Workplace interventions for smoking cessation (Review)

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ABSTRACT

Background
The workplace has potential as a setting through which large groups of people can be reached to encourage smoking cessation.

Objectives
To categorize workplace interventions for smoking cessation tested in controlled studies and to determine the extent to which they help workers to stop smoking or to reduce tobacco consumption.

Search strategy
We searched the Cochrane Tobacco Addiction Group Specialized Register in October 2004, MEDLINE (1966 - October 2004), EMBASE (1985 - October 2004) and PsycINFO (to October 2004). We searched abstracts from international conferences on tobacco and we checked the bibliographies of identified studies and reviews for additional references.

Selection criteria
We categorized interventions into two groups: a) Interventions aimed at the individual to promote smoking cessation and b) interventions aimed at the workplace as a whole. We applied different inclusion criteria for the different types of study. For interventions aimed at helping individuals to stop smoking, we included only randomized controlled trials allocating individuals, workplaces or companies to intervention or control conditions. For studies of smoking restrictions and bans in the workplace, we also included controlled trials with baseline and post-intervention outcomes and interrupted times series studies.

Data collection and analysis
Information relating to the characteristics and content of all kinds of interventions, participants, outcomes and methods of the study was abstracted by one author and checked by two others. Because of heterogeneity in the design and content of the included studies, we did not attempt formal meta-analysis, and evaluated the studies using qualitative narrative synthesis.

Main results
Workplace interventions aimed at helping individuals to stop smoking included ten studies of group therapy, seven studies of individual counselling, nine studies of self-help materials and five studies of nicotine replacement therapy. The results were consistent with those found in other settings. Group programmes, individual counselling and nicotine replacement therapy increased cessation rates in comparison to no treatment or minimal intervention controls. Self-help materials were less effective.

Workplace interventions aimed at the workforce as a whole included 14 studies of tobacco bans, two studies of social support, four studies of environmental support, five studies of incentives, and eight studies of comprehensive (multi-component) programmes. Tobacco bans decreased cigarette consumption during the working day but their effect on total consumption was less certain. We failed to detect an increase in quit rates from adding social and environmental support to these programmes. There was a lack of evidence that comprehensive programmes reduced the prevalence of smoking. Competitions and incentives increased attempts to stop smoking, though there was less evidence that they increased the rate of actual quitting.

Authors' conclusions

We found

1. Strong evidence that interventions directed towards individual smokers increase the likelihood of quitting smoking. These include advice from a health professional, individual and group counselling and pharmacological treatment to overcome nicotine addiction. Self-help interventions are less effective. All these interventions are effective whether offered in the workplace or elsewhere. Although people taking up these interventions are more likely to stop, the absolute numbers who quit are low.
2. Limited evidence that participation in programmes can be increased by competitions and incentives organized by the employer.
3. Consistent evidence that workplace tobacco policies and bans can decrease cigarette consumption during the working day by smokers and exposure of non-smoking employees to environmental tobacco smoke at work, but conflicting evidence about whether they decrease prevalence of smoking or overall consumption of tobacco by smokers.
4. A lack of evidence that comprehensive approaches reduce the prevalence of smoking, despite the strong theoretical rationale for their use.
5. A lack of evidence about the cost-effectiveness of workplace programmes.

PLAIN LANGUAGE SUMMARY

The workplace can be an effective setting for people to stop smoking.

Proven stop smoking methods, like group therapy, individual counselling and nicotine replacement therapy (NRT), are equally effective when offered in the workplace. The evidence is less clear for self-help methods. Bans and restrictions can reduce smoking at work, although it is not clear whether they reduce overall smoking levels. Social and environmental support, competitions and incentives, and comprehensive programmes do not show a clear benefit in helping smokers to quit at work.

BACKGROUND

Most adults spend about a third of their day in a workplace environment. The workplace is therefore a setting through which large groups of smokers can potentially be reached by health promotion (Gruman 1993).

There are several advantages to the traditional workplace as a setting for smoking cessation. First, it provides access to a large number of people who make up a relatively stable population. Second, it has the potential for higher participation rates than non-workplace environments. Third, it may encourage sustained peer group support and positive peer pressure. Fourth, it provides a particular opportunity to target young men, who traditionally have low general practitioner consultation rates and are thus less likely to benefit from opportunistic health promotion activity in primary care. Fifth, occupational health staff may be on hand to give professional support, and sixth, the employee generally is not required to travel to the programme or to dedicate their own personal time to it. However, all these assumptions are based on a model of the workplace that is rapidly changing.

Potential benefits of a smoke free environment

There are a number of potential benefits of a smoke-free workplace (Fisher 1990; Eriksen 1998; Harden 1999). These include:

- Protection of non-smokers from the harmful effects of environmental tobacco smoke
- Reduced absenteeism and loss of smoking staff due to ill health
- Reduced direct costs for health care
- Reduced costs for health, disability and life insurance
- Reduced cleaning costs
- Reduced risk of fires
- Increased productivity.

In addition, it has been suggested that workplace interventions can contribute to public health by reducing the prevalence of smoking in society (Chapman 1999; Fichtenberg 2002).

There is considerable international variation in the extent to which workplace programmes have been implemented and evaluated. The potential of workplace smoking cessation interventions has not been greatly exploited in European countries. For example, in the early 1990s scarcely any workplace smoking cessation programmes were reported to exist in Germany (Mielck 1990) or Spain (Serrano-Aguilar 1993). Similarly, a 1996 survey of 1104 Dutch workplaces found that only 9% reported face-to-face education or advice, 3% provided educational materials, and 1% provided smoking cessation classes (GBW-NIPO 1996). In the United Kingdom in 1989, the Labour Research Department reported the findings from a survey of 500 trade union representatives. The most common workplace health promotion activities cited were first aid/medical treatment, inspection of hazards and pre-employment medical screening: there was little activity directed towards lifestyle change (Labour 1989).

A survey of 1344 UK workplaces conducted in 1992 by the Health

Education Authority found that up to 40% undertook at least one major health-related activity in the previous year. The likelihood of this increased with workplace size. The workplaces of foreign-owned companies were more likely to have health promotional activity than British-owned companies. The presence of a recognized union was another important factor. The survey identified that 41% of workplaces with a recognized union had a smoking-related activity, compared to 28% without a union. Health promotion activity was particularly low in small or medium-sized companies, in the private sector, British-owned, and in certain sectors such as distribution and catering. Action on smoking appeared to be the most common health-related activity and the main implementation method was through group communication such as posters, leaflets and videos. Larger workplaces were more likely to offer counselling for smoking cessation. However, there was very little formal evaluation of these programmes. The assessments if carried out were through informal feedback from the workforce (HEA 1993).

In contrast, in the United States, the Office of Health Promotion and Disease Prevention sponsored national surveys in 1985 and 1992 that assessed the prevalence of a variety of workplace health promotion activities, including smoking policy and cessation activities. These two national surveys documented a sharp growth in workplace smoking restrictions. In 1985, 27% of the workplaces sampled reported having some kind of formal policy restricting smoking. At that time, any policy that limited smoking to particular areas or times (for example, only during breaks or lunch) was considered a formal smoking policy. The 1992 survey, which evaluated more specific details of smoking policies, found that 59% of workplaces (Linnan 1993) either banned indoor smoking entirely or restricted it to separately ventilated areas. Another 28% restricted smoking to designated areas without separate ventilation. Since the 1992 definition was considerably more specific than the earlier one, it can safely be concluded that the prevalence of workplace smoking policies more than doubled in the United States during the 1980s. In addition, 40% of workplaces reported in the 1992 survey that they offered information or activities to help employees stop smoking (Linnan 1993).

There are growing indications that European attitudes and policies are beginning to change, however, with the implementation in the Republic of Ireland of a total prohibition on smoking tobacco products in places of work, including pubs and restaurants, from March 2004 (Tobacco Act 2002). A combination of intensive information campaigns, free and available nicotine replacement therapy, price rises and advertising bans prepared the community for implementation of the ban. Anticipated changes in public health, such as hospital admission rates for myocardial infarction and the respiratory health of bar and restaurant staff, are being monitored by ongoing studies, with the opportunity to use neighbouring Northern Ireland (where no ban applies) as a control community (Allwright 2004). In the UK in November 2004 the Government White Paper *Choosing Health: making healthy choices easier* (DOH 2004) proposed a legislative ban on smoking in most public places and workplaces by 2008, including any pubs which serve food. Some national pub chains (for example, the Laurel Group, JD Wetherspoon) have already announced smokefree policies in some or all of their premises, and some cities (Liverpool and London, for example) are taking forward plans to bring in smoking bans within all workplaces or public places, or both.

Variation in implementation of programmes partly reflects the diversity of workplace interventions that have been both evaluated and implemented. The most common workplace intervention involves restrictions or bans on freedom to smoke in the workplace. Such policies may be linked to services to assist individuals to stop smoking. A number of studies conducted in workplaces have considered treatment modalities independent of workplace policies, though this is not a common approach in practice. More comprehensive approaches include smoking policies as part of a package of policies and services aimed at promoting employee health that may target individual behaviours such as diet and smoking, health screening and reduction of exposure to risk at work.

Given this diversity of interventions, we set out in this review to categorize and evaluate the effectiveness of workplace interventions tested in controlled studies.

OBJECTIVES

The specific objectives of the review were:

1. To categorize workplace interventions.

2. To assess the extent to which different kinds of workplace smoking programmes help smokers to reduce or stop cigarette consumption. We also wished to determine whether workplace smoking programmes reduce the exposure of non-smoking employees to environmental tobacco smoke. However, we did not review primary data for this outcome as this question has been addressed in a separate Cochrane review (Serra 2000).

3. To compare the effectiveness of different kinds of workplace smoking programmes in helping employees to stop or reduce smoking.

4. To collect and evaluate data on costs and cost effectiveness associated with workplace interventions.

CRITERIA FOR CONSIDERING STUDIES FOR THIS REVIEW

Types of studies

Because of the diversity of interventions, we applied different inclusion criteria for the different kinds of study. For interventions aimed at helping individuals to stop smoking, we included only

randomized controlled trials allocating individuals, workplaces or companies to intervention or control conditions. For studies of restrictions and bans, we also included controlled trials with baseline and post-intervention outcomes and interrupted times series studies.

Types of participants

Adults over 18 years of age, in employment, who smoked.

Types of intervention

Initial review of the data showed that there was great heterogeneity in the types of interventions conducted in the workplace. In synthesising data, we categorized these into two main groups:

1. Smoking cessation interventions aimed at individuals in the workforce
These studies aim to assess the effects of cessation programmes for individual workers who smoke. They test a range of interventions, including individual and group counselling, self-help materials, advice from a health professional and pharmacological therapy. They are usually aimed at individuals who seek help rather than at the workforce as a whole.

2. Interventions aimed at the workforce as a population
These studies assess the effects of programmes designed to reach the workforce as a population. Some studies assess the effect of restrictive smoking policies or bans, with or without clinical support for cessation attempts. Others assess the effect of social and environmental supports and incentives for not smoking. Some of these studies also evaluate the use of methods to promote participation, such as workplace competitions.

Some studies aimed at the workforce population assess a comprehensive approach to worker health, including smoking cessation as part of a larger strategy to create health-promoting workplaces. In these programmes efforts to reduce smoking are integrated with other health promotion and health protection initiatives, including efforts to reduce exposures to workplace hazards, modify job factors to support healthy outcomes, and promote health-enhancing behaviours. The approach typically targets multiple levels of influence, including the levels of the work environment, the workplace organisation, interpersonal supports, and the individual worker.

Types of outcome measures

The main outcome was employee smoking behaviour (cessation rates for programmes, workplace prevalence data), preferably sustained cessation for at least six months. Studies with less than six months follow-up were excluded. We also aimed to identify outcomes relevant to organizational productivity (rates of absenteeism).

SEARCH METHODS FOR IDENTIFICATION OF STUDIES

See: Cochrane Tobacco Addiction Group methods used in reviews.

The Cochrane Tobacco Addiction Review Group Specialized Register includes studies identified by systematic electronic searches of multiple databases, handsearching of specialist journals and conference proceedings, and grey literature (i.e. conference proceedings and unpublished reports not normally covered by most electronic indexing systems). In addition, a specific search of three electronic databases (MEDLINE, EMBASE and PsycINFO) was made using a search strategy developed for a review of non-smoking workplace health promotion strategies (Harden 1999). Databases were searched in October 2004.

Strategy for EMBASE

smok* or tobacco
('Health-Behavior') in DEM,DER
'Health-Promotion' in DEM,DER
'Health-Care-Psychology' or 'Health-Education'
'Prevention' or 'Health-Screening'
#2 or #3 or #4 or #5
explode 'occupational-health' / all subheadings
explode 'workplace-' / all subheadings
#7 or #8
#1 and #6 and #9

Strategy for MEDLINE

explode "Health-Behavior"/ all subheadings
explode "Health-Education"/ all subheadings
"Health-Promotion"/ all subheadings
explode "Primary-Prevention"/ all subheadings
#1 or #2 or #3 or #4
explode "Work"/ all subheadings
"Workplace"/ all subheadings
"Occupational-Health"/ all subheadings
#6 or #7 or #8
smok* or tobacco
#5 and #9 and #10

Strategy for PsycINFO

"Health-Behavior" in DE
explode "Health-Care-Psychology"
explode "Health-Education"
"Health-Promotion" in DE
explode "Prevention"
explode "Health-Screening"
#1 or #2 or #3 or #4 or #5 or #6
work* in DE
#7 and #8

smok* or tobacco
#10 and #9

The results of these searches were cross-checked against references in the identified papers and previous reviews and meta-analyses.

METHODS OF THE REVIEW

There were four stages in the review process:
Stage 1 One author pre-screened reports for relevance, i.e. studies that might be included, or useful background.
Stage 2 Two authors independently assessed the relevant studies for inclusion. Discrepancies were resolved by discussion. Reasons for the non-inclusion of studies were noted.
Stage 3 Data were extracted by one author and checked by a second author. Data on quit rates were abstracted using the number randomized as the denominator, making the assumption that those lost to follow-up (or not reported) continued to smoke.
This stage included an evaluation of quality, to assess whether the studies were randomized, whether the concealment of allocation in the randomization process was adequate, the adequacy of follow-up of participants, and whether outcome assessment was verified by biochemical measurement.
Stage 4 Because of the considerable heterogeneity in the type of interventions classified as workplace, we did not attempt meta-analysis, but synthesized the data through qualitative narrative review.

DESCRIPTION OF STUDIES

We found 61 studies meeting the inclusion criteria. Detailed information about each is shown in the table of included studies. The individual studies were assigned to one or more of the categories of intervention and these were considered together.

GROUP I: INTERVENTIONS AIMED AT THE INDIVIDUAL TO PROMOTE SMOKING CESSATION

A number of studies evaluated interventions aimed at the individual, usually without any attempt to target or modify the workplace as a whole. The types of intervention were diverse, including intensive behavioural interventions, self-help materials, advice from health professional and pharmacological treatments.

1. **Intensive behavioural interventions:** GROUPS:

We found ten randomized controlled trials that reported 6- to 24-month quit rates for individuals receiving behavioural interventions (DePaul 1987; DePaul 1989; DePaul 1994; Frank 1986; Glasgow 1984; Klesges 1987; Omenn 1988; Razavi 1999; Shimizu 1999; Sorensen 1993). A variety of approaches were tested so that few trials are directly comparable with one another. Some of these studies compared an intensive intervention, typically including group support meetings, with a less intensive intervention such as provision of self-help materials, or with a waiting list control. Some compared variations of group programmes, or the additional impact of incentives.

Three large randomized studies which evaluated workplace cessation support groups used as a supplement to a mass media programme and self-help materials were conducted by Jason and colleagues at De Paul University (DePaul 1987; DePaul 1989; DePaul 1994). DePaul 1987 randomized workplaces to self-help materials in conjunction with televised cessation programmes versus the same materials and programmes plus group or individual counselling at the workplace. In the second study (DePaul 1989), the basic design was enhanced with monthly booster sessions, and with successful quitters and up to five of their family and co-workers entered in a lottery at the end of the intervention period and at one year follow up. The third study (DePaul 1994) compared three interventions; self help alone, self help with incentive payments for days abstinent, and intensive group support with incentive payments, cognitive behavioural strategies and maintenance manuals.

Omenn 1988 recruited smokers at a single workplace. Participants with a preference for a group format were randomized to one of two smoking cessation programmes (Multiple Component Programme or Relapse Prevention Programme) or to a self help only condition (*American Cancer Society Quitter's Guide*). Those not interested in group support were randomized to a manual-based version of the same Multiple Component Programme or Relapse Prevention Programme, or the same Guide. The participation rate was 11%.

A Japanese study (Shimizu 1999) examined the effectiveness of a multi-component smoking cessation programme (intensive education, group lectures and individual counselling) compared to a waiting list control group of smokers. The participation rate was not reported.

Three studies evaluated ways to improve the results of group programmes:
Glasgow 1984 compared three versions of a controlled smoking programme in 36 employees: abrupt reduction, gradual reduction, or gradual reduction plus feedback on nicotine consumption with one pre- and two post-tests. Smoking reduction was defined as an outcome for this study, targeting nicotine content (brand smoked), number of cigarettes smoked daily, and percentage of each cigarette smoked. Participants could choose either cessation or reduction as their desired outcome. The participation rate was not reported, though an 8% attrition rate was reported.

Frank 1986 assigned 63 participants to one of three treatments: four hypnotic sessions with a booster, two hypnotic sessions, or two hypnotic and two behavioural sessions with a booster. A follow-up group of 15 later recruits received four hypnotic sessions and a booster session. The participation rate was not reported. The study lacked a no-treatment control group.

Klesges 1987 tested the effect of competitions on cessation rates in 136 smokers from eight workplaces. The workplace was the unit of randomization (cluster randomized) but with individuals as the unit of analysis. The participation rate was not reported but was estimated at 28% across all eight participating workplaces. The drop-out rate from treatment was 7% overall, with no difference across conditions.

Sorensen 1993 examined the effectiveness of a multi-component smoking cessation programme. The three-month intervention included consultation for employers on the adoption of a nonsmoking policy (90-minute consultation), training for nonsmokers (one-hour class) to provide assistance to smokers attempting to quit, and cessation classes for smokers (three one-hour behavioural cessation classes). Eight workplaces were randomized to two groups (intervention/no intervention) with one and two post-tests. Although the workplace was the unit of randomization, analyses were conducted using the individual as the unit of analysis. The participation rate was reported as 12% of smokers and 3.7% of nonsmokers. The attrition rate was not reported.

Razavi 1999 randomized 344 abstainers (98.6% of those eligible) who had completed a non-randomized cessation programme, to test the efficacy of two relapse prevention programmes. Participants were assigned to a psychologist-run support group (PG), or an ex-smoker-run support group (SG) or a no formal support group (NG), and were assessed at 12 months. Participants in the PG and SG groups attended monthly meetings, where cessation support was given, and weight, blood pressure, pulse and concomitant medical problems were monitored. At the end of nine months, participants completed a Brief Symptoms Inventory and a Life Events Scale. All participants at three months were followed up until 12 months post-treatment.

2. **Intensive behavioural interventions:** INDIVIDUAL COUNSELLING

We found seven studies that investigated individual counselling, in most cases given by a physician (Cambien 1981; Gomel 1993a; Kadowaki 2000; Kornitzer 1980; Lang 2000; Li 1984), and in Terazawa 2001 by trained nursing staff.

Two years post-intervention, Cambien 1981 followed up the first 1292 participants in a cluster-randomized controlled trial, the Paris Cardiovascular Risk Factor Prevention Trial, conducted in 160 sections of a civil service administration. They measured the effects of physician advice, information leaflets and physical monitoring on diet, alcohol and cigarette consumption in young men (25 to 35 years of age). The intervention participants received either three or four tailored counselling sessions, depending on whether their baseline assessment showed them to be at low or at high risk of coronary disease. The control group received only baseline and follow-up assessments.

Li 1984 studied asbestos-exposed smoking men undergoing screening in a mandated programme for naval shipyard workers. The workers were categorized as having normal or abnormal pulmonary status on the basis of a chest X-ray and pulmonary function tests. They were then randomly assigned within pulmonary function test categories to receive either a simple warning or three to five minutes of behavioural cessation counselling from the physician who gave them the results of their pulmonary tests. The participation rate is reported as 84.6%. The study did not have a no-treatment control group.

Lang 2000 compared the effects of a workplace intervention by the occupational physician, offering simple advice on smoking cessation for five to ten minutes, with a more active strategy of advice including a quit date and extra support. For both strategies, the medical team was composed of a physician and whenever possible a nurse, who would reinforce the physician's advice. Both the randomization and the analysis were by workplace.

Kadowaki 2000 evaluated the effectiveness of a smoking cessation intervention in all male smokers in a radiator manufacturing factory (in Japan). Participants in the intervention group received individual counselling by a doctor, and those who signed a Smoking Cessation Declaration underwent a five-month intervention. Subjects in the control group received equivalent delayed intervention after four months. Randomization was by individual smoker.

Gomel 1993a randomized 28 Sydney (Australia) ambulance stations to four intervention groups (without a no-treatment control), in an attempt to reduce cardiovascular risk factors. The HRA (Health Risk Assessment) group received measurements and risk assessments, including body mass index, blood pressure, cholesterol, smoking status, percentage of body fat and aerobic capacity. Those assessed as being at high risk were referred to their own family physician, but received no direct support from the intervention programme. The RFE (Risk Factor Education) group received a similar assessment, but were given standard advice, through written and video material. The BC (Behavioural Counselling) group, after the standard assessment, were offered up to six counselling sessions in risk reduction, together with a manual on behaviour change. The fourth group (BCI, Behavioural Counselling and Incentives) received the same programme as the BC group, together with an incentive scheme which gave individuals the chance to win A$40 for achieving risk reduction targets at three and six months, plus a prize of $A1000 for the station which achieved the highest percentage of successful participants at six-month follow up. The participation rate was 88% (431 participants, including 128 smokers).

In the Belgian Heart Disease Prevention Project, Kornitzer 1980 cluster randomized 30 paired Belgian factories to intervention or control conditions, with all male workers aged 40 to 59 eligible to take part. All intervention participants were screened for cardiovascular risk factors (blood pressure, serum cholesterol, weight, smoking and physical activity), and were given written advice to reduce their risks. The screening results were also passed on to participants' family and workplace doctors. The two deciles with

the highest risk score were ranked as the high risk group, and additionally received six-monthly physician advice and testing. At the environmental level, anti-smoking posters were regularly displayed, and each intervention factory held a conference on the dangers of tobacco use. A five per cent sample of the intervention group were re-assessed annually. In the 15 control factories a random 10% sample were fully assessed at baseline, and then followed throughout the trial. Within that group a 20% high risk group was identified and compared throughout with their intervention counterparts. The participation rate was 83.7% (n = 16,230).

Terazawa 2001 randomized 228 smokers presenting for routine occupational health checks in a Japanese factory; 117 were allocated to the intervention condition, and 111 to the control. All participants completed a baseline questionnaire and had carbon monoxide (CO) and urinary metabolites measured to verify their level of smoking. Intervention group smokers also received a 15 to 20 minute counselling session from a nurse trained in cessation methods, and those who were prepared to set a quit date received four follow-up phone calls to support their quit attempt.. Control subjects received the baseline screening and usual care. All participants were re-assessed at six and twelve months follow up.

3. **Self-help interventions**

We found nine studies that examined self-help interventions (Burling 1989; Burling 2000; Campbell 2002; Jeffery 1988; Omenn 1988; Sutton 1988a; Sutton 1988b; Sutton 1988c; Sutton 1988d). A variety of approaches were tested and included a computerized nicotine fading intervention (Burling 1989), computer-tailored advice magazines (Campbell 2002), short videos (Sutton 1988a; Sutton 1988b; Sutton 1988c; Sutton 1988d), self-help manuals (Jeffery 1988) and multiple component or relapse prevention written materials (Omenn 1988).

Burling 1989 provided an individualized nicotine fading schedule based on data which participants entered daily into a computer, as an addition to pamphlets, a help line and a draw. The participation rate was not reported. The study lacked a no treatment control group, and no attrition rate was reported. Burling 2000 also evaluated an internet-based interactive programme to aid preparation, quitting and relapse prevention.

The Health Works for Women trial (Campbell 2002) developed a two-pronged approach to helping rural blue-collar women workers to improve their diet and physical activity levels, amd to stop smoking. The programme was a combination of tailored 'magazines' at baseline and at six months, personalized for the characteristics and preferences of each participant, and social support at work from volunteer 'natural helpers'. The smoking intervention was incompletely delivered, however, as no lay helpers were willing to be trained to deliver the personal support. The control group received a minimal intervention (one personalized magazine) at six months, with no offer of social support. Randomization was by worksite. The participation rate was 73% at baseline.

Sutton (Sutton 1988a; Sutton 1988b; Sutton 1988c; Sutton 1988d), in a series of four randomized controlled studies in four UK companies, evaluated a minimal smoking intervention programme based on the use of motivational videotapes. In the videotape studies groups of smokers (n = 603) were randomly assigned to watch one of several different videotapes. They were followed up along with non-participants (n = 1015) at three months and again at one year.

Jeffery 1988 evaluated the impact of reduction versus smoking cessation goals in a smoking cessation programme in 59 volunteer smokers that included financial contracts, organized through payroll deduction, and twice-weekly group treatment sessions. Participants were provided with the Quit and Win self-instructional materials, developed by the Minnesota Heart Health Program. The participation rate was 2%.

Omenn 1988 offered multi-component cessation and relapse prevention programmes as both group and self-help interventions, and is detailed in the group behaviour section above.

4. **Pharmacological therapy**

Five studies investigated pharmacological therapy in the workplace (Kornitzer 1987; Kornitzer 1995; Rodriguez 2003; Sutton 1987; Sutton 1988e).
Sutton 1987 evaluated the effectiveness of a brief treatment for smoking using nicotine chewing gum in a large retailing company in London, UK. The study was randomized with a two-group pretest/post-test design. In total 270 of 334 cigarette smokers who expressed interest were invited to take part in the programme, which consisted of two individual consultations two weeks apart and a prescription for 2 mg Nicorette gum with recommendations for its use. The remaining 64 smokers constituted a no-intervention control group.

Sutton 1988e evaluated the effect of offering brief individual treatment based on nicotine chewing gum to a randomly chosen sample in one company (n = 161) still smoking at the three-month follow up to a previous video intervention (Sutton 1988d). The treatment course was administered by occupational health nurses and consisted of four short consultations over a 12-week period.

In a randomized study conducted by Kornitzer (Kornitzer 1987) a 2 mg dose of nicotine gum was compared with a 4 mg dose in smokers of at least 15 cigarettes a day. Packs of nicotine gum were free on demand, after a 15-minute counselling session. Intervention during the one-year follow-up period was minimal. Kornitzer 1995 evaluated the effects of adding nicotine gum to smokers already using the nicotine patch in a double-blind placebo-controlled randomized trial. The effect of the nicotine patch against placebo patch in both groups receiving placebo nicotine gum was also assessed.

Rodriguez 2003 delivered a combined intervention of individual structured counselling with nicotine patches in an open (non-

blinded) randomized controlled trial conducted in three Spanish worksites. Intervention participants (115 people) were graded by Fagerstrom score and treated with appropriate levels of nicotine replacement therapy for up to 12 weeks. Progress, withdrawal symptoms and adverse events were monitored over the 12-month trial period. Control group smokers (103 people) received brief, sporadic and unstructured advice, usually at their annual occupational health check.

GROUP II: INTERVENTIONS AIMED AT THE WORKPLACE AS A WHOLE

1. **Workplace tobacco control policies and bans**

We identified fourteen studies, of which two had a quasi-experimental design, which used as a control a matched workplace without a policy (Biener 1989; Stave 1991) and twelve with a one or two post-test cross-sectional uncontrolled design (Andrews 1983; Becker 1989; Borland 1990; Borland 1991a; Gottlieb 1990b; Hudzinski 1990; Jeffery 1993; Mayo 1990; Millar 1988; Mullooly 1990; Stillman 1990; Tsushima 1991).

Five studies evaluated the impact of a smoking ban with availability of smoking cessation programmes, in the Australian Public Service (Borland 1990), Texas Department of Human Services (Gottlieb 1990b), Johns Hopkins Medical Institutions (Stillman 1990), Johns Hopkins Children's Center (Becker 1989) and the Ochsner Medical Institution in Louisiana (Hudzinski 1990). Another study (Andrews 1983) evaluated the impact of a restrictive smoking policy with the addition of smoking cessation classes and individual classes for employees and patients of New England Deaconess Hospital.

Stave 1991 evaluated the impact of a smoking ban with health education programmes in 800 (400 per site) employees of Duke University Medical Centre (intervention) and the University Campus (comparison).

Biener 1989 studied the effect of a restrictive smoking policy; with self-help smoking cessation programmes offered to 165 employees at both policy and comparison hospitals in Rhode Island.

Jeffery 1993 compared smoking prevalence and consumption in 32 workplaces in the Minneapolis-St. Paul area with and without smoking restrictions. These workplaces were participating in a randomized trial of smoking cessation with weight control intervention.

Mayo 1990 measured prevalence and daily cigarette consumption before and after the implementation of a smoking ban in a psychiatric hospital in Colorado.

A Canadian study (Millar 1988) evaluated a restrictive policy among health and welfare workers, who were also offered self-help smoking cessation courses. Two hundred of the course participants were monitored for the first year of the policy implementation.

Mullooly 1990 also measured pre- and post-ban prevalence and cigarette consumption across 11 workplaces of the Kaiser Permanente Medical Program, with the individual as the unit of analysis. This study also assessed the number of quit attempts, and the perception of being bothered by other people's smoke.

Tsushima 1991 used pre- and post-ban surveys to evaluate the success of a total smoking ban among employees in a Hawaiian hospital, by measuring prevalence, daily cigarette consumption, cigarette consumption in working hours, and intention to quit. None of these three cross-sectional observational studies involved any formal cessation programme.

Hocking (Borland 1991a) evaluated the impact of a smoking ban that allowed staff time off work to attend an approved smoking cessation programme and publicity on quitting in approximately 1000 employees of Telecom Australia.

2. **Social support for not smoking**

Two studies evaluated social support as an increment to other cessation strategies (Glasgow 1986; Malott 1984). Social support, in this context, refers to the support of a 'significant other', for example a spouse, a workmate or a close friend.
Glasgow 1986 recruited 29 smokers who were assigned to small groups and were then randomly allocated to a basic programme or basic programme plus social support. The participation rate was not reported. Malott 1984 randomly assigned 24 smokers to controlled smoking or a controlled smoking plus partner support intervention. Both studies defined smoking reduction as one of their outcomes, targeting nicotine content (brand smoked), number of cigarettes smoked daily, and percentage of each cigarette smoked. Participants could choose either cessation or reduction as their desired outcome. The participation rate was not reported.

3. **Environmental support for not smoking**

We found four studies that reported environmental or institutional support programmes (Dawley 1991; Erfurt 1991; Hymowitz 1991; Windsor 1989)
Hymowitz 1991 evaluated the effect of an enriched environment on the impact of a group quit smoking programme in six workplaces. Two hundred and fifty-two smokers participated in the group quit smoking programmes; 131 at the full programme sites (group plus physician counselling plus workplace health promotion) and 121 at the group-only sites (group cessation programme). The participation rate was not reported.

Dawley 1991 evaluated a small study of workplace smoking control in two comparable oil refineries with 30 smokers. One company was randomly assigned to an environmental programme of smoking control, discouragement, and cessation (14 smokers) while the other company received only a smoking cessation programme (16 smokers). Humorous anti-smoking posters emphasizing the benefits of quitting smoking were distributed throughout the intervention workplace and were changed every two weeks.

Three weeks after the initiation of the smoking discouragement programme at one refinery, a group smoking cessation programme was begun at both plants. The participation rate was not reported.

Erfurt 1991 compared the effects of four interventions: (1) wellness screening, (2) wellness screening plus health education, (3) 1 and 2, plus follow-up counselling, and (4) 1, 2 and 3 plus peer support groups, buddy systems, health promotion classes, and plant-wide activities.

Windsor 1989 investigated the effect of a multi-component health education and skill intervention, compared with the incremental effect of a monetary incentive to the employees for achieving abstinence in a randomized trial. All employees received, in addition, a standardized self-help smoking cessation manual and maintenance manual. The participation rate was 19.7%. The study lacked a no-treatment control group and 9.8% of participants did not complete the programme but were included as smokers in the final analysis.

4. **Incentives**

We found five studies of incentives with comparison groups and quit rates. One additional study (Jeffery 1988) used financial incentives as an aid to cessation or reduction, but this was offered to all participants, irrespective of the group to which they were randomized.

Glasgow 1993 evaluated the impact of a year-long incentive-based workplace cessation programme (the HIP program). Nineteen workplaces were randomized to incentive or no incentive conditions. Smokers were paid US$10 each time they were confirmed abstinent by CO validation at monthly meetings over the year-long programme. In addition, each month at each workplace abstinent smokers were also eligible to win a lottery prize (which ranged from US$5 to US$20) and grand prize lotteries during the final month of the programme. All identified smokers in the workplace were considered as participants for the study, whether or not they participated in the intervention. Analyses were conducted at both the workplace and individual level and using both self-reported and biochemically validated cessation as endpoints. There was a participation rate of 23% in the incentive group.

Rand 1989 examined the relative contribution of a contingent payment (up to US$200) and workplace CO monitoring to the long-term maintenance of smoking abstinence. Forty-seven hospital employees who had abstained from smoking for five days were randomly assigned to one of three follow-up groups: contingent payment and frequent monitoring (n = 17), non-contingent payment with frequent monitoring (n = 16), or contingent payment with infrequent monitoring (n = 14).

Windsor 1989 studied the incremental effectiveness of a skill training with social support enhancement and monetary incentives to a self-help manual. The participants were randomized to four groups in a two by two factorial pre-test/post-test design. The monetary incentive was a US$25 payment to the employee after six weeks of abstinence. An additional US$25 incentive was awarded at the end of six months abstinence.

The SUCCESS Project (Hennrikus 2002) compared three programme options (telephone counselling, group sessions, or a choice of either), each offered with and without incentives for recruitment and cessation. Four workplaces were assigned to each of the six options, and were surveyed at baseline, and again at 12 and 24 months. Incentive site smokers were paid for signing up to a programme (US$10), for completing it (US$20) and for 30 days abstinence (US$20). Successful quitters were entered into a prize draw, to win up to US$500. A sample of quitters at 24 months were also paid US$25 if they supplied saliva for cotinine measurement.

Gomel 1993a, in a cluster-randomized study of 28 Australian ambulance stations, included an incentives component in its four-way comparison study to reduce cardiovascular risk factors. This trial is described above, under the individual counselling section.

5. **Comprehensive workplace programmes**

Eight trials evaluated comprehensive workplace programmes.

The 'Take Heart' study (Glasgow 1995) evaluated the short-term effects of a low-intensity heart disease risk reduction programme. Twenty-six workplaces with between 125 and 750 employees were randomly assigned to early or delayed intervention. Early intervention consisted of an 18-month multi-faceted programme that featured an employee steering committee and a menu approach to intervention activities tailored to each site.

The Working Well Trial (Sorensen 1996) used a randomized matched pair design, with the workplace as the unit of assignment and analysis in 108 workplaces, with an average of 316 workers per site. The intervention targeted individuals and the workplace environment, and included dietary habits (all four study centres) as well as smoking (three of the four centres). Each centre also addressed one additional risk factor; these included occupational exposure to carcinogens, exercise, cancer screening and smokeless tobacco.

Nested within the Working Well Trial, and based at the Massachusets study centre, was the WellWorks Study (Sorensen 1998), a randomized matched pair trial in 24 workplaces. The two-year intervention, aimed at changing dietary and smoking habits, integrated health promotion and health protection through joint worker-management participation in programme planning and implementation, consultation on workplace changes, and educational programmes targeting health behaviour change, including smoking cessation. This study particularly addressed differences in behaviour change between white-collar and blue-collar workers.

Based on the WellWorks Study, WellWorks-2 (Sorensen 2002) was a block-randomized controlled trial of 15 workplaces, all handling hazardous chemicals. The intervention and aims of the study

were very similar to the original WellWorks Project, being primarily health promotion and protection, but follow up was only to six months. Like its parent project, WellWorks-2 targeted differences between white- and blue-collar workers, and concentrated on smoking and nutrition; an additional outcome of interest in this study was changes in perceived hazard exposure.

Another study within the Working Well Trial was the Working Healthy Project (Emmons 1999). The Brown University study centre developed an extended programme within its 26 worksites (reduced eventually to 22), similar in aims and scope to the parent trial but including physical activity as a target objective, and following a cohort rather than assessment by cross-sectional surveys. The control sites received a minimal self-help programme of two smoking cessation courses and one each of nutrition and exercise, for those sites that wished to implement them.

A Dutch study (Willemsen 1998) compared a comprehensive intervention of self-help manuals, group courses, a mass media campaign, and smoking policies with a minimal intervention of self-help manuals only. Eight workplaces (four matched pairs) participated in the study. The 'bogus pipeline' procedure was used to improve the validity of self reports of smoking status. This means that subjects are informed that their self reports can be biochemically verified, although the test is not necessarily performed. Respondents who claimed they were nonsmokers at the 14-month follow up were asked to co-operate with biochemical validation of their smoking status.

A Swedish study (Nilsson 2001) reported the effects of a long-term comprehensive programme of lifestyle interventions, including smoking cessation, to reduce risk factors for cardiovascular disease. This randomized controlled trial for at-risk public sector employees also targeted body mass index, diastolic blood pressure, heart rate, low-density lipoprotein and cholesterol. The intervention group received individual counselling as well as 16 annual group sessions, using lectures, discussions, videos and outdoor activities; the control group received standard oral and written advice about cardiovascular risk reduction at the beginning of the trial, and nothing subsequently. Smoking point prevalence was assessed at 12 and at 18 months follow up.

The HealthWise Stepped Intervention Study (Shi 1992) allocated nine North Californian worksites belonging to Pacific Gas & Electric to four intervention levels. The seven sites allocated to levels 1 to 3 were randomly assigned, while the two smallest sites were allocated to Intervention level 4, in order to minimize the running costs of the trial. The trial lacked a no-treatment control site. The interventions ranged incrementally from Health Risk Assessments (HRAs) at the start and finish of the trial with a bimonthly health newsletter at Level 1, through the addition of a Health Resource Centre and self-care books at Level 2 sites, behavioural workshops and a social support team at Level 3, to an environmental smoking policy and a case management programme for the high risk group (the 15% with the highest overall risk score) at Level 4. Outcomes were measured by cross-sectional HRAs at baseline and at two-year follow up. The participation rate was 69% at baseline and 48% at follow up.

METHODOLOGICAL QUALITY

The studies covered by this review are diverse, both in design and objectives. In order to take a wide-ranging view of workplace interventions, we have applied different inclusion criteria according to the type of intervention studied. For interventions aimed at helping individuals to stop smoking, we included only randomized controlled trials. For studies of interventions aimed at the workplace as a whole, there were few randomized studies and we widened the inclusion criteria in order to include longitudinal uncontrolled studies with pre- and post-restriction measurements. These studies cannot control for other influences which may affect the smokers' wider environment over the same period, for example a change in cigarette price, or a media campaign. The conclusions from these studies therefore must be more tentative.

Some randomized studies aimed to intervene with the workplace as a whole. They use a cluster-randomized design, allocating entire workplaces to conditions. Such studies should be analyzed at the level of the cluster rather than the individual. When workplaces are the unit of allocation, but results are presented for individual quitters the assumption that outcomes are independent is violated, since people in the same site may be more like one another than expected by chance. If the analysis ignores the clustering, the confidence intervals are likely to be too narrow (Bland 1997). The effect is greater if there are a small number of large clusters. Cluster-randomized studies with individual outcomes also present problems related to the choice of an appropriate denominator. The number of smokers who attend group meetings or use self-help materials is considerably smaller than the total number of smokers in a workplace. In cluster-randomized studies the denominator chosen for the analysis may be all smokers, smokers who express interest in treatment, or those who attend sessions. If the intervention involves individual cessation treatment, then trials focus on the outcome in the group of attenders. If the intervention includes other changes to the workplace environment, for example the introduction of restrictions on smoking, it is reasonable to assess the impact on the smoking workforce as a whole.

Six of the included studies (10%) reported randomization procedures in sufficient detail to be rated A for their attempts to control selection bias. The majority of included studies (61%) either did not describe how randomization was performed or reported in insufficient detail to determine whether a satisfactory attempt to control selection bias had been made (rated B). Eighteen studies either failed to randomize appropriately or did not use a randomized trial design at all (rated C, inadequate or not applicable). In one study (Kornitzer 1987) blinding was broken at three months and subjects were free to choose the level of treatment they pre-

ferred; in another two studies (Sutton 1987; Sutton 1988e) a few control group subjects were allowed to move into the intervention group; one study (Li 1984) modified its randomization procedure partway through the study, and Shi 1992 allocated the two smallest of nine worksites to the most expensive intervention in order to keep trial costs down .

Two Japanese studies (Shimizu 1999; Terazawa 2001) are included on the basis of data derived from the abstracts alone.

The 'gold standard' outcome for smoking cessation studies is biochemical validation of self-reported cessation (i.e. testing of saliva, blood, urine or exhaled breath for evidence of recent smoking). This generally results in lower rates of cessation, due not only to people misreporting their smoking, but also to relapsing, or refusing to provide samples for other reasons. Using validation may not change the relative effect of the intervention, since similar levels of misreporting are likely to be seen in the control condition as well, unless no intervention at all is provided to the control. Of the 61 studies in which intervention was provided to individuals, 39 (64%) used some form or combination of biochemical verification procedures for at least one follow-up point. These included butt counts, environmental nicotine vapour monitoring, respirable particulate levels, carbon monoxide ((CO) in 46% of the included studies), salivary thiocyanate and urinary, blood or salivary cotinine.

Participation rate

In assessing the potential impact of workplace interventions it is important to know the proportion of smokers who can be recruited to different types of intervention, whilst recognizing that some barriers to recruitment to trials may not be relevant to real settings. In some of the studies included here the use of a workplace population would appear to have been largely a matter of convenience for ease of recruitment. These studies have typically not reported on the proportion of the smoking workforce who participated. Where studies have calculated the participation rate we have recorded this in the 'Characteristics of Included Studies' Table. The participation rates in the studies included here ranged from 11% to 88%.

GROUP I: INTERVENTIONS AIMED AT THE INDIVIDUAL TO PROMOTE SMOKING CESSATION

1. **Intensive behavioural interventions: GROUPS**

Only two of this group of trials described the method of randomization in sufficient detail to exclude the possibility of allocation bias. In one study (Omenn 1988) allocation was based on randomized assignment lists, while the other (Razavi 1999) used random numbers concealed by a label. Five studies (DePaul 1987; DePaul 1989; DePaul 1994; Klesges 1987; Sorensen 1993) used cluster randomization. All of the trials used biochemical validation of self-reported smoking status. Four studies (DePaul 1987; DePaul 1989; DePaul 1994; Omenn 1988) used saliva cotinine and one study (Sorensen 1993) collected saliva cotinine for 52% of their sample but these were not used. One study (Frank 1986) used saliva thiocyanate and one (Klesges 1987) used both saliva thiocyanate and expired air carbon monoxide. Two studies (Glasgow 1984; Shimizu 1999) used expired air CO alone, and one study (Razavi 1999) used a combination of expired CO and urinary cotinine, but also reported unvalidated rates for comparison.

2. **Intensive behavioural interventions**: Individual counselling

None of the seven studies in this group (Cambien 1981; Gomel 1993a; Kadowaki 2000; Kornitzer 1980; Lang 2000; Li 1984; Terazawa 2001) described the method of randomization. Four trials (Cambien 1981; Gomel 1993a; Kornitzer 1980; Lang 2000) used cluster randomization. Five used CO assessment for validation of self-reported cessation, but Lang 2000 only used partial validation, as several workplace physicians had no access to a carbon monoxide monitor. Gomel 1993a used serum cotinine to validate smoking status at all assessment points. Kornitzer 1980 relied upon self-report, without any biochemical validation.

3. **Self-help interventions**

Among this group of studies (Burling 1989; Burling 2000; Campbell 2002; Jeffery 1988; Omenn 1988; Sutton 1988a; Sutton 1988b; Sutton 1988c; Sutton 1988d) only one (Omenn 1988) described the method of randomization. All except Campbell 2002 validated their cessation rates, with seven studies (Burling 1989; Burling 2000; Jeffery 1988; Sutton 1988a; Sutton 1988b; Sutton 1988c; Sutton 1988d) using expired air CO, and the remaining study (Omenn 1988) using saliva thiocyanate.

4. **Pharmacological therapy**

Two studies adequately described either a placebo-controlled double-blind trial (Kornitzer 1995) or an open randomized controlled trial (Rodriguez 2003) and gave details of randomization. All five studies validated self reports of cessation. Four (Kornitzer 1995; Rodriguez 2003; Sutton 1987; Sutton 1988e) used expired air CO to verify smoking status, and the remaining study (Kornitzer 1987) verified with serum cotinine and carboxyhaemoglobin analysis in a random sample of 69% of the participants.

GROUP II: INTERVENTIONS AIMED AT THE WORKPLACE AS A WHOLE

1. **Workplace tobacco control policies and bans**

The studies included two quasi-experimental designs (Biener 1989; Stave 1991) which employed a matched workplace without a policy, and twelve studies (Andrews 1983; Becker 1989; Borland 1990; Borland 1991a; Gottlieb 1990b; Hudzinski 1990; Jeffery 1993; Mayo 1990; Millar 1988; Mullooly 1990; Stillman 1990; Tsushima 1991) with a one or two post-test cross-sectional uncontrolled design

Most of the included studies were of weak experimental design. The lack of a control group in the before and after studies makes

it difficult to distinguish the effects of the intervention from other factors that may have led to change.

Biochemical validation of quit rates was used in only two studies (Jeffery 1993; Stave 1991). Two studies reported environmental nicotine vapour levels (Becker 1989; Stillman 1990) and one study (Millar 1988) measured levels of respirable suspended particulates. Four studies (Biener 1989; Gottlieb 1990b; Millar 1988; Mullooly 1990) reported perceptions of decreased exposure to smoke or improved air quality

2. **Social support for not smoking**

Neither study (Glasgow 1986; Malott 1984) gave randomization details or participation rates. Self-reported cessation was validated in both studies using expired air CO and quantity of cigarette butts. The Glasgow study also monitored saliva cotinine.

3. **Environmental support for not smoking**

Three of the four studies in this group employed a clustered design. Two of them (Dawley 1991; Hymowitz 1991) analyzed by individual, while the third (Erfurt 1991) used the workplace as the unit of analysis The fourth study (Windsor 1989) was a randomized controlled trial within a single workplace. There was no biochemical validation of self-reported cessation in Erfurt 1991. Windsor 1989 reported validation by saliva thiocyanate, Dawley 1991 by urinary cotinine and Hymowitz 1991 by expired air CO.

4. **Incentives**

Details of Gomel 1993a are reported under the individual counselling heading.
Glasgow 1993 was described as cluster-randomized with both the workplace and the individual used as the units of analysis. Windsor 1989 described randomization using a computer-generated assignment system in numbered envelopes. Rand 1989 gave no details of randomization. The SUCCESS Project (Hennrikus 2002) was described as a 3x2 factorial study, with workplaces randomly assigned to the six treatment options, but stratified by gender and education level. No details of randomization were offered. All four studies reported biochemical validation, using saliva thiocyanate (Hennrikus 2002; Windsor 1989), carbon monoxide (Rand 1989) and carbon monoxide plus cotinine (Glasgow 1993).

5. **Comprehensive approach**

There were no details of randomization given. Six studies (Emmons 1999; Glasgow 1995; Sorensen 1996; Sorensen 1998; Sorensen 2002; Willemsen 1998) employed a cluster-randomized design, while the Swedish study (Nilsson 2001) aggregated its participants from four public sector workplaces within the same district. Shi 1992 combined pre-specified and randomized allocation of worksites to interventions in order to minimize the costs of the trial. Non-validated self-reported smoking cessation was recorded in seven studies (Emmons 1999; Glasgow 1995; Nilsson 2001; Shi 1992; Sorensen 1996; Sorensen 1998; Sorensen 2002) and saliva cotinine validation in the remaining study (Willemsen 1998).

RESULTS

Because of the heterogeneity of the design of the included studies, we did not perform meta-analyses in this review, but we have included graphical representations (Forest plots) of some of the study outcomes, grouped by type of intervention. Where there was more than one intervention arm, we have compared the control group (minimal or no intervention) with the next simplest treatment. This is an adjustment to our approach in the first version of this review. Although it may occasionally understimate the trial's true efficacy over multiple interventions, we avoid the risks of overstating the effect of the treatment or of tipping a result into significance by forcing a binary comparison that does not reflect the true findings of the trial. Studies treated selectively in this way include DePaul 1994, Erfurt 1991, Glasgow 1984, Kornitzer 1995, Omenn 1988, Rand 1989, Razavi 1999, Sutton 1988a, Sutton 1988b, Sutton 1988c, Sutton 1988d, and Windsor 1989. We have not presented the bans and restrictions studies graphically, as they usually do not include a control group, nor the comprehensive programme studies, as there were insufficient extractable data. Plottable data were also not available for Campbell 2002, Frank 1986, Hennrikus 2002, Kornitzer 1980 or Sorensen 1993.

We have also produced a results table, which gives details of types of participants, follow up, smoking outcomes and validation of cessation.

GROUP I: INTERVENTIONS AIMED AT THE INDIVIDUAL TO PROMOTE SMOKING CESSATION

1. **Intensive behavioural intervention**: GROUPS

Of the ten studies comparing a group format programme to self help or mass media alone, two of the three De Paul studies (DePaul 1989; DePaul 1994) showed a benefit of the additional support groups. At 12 months, point prevalence for the Group participants (DePaul 1989) was 26%, compared with 16% for Non-Group participants ($P < 0.06$), with sustained abstinence rates of 11% and 3% respectively ($P < 0.05$). In DePaul 1994 at 12 months, the Self Help participants achieved a sustained abstinence rate of 5.1%, the Incentives participants 11%, and the Group participants 31.2% ($P < 0.01$). Omenn 1988 and DePaul 1987 showed non-significant trends towards higher quit rates for groups than for self-help controls. The three Group arms of the Omenn study achieved 12-month validated quit rates of 16%, 18% and 8% (NS), while the self-help arms achieved 9%, 11% and 6% respectively (NS). The initial De Paul study (DePaul 1987) achieved 12-month sustained cessation rates of 6% for the Group participants versus 2% for the self-help participants (NS), with both arms achieving 19% point prevalence rate. A small study (Shimizu 1999) of a multi-component programme including group and individual counselling did not detect a statistically significant difference, with quit rates of 19% in the intervention group and 7% in the control group.

One study (Klesges 1987) testing both a relapse prevention component and a competition in a factorial design failed to detect evi-

dence for a long-term benefit of either. At the immediate post-test, the competition intervention resulted in higher quit rates (39% versus 16%, P < 0.004) but these differences were minimal at six months (12% versus 11%, NS). The six-month differences for relapse prevention were in the expected direction but not statistically significant (15% versus 8%), although the competition appeared to increase short-term quit rates.

Glasgow 1984 showed that at six months one-third of participants in the gradual condition were abstinent compared to no participants in the abrupt condition. However, in this small sample the result was not statistically significant. This study also targeted smoking reduction as a valid outcome, and 47% of participants stated that they wished to reduce their consumption. Reducers were found to have been successful for each of the target behaviours as they addressed them, without compensatory increases in the other two behaviours. Achieved reductions were statistically significant (P values from 0.001 to < 0.02). Mean reduction in nicotine content was 50%, in percentage of each cigarette smoked 34% and in number of cigarettes smoked 28%. Carbon monoxide (CO) levels were 28% lower on average, suggesting that participants were not compensating for the behavioural changes. All but one subject improved on at least two measures, and 46% on all four variables. At six-month follow up, reducers maintained all the changes except for percentage of the cigarette smoked, with both abrupt and gradual plus feedback subjects relapsing on this measure (P < 0.05).

Frank 1986, testing combinations of behavioural support and hypnotic sessions, showed no long-term differences between any treatment variants.

Sorensen 1993 demonstrated that at six-month follow up, 12% of smokers in the intervention group reported quitting, compared to 9% in the control group (P < 0.05), with cessation predicted by co-worker requests not to smoke.

A Belgian relapse prevention study (Razavi 1999) found differences between psychologist-supported quitters (43.7% still abstinent at 12 months), ex-smoker-supported quitters (37.5%) and no formal support quitters (35.5%), but these did not reach statistical significance

2. **Intensive behavioural interventions**: INDIVIDUAL COUNSELLING

Cambien 1981 found that at two-year follow up 21.4% (65/304) of smokers in the intervention group had quit, compared with 13.4% (41/306) in the control group. Although the descriptive Forest plot suggests that this result was statistically significant, the authors report that it was not. The result does not take account of the 195 participants lost to follow up, and the authors observe that those lost to follow up from the intervention group were significantly heavier smokers than the follow up attenders (P < 0.01) or the control participants.

Li 1984 found that at 11 months smokers given behavioural counselling from a physician were more likely to remain abstinent (8.4%) than those with a minimal warning (3.6%, P < 0.05). Prolonged abstinence rates did not differ between participants with abnormal lung function tests (3.7%) and normal lung function tests (5.9%).

Lang 2000 found point prevalence quit rates of 18.4% in the intensive group compared to 13.5% in the minimal intervention group at one year (P = 0.03). Self-reported sustained cessation of six months and more was reported in 6.1% of the intervention group compared with 4.6% of the comparison group (P = 0.26).

Kadowaki 2000 found cessation rates of 12.9% and 3.1% in the intervention and control groups respectively (P = 0.003). Among those who succeeded in quitting 48.6% maintained cessation at 18-month follow up. Overall the cessation rate was 8.4% after 22 months and the prevalence of male smokers had decreased from 62.9 to 56.7% (P = 0.038).

Gomel 1993a did not find significant differences in continuous abstinence rates between any of the four groups (HRA, RFE, BC and BCI) at six or twelve months. However, when the authors pooled the HRA group with RFE (n = 68 smokers) and BC group with BCI (n = 60 smokers) to test the efficacy of the counselling component, they detected statistically significant differences in abstinence rates. At six months, the combined HRA/RFE group had a continuous abstinence rate of 1%, compared with 10% for the BC/BCI pooled group (Fisher's Exact Test P = 0.05); 12-month rates were 0% and 7% respectively (P = 0.05). Incentives appeared to have no effect, or possibly a negative impact, with 3/30 smokers continuously abstinent at 12 months in the BC (counselling only) group compared with 1/30 in the BCI (counselling plus incentives) group, but this difference did not achieve statistical signifcance. The authors report that contamination between the intervention groups and low participation rates among the RFE stations meant that the effect size of the whole trial may have been compromized.

Kornitzer 1980 detected a decline in smoking prevalence of 18.7% in the high risk intervention group at two years follow up, compared with a 12.2% drop in the high risk control group (P < 0.05). A five per cent sample of all the intervention participants demonstrated a prevalence decline of 12.5% over two years, which was very close to the 10% sample control group's decline of 12.6% (NS). The authors speculate that the lack of face-to-face counselling (available only to the high risk intervention group) may have been a significant factor in the failure of the anti-smoking campaign. Stepwise multiple discriminant function analysis among the high risk groups identified fewer cigarettes smoked at baseline, more previous quit attempts and the residential area of the country as significant predictors of quitting among the intervention group, and higher education and more previous quit attempts among the controls. The significant differences between intervention and control high risk groups gradually disappeared over the subsequnet four years of the study, due to a combination

of less intensive intervention activity and a spontaneous rise in the control group's quit rate in line with secular trends.

Terazawa 2001 detected a point prevalence cessation rate of 11.1% (13/117) at 12 months in the intervention group, compared with 1.8% (2/111) in the control group. Twelve-month continuous abstinence rates were 6.8% (8/117) and 0.9% (1/111) respectively (Fisher's Exact 2-tailed Test P = 0.04 [our calculation]). Only 25 of the 117 counselled smokers in the intervention group agreed to make a quit attempt and would therefore have received the four follow-up phone calls

3. **Self-help programmes**

Computerized interventions

In Burling 1989 the individualized nicotine fading computer group had a six-month quit rate twice that of the contest group (21.4% versus 11.5%), but this result was not statistically significant. A small pilot study (Burling 2000) failed to detect a statistically significant difference in quit rates between the American Lung Association programme and an internet-based programme.

The intervention arm of the Health Works for Women trial (Campbell 2002) had a higher smoking prevalence at baseline (30%) than the control arm (22%), but only 9% of the intervention participants (26% of the current smokers) chose to concentrate their efforts on quitting. Both groups reduced their prevalence rate by about 3% at 18 months follow up. The intervention for smokers was incomplete, as no lay helpers were willing to be trained to support the smokers trying to quit. It is therefore not possible to draw any meaningful inferences from the lack of a detectable difference between the two arms of the trial.

Video studies

The four studies of minimal video interventions with control groups (Sutton 1988a; Sutton 1988b; Sutton 1988c; Sutton 1988d) failed to detect a difference in validated abstinence rates between the video groups, although the second study (Sutton 1988b) detected a difference between the video groups and the non-participant group (P < 0.05) This study, however, included younger smokers who smoked more heavily than participants in the other three studies. Another finding of the first of the studies (Sutton 1988a) was of more smokers trying to stop in the intervention group than in the control group (P < 0.05), but in that study the 'control' video concerned seatbelts, whereas the 'control' videos in the other three studies all related in some way to tobacco.

Other self-help studies

In Jeffery 1988, which evaluated the impact of reduction versus smoking cessation goals, both treatment groups achieved approximately the same effect of about 50% cessation at six months and 12% at one year. In Omenn 1988, employees with a preference for self-help rather than group programmes showed no statistically significant difference in quit rates between the three types of self-help manual.

4. **Pharmacological therapy**

Sutton 1987 reported one-year continuous abstinence rates of 12% among those allocated to nicotine gum and 2% among the control group (no P value given). If an intention-to-treat analysis (i.e. based on all randomized participants) is performed on these data, the quit rate drops to 7.8% for the intervention group at 12 months.

Sutton (Sutton 1988e) reported validated one-year abstinence rates of 22% in those receiving nicotine gum compared with 2% in the control group (P < 0.001). An intention-to-treat analysis of these data would yield an intervention quit rate of 10.1% (8/79). The more rigorous 'complete' abstinence rates (i.e. no smoking of any kind up to follow-up assessment) are 6.3% (5/79) for the intervention group and 2.4% (2/82) for the controls.

Kornitzer 1987 found that at three months 36.2% of the 2 mg nicotine gum group reported they had stopped smoking, against 44.8% in the 4 mg group (non-significant difference). At one year in the 2 mg and 4 mg groups respectively 22.3% and 32.2% reported smoking abstinence (non-significant difference). An intention-to-treat analysis of these data would yield cessation rates of 20.8% (21/101) for the 2 mg group and 24.5% (24/98) for the 4 mg group. The only statistically significant result was within the subgroup of more heavily addicted smokers (Fagerstrom score greater than 5); the 4 mg group achieved a quit rate of 32.9% (24/73) compared with the 2 mg group's rate of 18.5% (16/86, P < 0.05), but this does not include those smokers who dropped out between randomization and follow up.

In Kornitzer 1995 the three treatment groups (Group 1: active nicotine patch and active gum; Group 2: active nicotine patch and placebo gum; Group 3: placebo patch and placebo gum) achieved 12 month abstinence rates in Group 1, 2 and 3 of 18.1%, 12.7% and 13.3% respectively (P = 0.19). Odds ratios (OR) comparing Groups 1 and 2 at 12 months (OR 1.47, confidence interval (CI) 0.76 to 2.78, P = 0.125), and comparing Groups 2 and 3 (OR 0.96, no further details) were not significant. Time to relapse was longer in Group 1 compared with the other two groups (P = 0.04).

Rodriguez 2003 detected a 12 month CO-validated continuous abstinence rate of 20.2% (23/114) in the intervention group, compared with 8.7% (9/103) among the controls. This gave an OR of 2.58 (95% CI 1.13 to 5.90, P = 0.025). These results are based on an intention-to-treat analysis, except for one death in the intervention group.

Group II: INTERVENTIONS AIMED AT THE WORKPLACE AS A WHOLE

1. **Workplace tobacco control policies and bans**

In eight studies (Becker 1989; Biener 1989; Borland 1991a; Mayo 1990; Millar 1988; Stave 1991; Stillman 1990;Tsushima 1991) smoking policies or bans were associated with a reduction in the number of cigarettes consumed during working hours. Gottlieb 1990b also reported that the percentage of smokers consuming

15 or more cigarettes daily at work declined from 16.9% to 7.5% after one month and 4.9% after six months (P < 0.001). However, there was less consistent evidence that the overall daily consumption decreased. Eight studies (Andrews 1983; Becker 1989; Borland 1990; Jeffery 1993; Millar 1988; Mullooly 1990; Stillman 1990; Tsushima 1991) reported a small decrease in overall consumption while three studies (Biener 1989; Gottlieb 1990b; Hudzinski 1990) confirmed no decrease or a slight increase.

There is inconsistent evidence that smoking prevalence can be reduced with smoking policy or ban interventions, with five studies (Borland 1990; Gottlieb 1990b; Jeffery 1993; Mayo 1990; Mullooly 1990) reporting no change, and four studies (Becker 1989; Borland 1991a; Stillman 1990; Tsushima 1991) reporting small decreases. Hudzinski 1990, however, reported a decrease in prevalence from 22% to 14% at 12 months after the ban (P < 0.003), as did Millar 1988, who detected a decrease from 29% to 24% at 12 months (P < 0.001).

Stave 1991 reported that the three-month CO-validated quit rates were higher in the workplace with a policy compared to one without (9.2% versus 1.4%, P < 0.02), as were the nine-month validated quit rates of 10.8% versus 2.9% (P < 0.03). Biener 1989 found a net decrease in cessation rates of 4% (7% in the policy hospital and 11% in the comparison hospital, no P value given).

Two studies (Becker 1989; Stillman 1990) reported environmental nicotine vapour levels. In both studies, there was a decline in observed smoking by staff and visitors, and in environmental nicotine level by one to two orders of magnitude. The Canadian study (Millar 1988) measured respirable suspended particulates in a number of buildings, and detected lower levels throughout (P values from < 0.05 to < 0.001). Three studies (Biener 1989; Gottlieb 1990b; Mullooly 1990) reported perceptions of decreased exposure to smoke, and of improved air quality.

2. **Social support for not smoking**

Two studies of social support (Glasgow 1986; Malott 1984) found no difference with the addition of this component to a basic programme of group counselling and support. Both studies also defined smoking reduction as an outcome of interest, in which participants could choose to attempt either complete cessation or reduction of smoking. In the earlier study (Malott 1984) the authors note that among non-abstainers, at six months follow up the Controlled Smoking (CS) Group daily consumption of nicotine was 0.52 mg compared with Controlled Smoking+Partner Support (CS+PS) Group's consumption of 0.45 mg. Average number of cigarettes per day at six months follow up was CS:21.5, compared with CS+PS: 20.1. In both conditions, participants relapsed on number of cigarettes smoked (P < 0.05). In addition, CS participants relapsed on nicotine content (P < 0.05), and CS+PS relapsed on percentage of cigarette smoked (P < 0.01). Neither group relapsed on CO levels, and non-abstinent smokers in both groups were smoking less at follow up than they had been before treatment.

In Glasgow 1986 no outcome differences were detected between the two groups of reducers (Basic Programme [BP] and Basic Programme + Social Support [BP+SS]). Both groups at six months had achieved reductions in nicotine (BP: 0.90 to 0.49; BP+SS: 0.78 to 0.49, P < 0.05 for both). Number of cigarettes per day was reduced in both groups (BP: 20.5 to 18.3; BP+SS: 27.7 to 24.4), but was statistically significantly higher than at immediate post-test. The same pattern applied to percentage of each cigarette smoked, although the BP+SS group six-month rate was still lower (P < 0.05) than pre-test levels (BP: 83.3 to 74.8; BP+SS: 89.0 to 81.2). Carbon monoxide levels followed the same pattern, while saliva thiocyanate levels were higher at six-month follow up than at baseline. As with cessation, this study offered no evidence that social support enhanced sustained reduction.

3. **Environmental support for not smoking**

In Dawley 1991 at five months the abstinence rate at the environmental intervention site was twice that of the cessation-only site (43% versus 21%, no P value given). Hymowitz 1991 failed to detect an effect of environmental support. Twelve-month quit rates were 22% for physician counselling and group support alone, and 18% for the same support with an 'enriched milieu'. Outcomes for Windsor 1989 are reported under the Incentives heading.

Erfurt 1991 compared the effects of four interventions: (1) wellness screening; (2) wellness screening plus health education; (3) as 2, plus follow-up counselling; and (4) as 3, plus peer support groups, buddy systems, health promotion classes, and plant-wide activities. In each group there was a reduction in the prevalence of smoking over three years, and the smoking prevalence at three years was lower for interventions 3 and 4 compared with interventions 1 and 2 (P < 0.01), although this difference depended on combining the 1985 smokers with the then ex-smokers. Interventions 3 and 4 recorded slightly higher quit rates (20.3% and 18.9% respectively) than interventions 1 and 2 (17.1% and 17.6% respectively) among employees who were smoking at baseline, but the difference was not statistically significant, and may have been compromised by differences in baseline characteristics.

4. **Incentives**

Glasgow 1993 failed to detect a difference between incentive and no-incentive conditions across 19 workplaces. There were no statistically significant differences in self-reported cessation rates at one year (12.9% for incentives versus 12% for control) or at two years (18% for incentives versus 15.5% for control).

Rand 1989 found that contingent payments delayed but did not necessarily prevent relapse to smoking. The study failed to detect an effect on relapse of monitoring and feedback of carbon monoxide rates.

Windsor 1989 failed to detect an effect of monetary incentives on quit rates, with 6/95 achieving continuous cessation in the self-help group at 12 months compared with 5/95 in the self help plus incentives group. The corresponding rates for the counselling groups were 18/94 and 9/94. If anything, the incentive component appeared to have a negative impact. The authors therefore collapsed the incentive and no-incentive groups together in the analysis to test the efficacy of adding counselling and social support to self-help materials. This comparison yielded a cessation rate of 5.8% (11/190) at 12 months for the combined self-help groups, compared with 14.4% (27/188) for the self help with counselling and social support combined groups (P < 0.001).

The SUCCESS Project (Hennrikus 2002) found that programme recruitment was higher in the incentive sites (22% vs 12%, P = 0.0054), but that this did not translate to higher cessation rates. Although the authors suggest that telephone counselling appeared to be at least as effective as group programmes, the two types of support seem to have been offered at different levels of intensity, with dropouts from group programmes not followed up, while telephone counsellors routinely made ten contact attempts per session plus messages or letters to their participants.

Gomel 1993a failed to detect an effect of either individual or group incentives at 12 months follow up. Detailed outcomes for this trial are covered under the individual counselling heading.

The effectiveness of incentives and competitions as an aid to smoking cessation in any setting is covered in another Cochrane review (Hey 2005).

5. **Comprehensive programmes**

The 'Take Heart' study (Glasgow 1995) reported that the early and delayed intervention groups did not differ on changes in smoking rates, dietary intake or cholesterol levels. Despite documented implementation of the intervention, there were no short-term improvements beyond secular trends also observed in control workplaces. Glasgow 1997 also reported the results of 'Take Heart II' which was non-randomized but with a matched quasi-experimental study design similar to the first 'Take Heart' trial, plus updated menu and added guidance for employee steering committees and implementation. The authors reported that there were no statistically significant differences in smoking prevalence and smoking cessation between intervention and control workplaces.

The Working Well Trial (Sorensen 1996) reported a non-significant 1.53% difference between intervention and control workplaces in six-month smoking cessation rates. Smoking prevalence declined in intervention sites (from 24.5% to 21.2%) and in control sites (from 25.8% to 21.8%) (NS).

The WellWorks Study (Sorensen 1998), nested within the Working Well Trial, was a randomized controlled trial, with similar aims to its parent trial, but combining health promotion and health protection interventions, and also targeting outcome differences by job category. Six-month smoking abstinence rates were 15% in the intervention workplaces, and 9% in the control workplaces (P = 0.123). We have not used the first analyses for this study, published in 1996, since these did not include results from the control workplaces.

The WellWorks-2 Trial (Sorensen 2002) did not detect a significant difference in point prevalence rates at six months between intervention and control workplaces (reductions of 4.1% and 1.6% respectively). Cohort analysis failed to detect an effect in overall quit rates between intervention (11.3%) and control workplaces (7.5%, OR 1.57, P = 0.17).

At three-year follow up, the Working Healthy Project (Emmons 1999) did not detect significant differences between either the seven-day point prevalence quit rates (intervention 25.6% versus control 21.8%) or the six-month continuous abstinence quit rates (intervention 8.0% versus control 8.1%).

Willemsen 1998 failed to detect an effect of a comprehensive programme. The six-month sustained abstinence rates were 8% in the comprehensive workplaces and 7% in the minimal-treatment workplaces. Among the medium to heavy smokers, prolonged abstinence rates were 9% for the comprehensive programme and 4% for the minimal programme.

The Swedish trial of cardiovascular risk reduction (Nilsson 2001) detected a decline in smoking prevalence in the intervention group from 65% to 37% at 12 months, compared with a non-significant decline in the control group from 65% to 63%. Prevalence at 18 months was 40% for the intervention group and 59% for the control group, and this difference influenced the decrease in the mean risk score from 10.3 (SD 1.5) to 9.0 (SD 2.2, P = 0.042).

The HealthWise Stepped Intervention Study (Shi 1992) noted a decline in smoking prevalence at two-year follow up in all four intervention levels (nine worksites). Smoking reduced in Level 1 sites by 34%, from 18% to 12%, in Level 2 sites by 18%, from 17% to 14%, in Level 3 sites by 35%, from 24% to 15%, and in Level 4 sites by 44%, from 14% to 8%. All differences were statistically significant at P < 0.01 level, except for the Level 2 decline which was significant at the 0.1 level. Outcomes were measured by cross-sectional surveys rather than cohort analysis, with relatively low participation rates of 69% at baseline and 48% at follow up.

Economic analysis

There is limited literature on the costs of implementing workplace smoking control programmes. Only six of the studies identified for this review (Borland 1990; DePaul 1989; DePaul 1994; Erfurt 1991; Jeffery 1993; Windsor 1989) reported cost data. Five of the studies were conducted in the USA, and one in Australia.

Windsor 1989 found that material costs to deliver the programme plus lost employee time to participate produced a total programme cost of approximately US$50 per employee. The cost to implement the programme for combined groups 1 (brief advice and

self-help materials) and 3 (as 1 with monetary awards) was approximately US$9,500 (US$50 x 190 per combined intervention group). The estimated savings to the University for Groups 1 and 3 with a 5.8% quit rate (9 employee quitters at US$1,000) was about US$9,000. From a cost to benefit ratio perspective the estimated savings observed from combined groups 2 (as 1 with self help, further counselling, buddy selection and contract) and 4 (as 2 with monetary rewards for cessation) was the same as for groups 1 and 3 (US$9,500). The observed quit rate of 15% (27 employee quitters at US$1,000) produced an estimated saving of approximately US$27,000. The researchers suggested that reducing the estimated savings by 50% (for example, US$500 per employee per year instead of US$1,000) still led to estimated savings of US$13,500, 40% above the estimated cost of US$9,500. The cost to benefit ratio for the most effective methods (groups 2 and 4) was approximately 2 to 1.

Erfurt 1991 found that the annual direct cost per employee for post-screening interventions was US$2.97 for site 1 (control site), US$17.68 for site 2 (health education), US$30.96 for site 3 (health education plus follow-up counselling), and US$38.31 for site 4 (health education, follow-up counselling plus plant organization for health promotion). For engaging employees into treatment or programme participation, sites 3 and 4 were approximately 10 times more cost-effective than site 2. Also, for reducing risks and relapse prevention, sites 3 and 4 were five to six times more cost-effective than site 2. At sites 3 and 4 the total direct cost per percentage of risks reduced and relapse prevented was less than one dollar (US$0.67 and US$0.74, respectively) per employee per year.

DePaul 1989 showed that in the Group condition (media, self-help manuals, groups and incentives) 44 participants had quit at the 12-month follow up and for the Non-group condition 26 had quit smoking. Incentives and supplies cost approximately US$21,000 for the Group intervention, so each Group quitter cost US$477. Supplies for the Non-group cost about US$2,000, so each quitter cost US$77.

The last of the DePaul studies, DePaul 1994, summarized the cost implications of all three De Paul studies. The total cost for each intervention was Self-help US$4717, Incentives US$6992 and Group US$26,867. Costs per quitter (12 month point prevalence to continuous quit rate) were Self-help: US$225 - 1179; Incentives: US$250 - 699; Group US$455 - 790. The cost of the programme offered to the public (50,000 self-help manuals and newspaper supplements) was US$62,500. If 5% to 15% of the recipients of self-help materials could quit smoking, the cost would range from US$8 to US$25 per quitter. With the television series costing about US$20,000, if only 5% of smokers who watched it managed to quit, the cost per quitter would be US$3.

The Healthy Worker Project (Jeffery 1993) reported briefly on the economic implications of its workplace cessation programme. Given that a smoking employee costs the employer several hundred dollars a year more than a non-smoker, the cost of a two-year intervention programme (US$1500) could be economically justified by producing between 8 and 16 quitters per workplace.

To estimate the generalized impact of a daily reduction of 5.2 cigarettes, Borland 1990 extrapolated the results of his findings to the entire Australian Public Service, assuming a smoking prevalence of 24.7%. He calculated that this would lead to 52 million fewer cigarettes a year being smoked within the Service, at a saving of A$5.2 million, in addition to the public health benefits of such a reduction.

Acceptability of restrictions and bans

A secondary objective of this review is to examine the extent to which workers are exposed to the effects of colleagues who smoke. Primary data for this outcome have been more fully explored in another Cochrane Review (Serra 2000), but the studies of bans and restrictions in this review include some data on acceptability, levels of compliance and environmental consequences of the policies. Twelve of the 14 included studies in this group addressed this issue directly.

Andrews 1983 reported that 20 months after the introduction of a restrictive smoking policy in a Boston hospital, 93% of nonsmoker responders (staff and patients) and 83% of smoker responders approved of the policy. Staff compliance in non-smoking areas was variable, with "considerable friction" between smokers and nonsmokers in some areas. Patient compliance led in some cases to displacement of smoking rather than to reduction.

A smoking ban in a Maryland children's hospital (Becker 1989) produced widespread acceptance of the policy, with approval from 93% of nonsmokers and 66% of smokers. Complete compliance was achieved in public areas, with daily lobby butt counts falling from 940 to 19. Within six months of the ban, environmental nicotine vapour had declined from 13 to 0.51 ng per cubic metre ($P = 0.03$).

Biener 1989 reported the impact of a restrictive policy in a general hospital. Over 90% of smokers questioned and two-thirds of nonsmokers thought that the policy was "a good idea". At 12 months, 5% of nonsmokers at the policy hospital reported being bothered by smoke, compared with 25% at the comparison hospital (95% confidence interval for the difference: 8% to 32%). None of the smokers felt that their performance had improved under the policy, compared with 21% of nonsmokers who felt that improved air quality helped them to concentrate better. However, none of the nonsmokers felt that their performance had deteriorated, compared with 19% of the smokers.

A study of a no-smoking policy by a New Orleans medical institution (Hudzinski 1990) reported nearly 80% staff acceptance of the policy. At baseline a majority of employees (two-thirds of them smokers) said they were bothered by other people's smoke, and 35% were greatly bothered by it. At 12 months follow up, 74%

stated that the policy had improved such physical discomforts as burning eyes, sinus problems, cough , headaches and the offensive smell of smoke.

Mayo 1990 reported outcomes of a Colorado Hospital smoking ban. Twelve months after implementation 80.5% of employees said their workplace was smokefree, compared with 72% three months post-ban, and 41.5% before the ban (P < 0.01). Support for the ban increased from 59% pre-policy to 68% 12 months post-ban. Because inpatients were permitted to smoke indoors, 20% of employees continued to report exposure to environmental smoke. This study highlighted the special problems of restrictive policies applied to psychiatric hospitals, because of higher than average smoking prevalence among their patients.

The adoption of a smokefree policy was reported (Stave 1991) at baseline and at six month follow up, and was compared with a policy-free adjacent campus. Both sites at baseline supported the concept of a ban (intervention site 75.8%, control site 73.2%), although never-smokers were more strongly supportive (89.3% and 85.7% respectively) than were current smokers (37.8% and 31.3% respectively). At follow up, smoker disapproval was still above 60% on both sites. The authors point out that this unusual trend may be related to the workplaces' location in North Carolina, a tobacco-producing state.

Stillman 1990 reported an evaluation of a smoking ban in a large medical centre in Baltimore, Maryland, with particular reference to environmental effects. The follow-up survey eight months after implementation noted a reduction in cigarette butts of 80.7% (lobbies, lounges and entrances) and 96.8% (waiting areas), and fire incidents went from an average of 20 per year to nil in the first year of policy implementation. The level of environmental tobacco smoke, measured by passive-diffusion nicotine monitors, fell by one to two orders of magnitude in cafeterias (7.06 to 0.22, P = 0.0007), waiting areas (3.88 to 0.28, P = 0.0003), patient areas (0.84 to 0.12, P = 0.04), offices (2.05 to 0.12, P = 0.003), staff lounges (2.43 to 0.12, P = 0.003) and corridors and elevators (2.28 to 0.20, P = 0.02). The only area not to achieve statistically significant reductions was the restrooms (17.71 to 10.0). Estimates of acceptance and compliance were not outcomes of this study.

A study of a total smoking ban at a Hawaiian medical centre (Tsushima 1991) reported that baseline acceptance of the policy stood at 65.3%. At 12 months follow up, approval had risen significantly to 78.5% (P < 0.01). Fewer smokers (25.7% pre-ban versus 16% post-ban) planned to maintain their level of smoking (P < 0.05), and more smokers (7.9% pre-ban versus 24% post-ban) planned to stop smoking in the future (P < 0.01).

In a survey of Telecom Australia workers (Borland 1991a) Hocking reported that at 18 months post-ban 81% of respondents approved or strongly approved of the policy, with 53% of smokers approving. Thirty-three per cent of responders reported some tension between smokers and nonsmokers, with this perception closely correlated with ban violations (r = 0.71). Perceived work performance seemed unchanged. Only 23% reported effects, and of these 73% were positive and 27% negative, with most of the latter coming from smokers.

A study of the implementation of a restrictive policy (Gottlieb 1990b) reported increased nonsmoker satisfaction with the policy, and decreased smoker satisfaction. Compliance of 61.8% of staff was reported six months after implementation. Average days per week that responders reported being bothered by co-workers' smoke declined significantly (P < 0.001) over six months, and the number never bothered by smoke doubled from 41% to 80%.

Perceptions of smoke in the environment were reported in a before-and-after bans study (Mullooly 1990); the study found that being bothered by other people's smoke declined post-ban from 60% to 29% among nonsmokers, and from 14% to 6% among smokers. An aggregated estimate of 73% of nonsmokers and 46% of smokers across all sites agreed that the policy was strongly supported. Although 31% of smokers anticipated impaired performance after policy implementation, 83% post-ban reported no difference or improved efficiency, compared with 98% of nonsmokers.

A before-and-after study of a restrictive policy in Canadian health and welfare workplaces (Millar 1988) reported a decrease in perceptions of being bothered by smoke in all tested areas except for the cafeterias, which often included designated smoking areas. About 62% of employees indicated that air quality at work had improved after the policy, although differences between smokers and nonsmokers were not reported. Mean levels of respirable particulates were found to have decreased in all areas where they were measured, by 27% (P < 0.001) to 47% (P < 0.001). In this instance, the policy had been developed by a process of consultation and consensus between workforce and management.

Absenteeism

Only two studies of those identified for this review reported on the effects of smoking interventions on efficiency outcomes such as reduction in absenteeism or increases in productivity. The Healthy Worker Project (Jeffery 1993) found a net reduction in the percentage of workers reporting a sick day in the last month between treatment and control sites of 3.7% (P = 0.04) in cross-sectional analysis and 3.4% (P = 0.06) in cohort analysis. The rate of participation in smoking programmes was positively associated (P = 0.09) with changes in sick day prevalence, and this effect was strongest in baseline smokers (P = 0.002). Jeffery concluded that cessation programmes may yield important short-term economic benefits by reducing employee absenteeism.

Another study of a comprehensive lifestyle intervention (Nilsson 2001) reported on mean number of sick days over the last four months of the first year of the trial. Mean sick days taken by the intervention group fell from 6.0 to 2.9 (p = 0.03), while the mean sick days taken by the control group for that period rose from 4.5 to 7.4 (P = 0.04). However, smoking was only one of several

behaviours targeted in this trial, and the contribution of reduced smoking prevalence to absentee rates could not be separately estimated.

DISCUSSION

Workplace interventions are heterogeneous. Although the workplace may offer particular opportunities for recruitment to programmes, many of the interventions tested in workplace studies are not specific to this setting. This is particularly true of interventions aimed at helping individuals to stop smoking.

It is inappropriate to draw conclusions about the effectiveness of such interventions on the basis only of studies conducted in the workplace. In drawing conclusions about the effectiveness of these interventions we have therefore placed the findings of the workplace studies in the context of what is known from systematic reviews that include non-workplace studies. Although the results of some of the individual studies considered in this review have inconclusive findings, most are consistent with the findings from systematic reviews. Thus we can conclude that there is strong evidence that there is an effect of group therapy, of individual counselling, and pharmacological treatments. The Cochrane review of group therapy (Stead 2005) concluded that such programmes increase the likelihood of quitting, approximately doubling the odds of quitting in workplaces and other settings (odds ratio (OR) 1.97, 95% confidence interval (CI) 1.57 to 2.48 compared with self help). Only four included studies are common to that review and the present one (DePaul 1987; DePaul 1989; DePaul 1994; Omenn 1988), making the two bodies of evidence relatively independent of each other. The Cochrane review of individual counselling (Lancaster 2005a) identified 11 trials in workplaces and other settings, with only one study (Windsor 1989) in common with this review. The odds ratio for successful smoking cessation was 1.62 (95% CI 1.35 to 1.94). We failed to find evidence that more intensive counselling was more effective than brief counselling (OR 0.98, 95% CI 0.51 to 1.56). In addition, there was no evidence of a difference in effect between individual counselling and group therapy (OR 1.33, 95% CI 0.83 to 2.13). However, even in workplace settings, recruitment to counselling is often low (Eriksen 1998). Thus the effects seen in trials often produce small numbers of quitters in absolute terms; for example, a doubled quit rate of 1% is still only 2%.

Some minimal interventions are effective. The Cochrane review of physician advice (Silagy 2004), with two studies in common with this review (Lang 2000; Li 1984), found brief advice from a health professional increased quit rates (OR 1.69 95% CI 1.45 to1.98). Self-help interventions appear less useful. The Cochrane review of self help (Lancaster 2005b), with three studies in common with this review (Burling 1989; Burling 2000; Omenn 1988), found little effect of generic materials, but limited evidence that interventions tailored to the individual have some effect.

There is limited evidence from this review that cessation programmes aimed at the individual are more effective when combined with an institutional approach which provides environmental support for stopping smoking. Although there is a strong theoretical rationale for approaches that integrate smoking cessation with comprehensive health promotion and protection programmes in the workplace, formal studies of such approaches have failed to show that they significantly decrease prevalence of smoking.

One firm conclusion of this review is that workplaces can offer services with proven effectiveness to individual smokers seeking to stop smoking. From the public health perspective, however, the more interesting question is whether programmes aimed at the workforce as a whole can contribute to a reduction in smoking prevalence. The effect of workplace policies and bans is difficult to study with the same level of experimental control as interventions directed at the individual. Although the studies are of less rigorous design than the individual intervention studies, those included in this review offer consistent evidence that workplace tobacco policies and bans can decrease smokers' cigarette consumption during the working day. A Cochrane review of interventions to decrease smoking in public places (Serra 2000), with two studies in common with this review (Becker 1989; Gottlieb 1990b), has shown that restrictions and bans, if properly implemented, also decrease exposure of non-smoking employees to environmental tobacco smoke at work. There is conflicting evidence about whether they decrease prevalence of smoking or overall consumption of tobacco by smokers. The gradual introduction of community-wide workplace bans, such as the Irish and New York policies, may eventually give some indication of the true effects on population prevalence. In its first year of implementation, the Irish ban has led to a 16% drop in cigarette sales which cannot be explained by parallel campaigns or price rises (Allwright 2004). New York has experienced an overall decline of 11% in the number of smokers in the year following the ban, with a drop of 22% among young adult smokers aged 18 to 24. The decline was greater among women (13%) than among men (7%). Furthermore, those who continue to smoke are smoking less (NYC 2004). The long-term effects of community-wide worksite smoking bans, however, are yet to be evaluated.

Institutional bans and restrictions affect the entire workforce, including the nonsmokers, and here we found consistent evidence of positive behaviour and attitudinal changes following policy implementations (Brownson 2002). Only one of the 12 studies reporting on these issues found that a majority of smokers (60%) remained opposed to the ban at six months follow up, although, as the authors point out, this may have been related to the intervention and control workplaces being in a tobacco-growing area. The remaining studies all reported initial satisfaction with the policy, especially among nonsmokers, and found that levels of acceptance increased over time as the workforce became used to the new regimen.

Most of the bans and restrictions (eight of the 12 studies which addressed the environmental implications) were implemented in hospitals or medical centres, with varying levels of compliance. The fact that staff and patients were in a healthcare delivery environment may have increased the acceptability of a restrictive smoking policy. Some of the hospitals allowed smoking in restricted areas, while others embargoed any smoking on the site; some exempted patients from the restrictions, while others allowed patients to smoke in public areas only, and in one case only with written permission from their physician. Those studies which measured perceptions of being bothered by other people's smoke all reported improvements after policy implementation, for smokers as well as for nonsmokers, while performance at work was generally deemed by nonsmokers to have improved. Smokers were more divided on this measure, but in most cases they reported feeling that performance had improved, or at least had not deteriorated. Air quality, measured by nicotine vapour levels and by reduced symptoms of eye and respiratory problems, was also shown to have significantly improved following implementation of the policy. Bans and restrictions seem to be generally well received, especially where workplace managers involve staff in the implementation of the policy, and support smokers in concomitant attempts to quit or to reduce their smoking.

We found 14 previous literature reviews on workplace cessation programmes published between 1985 and 2002 (Bibeau 1988; Brownson 2002; Danaher 1980; Eriksen 1998; Fichtenberg 2002; Fielding 1991; Fisher 1990; Hallett 1986; Janer 2002; Klesges 1988; Orleans 1982; Peersman 1998; Smedslund 2004; Windsor 1984). Of these, six reviews have been systematic in their search of the literature, three offering a formal meta-analysis (Fisher 1990; Fichtenberg 2002; Smedslund 2004) and the other three a narrative-based review (Eriksen 1998; Janer 2002; Peersman 1998).

Fisher 1990 conducted a meta-analysis of 20 controlled studies of workplace cessation that had 34 comparisons of long-term (more than 12 months) quit rates. Using meta-analysis Fisher calculated that workplace interventions overall were associated with an increase in quit rates. As with our review, however, the studies selected for synthesis varied in the content and organization of the intervention. The authors calculated a weighted average quit rate of 13%, and used multivariate techniques to attempt to identify factors associated with a greater likelihood of success. They found that interventions conducted in smaller workplaces, which lasted two to six hours, included cessation groups, and addressed heavy smokers were associated with the largest effect sizes. Although our methodology did not allow us to examine all of these variables, the findings are consistent with ours in suggesting that more intensive interventions and group therapy are more effective than minimal interventions. A major difference from our review is that the Fisher analysis was unable, because of its inclusion criteria, to consider the effect of policies and restrictions on smoking in the workplace. Although the experimental methodology is weak, such policies emerge from our review as a central determinant of success in restricting tobacco smoke in the workplace, even though their effect on overall prevalence of smoking remains uncertain.

The Fisher review was updated and extended to cover subsequent studies of workplace interventions during the 1990s by Smedslund 2004 (for which Fisher is the second author). This review identified 19 controlled trials published between 1989 and 2000 in English-speaking peer-reviewed journals, and having a follow-up period of at least six months. The meta-analyses were stratified by whether or not the studies were randomized, and reported quit rates at six months, twelve months and more than twelve months. The weighted odds ratios for the three assessment points were 2.03 (95% CI 1.42 to 2.90) at six months, 1.56 (95% CI 1.17 to 2.07) at twelve months, and 1.33 (95% CI 0.95 to 1.87) at anything over twelve months. The authors compared the overall quit rates of 13% in the 1990 review (based on 34 comparisons) with 18% in the 2004 review (based on 28 comparisons). Funnel plots indicated strong evidence of publication bias for the six month and twelve month outcomes, and the authors note that the randomized studies demonstrated a consistently smaller effect than the non-randomized ones. Furthermore, the efficacy of the interventions appeared not to survive beyond the 12 month follow up. The main difference between this review and our own is their inclusion of non-randomized trials for treatment interventions.

Fichtenberg 2002 identified 24 studies (26 comparisons) on the effects of implementing a total smoking ban in the workplace, to compare its efficacy in prevalence reduction and reduced daily consumption with that achievable through tax increases. Using random-effects meta-analysis, Fichtenberg detected an overall reduction in smoking prevalence of 3.8%, and a decrease in consumption of 3.1 cigarettes daily per continuing smoker. The studies include randomized controlled trials, prospective, retrospective and population-based studies, with follow-up times ranging from six weeks to 24 months. Apart from three of the population-based studies, which included responders from partially smokefree workplaces, the review concentrated exclusively on studies of smokefree workplaces, and did not require a comparison workplace or pre- and post-ban assessments as inclusion criteria. Because our review assesses a variety of workplace tobacco initiatives, and because we only include studies with a minimum follow up of six months, there is relatively little overlap between our study population and theirs. We have not thought it appropriate to pool the results of such diverse studies, and our conclusions tend to be more conservative than those of the Fichtenberg review.

Eriksen 1998 identified 52 studies of cessation programmes including 29 studies of policy impact, and is thus closer to the population of studies included in this review. Eriksen concluded that smoking cessation group programmes were more effective than minimal treatment programmes, and that competitions could increase programme participation. In addition, tobacco policies were found to reduce cigarette consumption at work and workplace environmental tobacco exposure. These conclusions are therefore

consistent with our review, which includes a number of new studies not available at the time of the Eriksen review, which was based on a literature search to 1994.

Janer 2002 identified 45 health promotion trials aimed at reducing cancer risk factors in the workplace, including tobacco, diet, physical activity, obesity, ultraviolet light and alcohol consumption. Fourteen of the trials were primarily concerned with tobacco control, and another five addressed smoking cessation in combination with other risk reduction strategies. The authors decided against a meta-analysis, because of the heterogeneity of the trial designs, but they presented a variety of quantitative and graphical measures of study quality and implications. There was considerable overlap between their included tobacco studies and ours, with differences accounted for by their not stipulating a minimum follow-up time (compared with six months for our review), and by their requiring a minimum of 100 participants, at least 50 in each trial arm, whereas our review has no trial size requirement. They reported that work-based cessation programmes achieved slightly larger effects than community-based ones, delivering a quit rate of about 6% that could be attributed to the workplace intervention (compared with 1.8% in community trials), but with relapse rates by six months of 40% to 80%. Financial incentives, continuous support and tailored messages were associated with improvement in the intervention effect, although incentives appeared not to lead to quit rates sustained over time. More generally, the authors point to very low participation rates as the main weak point of health promotion programmes, and suggest that the way forward may lie in increased worker involvement with the preparation and conduct of the programmes.

Peersman 1998 identified 50 health promotion studies targeting behaviour change at the workplace, at both the individual and at the institutional level. To be included, the studies had to be outcome evaluations of interventions that were based on a needs assessment, or had been developed using participatory methods, or previously piloted with the target population, or any combination of those criteria. Retrospective studies were excluded, and prospective studies were only adjudged as "sound" if they met four minimum quality criteria: using a control or comparison group, providing baseline data for each group, providing post-intervention data for each group, and reporting on all outcomes targeted. Only 15 (30%) of the included studies met this 'gold standard', and could therefore be used to draw potentially reliable conclusions. This review, published by the UK Health Education Authority, had a particular concern for the applicability of the findings to the United Kingdom, and , like the Janer review (Janer 2002), identified low participation rates as an obstacle to programme efficacy. Although some of the studies included smoking cessation as one of several outcomes of interest, the authors explicitly excluded studies which were mainly or exclusively concerned with smoking, in order to avoid significant overlap with our own review.

A particular attraction of the workplace is that it provides a route of access for communicating about smoking and offering help to stop. However, participation rates are often low. A number of studies considered methods for increasing participation. This review found limited evidence that participation in programmes can be increased by competitions and incentives organized by the employer (see also Hey 2005). A particular limitation of the existing evidence is that most studies were conducted in stable workplace settings which are becoming less common, as workers are increasingly mobile (for example, in the construction and transport industries) or on short-term contracts (as in many modern service industries). The assumption that the workplace is a good place for recruitment can only be made for certain types of workplace.

In addition to effectiveness, it is clearly important for employers to consider the economic aspects of introducing smoking programmes in their workplaces. These issues are infrequently addressed in the studies included in this review, and those studies which do discuss the economic implications are difficult to compare. The absolute figures quoted obviously vary across time and across countries, and the methods of calculating costs differ from one study to the next. Some studies calculate a cost per quitter from among the smokers only, while others use the entire workforce as the denominator. These approaches also take no account of smokers who are not enrolled in the programme, but who are nonetheless reached and affected by the programme's publicity, or by friends and family who participate. Given that the quitters among them may have been influenced by the presence of the programme, they might reasonably be counted among the programme's successes. Furthermore, it is inappropriate to base the calculations simply on the programme costs, without reference to other direct costs such as occupied space that could have been used differently, donated or discounted time and resources, and avoidance of future healthcare expenditure on continuing smokers. Some studies risk an over-simplified approach to the analysis, calculating the costs per quitter in the intervention group without reference to the costs per quitter in the control or pre-policy group. The intervention costs should be reckoned as incremental to those incurred by the control group, which can be seen as demonstrating the background or placebo rate.

The results of cost-effectiveness studies depend on the economic perspective adopted, and a number of viewpoints may be valid. A cost analysis could assess effectiveness from the point of view of the individual worker (which will vary by their smoking status), the institution, the health service providers, the community, or the budget-holders (Drummond 1997). For example, employers who directly fund employee health insurance may look favourably on long-term reduction in their costs that might result from a successful smoking cessation programme. The perspective of employers operating in countries where the state is the main provider of health care will be very different. Cost-effectiveness analyses conducted in the USA (Warner 1996) therefore have limited applicability to other healthcare systems. The effectiveness data in this review could be used to model cost-effectiveness, but this would re-

quire a model that took account of the particular circumstances of individual healthcare systems. Reduction in smoking may lead to economic benefits in terms of reduced absenteeism and increased productivity. However, the studies included in this review provided limited data on these outcomes, and are too diverse to allow firm inferences to be drawn.

AUTHORS' CONCLUSIONS

Implications for practice

The workplace is an environment in which employees may be offered smoking cessation services such as advice from a health professional, individual and group counselling, self-help treatments and pharmacological treatment to overcome nicotine addiction. All of these have been tested in workplace settings, and the findings are consistent with those found in other settings. Although people taking up these interventions are more likely to stop, the absolute quit rate is low. Whether these are offered through the workplace or by referral to other agencies is likely to vary in different healthcare systems and with different methods of payment.

The potential advantage of the workplace is that more people can be reached and participation in cessation attempts is thereby increased. However, participation rates are usually low even within workplaces. There is limited evidence that participation in such programmes can be increased by competitions and incentives organized by the employer.

Workplace tobacco policies and bans, if properly implemented, reduce exposure of non-smoking employees to environmental tobacco smoke at work. There is less consistent evidence that they decrease consumption during the day among employees who smoke. There is conflicting evidence about whether they decrease prevalence of smoking or overall consumption of tobacco by smokers.

Although there is a strong theoretical rationale for approaches that integrate smoking cessation with comprehensive health promotion and protection programmes in the workplace, formal studies of such approaches have failed to show that they significantly decrease prevalence of smoking.

Implications for research

A particular finding of this review is the lack of data on economic aspects of workplace cessation programmes. Future studies should include measurement of direct and indirect costs, and if possible, economically relevant outcomes such as absenteeism and productivity.

FEEDBACK

Error in data for Forest Plot

Summary

The comment pointed out that data for Lang 2000 had been entered incorrectly, with control and intervention figures reversed

Author's reply

Data was amended, and Dr Verbeek was thanked for pointing out the error

Contributors

Jos Verbeek (Comment)
Kate Hey (response)

POTENTIAL CONFLICT OF INTEREST

None known.

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** Indicates the major publication for the study*

TABLES

Characteristics of included studies

Study	Andrews 1983
Methods	Country: USA Setting: employees and patients of New England Deaconess hospital Type: Observational study, One group, pre- and post-test
Participants	892 employees and patients pre-policy, 965 employees post-policy
Interventions	Evaluated the impact of restrictive smoking policy, with smoking cessation classes and individual counselling.

Characteristics of included studies (*Continued*)

Outcomes	Self-reported smoking status, biochemically unverified
Notes	Cessation support was in employees' own time, and attracted only 8/148 who expressed an interest (5/8 succeeded in quitting). Other outcomes included acceptability of policy, and levels of staff and patient compliance
Allocation concealment	C – Inadequate

Study	**Becker 1989**
Methods	Country: USA Setting: Johns Hopkins Children's Center, Baltimore Md Design: Observational study, pre- and post-ban tests
Participants	762 employees 6m pre-ban, 704 at 6m post-ban
Interventions	Evaluated impact of smoking ban, supported by cessation support, self-help materials, quit kits, general health checks, screening, CO monitoring
Outcomes	Self-reported unverified smoking status at 6m, butt counts, environmental nicotine vapour, attitudes
Notes	Other outcomes included acceptability of policy, staff and patient compliance
Allocation concealment	C – Inadequate

Study	**Biener 1989**
Methods	Country: USA Setting: 2 hospitals in Rhode Island Design: Quasi-experimental, 1 pre- and 2 post-tests
Participants	165 employees at 1m pre-policy, 156 at 6m post-test, 214 at 12m post-test
Interventions	Evaluated the effect of a restrictive smoking policy introduced at one hospital. Self-help smoking cessation programmes offered at both hospitals
Outcomes	Self-reported smoking status and daily cigarette consumption
Notes	Baseline characteristics were similar between both hospitals other than percentage of quit attempters prior to the survey being strikingly higher (30%) in the comparison than in the policy hospital (4%). Other outcomes include compliance and acceptability, as well as performance self estimate.
Allocation concealment	C – Inadequate

Study	**Borland 1990**
Methods	Country: Australia Setting: Australian Public Service, 44 locations Design: Observational study, 1 group, 1 pre- and 2 post-tests
Participants	2113 employees from 6 departments who completed initial survey and could be matched for follow up 5/6m later.
Interventions	Evaluated the impact of a smoking ban, with availability of smoking control programmes
Outcomes	Self-reported smoking status and cigarette consumption during 7 time periods across 24h
Notes	Extrapolation from these results to economic impact of similar reductions across the Australian Public Service indicate lost cigarette sales of A$5.2 million a year
Allocation concealment	C – Inadequate

Characteristics of included studies (*Continued*)

Study	**Borland 1991a**
Methods	Country: Australia Setting: Telecom Australia, 3 districts Design: Observational study, 1 group, 1 pre- and 2 post-tests
Participants	Study 1: 1089 surveyed prior to ban and 620 at 6m post. Study 2: sample increase by 30% due to company restructuring. 1424 surveyed 18m post-ban. Study 3: 124 employees consulted on successes and failures of implementation
Interventions	Evaluated the impact of introducing a smoking ban, with policy of time off to attend approved smoking cessation programmes and publicity on smoking cessation.
Outcomes	Self-reported smoking status and workday cigarette consumption
Notes	Only Study 1 (620 staff re-surveyed 6m post-ban) met our inclusion critera Other outcomes included compliance, and ther acceptability of the policy.
Allocation concealment	C – Inadequate

Study	**Burling 1989**
Methods	Country: USA Recruitment: Veterans Administration Medical Centre employee volunteers Design: RCT, no details of randomization method
Participants	58 smokers 57% female, Av. age 44 All participants smoked for at least 6m (validated with CO measurement) Participation rate: not reported
Interventions	1. American Cancer Society and ALA pamphlets about smoking, a telephone hotline, and a stop-smoking contest which gave vouchers for a draw, for each day when expired CO < 8ppm. 2. As 1, plus use of a computer to enter data on smoking behaviour and to smoke a cigarette through a filter attached to the computer; this produced an individualized nicotine fading programme
Outcomes	Abstinence at 6m Validation: CO < 8ppm
Notes	Participants in the computer group had lower self efficacy scores than the contest-only group
Allocation concealment	B – Unclear

Study	**Burling 2000**
Methods	Country: USA Recruitment: Worksite volunteers Design: RCT, no details of randomization method
Participants	87 smokers 36% female, Av. age 38, av. cigs/day 15 Participation rate: not reported
Interventions	1. The Last Draw, an internet-based interactive programme to aid preparation, quitting and relapse prevention, plus FadeAid, an aid to nicotine fading 2. ALA Freedom from Smoking booklet, 2 manuals and an audio relaxation tape
Outcomes	Abstinence at 6m (7day PP) Validation: CO
Notes	73% of Group 1 participants used the interactive programme, compared with 90% of the comparison group who used the ALA programme
Allocation concealment	B – Unclear

Characteristics of included studies (*Continued*)

Study	**Cambien 1981**
Methods	Country: France Recruitment: Worksite volunteers in 160 sections of an administrative organization. Design Cluster-randomized controlled trial. Randomization method not described
Participants	3336 men aged 25-35 at baseline. 424 classified as at high risk of coronary disease, 868 at low risk. Mean cpd 8.9 intervention, 10.0 control
Interventions	1. High risk intervention subjects recalled at 6m, 12m, 24m, low risk at 12m, 24m. All intervention subjects measured blood sample, weight, BP, no. of cpd. Given tailored advice on diet, alcohol and smoking at each visit. 2. Controls received no counselling or measurement between baseline and follow up
Outcomes	Abstinence/reduction at 2 yrs. At 2yrs 568 (86%) of intervention group returned, and 529 (84%) of control group. Validation: Blood CO
Notes	This trial was added to the 2005 update 95 intervention subjects lost to follow up were heavier smokers (+4.4 cpd) vs 100 control subects lost to follow up (+0.4 cpd).
Allocation concealment	B – Unclear

Study	**Campbell 2002**
Methods	Country: USA Recruitment: 10 small manufacturing companies in NC. Design: Cluster RCT, no details of randomization
Participants	859 blue-collar women at baseline (73% of eligible). 538 completed programme to 18m. 53% aged 40 or younger, 58% African American. Mean BMI 29. 30% I group, 22% C group smoked.
Interventions	1. Intervention: computer-tailored 'magazine' with dietary, exercise, smoking advice, at baseline and 6m, plus social support at work from trained helpers in participants' chosen activity. N.B. No lay helpers offered smoking support. 2. Delayed intervention (control): One computer-tailored 'magazine at 6m, no social support.
Outcomes	Abstinence at 18m: self-reported, no biochemical validation.
Notes	This trial was added to the 2005 update Natural (lay) helpers declined training in smoking cessation, so this arm of the intervention was not available to participants trying to quit
Allocation concealment	B – Unclear

Study	**Dawley 1991**
Methods	Country: USA Recruitment: worksite volunteers in 2 comparable oil refineries in Southern Louisiana Design: RCT, no details of randomization method
Participants	30 smokers (14 at intervention site and 16 at comparison site) 76% male Av. age: 39, av. cpd 21 Participation rate: not reported
Interventions	1. Intervention: comprehensive programme of smoking control, discouragement, cinnamon sticks as cigarette substitutes, and smoking cessation 2. Control: smoking cessation alone
Outcomes	Self-reported smoking cessation with urinary cotinine validation

Characteristics of included studies (*Continued*)

Notes	Introduction includes lengthy discussion of economic and health costs of smoking
Allocation concealment	B – Unclear

Study	**DePaul 1987**
Methods	Country: USA Recruitment: Employees at 43 worksites, recruited prior to a 3w television smoking cessation programme. Design: Cluster randomization by worksite, matched for size
Participants	233 smokers in 21 group discussion worksites, 192 in 22 non-group work sites. Groups led by trained employees Participation rate: not reported
Interventions	All participants were given self-help manuals by company co-ordinators and instructed to view the televized segments 1. Twice weekly group meetings 2. Self help alone
Outcomes	Abstinence at 12m (multiple PP) Partial validation by salivary cotinine or family/colleague report
Notes	
Allocation concealment	B – Unclear

Study	**DePaul 1989**
Methods	Country: USA Recruitment: Employees at 38 worksites, recruited prior to a 3w television smoking cessation programme. Design: Cluster randomization by worksite
Participants	419 smokers who participated in the worksite programmes, 206 Group, 213 No Group conditions. Participation rate: not reported
Interventions	1. 6 x twice-weekly group meetings to coincide with the 3w television series, then monthly meetings for a year. Abstinent smokers and 5 of their family and 5 co-workers entered for a lottery at the final group meeting and 12m follow up. 2. Self-help manuals only
Outcomes	Abstinence from end of programme to 24m Validation by saliva cotinine and co-worker or relative confirmation.
Notes	This study featured monthly booster sessions and monetary incentives for abstainers, as a development of the design of the first De Paul study
Allocation concealment	B – Unclear

Study	**DePaul 1994**
Methods	Country: USA Setting: 61 worksites Design: Cluster randomization by worksite
Participants	844 smokers recruited; 289 Self Help (SH), 281 Incentives (I), 283 Group (G). Av. age 38, Av cpd 21 72% female in SH, 58% female in I, 59% female in G Participation rate: 58% in SH, 59% in I, 55% in G
Interventions	Worksite interventions timed to coincide with a mass media intervention consisting of a week-long smoking cessation series on TV, and a complementary newspaper supplement. SH: Self-help manual (ALA Freedom from Smoking in 20 days) I: Self-help manual and incentive payment of US$1 for each day abstinent up to US$175

Characteristics of included studies (*Continued*)

	G: 6 group meetings over 3w followed by 14 booster meetings over 6m. Incentive payments. Handouts from same S-H manual. Maintenance manual (ALA A Lifetime of Freedom from Smoking)
Outcomes	Sustained abstinence at 12m Validation: CO < 9ppm. Saliva cotinine at 6m only
Notes	Discussion section includes some cost-benefit analysis.
Allocation concealment	B – Unclear

Study	**Emmons 1999**
Methods	Country: USA Setting: 26 worksites in RI and SE Mass (Brown University based). Only 22 sites completed the trial. Design: randomized matched pair, following a cohort over 3 yrs. Randomization process not described
Participants	22 worksites, and 2055 participants who completed all surveys. No demographic differences between intervention and control groups. Smoking prevalence 28% across both groups.
Interventions	1. Intervention sites: As with Working Well Trial (Sorensen 1996), but including physical activity; a combination of individual and environmental programmes, including space, showers, equipment and discounted membership of fitness facilities. 2. Control sites: Minimal care: Could offer 2 S-H smoking cessation programmes and 1 each on nutrition and physical activity.
Outcomes	Self-reported abstinence at 3 yrs for 6m prior to assessment, and 7-day PP No biochemical validation used. Secondary outcome: movement through stages of change
Notes	This trial was added to the 2005 update This is the Working Healthy Projected, nested within the Working Well trial
Allocation concealment	B – Unclear

Study	**Erfurt 1991**
Methods	Country: USA Setting: 4 General Motors worksites, Michigan Design: Cluster randomization by worksite
Participants	Random sample of 400-500 employees screened at baseline and followed up 3 yrs later. Predominantly male, white, blue collar. 41-45% smoked at baseline, but in the rescreened sample only 41% in site 3 and 36% in site 4 smoked at baseline
Interventions	Smoking, high blood pressure & obesity targetted. 1 worksite was allocated to each of 4 conditions: 1. Wellness screening; identify risks & referral 2. As 1. + media, programme sign-up campaigns and classes 3. As 1. + media, program sign-up campaigns, menu of interventions including guided self-help, group or individual counselling + follow up 4. As 3 + follow-up counselling + Plant Organization including peer support, aimed at reducing relapse. All sites initiated no smoking areas during the period.
Outcomes	Self-reported smoking status
Notes	Quit rates were calculated by combining 1985 smokers and ex-smokers (i.e. at risk of relapse)as the denominator. If the calculation is based only on current smokers at 1985 compared with 1988 quitters, the results do not reach statistical significance. Reduced prevalence at all 4 sites coincided with the setting-up of restrictive policies in each site.

Characteristics of included studies (*Continued*)

Allocation concealment	B – Unclear

Study	**Frank 1986**
Methods	Country: USA Recruitment: University of Missouri employees Evaluation: determine the effects of various amounts of hypnosis and hypnosis plus behavioural sessions Design: RCT, no details of randomization method
Participants	63 smokers Female: 62% Median education: 16 yrs Median income: US$27,000 Participation rate: not reported
Interventions	In the initial study, 48 subjects of the total (N = 63) used, were assigned to one of three treatments: 1. four hypnotherapy (HYP) sessions + booster 2. 2 HYP sessions 3. 2 HYP + 2 behavioural sessions + booster. A follow-up group was later recruited composed of 15 subjects who received 4 HYP + booster with less time between sessions.
Outcomes	Self-reported cessation at 3m and 6m, with saliva thiocyanate confirmation at 3m only.
Notes	
Allocation concealment	B – Unclear

Study	**Glasgow 1984**
Methods	Country:USA Recruitment: telephone company employees Design: RCT, no details of randomization method
Participants	36 employees and spouses (25 women and 11 men) 69% female. Av. age: 37 Smoked: average of 18 yrs and on average 30 cpd Participation rate: not reported
Interventions	Group therapy Three groups: 1. abrupt reduction 2. gradual reduction 3. gradual reduction with feedback pre- and two post-tests; 7 weekly meetings with goals of 50% reduction per week in abrupt group; 25% per week in gradual group; 25% per week with graphs of daily nicotine intake for gradual/feedback group.
Outcomes	Self report of smoking status and consumption with CO validation and cigarette butt weight.
Notes	Analyses were conducted on non-abstinent subjects at end of treatment, to assess reduction efficacy. Outcomes included changes in nicotine content (brand smoked), amount of cigarette smoked, and number of cigarettes smoked.
Allocation concealment	B – Unclear

Study	**Glasgow 1986**
Methods	Country:USA Recruitment: VA hospital, savings and loan association, and a health insurance agency employee volunteers Design: RCT, no details of randomization procedure
Participants	29 adult cigarette smokers 69% female. Av. age 33.5 Average 25 cpd Fagerstrom score 5.7, indicating moderate levels of tobacco dependence.

Characteristics of included studies (*Continued*)

	Participation rate: not reported
Interventions	1. Basic program (BP): subjects participated in 6 weekly group meetings- focused on making reductions in the no. of cpd and reductions in nicotine content. Midway through the programme subjects given the option of either complete cessation or reducing the percentage of each cigarette smoked. 2. BP and social support (SS): the same treatment as subjects in the BP group; in addition, each BP plus SS subject selected a partner who provided support and encouragement during non-work hours.
Outcomes	Self reports, examination and weighing of saved cigarette. Butts and 2 biochemical measures of smoking exposure, CO and saliva thiocyanate.
Notes	Outcomes included changes in nicotine content (brand smoked), amount of cigarette smoked, and number of cigarettes smoked. The influence of social support, or lack of it, was also assessed.
Allocation concealment	B – Unclear

Study	**Glasgow 1993**
Methods	Country: USA Recruitment: 19 worksites in Oregon. Design: Cluster randomized RCT
Participants	Worksites from 140-600 employees. Smoking prevalence of 21-22%; Av age 40-41. 63% female. 474 in Incentives (I) Group, 623 in No incentives (NI) Group
Interventions	Company steering groups ran the programmes 1. I Group members were paid US$10 for each verified abstinent month, up to 10m, + monthly and end-of-programme lotteries. There was also a buddy scheme, with cash prizes to helpers. 2. NI Group operated their normal company policy, which usually restricted but didn't ban smoking
Outcomes	Cessation rates at 12m and 2 yrs, verified by CO and salivary cotinine
Notes	Analysis was at both worksite and individual level.
Allocation concealment	B – Unclear

Study	**Glasgow 1995**
Methods	Country: USA Setting: 26 worksites in Oregon Design: Cluster randomized trial
Participants	26 heterogeneous worksites in Oregon with between 125 and 750 employees - an average of 247. Participation rate: at baseline, early intervention rate was 38% and delayed intervention 58%. At 2 yr follow up, early intervention rate was 40% and delayed intervention was 57%
Interventions	Take Heart Project, focusing on diet and smoking Early intervention (multifaceted programme consisting of employee steering committee and a menu approach to conducting key intervention activities tailored to each site) vs. delayed but similar intervention
Outcomes	Self-reported smoking cessation
Notes	This is the Take Heart worksite wellness program. Other outcomes included dietary intake and cholesterol levels
Allocation concealment	B – Unclear

Study	**Gomel 1993a**
Methods	Country: Australia Setting: 28 Sydney ambulance stations Design: Cluster-randomized RCT. method of randomization not described.
Participants	431 participants (88%) in 28 stations. av age 32 yrs. 128 smokers, mean cpd 17.9.

Characteristics of included studies (*Continued*)

Interventions	1. Health Risk Assessment (HRA): (10 stations, 40 smokers): Measurement of BMI, % body fat, BP, cholesterol, smoking status, aerobic capacity. Feedback given, with high risk people referred to family GP. This minimal 30 minute intervention was the control group. 2. Risk Factor Education (RFE): (8 stations, 28 smokers): Same measures as HRA, + advice through manual and videos in a 50 minute session. 3. Behavioural Counselling (BC): (6 stations, 30 smokers). Same as RFE group, + up to 6 counselling sessions (averaged 3) over 10w, + staged change manual. 4. Behavioural Counselling + Incentives (BCI): (4 stations, 30 smokers). As RFE, + manual and goal-setting and follow-up counselling (average 2 hrs). Also lottery draw for A$40 voucher if interim targets achieved, and final prize of A$1000 for highest achieving station at 6m.
Outcomes	Baseline, 3, 6 and 12m assessments. PP abstinence at 12m, validated by serum cotinine.
Notes	This trial was added to the 2005 update Fewer stations and participants were allocated to the more intensive interventions (BC and BCI) because of cost. Some contamination between conditions reported.
Allocation concealment	B – Unclear

Study	**Gottlieb 1990b**
Methods	Country: USA Setting: Texas Department of Human Services Design: Observational study, 1 group, 1 pre- and 2 post-tests
Participants	1764 employees 3m prior 1395 at 1m post 1158 at 6m post implementation
Interventions	Evaluated the impact of introducing a smoking ban, with availability of smoking control programmes.
Outcomes	Self-reported smoking status, daily cigarette consumption, and daily cigarette consumption at work
Notes	Other outcomes included perception of being bothered by smoke, and level of interaction between smokers and nonsmokers
Allocation concealment	C – Inadequate

Study	**Hennrikus 2002**
Methods	Country: USA Setting: 24 worksites in and around St Paul. No overlap with the Healthy Worker Project. Design: Randomized 2 x 3 factorial design, with smokers followed up at 12m and 24m. 85.5% responded to 12m survey, and 81.7% to 24m survey
Participants	2402 smokers on 24 sites, four sites randomized to each of the 6 conditions. There were significant differences in demographic characteristics between sites. Smoking prevalence ranged from 10.7% to 37.2%
Interventions	The three programme formats were group counselling, telephone counselling or a choice of group or phone. The programmes were then offered with and without incentives (=6). The incentive site smokers received US$10 for signing up to a programme, and US$20 for near or full completion. They were also offered US$20 for 30 days cessation, and were then entered into a prize draw for a US$500 cash prize.
Outcomes	Rates of recruitment to the programmes, and 7-day smoking PP at 12m and 24m follow up. Validation was by self report, confirmed by family member or friend. A sample of 188 quitters at 24m were asked to supply a saliva sample (128 complied). Winners of the prize draw could only claim their prizes by verifying abstinence with salivary cotinine.
Notes	This is the SUCCESS Project.

Characteristics of included studies (*Continued*)

	Significant differences between worksites meant that several covariates had to be controlled for in the analyses. Other outcomes included comparing quit rates of registrants for the programmes with non-registrants
Allocation concealment	B – Unclear

Study	**Hudzinski 1990**
Methods	Country: USA Setting: Ochsner Medical Institutions Design: Observational study, 1 pre- and two post-tests
Participants	1964 employees 6m pre-ban, 1608 at 6m post-ban, and 684 at 12m post-ban. 71% female at 12m
Interventions	Evaluation of a smoking ban, with an established 20 yr continuous cessation programme of group support and NRT
Outcomes	Self-reported unverified smoking status, and daily cigarette consumption
Notes	Other outcomes included being bothered by smoke, and the acceptability of the policy
Allocation concealment	C – Inadequate

Study	**Hymowitz 1991**
Methods	Country: USA Setting: 6 white-collar worksites. No worksite had a formal no-smoking policy or ongoing smoking cessation activities. Design: Cluster randomized trial
Participants	6 worksites ranging in size from 950 to 3,300 employees. 25% smoking prevalence. 252 employees aged 21 and older participated, representing only a small portion of the total number of smokers at each worksite. 62% female. Av. age 42.3 >60% White
Interventions	1. Full programme (I): volunteers participated in a 5w training programme for quit-smoking group leaders, and received additional training ,support, and how-to manuals to carry out a protocol for health education and sitewide intervention activities, as well as for the implementation of worksite smoking policies. 2. Group-only (C): volunteers participated in the training programme for group leaders, but did not carry out the protocols for health education and smoking policies
Outcomes	Self-reported cessation at 12m Validation: expired air CO
Notes	Unit of randomization was worksite but unit of analysis was the individual.
Allocation concealment	B – Unclear

Study	**Jeffery 1988**
Methods	Country: USA Setting: faculty and staff of the University of Minnesota Design: RCT
Participants	59 volunteer smokers. Av age 36.8, female 64.5% Participation rate: 2%
Interventions	Self-help manual; optional education/counselling; financial contracts of US$5 to US$25 bi-weekly. One group aimed at cessation, the other at reduction or cessation.
Outcomes	Self-reported cessation rate immediately post-treatment and at 6m, biochemically validated at both points
Notes	15,000 staff members were approached to join the study. Of 137 smokers expressing an interest in the programme, only 59 actually signed up to it.

Characteristics of included studies (*Continued*)

Allocation concealment	B – Unclear

Study	**Jeffery 1993**
Methods	Country: USA Setting: 32 worksites in the Minneapolis-St Paul area Design: Cluster randomized trial. a nested observational study assessed effects of introducing smoking restrictions
Participants	32 worksites. Smoking prevalence 25%, av age 38. Participation in smoking cessation classes 12%. Random sample of 200 employees at each site surveyed at baseline and at 2 yr follow up. In addition a further 200 sampled at 2 yrs, allowing both cohort and cross-sectional assessments of effect. 9 companies introduced more restrictive policies during course of intervention study
Interventions	Health promotion programme targetted weight and smoking. Cessation classes offered 4 times over 2 yrs. Included an incentive strategy: participants selected an amount to be deducted from pay cheque, which was refunded if quit Study also compared smoking prevalence and cigarette consumption in companies with and without a change in smoking restrictions over the course of the study
Outcomes	Self-reported smoking prevalence and cigarette consumption, confirmed by expired air CO
Notes	This is the Healthy Worker Project. Other outcomes included weight control, BMI and a separate report on illness-related absenteeism
Allocation concealment	B – Unclear

Study	**Kadowaki 2000**
Methods	Country: Japan Setting single factory, 542 employees Design: RCT, allocation by random number
Participants	263 male smokers Av. age 34, av cpd 19
Interventions	1. Physician advice, CO feedback, cessation contract, self-help materials. follow up over 5m. Smoking Cessation Marathon during month 4 2. Delayed intervention control
Outcomes	Abstinence for > 1m at 5m (also 12m follow up but by then control group also treated) Validation: CO < 9ppm, plus urine test at 12m
Notes	All male smokers (62.9%) were entered compulsorily into the trial. Female smokers (3.4%) were not included. Other outcomes included smoking reduction, willingness to quit and predictors of success.
Allocation concealment	A – Adequate

Study	**Klesges 1987**
Methods	Country: USA Recruitment: Employees from 4 worksites in Fargo, North Dakota and 4 in Eugene, Oregon Design: Cluster (worksite) randomisation but individuals the unit of analysis. Two (competition/nocompetition) by two (relapse prevention training/no relapse prevention training) factorial design
Participants	Participants: 136 smokers from 8 worksites. Site size ranged from 50 - 380 Av. age: 38. av cpd: 28 Smoked: average 19 years Participation rate: not reported - estimated 28% across all sites

Characteristics of included studies (*Continued*)

Interventions	Evaluates the incremental effectiveness of competition and relapse prevention training in the context of a multicomponent cessation programme Multicomponent cognitive behavioural programme for 6 weekly sessions; within-site competition with weekly feedback on a visible barometer and monetary prizes at programme completion and at 6m; relapse prevention booster sessions were held at 1m and 2m intervals following the programme.
Outcomes	Cessation at 6m Validation: CO and saliva thiocyanate
Notes	The competition incentive was conducted within each intervention worksite, rather than between the worksites. Other outcomes included relapse prevention, smoking reduction, nicotine levels (brands), % of cigarette smoked.
Allocation concealment	B – Unclear

Study	**Kornitzer 1980**
Methods	Country: Belgium Setting: 30 factories Design: Cluster-randomized matched pair design RCT. Randomization method not described.
Participants	Participants: 16,230 men aged 40-59 (83.7% of eligible men)
Interventions	1. Intervention: All screened for height, weight, cholesterol, smoking, BP, ECG, personality and psychological testing. Top 20% at risk counted as the 'high risk' group, who received 6-monthly individual physician counselling. Complete cessation was encouraged, but pipes or cigars allowed if necessary. Advice booklet also supplied. All smokers of 5 or more cpd received written advice to quit.. Environmental components included anti-smoking posters and a factory conference on dangers of tobacco. 2. Control: a 10% sample screened at baseline were followed up; the 20% of this sample with the highest risk score were also identified as the control 'high risk' subset, to be analyzed separately. The 'Design and Methodology' paper reports that all eligible men in the control factories all received an ECG, but this is not mentioned in later reports.
Outcomes	7-day PP at 2 yrs follow up. 5% sample of intervention group (327 men) were tested, + all of the original high-risk group (1268). The 10% random sample control subjects were reviewed after 2 yrs, including the 20% high risk subgroup (202 men). Self report only, without biochemical verification
Notes	This trial was added to the 2005 update This is the Belgian Heart Disease Prevention Project
Allocation concealment	B – Unclear

Study	**Kornitzer 1987**
Methods	Country: Belgium Recruitment: industrial worksite primary care clinic Design: RCT, no details of randomization method
Participants	199 adult male smokers (av cpd 24-5)
Interventions	1. Nicotine gum (4 mg) for at least 3m 2. Nicotine gum (2 mg) for same time period. Minimal physician support
Outcomes	PP abstinence at 12m Validation: cotinine and carboxyhaemaglobin in a sub-sample
Notes	Blinding was broken at 3m, and participants were free to choose their dosage of nicotine gum. Results were stratified by Fagerstrom score.

Characteristics of included studies (*Continued*)

Allocation concealment	C – Inadequate

Study	**Kornitzer 1995**
Methods	Country: Belgium Recruitment: Worksite Design: RCT, computer-generated list
Participants	374 volunteers male and female, age > 20 yrs. No. of cigarettes: > 10 day for > 3 years
Interventions	1.Active patch and active gum (2mg as required) 2.Active patch and placebo gum 3.Placebo patch and placebo gum High level of adjunct support.
Outcomes	Sustained abstinence at 12m Validation: baseline salivary cotinine, and expired CO < 10 ppm at each follow up
Notes	Other outcomes included dermatological and systemic adverse effects, and time to relapse.
Allocation concealment	A – Adequate

Study	**Lang 2000**
Methods	Country: France Setting: Annual health check in one large gas and electric company Design: Cluster randomization by site physician, physician as unit of analysis
Participants	28 site physicians covering 1269 smokers and 2614 nonsmokers Av. age: 38, 82% male Av cpd: 14
Interventions	1. Low intensity intervention: Physician advice 5-10 mins incl. leaflets 2. High intensity: as 1. plus quit date, moral contract, follow-up phone call, and 2nd visit
Outcomes	Abstinence (self-reported) for at least 6m at 1 yr follow up Validation: CO measurement in subgroup
Notes	Other outcomes included BMI and depression score
Allocation concealment	B – Unclear

Study	**Li 1984**
Methods	Country: USA Setting: naval shipyard Recruitment: Smokers identified at worksite screening (unselected) Design: RCT, no details of method
Participants	871 male asbestos-exposed smokers Av cpd: 24-26
Interventions	1.Advice from occupational physician; minimal warning, results of pulmonary function tests, leaflets 2. As group 1 plus behavioural counselling
Outcomes	Sustained abstinence at 11m Validation: expired CO
Notes	Other outcomes included stratification by lung function, reduction by continuing smokers, predictors of successful quitting and characteristics of smokers refusing to participate in the study. Randomization ratio (method not explained) changed halfway through the study from 3:1 to 1:1.

Characteristics of included studies (*Continued*)

	The study found wide variation in implementation of the study procedure by physicians
Allocation concealment	C – Inadequate

Study	**Malott 1984**
Methods	Country: USA Setting: volunteers from telephone company (8) and a medical clinic (16) Design: RCT, no details of randomization method
Participants	24 participants av age 34, had smoked for an average of 16 years, and av cpd 24. Average score on the Fagerstrom NTQ 6.0 Participation rate: not reported
Interventions	Group therapy 1. controlled smoking 2. controlled smoking plus partner support
Outcomes	Self-monitoring records, laboratory analyses of spent cigarette butts, and CO
Notes	Other outcomes included nicotine levels (brand smoked), smoking reduction, CO levels in continuing smokers and % of cigarette smoked.
Allocation concealment	B – Unclear

Study	**Mayo 1990**
Methods	Country: USA Setting: Colorado State Hospital, a psychiatric hospital in Pueblo, Co. Design: Observational study, 1 pre- and 2 post-ban tests
Participants	1031 employees at 1m pre-ban, 762 at 3m post-ban, and 745 at 12m post-ban. 73 smokers completed all 3 surveys
Interventions	Evaluation of a smoking ban, with no cessation programme. The ban was only 80% effective, as patients smoked in several areas.
Outcomes	Self-reported unverified smoking status, plus daily cigarette consumption.
Notes	Other outcomes included perceived exposure to ETS, and acceptability to staff of the restrictive policy. Inpatients at the hospital were allowed to continue smoking, compromising the perception of reduced ETS
Allocation concealment	C – Inadequate

Study	**Millar 1988**
Methods	Country: Canada Setting: Health and Welfare public service employees in the National Capital region. Design: Observational study, pre- and post-restriction tests
Participants	4200 employees were polled, of whom 62% responded to the pre-policy survey, and 53% to the follow-up survey. No demographic detail was reported.
Interventions	Evaluation of a restrictive smoking policy, with smoking allowed only in designated areas. The policy was developed with employee consensus and suggestions, and was implemented in conjunction with 2 self-help cessation programmes, 'Butt Out' and 'Time to Quit', run by public service health nurses.
Outcomes	Self-reported smoking prevalence, number of cigarettes smoked per day, number smoked at work, and sustained quit rates for a cohort of 200 quit attempters.
Notes	Other outcomes included perceptions of being bothered by smoke, levels of respirable suspended particulates, and measures of perceived compliance with the restrictions.

	The smoking cessation programme is not reported here, as it was not randomized or controlled.
Allocation concealment	C – Inadequate

Study	**Mullooly 1990**
Methods	Country: USA Setting: 11 worksites of the NW region of the Kaiser-Permanente Medical Program. Design: Observational study, 3 or more pre-ban and 2 post-ban tests, with individual as unit of analysis
Participants	1. 1985 ban sites ranged from 409 employees (1976) to1074 (1987). 2. 1986 ban sites ranged from 820 employees (1976) to 1219 (1987)
Interventions	Evaluation of a smoking ban, with no cessation programme, and designated smoking areas, outdoors and where patients could smoke
Outcomes	Self-reported unverified smoking status, daily cigarette consumption, number of quit attempts, perception of being bothered by other people's smoke
Notes	Unit of analysis was the individual. Other outcomes included perception of being bothered by ETS, acceptability of the ban, perception of increased work efficiency, intention to quit.
Allocation concealment	C – Inadequate

Study	**Nilsson 2001**
Methods	Country: Sweden Recruitment: 4 public sector worksites (568 employees) in Helsinborg. Design: RCT Randomization: method of allocation not stated.
Participants	Of 128 at-risk workers invited, 60/65 randomized to the intervention group attended for baseline assessment, and 53/63 from the control group. Mean age was 49.7, 61% female.
Interventions	1. Intervention group received 16 group sessions a year, as well as individual counselling by a nurse. Sessions included lectures, discussions, video sessions and outdoor activities. 2. Control group received standard written and oral advice about cardiovascular risk factors at the start of the intervention, and nothing thereafter.
Outcomes	PP at 12m and 18m. No biochemical validation.
Notes	Smoking was only one of several risk factors targeted, including BMI, BP,heart rate, low-density lipoprotein and cholesterol. Group sessions were held in working hours but away from the worksites.
Allocation concealment	B – Unclear

Study	**Omenn 1988**
Methods	Country: USA Recruitment: Single worksite (13,000 workers, 9 employers) Randomization: by nurses at aid stations using randomized assignment lists generated by research centre, within preference for format.
Participants	159 smokers (av. age 43, 66% male, av.cpd 25) with preference for group programme or no preference. 243 smokers with a preference for self help randomized to 3 different S-H programmes Groups lead by instructors trained in both programmes. Participation rate: 11%
Interventions	Group therapy preference: 1. Multiple Component programme. 3 sessions over 3w

Characteristics of included studies (*Continued*)

	2. Relapse Prevention programme. 6 sessions over 6w 3. Minimal Treatment programme. Self-help materials only. American Cancer Society's 22 page 'Quitter's Guide' 7-day plan. S-H preference: Same 3 programmes, all in manual form, with no group meetings.
Outcomes	Abstinence at 12m (single PP) Validation: saliva cotinine <= 35ng/ml
Notes	Group programmes were held away from worksite in non-work hours. 50% random sample of continuing smokers supplied salivary samples
Allocation concealment	A – Adequate

Study	**Rand 1989**
Methods	Country: USA Recruitment: Smoking volunteers employed at Francis Scott Key Medical Center, Baltimore. Design: RCT, no randomization detail
Participants	47 subjects who completed 5 days verified abstinence.
Interventions	1.Contingent payment for continued abstinence + frequent monitoring (n = 17) 2. Non-contingent payment for abstinence + frequent monitoring (n = 16) 3. Non-contingent payment, infrequent monitoring (n = 14)
Outcomes	Quit rate at 6m, confirmed by CO validation
Notes	Subjects had received a minimal cessation programme, i.e. a 15-minute talk and a booklet, with no skills training in cessation or relapse prevention.
Allocation concealment	B – Unclear

Study	**Razavi 1999**
Methods	Country: Belgium Recruitment: workplace volunteers Design: RCT by company, using random numbers and blinded list
Participants	344 quitters, abstinent for at least 1m at end of 3m X 7 cessation programme including group therapy and NRT. 38% female, av age 39.
Interventions	1. Relapse Prevention (RP). 10 sessions inc group discussion and role play led by professional counsellor 2. RP. 10 sessions of group discussion led by former smokers. 3. No RP
Outcomes	Abstinence for 9m from start of RP programme. Validation by expired CO < 10ppm and urinary cotinine <= 317ug/ml.(Rates for CO and self report alone also reported; higher than for doubly validated rates)
Notes	All participants for this study had achieved abstinence after a 3m group and NRT programme. This is a relapse prevention study, rather than cessation. Other outcomes include predictors of sustained abstinence, weight gain.
Allocation concealment	A – Adequate

Study	**Rodriguez 2003**
Methods	Country: Spain Setting: 1 transport company (mostly bus drivers) and 2 electrical utility worksites (mostly clerical) in Bilbao. Design: Open RCT, with randomization by sealed opaque envelopes and computer-generated random lists

Characteristics of included studies (*Continued*)

Participants	218 participants randomized to intervention (115) and control (103). All had physical check up, Fagerstrom NTQ, lab tests and ECG at baseline
Interventions	1. Intervention: 5-8 mins structured individual counselling on smoking cessation at baseline by occupational physician, + further contacts at 2 days, 15 days and 3m. Grade I (Fagerstrom score < 5) counselling only. Grade II (Fagerstrom score 5-7) 8 wks x14 mg nicotine patches. Grade III (Fagerstrom score > 7) 4 wks x 21 mg, 4wks x 14mg, 4wks x 7mg. Lower grade interventions could be upgraded if necessary. Participants kept records of progress, withdrawal symptoms, adverse events; weight and tobacco consumption were checked at specified intervals. 2. Control: minimal (30-60 secs) sporadic unstructured advice, usually at annual medical check up
Outcomes	Continuous abstinence (7 day PP at each assessment) at 12m. Validated at each assessment by expired CO <= 10ppm
Notes	This trial was added to the 2005 update Secondary outcomes were: change in tobacco withdrawal symptoms, and weight changes.
Allocation concealment	A – Adequate

Study	**Shi 1992**
Methods	Country: USA Setting: 9 Pacific Gas and Electric worksites, allocated to 4 levels of intervention. Design: Quasi-experimental, random assignment of worksites. Sites were blinded to other intervention conditions.
Participants	2887 workers across 9 sites at baseline HRA survey (69% of eligibles). At 2 yr follow up 1998 (48%) were surveyed. Cross-sectional, not cohort surveys. > 40% of participants were manual workers, 25-31% clerical, 15-21% managerial and 12-16% technical staff.. 74-79% male, > 70% aged 30-49.
Interventions	1. (3 sites, 1372 participants): HRA (height, weight, smoking, BP, cholesterol, HDL levels) at start and end of programme, + a bi-monthly health newsletter (counts as control group) 2. (2 sites, 1083 participants): As 1, + health resources centre and free self-care booklets. 3. (2 sites, 1016 participants) As 2, + behaviour change workshops and a divisional HealthWise social support team. 4. (2 sites, 693 participants): As 3, + case management programme for high-risk participants (the 15% with the highest risk scores) and an environmental policy (space, smoking policies, incentives, health fairs)
Outcomes	Smoking prevalence at 2 yr follow up in all four intervention groups. Self-report 'current smoker' at HRA; no biochemical confirmation
Notes	This trial was added to the 2005 update This is the HealthWise Stepped Intervention Study (HSIS). Level 4 sites were pre-selected by PG&E management (non-random) and were significantly smaller than the other levels, reflecting the expense of the Level 4 interventions
Allocation concealment	C – Inadequate

Study	**Shimizu 1999**
Methods	Country: Japan Setting: Omihachiman city office Design: RCT
Participants	53 volunteer smokers
Interventions	1. Intervention group received intensive education (i.e. the effect of smoking on health, the beneficial aspects of quitting smoking, how to stop smoking and how to deal with the withdrawal symptoms) for 5m, group lectures (twice) and individual counselling (three times). 2. Control group had no special treatment for 1st 5m

Characteristics of included studies (*Continued*)

Outcomes	Self-reported and validated using expired air CO concentration.
Notes	Other outcomes included predictors of cessation success. Data were derived from abstract only
Allocation concealment	B – Unclear

Study	**Sorensen 1993**
Methods	Country: USA Setting: 8 worksites in Bloomington, Minnesota Design: Cluster randomized trial.
Participants	Intervention worksites (I): 1885 workers, Comparison sites (C): 1479 workers. 39% smoked at baseline in I and 31% in C worksites Participation rate: 12% of smokers (range 8-29% by site); 3.7% of nonsmokers participated in classes to assist quitters.
Interventions	The 3m intervention included consultation for employers on the adoption of a non-smoking policy, training for nonsmokers to provide assistance to smokers attempting to quit, and cessation classes for smokers
Outcomes	Quit rate, self-reported (an attempt was made to collect saliva samples for analysis for cotinine). Baseline survey of all employees was conducted 9m before intervention, companies then randomized, then 3m intervention period, 1m and 6m after the completion of intervention. Evaluation period: 6m
Notes	Analyses were by individuals for some outcomes, although randomization was by worksite. The study area had been an intervention site for the Minnesota Heart Health Program, and outcomes may not be generalizable. Other outcomes included nonsmokers' support for quit attempts, co-worker requests not to smoke, co-workers non-smoking, number of quit attempts.
Allocation concealment	B – Unclear

Study	**Sorensen 1996**
Methods	Country: USA Setting: 108 worksites in 16 US states Design: Randomized matched-pair trial, using cross-sectional surveys at baseline and 2 yr follow up
Participants	108 worksites with over 28,000 employees (49 - 1700 workers per site). Participation rate 72%, Av age 41, 77% male, 92% white. Only 3 of the 4 study centres (84 sites) measured changes in smoking, as the 4th centre sites (Florida) had smoking bans already in place.
Interventions	Each workplace had an employee as co-ordinator, and an employee advisory board. 1) Individual core interventions: Process included a kickoff event, interactive activities, posters and brochures, self assessments, self-help materials, campaigns and contests, and direct education through classes and groups. 2) Environmental core interventions: Consultation on smoking policy, changes in cafeteria and vending machine food, and additional nutritional education. Control sites had results of employee survey, and in some cases an optional minimal intervention of posters and newsletters.
Outcomes	Self-reported smoking cessation, without biochemical validation. 6m abstinence at follow up, smoking prevalence.
Notes	This is the Working Well Trial. Randomization and analysis were both based on worksite. Other outcomes were dietary fat reduction, fibre intake and fruit and vegetable consumption. Some control sites had minimal interventions such as posters and brochures.

	The Working Well trial generated a nested cohort study, the WellWorks Trial, which examined dietary and smoking changes stratified by job type at the Massachusets worksites. See Sorensen 1998 reference.
Allocation concealment	B – Unclear

Study	**Sorensen 1998**
Methods	Country: USA Setting: 24 mainly manufacturing worksites in Massachusets, randomized into 12 pairs, and all thought to be using known or suspected carcinogens. Randomization was by worksite, but analysis was by individual. Analysis in this paper was cohort-based
Participants	5914 (61%) of sampled employees responded at baseline, and 5406 (62%) at 2 yr follow up. The cohort who responded to both surveys was 2658 employees.
Interventions	3 elements of intervention: 1) Joint worker-management programme planning and implementation 2) Consultation by project staff with management on environmental changes, inc tobacco control policies, healthy foods, occupational hazard reduction 3) Health education programs targeting individual behaviours in the risk factor areas.
Outcomes	Self-reported abstinence for 6m before final survey. No biochemical validation
Notes	The WellWorks Study is a nested component of the Working Well trial, but, unlike that trial, attempted to integrate health promotion and health protection interventions, and is therefore assessed separately. Other outcomes included fat, fibre and fruit and vegetable consumption, and differences between blue- and white-collar workers in all outcomes.
Allocation concealment	B – Unclear

Study	**Sorensen 2002**
Methods	Country: USA Setting: 15 manufacturing sites, probably handling hazardous chemicals, in Massachusetts. Design: RCT, randomized by worksite, but analysed by individual employee.
Participants	9019 employees (80%) across 15 sites. Mean workforce size 741 employees. Responders in the control groups were younger, more likely to be female, less educated, less likely to be white, and less likely to be hourly-paid rather than salaried.
Interventions	1. Control [8 sites] had Health Promotion (HP) intervention, i.e. consultation to management on tobacco control policies, catering and cafeteria policies, and programmes aimed at individuals, including self assessment with feedback, self-help activities, contests, demonstrations and displays, opportunities to try behaviours and goals, and group discussions. 2. Experimental Group [7 sites] (HP/OHS= health promotion with occupational health and safety) had the same elements as the Control sites, plus management recommendations to reduce occupational hazard exposure. For individuals, occupational health and safety training was added to the tobacco and nutritional elements of the control programme.
Outcomes	Quit rates (PP) at 6m, reported by cross-sectional survey and for the smoking cohort. Self report only, no beiochemical validation
Notes	This is the Wellworks-2 Trial, targeting particularly blue collar workers. Analyases were cross-sectional and cohort Other primary outcomes were nutrition and perceived exposure to occupational hazards.
Allocation concealment	B – Unclear

Study	**Stave 1991**
Methods	Country: USA

Characteristics of included studies (*Continued*)

	Setting: employees of Duke University Medical Center (intervention) and University campus (comparison) Design: Quasi-experimental, cross-sectional survey, 2 post-tests
Participants	800 (400 per site) at 3m post-test, 152 (80, 72 per site) at 15m post-implementation
Interventions	Evaluated the impact of a smokefree policy, a smoking cessation and health education programme.
Outcomes	Self-reported current and retrospective smoking status with CO validation
Notes	Other outcomes included number of quit attempts, acceptability of the policy, levels of compliance
Allocation concealment	C – Inadequate

Study	**Stillman 1990**
Methods	Country: USA Setting: Johns Hopkins Medical Institutions Design: Observational study, 1ne group, 1 pre- and 2 post-tests
Participants	6050 (69.2%) employees at 6m prior to policy 3423 (76.4%)at 6m post-policy
Interventions	Evaluated the impact of a smoking ban, with availability of smoking control programmes, and preparatory programmes of screening, education, appraisal and CO monitoring
Outcomes	Self-reported smoking status and daily cigarette consumption
Notes	Other outcomes included environmental fires, ETS, atmospheric nicotine vapour, cigarettes smoked per day, cigarettes smoked in working hours, butt counts.
Allocation concealment	C – Inadequate

Study	**Sutton 1987**
Methods	Country: UK Recruitment: Worksite primary care clinic in UK retail company (employees 3,253) Design: RCT, no details of method
Participants	270 participants invited out of 334 who expressed an interest Av age:34, 70% F av cpd 15.5
Interventions	1. Nicotine gum (2 mg) at least 4 boxes, duration not stated. (172 people) 2. Non-intervention control group (no placebo) of 64 continuing smokers Low level of support
Outcomes	Sustained abstinence at 12m; Validation: expired CO
Notes	Slight contamination of intervention group, as 4 control group members were moved at their own request into the intervention group.
Allocation concealment	C – Inadequate

Study	**Sutton 1988a**
Methods	Country: UK Setting: Company A with occupational health program near London Design: RCT: cessation motivation vs seat belt video groups
Participants	77 in videotape conditions (33 for smoking video, 44 for seatbelts video), 55 non-participant smokers (no-treatment control group).
Interventions	Trial was described to company as a 'health information programme', and was open to all employees, whether or not they smoked.

Characteristics of included studies (*Continued*)

	1. 25-minute video 'Dying for a Fag' (DFF) plus a cessation booklet, the Heatth Education Council's 'The smoker's guide to non-smoking' 2. 25-minute video on seatbelt use, + a leaflet about seatbelts 3. Smokers who chose not to participate - no videos or information
Outcomes	Self-reported PP smoking cessation at 3m and 1yr with CO validation < 10 ppm
Notes	Although all 4 trials (a-d) are of similar design, and are reported in a single paper, we have treated them here as four separate RCTs. Cash incentives were offered at baseline and at 12m follow up to boost questionnaire response rates. The authors also present a 4-study pooled analysis, which failed to detect signficant differences in cessation rates.
Allocation concealment	B – Unclear

Study	**Sutton 1988b**
Methods	Country: UK Setting: Company B with occupational health program near London Design: RCT: cessation motivation vs cessation motivation plus confidence boosting vs. political aspects of tobacco video groups
Participants	150 in videotape conditions (46, 50 and 54 in the 3 groups), + 374 non-participant smokers
Interventions	Trial was described to company as a 'smoking education programme', and was open only to smokers. 1. 25-minute video 'Dying for a Fag' (DFF) plus a cessation booklet, the Heatth Education Council's 'The smoker's guide to non-smoking' 2. DFF with additional sequence to boost the confidence of those making a quit attempt (DFF+C) 3. 'Licence to Kill', on the political aspects of smoking (LTK). 4. Smokers who chose not to participate - no videos or information
Outcomes	Self-reported PP smoking cessation at 3m and 1yr with CO validation < 10 ppm
Notes	Cash incentives were offered at baseline and at 12m follow up to boost questionnaire response rates. The authors also present a 4 study pooled analysis, which failed to detect significant differences in cessation rates. Although the cessation rates appear to be significantly better in this study than in the other 3, the authors point out that follow up was around New Year, when many people try and stop anyway, and may also have been influenced by the concurrent BBC series 'So you want to stop smoking'
Allocation concealment	B – Unclear

Study	**Sutton 1988c**
Methods	Country: UK Setting: Company C with occupational health program near London Design: RCT : cessation motivation vs cessation motivation minus a gory sequence vs. advertising aspects of tobacco videotapes groups
Participants	197 in videotape conditions (56, 67 and 74 in the 3 groups) + 226 non-participant smokers
Interventions	Trial was described to company as a 'smoking education programme', and was open only to smokers. 1. 25-minute video 'Dying for a Fag' (DFF) plus a cessation booklet, the Heatth Education Council's 'The smoker's guide to non-smoking' 2. DFF with graphic 'shock' sequence about diseased lungs edited out, to lower fear element (DFF-G) 3. 'The Tobacco War', on the advertising aspects of smoking (TW). 4. Smokers who chose not to participate - no videos or information
Outcomes	Self-reported PP smoking cessation at 3m and 1yr with CO validation < 10 ppm
Notes	Cash incentives were offered at 12m follow up to boost questionnaire response rate. There were no differences between the video and non-participant groups in long-term abstinence .

	The authors also present a 4 study pooled analysis, which failed to detect signficant differences in cessation rates.
Allocation concealment	B – Unclear

Study	**Sutton 1988d**
Methods	Country: UK Setting: Company D with occupational health program near London Design: RCT: cessation motivation vs another cessation motivation vs. advertising aspects of tobacco videotapes groups
Participants	179 in videotape conditions (62, 59 and 58 in 3 groups) + 360 non-participant smokers
Interventions	Trial was described to company as a 'smoking education programme', and was open only to smokers. 1. 25-minute video 'Dying for a Fag' (DFF) plus a cessation booklet, the Heatth Education Council's 'The smoker's guide to non-smoking' 2. "Smoker's Luck", on a continuing smoker suffering from advanced smoking-related disease (SL) 3. 'The Tobacco War', on the advertising aspects of smoking (TW). 4. Smokers who chose not to participate - no videos or information
Outcomes	Self-reported PP smoking cessation at 3m and 1yr with CO validation < 10 ppm
Notes	There were no differences between the video and non-participants groups in long term abstinence. Cash incentives were offered at baseline and at 12-month follow-up to boost questionnaire response rates. The authors also present a 4 study pooled analysis, which failed to detect signficant differences in cessation rates.
Allocation concealment	B – Unclear

Study	**Sutton 1988e**
Methods	Country: UK Recruitment: Worksite primary care clinic (employees 3,253) Design: RCT, no details of method
Participants	161 adult smokers who were still smoking after 3m of a videotape smoking cessation programme. Av cpd 15-19
Interventions	1.Nicotine gum (2 mg) for up to 12w 2.Non-intervention control group (no placebo). Low level of support
Outcomes	Validated long-term abstinence at 12m Validation: expired CO
Notes	Participants are the non-quitters at 3m from Sutton 1988d 5/82 control subjects asked for and received treatment. One was a long-term abstainer, and is classed as a control group success.
Allocation concealment	C – Inadequate

Study	**Terazawa 2001**
Methods	Country: Japan Setting: Occupational health clinic Design: RCT; details of randomization not described
Participants	228 smokers, randomized to intervention (117) or control (111). Average age 39, av cpd 23; 50% had made previous quit attempts.
Interventions	Baseline questionnaire during routine health check up, with CO and urinary metabolites measured and reported back.

Characteristics of included studies (*Continued*)

	1. Intervention: Stage-matched counselling (15-20 mins) by trained nurses, + 4 follow-up phone calls for those prepared to set a quit date. 2. Control: baseline questionnaire and usual care.
Outcomes	Continuous abstinence at 6m and 12m. Validated by CO ?
Notes	This trial was added to the 2005 update 25 smokers in the intervention group set a quit date and received the follow-up calls. Data were derived from abstract only
Allocation concealment	B – Unclear

Study	**Tsushima 1991**
Methods	Country:USA Recruitment: Straub Hospital employees, Hawaii Design: Pre-test, post-test survey
Participants	887 employees (57%) interviewed 1m before a total smoking ban, and 824 (52%) interviewed after 1 yr of the policy. av age 39, 76% female.
Interventions	Total smoking ban in all parts of the hospital for all staff and most patients. No support programme offered
Outcomes	1. Smoking prevalence (not verified). 2. Attitudes to the no-smoking policy 3. Future intentions about smoking behaviour 4. Number of cigarettes smoked per day, and the number smoked during working hours
Notes	Other outcomes included acceptability of total ban, and intentions to quit or reduce cigarette consumption.
Allocation concealment	C – Inadequate

Study	**Willemsen 1998**
Methods	Country: Holland Setting: 4 work sites (chemical, telecommunication, public transport and local government) and 4 other similar worksites Design: cluster randomized trial
Participants	279 employees at intervention sites and 234 employees at comparison sites Average age: 41 years 75% male
Interventions	1. Comprehensive program (self-help manuals, group courses, a mass media campaign, smoking policies and a 2nd yr programme) 2. Minimal intervention (self-help manuals only).
Outcomes	Self-reported smoking cessation and saliva cotinine estimation
Notes	Analysis of light vs heavy smokers suggests greater efficacy among heavy smokers (P values not given). Other outcomes included relapse rates, the effectiveness of a 2nd yr programme.
Allocation concealment	B – Unclear

Study	**Windsor 1989**
Methods	Country: USA Recruitment: University of Alabama employees volunteering for a quit smoking programme Design: randomized trial, using sealed numbered envelopes containing computer-generated assignment prior to baseline interview.
Participants	378 smokers Av. age 37, av cpd 23-27

	Therapist: health visitor
Interventions	All groups received a 10 minute session of brief advice 1.+ S-H manuals 2. +S-H and another session of counselling (20-30 mins) with skills training, buddy selection and a contract 3.as 1. With monetary awards for cessation 4.as 2 with monetary rewards for cessation
Outcomes	Abstinence at 1 yr (sustained at 6w, 6m & 1 yr) Validation: saliva thiocyanate < 100 ng/ml at all follow ups
Notes	Other outcomes included some cost-benefit analysis, including efficacy of incentives..
Allocation concealment	A – Adequate

ALA: American Lung Association
av: average
BMI: body mass index
BP: blood pressure
CO: carbon monoxide
cpd: cigarettes per day
ETS: environmental tobacco smoke
h: hour
HDL: high density lipids
HRA: health risk assessment
inc: Including
I: intervention; C: control
m: month
NRT: nicotine replacement therapy
NTQ: nicotine tolerance quationnaire
PP: point prevalence
ppm: parts per million
RCT: randomized controlled trial
S-H: self help
vs: versus
w: week
yr: year (s)

Characteristics of excluded studies

Study	Reason for exclusion
Addley 2001	Observational study, no control worksites. Smoking was one of a number of lifestyle changes surveyed over a three-year period, by a follow-up postal survey six months after assessment.
Baile 1991	Follow-up only four months. Evaluated the impact of a hospital smoking ban with no report of cessation programmes.
Bertera 1990	Non randomised. Evaluated the relative efficacy and cost-effectiveness of a stop smoking clinic versus self-help kit in the workplace
Borland 1991b	Examined predictors of smoking cessation attempts not cessation rates after the introduction of workplace smoking bans.
Borland 1995	One group post-test only. Surveyed smokers two years after a total workplace ban.
Brenner 1992	Population-based survey, to assess the effects of workplace smoking bans and cessation rates, expressed as a quit ratio
Brenner 1994	One group, post-test only. Evaluated smoking regulations at the workplace and smoking behaviour in Southern Germany.

Brigham 1994	Follow-up for only four weeks. Examined the effects of a restricted worksite smoking ploicy on employees who smoke.
Broder 1993	Pre- and post-ban surveys on three buildings (137 workers), to assess air quality and physical symptoms of ETS. Prevalence was not a primary outcome, but was reported as unchanged between the two surveys
Bunger 2003	Description of a cardiovascular risk reduction intervention in a power plant; no control or comparison site
Burling 1994	Descriptive report of a computer-directed programme for smoking cessation treatment. Previous reported outcome data from a minimal intervention and intensive stop smoking treatment are presented.
Campbell 2000	Cross-sectional survey of 859 women in nine North Carolina worksites, to assess health behaviours, risks and desire to change behaviour. A population-based survey, with no control group or intervention.
Conrad 1996	Non-randomised. Evaluated exposure to a worksite health-promoting environment as an aid to smoking cessation.
Cooreman 1997	Eight years had lapsed between surveys. Evaluated the impact of a smoking ban in a large Paris hospital
Cornfeld 2002	Large cohort study, not a controlled intervention trial
Daughton 1992	One group, no pre-test . Evaluated the effect of a smoking ban with partially subsidised cessation programmes.
Dawley 1984	Non-randomised. Evaluation of a smoking cessation treatment programme of ten one-hour sessions.
Dawley 1993	Follow-up for only four months. A programme of smoking control in one company versus a smoking cessation class in a second company.
Eisner 1998	Outcome not smoking cessation but bartenders' respiratory health. Evaluated the respiratory health of bartenders before and after legislative prohibition of smoking in all bars and taverns by the state of California.
Emont 1992	Outcome not smoking cessation. Evaluated the effectiveness of incentives as an aid to recruitment.
Etter 1999	Follow-up for only four months. Evaluated a short-term impact of a University-based smoke-free campaign.
Farkas 1999	Non-workplace for part of study. Evaluated the association of household and workplace smoking restrictions with quit attempts, six month cessation and light smoking.
Farrelly 1999	Cross-sectional not pre-post-test. Estimated the impact of workplace smoking restrictions on the prevalence and intensity of smoking amomg all indoor workers.
Glasgow 1997	Data from a population-based survey of adult smokers who completed surveys in 1988 and 1993, as part of the COMMIT trial.
Gomel 1993b	Follow-up for only six weeks. Examined the short-term effects of a workplace smoking ban on indices of smoking, cigarette craving, stress and other health behaviours in 24 employees.
Gottlieb 1990a	Non-randomised. Three-stage study included a baseline survey, an assessment of the effects of competition on recruitment to a self-help cessation programme and examination of the outcome of the cessation programme.
Gritz 1988	Non-randomised. Evaluation of a self-help smoking cessation programme for registered nurses.
He 1997	Follow-up for only three weeks. Examined the effects of acupunture on smoking cessation or reduction for motivated smokers.
Heloma 2001	Nine Finnish worksites surveyed before and after legislation to restrict ETS; not a controlled trial
Helyer 1998	Non-randomised. Evaluated the effectiveness of a worksite smoking cessation programme in the military.
Hope 1999	Non-randomised study, with no control or comparison group, and short follow-up (timing not stated). Surveyed five workplaces before and after a one-year health promotion campaign, targeting mulitple health behaviours, including smoking. Primarily interested in gender and social class differences
Hudzinski 1994	Outcome was daily cigarette consumption, cessation rate not reported. Study was designed to assess changes in employee health, particularly weight gain and CO levels, and smoking behaviour.
Humerfelt 1998	Community-based, not workplace. Evaluated the effects of postal smoking cessation advice in smokers with asbestos exposure and /or reduced forced expiratory volume in one second.
Hunt 2003a	The SMART study; RCT, targeting employed adolescents rather than adults.

Hunt 2003b	Healthy Directions - Small Businesses study; RCT, but smoking cessation was not the target intervention, and was offered in both intervention and control sites (=24).
Izuno 1990	Non-randomised. Examined the factors critical to behaviour modification with respect to smoking cessation at worksites.
Jason 1990	Non randomised. A cessation programme with incentives and competition offered in one company, compared to a control company.
Kadowaki 2004	Ten-year Japanese programme of annual small-scale smoking cessation interventions; assessed at two months, but primary outcome was overall prevalence after ten years. Controlled trial, but not randomized.
Kinne 1993	Population-based telephone survey of 1228 employed adults to assess impact of worksite smoking policies.
Klesges 1986	Non-randomised. A smoking cessation programme offered in five companies, with and without competitions for participation and cessation.
Koffman 1998	Not a randomised study, as one of the three participating worksites refused to be randomised.
Kunitsuka 2002	Survey of post-intervention multiple lifestyle changes, including number of cigarettes smoked. No control group used.
Longo 1996	Not pre-post-test evaluation but post-ban quit ratio. Examined the impact of workplace smoking bans on smoking behaviour of employees.
Longo 2001	Not pre-post-test. Examined the long term impact of worplace smoking bans on employee smoking cessation and relapse.
Lowe 1987	Cessation was not an outcome of interest. Evaluated method of contact (phone vs letter) as an aid to recruitment.
Maheu 1989	Non-randomised. Two worksites offered a multi-component behavioural programme with nicotine gum. Additional competition in one site.
Matson-Koffman 1998	Non-randomised. Evaluated the effectiveness of a multi-component smoking cessation programme supplemented by incentives and team competitions.
McMahon 2001	Small non-randomised pilot study, based on stages of change model, to compare expert systems, group support and self-help manuals.
McMahon 2002	Happy Heart at Work programme; 10-yr evaluation, without a control group
Musich 2003	Survey of changes in risks among GM employees; not a controlled trial
Muto 1998	Non-randomised. Evaluated the effectiveness of a smoking cessation programme known as 'Smoke Busters'.
Nepps 1984	Non-randomised. Evaluation of a minimal contact smoking cessation programme at the worksite.
Nerin 2002	Evaluation of an anti-smoking programme, without a comparison worksite
Offord 1992	One group, post-test only. Evaluated the effect of a smoking ban, with no-cost nicotine dependence treatment.
Okamura 2004	Non-randomized controlled trial, combining restrictive policies and cessation programmes with NRT. Primary outcome was reduction in BP.
Olive 1996	One hospital had pre-test data. Evaluated changes in employee smoking behaviour after implementation of restrictive smoking policies.
Olsen 1990	Non-randomised. Evaluation of a smoking cessation incentive programme for Dow chemical employees in the USA.
Olsen 1991	Non-randomised. A five-year evaluation of a smoking cessation incentive programme for chemical employees.
Patten 1995	Population-based telephone survey of 1844 Californian adult indoor workers, to assess changes in smoking status and cigarette consumption, related to whether or not their workplace was smoke-free, and for how long the ban had been in place..
Pegus 2002	The Heart At Work programme. Smoking prevalence was measured, but was not an intervention outcome
Richmond 1985	Non-workplace setting. A smoking cessation programe for use in general practice
Rosenstock 1986	Post-test only. Evaluated a non-smoking policy in a health maintenance organization

Characteristics of excluded studies (*Continued*)

Roto 1987	Non-workplace setting for half of the participants. Evaluated nicotine gum and advice versus advice only for smoking cessation.
Ryan 2002	594 employees at a UK pharmaceutical company (GSK) attempted to quit with bupropion, and were followed up at six months. Not an RCT.
Schlegel 1983	Non-randomised. Evaluation of 'BUTT OUT' , a quit smoking programme developed specifically for the Canadian Armed Forces.
Scott 1986	Non-randomised. Nurses in different units offered cessation treatment or a waiting list control. 29 participants.
Shipley 1988	Non-randomised. Determined the effect of a smoking cessation programme compared with health screening on employee smoking.
Sloan 1990	Non-randomised. Evaluated cessation and relapse in a year-long workplace quit-smoking contest.
Sorensen 1991	One group post-test only . Evaluated the impact of a restrictive smoking policy with free onsite smoking cessation classes.
Ullen 2002	Evaluation of a Swedish hospital smoking ban, but without a comparison worksite
Waage 1997	Non-randomised. Smoking intervention based on risk communication in subjects at risk of asbestos-related lung cancer.
Wakefield 1996	Did not report smoking cessation rate. Compared the reported prevalence and acceptance of bans on smoking among indoor workers in South Australia.
Whitney 1994	One group, post-test only. Determined the impact of a smoking cessation programme using nicotine replacement therapy as part of a larger wellness programme.
Wilbur 1986	Comprehensive health promotion intervention, but not a randomized trial
Willemsen 1995	Non-randomised. Evaluated a smoking cessation intervention for Dutch employees consisting of self-help methods and a group programme.
Willemsen 1999	Non-randomised. Examined the impact of a comprehensive worksite smoking cessation programme on employees who do not take part in cessation activities.
Woodruff 1993	Results of the 1990 California Tobacco Survey; 11704 working adults responded. Aim was to assess relationship of worksite policy (or its absence) to smoking status, controlling for demographic factors

ANALYSES

Comparison 01. Results of included studies

Outcome title	No. of studies	No. of participants	Statistical method	Effect size
01 Results of included studies			Other data	No numeric data

Comparison 02. Individual Treatments

Outcome title	No. of studies	No. of participants	Statistical method	Effect size
01 Individual Counselling (various endpoints)			Odds Ratio (Fixed) 95% CI	Subtotals only
02 Any behavioural therapy (various endpoints)			Odds Ratio (Fixed) 95% CI	Subtotals only
03 Any self-help intervention (various endpoints)			Odds Ratio (Fixed) 95% CI	Subtotals only

04 Pharmacological Treatments (various endpoints)	Odds Ratio (Fixed) 95% CI	Subtotals only

Comparison 03. Worksite Treatments

Outcome title	No. of studies	No. of participants	Statistical method	Effect size
01 Social support			Odds Ratio (Fixed) 95% CI	Subtotals only
02 Environmental support (various endpoints)			Odds Ratio (Fixed) 95% CI	Subtotals only
03 Incentives (various endpoints)			Odds Ratio (Fixed) 95% CI	Subtotals only

INDEX TERMS

Medical Subject Headings (MeSH)

Counseling; Psychotherapy, Group; Smoking [*prevention & control]; Smoking Cessation [*methods]; *Workplace

MeSH check words

Humans

COVER SHEET

Title	Workplace interventions for smoking cessation
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Date new studies sought but none found	Information not supplied by author
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Analysis 01.01. Comparison 01 Results of included studies, Outcome 01 Results of included studies

Results of included studies

Study	Baseline/follow-up	Smoking outcome	Validated ?
Andrews 1983	892 staff and patients interviewed prior to policy change. 32% smoked (41% nurses, 11% physicians, 37% other employees). 20 months after implementation, 965 staff were interviewed.	26% had quit smoking during the 20 months that the smoking policy had been in effect (no p value). Few of the ex-smokers said that the hospital's policy alone had made them quit, but 29% of the quitters said the policy had played a major role in their decision to quit. 33% of continuing smokers had reduced, and 4% were smoking more. 93% of non-smokers and 83% of smokers approved of the policy	Self-report, not biochemically verified
Becker 1989	762 (79%) staff were surveyed 6 months before the ban, and 704 (74%) 6 months after the ban	Prevalence declined from 15% to 13.8% (no p value), with percentage of smokers smoking at work declining from 82% to 43%. Smoking in public areas went from 53% of staff and visitors to 0% at post-test, with butt counts in lifts going from 940 to 19. Environmental nicotine vapour declined from 13 mu per cubic metre to 0.51 at 6 months.	Self-reported, not biochemically verified
Biener 1989	By cross-sectional survey, 82 staff in the policy hospital (28 smokers) and 83 in the comparison hospital (23 smokers) were interviewed 1 month before policy change, and then 6 and 12 months after. Sampling frame was expanded from 85 to 120 at 12 months, because of attrition rates of 29% at the policy site and 37% at the comparison site.	Impact of no-smoking policy changes; 7% of smokers in the policy hospital and 11% of smokers in the comparison hospital reported quitting by 12 months (no p value). Mean cigarette consumption at home decreased from 12.8 to 10.6 in the policy hospital and from 13.3 to 9.2 in the comparison hospital.	Self-reported, not biochemically verified
Borland 1990	2113 employees (492 smokers at pre-ban) completed initial and post-ban surveys; 4215 had completed the baseline pre-ban survey	Differences in smoking prevalence (23.3% pre versus 22.3% post, no p value) were comparable with normal community rates. Moderate smokers reduced average daily smoking by 5.8 cigarettes/day and heavy smokers by 7.9 cigarettes/day. Overall average reduction 5.2 cigarettes/day	Self-reported, not biochemically verified

Results of included studies (*Continued*)

Study	Baseline/follow-up	Smoking outcome	Validated ?
Borland 1991a	Study 1: 1089 employees surveyed pre-ban, and 620 6 months post-ban. Study 2: All available staff (1425) surveyed at 18 months post-ban. Study 3: 124 employees surveyed for reasons for successes and failures of the the implementation. Only Study 1 met our inclusion criteria.	No differences in smoking prevalence pre-ban and at 6 months. Workday cigarette consumption declined between three and four cigarettes at 6 months.	Self-reported, not biochemically verified
Burling 1989	58 smokers, all given self-help materials and support. Experimental group (29) also exposed to computerised nicotine fading.	No significant difference in quit rates. 3/29 in Group 1 vs 6/29 in Group 2. (See also Cochrane Review 'Self-help interventions for smoking cessation')	Validation (participation and abstinence) measured at CO>8ppm
Burling 2000	87 smokers, randomised to an interactive nicotine fading programme, or a conventional cessation programme. 73% of the experimental group used their programme, compared with 90% of the comparison group who used theirs	No significant difference in quit rates. 6/45 in Group 1.vs 5/42 in Group 2. There was more evidence of effect for those who used the programmes than for those that didn't. (See also Cochrane Review 'Self-help interventions for smoking cessation')	Monitored CO levels
Cambien 1981	304 intervention smokers recalled at 2 yrs, and 306 control smokers. 195 participants lost to follow up, proportion of smokers not reported	21.4% of intervention smokers quit, vs 13.4% of control smokers. Point prevalence at 2 yrs, not a significant difference	Validation by blood CO levels
Campbell 2002	538 women in 9 worksites (4 exp, 5 control) completed all surveys (282 I, 256 C) to 18m.	No raw data given for smoking, but prevalence went down by around 3% in both groups. No significant differences, and no p values.	Self-report on all outcomes, no biochemical validation
Dawley 1991	16 employees in the experimental company (comprehensive programme), and 14 in the comparison company (cessation-only programme)	Comprehensive Group achieved 43% (7/16) quit rate at 5 months, while the Cessation-only Group achieved 21% (3/14). P-values not given, but numbers too small for significant difference.	Validation by urinary cotinine
DePaul 1987	425 smokers in 43 corporations, randomised to group support programmes or self-help alone programmes Attrition rate was 8% in both groups	6% vs 2% continuously abstinent (NS), 19% in both groups were abstinent at 12 months point prevalence. Companies were the unit of analysis, similar results found using individual as unit of analysis. (See also Cochrane Review 'Self-help interventions for smoking cessation')	Partial validation by salivary cotinine, with family and colleague report

Results of included studies (*Continued*)

Study	Baseline/follow-up	Smoking outcome	Validated ?
DePaul 1989	419 smokers in 38 worksites, randomised to experimental programme (206) and comparison programme (213). The attrition rate was 17% for Group worksites and 29% for Non Group worksite participants, so correcting the data for attrition would increase the apparent efficacy of the Group condition.	At the company level of analysis the 12 month point prevalence quit rates were Group 26% vs No Group 16% (p<0.06); continuous abstinence rates were 11% (Group) vs 3% (No Group) (p<0.05). Reported rates were not based on Intention to Treat, but on participation in the programmes. Correcting for attrition would increase the efficacy of the Group programme. At 24 months, 30% of the Group smokers were abstinent, comnpared with 19.5% of Non-Group smokers (no p value). (See also Cochrane Review 'Self-help interventions for smoking cessation')	Partial validation by salivary cotinine, with family and colleague report
DePaul 1994	844 smokers in 61 worksites, randomised to Self-help [SH] (289), Incentives [I] (281) or Group support [G] (283). 12 month attrition rates were 52.5% in SH, 47.2% in I, and 37.5% in G.	12 month quit rates for sustained abstinence were 5.1% (n=79) SH, 11% (n=91) I, 31.2% (n= 109) G (p<0.01). An Intention to Treat analysis, taking account of attrition, would further favour the intervention groups. (See also Cochrane Review 'Self-help interventions for smoking cessation')	Validation by salivary cotinine at 6 months, and CO<9ppm at 12 months
Emmons 1999	2055 workers (28% smokers) completed all surveys from 22 worksites, and constituted the cohort.	At 3 yr final follow up, 8.0% of the intervention smokers had quit for 6m, and 8.1% of the control smokers. 25.6% and 21.8% respectively claimed 7-day PP. Differences were non-significant	Self-report, with no biochemical validation
Erfurt 1991	Four sites were assessed at baseline; Site 1 had 1096 smokers (45%), Site 2 598 (44%), Site 3 844 (41%) and Site 4 834 (44%). At 3 year follow-up Site 4 had been significantly restructured.	Participation was affected by the intervention: 5% in Site 1, 9% in Site 2, 53% in Site 3 and 58% in Site 4. Possible bias due to different baseline characteristics of people rescreened in site3 & 4 limit interpretation of follow-up smoking prevalences: 41.6%, 40.6%, 36.1%, 31.0% All sites had significant relative reductions in smoking: 7.8% (p<0.01), 10.6% (p<0.01), 11.7% (p<0.001), 13.2% (p<0.001).	Self-report only, not biochemically validated

Results of included studies (*Continued*)

Study	Baseline/follow-up	Smoking outcome	Validated ?
		Of those smoking in 1985 who were re-screened in 1988, 17.1% at Site 1 had quit, 17.6% at Site 2, 20.3% at Site 3 and 18.9% at Site 4 (NS).	
Frank 1986	48 smokers initially randomised to three groups, with varying levels of hypnosis, booster and self-management training. A 4th group (15 smokers) was later recruited, with Group 2 interventions applied more intensively. Attrition rate of 6% across the initial 3 groups at end of treatment, 17% at 3 months and 25% at 6 month follow-up.	No difference between the groups for smoking cessation 6 months after treatment, regardless of the frequency, length between sessions, or addition of behavioural methods. Quit rate was 20% for all groups, based on Intention to Treat. Intensive intervention produced initially higher quit rates (60% at end of treatment), but this reverted to 20% by 6 months (See also Cochrane Review 'Hypnotherapy for smoking cessation')	Salivary cotinine measured at 3 months, but self-report only at 6 months
Glasgow 1984	36 employees, randomised to abrupt reduction (13), gradual reduction (12) and gradual reduction + feedback (11). Attrition at 6 months was respectively 4, 0 and 1.	At 6 months up to one third in the gradual condition were abstinent compared to no subjects in the abrupt condition (NS). Intention to Treat analysis showed that the gradual reduction programme was more successful than the abrupt reduction ($p<0.05$)	CO<10 ppm at 6 months, weighing of cigarette butts
Glasgow 1986	29 employees randomised to Basic Programme (13) or Basic Programme + Social Support (16). Attrition 7% at end of treatment, and a further 7% at 6 months	Consistent with previous findings, supportive social interactions were not related to treatment outcome.3/13 in the Basic Programme had quit at 6 months, and 3/16 in the Basic + Social Support Group (NS). (See also Cochrane review 'Enhancing partner support to improve smoking cessation').	Self report, weighing of cigarette butts, CO monitoring and salivary thiocyanate
Glasgow 1993	19 worksites, random allocation to Incentive programme (474 smokers) or No Incentive programme (623 smokers). Attrition rates at 1 year were 19% (I) and 24% (no I), and at 2 years were 27% and 32% respectively	At 2 year follow-up 49/344 (14%) were abstinent in the Incentives group, and 49/426 (12%) in the No incentives group (NS). Intention to Treat analysis would give more conservative quit rates	CO monitoring and salivary cotinine
Glasgow 1995	26 worksites, randomised to early or delayed interventions. 1222 employees were followed up	Comprehensive programme; a 26% rate of cessation was noted across both longitudinal	Self report, not biochemically validated

Results of included studies (*Continued*)

Study	Baseline/follow-up	Smoking outcome	Validated ?
	at 2 years.	cohort groups (NS), and a 30% rate across both cross-sectional groups (NS). No significant differences were seen between the 2 types of intervention	
Gomel 1993a	28 ambulance stations randomized to 4 levels of risk reduction intervention. 128 baseline smokers followed for 1 yr	No significant differences between HRA and RFE groups at any follow-up point, nor between BC and BCI groups. HRA and RFE groups (68 smokers) were pooled and compared with 60 smokers in pooled BC and BCI groups. Continuous abstinence rates at 6m were 1% for HRA+RFE and 10% for BC+BCI (Fisher's Exact Test p=0.05); 12m rates were 0% and 7% (p= 0.05).	Serum cotinine validation used.
Gottlieb 1990b	3 surveys, 1 pre- and 2 post-policy. Number of smokers surveyed was 387 at pre-policy, 287 1 month post and 228 6 months post.	No significant differences in smoking prevalence (22.9% pre versus 21.6% at 1 month and 19.5% at 6 months post). The percentage of smokers consumingf 15 or more cigarettes daily at work declined from 16.9% prior to 7.5% after 1 month and 4.9% after 6 months. But total daily consumption rates did not vary significantly across time, being 51.3%, 44,2Self report, not biochemically validated% and 52.2% at the 3 observation points.	Self report, not biochemically validated
Hennrikus 2002	24 worksites, randomised to 6 programmes, 4 worksites in each programme. 2402 smokers were surveyed at baseline and at 12 and 24 months. 85.5% response rate at 12 months, and 81.7% at 24.	407 (17%) smokers signed up to programmes. 15.4% at 12 months and 19.4% at 24 months reported themselves as non-smokers. Recruitment was significantly higher in the incentive sites (22% vs 12% p=0.0054), but did not translate into higher cessation rates. Quit rates were consistently higher among programme registrants than among non-registrants, but the differential was greater in the non-incentive sites (15%) than in the incentive ones (6.7%), consistent with incentives attracting	Self-report, validated by family member or friend. A sample of quitters were asked to supply saliva, and were paid $25 if they complied. Winners of cessation prize draws had to supply a valid saliva sample.

Results of included studies (*Continued*)

Study	Baseline/follow-up	Smoking outcome	Validated ?
		smokers less motivated to quit.	
Hudzinski 1990	3 surveys, 1 pre- and 2 post-policy. 1946 employees (46%) responded to pre-policy survey, 1608 (38%) 6 months post, and 684 (16%) at 12 months post.	Smoking prevalence decreased from 22% to 14% at 12months (p<0.003). About 25% of smokers at 6 and at 12 months reported no longer smoking at work. But 40% of smokers said their consumption was unchanged outside work. 23% said they had reduced outside work, and 35% had increased. This latter group were mainly 35-44 year-olds, female, who had smoked for more than 10 years.	Self report, not biochemically validated
Hymowitz 1991	Six worksites randomised to Full Programme or Group-only interventions. Participation was 50% in the Full Programme sites, and 44% at Group-only (NS). 193/252 smokers who began the quit programme completed it. Randomisation was by worksite, but analysis was by individual.	At 12 months, 23/131 (18%) in the Full Programme arm had quit, while 27/121 (22%) in the Group-only arm had quit (NS).	Self-report and expired CO<8 ppm.
Jeffery 1988	59 employees were randomly assigned to reduction (29) or cessation (30) groups, and surveyed at baseline and at 6 and 12 months. Attrition was 30% - intention to treat analysis.	At 12 months 4/29 (14%) had quit in the reduction group, and 3/30 (10%) in the cessation group. No significant differences between the groups on either of the outcomes (dropout rate, cessation at 12 months).	self-report confirmed by expired CO<8 ppm.
Jeffery 1993	32 worksites randomised to treatment (to reduce obesity and smoking) or no treatment. 270 workers (12% of smokers) participated in smoking cessation programme. Participation at follow up was 94% for cross-sectional and 93% for cohort analysis	This is the Healthy Worker Project, with workplace as the unit of analysis. From cross-sectional data, average smoking prevalence decreased 3% (p=0.06) in intervention sites and increased 1% (NS) in control sites. In the cohort, prevalence decreased by 1% in control and 3% in intervention sites. Net difference 2% (p= 0.03). Company-specific decreases were highly correlated with programme participation.	self-report, with expired CO
Kadowaki 2000	263 male employees randomised to intervention (132) or control (131).	Quit rates 17/132 (Intervention), 4/131 (Control) at 5-month follow-up (p=0.003). Male	Expired CO<9 ppm at baseline, 5 months and 12 months, and a urine test at 12 months

Results of included studies (*Continued*)

Study	Baseline/follow-up	Smoking outcome	Validated ?
	No attrition, as inclusion was compulsory.	smoking decreased from 62.9% to 56.7% (p= 0.04). Delayed intervention in the control group lead to 13% quit rate (16/123)	
Klesges 1987	136/480 smokers over 8 worksites; all received a behavioural programme, with the intervention sites also receiving a competition and prize component. Each group of sites (Intervention and Control) were also divided between relapse prevention training (2) and no relapse training (2). Attrition rate was 7% at end of treatment, increased to 10% by 6 months follow-up.	Competition intervention resulted in significantly higher quit rates at the end of the trial (39% vs 16%, p<0.004) but these differences decayed at 6 months (12% vs. 11%, NS). Using the baseline of 480 smokers who could have participated, 3% were abstinent at 6 months	Expired CO<10 ppm
Kornitzer 1980	30 Belgian factories (16,230 men) randomized to intervention (risk assessment, physician and written advice) or control (assessment only). tested at 2 yrs.	High risk intervention group (n=1268) reduced prevalence by 18.7% (84.5% to 68.7%), and high risk control group (n=202) reduced by 12.2% (80.8% to 70.9%). P < 0.05. Random sample comparison: 5% of intervention group (n=327) reduced by 12.5%, compared with 10% control sample (n=800) reduced by 12.6% (ns).	Self report only, no biochemical validation.
Kornitzer 1987	199 employees were randomised to receive 2mg (101) or 4mg (98) nicotine gum. Attrition at one year was 6% in the 2mg group and 7.2% in the 4mg group.	At 3 months 36% of the 2mg group and 45% of the 4mg group claimed to be abstinent. At that point,blinding was broken and individuals could choose their treatment group. Results were stratified by Fagerstrom score dependency. At 12 months, the 4mg group (90) had a 50% higher abstinence rate than the 2mg group (94) (p<0.05); this fails to reach significance if an intention-to-treat analysis is conducted. In the first 3 (blinded) months of trial, the heavier smokers benefited more from the higher dose gum. After unblinding, 17% of the 4mg group	Baseline and 12 month cotinine blood samples (random sample of 69% at 12 months).

Results of included studies (*Continued*)

Study	Baseline/follow-up	Smoking outcome	Validated ?
		continued treatment, whereas 39% of the 2mg group continued treatment. In the 4mg group 31% switched to 2mg, while 5% of the 2mg group switched to 4mg.	
Kornitzer 1995	374 employees randomised to Group 1(149, active patch + active gum), Group 2(150, active patch + placebo gum) or Group 3(75, placebo patch + placebo gum)	At 12 months, abstinence in Group 1 was 18.1% (NS), in Group 2 12.7% (NS) and in Group 3 13.3% (NS). Time to relapse was significantly longer in Group 1 compared with the other 2 groups (p=0.04).	Salivary cotinine at baseline, and expired CO<10 ppm at subsequent checks
Lang 2000	30 worksite physicians (1095 smokers) were randomised to Group A (504, simple advice) or Group B (591, advice + support and 'contract').	2 physicians dropped out post randomisation. 3.4% of baseline non-smokers in each group were smokers at 1 year follow-up. The sustained abstinence rate at 6 months or more (A: 4.6%; B: 6.1%) was non-significant using the physician as the unit as analysis. At 12 months, Group A had a quit rate of 13.5%, and Group B a rate of 18.4% (p=0.03)	Self-report, with CO<7 ppm validation on a subset of 231 subjects whose physicians had access to a CO monitor.
Li 1984	871 employee smokers, randomised to Group 1 (simple warning) or Group 2(brief physician advice), stratified by normal/abnormal lung function. After fine tuning, at 3 months 215 workers received counselling, while 361 received simple warning and 3 were excluded. Attrition was 30%.	Counselled workers had an 8.4% abstinence rate at 11 months, compared with 3.6% in the control group (p<0.05). Feedback on abnormal lung function was not significantly related to increased rates of quitting	Expired CO<10 ppm at 11 months follow-up in all quitters, and in a random sample of 379 continuing smokers
Malott 1984	24 employees randomised to controlled smoking Group (1) or controlled smoking + partner support Group (2). Attrition 4% at 6 months	Few differences were observed between controlled smoking and controlled smoking plus partner support conditions either during treatment or at the 6-month follow-up. 25% of Group 1, and 17% of Group 2 were abstinent at 6 months (NS). (See Cochrane review 'Enhancing partner support to improve smoking cessation').	Self-monitoring, butt counts, expired CO levels
Mayo 1990	73 smokers, responding to one pre- and two post-	Smoking prevalence varied little, from 29% pre-	Self-report, not biochemically validated

Results of included studies (*Continued*)

Study	Baseline/follow-up	Smoking outcome	Validated ?
	ban surveys of a worksite smoking policy.	ban to 24% at 6 months and 25% at 12 months (NS). Among the 73 smokers who completed all surveys, mean daily consumption declined from 16.3 pre-ban to 14.5 at 12 months; work consumption decreased from 7.7 pre-ban to 4.2 at 12 months, but outside work increased from 8.3 pre-ban to 10.3 at 12 months. Net average decrease in daily cigarettes smoked was 1.8, from 16.3 to 14.5	
Millar 1988	Number of participants not reported, but 62% of 4200 employees responded to the pre-policy survey, and 53% to the post-policy follow-up. Additionally, but not reported in our review, 200 smokers who joined the cessation programme were followed-up by telephone for 12 months.	Smoking prevalence fell from 29% to 24% ($p<0.001$), mean number of cigrettes per day fell from 19.9 to 17.9 ($p<0.001$), mean number of cigarettes per day at work from 11.6 to 8.2 ($p<0.001$). Perceptions of being bothered by smoke fell significantly in all areas except for the cafeteria, which was often the designated smoking area. Mean respirable particulate concentrations fell in all measured areas ($0.05<p<0.001$).	Self-report, not biochemically validated
Mullooly 1990	11 worksites were surveyed pre- and post-ban. All sites had at least 3 pre-ban surveys, and 1 or 2 post- ban.	No short-term effect on smoking prevalence or reported attempts to quit. Reduction of 1.4 cigarettes at work per day at 1986 ban sites ($p<0.05$) and <0.1 cigarettes per day at 1985 ban sites (NS). Total cigarettes smoked per day did not decrease.	Self-report, not biochemically validated
Nilsson 2001	113 workers randomised to intervention (65) or control (63). Attrition at 12 months was 32% for the intervention group, and 24% for the control group. At 18 months the respective attrition rates were 34% and 27%.	Baseline prevalence for both groups was 65%. At 12 months the intervention group point prevalence rate was 37%, and the control group 63%. At 18 months, the rates were 40% and 59% respectively. This difference influenced the decrease in mean risk score from 10.3 to 9.0 after 18 months in the intervention group ($p=0.042$)	Self-report, not biochemically validated
Omenn 1988	402 employee smokers randomised within their preference for group or self-help programmes, to	Self-reported quit rates similar across all three group preference conditions but more missing	Salivary cotinine at 12 months <35 ng/ml

Results of included studies (*Continued*)

Study	Baseline/follow-up	Smoking outcome	Validated ?
	3 programmes, MCP (1), RPP (2) or MTP (3). 7% attrition rate at 12 months.	saliva samples in self-help so validated rates lower. All self-help programmes similar. Results: Group 1 8/51, Group 2 10/57, Group 3 4/51 (NS) SH1 7/76, SH2 9/82, SH3 6/85 (NS)	
Rand 1989	47 employees randomised to contingent payment/frequent CO monitoring group (17), non-contingent payment/frequent CO monitoring (16), non-contingent payment/ infrequent monitoring (14). 4 participants failed to abstain for 5 days, and were excluded before randomisation. At 6 months 11 more participants had dropped out. Analyses were Intention to Treat at randomisation.	Contingent payment combined with frequent CO monitoring delayed but did not ultimately prevent participant relapse to smoking by the end of the six month follow-up. Contingent payment group had CO value at or less than 11 ppm significantly longer than the other two groups (p=0.03). CO monitoring alone had no effect on abstinence. At six months, only 2 subjects (1contingent, 1 non-contingent) had achieved sustained abstinence.	Expired CO monitoring <12 ppm
Razavi 1999	344 post-cessation abstainers randomised to psychologist support (135), ex-smoker support (88), or no formal support (121),	12 months abstinence rates were 59/135 (43.7%) in the PG group; 33/88 (37.5%) in the SG group; 43/121 (35.5%) in no support group (NS).	Expired CO and urinary cotinine. Unvalidated self-report (higher) were also given.
Rodriguez 2003	218 smokers randomized to counselling + NRT (115) or minimal sporadic advice (103) in 3 Bilabao (Spain) worksites	12 months continuous abstinence rates were 23/114 (20.2%) for the intervention group, vs 9/103 (8.7%) in the control group (P = 0.025). NNT was 9 people treated for 3 ms to produce 1 quitter	Expired CO <+ 10 ppm
Shi 1992	2887 workers (533 smokers) across 9 Californian sites, partially randomized to 4 intervention levels. No non-intervention control group	2 yr cross-sectional survey of 1998 workers (250 smokers); Prevalence declined by 34% from 18% to 12% in Level 1 (p < 0.1); by 18% from 17% to 14% in Level 2 (p < 0.1); by 35% from 24% to 15% in level 3 (p < 0.01); by 44% from 14% to 8% in Level 4 (p < 0.01)	Self-reported PP at HRA, not biochemically validated
Shimizu 1999	53 volunteer employee smokers, randomised to intervention and control groups.	After the 5 months of intervention, smoking cessation rate in the intervention group (19.2%) tended to be higher than that in the control group (7.4%), (NS).	Expired CO monitoring

Results of included studies (*Continued*)

Study	Baseline/follow-up	Smoking outcome	Validated ?
		Control group was given same programme after the 5 months for the intervention group. At six months after both groups were treated, overall cessation rate was 24.5%, and at one year was 13.2%.	
Sorensen 1993	Eight worksites, randomised to intervention (1885 workers) or comparison (1479 workers). At baseline, 9 months before intervention, 34% of respondents were current smokers (I:39%;C:31%) Six-month data were on only 7 of the 8 sites, because of ownership changes at the 8th. Six-month survey was of all smokers then employed, = 66% of originally surveyed employees. Analyses were by individual, while randomisation was by worksite.	Analysis of all smokers, not just participants. At the 6-month follow-up, 12% of smokers in the intervention group reported quitting, compared with 8.8% in the control group ($p<0.05$), controlling for age, sex & occupation.	Self-report only. Baseline and follow-up salivary cotinines obtained for 52% of baseline smokers. These data were not analysed.
Sorensen 1996	108 matched worksites (>28,000 workers), randomised to intervention or control conditions, though Florida center sites did not target smoking, leaving smoking outcomes available in only 84 worksites.	Worksite was the unit of allocation and analysis. Baseline smoking data were not reported in detail. There was a difference of 1.53% (NS) in the 6-month quit rates between intervention and control sites, and a reduction in prevalence from 24.5% to 21.2% (I), and from 25.8% to 21.8% (C), a difference between the 2 groups of 0.66% (NS).	Self-reported, no biochemical validation
Sorensen 1998	Cohort analysis (2658 employees) of a randomised controlled study of 12 matched pairs of worksites. Worksite was unit of allocation, but analysis was by individual.	PP abstinence for the 6 months prior to 2-year follow-up was 15% for intervention group and 9% for control group ($p=0.123$) Blue-collar cessation rates for the 2 groups were 18% (I) and 9% (C), while the white-collar workers achieved higher rates in the control than in the intervention group; office worker rates were 2.5% (I) vs 5.1% (C), and professipnal/ managerial rates were 14.2% (I) vs 18.6% (C).	Self-reported, no biochemical validation
Sorensen 2002	Cross-sectional analysis (9019 at baseline [80%]	At six months, point prevalence in the HP/OHS	Self-reported, no biochemical validation

Results of included studies (*Continued*)

Study	Baseline/follow-up	Smoking outcome	Validated ?
	and 7327 [65%]) at six months follow-up, plus cohort analysis of 5156 employees who responded to both surveys (embedded cohort of 436 smokers). Worksite was unit of allocation, but analysis was by individual.	sites fell from 20.4% to 16.3%, and in the HP sites from 18.6% to 17%. In the embedded cohort (825 smokers) at six months, the HP/OHS quit rate was 11.3%, compared with the HP rate of 7.5% (OR=1.57, p=0.17). Within the cohort, blue-collar quit rates more than doubled in the HP/OHS sites (11.8%) compared with the HP sites (5.9%, p=0.04)	
Stave 1991	Cross-sectional telephone surveys, post-ban, with policy vs no-policy campuses, 400 randomly-selected employees from each. The smokers from the 3 month survey were re-interviewed at 9 months post-ban (97% response rate).	Study asked retrospectively about pre-ban smoking history. Baseline smoking rates were 23.6% (policy site) and 20.3% (no-policy site). CO validated quit rates at 3 months were significant (9.2% versus 1.4%, p<0.02), as were 9 months CO-validated quit rates (10.8% versus 2.9%,p<0.03)	Expired CO<5 ppm
Stillman 1990	2877/8742 (33%) employees adequately completed pre and post-ban surveys. Followed-up cohort of smokers=446 employees	Impact of no-smoking policy changes. Smoking prevalence decreased from 21.7% to 16.2% (p= 0.0001); Sustained quitting in the smoking cohort was 20.4% (91/446) by self-report, but on intention to treat basis (91/899)=10.1%	Self-report, no biochemical validation. Butts were counted as an outcome measure, unrelated to validation.
Sutton 1987	270/334 interested smokers invited to nicotine gum cessation programme; the uninvited 64 represented a control group. 172 (64%) of invitees attended the 1st consultation, 163 the 2nd. One-year follow-up rate was 99% (9% by phone).	12% (20/172) of those who attended the intervention course were abstinent at 12 months, compared with 1% (1/98) of those who did not accept the invitation, and 2% (1/64) of the control group; p values not given.	Expired CO<11 ppm
Sutton 1988a	Video programme (smoking, plus seat-belt advice) was offered to all employees. 77 employees were randomised to DFF video (33) or seatbelt (44=control) videos.	Abstinence rates (DFF: 3%, SB [control] 0%) were not significantly different from each other at 12 months follow-up, There was no significant difference in validated abstinence between the video groups and the non-participant group.	Expired CO<11 ppm.
Sutton 1988b	150 employees (smokers only) participated.	Abstinence rates (DFF: 11%, DFF+C 8%, LTK	Expired CO<11 ppm.

Results of included studies (*Continued*)

Study	Baseline/follow-up	Smoking outcome	Validated ?
	46 watched the DFF video, 50 watched a confidence-boosting version of the DFF video, and 54 (control group) watched LTK video.	[control] 9%) were higher than in the other 3 studies, but not significantly different from each other at 12 months follow-up. But there was a significant difference in abstinence rates between participant groups and the non-participant group (4%, p<0.05).	
Sutton 1988c	197 employees (smokers only) participated. 56 watched the DFF video, 67 watched a less gory version of the DFF video, and 74 (control group) watched the TW video. Non-responder smokers at baseline had higher smoking prevalence (45%) than responders (29%), suggesting some response bias.	Abstinence rates (DFF: 4%, DFF-G 3%, TW [control] 4%) were not significantly different from each other. at 12 months follow-up. There was no significant difference in abstinence rates between the video groups and the non-participant group.	Expired CO<11 ppm.
Sutton 1988d	179 employees (smokers only) participated. 62 watched the DFF video, 59 watched SL video, and 58 (control group) watched TW video. Non-responder smokers at baseline had higher smoking prevalence (34%) than responders (22%), suggesting some response bias.	Abstinence rates (DFF: 3%, SL 2%, Tw [control] 5%) were not significantly different from each other at 12 months follow-up. There was no significant difference in validated abstinence artes between the video groups and the non-participant group.	Expired CO<11 ppm.
Sutton 1988e	Fourth study (D) of the video studies groups provided a nested RCT. 161 continuing smokers at 3-month follow-up were randomised to intervention (79) or control (82). 40.5% response rate, attending at least one consultation.	22% (7/32) of attenders in the intervention group were abstinent at 12 months, compared with 2% (1/47) of the non-attending invitees, and compared with 2% (2/82)of the control group (p<0.001). 16% of intervention group achieved 'complete' sustained abstinence at 12 months, vs 2% control group (p<0.01).	Expired CO<11 ppm.
Terazawa 2001	228 smokers randomized to intervention (117) or control (111). 25 smokers in the intervention group made a supported quit attempt	PP 11.1% (13/117) in the intervention group at 12m, compared with 1.8% (2/111) controls. Continuous abstinence 6.8% (8/117) intervention, compared with 0.9% (1/111) controls. Fisher's Exact test 2-tailed P = 0.04	Probably validated by expired CO
Tsushima 1991	887/1550 employees (57%) responded pre-ban	Smoking prevalence declined from 17% to 15%	Self-report, not biochemically validated.

Results of included studies (*Continued*)

Study	Baseline/follow-up	Smoking outcome	Validated ?
	survey, and 824/1584 (52%) to 12-months post-ban survey (43% to both surveys).	(NS). Number of cigarettes smoked per day, and number smoked within working hours, appeared to decline (ns).	
Willemsen 1998	Four intervention worksites matched to 4 control sites (minimal self-help), giving 498 smokers who completed baseline survey and enrolled in programmes.	Overall sustained abstinence quit rates at 6 months were 8% (9% for heavy smokers) in the comprehensive group, and 7% (4% for heavy smokers) in the minimal group (no p values given)	Self-report, plus baseline Fagerstrom score. At 4-month follow-up, 'bogus pipeline' procedure was used, and at 14 months salivary cotinines were collected from 41/79 quitters
Windsor 1989	387 smokers randomly assigned to four groups, in a 2x2 factorial pre-/post-test design. 37 were lost to follow-up, and were counted as continuing smokers	As monetary incentives made no difference, groups 1&3 were compared with 2&4. Sustained abstinence at 1 year was 5.8% (11/190) in the self-help only groups, and 14.4% (27/188) in the self-help + counselling groups ($p<0.001$).	Baseline salivary cotinine, and follow-up salivas at 6 weeks, 6 months and 1 year.

Analysis 02.01. Comparison 02 Individual Treatments, Outcome 01 Individual Counselling (various endpoints)

Review: Workplace interventions for smoking cessation

Comparison: 02 Individual Treatments

Outcome: 01 Individual Counselling (various endpoints)

Study	Cessation n/N	Control n/N	Odds Ratio (Fixed) 95% CI	Weight (%)	Odds Ratio (Fixed) 95% CI
Cambien 1981	65/304	41/306		46.4	1.76 [1.15, 2.70]
Gomel 1993a	4/60	0/68		0.6	10.91 [0.58, 207.00]
Kadowaki 2000	17/132	4/131		5.1	4.69 [1.53, 14.36]
Lang 2000	36/591	23/504		33.7	1.36 [0.79, 2.32]
Li 1984	18/215	13/361		12.8	2.45 [1.17, 5.10]
Terazawa 2001	8/117	1/111		1.4	8.07 [0.99, 65.64]
Subtotal (95% CI)	1419	1481		100.0	2.00 [1.51, 2.66]
Total events: 148 (Cessation), 82 (Control)					
Test for heterogeneity chi-square=7.87 df=5 p=0.16 I^2 =36.4%					
Test for overall effect z=4.78 p<0.00001					

Analysis 02.02. Comparison 02 Individual Treatments, Outcome 02 Any behavioural therapy (various endpoints)

Review: Workplace interventions for smoking cessation

Comparison: 02 Individual Treatments

Outcome: 02 Any behavioural therapy (various endpoints)

Study	Cessation n/N	Control n/N	Odds Ratio (Fixed) 95% CI	Weight (%)	Odds Ratio (Fixed) 95% CI
DePaul 1987	14/233	4/192		8.1	3.00 [0.97, 9.28]
DePaul 1989	22/206	6/213		10.3	4.13 [1.64, 10.40]
DePaul 1994	10/281	4/280		7.6	2.55 [0.79, 8.22]
Frank 1986	9/45	3/20		6.5	1.42 [0.34, 5.91]
Glasgow 1984	4/12	0/13		0.6	14.29 [0.68, 300.37]
Klesges 1987	8/66	7/61		12.5	1.06 [0.36, 3.13]
Omenn 1988	10/57	4/51		6.8	2.50 [0.73, 8.54]
Razavi 1999	33/88	43/121		44.4	1.09 [0.62, 1.92]
Shimizu 1999	5/26	2/27		3.1	2.98 [0.52, 16.95]

(*Continued* . . .)

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Study	Cessation n/N	Control n/N	Odds Ratio (Fixed) 95% CI	Weight (%)	Odds Ratio (Fixed) 95% CI
Subtotal (95% CI)	1014	978		100.0	1.92 [1.37, 2.69]
Total events: 115 (Cessation), 73 (Control)					
Test for heterogeneity chi-square=10.69 df=8 p=0.22 I^2 =25.1%					
Test for overall effect z=3.81 p=0.0001					

Analysis 02.03. Comparison 02 Individual Treatments, Outcome 03 Any self-help intervention (various endpoints)

Review: Workplace interventions for smoking cessation

Comparison: 02 Individual Treatments

Outcome: 03 Any self-help intervention (various endpoints)

Study	Cessation n/N	Control n/N	Odds Ratio (Fixed) 95% CI	Weight (%)	Odds Ratio (Fixed) 95% CI
Burling 1989	6/29	3/29		8.8	2.26 [0.51, 10.08]
Burling 2000	6/45	5/42		16.6	1.14 [0.32, 4.05]
Jeffery 1988	3/30	4/29		13.5	0.69 [0.14, 3.41]
Omenn 1988	9/82	7/76		23.9	1.22 [0.43, 3.44]
Sutton 1988a	2/33	3/55		7.8	1.12 [0.18, 7.07]
Sutton 1988b	5/46	15/374		10.8	2.92 [1.01, 8.45]
Sutton 1988c	2/56	5/226		7.1	1.64 [0.31, 8.67]
Sutton 1988d	2/62	11/360		11.6	1.06 [0.23, 4.89]
Subtotal (95% CI)	383	1191		100.0	1.41 [0.87, 2.29]
Total events: 35 (Cessation), 53 (Control)					
Test for heterogeneity chi-square=3.36 df=7 p=0.85 I^2 =0.0%					
Test for overall effect z=1.40 p=0.2					

Analysis 02.04. Comparison 02 Individual Treatments, Outcome 04 Pharmacological Treatments (various endpoints)

Review: Workplace interventions for smoking cessation

Comparison: 02 Individual Treatments

Outcome: 04 Pharmacological Treatments (various endpoints)

Study	Intervention n/N	Control n/N	Odds Ratio (Fixed) 95% CI	Weight (%)	Odds Ratio (Fixed) 95% CI
Kornitzer 1987	24/98	21/101		40.9	1.24 [0.64, 2.40]
Kornitzer 1995	19/150	10/75		30.5	0.94 [0.41, 2.14]
Rodriguez 2003	23/114	9/103		19.8	2.64 [1.16, 6.01]
Sutton 1987	21/270	1/64		3.9	5.31 [0.70, 40.26]
Sutton 1988e	5/79	2/82		4.8	2.70 [0.51, 14.36]
Subtotal (95% CI)	711	425		100.0	1.65 [1.10, 2.48]
Total events: 92 (Intervention), 43 (Control)					
Test for heterogeneity chi-square=5.39 df=4 p=0.25 I² =25.7%					
Test for overall effect z=2.44 p=0.01					

Analysis 03.01. Comparison 03 Worksite Treatments, Outcome 01 Social support

Review: Workplace interventions for smoking cessation

Comparison: 03 Worksite Treatments

Outcome: 01 Social support

Study	Cessation n/N	Control n/N	Odds Ratio (Fixed) 95% CI	Weight (%)	Odds Ratio (Fixed) 95% CI
Glasgow 1986	3/16	3/13		51.8	0.77 [0.13, 4.65]
Malott 1984	2/12	3/12		48.2	0.60 [0.08, 4.45]
Subtotal (95% CI)	28	25		100.0	0.69 [0.18, 2.62]
Total events: 5 (Cessation), 6 (Control)					
Test for heterogeneity chi-square=0.03 df=1 p=0.86 I² =0.0%					
Test for overall effect z=0.55 p=0.6					

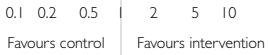
Analysis 03.02. Comparison 03 Worksite Treatments, Outcome 02 Environmental support (various endpoints)

Review: Workplace interventions for smoking cessation

Comparison: 03 Worksite Treatments

Outcome: 02 Environmental support (various endpoints)

Study	Cessation n/N	Control n/N	Odds Ratio (Fixed) 95% CI	Weight (%)	Odds Ratio (Fixed) 95% CI
Dawley 1991	7/16	3/14		2.7	2.85 [0.57, 14.33]
Erfurt 1991	39/223	39/228		48.1	1.03 [0.63, 1.67]
Hymowitz 1991	23/131	27/121		35.0	0.74 [0.40, 1.38]
Windsor 1989	27/188	11/190		14.2	2.73 [1.31, 5.68]
Subtotal (95% CI)	558	553		100.0	1.22 [0.88, 1.69]
Total events: 96 (Cessation), 80 (Control)					
Test for heterogeneity chi-square=8.65 df=3 p=0.03 I² =65.3%					
Test for overall effect z=1.19 p=0.2					



Analysis 03.03. Comparison 03 Worksite Treatments, Outcome 03 Incentives (various endpoints)

Review: Workplace interventions for smoking cessation

Comparison: 03 Worksite Treatments

Outcome: 03 Incentives (various endpoints)

Study	Cessation n/N	Control n/N	Odds Ratio (Fixed) 95% CI	Weight (%)	Odds Ratio (Fixed) 95% CI
Glasgow 1993	49/344	49/426		80.5	1.28 [0.84, 1.95]
Gomel 1993a	1/30	3/30		6.2	0.31 [0.03, 3.17]
Rand 1989	1/16	0/14		1.0	2.81 [0.11, 74.56]
Windsor 1989	5/95	6/95		12.2	0.82 [0.24, 2.80]
Subtotal (95% CI)	485	565		100.0	1.18 [0.80, 1.74]
Total events: 56 (Cessation), 58 (Control)					
Test for heterogeneity chi-square=2.01 df=3 p=0.57 I² =0.0%					
Test for overall effect z=0.83 p=0.4