The University of Sheffield
ScHARR School of Health and Related Research

Systematic review of how to stop smoking in pregnancy and following childbirth.

Review 1: Which interventions are effective and cost effective in encouraging the establishment of smoke free homes?
Review 2: Factors aiding delivery of effective interventions.
Review 3: The health consequences of pregnant women cutting down as opposed to quitting

Update information

November 2021: NICE guideline PH26 (June 2010) has been updated and replaced by NG209.

This guideline contains the evidence and committee discussion for recommendations from PH26 dated [2010] and [2010, amended 2021].

See www.nice.org.uk/guidance/NG209 for all the current recommendations and the evidence behind them.

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Authors:

Susan Baxter

Lindsay Blank

Louise Guillaume

Josie Messina

Emma Everson-Hock

Julia Burrows

School of Health and Related Research (ScHARR)

University of Sheffield

Regent Court,

30 Regent Street,

Sheffield,

S1 4DA,

UK

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EXECUTIVE SUMMARY

It has been reported (British Market Research Bureau, 2007) that nearly a third of mothers in England are smokers before pregnancy. Smoking during pregnancy can be associated with complications during labour, increased risk of miscarriage, premature birth, and still birth. Smoking in pregnancy has also been associated with low birth weight babies and an increased risk of infant mortality (Royal College of Physicians, 1992). Jarvis et al. (2007) estimate that almost half of all children in the UK are exposed to tobacco smoke at home. Environmental tobacco smoke can be associated with respiratory infections such as bronchitis and pneumonia, asthma, and other ear, nose and throat problems such as glue ear

The population under consideration in these reviews is all women who smoke that are planning a pregnancy, are pregnant or have an infant aged less than twelve months. This includes all women who stop smoking immediately prior to or during their pregnancy or soon after childbirth. These reviews address different research questions relating to smoking in pregnancy and following childbirth.

Research questions

Review one addresses the primary research question of which interventions are effective and cost effective in encouraging the establishment of smoke free homes? Review two addresses the question of what factors aid delivery of effective interventions (for smoking cessation in populations included in the guidance scope) and what are the barriers to successful delivery? The review relates to factors enabling or discouraging the uptake of smoking cessation services by women planning a pregnancy, pregnant women smokers and women smokers who have recently given birth. It includes studies that report the perspectives of staff delivering smoking cessation services, and studies reporting data from service users and potential service users. Review three addresses the question of what are the health consequences of pregnant women cutting down on their cigarette consumption as opposed to quitting?

Methods

Following searching of electronic databases, search results were downloaded into Reference Manager for sifting at abstract level. Following this sifting of database records at abstract level, papers for potential inclusion were obtained for full paper examination. Data in the included papers relating to theresearch question, funding source, study design, data collection, data analysis, population, findings, study limitations and any reported gaps in evidence described were extracted by one reviewer using the extraction form. Extractions were independently checked for accuracy by a second reviewer. In addition to extracting key information from included papers, there was consideration of the study quality as per recommended NICE methods (NICE, 2009).

Findings from Review one

Review one addresses the primary research question of which interventions are effective and cost effective in encouraging the establishment of smoke free homes? The searches identified seventeen papers that met the inclusion criteria for smoke-free homes (although three did not fully consider the effectiveness of the intervention and so are included here for information only, they do not contribute to the evidence statements). The studies were biased towards interventions conducted in the USA (ten of seventeen), with only one conducted in the UK. Therefore there may be some reservations with respect to the applicability of the interventions in a UK population.

The main limitation of study quality at RCT level was blinding. For studies of health promotion interventions it is impossible to blind the participants and there are many practical challenges to blinding the assessors. Other types of studies in the included papers were limited by small samples, short follow up, high dropout and quality was also limited by poor analysis and/or presentationof data.

The most common outcome in the papers related to self-reported cigarette consumption, mostly of parents but sometimes also of other family members or household visitors. The outcome related specifically to smoking in the

presence of a child, or more generically to smoking overall. Other common outcomes included measures of environmental nicotine levels obtained using nicotine monitors placed in one or more rooms in the home (five papers) also, measures of infant nicotine (six papers), and maternal cotinine (four papers).

Interventions were categorised in terms of those which were based on counselling; counselling plus additional aspects; individually adapted smoke free home policies; motivational interviewing and also staff training. This categorisation system may not sufficiently differentiate the detail of different interventions, but represents one way of effectively dividing the evidence.

Data from the included papers suggests only very weak associations between counselling interventions and smoke free related outcomes. There was mixed evidence in regard to interventions which combine counselling with other additional interventions, such as the provision of written materials or telephone support. There was also mixed evidence from studies reporting on interventions which were based on the use of motivational interviewing to promote smoke free homes, and also evaluations of individually adapted smoke free home plans. It is important to note that many studies whichindicated positive effects found these in self-reported measures only. There were also limitations throughout the papers in terms of study quality (especially sample size) and poor reporting of results in relation to effectiveness of the interventions.

The review findings indicate limited evidence regarding the success of interventions to reduce environmental tobacco smoke, with further studies, particularly in the UK, needed in order to recommend specific types of approaches or methods of delivery.

Evidence statements: Review one

Evidence statement 1:

Mixed evidence from six studies reported on counselling interventions to promote smoke free homes:

Arborelius and Bremberg 2001 (Sweden) BA-
Fossum et al. 2004 (Sweden) RCT+
Hovell et al. 2000 (USA) RCT++
Kallio et al. 2006 (Finland) RCT++
Ratner et al. 2001 (Canada) RCT++
Zakarian et al. 2004 (USA) RCT++

These studies showed only very weak associations between the counselling interventions and smoke free related outcomes (such as cotinine measures or self reported smoking). Due to the limited effectiveness seen, it is not possible to recommend specific types of counselling approaches or methods of delivery as most beneficial, however the most effective intervention (Hovell et al. 2000) consisted of behavioural counselling for smoking mothers delivered by graduate students with 20 hours of training and weekly supervision.

Evidence statement 2:

Mixed evidence from two studies was identified for interventions which combine counselling with additional elements such as the provision of written materials or telephone support:

Greenberg et al. 1994 (USA) RCT+
Lee 2008 (China) BA+

However, Lee (2008) reported only on knowledge outcomes, rather than behaviour change.

Evidence statement 3.

Good evidence from four studies looked at programmes to implement individually adapted smoke free home polices:

Chilmonczyk et al. 1992 (USA) RCT+
Strecher et al. 1993 (USA) RCT+
Stepans et al. 2006 (USA) RCT++

Or the individual delivery of a more generic policy:
Sockrider et al. 2003 (USA) RCT++

These interventions generally had problems with low compliance and loss to follow up. However, Sockrider et al. 2003 demonstrated a significant reduction in smoking as a result of their home smoking control index.

Evidence statement 4.

Good evidence from one study which reported on the use of motivational interviewing to promote smoke free homes demonstrated a significant decrease in nicotine levels in intervention households over six months (however, this was not supported by self-reported smoking rates).

Emmons 2001 (USA) RCT++

Evidence statement 5.

One study reported on the effect of an educational intervention on the screening and counselling activities of physicians with regard to passive smoking.
Narce-Valente and Kligman 1992 (USA) BA+
This study did not consider the effect of those who attended the intervention compared to those who did not so the effectiveness of the intervention is unclear.

Findings from Review two

Review two addresses the question of what factors aid delivery of effective interventions [for smoking cessation in populations included in the guidance scope] and what are the barriers to successful delivery? The review relates to factors enabling or discouraging the uptake of smoking cessation services by pregnant women smokers. It includes studies that report the perspectives of staff delivering smoking cessation services, and studies reporting data from service users and potential service users.

The searches identified twenty two papers that met the inclusion criteria. Of these, ten reported qualitative data and nine reported quantitative cross-sectional data (surveys). An additional three papers provide narrative descriptions of issues relating to delivery of interventions in the findings section. The papers encompass studies from five European countries, with three reporting British studies, one reporting data from Northern Ireland, one from France, and two from Sweden. Seven papers report data from the UnitedStates of America, five papers (four studies) from Australia, two papers from New Zealand, and one from South Africa. The papers include findings from staff participants (eleven studies), and pregnant women or recent mothers(ten studies). Only one paper reported data from both staff and service users.No papers provided data relating to women planning a pregnancy.

The evidence underpinning this review is from qualitative and cross-sectional studies, including only one high quality qualitative study, together with sixgood quality qualitative studies. The cross-sectional studies report data from surveys almost exclusively designed for the study and are largely un- validated, with potential for bias due to self-report and retrospective recall.

Analysis and synthesis of the themes within the findings of the includedpapers, suggests a number of key recurring themes relating to the delivery of interventions to stop smoking in pregnancy and following childbirth:

1 Whether or not the subject of smoking is broached when pregnant women are seen by health professionals

2 The advice/recommendations given by health professionals
3 The way that information and advice is communicated
4 The intervention provided during and after a consultation
5 Whether or not policies/procedures/protocols are in place
6 Record keeping and follow up
7 The knowledge and skill base of staff
8 Time constraints
9 Resource constraints
10 Staff perceptions of ineffectiveness
11 Differences between professional groups
12 Obstacles to accessing interventions

In regard to the broaching of the subject of smoking with pregnant women and recent mothers who smoke, the papers suggest that a high proportion (but not all) staff routinely ask about smoking status. Qualitative papers describe the proportion as “variation” and “most but not all”. The surveys report 76% to 96% routine inquiry. The lower of these two figures is from pregnant women report, with the others all from professional self-report. The highest figure (96%) is from a UK study of health professionals, however no corresponding data from women in the UK were found in the peer-reviewed literature.

The papers provide some insight into why intentions may not always be translated into practice. There is the suggestion that concerns regarding damaging the relationship between professional and pregnant woman may be important. Also, time constraints and differences between professional groups may be significant in whether the subject of smoking and smoking cessation intervention is broached.

In terms of the advice and recommendations given by health professionals, the papers report variation in practice and some dissatisfaction amongst pregnant women regarding the content and level of advice and information. There is the suggestion that not all women are provided with information leaflets, and also that there may be a need for a more thorough/more strongly persuasive explanation with the inclusion of evidence or “proof” of the

potential harm. Differences between women regarding preferences for information and follow-up discussion suggest the importance of individual-tailored advice and the challenge of providing content appropriate to each woman"s needs/wishes. Narrative from intervention studies conveys the perceived difficulties experienced by health professionals in providing advice. As reported in relation to broaching the subject of smoking, differences in approach between professionals such as cutting down versus quitting, may lead to variation and potentially conflicting advice/information.

Not only the content of the advice, but also the way that a message is conveyed, is reported to be important and challenging in the papers. Studies report that the tone and approach used may impact on a woman"s willingness to consider smoking cessation. In contrast to the findings above regarding the need for strongly persuasive explanations, “preaching” or “hard hitting” interactions can be perceived as acting as a barrier to a woman considering stopping or reducing smoking.

Findings regarding the content of the intervention provided during a consultation and offered subsequently, indicate variance in practice. Studies report around 57%-60% of professionals may offer smoking cessation counselling. The report of leaflets being provided varied considerably between studies, with reporting of 23%, or 54% or “most” of the time. Recommendation of nicotine replacement therapy was reported as low in one study, and also rates of referral on to other specialist services and personal support may be low.

Variance in practice may indicate a lack of policies or procedures, or lack of adherence or knowledge. Two of the cross-sectional studies included make the association between having well-defined procedures and good practice or increased number of interventions. A UK study suggests a low figure of 6% of staff reporting that they use guidelines to underpin their consultations with pregnant women or recent mothers who smoke.

The noting of smoking status on records and ongoing monitoring is examined in the included papers, with evidence that record keeping practices may be inconsistent (around 85%-95% self-report that smoking status would be recorded). A UK study, while reporting the higher of these figures for recording status, provides data suggesting a follow up rate throughout pregnancy of only 49%.

The review indicates staff perceptions of limited skills and knowledge regarding smoking cessation interventions. A perceived lack of time and staffing and material resources are reported to be significant barriers to both discussion during consultations and providing interventions. The views ofpregnant women smokers and recent mothers were very mixed in regard to the advice and information that they had received with a perception of insufficient information and lack of clarity of message.

Possibly linked to these negative staff perceptions of skills, time and resources is the review finding regarding pessimism amongst staff regarding the potential for their input to be effective in achieving smoking reduction or quitting amongst pregnant women or recent mothers. Studies report that staff previous experiences of failure to effect any change may impact on their interactions with current and future clients.

Survey data suggests variation in practice between different professional groups, in particular regarding the recommendation of quitting smoking versus cutting down, but also in regard to procedural aspects such as recording status, and repeat advice giving. There is the suggestion that midwives have greater concerns regarding maintaining the relationship between themselves and the pregnant woman, and are more likely to recommend cutting down rather than quitting initially. These differences may indicate different professional ethos and approaches, however offer the potential for a pregnant woman to receive contradicting advice.

In regard to specific aspects of interventions that may be barriers or facilitators to uptake, only a limited number of papers provided detail regarding this. The

data suggests that the length of individual programme intervention sessions may be influential. Also, it is reported that service delivery via telephone advice may be problematic in terms of achieving contact. A UK study suggests that transport considerations and child care for other siblings are important in enabling pregnant women to take up any smoking cessation intervention that may be offered.

The review suggests that a number of aspects of professional practice in relation to pregnant women smokers may need clarifying, including record keeping, the content of advice, ongoing management and review, also referrals on to other agencies. The review findings indicate that professionals perceive a need for greater training specifically in this area, and also that the greater use of protocols may further develop consistency in practice. It is suggested that professionals view providing advice and intervention to pregnant women smokers to be challenging, further suggesting a need for greater support for their practice via established protocols and/or training. The papers reviewed indicate evidence of a perception of ineffectiveness/pessimism towards intervention amongst some service providers which has the potential to become a cycle of self-fulfilling prophecy. Further dissemination of any available evidence regarding the effectiveness ofdifferent interventions may be beneficial in providing practitioners and service users with evidence-based choices.

Evidence statements: Review two

Evidence statement 1.

Two qualitative studies and five survey studies provide evidence that not all staff ask all pregnant women about their smoking status during consultations.

McCurry et al., 2002 (N Ireland service users) Qual+
Anderson et al., 2002 (USA service users) Qual-
Surveys - Grange et al. 2006 (France service users), Clasper & White 1995 (UK service providers), Cooke et al. 1998 (Australia service providers), Everett et al. 2005 (South Africa service providers), Glover et al. 2008 (New Zealand service providers).

One study reports data from a lower income/educated population (Anderson et al. 2002 (USA service users) Qual-).

Four studies provide evidence that staff may not ask about smoking status due to concerns regarding damaging the relationship between themselves and a pregnant woman.
McCleod et al. 2003 (New Zealand service providers) Qual++
Abrahammson et al. 2005 (Sweden service providers) Qual+
Lowry et al. 2004 (GB service users) Qual-
Katz 2008 (USA) Narrative.

Evidence statement 2.

Five qualitative studies and three surveys provide evidence that the information and advice currently provided by health professionals is perceived as insufficient or inadequate by some women and by professionals themselves. There is the suggestion that advice could be more detailed and explicit, and that professionals find discussion of individual smoking behaviours challenging.

Anderson et al. 2002 (USA service users) Qual-
Everett et al. 2005 (South Africa service providers) Qual+,
Arborelius & Nyberg 1997 (Sweden service users) Qual+,
McCurry et al. 2002 (N Ireland service users) Qual+,
Nichter et al. 2007 USA service users) Qual+
Surveys - Grange et al. 2006 (France service users), Cooke et al. 1998 (Australia service providers), Clasper & White 1995 (GB service providers).

Three of the studies report data from a lower income/lower educated/deprived area (Anderson et al., Arborelius & Nyberg, Nichter et al).

Evidence statement 3.

Five qualitative papers describe how the style or way that information/advice is communicated to pregnant women smokers can impact on how the advice or information is received. Concerns regarding advice being construed as nagging or preaching are reported, together with the recommendation that that a more caring, empathetic approach may be helpful.

Arborelius & Nyberg 1997 (Sweden service users) Qual+
Everett et al. 2005 (South Africa service providers) Qual+
Tod 2003 (GB service users) Qual+
Lowry et al. 2004 (GB service users) Qual-
Anderson 2002 (USA service users) Qual-.

Evidence statement 4.

One qualitative study and four surveys provide evidence that there is variance in practice amongst staff in regard to the type of intervention offered during and following a consultation, such as whether a leaflet is offered, whether there is referral on to a specialist programme, or whether ongoing personal support is offered.

McCurry et al. 2002 (N Ireland service users) Qual+
Surveys - Cooke et al. 2001 (Australia service providers), Grange et al. 2006 (France service users), Glover et al. 2008 (New Zealand service providers), Hartmann et al. 2007(USA service providers).

Evidence statement 5.

There is evidence from one qualitative study and two surveys that there is limited knowledge/availability/use of guidelines or protocols in practice.

Everett et al. 2005 South Africa service providers Qual+
Surveys - Clasper & White, 2005 (GB service providers), Hartmann et al. (USA service providers).

There is evidence from one survey that that having guidelines/protocols in place may be associated with an increase in the number of smoking interventions offered.
Cooke et al. 1998 (Australia service providers).

Evidence statement 6.

Evidence from four qualitative studies, three surveys and a study narrative suggests that record keeping practices and follow up enquiry may be inconsistent amongst practitioners. Pregnant women smokers and recent mothers differed in their views regarding the frequency with which they should be asked about their smoking.

McCleod et al. 2003 (New Zealand service providers) Qual++
Arborelius & Nyberg 1997 (Sweden service users) Qual+
Everett et al. 2005 (South Africa service providers) Qual+
Nichter et al. 2007(USA service users) Qual+
Surveys - Clasper & White 1995 (GB service providers), Glover et al. 2008 (New Zealand service providers), Grange et al. 2006 (France service users)
Narrative - Lando et al. 2001(USA).

Evidence statement 7.

Three qualitative studies, seven surveys and one narrative report suggest that staff perceive that they have limited skills and knowledge to implement successful smoking cessation interventions.

(McCleod et al. 2003 (New Zealand service users) Qual++,
Everett et al. 2005, (South Africa service providers) Qual+,
Abrahammson et al. 2005 (Sweden service providers) Qual+
Surveys - Walsh et al. 1985 (Australia service providers), Cooke et al. 1998 (Australia service providers), Cooke et al. 2001 (Australia service providers), Clasper & White, 1995 (GB service providers), Bishop et al. 1998 (Australia service providers), Hartmann et al. 2007 (USA service providers), Jordan et al. 2006 (USA service providers)
Narrative - Lando et al. 2001(USA).

Evidence statement 8.

Two qualitative studies, seven surveys and one narrative provide evidence that staff perceive that lack of time is a significant barrier to the implementation of smoking cessation interventions.

Everett et al. 2005 (South Africa service providers) Qual+
Lowe et al. 2002 (Australia service providers) Qual-
Surveys - Bishop et al. 1998 (Australia service providers), Clasper & White 1995 (GB service providers), Cooke et al. 1998 (Australia service providers), Glover et al. 2008 (New Zealand service providers), Hartmann et al. 2007 (USA service providers), Jordan et al. 2006 (USA service providers), Walsh et al. 1985 (Australia service providers)
Narrative - Lando et al. 2001(USA).

Evidence statement 9.

One qualitative study, six surveys and narrative from one study suggest that staff perceive that limited resources in the form of either staffing or patient education materials impact on the delivery of interventions.

Everett et al. 2005 (South Africa service providers) Qual+
Surveys - Walsh et al. 1985 (Australia service providers), Cooke et al. 1998 (Australia service providers), Bishop et al. 1998 (Australia service providers), Hartmann et al. 2007 (USA service providers), Jordan et al. 2006 (USA service providers), Lowe et al. 2002 (Australia service providers).
Narrative - Lando et al. 2001 (USA).

These papers report findings from Australia and the USA with no UK studies which may require consideration in terms of applicability to the UK context.

Evidence statement 10.

Two qualitative studies and seven surveys suggest that staff perceptions regarding the limited effectiveness of interventions may impact on their delivery of services.

Abrahammson et al. 2005 (Sweden service providers) Qual+
Everett et al. 2005 (South Africa service providers) Qual+
Surveys - Glover et al. 2008 (New Zealand service providers) Bishop et al. 1998 (Australia service providers), Clasper & White 1995 (GB service providers), Cooke et al. 1998 (Australia service providers) Hartmann et al. 2007 (USA service providers), Jordan et al. 2006 (USA service providers), Walsh et al. 1985 (Australia service providers).

One paper describes a lack of firm reasons for non attendance given by women who did not attend a smoking intervention programme (Katz et al. USA).

Evidence statement 11.

Four surveys provide evidence that typical practice in regard to smoking cessation advice and management of care can vary between doctors and midwives.

It is reported that General Practitioners are more likely to advise women to quit smoking completely, whereas midwives are more likely to advise gradual reduction. Also, the evidence suggests that midwives are more likely to refer on to other agencies and record smoking status. GPs may bemore likely than midwives to raise the subject of smoking at subsequent consultations.

Surveys - Cooke et al. 1998 (Australia service providers) Cooke et al. 2001 (Australia service providers), Clasper & White, 1995 (GB service providers), Glover et al. 2008 (New Zealand service providers).

Evidence statement 12.

One qualitative study and two narrative reports describe obstacles to pregnant women smokers accessing services as including: the length of sessions; difficulty making telephone contact; and a lack of transport or child care.

It is suggested that domiciliary or very local services, the provision of crèche facilities, appointment systems or telephone counselling could be suitable service delivery options.

Tod 2003 (GB service users) Qual+
Narrative - Katz et al. 2008 (USA service users), Solomon & Flynn 2005 (USA service users).

One study (Solomon & Flynn 2005, USA narrative) suggests however that telephone support services may have poor success in terms of contact rates.

Findings from Review three

The review identified four papers that provide evidence regarding potential health consequences of pregnant women reducing their cigaretteconsumption rather than quitting. No restrictions had been placed in terms of study design. However, all identified studies analysed sections of data from randomised controlled trials.

All the papers were graded as + for quality. None of the papers reported power calculations, with significant data regarding subgroup sample sizes and baseline smoking levels not included in one paper, and only sparse details regarding the analysis provided in two further papers. Two papers in particular present challenges in extracting the data required to answer this research question. The objective of these papers relates to smoking in pregnancy and reducing consumption and quitting however, they had the main aim of exploring different comparisons to that under scrutiny in this review.

The included papers use outcome measures of both self-reported number of cigarettes smoked per day, and also cotinine levels. They do not include any discussion regarding their selection of urine versus salivary cotinine as a measure. The health outcome under study in all papers was infant birthweight, measured in grams. One paper in addition, considers gestational age as an outcome.

All four papers differ slightly in the way that data regarding women whoreported reducing their cigarette consumption and/or had reduced levels of cotinine between baseline and end point were classified. Three papers differ slightly in the way that data on women who reported reducing their cigarette consumption and/or had reduced levels of cotinine between baseline and end point were classified. In terms of measurement timings, all papers report measures at baseline and end point of the trial only, with some lack of clarity regarding the timing of the end point data. Patterns of smoking between thesedata collection points is based only on the self-report data therefore, with cotinine levels only indicating current and recent (within seven days) smoking patterns.

Interpretation of the data within these papers was constrained by the studies having differing objectives to a comparison between quitting and reducing, although having women exhibiting these smoking behaviours within their sample. Two of the papers report data from more than fifteen years ago, which may limit their applicability to current evidence. All the papers report empirical work carried out in the USA, which may limit applicability to a UK population.

The review found limited evidence regarding the health impact of reducing smoking in pregnancy. Two studies report numerical increases (but not significance levels) in birth weight of infants born to pregnant smokers who reduce their intake, versus those who quit. Another study suggests that birth weight differences may only be significant in women who reduce to more than 50% of their daily intake (from 20 to 10 cigarettes per day). The fourth study reports significantly greater birth weight (77g) in infants born to pregnant smokers who quit versus those who reduce their intake. While indicating numerical differences in birth weight between infants born to mothers who quit smoking during pregnancy and those who carried on smoking but reduced their intake, three of the included papers provide only limited analysis regarding the order of magnitude of these differences in statistical terms such as probability size, effect size or odds ratios.

Three of the papers report differences in characteristics of the quitting versus reducing sample sub groups that may impact on the link between quitting and greater increases in infant birth weight. The data suggests that women who tend to quit smoking before or at the start of pregnancy tend to be lighter smokers than those that continue, including those that reduce their consumption. The reducers in the studies may therefore still have relatively high daily cigarette consumption.

Indeed, baseline daily cigarette consumption should be considered when interpreting findings demonstrating a benefit from a reduction of 50%; in the case of the Secker-Walker and Vacek (2002) study. This finding relates to participants who reduced from 20 to 10 cigarettes per day. A reduction of

50% from ten to five cigarettes per day may not have the same impact and further research would be required to explore this.

The linking of low levels of smoking with greater improvements in birth weight is highlighted in two of the other studies. Li et al. (1993) report in their findings, that the largest increases in birth weight were observed in infants born towhite women smokers with lower baseline cotinine values of 100ng/ml or less. Secker-Walker et al. (1998) also suggest that cigarette consumption has to reduce significantly to low levels in order to have an impact on infant birth weight. These studies suggest that there may be a threshold level in terms of the number of cigarettes smoked, above which there is a negative impact on infant birth weight. If so, women may need to reduce to this maximum in order to have any beneficial impact, rather than a general or percentage reduction.

Another issue that may be of importance in considering the health consequences of smoking reduction in comparison to quitting duringpregnancy is the timing of quitting and reduction. England et al. (2001) found an association between third trimester exposure to smoking and negative impact on birth weight. Similarly, Secker-Walker et al. (1998) found higher birth weights in babies born to women who quit sooner rather than later, and all quitters compared with reducers. These findings suggest that cessation and reduction earlier in the pregnancy may be preferable in terms of impacton birth weight.

The papers included in this review suggest that there are benefits in terms of higher birth weight to be gained from quitting smoking as opposed to cutting down. However, further work is needed to examine the degree of the difference to establish whether it is statistically (and clinically) significant.Further work is needed to examine the relationship between the level of smoking and these potential health benefits.

Evidence statements: Review three

Evidence statement 1.

There is limited evidence from four good quality studies that quitting versus reducing cigarette consumption during pregnancy is associated with increased infant birth weight of between 89 and 254g

England et al. 2001 Association analysis+ (USA)
Secker-Walker et al. 1998 Association analysis+ (USA)
Secker-Walker & Vacek 2002 Association analysis + (USA)
Li et al. 1993 Association Association analysis + (USA)

Two of the studies provide very little statistical analysis regarding the significance of these numerical differences between quitters and reducers. Only one study (Li et al. 1993 +) provides odds ratios, with OR 1.18 for quitters having a low birth weight infant compared to OR 1.73 for reducers. Baseline differences between quitters and reducers in all these studies may be significant.

These papers all examine data from studies carried out in the United States of America which may have implications for applicability to a UK setting.

Evidence statement 2.

There is limited evidence from one good quality study that the reduction in cigarette consumption required to make a significant impact on birthweight needs to be of the magnitude of more than 50% (among women smoking 20 cigarettes per day) to lead to a statistically significant increase in birth weight

Secker-Walker & Vacek 2002 Association analysis + (USA)

This paper examines data from studies carried out in the United States of America and may thus have implications for applicability to a UK population.

1. INTRODUCTION

1.1. Aims and objectives

These reviews address different research questions relating to smoking in pregnancy and following childbirth.

1.2 Research questions

Review one addresses the primary research question of which interventions are effective and cost effective in encouraging the establishment of smoke free homes?

The following sub-questions are also considered:

- What is the effectiveness and cost effectiveness of interventions including media campaigns and distribution of health promotion materials to promote smoke free homes?
- What is the acceptability and feasibility of these programmes?
- What individual or contextual factors predict effectiveness, acceptability and feasibility?

Review two addresses the question of what factors aid delivery of effective interventions (for smoking cessation in populations included in the guidance scope) and what are the barriers to successful delivery? This research question therefore is focussed on the delivery of interventions, rather than considering the effectiveness of interventions. It does not include personal or environmental factors which may influence pregnant women to reduce or cease smoking, and does not include views of pregnant women smokers on smoking. The review relates to factors enabling or discouraging the uptake of smoking cessation services by women planning a pregnancy, pregnant women smokers and women smokers who have recently given birth. It includes studies that report the perspectives of staff delivering smoking cessation services, and studies reporting data from service users and potential service users.

Review three addresses the question of what are the health consequences of pregnant women cutting down on their cigarette consumption as opposed to quitting?

2. BACKGROUND

2.1 English government policy on smoking in pregnancy and after childbirth

This guidance relates to the three key policy areas of firstly, children"s health and wellbeing, secondly, cancer prevention, and thirdly, the reduction of health inequalities. It will support a number of policy documents such as EveryChild Matters (HM Government, 2004), Maternity Matters: choice, access and continuity of care in a safe service (DH, 2007a), the Cancer Reform Strategy (DH, 2007b), Smoking Kills (DH, 1998), Health Inequalities: progress and next steps (DH 2008), and the Implementation Plan for reducing health inequalities in infant mortality: a good practice guide (DH, 2007c).

2.2 The need for guidance

It has been reported (British Market Research Bureau, 2007) that nearly a third of mothers in England are smokers before pregnancy. This study found that 49% gave up at some stage before the birth; however 7% continued to smoke throughout their pregnancy. Other studies (French et al., 2007, Lawrence et al., 2005) suggest that these figures may be an underestimate.

Smoking during pregnancy can be associated with complications during labour, increased risk of miscarriage, premature birth, and still birth. Smoking in pregnancy has also been associated with low birth weight babies and an increased risk of infant mortality (Royal College of Physicians, 1992).

While many women who quit during pregnancy maintain their non smoking status, three in ten mothers return to smoking less than a year after the birth of their baby (British Market Research Bureau, 2007). Jarvis et al., (2008) estimate that almost half of all children in the UK are exposed to tobacco smoke at home. Environmental tobacco smoke can be associated with

respiratory infections such as bronchitis and pneumonia, asthma, and other ear, nose and throat problems such as glue ear.

There is a strong association between smoking in pregnancy and socio-demographic factors such as age and social class (British Market Research Bureau, 2007). It has been estimated that if the factors associated with disadvantage are combined, the numbers of women who continue to smoke during pregnancy would be ten times higher in the most disadvantaged compared to the least disadvantaged group (Penn and Owen, 2002).

3. METHODS

3.1 Search methods

The challenges in searching for evidence to inform public health guidance are widely recognised (Spring et al. 2008, Pawson, 2005). These challengesinclude the volume of literature in the subject area, the variation in the language used within public health disciplines (and therefore the variation in indexing within databases and in the titles of papers), and gaps within the evidence base.

It is therefore not feasible in the case of some public health topics to develop a single, definitive search strategy from the study protocol, encapsulating all the relevant complexity and inconsistency in language without retrieving an unmanageable number of redundant records. Search strategies based solely on the study protocol have been shown to yield a limited number of useful references (Spring et al. 2008, Greenhalgh & Peacock, 2005, Ogilvie et al., 2005). This may be because within public health, defining the question to be addressed and the information that will be relevant is often complex and uses non-standardised terminology (Alpi, 2005, Curran et al., 2007). Therefore a search strategy that is informed by the findings of previous searches can be of more use in searching for public health evidence. In the case of these reviews, the key aim was to ensure that the searches retrieved evidence of relevance to the study question, rather than retrieving all evidence relating to smoking in pregnancy.

In order to address these challenges, the review team have built upon the existing NICE search methods (National Institute for Health and Clinical Excellence, 2009) to allow for a process in which the scope of relevance is explored and informed by the search process. A targeted approach to the identification of evidence has been taken. Instead of aiming to identify the relevant literature for a specific question using one search, we have adopted a systematic and emergent approach, which uses smaller, more targeted searches (iterations) to identify evidence that will inform understanding of the problem area. This evidence is then explored in order to inform further searches by the identification of useful terms. Searching continues until the review team decide that no new useful evidence is being identified and thatthe review has reached saturation in terms of the papers that it has identified.

In the case of the search for "Smoking in Pregnancy" the following approaches were utilised within the three search iterations:

- Freetext searching of databases (Science Citation Index and Social Science Citation Index via Web of Knowledge, Maternity and Infant Care via OVID SP, PsycINFO via OVID SP, Embase via OVID SP, Medline via OVID SP, CINAHL via EBSCOhost, ASSIA via CSA and British Nursing Index via OVID) SP
- Citation searching of included papers using Web of Science Cited Reference search and Google Scholar
- Liaison with internal topic expert (Emma Everson-Hock)
- Sifting the reference lists of included papers
- Sifting the reference lists of systematic reviews, literature reviews and discussion papers that were retrieved in the search process, but not included in the review due to study type.

A thorough audit trail of the search process and the search iterations was maintained, with all searches recorded in order that searches are transparent, systematic and can be replicated. A version of this audit trail is available in Appendix 4. As the table indicates, separate searches were undertaken for each review. However, it became evident early in the process that evidence

that was retrieved through a search for one question e.g. question two, may be useful for questions one or three. Therefore, the searches should be seen as potentially identifying evidence for all questions. All references were sifted with this in mind.

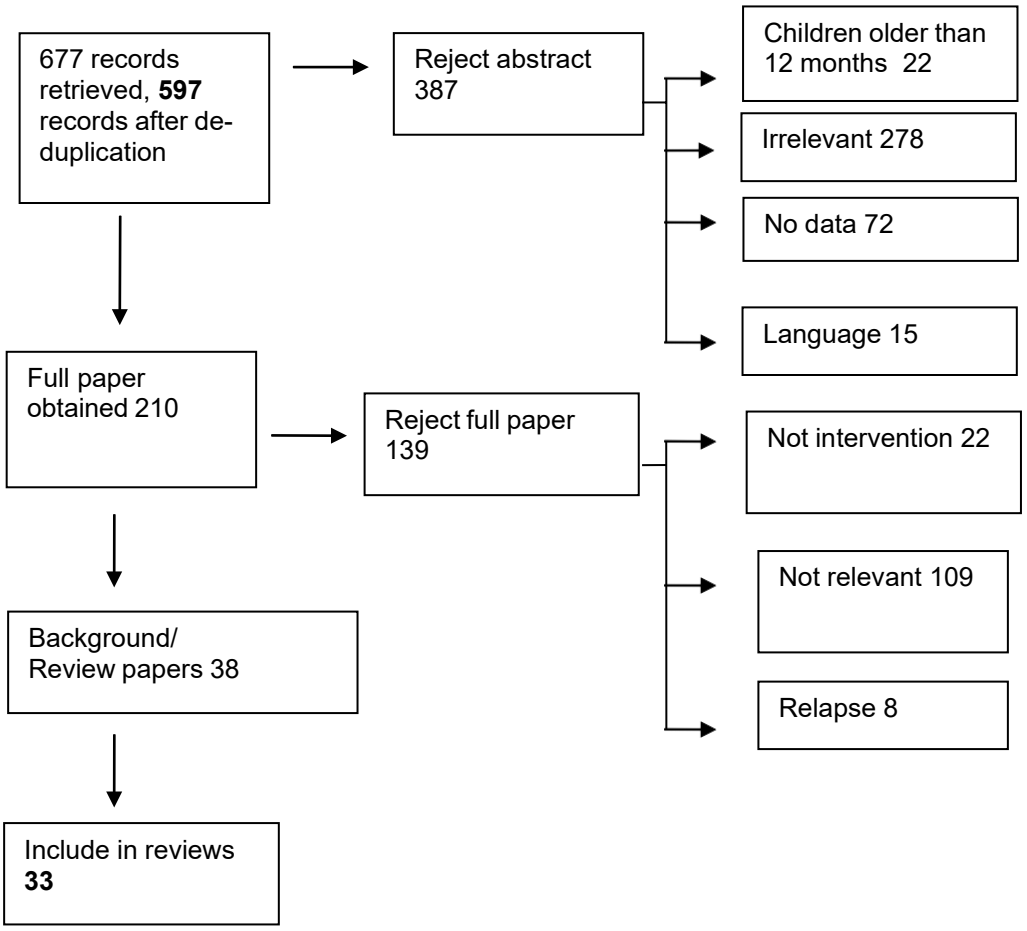
Following each search iteration (using the variety of methods outlined above), the search results were imported into Reference Manager for sifting by the systematic reviewers at abstract level. Following this sifting of database records at abstract level, papers for potential inclusion were obtained for full paper examination. Papers identified at this stage for further consideration included empirical work, but also relevant reviews and discussion papers to provide background information. Papers for potential exclusion were checked by a second reviewer, and where consensus could not be reached, by a third reviewer. Papers for inclusion were similarly checked by a second reviewer prior to extraction.

Figure 1 provides an illustration of the process of inclusion and exclusion of papers, indicating how the 2979 papers identified in the search iterations (Iteration 1 - 597, Iteration 2 - 1819 and Iteration 3 - 563) were reduced to the 41 papers that have been included in Reviews 1-3 (Iteration 1 – 33, Iteration 2 – 6, Iteration 3 – 2).

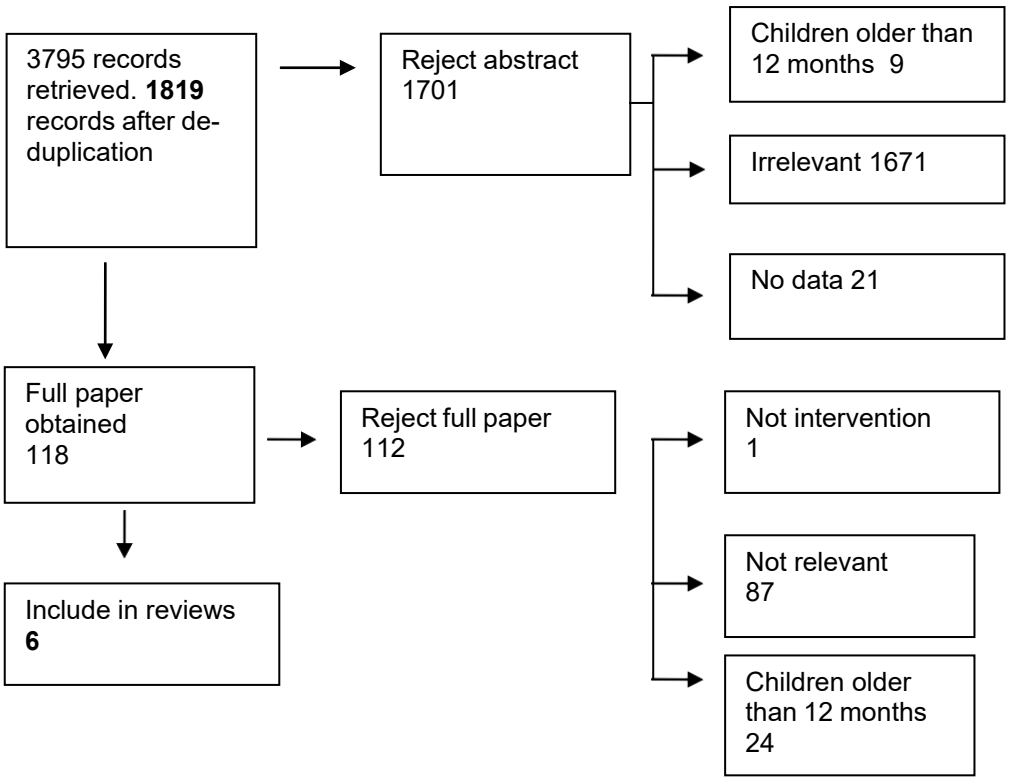
In addition to this searching via electronic databases, the reference list of included papers was examined and papers not already identified were added to the database and obtained. In addition, the reference lists of the review/discussion papers were scrutinised for any additional papers of potential relevance.

Figure 1. Flow chart illustrating the identification process

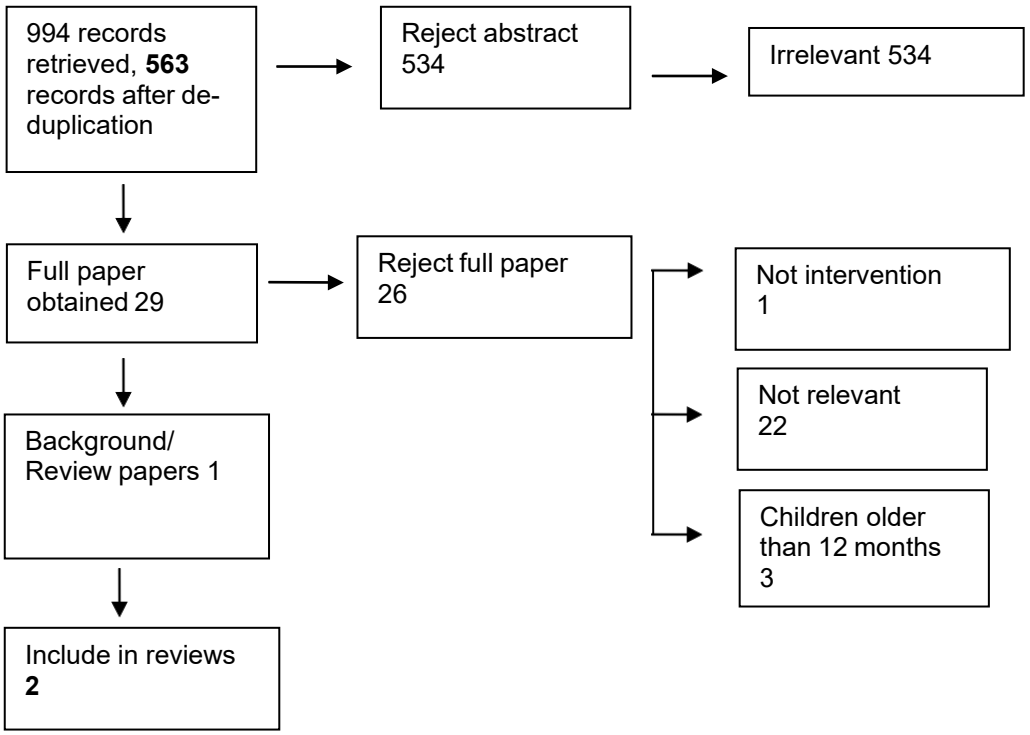
Search iteration one



Search iteration two



Search iteration three



3.2 Inclusion and exclusion criteria

All the retrieved literature was screened at title and abstract level for relevance, and those that had potential for inclusion were taken through to full paper appraisal.

3.2.1 Inclusion criteria

The population under consideration in this review is all women who smoke that are planning a pregnancy, are pregnant or have an infant aged less than twelve months. This includes all women who stop smoking immediately prior to or during their pregnancy or soon after childbirth. As health inequalities area particular concern, the review gives emphasis to groups where smoking rates are high such as women aged below twenty, those in routine or manual occupations, lone parents, or those who are unemployed. Also included in the review is anyone who smokes and lives in the same dwelling as a pregnant woman, a woman planning a pregnancy, or where there is a resident infant aged less than twelve months.

3.2.2 Exclusion criteria

The review does not include women who do not smoke, women living in smoke-free households, and women who smoke that are not planning apregnancy, are not pregnant, or do not have a child under twelve months old.

3.3 Data extraction strategy

Data relating to the research question, funding source, study design, data collection, data analysis, population, findings, study limitations and any reported gaps in evidence described were extracted by one reviewer using theextraction form. Extractions were independently checked for accuracy by a second reviewer. Disagreements were resolved by consensus and consulting a third reviewer where necessary. The data extraction tables are presented in Appendix 1.

3.4 Quality assessment criteria for included studies

In addition to extracting key information from included papers, there was consideration of the study quality as per recommended NICE methods (NICE, 2009).

The included papers across the three reviews encompassed quantitative intervention studies, qualitative studies and quantitative (cross-sectional) studies reporting frequencies and exploring associations.

The studies were placed in one of three grades as follows based on the methodology checklist:

Table 1. Criteria used for study grading

Code	Quality criteria
++	All or most of the criteria have been fulfilled. Where they have not been fulfilled the conclusions of the study or review are thought very unlikely to alter
+	Some of the criteria have been fulfilled. Those criteria that have not been fulfilled or not adequately described are through unlikely to affect conclusions
-	Few or no criteria fulfilled. The conclusions of the study are thought likely or very likely to alter

There is considerable debate regarding quality criteria for qualitative studies (NICE, 2009) with no established study design hierarchy. The included

qualitative studies were assessed according to the NICE (2009) quality appraisal checklist which considers theoretical approach, study design, data collection, trustworthiness, data analysis, conclusions and ethics.

Currently there is no specific checklist for cross-sectional studies as they are descriptive rather than analytical (NICE, 2009). It is recommended however (NICE, 2009), that the important things to consider in appraising the quality of cross-sectional studies are whether or not there are any potential confounding factors and/or whether there is potential for measurement bias. The quality of the cross-sectional studies included has therefore been considered in these respects.

3.5 Summary of study identification

Studies were identified via the search strategy outlined above (3.1 Search Strategy) and added to the Reference Manager database for sifting andfurther examination.

For Review one, ten papers were identified through the primary database search, six via the secondary citation searching, and one additional paper was identified through scrutinising reference lists (Table 2).

Table 2. Summary of study identification for Review one

Source	Number of hits	Papers identified
Initial search	597	10
Second/third/fourth search iteration	2382	6
Reference lists		1

For the second review question, nineteen papers were identified through the primary database search, two via the secondary citation searching, and one additional paper was identified through scrutinising reference lists (Table 3).

Table 3. Summary of study identification for Review two

Source	Number of hits	Papers identified
Initial search	597	19
Second/third/fourth search iterations	2382	2
Reference lists	-	1

For Review three all four papers were identified through the primary database search.

A particular feature of this work was the high number of papers which were identified as having potential for inclusion, were obtained as full papers, yet were subsequently excluded. The focus of the second review question on the delivery and uptake of services rather than the interventions themselves required scrutiny of many intervention studies, searching for those aspects describing delivery. These aspects were not reported in the paper abstracts, and often represented only a very small section of data within the paper where they were present.

Papers considered in regard to the third research question reported sub- groups of participants from full intervention trials. It was frequently not possible to identify which groups were reported in the findings at a paper abstract level, or which associations were being considered. On some occasions the comparators reported were outside the remit of the review, with examples of papers reporting data from pregnant women cutting down their cigarette consumption however, compared this with non-smokers. Some studies contained participants who had reduced cigarette consumption together with participants who had quit smoking, although this data could not be distinguished separately in the findings and thus had to be excluded.

24 papers were excluded on the grounds that they reported discussion or provided study outlines with no accompanying data. 218 papers were excluded as not being relevant to the research questions under consideration.
27 papers reported studies where more than 50% of the participants had children over the age of twelve months and therefore were outside the age

range of interest for this review. Studies excluded at this full paper stage are listed in Appendix 3.

4. RESULTS OF REVIEW ONE

4.1. Quantity of the evidence available

The searches identified seventeen papers that met the inclusion criteria. Table 4 lists the included papers by study design. The majority of the identified studies were of RCT design (12) with one further trial with non random allocation together with four before and after studies.

Table 4. Included papers by study design

Study design	Study (first author, year)	Country
RCT	Chilmoncayk 1992	USA
	Emmons 2001	USA
	Fossum 2004	Sweden
	Greenberg 2004	USA
	Hovell 2000	USA
	Kallio 2006	Finland
	Ratner 2001	Canada
	Severson 1994	USA
	Sockrider 2003	USA
	Strecher 1993	USA
	Stepans 2006	USA
	Zakarian 2004	USA
Non-RCT	Vineis 1993	Italy
Before and after	Al-alaway 2008	UK
	Arborelius 2001	Sweden
	Lee 2008	China
	Narce-Valente 1992	USA

4.2 Populations and settings

The papers included only one study from the UK, with the majority of studies coming from the USA (10) and Canada (1). Additional studies were identified from European countries including Sweden (2), Finland (1) and Italy (1). A final study was conducted in China. Most of the papers reported very poorly on the characteristics of their study populations and gave only outline demographic details for the parents or children involved. Information regarding

parent"s smoking habits at baseline was also poor, with details of the parents" smoking status such as number of cigarettes smoked per day or time since quitting smoking were rarely reported.

4.3 Quality of the evidence available Table

5. Quality rating of included papers.

	Al Alaway	Arborelius	Chilmonczy	Emmons	Fossum	Greenberg	Hovell	Kallio	Lee	Narce-Valente	Ratner	Severson	Sockrider	Strecher	Stepans	Vineis	Zakarian
1.1	-	-	+	++	+	++	++	-	++	-	+	-	++	-	+	-	++
1.2	+	Nr	++	++	+	-	++	++	++	++	+	++	Nr	+	++	++	+
1.3	+	Nr	++	++	++	-	++	++	++	++	+	++	Nr	+	+	++	+
2.1	Na	Na	++	++	+	++	++	++	NR	Na	NR	++	++	++	++	+	++
2.2	+	+	+	+	+	+	+	+	+	+	+	+	+	+	++	+	+
2.3	Na	Na	++	++	++	++	++	++	++	Na	++	++	++	++	++	-	++
2.4	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2.5	++	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+
3.1	-	-	++	++	++	++	++	++	-	+	++	-	++	-	++	-	++
3.2	++	-	++	++	+	+	-	++	-	++	++	++	++	-	+	++	++
3.3	++	++	++	++	++	++	++	++	++	-	++	-	++	-	++	-	++
3.4	Na	Na	++	++	++	++	++	++	-	Na	++	++	++	++	++	++	++
3.5	NR	++	-	+	-	++	++	++	++	Nr	+	+	++	++	-	++	+
4.1	++	-	++	++	++	++	++	++	+	-	++	++	++	++	Nr	++	++
4.2	++	++	++	++	++	++	++	++	+	++	++	++	++	++	++	++	++
4.3	-	++	++	++	++	-	++	++	++	++	-	-	++	++	++	-	-
4.4	-	++	++	++	++	-	++	++	++	++	-	-	++	++	++	-	-
Summary ratings																	
IV	+	+	+	++	+	-	++	++	+	-	+	-	++	+	++	-	++
EV	-	-	+	++	+	+	++	+	+	-	-	-	+	-	+	+	++
Total	-	-	+	++	+	+	++	++	+	+	++	+	++	+	++	+	++

4.3.1 Limitations on study quality

The main limitation of study quality at RCT level was blinding. For studies of health promotion interventions it is impossible to blind the participants and there are many practical challenges to blinding the assessors.

Other types of studies are fundamentally limited in their design but several also had issues with small samples, short follow up, high dropout and with poor analysis and/or presentation of data as is discussed in more detailbelow.

4.4 Outcome measures

Table 6 shows the type of outcome measure used by the included studies. The most common outcomes (eleven papers) related to self reported cigarette consumption, mostly of parents but sometimes also of other family members or household visitors. The outcomes may relate specifically to smoking in the presence of a child, or more generically to smoking overall. Other common outcomes included measures of environmental nicotine levels obtained using nicotine monitors placed in one or more rooms in the home (five papers) also, measures of infant nicotine (six papers), and maternal cotinine (four papers).

Table 6. Outcome measures of included studies.

Outcome type	Papers	No.
Cigarette consumption or smoking status (self reported)	Arborelius 2001 Emmons 2001 Fossum 2004 Greenberg 2004 Kallio 2006 Severson 1994 Sockrider 2003 Strecher 1993 Stepans 2006 Zakarian 2004 Vineis 1993	11
Environmental nicotine, measured by nicotine monitors	Emmons 2001 Hovell 2000 Ratner 2001 Sockrider 2003 Zakarian 2004	5

Infant cotinine levels	Chilmoncayk 1992 Greenberg 2004 Hovell 2000 Kallio 2006 Stepans 2006 Zakarian 2004	6
Maternal cotinine levels	Fossum 2004 Hovell 2000 Kallio 2006 Stepans 2006	4
Smoking cessation	Emmons 2001	1
Respiratory illness	Greenberg 2004	1
Knowledge and attitudes	Lee 2008	1
Physician smoking habits screening rate	Narce-Valente1992	1
Carbon monoxide in expired air (maternal)	Ratner 2001	1
Quit attempts	Severson 1994	1
No effectiveness outcomes	Al-alaway 2008	1

4.5 Interventions

Interventions were coded in terms of their typology, impact, applicability and quality score (Table 7). The typology of interventions was developed by the lead reviewer during the data extraction process and validated by a second reviewer during the quality checks.

Table 7. Typology, impact, applicability and quality score of included papers.

Study design (n)	Paper (1st author, date)	Typology*	Outcome**	Applicability	Quality
RCT	Chilmoncayk 1992	SHP	IC	USA	+
	Emmons 2001	MI	EN, SC, CC	USA White 46%	++
	Fossum 2004	C	CC, MC	Sweden	+
	Greenberg 2004	C+	CC, IC, RI	USA White 64%	+
	Hovell 2000	C	MC, IC, EN	USA White 47%	++
	Kallio 2006	C	CC, MC, IC	Finland	++
	Ratner 2001	C	EN, CM	Canada	++
	Severson 1994	C+	CC, QA	USA	+
	Sockrider 2003	SHP	CC, EN	USA White 73%	++
	Strecher 1993	SHP	CC	USA	+
	Stepans 2006	SHP	CC, MC, IC	USA	++
	Zakarian 2004	C	CC, IC, EN	USA White 76%	++
Non-RCT	Vineis 1993	C+	CC	Italy	+
Before/ After	Al-alaway 2008	MI	No effectiveness	UK	-
	Arborelius 2001	C	CC	Sweden	-
	Lee 2008	C+	K/A	China	+
	Narce-Valente1992	PE	PS	USA	+

*__Typology__:
MI: Motivational Interviewing, C: stop smoking Counselling, C+: counselling plus other interventions,
PE: professional education, SHP: comprehensive, individualised smoke free home policy

**__Outcome measures__
EN: environmental nicotine, measured by nicotine monitors, SC: smoking cessation, CC: cigarette consumption or smoking status (self reported), MC: maternal cotinine levels, IC: infant cotinine levels, RI: respiratory illness (infant), K/A: knowledge and attitudes, PS: physician screening, CM: carbon monoxide in expired air (maternal), QA: quit attempts.

As would be expected, those studies which employed an RCT design tended to score better on the quality rating scale, although the quality ratings for each study design varied across the identified studies. The studies identified for each type of study design included a variety of types of intervention, outcome measures and populations. The individual studies are discussed in detailbelow.

Most of the interventions consisted of programmes of counselling only (six studies), or counselling accompanied by other elements such as the provision of written materials (four studies). Four interventions featured the development of individually tailored smoke free home programmes, and two used motivational interviewing techniques. A final paper looked at professional education (physicians) to promote discussion and promotion of smoke free homes with patients.

No evidence was identified on the cost effectiveness of the interventions. In addition there were no papers which considered media campaigns. The distribution of health promotion materials were only considered as a part of multi component interventions, where their effectiveness was not considered independently.

4.5.1 Delivery of the intervention

Most of the papers reported briefly on who was responsible for the programme delivery. The most common mode of delivery was via nurses, some included no further definition (Arborelius and Bremberg 2001, Greenberg et al. 1994, Ratner et al. 2001, Severson et al. 1994, Stepans etal. 2006, Vineis et al. 1993), others were described as child health nurses (Fossum et al. 2004), and experienced public health nurse (Strecher et al. 1993). Other health professionals involved in intervention delivery included physicians (Chilmonczyk et al. 1992, Lee 2008, Narce-Valenter and Kligman 1992), paediatrician and dietician (Kallio et al. 2006) and paediatrician (Severson et al. 1994). Others were delivered by non-medical staff including ahealth educator (Emmons 2001), trained graduate students (Hovell et al.2000) and counsellors (Zakarian et al. 2004). The intervention by Al-alaway etal. (2008) included a range of staff encompassing smoking cessation staff, council staff, the fire service, sure start and midwives. The intervention by Sockrider et al. (2003) provided materials by post rather than delivered by particular staff.

4.6 Intervention impact

The heterogeneity of the interventions aim, design and outcome measures used preclude a meta-analysis of their results. We have therefore completed a narrative synthesis of the data, primarily in terms of study impact, design, type of intervention and outcome.

4.6.1. Counselling interventions.

Six interventions consisted of counselling provided either to just the mother or to both parents:

Arborelius and Bremberg (2001, Sweden) conducted a before and after study (-) to assess the development, spread and evaluation of a national child health care based method targeting environmental tobacco smoke. The intervention included 28 families (no demographic details) and included five preparatory steps (establishing readiness to change in child health organisation, survey of current nursing practice, establishing routines for surveillance, routine recording of smoking status, developing new counselling methods, piloting of the smoke free children intervention), followed by dissemination and training. Nurses received intervention training in the “south west” health region and in the rest of the area in 1997.

In the southwest region, the fraction of smokers was significantly lower in the years covered by the intervention compared to the years before ($p<0.001$ to $p<0.008$, primary data not provided). In the rest of the area, smoking in parents of infants up to 8 months only decreased by 0.9% in the yearsbefore/after training. The decrease was significant for both mothers and fathers ($p=0.0009$ and $p=0.005$). These results indicate that the introduction ofthe smoke free children initiative resulted in declining parental smoking rates for a specific child age group. The authors could not determine the smoking rate in the non pregnant population and therefore these results may represent a general trend rather than demonstration of an effective intervention.

Fossum et al. (2004, Sweden) conducted an RCT (+) to evaluate the effects of a counselling method („Smoke-free Children‟) aiming to protect infants from

environmental tobacco smoke. Five (out of 24) Swedish counties were selected for the study on the basis of highest maternal smoking prevalence and no previous nurse training in the counselling method to be used in study. The study population were Swedish-speaking mothers who had given birth toa healthy child. They were recruited from Child Health Centres, run by single Child Health Nurses (CHNs). In the selected five counties, 17 CHNs formedan intervention group and 20 CHNs a control group. Groups were matched on the size of the community, and on the prevalence of smoking(demographic details are not clear). In total 41 mothers participated: 26 in the intervention group, and 15 in the control group.

The intervention consisted of the counselling method “Smoke-free children”. This is described as a client-centred intervention aimed at increasing self-efficacy applied in a routine clinical setting. The CHNs in the intervention group received two days of training and a follow up session in the method by a pre-trained leader using standardised the programme. Training included video-recorded role playing and feedback. The study measured self-reported smoking with maternal salivary cotinine estimation at 1 month before birth and 3 months after birth, together with assessment of their child"s exposure to ETS by recall (elicited by trained interviewers blind to intervention or control group).

Before the intervention, the mean cotinine level was 185ng/mL in the intervention group and 245ng/mL in the control group. At follow up, cotinine levels had reduced by 10% in the intervention group (165ng/mL) and increased by 40% in the control group (346ng/mL), a significant difference (p=0.27). However, after the intervention, mothers in the intervention group reported higher levels of smoking than in the control group. Only weak correlations were found between self-reported smoking and cotinine.

Hovell et al. (2000, USA) conducted a RCT (++) to test the efficacy of behavioural counselling for smoking mothers in reducing young children"s exposure to environmental tobacco smoke. Participants were English and Spanish speaking mothers who smoked at least two cigarettes a day (breastfeeding mothers and those without a telephone were excluded). The

sample consisted of 108 women who attended sites of a supplemental nutrition programme. The women were from low income homes, were of mixed ethnicity (Black 21%, Hispanic 8%, White 47%, Other 4%), and half were single parents (46%). The mothers‟ mean age was 29 years and the children‟s mean age was 14 months. The mothers smoked an average of 12.4cigarettes per day.

The intervention consisted of seven individualised counselling sessions (three in person, four by telephone) based on shaping procedures (behavioural strategies for change). Sessions ranged from twelve to twenty eight minutes and were delivered by graduate students with twenty hours of training and weekly supervision. Control group mothers received usual nutritional counselling via the supplemental nutrition programme, and brief advice to quit smoking and not expose their children to ETS.

The study provides data in regard to children‟s reported exposure to ETS in and outside the home, both from mothers and from other sources of ETS (collected at baseline, 3, 6 and 12 months by interview). Also, data was collected on children‟s urinary cotinine concentrations (collected at baseline, 3 and 12 months), and mothers‟ saliva cotinine concentrations. Environmental nicotine monitors were placed in the room of greatest exposure for a randomly selected half of the intervention families.

The findings outline that mothers' reports of children's exposure to their smoke in the home declined in the counselled group from 27.3 cigarettes/week at baseline, to 4.5 at three months, and to 3.7 at twelve months. In the control group exposure rates reduced from 24.6 at baseline, to
12.1 at three months, and 8.4 at twelve months. The differences between the groups by time were significant (P = 0.002). Reported exposure to smoke from all sources showed similar declines, with significant differences between groups by time (p= 0.008).

At 12 months, the reported exposure in the counselled group was 41.2% that of controls for mothers' smoking (95% confidence interval 34.2% to 48.3%) and was 45.7% (38.4% to 53.0%) that of controls for all sources of smoke.

Children's mean urine cotinine concentrations decreased slightly in the counselled group from 10.93 ng/ml at baseline to 10.47 ng/ml at 12 months but increased in the controls from 9.43 ng/ml to 17.47 ng/ml (differences between groups by time p= 0.008). At 12 months the cotinine concentration in the counselled group was 55.6% (48.2% to 63.0%) that of controls.

Kallio et al. (2006, Finland), conducted a RCT (++) to determine whether repeated infancy-onset lifestyle counselling alters parental smoking and children‟s exposure to tobacco smoke. Families of 5 month old infants were recruited at well baby clinics in Turku, Finland (540 intervention, 522 control). At 8 months (study onset) 33.2% of fathers and 17% of mothers smoked (no other demographic details provided).

The intervention families received individualised and detailed child-targeted lifestyle counselling at each visit, which consisted of mainly dietary counselling aimed at reducing saturated fat, total fat, and cholesterol in the child‟s diet. Other lifestyle factors including smoking, sedentary lifestyle and overweight were discussed. At the child‟s age of 5, parents received a bookletabout the adverse health effects of smoking. Families of both the intervention and control groups met a paediatrician and dietician first at one to three monthintervals and then at four to six month intervals. When the children were aged between two and seven years old, groups took place at six-monthly intervals, and annually thereafter.

The study outcomes were: self-reported parental smoking; reported tobacco exposure of children; and serum cotinine level for both parents and children. Follow-up measurement when the child was eight years of age revealed that reported levels of smoking amongst mothers and fathers of the intervention and control groups did not differ significantly. Serum cotinine concentrations also did not vary between children of the intervention and control group. As might be expected, serum cotinine values were higher in reported smokers than those of children from non smoking families (p=0.007).

Overall, the children‟s serum cotinine values correlated poorly with the self-reported amount of exposure (r=0.094 p=0.57). As there was no difference in

smoking habits between the intervention and control groups at child"s age 8 years, it suggests that general discussions about cardio risk factors withparents do not have a significant effect on smoking habits. The authorssuggest that counselling regarding parental smoking and children"s exposure to ETS needs to be specific and intense, repeated frequently throughout the years and attention also has to be paid to eliminating sources of ETS other than those caused by parental smoking.

Ratner et al. (2001, Canada) conducted an RCT (++) to explore if theconcern for their unborn baby"s health which may lead to a pregnant woman to stop smoking, was carried over to the first year of the infant"s life in terms of protecting the child from environmental tobacco smoke. The inclusion criteria for participants were: that they were women who had smoked before their pregnancy; had stopped during pregnancy; had given birth to healthy infants; and could be contacted by telephone. Of 416 eligible women, 251 (60%) consented to participate. They were aged 15 to 40 (no further demographic details provided). Non-participants differed mainly in terms either of high confidence about remaining as non-smokers, or an intention not to remain abstinent, thereby seeing no benefit of participating in a programme. Interviews were completed with 241 (96%) and 238 (95%) participants at six and twelve month follow up respectively.

The intervention delivered at time of birth and during the first 3 months postpartum included nurse-delivered telephone support, relapse prevention, and information about the adverse effects of smoking and environmental tobacco smoke. No details of the comparator are provided. The outcome measures were self-reported smoking status together with reported efforts to protect their baby from ETC. These self-report measures were compared with assessments of carbon monoxide in expired air.

At six months postpartum, 76% of the women reported that they did not allow people to smoke in their home. 77% removed ashtrays, 9% displayed no smoking signs and 90% tried to ask people to smoke outdoors. At 12 months, 76% reported not allowing smoking in the house, 89% removed ashtrays, 8%

displayed no smoking signs and 85% tried to ask people to smoke outdoors. At 6 months, 78.5% reported no difficulties in making homes smoke free, this increased to 87% at 12 months. Some women (<10%) described additional actions aimed at reducing ETS. The women who relapsed to smoking were slightly more likely to smoke in their home at six months than those who remained abstinent (26.5% vs. 21%), and this gap widened at twelve months (26% vs. 15%). The statistical analysis of this data is limited: with percentages given but no indications of statistical significance.

Zakarian et al (2004, USA) conducted an RCT (++) to test the effectiveness of a behavioural counselling programme for reducing children‟s exposure toETS. Families were recruited from eight community health clinics in two systems. Clinics generated a list of all patients under five years and allmothers were contacted for telephone screening. Participants were English or Spanish speaking mothers with children younger than four, with the children exposed to a minimum of two of their mother‟s cigarettes per day. Current breast feeders were excluded. Of the 3448 mothers telephoned, 1584 were screened, and 191 (12.1%) qualified to participate. The first 150 were enrolled. Families were randomised to intervention or control after baseline measures. Assignment was stratified by child age, ethnicity and clinical site. There were 76 intervention and 74 control families. They were mostly unemployed (68%) and qualified for Medicaid (low SES) and they were mostlywhite 76% (Hispanic 12%, Black 1%). The mother‟s average age was 29 years and 40% were single parents. Their mean number of cigarettes per week was 12.8. The mean child age in months was 17.6 (SD 10).

The intervention involved counselling based on social learning theory. Mothers were offered seven behaviour counselling sessions over six months. Sessions one, three and seven occurred in person at clinic sites, and other sessions took place via telephone. Counselling included behavioural contracts to reduce children‟s ETS, the development of long and short term goals for shaping household behaviours, and also low or no cost rewards for success. Mothers were encouraged to use pictorial charts to self monitor smoking. Counsellors received 6 hours of individual and group training and supervision

and had monthly meetings to review progress. Standardised reports were completed for each session. In the control group, those who asked foradditional assistance to stop smoking were provided with a “quit kit” (no details) and a referral to community programmes. No formal smoking cessation counselling was provided.

The study outcome measures were children"s ETS exposure and mother"s smoking (measured by mother"s reports) and children"s urinary cotinine concentrations (sample collected at each study measure). Nicotine monitoring was also undertaken using meters for one week before the six month interview, in three rooms in the home.

Parent-reported measures indicated that, in both groups (intervention and control) children"s exposure to mother"s tobacco smoke in the home, and to all tobacco smoke, declined steeply from baseline to six months post test ($p<0.001$), and remained level during follow up. For both intervention and control participants, mother"s smoking rates decreased from baseline to post test. This change was statistically significant for mother"s indoor smoking rate ($p=0.047$) and mother"s total smoking rate ($p=0.003$). No difference between intervention and control groups was observed over time. There was also no significant change over time for children"s urinary cotinine levels.

Evidence statement 1:

Mixed evidence from six studies reported on counselling interventions to promote smoke free homes:

Arborelius and Bremberg 2001 (Sweden) BA-
Fossum et al. 2004 (Sweden) RCT+
Hovell et al. 2000 (USA) RCT++
Kallio et al. 2006 (Finland) RCT++
Ratner et al. 2001 (Canada) RCT++
Zakarian et al. 2004 (USA) RCT++

These studies showed only very weak associations between the counselling interventions and smoke free related outcomes (such as cotinine measures or self reported smoking). Due to the limited effectiveness seen, it is not possible to recommend specific types of counselling approaches or methods of delivery as most beneficial, however the most effective intervention (Hovellet al. 2000) consisted of behavioural counselling for smoking mothers delivered by graduate students with 20 hours of training and weekly supervision.

4.6.2. Counselling interventions with additional elements

Four interventions consisted of counselling plus additional elements such as the provision of written materials or telephone support. Only two studies reported on the effectiveness of the intervention. Details of the other two studies are given here for completion but do not contribute to the evidence statement.

Greenberg et al. (1994, USA) conducted an RCT (+) to determine if a home-based intervention programme could reduce infant passive smoking and lower respiratory problems. Eligible infants had to weigh at least 2000 g at birth and be free of significant postnatal medical problems. Infants were recruited from three hospitals where approximately 80% of the local population births occur.

Informed consent and demographic data was sought for all eligible infants. Mothers declining to enrol were asked for demographic data and a description of their smoking habits. A final study sample of 933 infants was randomly assigned to four groups: full data collection intervention or control or reduced data collection intervention or control. The study population were of mixed ethnicity (Black - 35%, White - 64.3%). The mothers had a mean age in years of 26, and a quarter (25.2%) were smokers (mean cigarettes/day=13.8).

The intervention consisted of four home visits by a nurse during the first six months of life, lasting approximately 45 minutes each. The visits involved counselling, information giving (verbal and booklets), jointly going through worksheets, target setting and other materials such as signs and stickers. The only contact with the control group was for data collection.

The study measured exposure to tobacco smoke (self reported cigarettes per day smoked in the infant‟s presence), environmental nicotine absorption (urinary cotinine), respiratory health (incidence of acute lower respiratory illness during first year of life) and prevalence of persistent lower respiratory symptoms at one year. 121 infants of smoking mothers completed the study. Among these, there was a significant difference in trend over the year between the intervention and the control groups in the amount of exposure to tobacco smoke. Infants in the intervention group were reportedly exposed to 5.9 fewer cigarettes per day at twelve months. There was no difference in infant urine cotinine excretion. The prevalence of lower respiratory tract symptoms was less among intervention group smoking mothers whose head of household had no education beyond high school (14.6% in intervention group and 34% controls).

There were significant differences in the characteristics of those who dropped out of the study. Of the 275 participants not completing the study, there were higher proportions of black, younger and less-educated mothers and also mothers who were smokers. However, the authors comment that the strength of the differences were weak. Self reported measures of exposure to tobacco smoke could have been biased with intervention group mothers more likely to report lower levels. However, the stability of the intervention effect persisted

for at least 7 months after the last intervention and the authors suggest this means that bias does not completely explain the positive outcomes. There was a lack of association between intervention and urine cotinine concentrations. The authors argue that this does not indicate a failure of the intervention as, in their view, this method as a measure of passive smoking is limited. However as a result of this, the results of this paper should be treated with caution.

Lee (2008, China) conducted a before and after study (+) to test an intervention designed using the knowledge, attitudes and behaviours of pregnant women regarding second hand smoke in the home. This was a two phase study. The first phase used focus groups to explore knowledge and perceptions. The second phase was the pilot intervention. For the second phase, 128 non-smoking pregnant women with smoking husbands were recruited and followed up for 16 weeks. This study had no control group. The women were stratified by age as follows: <25=38.3%; 26-30=48.4%; >30= 13.3%.

The intervention was conducted at first contact at a hospital event that consisted of motivational speeches by authoritative figures, video, role play and games designed to practice tactics and instil feelings of self-efficacy. A resource booklet was provided, and a telephone hotline was available for counselling and reinforcement to support bi-weekly telephone consultation provided by the researcher. A final “round up event” was staged to share experiences.

The outcome measures were self reported knowledge and attitudes only, with no consideration of smoking cessation or reduction, or providing a smoke free home. Knowledge and attitudes were measured by a questionnaire pre and post intervention. Participants‟ post-intervention scores were significantly higher than their pre-intervention scores, indicating a significant increase in knowledge, changes in attitudes towards stronger disapproval, and an increased likelihood of taking assertive action when exposed to second hand smoke in the family. Participants with some knowledge of the harmful components of second hand smoke increased from 32.7% to 92.2% ($p < 0.01$),

while those with some knowledge of the diseases caused by second hand smoke increased from 19.5% to 74.2% ($p<0.01$). Approximately 38% of the participants started the program with some knowledge of the harm of second hand smoke to the pregnancy and the foetus, and this figure improved to 73.4% after the intervention ($p<0.01$). Most participants were already aware ofthe benefits of a smoke-free environment at home. The high pre-intervention percentage of 82.8% having awareness increased to 95.3% ($p<0.05$).

The percentage of participants who disliked and strongly disliked being exposed to second hand smoke increased from 50.7% before the intervention to 82.8% after the intervention ($p<0.01$). Before the intervention, a high percentage of the participants reported that they were likely to take assertive action when exposed to second hand smoke from their husband. The high percentage of 92.2% increased to 98.4% after the intervention ($p<0.05$). When the source of exposure was other family members, the likelihood of assertive action was 56.2% at the pre-intervention period, lower than whenthe source of second hand smoke was the husband. This percentage increased to 86.7% after the intervention ($p<0.01$).

Additional studies for information only:

Severson et al. (1994, USA) conducted an RCT (+) to study the effectiveness of an intervention to reduce infant exposure to environmental tobacco smoke during regularly schedules, and paediatric well care visits. The study included mothers who reported smoking in the month prior to pregnancy and who had a “well baby” recruited from 49 paediatric practices in Oregon. Of these, 26 practices (72 providers) were randomised to the extended intervention and 23 practices (56) providers to the minimal or usual care condition (1224 mothers in control and 1666 in the intervention). No demographic information is given about the participant mothers.

The intervention began in hospital after delivery, where mothers received written materials after birth and additional intervention and further materials at the first four well baby visits. These visits generally occurred at two to three weeks and then two, four and six months after birth. The intervention was

delivered by paediatricians, nurse practitioners and physician‟s assistants and involved five steps. These included: encouragement to quit or stay quit; facts about passive smoke exposure; soliciting quit date if relevant; giving out materials; and encouraging mother to watch a video on passive smoking. The comparator group received materials in hospital after birth only. All mothers at birth (regardless of smoking status) received a brief message from the paediatrician about the health effects of passive smoking on infants and a package of materials (letter, brochure and sign) designed to reduce passive smoking exposure.

The study outcomes were: self-report of receipt of materials elicited by telephone interviews; smoking status; quit attempts; and knowledge of ETS elicited through mailed questionnaire at 6 months and one year postpartum. At two and four months postpartum, 87% of smokers and 74% of quitters reported receiving advice to quit or stay quit. 83% of smokers and 66% of quitters received advice on passive smoke exposure. About 70% of the mothers reported receiving materials on passive smoking. The video wasseen by about 50% of mothers. Comparison of the number of quit attempts and knowledge of ETS between the two arms of the study was not reported. The authors describe this data as not being available at the time of the report. Precise evaluation of the intervention described in this paper is problematic due to the omission of crucial details regarding methods and analysis. The authors also report that delivery of the intervention was problematic, with variability in the distribution and collection of health surveys and in the delivery of the messages and materials.

Vineis et al. (1993, Italy) conducted a non randomised controlled trial (+) to evaluate the effectiveness of an educational campaign to prevent the exposure of young children to parental tobacco smoke. All parents of newbornbabies in the town of Rivoli were contacted and asked to complete a questionnaire. Questionnaires were returned by 1015 families (89% responserate). 402 were allocated to the intervention group and 613 to the control group. Allocation of participants was not random, with the date of delivery being used in the allocation process. Characteristics of the population were

not specified, other than that there was a “high proportion of blue collarworkers”. Education and employment status was analysed in relation tosmoking habits and the effectiveness of the intervention.

The intervention consisted of a short counselling session (fifteen minutes) delivered by a nurse, together with three booklets – one on home accident prevention, one on the health effects of active smoking, and one on the health effects of ETS in children. The intervention period lasted for two years with follow up questionnaires sent to the target population two and four years after completion.

The study outcome was self report of the numbers of cigarettes smoked in the presence of children by mothers and fathers. This outcome was also analysed by social class. Results are not reported for the differences between intervention and control groups, other than that „little change” in smoking habits between the intervention and the control group was noted at the two follow up points. The authors suggest that the possibility of contamination between groups in terms of booklet exposure may have led to what they describe as the “modest effectiveness” of the smoking intervention.

Evidence statement 2:
Mixed evidence from two studies was identified for interventions which combine counselling with additional elements such as the provision of written materials or telephone support:

Greenberg et al. 1994 (USA) RCT+
Lee 2008 (China) BA+

However, Lee (2008) reported only on knowledge outcomes, rather than behaviour change.

4.6.3. Interventions to develop (mostly individualised) smoke free home policies.

Four papers evaluated programmes to implement individually delivered smoke free home policies. These policies were mostly tailored to the individual family, the one exception was the study by Sockrider et al (2003) where more generic materials were provided.

Chilmonczyk et al. (1992, USA), conducted an RCT (+) to test a low intensity, physician office based intervention strategy using infant urine cotinine to measure any reduction of infant environmental tobacco smoke exposure. The study included 103 mother-infant pairs (no demographic details provided)where the mother smoked ten cigarettes or more per day. A total of 518 mothers consented to providing information about household smoking habits and an infant urine sample. 103 mothers reported they smoked more than 10 cigarettes a day and were designated as the study sample, 52 of these received the intervention and 51 were randomly assigned to the control group. The intervention consisted of the physician telephoning each mother with the result of the infant cotinine test, and providing an explanation of the meaning of the result. In addition, personalised letters signed by the physician were sent to each mother giving specific recommendations for changing household smoking habits. No details of the control process other than “usual care” is provided. The follow up cotinine measurement at two months (obtained for 52% of the intervention and 57% of control infants) was 6% lower in the intervention group but this result was not significant. The authors suggest that low compliance with the follow up may have contributed to unreliability in the study findings.

Strecher et al. (1993, USA) conducted a RCT (+) which looked at the role of a theoretical framework in an intervention program designed to reduce infants" exposure to ETS. Infants were enrolled at birth (three hospitals) and randomly assigned to intervention or control. 2332 eligible infants were born but many mothers declined consent or could not be contacted after enrolment (intervention n=292, control n=293). In order to participate, infants had to have

no significant postnatal problems and a healthy birth weight (no other demographic data is provided).

The intervention consisted of four intervention nurse home visits (experienced public health nurse) between three weeks and six months of age (with follow up data collected at one year). Each visit lasted 45 minutes. At the visit the nurse defined passive smoking, and identified positive and negative outcomesrelating to exposure to tobacco smoke. Expectations were addressed through verbal reinforcement and by worksheets, which allowed the mother to identify possible sources of smoke which her infant may be exposed to and select specific strategies for reducing passive smoking from these sources. The mother then selected strategies which she felt could be confidently achieved. The control group received no intervention.

Study outcomes were exposure to tobacco smoke (deemed to occur when smoke was produced in the infants presence), together with the amount of exposure expressed as cigarettes per day. Two psychological constructs were also used. One defined by the authors measuring the expectation of outcomes resulting from behaviours associated with exposure, and the other measuring expectations of efficacy associated with the mother"s ability to engage in these behaviours (no clear details given). The intervention produced significant and sustained changes in outcome expectations ($F=22.0$ $p<0.001$) from baseline to follow up at seven months. A marginal effect ($F=3.2$, $p<0.08$) intervention by outcome expectation interaction effect was also found over this period, with the intervention having the greatest effect on mothers reporting initially low outcome expectations. No additional effects were seen between seven and twelve months. Interpreting the results of this paper in terms of the effectiveness of the intervention is problematic as they are presented in the context of supporting the psychological model.

Stepans et al. (2006, USA) conducted an RCT (++) to determine the effect of a smoking hygiene intervention on infants of breast feeding mothers who smoke. A convenience sample of thirty five mother-infant dyads from seven postpartum units was recruited and randomly assigned to the intervention or control group. Of the twenty seven dyads completing the study, sixteen were

in the experimental group and eleven were in the control group. Infants met the following criteria: hospital birth, at least 37 weeks gestation, birth weight >2,500 grams, on oxygen for no more than 24 hours after delivery, no significant postnatal health problems. Mothers were aged 18 years or older, smoked at least five cigarettes a day, and intended to breast feed (no further demographic details). Smoking hygiene was introduced when infants weretwo weeks old and reinforced at three and five weeks.

Intervention components included: the infant was not in the same room as someone who was smoking, if the mother smoked it should occur at least 90 minutes before or immediately after breastfeeding, an air cleaner was placed in the infant‟s room. All women received an ETS exposure pamphlet defining smoking hygiene and outlining the steps they could take to reduce theirinfant‟s exposure. The intervention group received the pamphlet at week two;the control group received it at week five, after the completion of data collection. The outcome measures were: infant health (respiratory symptoms); urinary nicotine and cotinine levels; and smoking hygiene behaviours. No differences in infant urinary nicotine (p=0.07) or cotinine (p=0.29) levels, or between breast milk nicotine (p=0.17) or cotinine (p=0.44) levels were seen between the two groups. There were also no differences between frequency of respiratory symptoms in either the control or intervention groups when week two was compared with three and five. Only 27% of women in the intervention group implemented all aspects of thesmoking hygiene intervention.

Sockrider et al. (2003, USA) conducted an. RCT (++) to examine the effect of an intervention to sustain prenatal smoking cessation postpartum in order to reduce infant ETS exposure. 485 women were involved in the intervention, termed project PANDA at 28 weeks gestation. 87% completed data at baseline and the twelve month follow up and were included in the analysis (N=325). The women had an average age of 28 and were of varied SES (income) and ethnicity (White 73%, Black 13%, Hispanic 13%, Other 1%). Current smokers made up 66% of the sample (83% of these reporting smoking 100 or less cigarettes per week prior to pregnancy), with the rest

having quit smoking (34%). The intervention consisted of a home smoking control index comprising four items: mother smokes in home; partner smokes in home; other household smokers are asked to smoke outside; and visitors are asked to smoke outside. These indices were used to classify homes as either having a smoking policy in effect, having no policy or no policy was needed.

The intervention consisted of families receiving one video tape and five newsletters for the women (and a different set for the partners), distributed by mail between twenty eight weeks gestation and six weeks postpartum. The newsletter included specific messages about protecting infants from ETS exposure, a sign to designate the home as smoke free and tips on relapse prevention. Control (usual care) subjects received messages about ETS exposure only as part of standard counselling from infant paediatric care or community education.

The study outcome measures were: the home smoking control index; reported tobacco smoking in the home; and validation of self reported smoking in the home using nicotine monitors. Of those who needed to control smoking in the home, 63% had a home smoking policy in effect at three months, 60% at six months, and 64% at twelve months. Predictors of having a policy at sixmonths included having a policy at the previous assessment, having confidence in limiting infant ETS exposure in the home, and perceiving a difficultly in preventing exposure. A significantly larger proportion of mothers who reported not smoking post partum were classified as having a policy in effect at each post partum interview (all $p<0.02$). Home nicotine concentrations were associated with self reported home ETS status at six andtwelve months post partum ($r=0.53$ and $r=0.55$, both $p<0.001$). When compared with controls, smokers who received the smoking intervention were significantly more likely to restrict smoking in the home (58% compared to 29% allowed smoking, significance level not provided). The authors conclude that early establishment of a policy appears to be important for ensuring sustained ETS avoidance over time.

Evidence statement 3.

Good evidence from four studies looked at programmes to implement individually adapted smoke free home polices:

Chilmonczyk et al. 1992 (USA) RCT+
Strecher et al. 1993 (USA) RCT+
Stepans et al. 2006 (USA) RCT++

or the individual delivery of a more generic policy:
Sockrider et al. 2003 (USA) RCT++

These interventions generally had problems with low compliance and loss to follow up. However, Sockrider et al. 2003 demonstrated a significant reduction in smoking as a result of their home smoking control index.

4.6.4. Motivational interviewing interventions

Two papers report findings from interventions which were based on the use of motivational interviewing to promote smoke free homes. However, only one reported on effectiveness. The second paper is included here for information, but does not contribute to the evidence statement.

Emmons (2001, USA) conducted an RCT (++) to determine whether a motivational intervention for smoking parents of young children would lead to reduced household passive smoking exposure. The study population consisted of 323 current smokers or recent quitters with a child or grandchild under three years old in the household; and who were able to read and speak English or Spanish. Participants were recruited through primary care settings: family practice, obstetrics, and paediatric departments of eight community health centres serving diverse, low-income populations. In total 685 potential participants were contacted. 304 of these refused; 86 were ineligible and 4 took part in a pilot intervention. Data in the study are from the 279 participants

who provided a baseline household air sample. 141 smokers were randomised to the control (self-help) group and 150 smokers were randomised to the Motivational Interviewing group. The study population was of mean age 28 years, mostly female (91.5%), of low income and mixed ethnicity (White 46%; Black 21%; Hispanic 21%; Other 14). They smoked on average 14 cigarettes per day (SD=9.3) and the average length of time smoking was 11.8 years (SD=7.7). More than 30% of participants had a partner who smoked. Children in the households were aged less than 3 years.

The intervention consisted of Motivational Interviewing (MI) in one 30-45minute session conducted in the participant"s home by a trained health educator. This was followed by four telephone counselling calls. Feedback about household nicotine levels was provided after the final follow-up assessment. A key component of the intervention was feedback from baseline household air nicotine assessments and assessment of the participants" carbon monoxide level, followed by tailored goal-setting. The control group underwent a programme of „Self Help" through printed materials sent by post. Both groups were provided with smoking cessation manuals, passive smoke reduction tip sheets and a resource guide on community-based health and social services resources.

The study measured exposure levels of environmental nicotine at baseline, three, and six months via nicotine concentration (μg/m³) in the TV room and kitchen, together with reported smoking cessation and cigarette consumption. The six month nicotine levels were significantly lower ($p<0.05$) in the MI households. Repeated measures analysis of variance across baseline, three month and six month time points showed a significant time by treatment interaction, whereby nicotine levels for the MI group decreased significantly. The nicotine levels for the self-help group increased, but were not significantly different from baseline. There were no significant differences in smoking cessation rates between groups at any of the follow-ups, and no change in smoking rate between groups at any of the follow-up assessments. The authors suggest that a six month follow-up period does not allow for evaluation of long-term changes in household exposure.

Al-alaway et al (2008, UK) conducted a before and after study (-) with members of the public aged between 16 and 65, in 13 neighbourhood renewalareas in Doncaster (no further demographic details given). The intervention was delivered by staff from Doncaster smoking cessation service, Doncaster council, South Yorkshire Fire Service, Sure Start and two midwives. Training in motivational interviewing was given. Respondents were selected via routine contact with frontline staff and asked whether they wanted to make their homes smoke free. If they agreed to participate they were provided with a leaflet offering a choice of three "promises" (Gold – smoke free home; Silver –smoking only in one room and never in the presence of children; Bronze – never smoke in the presence of children). In total 825 "promises" were returned after initial contact, of which, 523 (63%) were from current smokers. Non smokers (386, 95%), and smokers who had just quit (10, 91%) were more likely than smokers (271, 52%) to opt for a gold promise ($p<0.001$). Due to time constraints, 230 participants were randomly selected to receive follow up by postal questionnaire (81) or telephone survey (149).

The most common motivators to keep promises were: the health of children (26%) and a cleaner house/decor (12%). Feelings after making the promise included: healthy/health conscious (20%), responsible (17%), caring for others (17%), a good parent (15%) and a sense of achievement (11%). The selection of participants for follow up (although random) may have introduced bias into this study. Also, no data on the effectiveness of the intervention in relating to maintaining a smoke free home is presented. This paper provides information on an intervention but cannot be used to contribute to an evidence statement as the effectiveness of the intervention is not considered.

Evidence statement 4.

Good evidence from one study which reported on the use of motivational interviewing to promote smoke free homes demonstrated a significant decrease in nicotine levels in intervention households over six months (however, this was not supported by self reported smoking rates).

Emmons 2001 (USA) RCT++

4.6.5. Professional training intervention

Narce-Valente and Kligman (1992, USA) conducted a before and after study (+) to assess the pre intervention and post intervention screening and counselling activities of physicians with regard to passive smoking. Patients of twenty eight physicians were sampled from the University of Arizona Family Practice Residency Program (106 office visits). The visits were by children aged five years or younger seen for diagnosis of upper tract respiratoryinfection, bronchitis, pneumonia or otitis media and their families (no further demographic details).

The two part intervention consisted of a two hour educational seminar for the physicians and a passive smoking chart reminder documentation system. The seminar contained information on the health effects of passive smoking and on techniques for physicians to use in counselling parents on the reduction of exposure of children to ETS. In addition, a newly developed office-based chart reminder consisting of a stamp in red ink on a flow chart could be used to document whether a child was exposed to smoke at home, and if so act as a reminder to counselling which could be offered.

The study outcome was physician screening and counselling regarding passive smoking. Of the twenty eight physicians, eleven attended the seminar. In comparing pre and post intervention parental surveys there were increases in passive smoking screening (17% vs. 32% p=0.03) and counselling (19% vs. 46% p=0.03) activities of physicians. Chart documentation of these activities however showed very little change regardingscreening (2% vs. 6% p=0.10) or counselling (4% vs. 6% p=0.64). Screening and counselling increased as a result of the intervention, but the effect on those who attended the seminar versus those who did not was not considered. This makes it difficult to draw any conclusions on the effectiveness of the intervention from these results.

Evidence statement 5.

One study reported on the effect of an educational intervention on the screening and counselling activities of physicians with regard to passive smoking.
Narce-Valente and Kligman 1992 (USA)BA+
This study did not consider the effect of those who attended the intervention compared to those who did not so the effectiveness of the intervention is unclear.

4.7. Discussion

4.7.1. Summary of identified research

The searches identified seventeen papers that met the inclusion criteria for smoke-free homes (although three did not fully consider the effectiveness of the intervention and so are included here for information only, they do not contribute to the evidence statements). The studies described here are biasedtowards interventions conducted in the USA (ten of seventeen), with only one conducted in the UK. Therefore there may be some reservations with respect to the applicability of the interventions in a UK population.

Interventions were categorised in terms of those which were based on counselling; counselling plus additional aspects; individually adapted smoke free home policies; motivational interviewing and also staff training. This categorisation system may not sufficiently differentiate the detail of different interventions, but represents one way of effectively dividing the evidence.

The review findings indicate limited evidence regarding the success of interventions to reduce environmental tobacco smoke. Data from the included papers suggests only very weak associations between counselling interventions and smoke free related outcomes. One study reported on the effect of an educational intervention on the screening and counselling activities of physicians however, the effectiveness of the intervention is unclear. There was mixed evidence in regard to interventions which combine

counselling with other additional interventions, such as the provision of written materials or telephone support.

There was also mixed evidence from studies reporting on interventions which were based on the use of motivational interviewing to promote smoke free homes, and also evaluations of individually adapted smoke free home plans. It is important to note that many studies which indicated positive effects found these in self-reported measures only. There were also limitations throughout the papers in terms of study quality (especially sample size) and poor reporting of results in relation to effectiveness of the interventions. These factors need to be taken into account when considering the evidence.

4.7.2 Research questions for which no evidence was identified

No evidence was identified on the cost effectiveness of the interventions. In addition there were no papers which considered media campaigns. The distribution of health promotion materials were only considered as a part of multi component interventions, where their effectiveness was not considered independently.

4.7.3 Evaluating the impact of different approaches

Evaluation of this type of intervention has the potential to use more reliable outcome measures than may be the case for other interventions in the public health field. The use of nicotine monitors and cotinine measures (from both infant and mother) for example, provide well-established outcome measures which do not rely on self reporting. However, the results obtained from different measures were, on occasion, contradictory, and some studies still relied on self-reporting for their outcomes.

Across the studies there was a lack of intervention fidelity, with large numbers of participants not adhering to the intervention. This, along with limited follow up in many cases makes it difficult to recommend specific intervention types or components.

4.7.4 Adverse or unexpected outcomes

No interventions reported on adverse outcomes.

4.7.5 Applicability in the UK context

Care should be taken when considering the potential applicability of the majority of these studies to the UK context as nearly all were conducted outside the UK and differences in service delivery, financial considerations, and staffing provision may be significant. However many of the non-UK populations were sufficiently similar demographically to allow comparison.

4.7.6 Implications of the review findings

The literature in general is not well developed, especially in terms of good quality effectiveness and cost effectiveness studies. The literature has a substantial bias towards interventions conducted in the USA (with only one study conducted in the UK identified), which will have implications for applicability in the UK.

The review considered a range of interventions encompassing counselling, counselling plus additional aspects, individually adapted smoke free home programmes, motivational interviewing and also staff training. The findings indicate limited evidence regarding the success of these interventions to reduce environmental tobacco smoke. Concerns regarding design, outcome measures and data collection for many of the studies require any recommendations drawn from this literature to be treated with caution.

5. RESULTS OF REVIEW TWO

5.1. Quantity of the evidence available

The searches identified twenty two papers that met the inclusion criteria (outlined in section 3.2). Of these, ten reported qualitative data and nine reported quantitative cross-sectional data (surveys). An additional three papers provide narrative descriptions of issues relating to delivery of interventions in the findings section (see Table 8). The two papers by Cooke et al. (1998 & 2001) are from the same study; however provide different setsof data. The earlier paper reports findings from the baseline survey prior to the commencement of an intervention, and the later paper reports staff views of the intervention. The paper by Lando et al. (2001) examines data from two intervention studies using different intervention programmes, and thus reports data from two sets of participants.

Table 8. Included papers by study design

Cross-sectional (survey)	Bishop et al. 1998 Claper et al. 1995 Cooke et al. 2001 Cooke et al. 1998 Glover et al. 2008 Grange et al. 2006 Hartmann et al. 2007 Jordan et al. 2006 Walsh et al. 1995
Qualitative interviews	Abrahamsson et al. 2005 Arborelius & Nyberg 1997 Everett et al. 2005 Lowe et al. 2002 McCleod et al. 2003 McCurry et al. 2002 Nichter et al. 2007 Tod 2003
Qualitative focus group	Anderson 2002 Lowry et al. 2004
Narrative as part of findings	Katz et al. 2008 Lando et al. 2001 Solomon & Flynn 2005

5.2 Populations and settings

The papers encompass studies from five European countries, with three reporting British studies, one reporting data from Northern Ireland, one from France, and two from Sweden. Seven papers report data from the United States of America, five papers (four studies) from Australia, two papers from New Zealand, and one from South Africa (see Table 9)

Table 9. Included papers by population characteristics

STAFF		
Abrahammson et al. (2005)	Midwives. 2-24 years experience in antenatal work. All female. Age 27-61.	Sweden
Bishop et al. (1998)	Antenatal clinic staff Midwives + Doctors.	Australia
Clasper & White (1995)	Hospital Midwives, Community Midwives, GPs, Obstetricians.	GB
Cooke et al. (1998)	Antenatal clinic staff Midwives + Doctors.	Australia
Cooke et al. (2001)	Antenatal clinic staff. Midwives + Doctors. 23 smokers. Mean length of clinical experience= 10 years.	Australia
Everett et al. (2005)	Doctors in public sector hospitals.	South Africa
Glover et al. (2008)	GPs + Midwives 82% European 71% aged 35-54 years 99% Midwives female, 46% GPs.	New Zealand
Hartmann et al. (2007)	Staff working in prenatal care. Obstetricians, Midwives, Family Physicians, Nurses, Assistants.	USA
Jordan et al. (2006)	Obstetricians + Gynaecologists. Male 59%, White 80%, non smokers 80%, working in suburban locations 53%. Average 15 years of experience, average age 46. 76% worked in private practice.	USA
Lowe et al. (2002)	Medical Superintendents + Directors of Nursing/Head Midwife	Australia

McCleod et al. (2003)	Midwives 9 had received smoking cessation training. 7 non smokers, 7 ex smokers, 2 smokers. Years in practice - 1 less than 5, 6: 5-10 years, 2: 16-20 years, 7: more than 20 years.	New Zealand
Walsh et al. (1995)	Medical Directors + Nursing Directors 66% clinics in rural city or town, 26% in city suburb, 8% inner city.	Australia
SERVICE USERS		
Anderson (2002)	Pregnant women who were smoking. Described as primarily lower income, lower educated women, most in their 20s. Nearly half had other children.	USA
Arborelius & Nyberg (1997)	Women who had smoked during pregnancy and given birth during previous few months. Age 20-38. All low level of educational attainment. Skilled, unskilled workers + 5 unemployed.	Sweden
Grange et al. (2006)	Post-partum women. Given birth the same day or 2 days before. 46% 30-39 years of age. 18% smoked during pregnancy, 13% gave up during pregnancy.	France
Katz et al. (2008)	Black/African-American or Latino pregnant women. Resident in District of Columbia Over 18 years of age English speaking Pregnancy less than 28 weeks gestation Smokers only 54%, smokers and depressive symptoms 11%, smoking and partner violence 5%, all 3 risks 6%.	USA

Lando et al. (2001)	Pregnant women smokers. Current and recent smokers (within 30 days prior to conception) Mean age 28 + 24 years 44% + 26% had not smoked in the previous 7 days. RCT - 88% Caucasian, 82% married or living with partner, 64% employed full time, 17% college graduates.	USA
Lowry et al. (2004)	Pregnant women smokers "mainly women from deprived areas , social class C2D and E".	GB
MCCleod et al. (2003)	Women within 4 months of giving birth. All smoked at conception, 4 stopped during pregnancy, 4 reduced, 3 continued to be regular smokers. Age 21-36. 11 European ethnicity, 2 Maori.	New Zealand
McCurry et al. (2002)	Pregnant women Age 16-38 years "Committed smokers"	Northern Ireland
Nichter et al. (2007)	Low income pregnant women. 4th or 5th month of pregnancy All smoking at the time of pregnancy, 64% had continued to smoke during pregnancy, although all had attempted to reduce at some point. 62% Anglo American, 21% Mexican American, 11% African American, 6% multi ethnic. Most women in "high stress relationships", one quarter in positive, stable relationships.	USA
Solomon & Flynn (2005)	Pregnant women attending a women infants and children programme identified as a smoker.	USA
Tod (2003)	Pregnant women smokers South Yorkshire Age: 19-38	GB

The papers include findings from staff participants (eleven studies), and pregnant women (ten studies). Only one paper reported data from both staff and service users (McCleod, 2003). No papers were found reporting data on women planning a pregnancy.

Of the staff participants, two papers (Abrahammson et al., McCleod et al.) report data from midwives, one paper (Everett et al.) considers doctors, four papers (Bishop et al., Cooke et al., Cooke et al., Glover et al.) include antenatal clinic midwife and doctor participants, one paper considers obstetricians and gynaecologists (Jordan et al.), two papers report data from teams of four or five different professions (Clasper & White, Hartmann et al.), and two papers (Lowe et al., Walsh et al.) consider senior hospital staff(medical superintendents and senior midwives/medical and nursing directors).

The papers reporting service user participants include both women who were currently pregnant and smoking (eight papers), and women who had recently given birth and smoked at some time during the pregnancy (three papers). Of papers reporting currently pregnant women, Lando et al. (2001) reports data from two sets of participants where 46% in one group and 26% in the other group reported that although they were recent smokers, at the time of data collection they had not smoked in the previous seven days. The study by Nichter et al. (2007) also contains women who were not currently smoking in the sample, with 64% confirming they were still smoking at the time of data collection. The McCleod et al. (2003) study of women following birth also contains four of the eleven participants who stopped smoking prior to the birth (although does not record if this was still the case at the time of data collection).

Four papers (Anderson, 2002, Arborelius & Nyberg, 1997, Lowry et al., 2004, Nichter et al., 2007) describe the women study participants as being of low income, or low education, or low socio-economic status and thus may be of particular importance in considering health inequality issues. A UK study (Tod, 2003) took place in a health action zone. In addition, one paper (Katz et al., 2008) reports finding from Black/African-American or Latino pregnant women

in the USA which may also suggest lower socio-economic circumstances. This study includes not only pregnant women smokers, but also pregnant women with depressive symptoms and subject to partner violence. As more than 50% of the sample were smokers this paper has been included in the review, however the particular population characteristics may need consideration.

5.3 Quality of the evidence available

The methodology checklist outlines fourteen key questions to be considered when rating a qualitative study:

1. Is a qualitative approach appropriate?
2. Is the study clear in what it seeks to do?
3. How defensible is the research design?
4. How well was the data collection carried out?
5. Is the role of the researcher clearly described?
6. Is the context clearly described?
7. Were the methods reliable?
8. Is the data analysis sufficiently rigorous?
9. Are the data rich?
10. Is the analysis reliable?
11. Are the findings credible?
12. Are the findings relevant?
13. Are the conclusions adequate?
14. How clear and coherent is the reporting of ethics?

Each of these aspects is then considered and a judgement made as towhether the criteria have been fulfilled and the checklist item can be considered to be appropriate/clear/reliable/rigorous or otherwise the criteria has not been fulfilled and the item is inappropriate/unclear/unreliable/not rigorous/poor.

Of the ten qualitative papers, one was rated as ++, six rated as +, and three papers were rated as – for quality (see Table 10).

Table 10. Quality rating of included qualitative papers.

** Appropriate/clear/reliable/rigorous/rich

* Inappropriate/unclear/unreliable/ not rigorous/poor

0 Unsure/unable to judge

Paper	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Quality grade
Abrahamsson et al. 2005	**	**	**	**	**	**	0	*	**	0	*	**	*	**	+
Anderson 2002	**	**	**	*	0	*	0	*	**	0	*	**	*	0	-
Arborelius & Nyberg 1997	**	**	**	**	**	**	0	*	**	*	**	**	**	0	+
Everett et al. 2005	**	**	**	**	0	0	0	**	**	**	**	**	**	0	+
Lowe et al. 2002	0	**	**	*	*	**	0	*	*	0	0	*	*	0	-
Lowry et al. 2004	**	0	**	0	*	0	0	*	*	0	0	0	**	0	-
McCleod et al. 2003	**	**	**	**	**	**	0	**	**	**	**	**	**	**	++
McCurry et al. 2002	**	**	**	0	0	*	0	**	**	0	**	0	**	**	+
Nichter et al. 2007	**	**	0	0	**	*	0	**	**	**	**	**	**	0	+
Tod 2003	**	**	**	0	0	*	0	**	**	**	**	**	++	++	+

5.3.1 Limitations on study quality

The included papers report data from qualitative and cross sectional study designs, on some occasions forming part of a larger intervention study. During the sifting process studies using other designs such as randomised controlled trials were considered for inclusion however these studies had no relevant information in the findings section.

The main limitation on quality relates to the use of single methods of data collection within all the included studies. Although the concept of reliability in qualitative research is controversial, the use of and comparison of data from multiple methods (triangulation) is often considered to add strength/depth to the findings. Only one paper (McCleod et al., 2003) received a ++ rating.

Although this paper, as with the others, used only a single data collection method, it was felt that the higher rating was justified in view of the rigorous data collection and analysis process, and richness of the data provided. This is the only paper also to include data from both staff and recently pregnant women smokers.

In addition to these ten qualitative studies, the paper set includes nine cross-sectional studies and three narrative report studies. The three studies reporting findings only as narrative, rather than data would rate as – for quality, but are simply referred to as “narrative” in the findings in order to distinguish them.

As indicated earlier, the cross-sectional studies are judged in terms of any potential confounding factors and/or whether there is potential for measurement bias. Four papers provide no details regarding the design and construction of the survey tool (Bishop et al., 1998, Glover et al., 2008,Grange et al., 2006, Walsh et al. 1995). Two papers describe a pilot phase (Clasper & White 1995, Cooke et al., 2001). One paper reports that they used a survey that had been adopted in a previous study (Cooke et al., 1998) and one describes the development of the tool from a review of the literature (Jordan et al., 2006). All these studies use self-report measures creating considerable opportunities for bias due to incomplete or inaccurate recall of events during pregnancy, and the use of largely untested measurement instruments. Also, in relation to staff participants, self report of behaviour maybe very different to actual behaviour.

5.4 Review findings

Analysis and synthesis of the themes within the findings of the includedpapers, suggests a number of key recurring themes relating to the delivery of interventions to stop smoking in pregnancy. These are:

1 Whether or not the subject of smoking is broached when pregnant women are seen by health professionals
2 The advice/recommendations given by health professionals

3 The way that information and advice is communicated
4 The intervention provided during and after a consultation
5 Whether or not policies/procedures/protocols are in place
6 Record keeping and follow up
7 The knowledge and skill base of staff
8 Time constraints
9 Resource constraints
10 Staff perceptions of ineffectiveness
11 Differences between professional groups
12 Obstacles to accessing interventions.

5.4.1 Whether or not the subject of smoking is broached when pregnant women are seen by health professionals

Seven papers provide evidence regarding the frequency with which health professionals routinely broach the subject of smoking with pregnant women or recent mothers. Anderson et al., 2002, (Qualitative study -) described "variation" amongst pregnant women in the USA regarding whether smoking cessation had been discussed with them. Similarly McCurry et al., 2002 (Qualitative interview study +) found that most pregnant women smokers in the sample reported that health professionals in Northern Ireland had at sometime asked about their smoking behaviour "however not all". Grange (2006) in a survey of women in sixty maternity hospitals in France a few days after delivery, reported that 76% of women who were smoking at the start of pregnancy said that they had been asked about tobacco consumption by a clinician or midwife. Of the women who continued to smoke during their pregnancy, it was reported that 21% said that they had not been questioned on the subject.

In a survey of a range of maternity service staff in Britain, Clasper and White (1995) reported a much higher rate of 96% of participants agreeing that they routinely asked about the smoking status of pregnant women. Glover et al. (2008) found similar figures of 92% of GPs and 82% of midwives in New Zealand reporting that they usually asked pregnant women about their

smoking status. Cooke et al. (1998) in a similar survey in Australia antenatal clinics, reported a figure of 83% of staff agreeing that they assessed smoking status. Everett et al. (2005) in a survey of doctors in South Africa report a more mixed picture of practice, with some doctors not noting smoking status during a consultation, or giving cessation advice only where there was a health problem associated with smoking or where there was a history of miscarriage or stillbirth. These surveys report whether or not participants may have enquired about smoking status, although not at which point in time, and require retrospective recall of practice.

Four papers provide evidence regarding why not all health professionals may discuss smoking status with all pregnant women. Abrahammson et al., 2005 (Qualitative interview study +) outlines the experiences of midwives in Sweden. This study describes health professionals sometimes avoiding the issue of smoking due to previous experiences of attempted persuasion or information-giving having a negative impact on the relationship between the midwife and the pregnant woman. The study highlights the key perceived importance to participants of establishing a good mutual relationship, and building co-operation through this relationship and respect for what the woman wanted. The authors suggest that midwives perceived a potential conflict between discussing smoking in pregnancy, and increasing a woman‟s sense of guilt.

McCleod et al., 2003, (Qualitative interview study ++) describe midwives perceptions in New Zealand that asking women about smoking status was challenging, although the perceptions of pregnant women in the study was that it should be a part of a midwives job. This study, which formed part of a larger experimental intervention, used a laminated card with six statements about smoking status which the midwife showed to the woman and asked her to choose the one that best described her smoking status. The midwives reported that this was a useful way of addressing the perceived challenge of broaching the subject.

A focus group study (Lowry et al., 2004, Qualitative -) describes the perspective of women participants attending an antenatal clinic in the UK.The study was undertaken to inform the development of smoking cessation programme, and the authors describe the crucial role of relationships betweenwomen and health professionals, although report this in the narrative conclusions rather than study findings.

Katz et al (2008) provide supporting narrative evidence regarding the concerns staff have, in respect to the potential for discussion of smoking to damage relationships. This study is a randomised controlled trial of a ten session clinic-based intervention for pregnant African-American women. The study targeted personal smoking, environmental tobacco smoke and alsopartner violence. The authors describe that adjustments were made to the content of the intervention in regard to both violence and personal smoking “if a woman simply did not want to discuss their experiences on this issue furtheror the facilitator thought the relationship might be jeopardised”. It is reported that for 5% of the sessions some of the content regarding personal smoking was omitted, and for a further 5% of sessions, the content was changed from personal smoking impact to environmental tobacco smoke risks.

Evidence statement 1.

Two qualitative studies and five survey studies provide evidence that not all staff ask all pregnant women about their smoking status during consultations.

McCurry et al., 2002 (N Ireland service users) Qual+
Anderson et al., 2002 (USA service users) Qual-
Surveys - Grange et al. 2006 (France service users), Clasper & White 1995 (UK service providers), Cooke et al. 1998 (Australia service providers), Everett et al. 2005 (South Africa service providers), Glover et al. 2008 (New Zealand service providers).

These findings are from studies of both staff, pregnant women smokers and recent mothers across a range of countries including two from the UK. One study reports data from a lower income/educated population (Anderson et al. 2002 (USA service users) Qual-).

Four studies provide evidence that staff may not ask about smoking status due to concerns regarding damaging the relationship between themselves and a pregnant woman.
McCleod et al. 2003 (New Zealand service users) Qual++
Abrahammson et al. 2005 (Sweden service providers) Qual+
Lowry et al. 2004 (GB service users) Qual-
Katz 2008 (USA) Narrative.

5.4.2 The advice/recommendations given by health professionals

Five qualitative studies, three surveys, and two narrative reports describe the content of consultations regarding smoking between healthcare staff and pregnant women smokers. A survey of women in France (Grange et al., 2006) found that 53% of women who had continued to smoke during pregnancy reported receiving no information about the benefits of giving up smoking, and 77% said that they had not received any information leaflet. Minimal advice was reported by 16%. Interestingly, 63% of this same group of continued smokers said that they would not have liked any more support or information.

Further evidence is provided by Anderson (2002) in a focus group study of women in the USA (Qualitative study -). None of these women participants who were currently pregnant smokers described “a thorough attempt to explain what smoking was doing to the baby, how quitting lowers risks, and how to go about trying to quit”. In a study by Arborelius and Nyberg (1997 Qualitative interview +) nine of the thirteen Swedish women stated that they would have given up if they had been given proof that smoking was dangerous or that the baby would be harmed. McCurry et al. (2002 Qualitativeinterview +) report that the pregnant women in their study in Northern Ireland perceived that they had been advised rather than strongly persuaded to give up smoking.

Nichter et al. (2007 Qualitative interview +) report the perception of mixed messages from doctors amongst pregnant women in the USA. One of the participants described how she was encouraged to cut down her smoking, but had also been told that if cutting down/quitting was becoming very stressful that she should stop, as stress could harm the baby more. Other women described receiving advice to quit, but the majority reported that they received no messages that were helpful, describing it as being “just a policy” for health professionals to ask and give a pamphlet.

Everett et al. (2005 Qualitative interview +) indicate concerns amongst some staff regarding the consultations. This study of doctors in South Africa describes participants as characterising their approach as mostly exhorting

women to stop smoking, which they were aware was inadequate. Other data relating to staff perceptions however suggest a more positive picture. Cooke et al. (1998) reports that 81% of staff in an antenatal hospital clinic in Australia describe that they provide education regarding the risks/effects of smoking. Clasper and White (1995) report a higher figure in UK hospital practitioners of 96% declaring that they explain the risks of smoking, and 67% offering advice regarding how to stop.

The narrative findings in a paper comparing two different interventions in the USA (Lando et al. 2001) describe how staff delivering the intervention programme struggled to actively engage women in the discussion of issues pertaining to smoking. Also, this paper describes how many paediatricians preferred to discuss environmental tobacco smoke rather than maternal smoking “since the baby not the mother was the patient”. The narrative of the Katz et al. (2008) study also describes how discussion could be refocused on environmental tobacco smoke issues when personal smoking discussion became too difficult.

Evidence statement 2.

Five qualitative studies and three surveys provide evidence that the information and advice provided by health professionals can be perceived as insufficient or inadequate by some women and by professionals themselves. There is the suggestion that advice could be more detailedand explicit, and that professionals find discussion of individual smoking behaviours challenging.

Anderson et al. 2002 (USA service users) Qual-
Everett et al. 2005 (South Africa service providers) Qual+,
Arborelius & Nyberg 1997 (Sweden service users) Qual+,
McCurry et al. 2002 (N Ireland service users) Qual+,
Nichter et al. 2007 USA service users) Qual+
Surveys - Grange et al. 2006 (France service users), Cooke et al. 1998 (Australia service providers), Clasper & White 1995 (GB service providers).

Three of the studies report data from a lower income/lower educated/deprived area (Anderson et al., Arborelius & Nyberg, Nichter et al).

5.4.3 The way that information and advice is communicated

Five qualitative papers report findings regarding the way or manner in which staff discuss smoking issues with pregnant women.

Anderson et al., 2002 (Qualitative focus group -) describe the perceptions of women in the USA study that the health professional was “preaching” or “nagging” which resulted in counterproductive discussions. Also, some women reported that they had been insulted by the professional"s condescending tone, and had left the consultation feeling resentful. Arborelius and Nyberg 1997 (Qualitative interview +) similarly describe that ten of the thirteen women in this Swedish study stated that a midwife should not be authoritarian, should not exhort, pressure or nag. Two of the

participants made positive comments in particular about midwives they had encountered who were friendly and never negative.

A UK study (Lowry et al. 2004 Qualitative focus group -) similarly reports that women are particularly sensitive to the approach and tone used by a professional, being disparaging of anything “preaching” or “hard hitting”. They emphasis the importance of an approach that is “ongoing support” rather than “nagging”. They also describe the perception of mixed messages amongst pregnant women, reporting the view that professionals were nagging them to quit but not following through this advice with enthusiasm or empathy.

Tod (2003) echoes this perception of the negative effective of advice given in a judgemental manner (Qualitative +). Some of the UK women participants in this study described how the perception of being judged led to them continuing to smoke as they were upset and saw it as a position of defiance. Only one study reporting staff perceptions includes data relating to the method of communication between staff and pregnant women smokers. Everett et al. (2005) describes how five of the fifteen South African doctors expressed the view that a more caring and empathetic approach could improve communication.

Evidence statement 3.

Five qualitative papers describe how the style or way that information/advice is communicated to pregnant women smokers can impact on how the advice or information is received. Concerns regarding advice being construed as nagging or preaching are reported, together with the recommendation that that a more caring, empathetic approach may be helpful.

Arborelius & Nyberg 1997 (Sweden service users) Qual+
Everett et al. 2005 (South Africa service providers) Qual+
Tod 2003 (GB service users) Qual+
Lowry et al. 2004 (GB service users) Qual-
Anderson 2002 (USA service users) Qual-.

5.4.4 The intervention provided during and after a consultation

Four survey papers plus one qualitative paper provide evidence regarding interventions provided as part of a consultation or subsequently. Cooke et al. (1998 & 2001) describe the practice of midwives and doctors in an antenatal clinic in Australia. The earlier paper reporting baseline data found that 54% of staff reported giving out pamphlets on the effects of smoking, and 10% offering a video on smoking. 57% gave counselling on methods to quit, 29% aself-help quit booklet and 15% negotiated a quit date. 42% offered a referral on to other services. The study reports that more than half (57%) of the clinicians recommended that clients cut down smoking rather than quit.

The later paper reports findings following dissemination of a stop smoking programme with multiple components to antenatal clinic staff. The study found that the number of different types of intervention that were offered to pregnant women by staff changed following the intervention. There were significant increases in particular in patient education, counselling, and use of the programme"s self-help quit booklet ($p<0.001$).

Grange et al. (2006) reports that 77% of women in this French study who smoked throughout pregnancy, said that they had not been given an information leaflet, and 91% had not been offered a specialised consultation. Hartmann et al. (2007) report service provider perceptions in the USA, indicating that 91% of staff sampled in prenatal care reported having at least one smoking cessation resource available. The authors describe that in order for staff to operate at the level of best practice, they should have access to at least one material counselling resource to use with pregnant women smokers.

Glover et al. (2008) report the knowledge level of GPs and midwives regarding smoking cessation in New Zealand. This survey linked the likelihood of staff recommending particular interventions with their perceptionsof which were the most effective. 60% of participants reported that theyusually provide smoking cessation counselling to pregnant women. Reported recommendation of nicotine replacement therapy was low with only 34% of GPs and 31% of midwives likely to recommend nicotine gum. 93% of staff

reported that they usually discus the adverse effects of smoking during pregnancy with smoking patients at the first visit. The study also reports percentages of staff advising quitting versus cutting down. 71% of GPs and 11% of midwives said that they advise patients to stop smoking completely. 80% of midwives and 28% of GPs said that they would advise cutting down initially with a view to stopping altogether.

A qualitative study (McCurry et al. 2002 Qualitative +) describes GPs as having only a minimal role in ongoing smoking cessation intervention in Northern Ireland. Most women in this study reported having been given leaflets, books, information about specialist clinics and help lines. Only a few reported being offered personal support by their midwife and none received help in developing a quit plan.

Evidence statement 4.

One qualitative study and four surveys provide evidence that there is variance in practice amongst staff in regard to the type of intervention offered during and following a consultation, such as whether a leaflet is offered, whether there is referral on to a specialist programme, or whether ongoing personal support is offered.

McCurry et al. 2002 (N Ireland service users) Qual+
Surveys - Cooke et al. 2001 (Australia service providers), Grange et al. 2006 (France service users), Glover et al. 2008 (New Zealand service providers), Hartmann et al. 2007(USA service providers).

5.4.5 Whether or not policies/procedures/protocols are in place

Four papers outline the potential significance of whether or not a service has well-defined procedures in place, detailing the care that should be provided for pregnant women smokers. A survey by Cooke et al. (1998) associated having a policy/procedure in place with an increase in the number of smoking interventions offered by healthcare staff in Australia (effect size 0.1 $p<0.01$).

Hartmann et al. (2007) report that only 20% of staff working in prenatal care in the USA said that they have a written protocol for smoking cessation. Clasper and White (1995) in a UK survey found a low figure of 6% of staff using guidelines covering advice and help which should be given to pregnant smokers. Qualitative data (Everett et al. 2005) from South African doctors suggests that these participants were unaware of available guidelines for counselling pregnant women.

Evidence statement 5.

There is evidence from one qualitative study and two surveys that there is limited knowledge/availability/use of guidelines/protocols in practice.

Everett et al. 2005 South Africa service providers Qual+
Surveys - Clasper & White, 2005 (UK service providers), Hartmann et al. (USA service providers).

There is evidence from one survey that that having guidelines/protocols in place may be associated with an increase in the number of smoking interventions offered.
Cooke et al. 1998 (Australia service providers).

5.4.6 Record keeping and follow up

Evidence from four qualitative studies, three surveys and a study narrative relates to record keeping practices and follow up after initial consultation.

Arborelius and Nyberg 1997 (Qualitative interview +) report the perception of Swedish women who had smoked during pregnancy, that midwives who systematically asked about their smoking and kept a record of their consumption were viewed positively. McCleod 2003 (Qualitative interview ++) in contrast reports UK midwives" concerns that continued asking about smoking could have a negative effect on women who may not be ready to make changes. The same study however confirms that some women valued

the ongoing enquiries throughout their pregnancy. The importance of being able to tell the midwife that they had succeeded in making changes, no matterhow small, in response to brief enquiries about progress at each visit was described. The study also highlights that approaches need to be tailored to individuals. It suggests that repeated enquiry needed to be associated withthe extent to which women were ready to make changes, as if women were clear that they did not want to many any changes, ongoing enquiry was less welcome.

Nichter et al., 2007 (Qualitative interview +) contains data from one participant in this study of low income women in the USA, who reported that she was aided in her quitting attempts by regular telephone calls she received from a telephone help line.

Everett et al. 2005 (Qualitative interview +) describes that some doctors in South Africa did not note smoking status during a consultation, initially or at follow up appointments. The Clasper and White (1995) survey suggests that around 95% of UK health professionals record the smoking status in the notes. However, only 49% reported that they monitor or review smoking status throughout the pregnancy. Glover et al. (2008) provide figures of 98.5% of midwives and 84.5% of GPs reporting that they routinely record the smoking status of patients in New Zealand.

Grange et al. (2006) describe the perception of women in this study in France that 84% had not been asked about their attempts to give up. Narrative in the Lando et al. (2001) study comparing two interventions in the USA describes the tendency for practitioners to stop discussing smoking once a woman had quit, opening up the possibility of relapse.

Evidence statement 6.

Evidence from four qualitative studies, three surveys and a study narrative suggests that record keeping practices and follow up enquiry may be inconsistent amongst practitioners. Pregnant women smokers differed in their views regarding the frequency with which they should be asked about their smoking.

McCleod et al. 2003 (New Zealand service providers) Qual++
Arborelius & Nyberg 1997 (Sweden service users) Qual+
Everett et al. 2005 (South Africa service providers) Qual+
Nichter et al. 2007(USA service users) Qual+
Surveys - Clasper & White 1995 (GB service providers), Glover et al. 2008 (New Zealand service providers), Grange et al. 2006 (France service users)
Narrative - Lando et al. 2001(USA).

5.4.7 The knowledge and skill base of staff

Three qualitative studies, seven surveys and one narrative report describe concerns regarding the knowledge and skill base of staff in relation to smoking cessation in pregnant women.

Abrahammson et al. 2005 (Qualitative +) describes midwife concerns in Sweden regarding their competence to deal with the challenge of broaching the subject of smoking in pregnancy. McCleod et al. 2003 (Qualitative interview ++) similarly use the term challenging when reporting midwives‟ efforts to ask about and support pregnant women smoking in New Zealand. Everett et al. 2005 (Qualitative +) describe doctor‟s concerns that they are ill equipped and lack knowledge in particular regarding how to motivate pregnant women to cease smoking.

These themes are echoed in the survey by Walsh et al. (1985) who report lack of staff training in counselling smokers was rated as very important by

49% of nurses, and 34% of medical staff in Australian antenatal clinics. Also, work by Cooke et al. (1998) in Australia describes participants rating themselves as “more willing than able” to counsel for smoking cessation and a lack of training as being an important barrier to smoking cessation services. In this sample of 204 midwives and doctors, 17% reported that they had been offered in-service training in the past 18 months on smoking cessation interventions, with 11% having attended a programme. 66% reported that training and support for staff in this area was inadequate. The authors report the association between having recent training in smoking intervention, and an increased number of smoking interventions offered to women (Effect size 0.13 $p<0.001$).

A UK study by Clasper and White (1995) similarly reports that staff perceive a lack of knowledge and skills, with 53% of the hospital midwives, community midwives, GPs and obstetricians perceiving that they were insufficiently trained. More training and more time were the factors mentioned most commonly as ways to make their smoking cessation counselling more effective. 23% of the participants declared that they enjoyed giving counselling, 60% reported that it was difficult. Bishop et al. (1998) describe a tendency for staff to use personal experience of smoking, quitting or non- smoking to influence the content of their consultations. Hartmann et al. (2007) report in their survey of staff in the USA working in prenatal care, that 48% had no formal training in smoking cessation intervention, and 9% reported a lack of confidence in their personal intervention skills. Jordan et al. (2006) describe clinicians being unsure of where to send patients for further treatment, however only a small number (3%) identified low confidence/perception of ineffective intervention as a barrier to using a smoking cessation method.

In the narrative findings of a paper comparing two interventions, Lando et al. (2001) describe the role of staff and service provider attitudes in relation to successful implementation of smoking cessation interventions. The authors describe the need for staff and service providers to be “psychologically

readied to deliver an intervention", and that developing the skills and comfort level to carry out an intervention successfully took time.

Evidence statement 7.

Three qualitative studies, seven surveys and one narrative report suggest that staff perceive that they have limited skills and knowledge to implement successful smoking cessation interventions.

(McCleod et al. 2003 (New Zealand service users) Qual++,
Everett et al. 2005, (South Africa service providers) Qual+,
Abrahammson et al. 2005 (Sweden service providers) Qual+
Surveys - Walsh et al. 1985 (Australia service providers), Cooke et al. 1998 (Australia service providers), Cooke et al. 2001 (Australia service providers), Clasper & White, 1995 (GB service providers), Bishop et al. 1998 (Australia service providers), Hartmann et al. 2007 (USA service providers), Jordan et al. 2006 (USA service providers)
Narrative - Lando et al. 2001(USA).

5.4.8 Time constraints

Seven surveys, two qualitative studies, and study narrative findings describe staff concerns regarding the impact of time constraints on providing smoking cessation services to pregnant women. Bishop et al. (1998) and Cooke et al. (1998), identify lack of time as a key barrier, similarly Glover et al. (2008) describe a lack of time during a consultation as a key reason for participants not asking women about smoking status. Clasper and White (1995), in theonly UK survey describing this aspect, report doctors and midwives quoting more training and more time as the ways to make their counselling more effective. Hartmann et al. (2007) similarly identify time constraints as the most commonly acknowledged barrier to intervention. The Jordan et al. (2006) survey has a slightly different emphasis, with the vast majority of obstetrician and gynaecologist participants in the USA perceiving no barriers preventing

them from using a smoking cessation method (5As), although 10% did identify lack of time as a constraint.

Lowe et al., 2002 (Qualitative interview -) collected data from medical superintendents and senior midwives at hospitals enrolled in a smoking cessation programme in Australia, but currently not providing the intervention. The staff interviewed were “not convinced” that they could overcome the barriers of staff time and lack of administrative support. In another qualitative study, Everett et al., 2005 (Qualitative interview +) reported that the doctor participants perceived that their efforts would be more effective if they had more time for discussion during consultations.

In a narrative discussion of the implementation of two interventions in the USA, Lando et al. describe lack of staff time as one of the key hindrances to programme delivery.

Evidence statement 8.

Two qualitative studies, seven surveys and one narrative provide evidence that staff perceive that lack of time is a significant barrier to the implementation of smoking cessation interventions.

Everett et al. 2005 (South Africa service providers) Qual+
Lowe et al. 2002 (Australia service providers) Qual-
Surveys - Bishop et al. 1998 (Australia service providers), Clasper & White 1995 (GB service providers), Cooke et al. 1998 (Australia service providers), Glover et al. 2008 (New Zealand service providers), Hartmann et al. 2007 (USA service providers), Jordan et al. 2006 (USA service providers), Walsh et al. 1985 (Australia service providers)
Narrative - Lando et al. 2001(USA).

5.4.9 Resource constraints

In addition to the time constraints reported above, six surveys, one qualitative study and narrative study findings make reference to staff concerns regarding limited resource availability.

Walsh et al. (1995) report that 39% of nurses and 24% of medical staff in their study in Australia identified too few staff as a “very important” barrier to their involvement in providing smoking cessation programmes. This is echoed by Lando et al. (2001) in narrative findings outlining how the use of temporary staff, and decrease in nursing staff had impacted on the delivery of a smoking cessation intervention.

Cooke et al. (1998) describe lack of good quality materials as a barrier to smoking cessation, Bishop et al. (1998) echo these findings, with participants in this study also describing a lack of patient education materials. Hartmann et al. (2007) associate having at least one material counselling resource available to be associated with best practice (Odds ratio 9.6). Jordan et al. describe a lack of reimbursement for services in their study of obstetricians and gynaecologists in the USA, and Lowe et al. (2002) a lack of administrative support.

Everett et al. (2005) report that doctors in their South African study declared that they would be receptive to the introduction of smoking cessation interventions only if it brought additional staff in to the system, and was independently administered and funded.

Evidence statement 9.

One qualitative study, six surveys and narrative from one study suggest that staff perceive that limited resources in the form of either staffing or patient education materials impact on the delivery of interventions.

Everett et al. 2005 (South Africa service providers) Qual+
Surveys - Walsh et al. 1985 (Australia service providers), Cooke et al. 1998 (Australia service providers), Bishop et al. 1998 (Australia service providers), Hartmann et al. 2007 (USA service providers), Jordan et al. 2006 (USA service providers), Lowe et al. 2002 (Australia service providers).
Narrative - Lando et al. 2001 (USA).

These papers report findings from Australia and the USA with no UK studies which may require consideration in terms of applicability to the UK context.

5.4.10 Staff perceptions of ineffectiveness

Seven surveys and two qualitative studies report staff perceptions regarding the limited effectiveness of interventions and pessimism regarding the potential for their input to effect any change.

Bishop et al. (1998) report findings that the Australian antenatal clinic staff they surveyed perceived that lack of client motivation was an immovable barrier to them effecting any change. Clasper and White (1995) in the UK found that only 56% of the staff they surveyed viewed smoking cessation counselling given by health professionals as reducing levels of smoking in pregnant smokers. Hartmann et al. (2007) similarly provide figures of 68% of staff working in prenatal care identifying lack of patient interest as a barrier to intervention. Jordan et al. (2006) report 7% of staff identifying pregnant smokers not being responsive to suggestions, and previous failures (6%)

contributing to the barriers preventing them from using a smoking cessation method.

Cooke et al. (1998) also quote pessimism about the effectiveness of smoking advice as being a barrier to smoking cessation interventions. Walsh et al. (1985) report 25% of nurses and 21% of medical staff identified pessimism about the effectiveness of smoking advice as a "very important" barrier to them being involved in providing smoking cessation programmes. In relation to this pessimism regarding the potential for effectiveness of intervention, the Glover et al. (2008) survey reports that 33 of 147 GPs and 74 of the 203 midwives indicated that they knew very little about the effectiveness for pregnant women of cessation treatments.

Abrahammson et al. 2005 (Qualitative interview +) also describes staff pessimism regarding their potential to effect change, and previous experiences of having negative responses from women when the subject of smoking had been broached. The data includes participants reporting that based on previous experience "informing does not work". Everett et al. 2005 (Qualitative interview +) similarly outline frustration among the doctor participants at their lack of success in encouraging women to stop smoking. The doctors reported that while smoking was important, in the particularpopulation they worked with in South Africa, their patients had other competing and often more important health needs associated with low socio- economic status.

Katz et al. (2008) provide data relevant to these pessimistic views of staff from pregnant women service users via a telephone debriefing at the end of an intervention. 29% of those who had not attended any sessions reported that they did not feel that they needed/wanted to participate. 22% of those who had only attended one to three sessions reported that they were not sure why or did not know why they did not attend any further sessions.

Evidence statement 10.

Two qualitative studies and seven surveys suggest that staff perceptions regarding the limited effectiveness of interventions may impact on their delivery of services.

Abrahammson et al. 2005 (Sweden service providers) Qual+
Everett et al. 2005 (South Africa service providers) Qual+
Surveys - Glover et al. 2008 (New Zealand service providers) Bishop et al. 1998 (Australia service providers), Clasper & White 1995 (GB service providers), Cooke et al. 1998 (Australia service providers) Hartmann et al. 2007 (USA service providers), Jordan et al. 2006 (USA service providers), Walsh et al. 1985 (Australia service providers).

One paper describes a lack of firm reasons for non attendance given by women who did not attend a smoking intervention programme (Katz et al. USA).

5.4.11 Differences between professionals

Four surveys highlight that there are differences in typical practice between professional groups. Cooke et al. (1998) found differences between doctors and midwives in terms of their likelihood of referring on to other services (midwives were more likely to refer on ($p<0.001$). Also, midwives were more likely to advise clients to gradually reduce, whereas doctors were more likelyto advice clients to quit by abrupt cessation ($p<0.01$). Cooke et al. (2001) in addition found that following training, midwives were more likely than doctors to use at least one of the programme components (58% versus 22%).

Clasper and White (1995) echoed these findings in the UK, indicating that midwives were more likely to carry out a range of smoking cessation information and counselling interventions than doctors ($p<0.01$). Midwives reported asking about smoking, advising smokers how to stop, and monitoringand reviewing smoking status throughout pregnancy more often than doctors.

Glover et al. (2008) similarly identified differences between midwives and GPs in terms of the percentage who recorded smoking status (98.5% of midwives, 84.5% of GPs), likelihood of asking about smoking status at first visit (GPs 92%, midwives 82%). As with the Cooke et al. study, this work also suggestedthat doctors were more likely to advise women to stop smoking completely, whereas midwives were more likely to advise cutting down initially with a view to stopping (80% versus 20% RR 2.86 CI 2.18-3.74). GPs were also more likely to give stop smoking advice at each antenatal visit as opposed to only discussing it if it was raised by the woman (69% versus 47% RR 1.45 CI 1.2- 1.75).

Evidence statement 11.

Four surveys provide evidence that typical practice in regard to smoking cessation advice and management of care can vary between doctors and midwives.

It is reported that General Practitioners are more likely to advise women to quit smoking completely, whereas midwives are more likely to advise gradual reduction. Also, the evidence suggests that midwives are more likely to refer on to other agencies and record smoking status. GPs were more likely to raise the subject of smoking at subsequent consultations than midwives.

Surveys - Cooke et al. 1998 (Australia service providers) Cooke et al. 2001 (Australia service providers), Clasper & White, 1995 (GB service providers), Glover et al. 2008 (New Zealand service providers).

5.4.12 Obstacles to accessing interventions

Two narrative reports and one qualitative study describe barriers that may discourage potential service users taking up offered intervention programmes.

Katz et al. (2008) describe the recruitment issues encountered during a randomised controlled trial intervention in the USA. Data was collected via a

telephone debriefing with a sample of participants, describing factors quoted by participants as reasons for not attending. As described previously, some participants were unable to give a reason. However, 24% of those who did not attend any sessions reported that the sessions being too long was a significant obstacle. The average length of each session is reported by the authors to be 35 minutes, with the programme consisting of ten sessions.17% of those who attended only one to three sessions similarly identified the sessions being too long as a reason for their non attendance. 17% of this group also reported that the timing of the sessions was wrong in relation to the stage of their pregnancy (programme began during later stages of pregnancy) or that they only attended when they also had a clinic appointment.

Solomon and Flynn (2005) report on the implementation of a telephone support intervention. The authors identified that 22% of referrals for the programme that they received from clinic staff were never reached by telephone, even allowing for eight attempts at initiating the calls. 22% received only one contact, which the authors attributed to women accepting the referral when offered but later declining when contacted.

Tod 2003 (Qualitative interview +) report data from a UK study. Pregnant women smokers in this study reported that their mobility to attend smoking cessation services was very limited due to a lack of transport and alternative child care. They reported that only domiciliary or very local services would be suitable for them, and suggested that the provision of crèche facilities, appointment systems or telephone counselling could be suitable service delivery options.

Evidence statement 12.

One qualitative study and two narrative reports describe obstacles to pregnant women smokers accessing services as including: the length of sessions; difficulty making telephone contact; and a lack of transport or child care.

It is suggested that domiciliary or very local services, the provision of crèche facilities, appointment systems or telephone counselling could be suitable service delivery options.

Tod 2003 (GB service users) Qual+
Narrative - Katz et al. 2008 (USA service users), Solomon & Flynn 2005 (USA service users).

5.5 DISCUSSION

This review has considered the delivery of services for pregnant women smokers, and for women smokers following childbirth. No studies were identified relating to women smokers planning a pregnancy. The review identified 22 papers reporting 12 areas where the literature describes potential barriers or enablers to uptake of these services.

These areas are: whether or not the subject of smoking is broached when pregnant women are seen by health professionals; the advice/recommendations given by health professionals; the way that information and advice is communicated; the intervention provided during and after a consultation; whether or not policies/procedures/protocols are in place; record keeping and follow up; the knowledge and skill base of staff; time constraints; resource constraints; staff perceptions of ineffectiveness; differences between professional groups; and obstacles to accessing interventions.

The evidence underpinning these aspects is from qualitative and cross-sectional studies, including only one high quality qualitative study, together with six good quality qualitative studies. The cross-sectional studies report data from surveys almost exclusively designed for the study and largely un- tested, with potential for bias due to self-report and retrospective recall.

In regard to the broaching of the subject of smoking with pregnant women and recent mothers who smoke, the papers suggest that a high proportion (but not all) staff routinely ask about smoking status. Qualitative papers describe the proportion as “variation” and “most but not all”. The surveys report 76% to 96% routine inquiry. The lower of these two figures is from pregnant women report, with the others all from professional self-report. The highest figure (96%) is from a UK study of health professionals, however no corresponding data from women in the UK were found in the peer-reviewed literature. The papers provide some insight into why intentions may not be always translated into practice, with the suggestion that concerns regarding damaging the relationship between professional and pregnant woman may be important,and also as will be discussed later, time constraints and differences between professional groups may also be significant in whether the subject of smoking and smoking cessation intervention is broached.

In terms of the advice and recommendations given by health professionals, the papers report variation in practice and some dissatisfaction amongst pregnant women regarding the content and level of advice and information. There is the suggestion that not all women are provided with information leaflets, and also that there may be a need for a more thorough/more strongly persuasive explanation with the inclusion of evidence or “proof” of the potential harm. Differences between women regarding preferences for information and follow-up discussion suggest the importance of individual- tailored advice and challenge of providing content appropriate to each woman"s needs/wishes. Narrative from intervention studies conveys the perceived difficulties experienced by health professionals in providing advice. As reported in relation to broaching the subject of smoking, differences in

approach between professionals such as cutting down versus quitting, may lead to variation and potentially conflicting advice/information.

Not only the content of the advice, but also the way that a message is conveyed, is reported to be important, and challenging in the papers. Studies report that the tone and approach used may impact on a woman"s willingness to consider smoking cessation. In contrast to the findings above regarding the need for strongly persuasive explanations, “preaching” or “hard hitting” interactions can be perceived as acting as a barrier to a woman considering stopping or reducing smoking.

Findings regarding the content of the intervention provided during a consultation and offered subsequently, indicate variance in practice. Studies report around 57%-60% of professionals may offer smoking cessation counselling. The report of leaflets being provided varied considerably between studies, with reporting of 23%, or 54% or “most” of the time. Recommendation of nicotine replacement therapy was reported as low in one study, and also rates of referral on to other specialist services and personal support may be low.

Variance in practice may indicate a lack of policies or procedures, or lack of adherence or knowledge. Two of the cross-sectional studies included make the association between having well-defined procedures and good practice/increased intervention. A UK study suggests a low figure of 6% of staff reporting that they use guidelines to underpin their consultations with pregnant women or recent mothers who smoke.

The noting of smoking status on records and ongoing monitoring is examined in the included papers, with evidence that record keeping practices may be inconsistent (around 85%-95% self report that smoking status would be recorded). A UK study, while reporting the higher of these figures for recording status, provides data suggesting a follow up rate throughout pregnancy of only 49%.

The review indicates a perception amongst staff that they have limited skills and knowledge regarding smoking cessation interventions, and that perceived lack of time and resources are significant barriers to both discussion during consultations and providing interventions. The views of pregnant women smokers were also very mixed in regard to the advice and information that they had received with a perception of insufficient information and lack of clarify of message.

Possibly linked to these negative staff perceptions of skills, time and resources is the review finding regarding pessimism amongst staff regarding the potential for their input to be effective in achieving smoking reduction or quitting amongst pregnant women. Studies report that staff previous experiences of failure to effect any change may impact on their interactions with current and future clients.

Survey data suggests variation in practice between different professional groups, in particular regarding the recommendation of quitting smoking versus cutting down, but also in regard to procedural aspects such as recording status, and repeat advice giving. There is the suggestion that midwives have greater concerns regarding maintaining the relationship between themselves and the pregnant woman, and are more likely to recommend cutting down rather than quitting initially. These differences may indicate different professional ethos and approaches, however offer the potential for a pregnant woman to receive contradicting advice.

In regard to specific aspects of interventions that may be barriers or facilitators to uptake, only a limited number of papers provided detail regarding this. The data suggests that the length of individual programme intervention sessions may be influential. Also, the potential for telephoneadvice to be problematic in terms of achieving contact. A UK study suggests that transport considerations and child care for other siblings are important in enabling pregnant women to take up any smoking cessation intervention that may be offered.

The review suggests that a number of aspects of professional practice in relation to pregnant women smokers may need clarifying, including record keeping, the content of advice, ongoing management and review, also referrals on. The review suggests that professionals perceive a need for greater training specifically in this area, and also that the greater use of protocols may further develop consistency in practice. It is suggested that professionals view providing advice and intervention to pregnant women smokers to be challenging, further suggesting a need for greater support for their practice via established protocols and/or training. The papers reviewed indicate evidence of a perception of ineffectiveness/pessimism towards intervention amongst some service providers which has the potential to become a cycle of self-fulfilling prophecy. Further dissemination of any available evidence regarding the effectiveness of different interventions specifically in relation to pregnant women, may be beneficial in providing practitioners and service users with evidence-based choices.

6. RESULTS OF REVIEW THREE

6.1. Quantity of the evidence available

The searches identified four papers that met the inclusion criteria. No restrictions had been placed in terms of study design. However, all identified studies analysed sections of data from randomised controlled trials.

Table 11. Included papers by study design

Group analyses from a prospective randomised smoking cessation intervention	Li et al. 1993 England et al. 2001
Group analyses and comparison of data from two prospective randomised smoking cessation interventions	Secker Walker & Vacek 2002 Secker Walker et al. 1998

6.2 Populations and settings

The papers all report studies carried out in the United States of America.

Table 12. Included papers by population characteristics

Li et al. 1993	Women recruited from four maternity clinics USA	Mean age: 23 Mean years education: 12 Ethnicity: quitters 73% and reducers 49% Black	N=78 quitters N = 144 reducers	Mean no. of cigarettes smoked at baseline: quitters – 5.5 (SD 6.6), reducers – 11.3 (SD 7.6)
England et al. 2001	Women recruited from three “public clinics” USA	Mean age: 21 Mean years education: 44% less than 12 years Ethnicity: quitters 86% and reducers 82% Black	N = 224 quit before enrolled, 127 quit after enrolled N=227 reducers	Mean no. of cigarettes smoked at baseline: quitters – 5.1 (SD 5), Reducers – 18 (SD 13.5)

Secker-Walker & Vacek 2002	Women recruited from maternal infant care and adolescent clinic USA	Mean age: 23 Education: 12% had attended high school Ethnicity: Less than 2% non White	N = 36 quitters N= 204 reducers	Mean no. of cigarettes smoked at baseline: Quitters – 9.6 (CI 7-12) Reducers – 14.3 (CI 12-18)
Secker-Walker et al. 1998	Women recruited from prenatal service USA	Mean age: 23 Education: 33% up to High School, 44% High School, 23% above High School Ethnicity: 98.5% White	N = 149 recent quitters N = 224 reducers	Mean no. of cigarettes smoked at baseline: 13 (SD 7) entire sample (not subdivided into quitters/reducers)

6.3 Quality of the evidence available

The methodology checklist outlines seventeen aspects to be evaluated when rating a correlation or association study: relating to the population; the method of selection of exposure group; the outcomes; and the analyses.

1. Is the source population or source area well described?
2. Is the eligible population or area representative of the source population or area?
3. Do the selected participants or areas represent the eligible population or area?
4. How was selection bias minimised?
5. Was the selection of explanatory variables based on a sound theoretical basis?
6. Was the contamination acceptably low?
7. How well were likely confounding factors identified and controlled?
8. Is the setting applicable to the UK?
9. Were the outcome measures and procedures reliable?
10. Were the outcome measurements complete?
11. Were all the important outcomes assessed?

12. Was there a similar follow up time in exposure and comparison groups?
13. Was follow-up time meaningful?
14. Was the study sufficiently powered to detect an intervention effect (if one exists)?
15. Were multiple explanatory variables considered in the analyses?
16. Were the analytical methods appropriate?
17. Was the precision of association given or calculable: Is association meaningful?

Each of these aspects is then considered and a rating of ++, + or – is assigned to each, with a summary rating for internal and external validityusing the scale below.

Table 13. Criteria used for grading of internal and external validity

Code	Quality criteria
++	Indicates that for that particular aspect of study design, the study has been designed/conducted in such a way as to minimise the risk of bias
+	Indicates that either the answer to the checklist question is not clear from the way the study is reported, or that the study may not have addressed all potential sources of bias for that particular aspect of study design
-	Should be reserved for those aspects of the study design in which significant sources of bias may persist
Nr	Not reported – the study fails to report how they have/might have been considered
Na	Not applicable

Of the four papers, all were rated as + for quality (see Table 14).

Table 14. Quality rating of included papers.

	England et al. 2001	Li et al. 1993	Secker-Walker et al. 1998	Secker-Walker & Vacek 2002
Population				
1	+	+	+	+
2	+	+	+	+
3	+	+	+	+
Method of selection of exposure				
4	+	+	+	+
5	+	+	++	++
6	Na	Na	Na	Na
7	+	+	+	+
8	+	+	+	+
Outcomes				
9	++	++	++	++
10	++	++	++	++
11	++	++	++	++
12	++	++	++	++
13	++	++	++	++
Analyses				
14	Nr	Nr	Nr	Nr
15	+	+	++	+
16	++	++	+	++
17	-	++	-	-
Summary validity rating				
Internal	+	+	+	+
External	+	+	+	+
Summary quality rating	+	+	+	+

6.3.1 Limitations on study quality

A key limitation found in all studies was the degree of reporting of population characteristics. The papers tend to report basic demographic details such as age, educational level and ethnicity and describe participants as being recruited via clinics. However, details of the source population are poorly described, with information regarding the sampling process and representativeness also being very limited. This may be related to the papers reporting only a section of data from the intervention trial, rather than the full trial findings.

The studies scored better in regard to the outcomes and theoretical underpinning of outcome measures, with all studies using infant birth weight, and the well-established biochemical measure of cotinine level in urine or saliva in addition to the self-reported measure of the number of cigarettes smoked per day. The Secker-Walker et al. (2002) paper whilst providing data relating to quitting versus reducing, has the main purpose of examining different levels of reduction (more than 50% versus less than 50%) rather thancomparing quitting versus reducing subgroups. Due to the way that the information is presented, data relating to the self-report measure for quitting versus cutting down groups only can be compared.

Follow-up timings were the same for study sub-groups, however there was some lack of clarity regarding the timing of follow up data collection across the studies. Li et al. (1993) report that baseline data was collected at the first prenatal visit, and end point data at the end of pregnancy (>= 32 weeks). England et al. describe baseline data as being obtained at “the first or second prenatal visit” and end point data collected “in the third trimester” with a minimum timing between baseline and end point measures as being at least eight weeks. Secker-Walker & Vacek (2002) outline the first measure as being at mean 14.6 weeks (SD 7 weeks), and the end point visit being mean 35 weeks (SD 1.2 weeks). Secker-Walker et al. (1998) report similar data of the first visit at 14 weeks (SD 6 weeks) and the end point as being 36 weeks (SD 1.5). The standard deviation of six/seven weeks for baseline measures seemswide.

In terms of analyses, none of the papers reported power calculations. Significant data regarding subgroup sample sizes and baseline smoking levels were not included in the Secker-Walker et al. (1998) paper. Secker-Walker & Vacek (2002) use Analysis of Variance (ANOVA) to compare subgroups. Li et al. (1993) also provide ANOVA calculations, together with multiple regression analyses. The Secker-Walker et al. (1998) paper calculates correlation coefficients and regression equations including p values, although provides only sparse details regarding the analysis and lacks confidence intervals or standard deviations. The England et al. (2001) paper examined data using

general linear models and regression smoothing techniques. Both this paper and the Secker-Walker & Vacek (2002) paper do not include standard deviations, although provide confidence intervals.

As will be described fully in subsequent sections, two of the papers (Secker-Walker & Vacek (2002) and England et al. (2001) whilst being graded as + for quality, present challenges in extracting the data required to answer this research question. As with a number of the papers which seemed initially relevant, but were later excluded, the objective of these two papers relates to smoking in pregnancy and reducing consumption and quitting. However, they had the main aim of exploring different comparisons to that under scrutiny in this review. In the papers that were excluded it was not possible to identify quitters versus reducers in the data. In these two papers data for these two groups is identifiable, however full statistical analysis is not described. Due to the small number of papers identified for the review and the ability to identify these relevant data sets, these papers have been included. It was considered whether they should be graded lower than the other papers, although it is not the quality of the paper that is poor. Rather, they are intending to answer a different research question, therefore it was felt that this lower quality grading would be unjustified.

6.4 Findings

6.4.1 Outcome measures

The included papers report both self-reported number of cigarettes smoked per day, and also cotinine levels. Li et al. (1993) use salivary cotinine whereas Secker-Walker et al. (1998), Secker-Walker & Vacek (2002) and England et al. (2001) use urine cotinine levels. The papers do not include any discussion regarding their selection of urine versus salivary cotinine as a measure. Li et al. (1993) describe the advantage of cotinine as being a stronger measure compared with self-reported cigarette consumption. Also, they highlight that smokers who change their smoking behaviour may compensate to maintain the same nicotine dose by switching brands, varying the depth of inhalation orpuff volume or rapidity of smoking. They suggest that use of a biochemical

measure is therefore critical rather than relying on self-report numbers of cigarettes smoked. In addition to birth weight, the Li et al. (1993) paper is the only study to consider gestational age as an outcome.

The Secker-Walker et al. (1998) paper includes an examination of the self-report versus biochemical measure data. They report correlation coefficients of 0.6 ($p<0.001$) between reported cigarette consumption and urinary cotinine at both baseline and end point. Also, self-reported changes in cigarette consumption were significantly related to changes in urinary cotinine concentrations ($r = 0.31$ $p<0.001$).

The health outcome under study in all papers was infant birth weight, measured in grams. Secker-Walker & Vacek (2002) and Secker-Walker et al. (1998) describe this data as being collected from the labour and delivery logor hospital discharge summary. Similarly, Li et al. report using medical records. England et al. (2001) report that birth weight was obtained from women at the post partum visit for 86% of participants and from maternity summary or birth certificate records for the remaining 14%.

6.4.2 Health outcomes

The review found limited evidence regarding the health impact of reducing smoking in pregnancy. England et al. (2001) and Secker-Walker et al. (1998) report numerical increases (but not significance levels) in birth weight ofinfants born to pregnant smokers who reduce their intake, versus those who quit. Secker-Walker et al. 2002 suggest that birth weight differences may only be significant in women who reduce to more than 50% of their daily intake (from 20 to 10 cigarettes per day). Li et al. (1993) report significantly greater birth weight (77g) in infants born to pregnant smokers who quit versus those who reduce their intake (see Table 15). All four papers differ slightly in the way that data regarding women who reported reducing their cigarette consumption and/or had reduced levels of cotinine between baseline and end point were classified and three papers differ slightly in the way that data on women who reported reducing their cigarette consumption and/or had reduced levels of cotinine between baseline and end point were classified. In

terms of measurement timings, all papers report measures at baseline and end point of the trial only, with some lack of clarity regarding the timing of the end point data (see 4.3.1 Limitations on study quality). Patterns of smoking between these data collection points is based only on the self-report data therefore, with cotinine levels only indicating current and recent (within seven days) smoking patterns. Details of the four studies reviewed are presented in this section.

Table 15. Reported health outcomes

Study	Key finding
England et al. 2001 (+)	Quitting rather than reducing cigarette use (self-reported) was associated with an increase of 286g (CI 193-376) versus 32g (CI 32-95) in infant birth weight. By cotinine measure, the quit group had 197g (CI 94-301) increase in birth weight compared to 21g (CI 52-95) increase in the reduced group. The increases are in relation to women who did not change. No significance levels reported.
Secker-Walker & Vacek 2002 (+)	Compared with women who quit, there was a mean difference of 210g lower infant birth weight for woman who reduced their cigarette consumption by 50% or less, and 146g lower infant birth weight for women who reduced their cigarette consumption by more than 50%. There was no significant difference in infant birth weight amongst women who quit smoking compared to those who reduce by less than 50% (adjusted for cigarette consumption at first visit) p value not provided, self-report data only.

Li et al. 1993 (+)	Quitting rather than reducing cigarette use was associated with an increase in infant birth weight of 167g. Significant (p=0.04). Odds ratio of having a low birth weight infant 1.18 for quitters compared to 1.73 for reducers. Smoking reduction appeared to have little or no beneficial effect on gestational age compared with quitting smoking (mean 39.2 SE +/- 4 versus mean 38.8 SE +/- 3).
Secker-Walker et al. 1998 (+)	Quitting was associated with a increase of 89/189g in infant birth weight compared to reducing from 20 to 10 cigarettes per day (SD or p values not reported).

The England et al. (2001) paper examined data from the Smoking Cessation in pregnancy project, which included participants from three states in the USA and collected data between 1987 and 1991. The study aimed to examine any association between tobacco exposure during pregnancy and infant birth weight, together with any association between the timing of exposure totobacco and infant birth weight. There were five subgroups: women who quit before enrolment in the programme; women who quit after enrolment; women who reduced consumption; women who increased consumption; and those who did not change. These groups are defined by both self-report and cotinine measures with a 50% cut off, thus those with less than 50% reductionin reported smoking and/or cotinine level were classified by this study as “did not change”.

The analysis used general linear models to generate mean adjusted birth weights for women who reduced their consumption by 50% or more and those who did not change, and regression smoothing techniques to characterise the relationship between birth weight and early exposure versus birth weight and third trimester exposure (with third trimester exposure being associated with

significantly lower birth weight). This study therefore had a slightly different research question in part to the one examined in this review. However, the study findings while being reported in terms of patterns of exposure also report baseline and outcome data within five subgroups, three of which (reduced, quit before enrolment and quit after enrolment) are able to provide information relevant to this review. The subgroup sample sizes of n=277 reducers, n=224 quitters before enrolment and n=127 quitters after enrolment are the largest of the four papers.

While reporting outcomes for all five groups in tabular form, the study data disappointingly in the narrative is examined in terms of a comparison between quitters and those who did not change, and reducers and those who did not change. While means and confidence intervals can be extracted and compared for reducers and quitters the paper does not report analysis or significance levels for these comparisons. From the tabular data, quitting rather than reducing cigarette use (self-reported; ≥50% reduction) was associated with an increase of 286g (CI 193 - 376) versus 32g (CI 32 - 95) in infant birth weight. By cotinine measure, the quit group had a 197g (CI 94 - 301) increase in birth weight compared with the 21g (CI 52-95) increase in thereducer group (≥50% reduction).

However, the findings of this study are complicated by baseline differences between the groups indicating that quitters were lighter smokers prior to the intervention than reducers. Smokers who quit at enrolment reported smoking a mean 5.1 (SD 5) cigarettes per day, while the mean was 18 (SD 13.5) for those who reduced consumption. Cotinine levels also echoed this difference with 812 ng/ml (SD 870) for quitters and 2,788 (SD 2,013) for reducers at enrolment. In addition, the authors report that this pregnancy was the first child for a greater percentage of women who quit compared with continued smokers, and also that women who quit had a lower mean age.

In the Secker-Walker & Vacek (2002) paper the subgroups are also divided by level of reduction for both self-report and cotinine level (more than 50% and less than 50%) in addition to quitters by self-report. The main purpose of the

paper however, is to examine potential differences between these two groups of reducers rather than the reducers and the quitters. As in the above study, the data for all three groups is presented in tabular form. However, theanalysis carried out focuses on the two groups of reducers.

The authors adopt a three sub-group analysis, comparing self-report data for women who quit, with those who reduced consumption by less than 50%, and those who reduced consumption by 50% or more. Also, they divide data on urinary cotinine levels into participants who had levels that reduced less than 50% and participants whose levels reduced 50% or more between baseline and end point. All three of these subgroups are of relevance to this review, therefore it is possible to extract some general findings, but not significance levels. The use of a cutoff for cotinine levels that is not fully explained complicates extracting data relating to these outcomes.

From the narrative report, there was no significant difference in infant birth weight amongst women who quit smoking compared to those who reduced by less than 50% (adjusted for cigarette consumption at first visit) p value not provided, based on self-report data only. The tabular data provides an adjusted infant birth weight of 3203g (CI 3128-3278) for the reducers of less than 50%, an adjusted mean birth weight of 3267g (CI 3124-3410) for the reducers of more than 50%, and an adjusted mean birth weight of 3413g (CI 3270-3556) in the quit group – therefore an adjusted mean difference of 210g less for the lesser reducers and 146g less for the greater reducers compared with the quitters. These findings are not examined in the body of the paper.

The study findings are complicated by baseline differences in self-reported smoking and cotinine levels indicating that those who reduced their cigarette consumption were heavier smokers than those who quit. The authors provide figures of mean cigarettes smoked per day as 9.6 (CI 7.3-11.8) for quitters and 12.9 (CI 11.8-14) and 15.7 (CI 13.7-17.7) for reducers of less than 50% and more than 50% respectively. The figure for both types of reducers was significantly different from quitters ($p<0.05$). These differences amongst the reducers are also supported by differences in the urine cotinine measure, with

significantly higher cotinine at baseline for women who substantially (more than 50%) reduced their cotinine during the trial.The subgroup who reduced their cigarette consumption by more than 50% reported smoking 15.7 (CI 13.7-17.7) cigarettes per day and had a cotinine concentration of 4766 (3916- 5801).

Similarly, data adjustment must be considered in interpreting the findings. Secker-Walker & Vacek (2002) provide infant birth weight data in both adjusted and not adjusted forms. Adjusted figures are given based on both cigarettes per day at first visit, and also urine cotinine level at first visit. The adjustment is of key importance to the findings as the average birth weight of infants of women who reported quitting smoking after their first visit was significantly greater than that of women whose reduction in cigarette consumption was less than 50% (3446g CI 3298-3594 versus 3203g CI 3127-3278, respectively). However, after adjustment for the number of cigarettes smoked at first visit, the authors report that this difference was no longer statistically significant (3413g CI 3270-3556 versus 3203g CI 3128-3278,respectively).

The urinary cotinine measure in the same study is more problematic to interpret due to the study implementing a cutoff value of 500 ng/ml or less. The authors report that both groups of reducers had infants with significantly lower birth weights than women whose cotinine levels were below the cutoff point for quitting at their last visit ($p<0.05$). However, it is not possible to determine from the paper which of the participants were below the cut off at last visit as only first visit cotinine levels are reported. It is possible that this “below the cutoff group” may have been quitters. The authors provide data for adjusted birth weight by first visit cotinine level (difference of 21g and 33g) but make no mention of this comparison between the two reducers groups and the quit group in the narrative.

The Li et al. (1993) paper has the purpose of a general evaluation of the impact of smoking reduction on infant birth weight and gestational age using cotinine levels. It therefore examines data from five subgroups including

women who have never smoked, quitters, and reducers. The authors provide data by cotinine levels of 100 ng/ml or less (described as likely to be infrequent smokers, smokers with low nicotine intake or light smokers of less than 5 per day), 101-200 ng/ml, and more than 200 ng/ml. Reducers are defined as having a changed cotinine level between baseline visit and end point of either at least 60 ng/ml reduction if baseline level was more than 100 ng/ml, or alternatively a 20 ng/ml reduction if baseline level was 100 ng/ml or less. The authors describe a reduction of 20 ng/ml as being roughly equivalentto reducing smoking by three cigarettes per day. In addition they subdivide data into racial groups (Black versus White). The quitters and reducer groups are of relevance to this review. ANOVA and linear contrasts are used to examine differences between the groups for the birth weight and gestational age outcomes, and multiple regression analyses to assess any group differences including adjustment variables.

The study reports higher birth weights in infants born to mothers who had quit smoking in pregnancy versus those who had reduced smoking (adjustedmean birth weight 167g heavier (3242 versus 3075 p = 0.04). Interestingly, the data also indicates that mean birth weights were higher in infants of women who had quit smoking during pregnancy than mothers who had never smoked, which is not discussed in the findings. The paper also presents odds ratio data, calculating an adjusted odds ratio of having a low birth weight infantto be 1.18 (CI 0.5 - 2.75) for infants of quitters, and an odds ratio of having a low birth weight infant to be 1.73 (CI 0.96 – 3.12) for infants of reducers. The difference between birth weight in infants of quitters versus reducers was significant ($p<0.05$).

In terms of gestational age, the paper provides an adjusted gestational age of 39.4 mean weeks (SE +/- 4) for quitters and 38.8 mean weeks (SE +/- 3) for reducers. As may be expected, the narrative findings outline that smoking reduction appeared to have little or no beneficial effect on gestational age compared with quitting smoking although no significance levels are provided for a quitters versus reducers comparison.

The study examines the potential for differences among the two racial groups included in the study (Black and White). This data is reported as a comparison between smokers and never smokers, and reducers and no change however, with no comparison made between reducers and quitters by race.

As with the previous two studies, the findings of the Li et al. (1993) study are complicated by baseline differences between the groups indicating that quitters were initially lighter smokers than were reducers. The authors report quitters smoking a mean of 5.5 (SD 6.6) cigarettes per day versus reducers smoking 10.8 (SD 8). The authors also report other differences in baseline characteristics between women who quit and women who continued smoking (includes reducers, no changers and unknown). The quitter group started prenatal care earlier, weighed more at the onset of care and had a higher percentage of black patients, in addition to having a higher number of self-reported light smokers. Adjusted data is only provided for birth weight, with adjustment according by mother"s age, race, height, weight at entry and gestational age at delivery.

The Secker-Walker et al. (1998) paper has the purpose of comparing the effect of reductions in cigarette consumption on infant birth weight. It analyses sections of data from two trials that took place in the USA in 1984-87 and 1988-92. The authors report data in four subgroups based on the reported cigarette consumption measure, and four subgroups based on the urinary cotinine measure. They group data into those who smoked 20 cigarettes a day throughout pregnancy, those who cut down after the first prenatal visit from 20 to 10 cigarettes a day, those who smoked 20 cigarettes a day but quitafter the first visit and stayed non smoking, and those who quit before the first visit and stayed non smoking. The latter three of these subgroups are of relevance to this review.

For urinary cotinine levels there is also a similar four subgroup division, with cotinine level staying at 2,000 ng/ml (smoked throughout pregnancy) cotinine level reduced from 2000 to 1000 ng/ml (cut down after first visit), cotinine level reduced from 2000 to 50 ng/ml (quit after first visit and stayed non smoking)

and cotinine level of 50 ng/ml (quit before first visit and stayed non smoking). Similarly, the latter three of these subgroups are of relevance to this review.

The study used correlation and regression analyses to examine how cigarette consumption, urinary cotinine levels and changes in smoking duringpregnancy were related to birth weight. From the data the authors built a model suggesting how four scenarios of smoking behaviour could predict gains in birth weight. One of the smoking behaviours used in the model is cutting down from 20 to 10 cigarettes after the first visit, another is quitting before the first antenatal visit and staying non smoking, and the third of interest to this review is smoked twenty cigarettes at first visit, quit after this visit and stayed non smoking.

Using this model, the authors suggest that the adjusted birth weight of an infant born to a woman who cuts down from 20 to 10 cigarettes a day after thefirst visit would be 3300g. An infant born to a woman who quit before the first visit would have a birth weight of 3489g. An infant born to a woman who quit after the first visit would have a birth weight of 3389g. Thus quitting earlier or later in the pregnancy would result in an increase of 189g or 89g respectively in infant weight compared with reducing. The authors provide a mean cigarette consumption for the entire study population only and do not comparegroup differences at baseline.

Similarly, data adjustment must be considered in interpreting the findings. Secker-Walker et al. (1998) provide both adjusted and non adjusted figures, with adjustment based on estimated gestational age at the first visit, however report that this had no effect on the findings. England et al. (2001) included adjustment for infant sex and gestational age at delivery. They also explored hours of exposure to environmental tobacco smoke in the third trimester, however did not include this in the final model.

Evidence statement 1.

There is limited evidence from four good quality studies that quitting versus reducing cigarette consumption during pregnancy is associated with increased infant birth weight of between 89 and 254g

England et al. 2001 Association analysis+ (USA)
Secker-Walker et al. 1998 Association analysis+ (USA)
Secker-Walker & Vacek 2002 Association analysis + (USA)
Li et al. 1993 Association Association analysis + (USA)

Two of the studies provide very little statistical analysis regarding the significance of these numerical differences between quitters and reducers. Only one study (Li et al. 1993 +) provides odds ratios, with OR 1.18 for quitters having a low birth weight infant compared to OR 1.73 for reducers. Baseline differences between quitters and reducers in all these studies may be significant.

These papers all examine data from studies carried out in the United States of America which may have implications for applicability to a UK setting.

Evidence statement 2.

There is limited evidence from one good quality study that the reduction in cigarette consumption required to make a significant impact on birthweight needs to be of the magnitude of more than 50% (among women smoking 20 cigarettes per day) to lead to a statistically significant increase in birth weight

Secker-Walker & Vacek 2002 Association analysis + (USA)

This paper examines data from studies carried out in the United States of America and may thus have implications for applicability to a UK population.

6.5. DISCUSSION

The review identified four papers that provide evidence regarding potential health consequences of pregnant women reducing their cigaretteconsumption rather than quitting. Interpretation of the data within these papershas been constrained by the studies having differing objectives to a comparison between quitting and reducing, although having women exhibiting these smoking behaviours within their sample. Two of the papers report data from more than fifteen years ago, which may limit their applicability to current evidence. All the papers report empirical work carried out in the USA, which may limit applicability to a UK population.

While indicating numerical differences in birth weight between infants born to mothers who quit smoking during pregnancy and those who carried on smoking but reduced their intake, three of the included papers provide only limited analysis regarding the order of magnitude of these differences instatistical terms such as probability size, effect size or odds ratios.

Three of the papers report differences in characteristics of the quitting versus reducing sample sub groups that may impact on the link between quitting and greater increases in infant birth weight. The data suggests that women who

tend to quit smoking before or at the start of pregnancy tend to be lighter smokers than those that continue, including those that reduce their consumption. The reducers in the studies may therefore still have relatively high daily cigarette consumption.

Indeed, baseline daily cigarette consumption should be considered when interpreting findings demonstrating a benefit from a reduction of 50%; in the case of the Secker-Walker and Vacek (2002) study. This finding relates to participants who reduced from 20 to 10 cigarettes per day. A reduction of 50% from 10 to five cigarettes per day may not have the same impact and further research would be required to explore this.

The linking of low levels of smoking with greater improvements in birth weight is highlighted in two of the other studies. Li et al. (1993) report in their findings, that the largest increases in birth weight were observed in infants born towhite women smokers with lower baseline cotinine values of 100ng/ml or less.Secker-Walker et al. (1998) also suggest that cigarette consumption has to reduce significantly to low levels in order to have an impact on infant birth weight. These studies suggest that there may be a threshold level in terms of the number of cigarettes smoked, above which there is a negative impact on infant birth weight. If so, women may need to reduce to this maximum in orderto have any beneficial impact, rather than a general or percentage reduction.

Another issue that may be of importance in considering the health consequences of smoking reduction in comparison to quitting duringpregnancy is the timing of quitting and reduction. England et al. (2001) found an association between third trimester exposure to smoking and negative impact on birth weight. Similarly, Secker-Walker et al. (1998) found higher birth weights in babies born to women who quit sooner rather than later, and all quitters compared with reducers. These findings suggest that cessation and reduction earlier in the pregnancy may be preferable in terms of impact on birth weight.

There are some key methodological issues within the four studies reviewed that complicate the comparison and synthesis of study findings. The papers differ slightly in the way that data regarding women who reported reducing their cigarette consumption and/or had reduced levels of cotinine between baseline and end point were classified. In addition, all papers report measures at baseline and end point of the trial only, with some lack of clarity regarding the timing of the end point data (see 4.3.1 Limitations on study quality). Patterns of smoking between these data collection points is based only on the self-report data therefore, with cotinine levels only indicatingcurrent and recent (within seven days) smoking patterns.

The papers included in this review suggest that there are benefits in terms of higher birth weight to be gained from quitting smoking as opposed to cutting down. However, further work is needed to examine the degree of the difference to establish whether it is statistically (and clinically) significant.Further work is needed to examine the relationship between the level of smoking and these potential health benefits.

7. Appendices

Appendix 1. Extraction tables for included studies

Extraction tables Review one

1. Study reference 2. Research question 3. Funding 4. Study design/Quality	1.Sampling strategy 2. Sample achieved 3. Method of allocation	Population characteristics	1. Details of intervention 2. Details of any comparator 3. Data collection method for qual studies	1. Outcome 2. Method of analysis	Study findings/key themes	Limitations of study identified by authors/reviewer
1. Al-alawy et al. (2008) 2. To determine the impact of a smoke-free homes initiative in Doncaster 3. Not stated 4. Before/After -	1. „Members of the public" were „randomly selected" and informed of smoke-free homes promise through routine contact with frontline staff. 2. 825 promise slips were returned. Of those agreeing to participate in follow-up (n=755), 230 were „randomly selected" due to time and resource constraints. Of these 230, 81 were sent postal questionnaire, 149 were contacted	UK setting: 13 Neighbourhood Renewal Areas in Doncaster "Members of the public" included if: • Aged between 16 & 65 • Lived in NRS areas No details given of participant characteristics or details of: Ethnicity ,Age, Gender, Socio-economic status	1. Delivered by staff from Doncaster smoking cessation service, Doncaster council, South Yorkshire Fire Service, Sure Start and two midwives who were given motivational interviewing training. Respondents were asked by frontline staff if they wanted to make their homes smoke-free and provided with a leaflet offering a choice of three promises: Gold – To make home completely smoke free at all times Silver – To allow smoking in 1 room only and never in presence of children Bronze – To never	1. Promises received broken down into percentages of gold/silver/bronze Follow-up: Self-reported motivation to keep promise, self-reported feeling after making promise and self-reported of location of smoking after making promise 2. Statistical analysis: Chi-squared test used for	825 „promises" covering 823 children returned after initial contact: 567 (69%) gold; 221 (27%) silver and 37 (4%) bronze. Of the 825, 523 (63%) were from smokers: 271(52%) gold; 206(39%) silver; 46 (9%) bronze Non-smokers (386/301, 95%) and smokers who had just quit (10/11, 91%) were more likely to opt for gold promise than smokers (271/523, 52%) ($p<0.001$) Follow-up (n=82, 36% response rate) Most common motivations to keep promise were health of children (26%), children (12%) and cleaner house or decoration (12%). Feeling after making promise: 20% felt healthy or health conscious, 17% felt responsible, 17% felt they cared about the health of others, 15% reported they felt a good parent and 11% felt a sense of achievement	Identified by reviewer: 1. No ethics approval (authors justified this by calling the study a „local service development evaluation") 2. Sampling frame and method of randomisation not specified 3. No details given of how many approached to make promise (original sample) 4. No details provided regarding the validity or reliability of the questionnaire used

	for a telephone survey. 3. Method of allocation stated as being random (but no details provided as to how this was achieved)		smoke in presence of children 2. No comparator specified 3. Not applicable	hypothesis testing of association between type of promise made and smoking status.		5. No details given as to how or why the 230 selected for follow up were divided into postal questionnaire group (n=82, 10% response), or telephone survey group (n=74, 50% response). The low response rate was not commented on by authors as a potential source of bias. 6. Statistically significant findings may be undermined given the numerous sources of bias arising in study Identified by authors: 1. Possibility of selection bias

1. Arborelius and Bremberg (2001). 2. To assess the development, spread and evaluation of a national child health-care-based counselling method targeting environmental tobacco smoke. 3. Swedish National Institute of Public Health, Swedish Cancer Society. 4. Before/After -	1. No clear sampling strategy, not obvious RCT design. 2. 28 families included	Healthy population. Country: Sweden No demographic data given.	1. Intervention: 6 steps: Five preparatory steps (establishing readiness to change in child health organisation – survey of nurse‟s present practices, establishing of routines for surveillance – routine recording of smoking status, developing new counselling method – smoke free children, piloting of smoke free children, dissemination and training. Smoke free children counselling method developed based on Bandura (1997) self efficacy concept. Discussions took place at normal health care visits and included: Knowledge of passive smoking. Discussion of charting tobacco smoke in the environment. At first follow up discussing current smoking habits and suggest changes. At second follow up,	1. Outcomes: parental smoking rates. 2. Analysis: X^2 (no methodology given).	In south west health district nurses were trained in 1996. Since 1996 the annual average decrease in parental smoking for all subgroups was 1.6%. The fraction of smokers was significantly lower in the years covered by the intervention compared with the preceding years ($p<0.001$ to $p<0.008$: X^2 test). In the rest of Stockholm county training occurred in 1997. Before that year, no decrease was seen in smoking of parents of 0-4 week old infants. In parents of infants up to 8 months, smoking decreased by 0.9% between the two years studied. The decrease was statistically significant for both mothers and fathers ($p=0.009$ and 0.005 X^2). In 1997 (first year of intervention), the average decrease was 2.7%. The fraction of smokers was significantly lower than the years preceding the intervention ($p<0.001$).	Comparisons indicate that the introduction of smoke free children was accompanied by decreasing rates of parental smoking. No direct comparison – comparison was before intervention data. Confounder: not possible to determine rates of smoking decline in non pregnant population – may just be part of a trend (authors).

			support habit changes and discuss problems. Step six (final intervention step): study the effects on parental smoking using routine data. 2. No comparator (compared to before training/intervention)			
1. Chilmonczyk et al 1992 2. To test a low intensity physician‟s office-based intervention strategy using infant urine cotinine, aimed at reducing infant ETS exposure 3. Davis Foundation, Falmouth, Maine 4. RCT +	1. Inclusion criteria Smoking 10 or more cigarettes/day. Parents who brought infants to physician for well child visit were asked for consent to provide information about household smoking habits and provide infant urine sample – 518 parents consented and were enrolled. From the consecutive sample of 518 enrolled mother/infant pairs, 103 mothers	Healthy population. Country: USA n=103 mother/infant pairs 28 family practitioner and paediatrician offices and 2 hospital based clinics in Maine Ethnicity: No details given Age: Mean age infants: 1.75 months Mean age mothers 24 years Education: Mean number of years education 11.9 Mean number of cigarettes smoked/day 18.5	1. Intervention Physician telephoned mother to report urine cotinine result and to explain its meaning. Mothers were then sent an individualised form letter signed by the physician providing specific recommendations for changing household smoking habits 2. Comparator There was a control group. Details of „usual care“ not given	1. Outcome Infant urine cotinine measurement at 2 months post intervention 2. Comparison of intervention and control group using mean log ratio (skewed data)	Follow up urine cotinine measurements at 2 months were obtained in 27 (52%) of infants from the intervention group and 29 (57%) of the controls. The mean log ratio of the follow-up to initial urine cotinine measurement was 6% lower in the intervention group than the control group, but this different was not statistically significant.	Identified by reviewer: No details given about usual care in control group Identified by authors Low compliance with follow up urine sample. Analysis performed on compliers and non-compliers suggest that the two groups were similar except for the mother‟s level of education which was lower in the group of non-compliers (p=0.01)

	reported that they smoked 10 or more cigarettes/day and these 103 formed study sample. 2. 103 mother/infant pairs: Intervention -52 pairs; Control - 51 pairs 3. Random assignment by computer on an individual basis to intervention or control group					
1. Emmons (2001) 2. To determine whether a motivational intervention for smoking parents of young children will lead to reduced household passive	1. Inclusion criteria: Current smokers or recent quitter; having child or grandchild under 3 years in household; able to read and speak English or	Healthy population. Country: USA Low income population. n=291 Ethnicity: White 46%; Black 21%; Hispanic 21%; Other 14%. Age: Mean age 28.4 years Gender: Women 91.5% Single parents 50%	1. Intervention: Motivational Interviewing (MI): 30-45 minutes MI session in participant‟s home with trained health educator and 4 follow-up telephone counselling calls. Key component of	1. Outcomes: Exposure levels of environmental nicotine at 6 months measured by nicotine concentration (μg/m³) in TV room and kitchen Secondary	The 6-month nicotine levels were significantly lower ($p<0.05$) in MI households. Repeated measures analysis of variance across baseline, 3-month and 6-month time points showed a significant time by treatment interaction, whereby nicotine levels for the MI group decreased significantly. The nicotine levels for the self-help group increased but were not significantly different from baseline. There were no significant differences in smoking cessation rates between groups at any of the follow-	Identified by reviewer: External validity for purposes of review – children‟s age less than 3 years Identified by authors:

smoking exposure 3. National Institutes of Health; Liberty Mutual Insurance Company; the Boston Foundation; NYNEX 4. RCT ++	Spanish. Participants recruited through primary care settings: family practice, obstetrics, and paediatric departments of 8 community health centres serving diverse, low-income populations. 685 potential participants contacted. 304 of these refused; 86 were ineligible and 4 took part in a pilot intervention. 323 participants were consented and randomised and of these 32 were not available for baseline data collection within the timeframe needed. 2. 291 participants were followed for 6 months. Data in study are from the 279 participants	Mean educational level 11.3 years Average cigarettes smoked 14/day (SD=9.3) and average length of time smoked 11.8 years (SD=7.7) More than 30% of participants had a partner who smoked. Age of children in households not given. Only information regarding children‟s age can be taken from inclusion criteria that they would be under 3 years of age.	intervention was feedback from baseline household air nicotine assessments and assessment of the participant‟s carbon monoxide level followed by tailored goal-setting. 2. Control Group – „Self Help‟: Received printed materials* in mail. Feedback about household nicotine levels was provided after the final follow-up assessment. *Both groups were provided with smoking cessation manuals, a passive smoke reduction tip sheets and a resource guide on community-based health and social services resources.	outcomes: Repeated measures for kitchen nicotine levels across baseline, 3-month and 6 month time points Smoking cessation and cigarette consumption rates 2. Method of analysis Based on intention to treat. Concentration data positively skewed (as is typical for most exposure data) so natural log transformation applied to these data and all subsequent analyses. Repeated measures ANOVA for secondary outcome analysis	ups and no change in smoking rate between groups at any of the follow-up assessments.	i. Study sample represents approximately 52% of those contacted about the study. However, once enrolled, the drop-out rate and loss to follow-up were relatively low. ii. 6 month follow-up period does not allow for evaluation of long-term changes in household exposure.

	who provided baseline household air sample. 141 smokers randomised to control (self-help) group and 150 smokers randomised to Motivational Interviewing group. 3. Unit of randomisation was the individual family. A computer-generated randomisation table was used. Randomisation information was kept from the study staff until the baseline assessment was completed.					

1. Fossum et al (2004) 2. To evaluate the effects of a counselling method („Smoke-free Children) on protecting infants from ETS 3. Funding: National Institute of Public Health; Swedish Cancer Society; Swedish Heart and Lung Foundation; Swedish Asthma and Allergy	1. Five (out of 24 counties) selected on basis of highest maternal smoking prevalence and no previous nurse training in the counselling method to be used in study. Inclusion criteria: Swedish-speaking mothers who had given birth to a healthy child. Child Health Centres (CHCs) are run by	Healthy population. Country: Sweden n=41 Participants selected from mothers using community child health centres. Ethnicity: No details Age range: No details Socioeconomic status: No details Education: 9 (22%) had $\leq$ 9 years schooling; 30 (73%) had > 10-12 years schooling; No schooling information for 2 (5%). Cohabiting: 37 (90%)	1. Intervention: Counselling method „Smoke-free children" - a client centred intervention aimed at increasing self-efficacy applied in a routine clinical setting. Delivered by Child Health Nurses (CHNs). CHNs in intervention group received 2 day training and a follow up session in method by pre-trained leader using standardised programme. Training included video-	1. Outcomes • Self-reported smoking with maternal salivary cotinine estimation at 1 month before birth and 3 months after birth • Assessment of child"s exposure to ETS by recall (elicited by trained	Self reported smoking: (Cotinine estimation achieved in 22/26 in intervention group and 8/14 in control group). Before the intervention, mean cotinine level was 185ng/mL in the intervention group and 245ng/mL in the control group. Cotinine levels were reduced in the intervention group (165ng/mL) and increased in the control group (346ng/mL). Cotinine levels increased by 40% in control group and diminished by 10% in the intervention group. (p=0.27) Yet after the intervention, the mothers themselves reported more smoking in the intervention group than in the control group, only weak correlations were found between self-reported smoking and cotinine.	Identified by reviewer: Outcomes for ETS assessment not clearly specified Identified by author: Potential selection bias – lower participation rate in control group and possible lower motivation of CHNs in the control group.

Association; Stockholm County Asthma and Allergy Foundation; Solstickan Foundation 4. RCT +	single Child Health Nurses (CHNs) and enrol on average 50 newborn children per year. CHCs used by 99% of parents. In the selected five counties, 17 Child Health Nurses (CHNs) formed an intervention group and 20 CHNs a control group. Groups matched on size of community and prevalence of smoking. 2. 41 mothers participated: 26 in the intervention group, 15 in the control group 3. Method of allocation not specified.	Only one child in the family 18 (44%)	recorded role playing and feedback. 2. Comparator Control group comprised mothers attending Child Health Clinics run by CHNs who did not receive the training.	interviewers blind to intervention or control group) • Questionnaire assessment of CHN"s counselling method 2. Analysis ANCOVA and non-parametric tests; Mann-Whitney, Chi-squared, Fisher"s exact test and Spearman rank correlation.		
1.Greenberg et al (1994) 2. To determine if home-based intervention programme could	1. Inclusion criteria Eligible infants had to weigh at least 2000 g at birth, be free of significant	Healthy population. Country: USA (North Carolina) n=933 Ethnicity: Black -35% White – 64.3%	1. Intervention 4 nurse home visits during 1st 6 months of life, lasting approximately 45 minutes each.	1. Outcomes Exposure to tobacco smoke – expressed as cigarettes per day smoked in infant"s presence	121 infants of smoking mothers completed study. Among these there was a significant difference in trend over the year between the intervention and the control groups in the amount of exposure to tobacco	Identified by authors: Frequent data collection could have interacted with the intervention

reduce infant passive smoking and lower respiratory illness 3. National Heart, Lung and Blood Institute, National Institutes of Health 4. RCT +	postnatal medical problems. Infants were recruited from three hospitals where approximately 80% of the local population births occur. Informed consent and demographic data was sought from all eligible infants. Mothers declining to enrol were asked for demographic data and a description of their smoking habits. 2. Out of 2332 eligible infants final study sample was 933 infants. [1241 unavailable for study due to lack of consent (1111) or not contactable (130). 158 randomly selected not to provide baseline data to enable the effect of data collection processes to be assessed] 3. A computer-	Age (mothers) Mean years 25.7 Smokers: 25.2% Mean cigarettes/day 13.8 Education Less than high school graduate – 23.6% High school graduate 35.7% More than high school 40.7%	Intervention involved counselling, information giving (verbal and booklets), jointly going through worksheets, target setting and other materials such as signs and stickers. One of the full and one of the reduced data collection groups received the intervention. Comparator There were 2 control groups – one with full data collection and one with reduced data collection. The only contact with the control groups was for data collection.	Environmental nicotine absorption measured by urinary cotinine Respiratory health measured by incidence of acute lower respiratory illness during 1st year of life (mother report of cough or wheeze) and prevalence of persistent lower respiratory symptoms at 1year. 2. Intention to treat analysis. Repeated measures models used to analyse relationship between the intervention and exposure to tobacco smoke.	smoke. Infants in the intervention group were exposed to 5.9 fewer cigarettes per day at 12 months. There was no difference in infant urine cotinine excretion. The prevalence of lower respiratory symptoms was lower among intervention group smoking mothers whose head of household had no education beyond high school (14.6% in intervention group and 34% controls)	programme to produce the intervention effects, but further two-way ANOVA analysis suggested that the intervention program reduced the amount of exposure to tobacco smoke independent of the data collection process. There were statistically significant differences in the characteristics of those who dropped out of the study. Of the 275 participants not completing the study, there were higher proportions of black, younger and less-educated mothers and mothers who smoked. However, the authors comment that the strength of the differences

	generated list of random numbers for each of the three hospitals to assign infants to one of the four groups: full data collection intervention or control or reduced data collection intervention or control. After 168 infants were assigned to the reduced data collection groups, infants were randomly assigned to only the two full data collection groups to provide a sufficient number of infants for those analyses requiring a full data set. However, if a family dropped out of the study or was removed from the study, the next family that enrolled was automatically assigned to the same group as the family that was					were weak. Self reported measures of exposure to tobacco smoke could have been biased with intervention group mothers more likely to report lower levels. However, the stability of the intervention effect persisted for at least 7 months after the last intervention and the authors suggest this means that bias does not completely explain the positive results. The possibility of maternal reporting bias regarding lower respiratory symptoms was addressed in part by the information given to mothers. The lack of association

	lost.					between intervention and urine cotinine concentrations is not suggested by authors to indicate a failure of the intervention in view of what they state as the limitations of this method as a measure of passive smoking.
1. Hovell et al (2000) 2. To test the efficacy of behavioural counselling for smoking mothers in reducing young children‟s exposure to environmental tobacco smoke 3. Robert Wood	1. Inclusion criteria: English and Spanish speaking mothers who smoked at least two cigarettes a day. Excluded breastfeeding mothers and those without a telephone. Sample taken	Healthy population. Country: USA Low income homes in San Diego n=108 Ethnicity: Black- 23 (21%) Hispanic- 30 (28%) White- 51 (47%) Other- 4 (4%) Single parent: 50 (46%)	1.Intervention Seven individualised counselling sessions (3 in person, 4 by telephone) based on shaping procedures (behavioural strategies for change). Range of mean duration of sessions 12.6 to 28 minutes. Counselling delivered by graduate students with 20 hours	1. Children‟s reported exposure to ETS in and outside the home both from mothers and other sources of ETS. Collected at baseline, 3, 6 and 12 months by interview. Children‟s urinary cotinine	Mothers' reports of children's exposure to their smoke in the home declined in the counselled group from 27.30 cigarettes/week at baseline, to 4.47 at three months, to 3.66 at 12 months and in the controls from 24.56, to 12.08, to 8.38. The differences between the groups by time were significant (P = 0.002). Reported exposure to smoke from all sources showed similar declines, with significant differences between groups by time (P = 0.008). At 12 months, the reported exposure in the counselled group was 41.2% that of controls for mothers' smoke (95% confidence interval 34.2% to 48.3%) and was	Identified by reviewer: 1. Enrolled those who signed consent forms first – possibility of selection bias at enrolment to study stage. However, the two groups were well matched in demographic and

Johnson Foundation Smoke-Free Families Programme (Grant No 027946 SFP) and Centre for Behavioural Epidemiology and Community Health 4. RCT ++	from women who attended sites of the supplemental nutrition programme. 2. 108 women (out of possibly eligible 1147 families) who were the first to sign consent forms were enrolled and 3. Randomly assigned to counselling or control condition by sealed envelope. Random numbers used to stratify assignment by three ethnic groups.	Employed: 13 (12%) Education: < High school 42 (39%) High school 27 (25%) Trade school 8 (7%) College attended 28 (26%) College graduate 3 (3%) Mothers‟ mean age (years): 28.75 Children‟s mean age (months): 14.2 Mean no, cigarettes smoked/day 12.4	of training and weekly supervision. 2. Control group mothers received usual nutritional counselling of the supplemental nutrition programme and brief advice to quit smoking and not expose their children to ETS	concentrations, collected at baseline, 3 and 12 months. Mothers‟ saliva cotinine concentrations. Environmental nicotine monitors placed in room of greatest exposure for a randomly selected half of the intervention families. (Laboratory staff blinded to identity and group assignment) 2. Analysis based on intention to treat. Differential rate of change in reported exposure and cotinine estimates of exposure relied on analyses of repeated measures over time. Estimated power to detect differential change between groups exceeded	45.7% (38.4% to 53.0%) that of controls for all sources of smoke. Children's mean urine cotinine concentrations decreased slightly in the counselled group from 10.93 ng/ml at baseline to 10.47 ng/ml at 12 months but increased in the controls from 9.43 ng/ml to 17.47 ng/ml (differences between groups by time P = 0.008). At 12 months the cotinine concentration in the counselled group was 55.6% (48.2% to 63.0%) that of controls.	dependent variables suggesting successful random assignment.

				0.80 for all dependent variables. Effects of counselling analysed using the generalised estimating equations approach, with linear components of time as “within subjects” factors and the interaction as a “between subjects” factor. Authors calculated differential change from baseline to end of follow up and then repeated this for baseline to three months (counselling effect) and from three months to end of follow up (maintenance effect)		

1. Kallio et al. (2006) 2. To determine whether repeated infancy-onset lifestyle counselling alters parental smoking and children‟s exposure to tobacco smoke. 3. Finnish Cancer Research Foundation and others. 4. RCT ++	1. Randomized prospective intervention trial. Families of 5mth old infants were recruited at the well baby clinics in Turku, Finland. Allocated at random 2. N=540 intervention N=522 control. 3. Random number allocation. No concealment.	Healthy population. Country = Finland. At 8 months (study onset) 33.2% of fathers and 17% of mothers smoked. No other demographic details given.	1. Intervention families received individualised and detailed child targeted lifestyle counselling at each visit. Intervention comprised mainly dietary counselling aimed at reducing saturated fat, total fat, and cholesterol in the child‟s diet. Other lifestyle factors including smoking, sedentary lifestyle and overweight were discussed. At the Child‟s age of 5, parents received a booklet about the adverse health effects of smoking. 2. Families of intervention and control groups met a paediatrician and dietician first at 1 to 3mth intervals and 4 to 6mth intervals respectively At 2-7 years both groups took place at 6mth intervals, and annually thereafter.	1. Self reported parental smoking, reported tobacco exposure of children, serum cotinine for parents and children. 2. The distribution of serum cotinine was highly skewed so a logarithmic transformation was applied and non-parametric models used.	At child‟s 8 years of age, mothers and fathers of the intervention [control group], 29 (10.1%) [45 (15.1%)] and 43 (19.7%) [60 (25.15)] smoked regularly. Smoking habits in the intervention and control groups did not differ. Serum cotinine concentrations did not vary between genders or between children of the intervention and control group. Both parents of 29 children smoked daily. Serum cotinine values were higher than those of children from no smoking families (p=0.007). Overall, children‟s serum cotinine values correlated poorly with reported amount of exposure (r=0.094 p=0.57). As there were no difference in smoking habits between the intervention and control groups at child‟s age 8 years, it suggests that general discussions about cardio risk factors with parents do not remarkably influence smoking habits.	Counselling regarding smoking parents and children‟s exposure to ETS needs to be specific and intense, repeated frequently throughout the years and attention also has to be paid to eliminating other sources of ETS other than those caused by parental smoking.

1.Lee (2008) 2. To test an intervention designed using the knowledge, attitudes and behaviours of pregnant women regarding second hand smoke in the home. 3. Partly funded by the Fogarty International Centre, National Institutes of Health, Bethsheda, Maryland 4. Before/After +	Two phase study. First phase used focus groups to explore knowledge and perceptions. Second phase was the pilot intervention. 1. Convenience sample. Inclusion criteria: non smokers who had husbands who smoked 2. First phase: 55 participants for focus groups recruited from pregnant women attending 3 hospitals for prenatal care. Second phase: 128 non-smoking pregnant women with smoking husbands recruited and followed up for 16 weeks. 3. Method of allocation – convenience sample used. No	Healthy population. Country: China <u>Phase 1: n=55</u> Age (women) <u><</u>25: 29.4% 26-30: 56.9% >30: 13.7% Education (women) <High school 25.5% High school 43.6% >High school 30.9% Education(husband) <High school 21.5% High school 27.5% >High school 51% Monthly family income (RMB) <1000 3.7% 1000-2999 38.9% 3000-5000 22.2% >5000 35.2% <u>Phase 2</u> Age (women) <u><</u>25: 38..3% 26-30: 48.4% >30: 13.3% Education (women) <High school 10.2% High school 36.2% >High school 53.6% Education(husband) <High school 11.7% High school 27.3% >High school 61% Monthly family income (RMB)	Intervention Phase 1: Two rounds of focus groups. First round with open questions to explore knowledge, attitudes and behaviours and idea gathering used to design pilot intervention. Second round of focus groups with same participants to test messages and concepts. Phase 2: Intervention Communication activities. First contact at hospital event with motivational speeches by authoritative figures, video, role play and games designed to practice tactics and instil feelings of self-efficacy. Resource booklet provided. Hospital records of participants flagged to enable systematic reinforcement of messages from clinicians at all checkups. Telephone hotline provided for counselling and	1.Outcomes (Intervention) Self reported knowledge and attitudes measured by questionnaire pre and post intervention. 2.Analysis Percentage change in self reported knowledge and attitude. Statistical analysis for significance using Chi square method.	Participants‟ post-intervention scores were significantly higher than their pre-intervention scores, indicating a significant increase in knowledge, changes in attitudes towards stronger disapproval, and an increased likelihood of taking assertive action when exposed to secondhand smoke in the family. Participants with some knowledge of the harmful components of secondhand smoke increased from 32.7% to 92.2% (P <.01), while those with some knowledge of the diseases caused by secondhand smoke increased from 19.5% to 74.2% (P <.01). Approximately, 38% of the participants started the program with some knowledge of the harm of secondhand smoke to the pregnancy and the foetus, and this figure improved to 73.4% after the intervention (P <.01). Most participants already were aware of the benefits of a smoke-free environment at home. The high pre-intervention percentage of 82.8% improved even higher to 95.3% (P <.05). The percentage of participants who disliked and strongly disliked being exposed to secondhand smoke increased from 50.7% before the intervention to 82.8% after the intervention (P <.01). Before the intervention, a high percentage of the participants reported that they were likely to take assertive action when exposed to secondhand smoke from their husband. The high percentage of 92.2% increased to 98.4% after the intervention (P <.05). When the source of exposure was other family members, the likelihood of assertive action was 56.2% at the pre-intervention period, lower than when the source of secondhand smoke was the husband. But this percentage increased to 86.7% after the intervention (P <.01)	Identified by authors i. Sample was a convenience sample so may not be representative of the population. ii. No comparison group iii. Small sample size iv. No evaluation of the relative effectiveness of the different components of the intervention model.

	control group.	<1000 6.4% 1000-2999 39.2% 3000-5000 36% >5000 18.4%	reinforcement. Bi-weekly telephone consultation provided by researcher and a final round up event to share experiences. 2. No comparison group			
1. Narce-Valente and Kligman (1992). 2. Chart audits and post visit parental survey to assess the pre intervention and post intervention screening and counselling activities of physicians with regard to passive smoking 3. Funding? 4. Before/After +	1. Patients were sampled from the University of Arizona Family Practice Residency Program. 2. N = 28 physicians. 129 office visits qualified for the study, after exclusions n=106 (80.3%) Of the 28 physicians, 11 attended the seminar. 3. No allocation method discussed.	Country: USA. Children aged five years or younger seen for diagnosis of upper tract respiratory infection, bronchitis, pneumonia or otitis media.	1. The two part intervention consisted of a 2 hour educational seminar for the physicians and a passive smoking chart reminder documentation system. A 2 hour seminar contained information on the health effects of passive smoking and on techniques for physicians to use in counselling parents on the reduction of exposure of children to ETS. In addition a newly developed office based chart reminder consisting of a stamp in red ink on a flow chart could be used to document whether a	1. Physician screening and counselling regarding passive smoking. 2. Chi squared to test for significant differences pre and post test.	In comparing pre and post intervention parental surveys there were increases in passive smoking screening (17% vs. .32% p=0.03) and counselling (19% vs. 46% p=0.03) activities of physicians. Chart documentation of these activities however showed very little change regarding screening (2% vs. 6% p=0.10) or counselling (4% vs. 6% p=0.64). Screening and counselling increased as a result of the intervention.	

			child was exposed to smoke at home and if so act as a reminder to counselling which could be offered.			
1. Ratner et al.(2001) 2. To explore if the concern for their unborn baby‟s health leading to pregnant women stopping smoking was carried over to the first year of the infant‟s life in terms of protecting the child from environmental tobacco smoke. 3. British Columbia Medical Services Foundation; the National Health research and Development Programme; the Canadian Institutes of	Data for this study were collected as part of an RCT testing the efficacy of a smoking relapse prevention for women who had stopped smoking during pregnancy. 1. Inclusion criteria: Participants smoked cigarettes before their pregnancy, stopped during pregnancy, gave birth to healthy infants and could be contacted by telephone. Participants recruited from a pool of 8837 women screened for study eligibility over a seven month	Healthy population. Country: Canada n=251 Ethnicity and socio-economic status: No details given other than stating women in the sample were „socio-economically and culturally‟ diverse Age range: 15 to 40 Living with partner: 84%	1. Intervention Delivered at time of birth and during first 3 months postpartum. Included nurse-delivered telephone support, relapse prevention and information about the adverse effects of smoking and environmental tobacco smoke. Primary purpose of intervention to assist participants in maintaining smoking cessation. 2. No details of comparator given.	1. Self-report of smoking status and efforts to protect baby from ETC elicited through interviews at 6 and 12 months following delivery. Self reports of smoking status were verified with assessments of carbon monoxide in expired air. 2. Percentages of self reported outcomes.	At 6 months postpartum, 76% of the women reported that they did not allow people to smoke in their houses. 77% removed ashtrays, 9% displayed no-smoking signs and 90% tried to ask people to smoke outdoors. At 12 months, 76% reported not allowing smoking in the house, 89% removed ashtrays, 8% displayed no smoking signs and 85% tried to ask people to smoke outdoors. At 6 months, 78.5% reported no difficulties in making homes smoke free, this increased to 87% at 12 months. Some women (<10%) described additional actions aimed at reducing ETS. The women who relapsed to smoking were slightly more likely to smoke in their houses at 6 months than those who remained abstinent (26.5% vs. 21%) and this gap widened at 12 months (26% vs. 15%).	Identified by reviewer: Incomplete description of methods, characteristics probably due to it being a paper reporting on data collected for larger trial on smoking relapse prevention. Statistical analysis limited: percentages given but no indications of statistical significance. No control group specified. Identified by author: Limited generalisability due to low (60%) participation rate

Health Research 4. RCT ++	period in 1996 in five Greater Vancouver teaching hospitals. 2. Of 416 eligible women, 251 (60%) consented to participate. Non-participants mainly differed in terms either of high confidence about remaining as non-smokers or intention not to remains abstinent, thereby seeing no benefit of participating in a relapse prevention programme. Minimal loss to follow up – interviews were completed with 241 (96%) and 238 (95%) participants at 6 and 12 months respectively. 3. Method of allocation not specified					

1. Severson et al (1994) 2. To study the effectiveness of an intervention to reduce infant exposure to environmental tobacco smoke during regularly schedules, paediatric well care visits 3. National Heart, Lung and Blood Institute 4. RCT +	1. Inclusion criteria: any mother who reported smoking in the month prior to pregnancy and who had a „well baby". 2. 49 paediatric practices in Oregon recruited to study. Of these, 26 practices (72 providers) were randomised to the Extended intervention and 23 practices (56) providers to the minimal or usual care condition. 1224 mothers in control („minimal" condition) and 1666 in the Intervention („extended" condition) 3. No details of method of allocation specified.	Healthy population. Country: USA n= 2890 No demographic information given about participant mothers.	1. Intervention Began at hospital after delivery. Received written materials* after birth and additional intervention and further materials at the first four well baby visits, generally occurring at 2-3 weeks and 2, 4 & 6 months after birth. Intervention delivered by paediatricians, nurse practitioners and physician"s assistants) and involved 5 steps including encouragement to quit or stay quit, facts about passive smoke exposure, soliciting quit date if relevant, giving out materials and encouraging mother to watch video on passive smoking. 2. Comparator „Minimal" group received materials in hospital after birth. All mothers at birth (regardless of smoking status) received a brief message from the	1. Outcome Self-reports of receipt of materials elicited by telephone interviews. Smoking status, quit attempts and knowledge of ETS elicited through mailed questionnaire at 6 months and one year postpartum. 2. Percentages	At 2 and 4 months postpartum, 87% of smokers and 74% of quitters reported receiving advice to quit or stay quit. 83% of smokers and 66% of quitters received advice on passive smoke exposure. About 70% mothers reported receiving materials on passive smoking. The video was seen by about 50% of mothers. Comparison of number of quit attempts and knowledge of ETS between the 2 arms of the study not reported as apparently data not available at time of report.	Identified by Reviewer Outcomes of interest not reported in study Details of participant characteristics not specified. Too little details about methods and analysis to enable proper appraisal. Identified by authors: Implementation of intervention problematic with variability in the distribution and collection of health surveys and in the delivery of the messages and materials.

			paediatrician about the health effects of passive smoking on infants and a package of materials (letter, brochure and sign) designed to reduce passive smoking exposure			
1. Sockrider et al. (2003). 2. Examines the effect of an intervention to sustain prenatal smoking cessation postpartum. Reduce infant ETS exposure 3. National heart, lung and blood institute. 4. RCT ++	1. Prospective randomised single blind trial. 485 women involved in project PANDA at 28 weeks gestation who reported not smoking for 28 days before enrolment. 87% completed data across the 12 month FU and were included in the analysis. 2. N=325. 3. Method of allocation not described.	Healthy population. Women Average age 27.7 White 73%, Black 13%, Hispanic 13%, Other 1%. 67% employed full/part time. Current smoker 66% (83% 100 or less cigarettes per week prior to pregnancy), quit 34%. Varied SES (income).	1. A home smoking control index composed of four items (mother smokes in home, partner smokes in home, other household smokers are asked to smoke outside, visitors are asked to smoke outside) was used to classify homes as: having a smoking policy in effect, no policy or no policy needed. Those who needed to control smoking received one video tape and five newsletters for the women (and a different set for the partners) distributed by mail between 28 weeks gestation and 6 weeks postpartum. The	1. Home smoking control index, reported tobacco smoking in the home, validation of self reported smoking in the home using nicotine monitors. 2. Logistic regression using a stepwise approach. Due to skewedness inverse values were used for ETS exposure (more closely approximated to normal).	Of those who needed to control smoking in the home, 63% had a home smoking policy in effect at 3mths, 60% at 6mths, and 64% at 12mths. Predictors of having a policy at 6 months included having a policy at the previous assessment, confidence in limiting infant ETS exposure in the home, perceived difficultly in preventing exposure. A significantly larger proportion of mothers who reported not smoking post partum were classified as having a policy in effect at each post partum interview (all $p<0.02$). Home nicotine concentrations were associated with self reported home ETS at 6 and 12 months post partum ($r=0.53$ and $r=0.55$, both $p<0.001$). When compared with controls, smokers who received the smoking intervention were significantly more likely to restrict smoking in the home (58% compared to 29% allowed smoking) (p value etc not given). Early establishment of a policy appears to be important for ensuring sustained ETS avoidance over time.	P value for headline result (intervention increased likelihood of ETS restriction policy in smokers).

			newsletter included specific messages about protecting infants from ETS exposure, a sign to designate the home as smoke free and tips on relapse prevention. 2. Control (usual care) subjects received messages about ETS exposure only as part of standard counselling from infant paediatric care or community education.			
1. Stepans et al. (2006). 2. The effect of a smoking hygiene intervention on infants of breast feeding mothers who smoke. 3. American Nurses Foundation 4. RCT ++	1. Convenience sample of 35 mother-infant dyads from seven postpartum units was recruited and randomly assigned to the intervention or control. Of the 27 dyads completing the study, 16 were in the experimental group and 11 were in the control.	Infants met the following criteria: hospital birth, at least 37 weeks gestation, birth weight >2,500 grams, on oxygen for no more than 24 hours after delivery, no significant postnatal health problems. Mothers were aged 18 years or older, smoked at least five cigarettes a day, and intended to breast feed.	1. Smoking hygiene was introduced when infants were two weeks old and reinforced at 3 and 5 weeks. Intervention components included: infant was not in the same room as someone who was smoking, if the mother smoked it should occur immediately after, or at least 90 minutes before breastfeeding, a hepa room clear air cleaner was placed in the infant‟s room. All women received an	1. Infant health (respiratory symptoms) and urinary nicotine and cotinine levels, smoking hygiene behaviours. 2. ANOVA	No differences in infant urinary nicotine and cotinine levels, or breast milk nicotine and cotinine levels between the two groups No differences between frequency of respiratory symptoms in either the control or intervention groups when week 2 was compared with 3 and 5.	Only 27% of women in the intervention group implemented all aspects of the smoking hygiene intervention.

			ETS exposure pamphlet defining smoking hygiene and outlining the steps they could take to reduce their infant‟s exposure. The intervention group received the pamphlet at week two; the control group received it at week five, after the completion of data collection.			
1. Strecher et al. (1993). 2. The role of a theoretical framework in an intervention program designed to reduce infants exposure to ETS 3. Funding? 4. RCT +	1. Infants were enrolled at birth (three hospitals) and randomly assigned to intervention/control. 2332 eligible infants were born. Many mothers declined consent or could not be contacted after enrolment. 2. Intervention N=292 Control N=293.	Healthy population. Country USA. Infants had to have no significant postnatal problems and a healthy birth weight. No other demographic data.	1. Four intervention nurse home visits (experienced public health nurse) between 3 weeks and 6 months of age. Follow up data collected at 1 year. Each visit lasted 45 minutes. The nurse defined passive smoking, identified positive and negative outcomes relating to exposure to tobacco smoke. Expectations were addressed through verbal reinforcement and by worksheets which allowed the mother to: identify possible sources of smoke which her infant	1. Exposure to tobacco smoke (deemed to occur when smoke was produced in the infant‟s presence). Amount of exposure expressed as cigarettes per day. Two psychological constructs used: Expectation of outcomes which result from behaviours associated with exposure and expectations of efficacy	No significant baseline differences. The intervention produced significant and sustained changes in outcome expectations ($F=22.0$ $p<0.001$) from baseline to follow up at 7 months. A marginal effect ($F=3.2$, $p<0.08$) intervention by outcome expectation interaction effect was also found over this period with the intervention having the greatest effect on mothers reporting initially low outcome expectations. No additional effects were seen from 7 to 12 months.	Interpreting the results of this paper is problematic as they are presented in the context of supporting the psychological model.

			was or may be exposed to, select specific strategies for reducing passive smoking from these sources. The mother then selected strategies which she felt could be confidently achieved. 2. Control = no intervention.	associated with mother‟s ability to engage in these behaviours. 2. Analysis of co-variance.		
1. Vineis et al (1993) 2. A population based non-randomised trial to evaluate the effectiveness of an educational campaign in preventing the exposure of young children to parental tobacco smoke. 3. Piemonte Regional Administration; Ricerca Biomedical Finalizzata, Regione Piemonte	1. All parents of newborn babies in the town of Rivoli contacted with questionnaire. Of those attending first vaccination appointment the local health unit, 40% were assigned to intervention, 60% to control. Allocation was not random and appointments were given according to date of delivery. 2. Eligible population 1142 families. Questionnaires	Healthy population. Country: Italy n=1015 Inclusion Criteria: All parents of newborn babies living in the town of Rivoli. Characteristics of population not specified other than that there was a „high proportion of blue collar workers‟. Education and employment status was analysed in relation to smoking habits and the effectiveness of the intervention.	1. Intervention Short counselling (15 minutes) by nurse and delivery of 3 booklets – one on home accident prevention, one on health effects of active smoking and one on health effects of ETS in children. Intervention period lasted 2 years and two and four years after its completion follow up questionnaires were sent to the target population. 2. Comparator The control group did not receive the counselling or the booklets	1.Relevant outcomes Self reports of numbers of cigarettes smoked in presence of children by mothers and fathers. This outcome also analysed by social class. Analysis Percentages	38% of smoking fathers and 59% of mothers reported not smoking in presence of children; 35% of fathers and 17% of mothers reported smoking between 1 and 5 cigarettes; 15% of fathers and 13% of mothers reported smoking between 6 and 10 cigarettes. Results are not reported for the differences between intervention and control groups, other than that „little change in smoking habits between the intervention and the control group was noted 2 and 4 years after the intervention.	Identified by reviewer: Non-random allocation of participants to control and intervention group. Outcomes not reported in terms of ETX exposure Identified by authors: Possibility of contamination between groups in terms of booklet exposure may have led to the modest effectiveness of

4. nRCT +	returned by 1015 (89% response rate). 402/1015 allocated to intervention group and 613/1015 to control group. 3. Non random method of allocation – allocated according to date of birth of baby					the smoking intervention.
1. Zakarian et al (2004). 2. RCT to test the effectiveness of a behavioural counselling program for reducing children‟s exposure to tobacco smoke (ETS).	1. Families were recruited from eight community health clinics in two systems. Clinics generated a list of all patients under five years and all mothers were contacted for telephone	Healthy population. Country: USA Unemployed 68% Medicaid Ethnicity: white 76%, Hispanic 12%, Black 1% Age: 29.1 (6.3) Gender: female 40% single parents Mean number of cigarettes per week: 12.8 Mean child age in months:	1. Intervention: Counselling based on social learning theory. Mothers were offered seven behaviour counselling sessions over 6 months. Sessions 1, 3 and 7 occurred in person at clinic sites, other sessions over the phone. Counselling	1. Outcomes: Measures of children‟s ETS exposure and mother‟s smoking, Measured by mother‟s reports. Children‟s urinary cotinine concentrations – sample collected	Parent reported measures indicate that, in both groups (intervention and control, children‟s exposure to mother‟s tobacco smoke in the home, and to all tobacco smoke, declined steeply from baseline to six months post test ($p<0.001$) , and remained level during follow up. Mother‟s smoking rates decreased from baseline to post test and no difference in groups was observed over time, this change was statistically significant for mother‟s indoor smoking rate ($p=0.47$) and mother‟s total smoking rate ($p=0.003$). There was	Results indicate acceptable test-retest reliability and validity of measures.

3. Maternal and child health bureau, US Department of Health and Human services. 4. RCT ++	screening. Inclusion criteria: English or Spanish speaking mothers with children younger than 4. Children exposed to a minimum of two of their Mother‟s cigarettes a day. Current breast feeders were excluded. 2. Of the 3448 mothers telephoned, 1584 were screened, and 191 (12.1%) qualified to participate. The first 150 were enrolled. 3. Families were randomised to intervention or control after baseline measures. The study was a randomised, double blind control trial with a two group repeat measures design. Assignment was	17.6 (10.0) 2. Control: “Measures only” (no details)	included behavioural contracting for reducing children‟s ETS: developing long and short term goals for shaping household behaviours, and low or no cost rewards for success. Mothers used pictorial charts to self monitor smoking. Those who asked for assistance to stop smoking were provided with a “quit kit” (no details) and a referral to community programmes. No formal smoking cessation counselling was provided. Counsellors received 6hrs of individual and group training and supervision and had monthly meetings to review mother‟s progress. Standardised reports were completed for each session.	at each study measure. Mother and other parent‟s smoking status (self reported). Nicotine monitoring –one week before six month interview, in three rooms in the home. 2. Method of analysis; Based on intention to treat analysis. Cross sectional group differences examined using one way ANOVA. Mothers smoking cessation assessed with Pearson‟s chi-squared. Mothers who were lost to follow up and not measured were counted as smokers.	no significant change over time for children‟s urinary cotinine levels.	

	stratified by child age, ethnicity and clinical site. Random number lists were generated for each strata. Intervention n=76 Control n=74					

Extraction tables Review Two

1. Study reference 2. Research question 3. Funding	1. Sampling strategy 2. Sample achieved 3. Method of allocation	Population characteristics	1. Details of intervention 2. Details of any comparator 3. Data collection method for qual studies	1. Outcome 2. Method of analysis	Study findings/key themes	Limitations of study identified by authors/ reviewer
1. Abrahammson et al. (2005) 2.What are the experiences of midwives approaching women smokers in antenatal care? 3. Funding: Kristianstad University	Purposive sampling for variation in interests, participation in specific training, geographical location of work, age and duration in the position. 24 participants of 27 invited.	N=24. Sweden. Midwives. 2-24 years experience in antenatal work. All female. Age 27-61. All had been involved in recent training as part of a smoke free project including motivational interviewing training.	Qualitative interview study. 20 conducted in person, 4 via telephone.	Phenomenographic approach. Developing a set of story types to make sense of individual experiences.	Avoiding the issue of smoking linked to previous experiences of persuasion or information giving having a negative influence on the relationship between midwife and pregnant woman, or having a lack of competence to deal with the situation. Importance of informing the women to better understand how smoking influenced the baby‟s wellbeing. However experience was that this “informing” did not work. Mutual relationship seen as a tool that would encourage the woman to think over the smoking issue. Conflict between information-giving which had potential to increase women‟s sense of guilt which counteracted encouragement. Need to build co-operation by respect for what the woman wanted.	Midwives with lower interest in smoking issues hard to recruit, sample may differ therefore from general population.

1. Anderson (2002) 2. What are pregnant women‟s experiences with their care provider? 3. No funding declared.	No details provided regarding sampling strategy	N=26 USA. Pregnant women who were smoking. Described as primarily lower income, lower educated women, most in their 20s. Nearly half had other children.	Qualitative focus group study. 3 focus groups run.	No details regarding analysis of data.	Variation in whether smoking cessation had been discussed by physicians. None of the participants described a thorough attempt to explain what smoking was doing to the baby, how quitting lowers risks, and how to go about trying to quit. Some women insulted by condescending tone and left feeling resentful. Discussions often reported as counter-productive due to perceptions of preaching, nagging. Descriptions of physicians requesting cutting down only.	Authors declare “the participants were not representative of all pregnant women in West Virginia”.
1. Arborelius & Nyberg (1997) 2. What are the perceptions of pregnant women regarding how smoking should be discussed? 3. No funding declared.	Sample obtained from antenatal clinic registration list. Contacted by letter + telephone. 17 women who had given birth during a 2 month period and were recorded as smokers invited.	N=13 Sweden. Women who had smoked during pregnancy and given birth during previous few months. Age 20-38. All low level of educational attainment. Skilled, unskilled workers + 5 unemployed.	Qualitative interview study	Thematic analysis	9 women stated they would have given up if they had been given proof that it was dangerous or that the baby would be harmed. 10 women stated the midwife should not be authoritarian, and not exhort, pressure or nag. Two women reported positive experiences with midwives who were friendly and never negative and systematically asked about smoking and kept a record of their consumption.	

1. Bishop et al. (1998) 2. What do staff identify as barriers to reducing the prevalence of antenatal smoking? 3. No funding declared.	No details regarding return rates for questionnaire	N=39 Antenatal clinic staff Australia 13 midwives, 26 doctors. Data collection as part of a three year smoking intervention study	Survey study including scaled and free text responses.	Thematic analysis of text data.	Perception of lack of skills and knowledge among staff regarding smoking cessation. Tendency for staff to use personal experience of smoking, quitting or non smoking to influence content of consultations. Perception of lack of patient motivation as an immovable barrier. Lack of time and the clinic setting perceived as barriers against counselling smokers. Lack of patient education materials. Importance of public education messages, although reports of misinterpretation of messages such as a low weight baby being beneficial.	

1. Clasper & White (1995) 2. What is the attitude to and delivery of smoking cessation programmes amongst midwives, GPs and obstetricians? 3. Funding: none declared	Participants identified from list of practices within County Durham. Survey sent to work address, reminder after 3 weeks, and second reminder after further 3 weeks. 67% response rate (497/744) 75% response from hospital midwives, 81% community midwives, 54% GPs, 55% obstetricians.	N=497 UK Hospital midwives 253, community midwives 74, 149 GPs, 21 obstetricians.	Survey	Percent Chi square	96% of participants reported that they routinely asked about the smoking status of pregnant women when they saw them the first time. 95% reported that they recorded the status. 96% reported that they explained the risks. 67% reported that they advised pregnant smokers on how to stop. 49% reported that they monitored or reviewed smoking status throughout pregnancy. Midwives significantly more likely to carry out all these activities than doctors ($p<0.01$). The use of guidelines covering advice and help which should be given was 6%. 28% of professionals thought they had good skills in smoking cessation counselling. 26% reported that they enjoyed giving counselling. 60% reported that it was difficult. 53% reported that they were insufficiently trained. GPs reported smoking cessation counselling to be the least difficult and perceived themselves to be the most trained ($p<0.01$). More training and more time were the factors mentioned most commonly as ways to make their counselling more effective (no numbers provided). 56% reported that smoking cessation counselling given by health professionals reduced the smoking of pregnant smokers.	Self report

1. Cooke et al. (1998) 2. What are the smoking intervention practices of in antenatal clinics? 3. Funding: Newcastle University Australia	Convenience sample of 23 hospitals within a geographical area. Hospitals had antenatal clinics and more than 500 births per year. All midwives and doctors working at 20 antenatal clinics during a specified two week period invited to complete survey. 63% return rate.	N=204 Australia Antenatal clinic staff 120 midwives, 84 doctors. Average 12 years experience working in obstetrics. 9% smokers.	Survey Scaled responses.	Percent T test Regression analysis	83% of staff reported assessing smoking status. 81% reported providing education regarding risks/effects of smoking. Midwives significantly more likely than doctors to offer written materials ($p<0.01$). Midwives significantly more likely than doctors to refer on ($p<0.001$). Doctors significantly more likely than midwives to advise clients to quit by abrupt cessation rather than gradual reduction ($p<0.01$). Participants perceived themselves as more willing than able to consel for smoking cessation ($p<0.001$) Barriers to smoking cessation – lack of good quality materials, lack of training, lack of teamwork, lack of time, and pessimism about the effectiveness of smoking advice. 17% of the sample had been offered in service training on smoking cessation activities in the past 18 months and 11% had attended a programme. Midwives more likely than doctors to report being offered training in smoking cessation interventions ($p<0.05$). 66% reported training and support for clinic staff was inadequate. Practitioner ability in terms of counselling about smoking cessation and having recent training for smoking intervention positively predicted the number of smoking interventions offered ($R^2 = 0.13$ $p<0.01$). Organisational factors such as having a policy/procedure in place positively predicted the number of smoking interventions offered ($R^2 = 0.10$ $p<0.01$). Work pressure positively predicted the number of smoking interventions offered ($R^2 = 0.04$ $p<0.0001$).	Self-report

1. Cooke et al. (2001) 2. Does the type of dissemination affect the uptake of smoking cessation programmes by midwives and doctors? 3. Funding: New South Wales Department of Health	Convenience sample of staff in antenatal clinics in publicly funded hospitals with more than 500 births in a geographical area. 23 of 25 potential clinics included. 64% response rate from staff.	N=182 antenatal clinic staff. Australia. Data part of intervention study. 118 midwives, 64 doctors. 23 smokers. Mean length of clinical experience= 10 years.	Survey Scaled responses	Means, percentages Logistic regression T test ANOVA	Midwives were more likely than doctors to initially adopt (ever use) at least one of the programme components (58% vs 22%). Median number of components of the programme used in the last month was one for midwives and nil for doctors. Most commonly used component was the quit smoking pack. More than three quarters of midwives and doctors reported that lack of time, lack of teamwork, lack of training and lack of high quality programmes act as barriers to the use of smoking cessation education.	Self report

1. Everett et al. (2005) 2. What are the practices and attitudes of doctors regarding smoking cessation during pregnancy? 3. Funding: Research for International Tobacco Control	Purposeful sampling across 5 public sector hospitals in Cape Town.	N=15 Doctors in public sector hospitals. South Africa	Qualitative interview study	Thematic analysis	Doctors reported that while smoking was important that their patients had other competing health needs of a low socio-economic status population. Doctors were unaware of available clinical guidelines for counselling pregnant women or the evidence regarding effectiveness of interventions. Generally approach consisted of exhorting women to stop smoking. They were aware this was inadequate but felt ill-equipped to counsel women. Reported that their efforts would be more effective if they had more time for discussion, a more in-depth understanding of how to motivate patients, and attractive resources to distribute. Some doctors did not note smoking status during consultation, gave cessation advice only where there was a problem, or made initial enquiries but did little to monitor or review the situation. Approach limited to repeatedly giving advice. All doctors expressed frustration regarding their lack of success in encouraging women to stop smoking. 5 respondents expressed the view that a more caring and empathetic approach could improve communication. Most of the doctors expressed a positive attitude to training in best practice guidelines and the distribution of a self help guide for women. Doctors reported staff would be receptive to the introduction of a smoking cessation intervention only if it brought additional staff in to the system, was independently administered and funded, and cast doctors and midwives in a supportive rather than primary role.	Particular population characteristics.

1. Glover et al. (2008) 2. What is the knowledge level of GPs and midwives regarding smoking cessation, and what support is provided? 3. Funding: Ministry of Health	Sample randomly selected by computer programme from National database of GPs and midwives. Second sample generated for midwives due to limited availability of contact addresses. Survey posted to potential participants (376 GPs, 397 midwives) + resent one month later if no response. Response rate 48% (GPs 39%, Midwives 57%).	N= 147 GPs 203 midwives New Zealand 82% European 71% aged 35-54 years 99% midwives female, 46% GPs. Responses for all regions of NZ.	Survey	Percent Relative risk	98.5% of midwives and 84.5% of GPs reported that they routinely recorded the smoking status of patients on the patient record. GPs more likely to ask about smoking status than midwives at first visit (92% vs 82% RR 1.12 CI 1.03-1.21) Key reason given for not asking was the short time available. Other respondents reported that they didn‟t see pregnant women till late in pregnancy so didn‟t ask. Several GPs commented that recording smoking status was the responsibility of the practice nurse and that they usually only saw a woman once to confirm pregnancy. 94% of GPs and 90% of midwives reported usually asking pregnant women who smoked if the wished to stop. GPs significantly more likely than midwives to report advising patients to stop smoking completely. Midwives more likely to advise cutting down initially with a view to stopping (80% vs 20% RR 2.86 CI 2.18-3.74). GPs more likely to give stop smoking advice at each antenatal visit as opposed to only discussing it if raised by the woman (69% vs 47% RR 1.45 CI 1.2-1.75). The likelihood of recommending particular treatments compared favourably to perceptions of which were the most effective. 33 GPs and 74 midwives indicated that they knew little about the effectiveness for pregnant women of the list of cessation treatments. Differences in treatments recommended by GPs and Midwives. No difference in regard to NRT patches, but GPs less likely to refer for acupuncture or hypnotherapy. GPs more likely to refer to Quitline (RR 1.2 CI 1.09-

1. Grange et al. (2006) 2. What are the perceptions of pregnant women regarding smoking reduction? 3. Funding: Association Allies France	Purposive sampling of 60 maternity hospitals in 4 regions in France with more than 1500 deliveries annually. Additional convenience sampling of 40 smaller units within geographical proximity of investigators. Convenience sampling of women who smoked within these units. Predicted sample size 400.	N=979 post-partum women. France. 18% smoked during pregnancy, 13% gave up during pregnancy.	Survey Scaled response	Chi square T test	76% of women who smoked at the start of pregnancy said that they had been asked about their tobacco consumption by a clinician or midwife. Minimal advice only was given in 16% of cases. Among the women who did not give up smoking 21% said they had not been questioned on the subject, 53% reported they had not been given any information about the benefits of stopping smoking, and 84% had not been asked about their attempts to give up smoking. 77% of these women said they had not been given an information leaflet, 91% had not been offered a specialised consultation.	Self report Sampling strategy not fully clear

1. Hartmann et al. (2007) 2. What are the smoking cessation best practice factors? 3. Funding: none disclosed	List of potential participants drawn up from professional registers. Addresses available for 1,138 of 1,687. 74% response rate (844) of these 295 incomplete or staff not currently in prenatal care.	N=549 USA. Staff working in prenatal care. 50% obstetricians, 18% midwives, 15% family physicians, 13% nurses, 4% assistants.	Survey Scaled responses	Percent Chi square Logistic regression	48% reported having had no formal training in smoking cessation intervention. 20% reported having a written protocol for smoking cessation. 90% reported at least one resource available. Most commonly acknowledged barriers to intervention were time constraints (71%) lack of patient interest (68%), limited effectiveness of interventions (39%), lack of confidence in personal intervention skills (9%). Providers reporting at least one material counselling resource were more likely to be associated with best practice (OR 9.6) Having a written protocol to identify staff responsibility was associated with best practice (OR 2.5).	
1. Jordan et al. (2006) 2. What are the perceptions of physicians regarding a smoking cessation programme? 3. Funding: Tobacco use prevention and control foundation	Random sample of 300 from practice register of 1614. 22 delivery failures, 28 retired or working in other areas. Response rate of 50%	N=125 Obstetricians/ Gynaecologists. USA Male 59%, White 80%, non smokers 80%, working in suburban locations 53%. Average 15 years of experience, average age 46. 76% worked in private practice.	Survey Scaled responses	Percent T test ANOVA Pearson correlation	Vast majority of respondents perceived no barriers preventing them from using the 5As smoking cessation method. Lack of time identified by 10% Not knowing where to send patients for treatment identified by 10%. Pregnant smokers not being responsive to suggestions (7%) lack of reimbursement for service (6%), previous failures (6%) low confidence/perception of intervention ineffective (3%), not area of expertise/perception smokers don‟t want to quit/fear of offending (2%), other (4%).	

1. Katz et al. (2008) 2. Can a behavioural counselling intervention improve pregnancy outcomes? 3. Funding: National Institute of Child Health and Human Development/National Center on Minority Health and Health Disparities	Participants recruited at prenatal clinics. Screening questionnaire to identify women who smoked, had depressive symptoms or exposed to partner violence. 1,398 potential participants, 1070 (76%) recruited.	N=1044 USA Black/African-American or Latina Resident in District of Columbia Over 18 years of age English speaking Pregnancy less than 28 weeks gestation Smokers only 54%, smokers and depressive symptoms 11%, smoking and partner violence 5%, all 3 risks 6%. Subsection of 152 women also completed telephone debriefing after study.	Randomised controlled trial (randomisation method not described)	Narrative description of intervention issues. Percentages	Adjustments were made to the content of the intervention in terms of violence and smoking after a few months due to difficulties in delivering this content and the risk of increased drop outs. "if a woman simply did not want to discuss their experiences on this issue (smoking or partner violence) further, or if the facilitator thought the relationship might be jeopardised, they were instructed to alter delivery". "For the active smoking component, which focussed on both smoking cessation and significant reduction, the facilitators were instructed to pursue a harm reduction strategy, and to cover the environmental tobacco smoke topic instead". 71% of smoking sessions fully completed. 5% of sessions on smoking had content omitted and 5% of sessions were changed to environmental smoke risk rather than active smoking. Telephone debriefing – 17/152 had not attended any sessions. Reasons – 41% the researcher had not informed or advised them to come back, 29% did not feel they needed/wanted to participate, 24% the sessions were too long. 18/152 had attended 1-3 sessions. Reasons – 22% not sure why or did not know why did not attend any more, 17% sessions too long, 17% timing in relation to pregnancy/delivery wrong or only participated when went to the clinic.	Nature of the population

1. Lando et al. (2001) 2. How do 2 different interventions for maternal smoking compare? 3. Funding: National Heart, Lung and Blood Institute	Parents scheduling/attending prenatal visit invited to participate by telephone/in person. 82% uptake reported for one study, not reported for other.	N=306 + 2055 USA Current and recent (within 30 days prior to conception) women smokers. Mean age 28 + 24 years 44% + 26% had not smoked in the previous 7 days. RCT - 88% Caucasian, 82% married or living with partner, 64% employed full time, 17% college graduates. No demographic detail for CBA study.	Compares findings from a RCT and a controlled before and after study.	Narrative description of implementation issues	In a large percentage of calls forming part of the delivery intervention counsellors were unable to actively engage women in discussion of issues pertaining to smoking. Provider resistance and problems with the logistics of implementing and maintaining the intervention in a busy and rapidly changing health care setting. Difficulties in system complexities and staff and provider attitudes. Staff and providers had to be “psychologically readied to deliver the intervention” developing the skills and comfort to perform the intervention took time. Providers often stopped discussing smoking once a woman quit. Many paediatric providers preferred to discuss environmental tobacco smoke rather than maternal smoking “since the baby not the mother was the patient”. Other hindrances – lack of time, use of temporary staff, decrease in nursing staff and a shift from individual visits to group visits.	

1. Lowe et al. (2002) 2. What was the impact of a smoking cessation programme? 3. Funding: Queensland Health	Sampling via eligibility survey. Hospitals providing care for 10 or more patients a year with Aboriginal or Torres Strait Island population of less than 50%. Hospitals not currently providing antenatal smoking cessation care. 80 potential hospitals, 70 included. Survey sent to medical superintendent for each hospital with request to be also passed o to a key antenatal member of staff (midwife).	Medical superintendants/midwives. Australia. Specific number of staff interviewed not provided. 35 intervention hospitals.	Telephone interview. Part of intervention study.	Data analysis method not described	Hospitals not providing the programme at follow up reported that they were "not convinced" that they could not overcome barriers of staff time to provide the service and a lack of infrastructure support by administration. 5 hospitals reported discontinuing the programme due to the inability to obtain supplies of the self-help booklet (no individual responsible for maintaining supplies or following up orders).	Respondents not identified.

1. Lowry et al. (2004) 2. What issues face pregnant smoking women? 3. Funding: Tyne and Wear Health Action Zone	Recruitment via door-to-door method by trained market research interviewers. 12 focus groups. 10 in 1992 and 2 "more recently". Participants informed discussion would be on health and illness.	Reported as 9 focus groups in abstract, 12 elsewhere in paper. Number of participants not provided. Described as "mainly women from deprived areas , social class C2D and E".	Qualitative focus group study. Study carried out to inform development of a smoking cessation programme.	Thematic analysis	Relationship between woman and health professional is crucial in regard to how receptive they will be to messages and support. Women particularly sensitive to approach and tone used being disparaging of anything "preaching" or "hard hitting". Perception of "mixed messages" with professionals nagging them to quit but not following through with enthusiasm or empathy. Need for ongoing support rather than ongoing "nagging". Supporting women needs to take account of the context of their lives such as role of cigarettes in coping with boredom, problems and routine.	Ethical concerns regarding withholding topic of focus group discussion. Lack of detail regarding number of participants. Lack of illustrative quotes.

1. MCCleod et al. (2003) 2. What are the perceptions of midwives and pregnant women in regard to changing smoking behaviour? 3. Funding: Health Research Council of New Zealand	Sample drawn from participants who had been in the intervention arm of a larger experimental study. Purposive sampling of women on the basis of smoking status, outcomes, age, previous pregnancy and partner‟s smoking status. Purposive sampling of midwives on the basis of age and experience and differing levels of participation in the study. 15 women invited to participate, 4 declined. 16 midwives invited to participate, all agreed.	N=11 women within 4 months of giving birth. New Zealand, North Island. All smoked at conception, 4 stopped during pregnancy, 4 reduced, 3 continued to be regular smokers. Age 21-36. 11 European ethnicity, 2 Maori. N=16 midwives New Zealand, North Island. 9 had received smoking cessation training, four had been in control arm of the study, three had been in breast feeding training arm of the study. 7 non smokers, 7 ex smokers, 2 smokers. Years in practice - 1 less than 5, 6: 5-10 years, 2: 16-20 years, 7: more than 20 years.	Qualitative interview study. Data part of larger Midwifery Education for Women who smoke (MEWS) intervention study	Thematic analysis using principles of Boyatzis for developing coding. 3 members of research involved in coding.	Midwives reported that asking women and supporting women in making changes was challenging. The intervention study used a laminated card listing six statements describing a woman‟s smoking status which was reported as useful by the midwives. Concerns that asking about smoking could damage the relationship with a woman. Women reported that asking about smoking was a part of a midwives job. Midwives report difficulty in identifying the women who would be receptive to support and those who would resent any advice. Concerned about the effect continued asking could have on women who may not be ready to make changes. Some uncertainty about asking and how to deliver the information by midwives. Motivational interviewing had been part of the intervention and was reported as helpful by one midwife. Importance of brief enquiry at every visit with women valuing being able to tell the midwife that they had succeeded in making changes no matter how small. Importance of involving partner.	Participants already part of the wider study.

1. McCurry et al. (2002) 2. What are pregnant smoker‟s views on smoking cessation advice? 3. Funding: None declared	Pregnant smokers attending a hospital maternity unit, a community midwifery team, and a GP practice were approached during a 10 week period. Approach by health professional. Quota sampling – all women approached until 25 participant target reached. 10 potential participants did not attend interview, gave birth prematurely or miscarried.	N=15 Pregnant women Resident within one health board in Northern Ireland Age 16-38 years Described as “committed smokers” although most had managed to cut down since becoming pregnant.	Qualitative interviews	No details regarding data analysis	Most women reported that health professionals had at sometime asked about their smoking behaviour, however not all. Women felt that they had been advised rather than strongly persuaded to give up smoking. Appeared that GPs took a minimal role in any further smoking cessation intervention. Most women had been given leaflets and books, information about clinics and help lines although only a few reported being offered personal support by their midwife. None of the women reported that they had received help in developing a quit plan.	

1. Nichter et al. (2007) 2. What factors motivate women to quit smoking? 3. Funding: Robert Wood Johnson Foundation	Women recruited from clinics, family practice offices, baby fairs, advertisements, flyers in shops. No details regarding approach versus participation numbers.	N=53 USA, large city Low income women 4th or 5th month of pregnancy All smoking at the time of pregnancy, 64% had continued to smoke during pregnancy, although all had attempted to reduce at some point. 62% Anglo American, 21% Mexican American, 11% African American, 6% multi ethnic. Most women in "high stress relationships", one quarter in positive, stable relationships.	Qualitative interviews. Part of a larger longitudinal study.	Thematic analysis Team coding.	One participant reported that she was aided in her quitting attempts by regular phone calls she received from a telephone helpline which showed somebody else was interested. Perception of mixed messages from a doctor. Encouraged cutting down but also said if quitting was stressful she should stop trying to quit as stress could harm the baby more. Most women had received advice from their doctor to quit but the majority reported that they received no messages that were helpful. Several described it being "just a policy" to ask and give a pamphlet.	Limited number of supporting quotes.

1. Solomon & Flynn (2005) 2. How successful was a telephone support service? 3. Funding: Vermont Department of Health	Women attending a women infants and children programme identified as a smoker. Of the 1,159 women who were smokers 187 (34%) accepted the telephone support package offered at the start of the programme. Over 6 years 948 women took part in the programme.	N=948 women referred for the programme USA	Uptake data only	Percentages	22% of referrals were never reached by telephone. After 8 attempts the support person stopped initiating calls. 22% received only 1 telephone contact which the authors attribute to women accepting the referral when offered but later declining when contacted. Additional participation losses due to disconnected telephones (no figures provided).	

1. Tod (2003) 2. What are the barriers to smoking cessation in pregnancy? 3. Funding: South Yorkshire Coalfields Health Action Zone	Convenience sample. Participants recruited via midwives. Different approach by different services including personal invitation, general leaflet distribution. 300 invitation letters distributed, 18 reply slips returned. Of these 7 could not be contacted.	N=11 Pregnant women smokers South Yorkshire Age: 19-38	Qualitative interviews	Thematic analysis using principles of Framework	Perception of negative effect of advice given in a judgemental manner. Perception of being judged led women to continue smoking as they were upset of as a position of defiance. Women‟s mobility to attend smoking cessation services due to lack of transport and alternative child care. Only domiciliary or very local services were accessible. Provision of crèche facilities, appointment systems or telephone counselling suggested.	Convenience sample Limited quotations to support reported findings

1. Walsh et al. (1985) 2. What are care providers perceptions of smoking cessation? 3. Funding: New South Wales Cancer Council	Hospitals with antenatal clinics identified from a list of service providers and initial letter contact. 191 hospitals returned form confirming had an antenatal clinic and providing contact details for Medical and Nursing Director of antenatal clinic. 16 hospitals excluded as antenatal classes only. 1 hospital no medical director. Questionnaires returned by 80% of eligible hospitals.	N=140 83 Medical directors 108 Nursing directors Australia 66% clinics in rural city or town, 26% in city suburb, 8% inner city.	Survey Scaled responses	Percentages Means, Standard deviations	16 barriers to antenatal staff involvement in smoking cessation programmes identified. 4 barriers rated as "very important" by highest percentage of staff were lack of staff training in counselling smokers (nursing 49% medical 34%), lack of time (nursing 40% medical 31%) too few staff (nursing 39% medical 24%) and pessimism about the effectiveness of smoking advice (nursing 25% medical 21%). Other factors were lack of staff teamwork (24% nurses 25% medical) staff believing pregnant smokers not interested in counselling (23% nursing 20% medical) staff unfamiliar with role expected of them (21% nursing 16% medical), staff being smokers themselves (21% nursing 18% medical), staff believing preventive medicine not part of their role (21% nursing 3% medical).	

Extraction table Review Three

<table>
<tr><th>Study Details</th><th>Participant characteristics</th><th>Intervention Characteristics</th><th>Results</th><th>Comments</th></tr>
<tr>
<td>England et al 2001

Study design: Data from RCT

Study date: 1987-1991.

Location: USA

Objective: To determine 1) whether reducing tobacco exposure during pregnancy increases the birth weight of term infants and 2) the relative effects of early- and late-pregnancy exposure to tobacco on infant birth weight.

Recruitment: Data were obtained from the Smoking Cessation in Pregnancy RCT, conducted in public</td>
<td>Number of patients: 1,583

Mean Age:
Quit before enrol:21.6 (4.5)
Quit after enrol: 21.2 (4.3)
Reduced: 22.8 (4.9)
No change: 23.3 (4.5)

Parity- nulliparous (%):
Quit before enrol: 61.2
Quit after enrol: 59.8
Reduced: 44
No change: 38.2

Education <12yr(%) :
Quit before enrol: 44.6
Quit after enrol: 40.2
Reduced: 47.7
No change: 41.5

Ethnicity- % black:
White
Quit before enrol: 87.5
Quit after enrol: 86.6
Reduced: 81.6
No change:89.6

Black
Quit before enrol: 12.5
Quit after enrol: 13.4</td>
<td>Data from a prospective, randomized trial of women who received prenatal care in public prenatal clinics and enrolled in a program for care</td>
<td><u>Cigarettes per day at enrolment and adjusted birth weight</u>
<table>
<tr><th></th><th>m</th><th>sd</th><th>n</th></tr>
<tr><td>No change</td><td>3205</td><td>NR</td><td>701</td></tr>
<tr><td>Quit before enrol</td><td>3492</td><td>--</td><td>224</td></tr>
<tr><td>Quit after enrol</td><td>3491</td><td>--</td><td>127</td></tr>
<tr><td>Reducers</td><td>3237</td><td>--</td><td>277</td></tr>
</table>
<u>Urine cotinine at enrolment and adjusted birth weight</u>
<table>
<tr><th></th><th>m</th><th>CI</th><th>n</th></tr>
<tr><td>No change</td><td>3216</td><td>Nr</td><td>701</td></tr>
<tr><td>Quit before enrol</td><td>3524</td><td>Nr</td><td>224</td></tr>
<tr><td>Quit after enrol</td><td>3413</td><td>3009-3581</td><td>127</td></tr>
<tr><td>Reducers</td><td>3237</td><td>3173-3300</td><td>277</td></tr>
</table>

Women who smoke during pregnancy may need to reduce to low levels of exposure (less than eight cigarettes per day) to improve infant birth weight.
after stratification by level of cigarette use at enrollment, the mean adjusted infant birth weight for women with low exposure who reduced their cigarette use was 201 g heavier than that for light smokers whose cigarette use did not change
The mean adjusted infant birth weight for women whose urine cotinine concentration reduced was only 21 g heavier compared with those whose cotinine concentration did not change; this finding was not significant (p = 0.57)
After stratifying subjects by cotinine level at enrollment,- no significant increase in mean adjusted infant birth weight among women who reduced

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clinics in three states (Colorado, Maryland, and Missouri) **Funding:** Federally funded **Analysis:** ▪ General linear models were used to generate mean adjusted birth weights for women who reduced their tobacco exposure by 50 percent or more and for those who did not change their exposure. ▪ Regression smoothing techniques were used to characterize the relation between birth weight and early exposure and birth weight and third-trimester exposure. **Length of Follow Up**: Self-reported cigarette use and	Reduced: 18.4 No change: 10.4 **Gestational age at enrolment mean: NR** **Marital status- husband or partner %:** Quit before enrol:78.1 Quit after enrol: 80.3 Reduced: 73.7 No change: 78.6 **Baseline comparability:** Demographic characteristics varied among women with different exposure patterns **Inclusion Criteria:** ▪ women who reported having smoked within 7 days before thinking they were pregnant or within 7 days before screening were considered smokers ▪ Black or White women ▪ singleton, term infants (37 or more completed weeks' gestation) ▪ plausible birth weights (between the 0.5 and 99.5 percentiles for term infants, which is between 900 and 5,300 g). ▪ women who delivered term infants in order to evaluate the effects of tobacco exposure on fetal growth independent of potential effects on preterm delivery.		their cotinine concentration compared with those whose cotinine level did not change	

urine cotinine concentration were collected from 1,583 pregnant smokers at study enrollment and in the third trimester **Loss to Follow up:** NR	**Exclusion Criteria: NR**			
Li et al., 1993 **Study design:** Group analyses from a prospective, randomized smoking-cessation intervention **Study date:** 1986-91 (Birmingham Trial) **Location*:*** USA **Objective:**To evaluate the impact of cotinine-confirmed smoking reduction during pregnancy on infant birth weight and gestational age at birth	**Number of patients:** Never smokers: 476 Quitters: 78 Reducers: 144 No change: 323 Unknown: 258 **Mean Age*:*** Never smoker: 20.2 (10.1) Quitters: 23.1 (5.0) Reducers: 24.4 (5.7) No change: 24.3 (6.3) Unknown: 24.5 (8.8) **Parity: NR** **Education- years mean(sd) :** Never smokers: 11.2 (5.0) Quitters: 12.9 (3.1) Reducers: 12.1 (2.8) No change: 12.1 (3.1) Unknown: 12.4 (3.3) **Ethnicity- % black:** Never smokers: 93	**Intervention:** The experimental group (n=400) received the following during their first prenatal visit: (1) a 15-minute smoking-cessation skills counseling session (2) a self-directed, 7-day smoking-cessation manual entitled A Pregnant Women's Guide to Quit Smoking (3) individual cessation reinforcement by registered nurse or physician staff members at each clinic visit (4) social support methods, including a buddy letter, a buddy contract, and a buddy tip sheet. **Control:** The control group (n=414) received standardized written	▪ Patients were classified into two groups by a baseline cotinine cutoff point of 100 ng/ based on two different classes of smokers ▪ Smokers with cotinine levels of 100 ng/mL or less were more likely to be infrequent smokers, smokers with low nicotine intake], or light smokers (<=five cigarettes per day). ▪ Reducers were defined as patients whose cotinine levels changed from the first baseline prenatal visit (mean gestational age+/- SD, 16+/- 7 weeks) to the end-point observation (>=32 weeks' gestational age) in one of the following two ways: ▪ at least a 60-ng/mL reduction for patients with baseline cotinine level greater than 100 ng/mL ▪ at least a 20-ng/mL reduction for patients with a baseline cotinine level of 100 ng/mL or less. ▪ The no-change group included smokers who did not meet these criteria. A 60-ng/mL reduction was selected because a mean birth weight decrease of about 120 g has been observed with a mean cotinine level increase of approximately 60 ng/mL (range, 138 to 284 ng/ml. A 20-ng/mL reduction in cotinine level is approximately equal to a reduction of three cigarettes smoked per day. ▪ Continuing smokers who had a missing cotinine value at the baseline or end-point observation (n=258) were classified into an unknown group for smoking-reduction status.	

Recruitment: Four maternity clinics of Jefferson County Health Department in Birmingham, USA. 32 weeks or less at the first prenatal visit

Funding: National Cancer Institute

Analysis: Analysis of variance (ANOVA) and multiple regression

Length of Follow Up: end of pregnancy

Loss to Follow up:
- five patients had a missing value for infant birth weight
- four patients had a missing value for gestational age at delivery
- A 14.3% quit rate among the experimental group and an 8.4%

Quitters: 73.1
Reducers: 49.3
No change: 49.2
Unknown: 60.1

Gestational age at enrolment mean (sd):
Never smokers: 16.3 (7.6)
Quitters: 14.1 (5.9)
Reducers: 16.3 (6.7)
No change: 15.3 (6.7)
Unknown: 17.5 (7.8)

Marital status- unmarried %:
Never smokers: 78.8
Quitters: 71.4
Reducers: 71.1
No change: 65.1
Unknown: 79.4

Baseline comparability:
- The three subgroups of the continuing smoker group--reducer, no-change, and unknown--were similar in baseline age, education, height, and weight.
- The cotinine level of the reducer group (mean+/- SD, 199+/- 120 ng/mL) was significantly higher at baseline than the no-change (mean+/- SD, 106+/- 68 ng/mL) and unknown (mean+/- SD, 127+/- 94 ng/mL) groups (P=.0001)
- self-reported average number of cigarettes smoked per day was similar in the three groups of

risk information and verbal advice to quit.

SMOKING OUTCOMES

Smoking number of cigarettes per day baseline

	m	sd	n
Not smokers	--		476
Quitters	5.5	6.6	78
Reducers	11.3	7.6	144
No change	10.8	8.0	323
Unknown	11.8	10.4	258

Quitters vs reducers & quitters vs no changers sig diff p<0.05
no data for end point cigs smoked

Smoking saliva cotinine ng/ml

	Baseline			End point		
	m	sd	n	m	sd	n
Not smokers	1.1	5	476	3.8	21	476
Quitters	41.5	50	78	3.7	6	78
Reducers	196.7	120	144	82.8	63	144
No change	106.4	68	323	134.6	86	323
Unknown	125.8	94	258	NR	NR	258

P 0.001

Smoking saliva cotinine ng/ml
Ethnicity: Black and White

Black	Cot<100ng/ml			Cot>100ng/ml		
Baseline	m	sd	n	m	sd	n
No Change	51	321	64	164	48	97
Reducers	69	19	15	250	124	54
End point						
No Change	84	55	64	188	83	97
Reducers	21	17	15	110	72	54

quit rate among the control group were confirmed.	continuing smokers. **Inclusion Criteria:** Only smokers with a fetal gestational age of 32 weeks or less were Single live birth **Exclusion Criteria:** Twins excluded		**White** Cot<100ng/ml Cot>100ng/ml **Baseline** m sd n m sd n No Change 48 32 93 151 46 73 Reducers 72 19 16 210 93 55 **End point** No Change 90 78 93 164 65 73 Reducers 28 18 16 88 47 55 **I** **INFANT OUTCOMES** **Infant birth weight (g) not adjusted** m sd n Not smokers 3141 711 476 Quitters 3371 581 78 Reducers 3120 651 140 No change 3043 587 327 Unknown 2935 832 258 Quitters vs reducers sig diff p<0.05 **Infant birth weight (g) adjusted** m sd n Not smokers 3180 63 476 Quitters 3242 63 78 Reducers 3076 44 140 No change 3001 29 327 Unknown 3078 32 258 Quitters vs reducers sig diff p<0.05	

Infant birth weight (g) adjusted
Ethnicity: Black and White

	Cot<100ng/ml			Cot>100ng/ml		
Black	m	sd	n	m	sd	n
No Change	3068	71	64	2962	57	97
Reducers	3288	136	15	3001	74	54
White						
No Change	3159	52	93	2956	60	73
Reducers	3264	126	16	3197	75	55

Low birth weight (under 2500g)

	n	N	%
Not smokers	52	476	10.9
Quitters	8	78	10.3
Reducers	21	140	15
No change	50	327	15.3
Unknown	42	258	16.3

Low birth weight (under 2500g)
adjusted odds ratio %, 95% CI

	OR	CI	%
Not smokers	--	--	476
Quitters	1.18	.50-2.75	78
Reducers	1.73	.96-3.12	140
No change*	1.92	1.23-3.04	327
Unknown*	1.99	1.25-3.19	258

*compared to never smokers p <0.05

Weeks gestation at delivery- not adjusted

	m	sd	n
Not smokers	38.6	3.1	476
Quitters	39.3	1.9	78
Reducers	38.6	2.8	140
No change	38.7	2.4	327
Unknown	37.7	4.4	258

Quitters vs no changers sig $p<0.05$

Weeks gestation at delivery- adjusted

	m	sd	n
Not smokers	38.7	.2	476
Quitters	39.2	.4	78
Reducers	38.8	.3	140
No change	38.5	.2	327
Unknown	37.9	.2	258

Weeks gestation at delivery- adjusted
Ethnicity: Black and White

	Cot<100ng/ml			Cot>100ng/ml		
Black	m	sd	n	m	sd	n
No Change	37.9	0.4	64	38.3	0.3	97
Reducers	39.1	0.7	15	38.1	0.4	54
White						
No Change	39.4	0.3	93	38.6	0.3	73
Reducers	39.6	0.7	16	39.2	0.4	55

Preterm delivery less than 37 wks

	n	N	%
Not smokers	58	476	12.2
Quitters	8	78	10.3
Reducers	22	140	15.7
No change	43	327	13.2
Unknown	50	258	19.4

Preterm delivery less than 37 wks-
adjusted odds ratio %, 95% CI

	OR	CI	%
Not smokers	--	--	476
Quitters	0.96	.42-2.23	78
Reducers	1.62	.92-2.84	140
No change	1.25	.78-1.98	327
Unknown	1.95	1.25-3.04	258

Unknown compared to never smokers sig p <0.05

Additional data

Mean Birth Weight by Race According to Cotinine Levels at Baseline and at the End Point Among Continuing Smokers

Cotinine Level at End Point, ng/mL	Cotinine Level at Baseline					
	≤100 ng/mL		101-200 ng/mL		>200 ng/mL	
	Black	White	Black	White	Black	White
≤100						
Birth weight, mean±SD	3110±658	3305±573	2952±682	3133±632	2833±485	3099±715
No. of women	58	74	33	44	9	9
101-200						
Birth weight, mean±SD	2966±468	3312±466	2846±542	2949±689	2872±532	3100±407
No. of women	19	32	48	30	17	18
>200						
Birth weight, mean±SD	2823±216	2367±928	3049±507	3037±630	2875±729	3128±425
No. of women	2	3	22	16	22	9
All						
Birth weight, mean±SD	3073±610	3281±569	2923±584	3054±649	2867±612	3107±489
No. of women	79	109	103	90	48	36

Secker Walker and Vacek 2002 **Study design:** RCT University of Vermont Trial **Study date:** 1988-92 **Location***:* USA **Objective:** To examine the effects of a 50% reduction of smoking on infant outcome measures **Recruitment:** Obstetrics and Gynecology‟s Maternal Infant Care clinic, a state-supported clinic for under-served women, and in the Adolescent clinic **Funding:** **Analysis:** ▪ Analysis of variance was used to compare the	**Number of patients:** 240 **Mean Age***:* 22.8 (5.1) **Parity-** primigravida 43% **Education- >high school:** 12% **Ethnicity- % non-white: <**2% **Gestational age at enrolment mean NR** **Marital status NR** **Reported number of cigarettes smoked per day:**12.9 (7.0) **Smoking less than 20 cigarettes per day at their first prenatal visit**: 70% **Average urinary cotinine** 3,892 (3,469) ng/ml, **Baseline comparability:** ▪ The women did not differ significantly with regard to race, education, or percentage primigravida ▪ from the 157 women who were excluded from the study because of loss to follow-up or incomplete data. However, the excluded women were on average 1 year younger, and fewer (43%) received	**Intervention:** ▪ The smoking cessation protocol was delivered by trained physicians with referral to an on-site smoking cessation counselor ▪ the first visit took place at 14.6 ± 7.0 weeks ▪ last visit at 35.0 ± 1.2 weeks **Control: NR**	▪ For women who reduced their cigarette consumption by 50% or more, the average last visit cigarettes per day was 6.3 (95% confidence interval [CI]: 5.2-7.4) ▪ For women who did not reduce their consumption to that extent, the average number of cigarettes consumed per day at the last visit, 14.8 (95% CI: 13.6-16.0),was significantly increased from the first visit ($p <$ .001). ▪ no significant difference between the average birth weight of infants born to women who reduced their consumption by 50% or more and that of those who reduced their consumption less than this ▪ the average infant birth weight of those who had a 50% or more reduction being 36 g heavier. ▪ The average birth weight of infants of women who reported quitting smoking after their first visit was significantly greater than that of women whose reduction in cigarette consumption was less than 50%. After adjustment for the number of cigarettes smoked at the first visit, this difference in birth weight was no longer statistically significant. ▪ The average last visit urinary cotinine concentration was 1,495 ng/ml (95% CI: 1,273- 1,756) for those whose concentration was reduced 50% or more and 103 ng/ml (95% CI: 66-161) for those who reduced to below the cutoff. The women who did not reduce their cotinine concentration by 50% had an average concentration at the last visit of 4,064 ng/ ml (95% CI: 3,619 to 4,562), a significant increase compared to their first visit ($p <$ .001). ▪ There was no significant difference between the average birth weight of infants born to the women whose urinary cotinine was reduced by 50% or more and that of those with lower urinary cotinine reductions, the average infant birth weight of those who had a 50% or more reduction being 21g lighter. ▪ The average infant birth weights for these two groups of women were significantly lower than the average infant birth weights for women with urinary cotinine belowthe cutoff at their last visit. These differences were slightly smaller after adjustment for cotinine levels at the first visit, but they remained statistically significant.	▪ There were no significant differences in average birth weight between infants of women who continued to smoke but reduced their cigarette consumption by 50% or more and infants of women with lesser reductions. ▪ These results indicate that this birth weight comparison does not provide a valid estimate of the harm reduction associated with a reduction of 50% or more in cigarette consumption during pregnancy.

groups with respect to infant birth weight and smoking levels at first visit. ▪ The Student-Newman-Keuls procedure was used for making multiple pairwise comparisons among the three groups. Analysis of covariance was used to assess differences in birth weight after adjustment for the level of smoking at the first visit. ▪ Identicalanalyses were performed using urinary cotinine levels to determine percentage reduction in smoking and its effect on infant birth weight. ▪ The natural logarithm of the urinary cotinine concentration was used in statistical analyses to obtain	Medicaid. Both groups smoked an average of about 13 cigarettes per day at the first prenatal visit, but the average urinary cotinine level was significantly lower for the excluded women: 3,284 ng/ml compared with 3,892 ng/ml for the women included in the study **Inclusion Criteria:** ▪ current smokers ▪ singleton births **Exclusion Criteria:** ▪ Non- English ▪ known psychotic disorder		**Cigarettes per day at first visit** m CI n Reduction <50% 12.9 11.8-14 160 Reduction >50% 15.7 13.7-17.7 44 Quitters 9.6 7.3-11.8 36 Reduction of >50% sig diff from reduction <50% p<0.05 **Cigarettes per day and Infant birth weight (g)- adjusted** m CI n Reduction <50% 3203 3128-3278 160 Reduction >50% 3267 3124-3410 44 Quitters 3413 3270-3556 36 **Urine cotinine at first visit** m CI n Reduction <50% 2868 2506-3281 139 Reduction >50% 4766 3916-5801 48 Quitters 1906 1408-2578 36 Both groups of reducers sig diff from women with levels below cutoff p<0.05 Reduction of >50% sig diff from reduction <50% p<0.05 **Urine cotinine and Infant birth weight (g)- adjusted** m CI n Reduction <50% 3214 3133-3295 139 Reduction >50% 3226 3114-3338 48 Quitters 3447 3291-3604 36 Both groups of reducers sig diff from women with levels below cutoff p<0.05	

a less skewed distribution.We have used a probability of <.05 as the level for testing statistical significance. **Length of Follow Up**: end of pregnancy **Loss to Follow up:** ▪ 23 women suffered fetal losses and were not followed further ▪ 98 women were lost to follow-up (66 women transferred their care to other obstetric practices or moved out of the area, 12 voluntarily dropped out of the study, 17 delivered before their 36-week visit, and 3 could not be traced), ▪ 36 women were missing urinary cotinine data for				

either their first or last prenatal visit.				
Secker-Walker et al. 1998 **Study design:** observational data collected from RCT trial. **Study date:** 1984-1992 **Location***:* USA **Objective:** To compare the estimated effect on birth weight of reductions in smoking **Recruitment:** data collect from first prenatal visit and then again towards end of pregnancy. First visit 14 6) weeks gestation. Follow up at 36 (1.5) weeks (mean (sd)) **Funding:** National institute of	**Number of patients:** 641 **Mean Age***:* 23 (5) **Parity- first pregnancy n(%):** 305 (48) **Education- n(%) :** <High school 209 (33) High school 284 (44) < High School 148 (23) **Ethnicity: 98.5% White** **Gestational age at enrolment: NR** **Marital status: NR** **Smokers at baseline n(%):** 492 (77) **Cigarettes smoked p/day at baseline m(sd):**13 (7) **Urine Cotinine baseline m (sd):** 1478 (1288) **Baseline comparability:** women included in analysis smoked about one fewer cigarettes than women excluded due to incomplete data. No other significant differences **Inclusion Criteria:**	▪ Data collected from RCT ▪ cigarette smoking data, urinary cotinine data, and birth weight collected	**SMOKING OUTCOMES** **Smoking number of cigarettes per day baseline** n N % Reducers NR NR 35 No change NR NR 41 Increased NR NR 23 **INFANT OUTCOMES** **Infant birth weight (g) by number of cigarettes smoked per day- adjusted** m sd n Quitters (smoked 20/day, but quit) 3389 nr Reducers (20 to 10 cigs/day) 3300 nr No change (smoked 20 cigs/day) 3211 nr **Infant birth weight (g) by urine cotinine (UC) levels- adjusted** m sd n Quitters (from 2000-50 ng/ml) 3421 nr Reducers (from 2000- 1000 ng/ml) 3279 nr No change (stayed at 2000 ng/ml) 3246 nr	

health grant **Analysis:** Correlation and regression **Length of Follow Up**: end of pregnancy **Loss to Follow up:** NR	▪ Single births ▪ Complete cigarette smoking data, urinary cotinine data, and birth weight **Exclusion Criteria: NR**			

Appendix 2: Included papers

Review one Included papers

Al-alawy, K., Wellington, N., Dalton, E., Fendall, L., MacDonald, T.,Williamson, M., Al-alawy, K., Wellington, N., Dalton, E., Fendall, L., MacDonald, T., & Williamson, M. 2008, "Smoke-free homes: outcomes of a local service development", Community Practitioner, vol. 81, no. 12, pp. 30- 33.

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Appendix 3: Excluded papers

Not relevant for any question

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Appendix 4: Search strategies

Date	Search Terms/Search Strategy	Database (inc limits)	Hits
Search Iteration One (677 records before de-duplication, 597 records after deduplication)			
25.03.09	((smoke adj2 free) or smokefree).ti,ab. AND (home* or house* or residence*).ti,ab.	Medline 1990-2009 English Humans	159
25.03.09	((smoke adj2 free) or smokefree).ti,ab. AND (pregnan*).ti,ab.	Medline 1990-2009 English Humans	38
25.03.09	((smoke adj2 free) or smokefree).ti,ab. AND (home* or house* or residence*).ti,ab.	Embase 1990-2009 English Humans	96
25.03.09	((smoke adj2 free) or smokefree).ti,ab. AND (pregnan*).ti,ab.	Embase 1990-2009 English Humans	19
25.03.09	((smoke adj2 free) or smokefree).ti,ab. AND (home* or house* or residence*).ti,ab.	Maternity and Infant Care (No limits applied)	11
25.03.09	((smoke adj2 free) or smokefree).ti,ab. AND (pregnan*).ti,ab.	Maternity and Infant Care (No limits applied)	20
25.03.09	(smoke free or smokefree) in TITLE AND (house* or home* or residence*) in TITLE	Science Citation Index and Social Science Citation Index (No limits applied)	34
25.03.09	(smoke free or smokefree) in TITLE AND (pregnan*) in TITLE	Science Citation Index and Social Science Citation Index (No limits applied)	5
06.04.09	(anti smoking or antismoking).ti. AND (Pregnan* or prenatal or pre natal or antenatal or ante natal	Medline (No limits applied)	10

	or post natal or postnatal).ti.		
06.04.09	(smoking adj (cessation or intervention)).ti. AND (Pregnan* or prenatal or pre natal or antenatal or ante natal or post natal or postnatal).ti.	Medline (No limits applied)	232
06.04.09	(tobacco adj (cessation or intervention)).ti. AND (Pregnan* or prenatal or pre natal or antenatal or ante natal or post natal or postnatal).ti.	Medline (No limits applied)	2
06.04.09	((quit* or stop*) adj (smoking or smoker)).ti. AND (Pregnan* or prenatal or pre natal or antenatal or ante natal or post natal or postnatal).ti.	Medline (No limits applied)	51
Search Iteration Two (3795 records retrieved. Following deduplication amongst records retrieved in this iteration then deduplication with records retrieved through Iteration One, 1819 new records imported)			
21.04.09	Entered into Ref Man Library the paper that Liddy mentioned Entered into Ref Man Library the three papers in the reference list that referred to smoking in pregnancy Citation search on all four of these papers	Web of Science Cited Reference Search (No limits applied)	108
29.04.09	1. (secondhand smok* or second hand smok* or passive smok* or environmental tobacco smok*).ti,ab. 2. (home* or house* or residence* or indoors*).ti,ab. 3. (pregnan* or famil* or newborn* or infant* or fetus or foetus).ti,ab 4. 2 or 3 5. 1 and 4 6. limit 5 to (english language and humans and yr="1990 - 2009")	Medline 1990-2009 English Humans	1682
29.04.09	Search as above	Embase 1990-2009 English Humans	1455
29.04.09	Search as above	British Nursing Index (Not able to limit by date, humans or English Language)	22
29.04.09	Search as above	Maternity and Infant Care	250

		1990-2009 (Only able to limit by date)	
29.04.09	Search as above	Social Science and Science Citation Indices (No limits applied)	259
29.04.09	(TI=((secondhand smok* or second hand smok* or passive smok* or environmental tobacco smok*).)) and(home* or house* or residence* or indoors* or pregnan* or famil* or newborn* or infant* or fetus or foetus)	ASSIA 1990-2009 English	55
29.04.09	As above (Title only)	CINAHL 1990-2009	72
Search Iteration Three (994 records retrieved. Following deduplication amongst records retrieved in this iteration then deduplication with records retrieved through Iteration One and Iteration Two, 563 new records imported)			
10.06.09	Citation Searches for papers included in Review Two at 09.06.09 (see folder)	Web of Science Cited Reference Search (No limits applied)	309
10.06.09	Citation Searches for papers included in Review Three at 09.06.09 (see folder)	Web of Science Cited Reference Search (No limits applied)	344
10.06.09	Citation Searches for papers included in Review Three at 09.06.09 (see folder)	Web of Science Cited Reference Search (No limits applied)	264
12.06.09	(((cut* adj down) or reduc* or limit*) adj2 (smok* or tobacco)).ti. AND (pregnan* or pre natal or prenatal or ante natal or antenatal).ti. limit to (english language and humans and yr="1990 - 2009")	Medline 1990-2009 English Humans	21
12.06.09	(((cut* adj down) or reduc* or limit*) adj2 (smok* or tobacco)).ti. AND (pregnan* or pre natal or prenatal or ante natal or antenatal).ti. limit to (english language and humans and yr="1990 - 2009")	Embase 1990-2009 English Humans	19
12.06.09	(((cut* adj down) or reduc* or limit*) adj2 (smok* or tobacco)).ti. AND	PsycINFO 1990-2009 English	12

	(pregnan* or pre natal or prenatal or ante natal or antenatal).ti.	Humans	
12.06.09	(((cut* adj down) or reduc* or limit*) adj2 (smok* or tobacco)).ti.	Maternity and Infant Care 1990-2009 (Only able to limit by date)	25
12.06.09	(((cut* adj down) or reduc* or limit*) and (smok* or tobacco)).title AND (pregnan* or pre natal or prenatal or ante natal or antenatal).title	Social Science Citation Index and Science Citation Index 1990-2009 English Language	60

Appendix 5: Additional references

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