their treatment adjusted as appropriate. Intervention: Caregiver received 3 nurse-led sessions over a 5 week period, employing behaviour-change strategies and basic asthma and ETS education, along with repeated feedback on the child's urinary

	cotinine level (measured each session). The child and other family members were sometimes involved. Control: caregivers received basic asthma advice by a nurse, along with the statement that ETS is to be avoided. Mothers who requested the cotinine result were told whether or not cotinine had been detected.
Outcomes	At 12 months: Urinary cotinine, acute asthma episodes. Secondary study outcomes were hospitalisation, prohibition of smoking in the home; CPD; parent-reported exposure of children and asthma control
Notes	Follow-up cotinine data obtained in 51/87 (59%)

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Hovell 2002

Methods	Country: USA Setting: Community Type: RCT
Participants	204 families with an asthmatic child from 3 to 17 years of age whose natural parent(s) were Latino or Hispanic, lived with at least 1 smoker and who reported exposure to at least 6 cigarettes in the previous week.
Interventions	Intervention: Asthma management education session delivered in the home including generic advice to reduce child exposure to ETS. Follow-up coaching consisting of 7 in-home sessions of 30-45 mins over 3 months plus follow-up phone call. Control: Asthma management education session and follow-up visits for measurement only.
Outcomes	At 4, 7, 10 and 13 months. Parental report of child ETS exposure Child's urinary cotinine Air nicotine levels (20% of homes) Parental saliva cotinine
Notes	Retention: 188/204 (92%). 11 participants dropped out prior to randomization, 5 dropped out before outcome measurement.

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Yes	Excel spreadsheet

Krieger 2005

Methods	Country: USA Setting: Community Type: RCT
Participants	274 low income households containing a child aged 4-12 years who had asthma recruited by media publicity, hospitals and emergency departments.
Interventions	Intervention: High-intensity intervention with community health workers providing in home environmental assessments, education, support for behaviour change (7 sessions) and a full set of resources. Control: Low-intensity intervention group received a single visit and limited resources.
Outcomes	Parent self report Pediatric asthma caregiver quality of life Self reported asthma related urgent health care service use Participant report of presence of asthma triggers in the home, including smoking behaviour
Notes	Retention: 110/138(80%) in high intensity and 104/136(76%) in low intensity group.

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Yes	Sequence numbers and group allocation were concealed in sealed, opaque, numbered envelopes prepared centrally and provided sequentially to interviewers.

Groner 2000

Methods	Country: USA Setting: hospital RCT
Participants	479 smoking mothers accompanying a child under 12 years to a hospital
Interventions	Two intervention groups ('Child Health Group' [CHG]; 'Mother's Health Group' [MHG]) and a control group. Intervention: received a brief (10-15 min) counselling session given by a trained nurse while waiting to see a doctor. Subjects in the CHG were informed of the hazards of ETS on their child, but not themselves; subjects in the MHG were informed of the effects of smoking on their own health but not their child. They were given standard self-help manuals and materials specific to their group allocation. Notably, even mothers in the CHG were not encouraged to change their smoking location. They received reminder postcards at 2 weeks and 4 months post intervention encouraging them to quit. Control Group: received usual care with no additional advice about smoking.
Outcomes	Maternal smoking status; stage of change; CPD; smoking location; knowledge of ETS effects at 6 months. Assessment by telephone at 1 and 6 months post intervention, blinded assessor, or mailed questionnaire.

Groner 2000 (*Continued*)

Notes	Retention: 232/479 (48%)	
Risk of bias		
Item	**Authors' judgement**	**Description**
Allocation concealment?	Unclear	B - Unclear

Hovell 2000

Methods	Country: USA Setting: Individual counselling in person and by phone RCT	
Participants	108 mothers smoking at least 2 CPD with child/ren <4 years, using a supplemental nutrition programme	
Interventions	Intervention: Mothers given 7 individualised counselling sessions (3 in person, 4 by phone) designed to reduce child exposure to ETS. Mothers recorded their smoking and child's exposure and were given 'No Smoking' signs and stickers; at subsequent sessions new objectives were set and positive feedback to mothers was given, where appropriate. Total duration 3 months Control: usual care nutritional and brief advice about smoking and child ETS exposure.	
Outcomes	Child urine cotinine, reported exposure, parental smoking Mothers were surveyed at 3, 6 and 12 months, urine collected at baseline, 6 and 12 months .	
Notes	Retention: 96/108 (89%)	
Risk of bias		
Item	**Authors' judgement**	**Description**
Allocation concealment?	Yes	A - Adequate

Wakefield 2002

Methods	Country: Australia Setting: recruited from paediatric outpatient clinics, intervention by mail and phone CT: alternation by week of attendance at clinic
Participants	292 smoking parents of children aged 1-11 with asthma
Interventions	At baseline urine analysed for cotinine:creatinine ratio. Intervention: parents sent a letter signed by the study coodinator explaining their child's baseline cotinine-to-creatinine ratio, and encouraging banning smoking at home. 2 booklets enclosed: 1 explained the effects of ETS on children and gave advice to parents on its restriction; the other concerned quitting. The index parent was contacted by telephone 1 week and 1 month later for advice and encouragement. Control: usual advice about smoking from doctors and nurses.

Wakefield 2002 (*Continued*)

Outcomes	At 6 months: smoking bans at home: Secondary study outcomes: parent reports of bans on smoking in car; CPD child urinary cotinine; parent-reported cessation
Notes	Retention 264/292 (90.4%)

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	No	C - inadequate

Kimata 2004

Methods	Country: Japan Setting: Hospital outpatient clinic RCT
Participants	Children with mild atopic eczema/dermatitis syndrome and normal children whose parents smoked 10-15 CPD at home
Interventions	Intervention: Not clear: "Parents of the cessation of passive smoking group agreed to stop smoking" Control: Usual care
Outcomes	At 1 month: Child urinary cotinine Child skin wheal response Child plasma neurotrophin levels
Notes	Not provided.

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	Not described.

Chan 2005

Methods	Country: Hong Kong, China Setting: Hospital (pediatric wards/outpatients) Type: RCT
Participants	80 parents of sick children presenting to a clinic or admitted to a children's ward of a major Hong Kong hospital

Chan 2005 (*Continued*)

Interventions	Intervention: Individualised motivational intervention for 30 minutes with nurse counsellor; appropriate stage-matched intervention was used to 'increase motivation and lower resistance to quit' telephone reminder 1 week after the intervention. Control: Healthy diet counseling for their sick children as a placebo intervention.
Outcomes	1 month follow up Parents report of daily cigarette consumption in past 30 days
Notes	Retention: 77/80

Chan 2006a

Methods	Country: Hong Kong, China Setting: Hospital (paediatric wards and outpatient departments) RCT
Participants	1483 Mothers of sick children admitted to the ward or attending the outpatient department from all the participating trial centres November 1997 - September 1998.
Interventions	Intervention: Mothers received information from nurses including standardized health advice, booklet about preventing child exposure to passive smoking, booklet to give to fathers on quitting smoking, a no smoking sign to place in the home to remind the father not to smoke and a telephone reminder 1 week later. Control: Normal care by nurses.
Outcomes	3, 6 and 12 month follow up. Mother self-reports actions taken to reduce child passive smoke exposure.
Notes	Retention: 1273/1483 (86%)

Risk of bias

Item	**Authors' judgement**	**Description**
Allocation concealment?	Unclear	Computer-generated random numbers placed in sealed envelopes. Some possibility of contamination.

Curry 2003

Methods	Country: USA Setting:Paediatric clinics serving ethnically diverse population of low income families RCT
Participants	303 Self-identified women smokers whose children received care at participating clinics

Curry 2003 (*Continued*)

Interventions	Intervention: During clinic visit women received brief motivational message from the child's clinician, a guide to quitting smoking, and a 10 minute interview with a nurse or study interventionist.Women also received as many as 3 outreach telephone counselling calls from the clinic nurse or interventionist in the 3 months following the visit. Control:Usual care
Outcomes	3 and 12 month follow up. Maternal self-reported 7-day abstinence Maternal CO testing
Notes	Retention: 81% at 12 months

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	No	Participants chose ping pong ball from brown paper bag

Nuesslein 2006

Methods	Country: Germany Setting: Paediatric clinic RCT
Participants	40 mothers attending participating paediatric practice and self reporting smoked at least 10 CPD
Interventions	All participants received a quit smoking information sheet and had urinary cotinine levels taken. Intervention: Received results of their cotinine levels within 1 week. Control: Did not receive results of cotinine levels until completion of data collection.
Outcomes	At 6 weeks. Maternal self report of tobacco consumption Urinary cotinine levels
Notes	Retention: 38/40 (95%)

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	Not stated.

Yilmaz 2006

Methods	Country: Turkey Setting: Hospital RCT
Participants	375 mothers with children attending 'well child' clinic or for any primary complaint
Interventions	Intervention 1: Smoking cessation intervention aimed at child's health Intervention 2: Smoking cessation intervention aimed at mothers' health Control: No smoking cessation advice
Outcomes	Maternal smoking status Smoking location change Post-intervention knowledge change
Notes	Retention: 128/150 (85%)

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	No	A nurse 'randomly picked numbers' from a list of participants to assign the groups

CO: carbon monoxide
CPD: cigarettes per day
CT: controlled trial
ETS: environmental tobacco smoke
IgE: Immunoglobulin E
min: minute(s)
RCT: randomized controlled trial

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

Study	Reason for exclusion
Philips 1990	Met main inclusion criteria but the outcome measure was the report by kindergarten students of their intent to avoid cigarette smoke (leave the room themselves or ask an adult smoker to stop smoking). This outcome measure is believed by the authors to be too unreliable to include this study.
Meltzer 1993	Multiple-baseline, quasi-experimental design.
Murray 1993	Longitudinal study.
Campion 1994	The outcomes are assessed by 2 surveys carried out before and after the campaign. This study targeted pregnant women.

(*Continued*)

Wilson 1996	Baseline results only.
Manfredi 1999	This study targets predominantly women, some of whom were mothers.
Cookson 2000	Before and after study
Spencer 2000	Pilot study only. No further results available.
Emmons 2000	Quasi-experimental historical comparison design
Arborelius 2001	Longitudinal study.
Badger 2003	Conference abstract only. Authors contacted and no further study information provided.
Okah 2003	Secondary analysis of an RCT of bupropion for smoking cessation.
Morgan 2004	Does not include outcome data related to ETS.
Loke 2005	Intervention targets pregnant women and their non-smoking spouses during perinatal period only.
Stepans 2006	Pilot study only.
Klinnert 2007	Does not include outcome data related to ETS.
Burmaz 2007	Minimal data on smoking at either baseline or follow up as smoking only very small component of intervention.

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

Sockrider 2003

Trial name or title	Project PANDA (Parents and Newborns Developing and Adjusting)
Methods	RCT
Participants	485 pregnant women at 28 week gestation reported *not* having smoked in the last 28 days, but had a history of smoking before pregnancy.
Interventions	Intervention: Mothers received 1 video and 5 newsletters; partners received a different set of videos and newsletters; all information was distributed by mail between 28 week gestation and 6 weeks postpartum. Newsletters included information on protecting the infant from ETS, tips on relapse prevention and a sign to designate the home as smoke free. Control: Usual care, would have received messages about ETS exposure as part of standard counselling from the paediatric care provider or community education.

Sockrider 2003 (*Continued*)

Outcomes	Home Smoking Control Index: 4 interview questions, responses classified home into 1 of 3 categories regarding their home smoking policy. Reported tobacco smoking in the home: estimate of average number of hours smoking in the home each day Validation of self-reported smoking in the home: passive nicotine monitors used to validate self report.
Starting date	Note first paper published, no ETS results as yet.
Contact information	Dr Patricia Mullen
Notes	Email contact with authors, no reply at time of publication

Borrelli 2004

Trial name or title	Parents of Asthmatics Quit Smoking (PAQS) Study
Methods	2-group randomized design. Compares the efficacy of 2 theoretically-based interventions, the Behavioural Action Model (BAM) and the Precaution Adoption Model (PAM).
Participants	Smokers who are the primary caregivers of children with asthma Children are receiving nurse-delivered home-asthma care and education services as part of insurers standard of care. Caregiver smokes at least 3 CPD, is >18, speaks English or Spanish and is not receiving treatment for smoking cessation.
Interventions	Both groups (BAM and PAM) receive the same level of intervention regardless of the cessation counselling group they are in. This comprises: • Provision of asthma treatment and the 'Breath Easy' asthma education programme • Self-help smoking cessation treatment manuals (American Lung Association) • Free nicotine patch therapy, if they are ready to quit in the next 30 days. BAM: the counselling intervention is delivered through AHCPR guidelines, more action-orientated. PAM: the counselling intervention is delivered through motivational interview, uses CO feedback and feedback on ETS levels to increase smokers' risk perceptions.
Outcomes	Primary: Smoking status, change in motivation/ stage of change, ETS Secondary: Asthma symptoms, health care utilization, school days missed, activity limitations
Starting date	May 2001
Contact information	Belinda Borelli
Notes	Email contact with author - outcome results not yet available.

Wilson 2005

Trial name or title	Cincinatti Asthma Prevention (CAP) Study
Methods	Baseline study results only available. Full intervention details not yet reported.
Participants	222 children who have been diagnosed with asthma by physician and are exposed to 5+ CPD, in or around the home. Home has electricity and family have no plans to move in the next 12 months
Interventions	Not yet reported.
Outcomes	ETS exposure self report ETS exposure biological verification with hair and serum samples tested for cotinine Housing characteristics collected by an environmental technician and collection of level of particulate matter Race and sociodemographic covariates
Starting date	Part of ongoing CAP study
Contact information	Dr Bruce Lanphear
Notes	Email contact with author - study outcomes not yet available.

Chan 2006b

Trial name or title	Implementing smoking hygiene policies in households with infants exposed to secondhand smoke: intervention targeted at non-smoking mothers
Methods	RCT
Participants	208 Chinese families with non-smoking mother, smoking father and infant living together in the same household, and attended a maternal and child health centre
Interventions	Multi-step family smoking cessation intervention delivered onsite by a nurse smoking cessation counsellor. Mothers given guidelines and motivated to implement the household no-smoking policy.
Outcomes	Implementation of household no-smoking policy
Starting date	2005
Contact information	Dr Sophia Chan
Notes	Email contact with author - full outcome results not yet available.

Winickoff 2007b

Trial name or title	CEASE (Clinical Effort Against Secondhand Smoke Exposure) study
Methods	2 paediatric practices randomly selected from within the Boston area and then randomly allocated to receive the CEASE intervention or usual care.
Participants	Paediatric clinicians and parental smokers
Interventions	The intervention used available systems of care rather than research staff.The primary outcome was rates of paediatric clinicians giving assistance to parental smokers (defined as discussion of cessation methods beyond simple advice, recommendation or prescription of pharmacotherapy, or enrollment in a quitline or local programme).
Outcomes	Parental behaviour change: number of cigarettes smoked, smoking cessation
Starting date	Unclear
Contact information	Dr Jonathan Winickoff
Notes	At time of the review update only limited results available from conference abstract, study author provided a qualitative paper on development of intervention currently in press and reported that full outcome data were not yet available.

Wipfli 2008

Trial name or title	FAMRI Homes Study
Methods	Cross-sectional study with Pilot RCT alongside
Participants	Non-smoking women and children in developing countries throughout the world.
Interventions	Baseline study only; intervention not yet reported
Outcomes	Passive air monitors to measure household air nicotine Hair nicotine test for personal ETS exposure (taken from primary female caregiver and 1 child <11 years in the house)
Starting date	2006
Contact information	via Dr Sophia Chan
Notes	Data on cross-sectional study available only; no information currently available regarding pilot RCT

DATA AND ANALYSES

Comparison 1. Results

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Main outcomes			Other data	No numeric data

Analysis 1.1. Comparison 1 Results, Outcome 1 Main outcomes.

Main outcomes

Study	
Abdullah 2005	Biochemically validated quit rate: Intervention 47 (10.6) Control 21 (4.5) Had not quit but had reduced intake: Intervention 145 (32.6) Control 83 (18.1) Stopped smoking for at least 24 hours: Intervention 145 (32.7) Control 136 (29.7) Complete restriction: Intervention 113 (24.6) Control 151 (34.1) Partial restriction: Intervention 278 (62.7) Control 259 (56.4)
Armstrong 2000	Smoking in house around infant (maternal self report verified by researcher observation during home visit) Intervention 8.6% v Control 23.8% (P<0.05)
Chan 2005	No statistically significant evidence of effect. Quit rate at 1 month post intervention: Intervention 7.5% [95%CI: 0 to 21] v 2.5% [95% CI: 0 to 7] control NS Reduced smoking consumption by half (self report): Intervention: 15% Control: 10% NS Reported quit attempts in last 30 days: Intervention 20% Control 7.5% NS Moved up the stage of readiness to quit: Intervention 17.5% Control 10% NS
Chan 2006a	Three most frequently reported actions taken by the mother to protect the child from passive smoking at home: opening the windows (N=641, 43.9%), asking the father not to smoke near the child (N=608, 41.6%), and moving the child away from the smoke (N=482, 33%). Moved the children away when they were exposed to the fathers' smoke at home at 3-month follow up (78.4% vs. 71.1%; P= 0.01) NS at 6 and 12 months. Number of smokers (excluding the father) living with the child at 12 month follow up (11%vs13% P=0.049) Smokers who smoked at home (Excluding Child's Father), at 12-month follow up (92% vs 93% NS) Child's ETS exposure at home by any smoker 3 mths Intervention 37% vs Control 42% (P=0.02) 6mths 51% vs 53% P=0.48 12 mths 52% vs 58% P=0.03
Chilmonczyk 1992	No evidence of effect. Intervention: 27/52 provided follow-up urine. Control 29/51 provided follow-up urine. Mean log urinary cotinine difference x100: Intervention group 2.05, control 2.17. P=0.26
Conway 2004	No significant effect. Hair nicotine (log ng/mg) 3mth Intervention 0.28, Control 0.32;12mth Intervention 0.23, Control0.23 NS Hair cotinine (logng/mg) 3mth Intervention 0.04, Control 0.04;12mth Intervention 0.02, Control 0.04 NS Parent report reduction: % confirmed reducers 3mth Intervention 52%, Control 46%; 12mth Intervention 61%, Control 56% NS

Main outcomes (*Continued*)

Curry 2003	Abstinence rates: 3 mth Intervention 7.7% vs Control 3.4%; 12mth Intervention 13.5% vs Control 6.9% - 12 mth difference statistically significant. Serious attempt to quit at 12 months Adjusted OR 1.53 (95% CI 0.96 to 2.44) Ever quit for 24h at 12 months Adjusted OR 0.94 (95% CI 0.59 to 1.5) Prevalent abstinence 3 months Adjusted OR 2.40 (95% CI 0.85 to 7.8) 12 months Adjusted OR 2.77 (95% CI 1.24 to 6.60) Sustained abstinence (abstinent at 3 and 12 months) Adjusted OR 1.83 (95% CI 0.29 to 14.30)
Davis 1992	No evidence of difference between self-help guides. Self-reported quit attempts: Guide 1 121/198 (61%), Guide 2 122/204 (60%), Guide 3 147/229 (64%); Self-reported abstinence for last week: Guide 1 28/198 (14%), Guide 2 24/204 (12%), Guide 3 27/229 (12%) P>0.05
Elder 1996	No evidence of effect on tobacco-free school policy after 3 years: Intervention 78% of 56 schools, Control 75% of 40 schools
Emmons 2001	Quit rates: Intervention 7.5%, Control 10.1%, P>0.05 CPD: no effect Kitchen and TV room air nicotine (log transformed units): Intervention 3.7 & 3.1 fell to 2.6 & 2.3, Control 3.0 & 3.5 changed to 6.9 & 3.5. * P<0.05,
Eriksen 1996	No evidence of effect. Quit smoking: Intervention 7/222 (3%) vs Control 1/ 221 (0.5%); Stopped indoor smoking 4/222 vs 4/ 221; Any positive change 32/222 (14%) vs 34/221 (15%)
Fossum 2004	Self-reported smoking (number of cigarettes) 1 month before childbirth: Intervention 13.1 vs Control 10.8 NS; 3 months after childbirth Intervention 12.8 vs Control 8.2 (significant); Past 24 hrs Intervention 11.8 vs Control 7.8 (significant). Salivary cotinine: Mean for Intervention reduced from 185 ng/ml to 165; mean for Control increased from 245 to 346 ng/ml. Weak correlation between mother's reported rate of smoking and cotinine levels for both control and intervention groups.
Greenberg 1994	Parents report significant reduction in number of CPD: Intervention 12.5 CPD pre vs 7.7 CPD at 12month follow up, Control 12.3 CPD pre vs 13.3 at follow up P=0.01. Child urinary cotinine does not support this. Baseline mean urinary cotinine/ creatinine (nmol/mmol) Intervention 66 vs Control 51; at follow up Intervention 107 vs 98 Control. p=NS Prevalence of persistent lower respiratory symptoms Intervention 17.8%, Control 30.9% [difference 13.1%, 95% CI -1.0 to 27.0]
Groner 2000	No evidence of effect. Self-reported quit rates: Intervention Child Health Group 7/153, Mother's Health Group 4/164, Control 7/ 162. P=NS Self-reported CPD reduced in all groups;

Main outcomes (*Continued*)

	Self-reported not smoking indoors reduced: Intervention CHG 24, MHG 12, Control 13. P<0.05
Hovell 2000	Reduction in parent-reported child exposure to cigarettes in the home and in total. At home reported exposure Intervention baseline 3.9 CPD, follow up 0.52 CPD vs Control 3.51 CPD baseline, 1.20 CPD follow up. The trend for parent-reported total CPD exposure was similar. Reports not supported by child urinary cotinine concentrations (ng/ml). Intervention baseline 10.93, follow up 10.47 vs Control baseline 9.43, follow up 17.47; 56% reduction (95% CI 48 to 63)
Hovell 2002	No significant effect. Decline in reported ETS exposure from (Intervention) 97% to 52% vs (Control) 93% to 69% at end of intervention (month 4). At follow up month 13, 9 months post-intervention (Intervention) 52% to 45% and (Control) 69% to 54%. Average parent-reported exposure levels declined over the follow-up period from 0.57 to 0.47 CPD (Intervention) and 1.11 to 0.71 CPD (Control). These results show a difference of mean 0.34 CPD reduction in exposure by report. Biological verification of child exposure reveals a less successful outcome. Child cotinine levels fell in the intervention group immediately post-intervention (month 4) 1.44 to 1.19 ng/mL, and rose in control group 1.17 to 1.35 ng/mL. Between end of intervention and follow up 9 months later levels fell 1.19 to.97 ng/mL (intervention) and 1.35 to 0.86 ng/mL (control). There was no significant difference in the mothers' rate of smoking cessation between groups.
Hughes 1991	No evidence of effect on homes with smoker: Intervention baseline 60% of 47 homes, follow up 52% vs Control baseline 57% of 48 homes, follow up 51% P=NS
Irvine 1999	No evidence of effect. Mean decrease in child salivary cotinine (ng/ml): Intervention 0.70 vs Control 0.88. Difference= 0.19, 95% CI -0.86 to 0.48 Mean increase in mothers' salivary cotinine (ng/ml): Intervention 3.1 vs Control 1.8. Difference= 1.3, 95% CI -26.4 to 23.9 Self-reported quit attempts: Intervention 101/213 vs Control 97/222, P=NS
Kallio 2006	At child 8 years of age 10.1% (29/287) of mothers and 19.7% (43/218) fathers in the intervention group smoked regularly. The corresponding %s for the control group were 15.1% (45/298) mothers and 25.1% (60/239) fathers. Additionally 5.9% (17/287) of intervention group mothers and 8.3% (18/218) of intervention group fathers smoked occasionally compared with 5.7% (17/298) of control group mothers and 6.7% (16/239) of control group fathers (NS).
Kimata 2004	After 1 month urinary cotinine levels reduced 285±43 $ngmL^{-1}$ to 2.2±0.85 $ngmL^{-1}$ in AEDS cessation group, 257±31 $ngmL^{-1}$ to 1.8±52 $ngmL^{-1}$ in normal child cessation group and 274±42 $ngmL^{-1}$ vs 298±52 $ngmL^{-1}$ in control group of children with AEDS. AEDS children showed significant reduction in SCORAD index skin wheal (mm) from 9.9 baseline to 7.5; Control group 9.6 baseline to 9.3. Also significant changes in response to house dust mite & cat dander & lower neutrophil levels.
Krieger 2005	Report that 20% of the sample quit smoking and that among smokers who did not go outside to smoke prior to intervention, a quarter did so after education, but data are not provided and it is unclear whether intervention outcomes were different between groups. Homes where smoking was reported as not allowed at baseline 80% (high intensity group) vs 76% (low intensity group) and at exit 77% (high) vs 80% (low) P=0.33 NS.

Main outcomes (*Continued*)

McIntosh 1994	Number of smokers who moved outside: Intervention 7/30, Control 4/30. Urinary cotinine concentrations of children of subjects reportedly smoking outside are above 10.0 in 4/6 (range 6.7 to 54) in Intervention children tested, and in 3/3 (range 12.2 to 21.5) control children tested. These levels suggest significant ETS exposure.
Nuesslein 2006	Calculated nicotine consumption Intervention: 12 micrograms to 4.65 micrograms vs Control: 12 micrograms to 7.5 micrograms NS Urinary cotinine levels Intervention 3520 ng/ml to 741 ng/ml vs Control 4572 ng/ml to 724 ng/ml P>0.05 NS Across the entire sample (both intervention and control groups) there was an overall reduction in self-reported smoking with average number of cigarettes smoked reduced from 17 to 10 per day and significant reduction in calculated nicotine consumption using self report data 12 micrograms to 5.5 micrograms (P<0.05), urinary cotinine 4101 ng/ml to 741 ng/ml (P<0.05).
Ratner 2001	6 month Follow up: 36% abstinent, 26% occasional, 38% daily smoking. 76% homes smokefree. 12 month Follow up: 20% abstinent, 35% occasional, 46% daily. 76% homes smokefree No difference between groups. 6 month Follow up abstinence was 41% vs 30% (intervention vs control) but at 12 months abstinence was sustained in 21% vs 18.5% (intervention vs control) NS. Daily smoking at 6 months was 31% vs 45% (intervention vs control) but at 12 months was 41% vs 50% (intervention vs control). NS Abstinence reported as 38% vs 27% (treatment vs control) NS.
Schonberger 2005	At 6 month Follow up Maternal post-natal smoking Intervention 52% (14/27) vs. Control 28% (8/30) P=0.04) Partner smoking Intervention 31% (14/44) vs Control 20% 9/45) NS Smoking by others Intervention 47% vs Control 50% NS
Severson 1997	Cessation at 6 & 12 months: Intervention 25/1073 (2.3%), Control 10/802 (1.2%), P<0.05*, 1-tailed test Cessation at 12 months: Intervention 59/1073 (5.5%), Control 38/802 (4.7%) NS. Relapse prevention at 6 & 12 months: Intervention 200/609 (33%). Control 109/417 (26%), P<0.05*, 1-tailed test Relapse prevention at 12 months: Intervention 261/609 (43%), Control 163/417 (39%) * when controlling for other variables this effect was lost. Significant benefits of intervention on CPD, readiness to quit, likelihood of making a quit attempt, attitude towards smoking, knowledge of ETS effects on children.
Vineis 1993	Smoking cessation for mothers: Intervention 12/74 vs Control 10/84, OR 1.4, 95%CI 0.6 to 3.5 Smoking cessation for fathers: Intervention 18/173 vs Control 26/244 OR 1.0
Wahlgren 1997	Intensive intervention was able to demonstrate a statistically significant but very small reduction in cigarette exposure from parents' cigarettes reported by parents without biological verification. Mean number of parent cigarettes smoked in presence of child fell in Intervention group: 5.8CPD baseline, 3.4CPD at clinic pre-intervention to 1.2 CPD at 6 months following completion of intervention. In control group, parent reported exposure fell from 8.0 baseline, 5.7 pre-intervention to 4.6 CPD at 6 month follow up. P for trend <0.01. Environmental monitor (1 room with heaviest child exposure) measured air nicotine (mcg/ cubic metre). Intervention group baseline 1.7, follow up 1.9 vs Control baseline 2.3, follow up1.4

Main outcomes (*Continued*)

Wakefield 2002	Home smoking ban: Intervention 41% at baseline, 49% at Follow up vs Control 40% at baseline, 42% at Follwo up. Relative increase in bans not significant; P=0.40 Car smoking bans: Intervention baseline 33%, Follow up = 52%, Control baseline 37%, Follow up 48%, NS; Low rates of parental cessation, no difference between groups. Urinary cotinine measured for 209 children: Mean cotinine/ creatinine Intervention B = 22.8 nmol/mmol Follow up 21.0, Control baseline 25.7, Follow up 21.0, NS, P=0.40
Wiggins 2005	No significant effect of either intervention. Support health visitor group vs control group, RR 0.86 (95% CI 0.86 to 1.19); Community support group RR 0.97 (95% CI 0.72 to 1.33)
Wilson 2001	Of 51 children with complete urinary cotinine: creatinine ratio (CCR) data. Log CCR (ng/mg) Intervention baseline 1.82, Follow up 1.27 vs Control baseline 2.34, Follow up 1.93, adjusted Diff -0.38, adjusted P= 0.26. Proportion with >1 acute asthma visit/ year: Intervention baseline 50, Follow up 29.6, Control baseline 37.2, Follow up 46.5, OR 0.32, P=0.03 No significant differences in hospitalisation, prohibition of smoking in home, or smoking.
Winickoff 2008	Prevalence of self-reported 7 day abstinence 38% at baseline and 30% at follow up in the control group vs 31% at baseline and 30% at follow up in the intervention group (Effect size = 13% P=NS) Cotinine-confirmed 7 day abstinence for baseline current smokers NS. For baseline current smokers 18% in the control and 64% in the intervention group reported making a 24hr quit attempt by follow up (P=.005).
Woodward 1987	No evidence of effect. Mother self-reported quitting: Intervention 6%, Control 2.2%, P=0.25. Median infant urinary cotinine levels (mcg/litre): Intervention 11.0 (n=48) vs Control 10.0 (n=53), P=NS
Yilmaz 2006	Quit smoking: Child intervention group 24.3%; Mother intervention group 13%; Control 0.8%. (χ^2 = 29.5, P<0.0001) Smoking location change: Child intervention: 73%, Mother intervention: 46.6%, Control 11.6% (χ^2 =90.1, P<0.0001) Knowledge change (score on MCQ, possible score 0-100): mean post-intervention score in child intervention 63.51 (±7.35 - not stated whether these ± is standard deviations, or 95% confidence intervals) mother intervention 57.69 (±10.46) control 56.68 (±7.67) (ANOVA showed that these scores differed) P<0.0001 (Note: not an intention-to-treat analysis)
Zakarian 2004	Both groups showed significant decline in reported exposure to mother's cigarette's/week (intervention group 18.89 at baseline to 5.41 at 12 months, control group 13.25 at baseline to 5.23 at 12 months) (P<0.001). Total exposure to cigarettes/week (intervention group 53.2 at baseline to 21.99 at 12 months, control 54.48 at baseline to 18.22 at 12 months) (P<0.001) however, no significant difference between groups. Children's urinary cotinine concentration did not show a sigificant change over time in either group - No significant difference between groups.
Zhang 1993	Number (proportion) of smoking fathers: Intervention baseline 6843/9953 (68.8%) & follow up 60.7% vs Control baseline 6274/9580 (65.5%), follow up "approximately the same" [numbers are not stated] Proportion of fathers who quit smoking for at least 180 days: Intervention 800/9953 (11.7%), Control 14/6274 (0.2%)

WHAT'S NEW

Last assessed as up-to-date: 7 August 2008.

Date	Event	Description
8 August 2008	New search has been performed	Review Update.
3 July 2008	New citation required but conclusions have not changed	Additional authors

HISTORY

Protocol first published: Issue 3, 1999

Review first published: Issue 3, 2003

CONTRIBUTIONS OF AUTHORS

NP was involved in coordinating the review update, extracted data and wrote and edited the review update.

RR was involved in coordinating the original review, wrote the original review, and extracted data for both the original review and the update.

EW was involved in coordinating the original review and the update, extracted data for the original review, and edited both versions.

AP, NS, PW and RC were involved in the development of the original review, and extracted data from papers and edited both the original review and the update.

GFT extracted data and assisted with editing the review update.

DECLARATIONS OF INTEREST

No conflict of interest known.

SOURCES OF SUPPORT

Internal sources

- The McCaughey Centre, Melbourne School of Population Health, University of Melbourne, Australia.

External sources

- National Health & Medical Research Council, Australia.
- Murdoch Children's Research Institute, Australia.
- VicHealth (Victorian Health Promotion Foundation), Australia.

INDEX TERMS

Medical Subject Headings (MeSH)

*Caregivers; *Family; Age Factors; Controlled Clinical Trials as Topic; Environmental Exposure [prevention & control]; Infant, Newborn; Smoking [*prevention & control]; Smoking Cessation; Tobacco Smoke Pollution [*prevention & control]

MeSH check words

Child; Child, Preschool; Humans; Infant