

Smoking Cessation in the Workplace, What Works: A Literature Review

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Executive Summary

This review aimed to evaluate workplace cessation programmes to find out what works, what type of workplaces implement them, the different cessation programmes that are used, who delivers the programmes, and the economic costs of programmes. This review is not a systematic review as articles were selected for review based on face value using a number of websites and search engines.

There are a large number of studies on workplace cessation programmes, however, the data on the current programmes available and who implements them, is limited. A variety of smoking status measures and follow-up times are used in the literature and this makes comparisons difficult. The following are the main points gathered from the review of the literature:

- Less intensive programmes had higher participation rates, and were also more cost-effective than more intensive programmes.
- Programmes that had higher success-rates included those with a mixture of self-help and professional counselling (either in the form of group therapy or telephone Quitlines). Self-help, education, or one session with a health professional alone did not substantially increase quit rates, but may increase a participant's likelihood to make another quit attempt in the future.
- 'Blue-collar' workplaces are often unpredictable settings for workplace cessation programmes. Workers frequently change worksites (e.g. builders) or work different shifts. Education and telephone cessation services were optimal for reaching a larger number of these workers.
- Competitions and incentives may not always increase cessation rates, but were effective at increasing participation rates.
- Support from non-smoking workmates was shown to increase participation rates and cessation rates. Including non-smoking workmates in any competitions or incentive programmes has been shown to reduce feelings of dissent.
- When calculating the total cost of loss of productivity and healthcare from smoking in the workplace, and subtracting the cost of implementing a workplace programme, the workplace may see an increase in returns of about \$3.26 - \$9.87 (NZD) per dollar spent on smoking cessation, based on overseas studies. This increase in returns may

be higher in New Zealand due to the availability of a freephone Quitline, and heavily subsidised nicotine replacement therapy.

Introduction

Smoking has serious health effects for both the smoker and people around them. Smokers below the age of 50 may increase their risk of a fatal heart attack five-fold compared to non-smokers (Edwards 2004). Smokers also expose themselves to an increased risk of throat and lung cancer, osteoporosis, infertility, and many more health issues (Edwards 2004). In New Zealand, around 5000 deaths per year are directly attributable to direct smoking or exposure to second-hand smoke (SHS) (Ministry of Health [MoH] 2008a). People exposed to SHS in their home or workplace may increase their risk of lung cancer or heart disease by 20-30% (U.S. Department of Health and Human Services [USDHHS] 2006). Furthermore, using a conservative measure, SHS exposure is estimated to be responsible for around 325 deaths in New Zealand per annum (Woodward et al 2001). Although there has been a significant decrease in smoking in recent years (Hill et al 2003; Ministry of Health 2006), smoking prevalence in New Zealanders over 15 years still remains unacceptably high at 19.9% (measured in 2006/07; MoH 2008b), especially among Māori whose prevalence is 42.2% (MoH 2008b).

Smoking in the workplace has adverse effects on both employee health and productivity. In 2006, 8.4% of New Zealanders reported being exposed to SHS in the workplace (Waa and McGough 2006). This level remains high even though New Zealand introduced the Smoke-free Environments Act in 1990 (New Zealand Government, 2008) and its amendment in 2003 (MoH 2005a) which effectively prohibited smoking in all indoor work spaces. This means that some non-smokers were still being exposed to tobacco smoke in the workplace. Research on the negative effect of smoking on productivity and health has shown that the amount smoked is dose dependently related to workplace absenteeism (Halpern et al 2001; Health Canada 2008; Lundborg 2007). To explain, current smokers had more sick-leave days than previous smokers, and never-smokers had the lowest levels of sick leave (Halpern et al 2001). Halpern and colleagues (2001) and Health Canada (2008) also found that smokers are generally less productive in the workplace than non-smokers. Health Canada estimated that smokers take on average half an hour extra break each day to smoke during working hours, which amounts to 120 hours lost per smoker, per year. A survey carried out on GlaxoSmithKline workplaces in the United Kingdom, found that 43% of total working hours lost was due to the 23% of employees who smoked while at work (Ryan and Crampin 2006). The cost to the New Zealand economy due to loss of productivity (caused by smokers

taking longer breaks and increased absenteeism) in 2005 may have reached around \$1.7 billion (New Zealand dollars; NZD; O’Dea and Thomson 2007).

Due to the adverse effects of smoking on workplace and productivity, the use of effective workplace smoking cessation initiatives is worthwhile in terms of health, social, and economic gains. This review focuses on components used in workplace smoking cessation programmes. It aims to evaluate the current literature and summarise the factors which have the greatest impact on smoking cessation in the workplace. It will also briefly look at the costs and benefits of a workplace smoking programme. The aims of this review are as follows:

- Identify the effectiveness of different types of workplace cessation programmes and initiatives.
- Describe the range of workplaces that have workplace cessation programmes in place, or have been identified by researchers/practitioners as appropriate settings. Identify any key differences by industry type.
- Describe how programmes or initiatives started, and who had input into them (e.g. relationship with public health nurse or practitioner, a Quitline, or self-started).
- Describe how employees who smoke are recruited to the cessation programme, and what programme components increase levels of participation.
- Describe what the programmes involve, the level of support and resourcing involved, and how these characteristics link to effectiveness (e.g. quit rates, uptake, and amount of sick leave).
- Evaluate whether the gain of economic costs due to lower smoking prevalence outweighs the costs of implementing a smoking cessation programme.

Rationale for workplace cessation initiatives

Due to the adverse effects of smoking on both health and the economy, many countries — including New Zealand — introduced legislation restricting smoking in indoor public places. In 1990, New Zealand was the third country to introduce a regulation which prevented smoking in the office — the Smoke-free Environments Act, 1990 (SEA; New Zealand Government 2008). This law also introduced restrictions on smoking in indoor public places such as restaurants (New Zealand Government 2008). This Act was later amended in 2003 to include workplaces and settings not included in the original Act, such as factories, and ‘smoko’ rooms and, prevent smoking altogether in some workplaces such as the indoor

areas of restaurants and bars (SEAA; Ministry of Health 2005a). The SEA and its amendments were introduced with the aim of reducing the prevalence of smoking in New Zealand and also reducing people's exposure to SHS (New Zealand Government 2008).

The New Zealand Quitline (0800 778 778) is a national free telephone service which provides support and advice for people wanting to quit smoking. An important component of a typical Quitline programme is the issuing of nicotine replacement therapy (NRT)¹ to clients who are interested in using it. The use of NRT to quit has a strong evidence base; with an approximate doubling of one's success in quitting (MoH, 2007). The Quit Group (the organisation that is responsible for the Quitline) also provides resources, strategies, and advice for workplace smoking cessation programmes via their website and Quit@work Advisor. In response to the 2003 SEAA, the number of registered callers to Quitline significantly increased (Wilson et al 2005; Wilson et al 2007), and the number of tobacco products sold decreased (Asthma and Respiratory Foundation of New Zealand 2005). This increase in people willing to give up smoking highlights the effectiveness of smoke-free legislation. Similarly, introducing smoke-free policies and cessation programmes in the workplace may also increase the number of people making a quit attempt. That health care costs and lost productivity associated with smoking were well over \$1.7 billion NZD in the 2005 calendar year (O'Dea and Thomson 2007), provides another significant reason for intervention via policy changes, and through workplaces.

Smoking cessation programmes have been established in communities and workplaces with the aim of reducing smoking prevalence. These programmes often follow the form of structured counselling in either group or individual settings, along with other tools such as self-help and information manuals, and competitions or incentives (Sorenson 2001). Although community smoking interventions are relatively successful; a review by Janer et al (2002) found workplace cessation programmes to be more successful than community programmes with an overall quit rate of around 6% (ranging from 0.9-12% using the most conservative analysis) when changes in the control group were accounted for. Quit rates ranged from 10-15% when changes in the control group were excluded. Workplaces have been suggested as the ideal place for smoking cessation (Glasgow et al 1984; Sorenson 2001; Tiede et al 2007) because the workplace is a relatively constant environment where people have consistent access to intervention programmes. Further, workplaces have the

¹ Nicotine replacement therapy (NRT) is available in three forms through the Quitline. The patch is a slow-release product, usually worn on the upper arm for 16-24 hours. The lozenge and gum are oral forms of NRT that provide a rapid-release of nicotine; and these two products are very useful for coping with smoking urges.

added bonus of management support and peer support networks, and employees do not need to travel to get to cessation programmes (Glasgow et al 1984; Graham et al 2007; Moher et al 2005; Tiede et al 2007). Workplace cessation programmes may also have direct benefits to the company. Economic losses due to smoking-related factors such as increased absenteeism, and low productivity, may be reduced following a reduction in workplace smoking (Halpern et al 2001; Halpern et al 2007; Lundborg 2007). Smoke-free workplaces also reduce risk of fire hazards, damage from cigarette butts, reduced cleaning costs, and may improve the company's image (Moher et al 2005). However, the implementation of workplace cessation programmes can be met with barriers. Many workplaces are reluctant to implement these programmes due to: the perception that a success rate of around 10% is low, low participation rates, and high running costs (Glasgow et al 1988). It is apparent though that a 10% success rate is significantly higher than what would happen in the absence of an organised cessation programme. This review will show that participation rates are amenable to increase, and running costs can be outweighed by benefits to the individual and the organisation. The following review will describe and assess workplace smoking cessation programmes. There is detailed discussion of the barriers to implementing these programmes, and the factors and approaches that work, as per the aims previously mentioned.

Method

Eight databases were used for this search which was carried out between 22 October and 12 November 2008. A total of 15 search terms were used. Due to the high number of items retrieved from the search, articles were chosen on the basis of article title and the content of the abstract. Only those directly related to smoking cessation programmes implemented in the workplace were included. Articles which mentioned extensive health programmes which included smoking cessation were not included in this review.

The following databases were used for the review:

- PyschINFO via CSA
- ProQuest
- PubMed
- The Cochrane Library
- ERIC
- WOK Web of Science
- Business Source Premier
- Wiley InterScience.

The following search terms were used across abstracts and titles. Some of the terms were not used in general databases due to its multiple definitions (e.g. employ*):

- work*
- workplace
- worksite
- workforce
- work-place
- work-site
- employ*
- occupation
- nicotine
- tobacco
- smok*
- cessation
- intervention
- program*

- quit*

Google and GoogleScholar were also searched. The terms used were:

- "work* cessation program*"
- "Quit* smok* at work*"
- "Employ* quit* smok*"

Other websites searched were:

- <http://www.quit.org.au/browse.asp?ContainerID=1807>
 - Quit Victoria (Australia)
- <http://tobacco.health.usyd.edu.au/site/supersite/resources/docs/index.htm>
 - Tobacco Control Supersite (University of Sydney, Australia)
- <http://www.globalink.org/tobacco/>
 - Globalink (global tobacco control)
- <http://www.cochrane.org>
 - Cochrane Collaboration
- <http://www.treatobacco.net/English/home/home.cfm.html>
 - Database and Education Resource for Treatment of Tobacco Dependence
- <http://www.tobaccoresearch.net/>
 - Global Tobacco Research Network
- http://www.treatobacco.net/English/search/search_action.php
 - Global Cancer Control
- http://www.wicomicohealth.org/Department_Pages/HealthPromotionPrograms/TobaccoUsePreventionAndCessationProgram/onsitesupport.asp
 - Wicomico County Health Department (USA)
- <http://www.niquitin.co.uk/stop-smoking-community/quitting-at-work>
 - NiQuitin (UK)
- <http://www.smoke-freeworking.com/>
 - Smoke-free Working
- http://www.floridainstituteforsmokingcessation.com/index.php?option=com_frontpage&Itemid=1
 - Florida Institute for Smoking Cessation (USA)
- <http://apps.nccd.cdc.gov/shrl/AdvancedSearch.aspx>
 - Centers for Disease Control and Prevention

And the following New Zealand websites were searched:

- <http://www.quit.org.nz/page/index.php>
 - The Quit Group
- www.ash.org.nz
 - ASH
- <http://www.wnmeds.ac.nz/Research/index.html>
 - Health Promotion & Policy Research Unit
- <http://www.hsc.org.nz/publications.html>
 - Health Sponsorship Council
- <http://www.moh.govt.nz/publications>
 - Ministry of Health.

The following journals were searched using similar terms to the database search:

- Tobacco Control
- Nicotine and Tobacco Research
- Journal of Smoking Cessation
- Addiction
- Journal of Occupational and Environmental Medicine
- British Medical Journal.

Review findings

The history of workplace smoking programmes and some current practices

Smoking reduction policies in the workplace were originally implemented for the protection of workplace machinery rather than for employee's health (Moher 2005; Walsh and McDougall 1988); however, today the focus is more on health (Schleiter 2008; Sorenson 2001; Walsh and McDougall 1988). In the United States (US), this is often fuelled by the increase in health insurance costs to employers arising from those employees that smoke (Schleiter 2008). This has led some employers to introduce workplace smoking cessation programmes.

Some workplaces in the US provide incentives and discounted health insurance to those who are smoke-free, and offer cessation programmes to those who are not; others have even gone as far as threatening to fire anyone who is not smoke-free by the end of a grace period (Schleiter, 2008; Walsh and McDougall 1988), or asking smokers to sign out when they are taking a smoking break — whereby this break will be deducted from their hours (O'Hagan 2002). A number of workplaces in Australian Capital Territory, Australia, reward non-smokers by giving them extra time off, and punish smokers with practices such as making them stay at work after hours (Doherty, 2003). Some polytechnics and universities in South-East Asia have a rule that if caught smoking on campus, they are obligated to have a two-hour smoking counselling session with a trained psychology student (personal communication with Penny Tok, 30 April, 2009). The ethics of these policies may be considered questionable by some, in that smokers may feel stigmatised and unfairly punished for a habit that is not completely within their control.

Implementation of workplace smoking cessation programmes

Literature on the number of workplaces that have implemented their own structured cessation programmes, and the types of programmes, is limited. The U.S. Department of Health and Human Services (1992) estimates that in 1992, approximately 40% of US private sector employers implemented a smoking cessation programme, and in 1999, 79% of US workplaces had some sort of smoke-free policy such as set smoking areas (USDHSS 2006). There is also limited information on the types of people who implement workplace cessation programmes. Most of the literature into this is from published journal articles

where a cessation intervention was designed and implemented by researchers, who often organised their own professional support for the participants. Workplace cessation programmes are often available or promoted through internet pages (for example, www.smokefreeworking.com); through a local, free telephone counselling support service (e.g. Quit Victoria 2009); or through healthcare providers. These cessation programmes often involve providing the workplace with self-help manuals, telephone counselling services, seminars (e.g. Quit Victoria 2009), and internet services (e.g. SmokeFree Working 2009).

Components of a workplace smoking cessation programme

Workplace smoking cessation programmes can involve a variety of components. These may include counselling, group therapy, self-help, and NRT. Counselling may involve setting a quit date, advice on coping with craving and relapse, and other forms of general support. Many self-help manuals offer similar advice as counsellors, however, it is provided in hard copy form as an additional resource, and for those who wish to quit without help. NRT has been found to increase the effectiveness of a cessation programme in a workplace by 10% (Osinubi et al 2003). Workplaces can also provide incentives and competitions to promote quitting. Competitions and incentives give participants rewards for joining cessation programmes and staying smoke-free. Another option for workplaces is to disallow smoking in the workplace. The following section addresses initiatives put into place in workplaces and their effectiveness.

Effectiveness of different workplace cessation programmes

A small number of smokers manage to quit smoking without the aid of any cessation intervention. It is estimated that about 2% of those who try to quit on their own succeed permanently (West 2006). For this reason, it is important to test whether an organised cessation programme works better than quitting without support. This is usually measured by having two groups, one that receives the intervention (experimental group) and one that does not (often receiving no treatment; control group). This section focuses largely on interventions that had an experimental condition and a control condition (i.e. receives no intervention or receives a lesser form of the intervention), or a singular intervention within a workplace. It is worth noting that many of the studies in the following sections may also have no control groups, in this case they may be researched before and after the intervention has been put into place (called pre- and post-test analysis). The use of control groups and pre-post study designs will be made apparent in the way that the studies and results are described.

Effects of changing intensity of workplace programmes

For the purpose of this review, intensity of the intervention refers to the amount of components in the intervention. Intensity is also measured by: the level of person-to-professional contact, number of sessions, use of NRT, and any other additional components. It is important to weigh up the costs of implementing a cessation programme with its effectiveness. A programme which is very effective may not be worth the effort if it is very time-, labour-, and cost-intensive. It is often assumed that the more intensive programmes will be the most effective with higher quit rates (Parrott and Godfrey 2004). A more intensive programme is championed by Burling et al (1989), who states that high relapse rates may indicate a need for maintenance and relapse prevention sessions. Cruse et al (2001) also held this view citing evidence that participants often suggest follow-up sessions, and methods of dealing with relapse risk factors (such as stress) as improvements to workplace programmes. However low-intensity programmes are often cheaper and cost-efficient to run; and for this reason, it is important to compare the effectiveness of different intensity interventions, which can then aid us in deciding on the most cost-effective programme.

The impact of low-intensity programmes

The simplest version of a workplace cessation programme is educating the workplace on the benefits of quitting. This method is inexpensive and easy to implement. For this reason workplaces are more likely to implement this type of programme than a more intensive, expensive option (Tiede et al 2007).

Schnoll and colleagues (2005) carried out an intervention on a variety of workplaces using a simple cancer education feedback system. This method involved surveying participants on their smoking status and thus cancer risk. Using the responses of this survey, tailored cancer reduction information — such as advice about quitting smoking — was provided. The study found that this simple intervention increased participants' intention to quit² and reduced the total number of smokers in the cohort by 4% two years following the intervention (6.1% quit rate). This study did not acknowledge participants who dropped out of the study (intention-to-treat³) and also did not have a comparison control group. This

² Prochaska and DiClemente (Prochaska et al 1992) theorised about the stages a person undergoes when they are attempting to change a health-related behaviour. Pre-contemplation is the stage where they are not even thinking of making a change (i.e. giving up smoking). The contemplation stage is where they acknowledge needing to change but are not ready to do it yet. Preparation is readying oneself to change, action is carrying out the change, and maintenance is maintaining the change.

³ Intention-to-treat involves including participants in the analysis who had dropped out of the trial part way through and classifying them as smokers. This type of analysis results in more conservative quit rate outcomes.

study found that those who were heavier smokers, young, male, and who indicated they were not yet ready to quit, were more likely to drop out of the study. These people are often those who are less likely to have quit smoking (Tanaka et al 2006), and thus not including them in the analysis may have given an overly optimistic outlook of the results. The lack of a control group could also mean that those who quit may have quit via other external methods, for example, the area could have had a mass media anti-smoking campaign while the study was taking place. A control group with a relatively high quit rate would indicate that these environmental changes had an impact. This reduces our certainty that we can attribute any of the measured outcomes solely to the programme.

Similar to Schnoll et al (2005), Gunes et al (2007) found that health education about the damage of smoking increased the proportion of people intending to quit in the near future, however education had no effect on the percentage of smokers who did quit. Thus although these studies had no cessation counselling, education alone can increase people's willingness to quit. These studies highlight the need for professional support when quitting smoking.

Another low-cost, low-intensity approach to smoking cessation was developed by Armitage (2007) who investigated whether asking people to create a quitting plan for the next two months would change smoking behaviour. The experimental group received a questionnaire asking about their smoking status, and this asked them to record a plan to quit smoking, which they may or may not have implemented. The control group received the same questionnaire but without the planning component. The experimental group had an 11.6% quit rate after a two month follow-up, compared to 2.3% in the control group ($p < .05$). This study showed that people who planned the quit attempt were more likely to quit than those who did not. Furthermore, it shows that although professional support is recommended, a cheap low-intensity intervention may produce a small positive effect.

The impact of increasing the intensity of the programme

The results of Schnoll et al (2005) and Gunes et al (2007) highlight smokers' need for expert advice on quitting in the workplace (although this can also be assumed for community interventions), as these studies found that people without this support were less likely to quit. Using twelve Japanese worksites, Tanaka and colleagues (2006) examined the effect of a treatment programme that was similar to the above studies, but included professional counselling and small workplace competitions. This intervention was carried out in Japan five times between the years 1999-2003. At this time, Japan had no workplace smoke-free

policies such as smoke-free areas. Without broader smoke-free policies or legislation in place, this study has the advantage of having a control group with no cessation intervention. The twelve worksites were divided into control and experimental groups according to the preference of the companies' safety and health commission. The intervention was entirely optional and consisted of posters and brochures advocating workplace cessation and educational messages about becoming smoke-free; four short counselling sessions by a public health nurse, and free NRT for those who requested it. At the end of the 36-month period (from baseline survey to the end of the fifth application of the intervention), the study found that the intervention increased the likelihood of smokers to quit (where being classed as smoke-free involved six months of continuous abstinence) 1.4 times higher (OR: 1.38, 95% CI: 1.05-1.81, $p < .05$) than the non-intervention group (12.1% versus 9.4% quit rate).

A similar intervention to Tanaka et al (2006) was carried out with apprentice iron workers (Barbeau et al 2006). Although this intervention was carried out in a different environment (e.g. no smoke-free policies) and had only a one month follow-up period; the intervention had a similar format to Tanaka. The interventions differed only in that Barbeau's intervention had eight group sessions and a more intensive educational programme (incorporated into their apprenticeship classes and carried out by the industrial hygienist). The study found that participants who completed this intervention were three times more likely to have quit than those who did not participate (OR = 3.0, 95% CI:1.15-7.83); where 19% of smoking participants were smoke-free using a seven-day point prevalence measure⁴. A lower level outcome in this study was intention to quit. They found that participation in the intervention was associated with an increased intention to quit where those who indicated a higher willingness to quit were more likely to remain in the study. The study highlights that those who are exposed to more dangers in the workplace (such as toxin exposures in the iron factory) may benefit greatly from education highlighting their increased risk of smoking-related illnesses. Although the outcomes of this study look positive, the study did not have a control group. This study compared those who had completed treatment with those who did not choose to take part. This creates a selection bias where those motivated to quit were compared to those who were not motivated to quit. Thus comparing the quit rate of these two groups introduces further bias and may create an increased estimate of the intervention's effectiveness. However Ringen and colleagues (2002) defended the design of this type of study as it reflects the "real-world" situation

⁴ Point-prevalence analyses are often used as a measure of being quit. The researchers state a length of time a participant has not had a cigarette as a requirement for fitting the definition of being smoke-free [quit].

where it is not usually possible to force participants into a cessation programme. Further, the short follow-up period of the study makes it difficult to compare it to other studies because many people relapse following treatment. In order to thoroughly examine the effectiveness of the intervention, longer follow-up periods were needed.

A more intensive intervention was carried out which involved one individual interview, nine group sessions of cognitive-behavioural therapy, and subsidised NRT. One-hundred-and-six smokers participated in this intervention (just under 20% of the smoking employees), and 80% of participants sufficiently adhered to the intervention requirements (Nerin 2005). Of those that adhered, 71.8% were quit at the 6-month follow-up using a 6-month continuous abstinence measure, and breath CO levels verification using point prevalence. Intention-to-treat analysis found that 57.5% of all participants were smoke-free at follow-up (also continuous abstinence; Nerin et al 2005) however no control group was analysed.

The studies in this section have added the additional component of counselling. This increased the effectiveness of the interventions by 0.5-13%, however the studies are difficult to compare due to the difference in follow-up time and lack of control groups. A more intensive intervention may also include the use of group sessions. These may be in the form of discussion groups or counselling. Group therapies are often a popular choice of intervention format as they can capture a large number of participants at one time, and thus also be more cost-effective.

Debate around the use of higher intensity programmes

There are mixed views as to whether more intensive workplace cessation programmes achieve higher quit rates. The use of more intensive programmes in the workplace has its advantages. For example, in Burling et al's (1989) computer-based cessation intervention (described later on page 20), they showed that the more intensive treatment resulted in a 10% higher cessation rate compared to the less intensive treatment. Whereas Schnoll et al's (2005) study using a personalised educational intervention reported a reduction in smoking prevalence of only 0.3%.

Jason et al (1997) found that although intensive interventions are more effective, the time and cost put into a more intensive intervention is often not worth the extra effort. Jason et al (1997) compared the effectiveness of three different workplace cessation interventions. This study involved 21 companies which were divided randomly across three groups. All

three groups were exposed to the media component of the intervention which was a five-day campaign discussing behavioural changes a person can carry out, and the negative effects of smoking. The three groups each received either self-help information alone (SH) — this was a book on the benefits of quitting and techniques they could use; self-help plus an incentive (SHI; \$1 [USD] per day for being smoke-free); or self-help, an incentive, and group meetings (G).

There was a significant difference between the 7-day point prevalence results of the three groups at the 6- and 12-month follow-ups ($p < .05$) where G consistently had the highest quit rate (33.1% versus 18.4% SHI and 15.7% SH, at 12-months). Following 12-months, the G and SHI treatments were significantly better than the SH treatment. Using intention-to-treat, G had a significantly higher quit rate than both SHI and SH conditions at all time points except for 18 months following the start of the intervention. Similar results were shown for continuous quit rates. Although not always statistically significant, the group intervention always had the better results and this suggests that the higher intensity treatment was more effective when compared to the lower intensity. However the differences between SHI and G were often not significant, highlighting that higher intensity treatments are often not considerably better.

Two studies (Willemsen et al 1998 and Sorenson et al 1996) provide further support for intensive cessation techniques not being worth the extra cost. Willemsen et al (1998) found that an intensive intervention using group counselling, media, education, and workplace policies was more effective than a self-help manual by 4% (16% and 12% quit, respectively) at 14 months using 7-day point prevalence and intention-to-treat analysis (using a prolonged 6-month abstinence measure there was no difference between groups). They regarded this difference in quit rates not significant enough to warrant the extra input into the more comprehensive intervention.

In relation to the question of providing more intensive interventions, Hennrikus et al (2002) found that across a variety of workplaces, phone counselling was either more effective than, or at least as effective as, a more intensive group counselling treatment ($p < .05$). However, this study failed to provide the overall cessation rate, presenting rates across different workplaces only. Interestingly, Burling et al's (1989) suggestion of a maintenance programme in an appropriate setting may still not be effective as shown in the study carried out by Hymowitz et al (1991). Hymowitz et al (1991) developed an intervention for six

white-collar worksites, where the experimental group received an “enriched milieu” (the author’s term for high-intensity intervention) cessation intervention. This intervention included health education — training the staff to implement smoking cessation counselling and also activities to promote health awareness, introducing smoke-free policies to the workplace which restricted areas where employees could smoke, and group therapy. The control workplaces only received group therapy. This study however found no significant differences of quit rates between groups where both had a quit rate of about 20% at the end of 12-months.

Both this review, and also the reviews carried out by Moher et al (2005) and Janer et al (2002) have found negligible support for higher intensity interventions being more effective than more simplistic interventions.

Environmental influences on smoking cessation

In most cases, an intervention in the workplace works better than smokers quitting without support, however, many could argue that if employers did not want smoking in the workplace they could prohibit smoking in the workplace. This method has benefits as it involves less cost and none of the employers’ time is needed to implement the intervention. When New Zealand introduced the 2003 SEAA to prohibit smoking in the workplace, there was an increase in the number of people interested in quitting smoking, as shown by the increase in callers to the Quitline (Wilson et al 2005; Wilson et al 2007), therefore this method has merit. Further, a review by Fichtenberg and Glanz (2002) found that studies that have examined the introduction of smoke-free workplaces show a reduction in the proportion of smokers by 3.8%.

However this method does pose some problems for the workplace. Although smokers are prohibited from smoking in the workplace, they may not quit which will bring about no reduction in absences. Smoking workers will still experience pre-occupation with when they can smoke the next cigarette, and may try to smoke in secret (Parry et al 2000). Those who are permitted to smoke outside in entranceways may leave smoking debris and thus increase fire hazards or make the workplace less appealing by having smoke and smokers crowding the entranceway (Parry et al 2000). A survey on the introduction of a total smoking ban in universities in Scotland in 1997, showed that both smokers and non-smokers were opposed to it due to the hazards associated with smoking in the university entranceways (Parry et al 2000).

Interestingly, a study has shown that adding treatment to a forced smoking ban on the workforce is not always effective. Troops in a military academy were forced to give up smoking during the six weeks of their basic military training (Klesges et al 1999). Klesges and colleagues (1999) examined the effectiveness of this forced smoking ban with, or without additional cessation treatment. Researchers randomly assigned 75% of these troops to receive extra cessation treatment, while the remaining 25% were subjected to the ban only (as per normal procedure). Treatment involved a 50-minute group session using education and behavioural intervention techniques such as role-playing, relapse prevention sessions, and the signing of commitment cards. The intervention and non-intervention groups had equal cessation rates at the 12-month point of 18%. Further analysis was carried out on the results to see if treatment had any effect on people's motivation to quit. Those who had no intention to quit by the end of the 6-week training, but participated in the intervention, were 1.8 times more likely to be smoke-free at 12-months than those who did not receive the extra intervention (OR = 1.79, $p < .05$). Klesges et al found that 4% of smokers strongly resented the imposed rule, and this proportion seems quite small. The responses to this survey question could be biased due to the strict military training received by participants; furthermore those in a military setting may be more likely to accept this imposed rule as part of their training, as when undergoing military training, people are expected to forgo many other commodities and activities. When imposing this rule in other workplaces, forced smoking cessation or regulations may create resentment among employees, and may be questionable from a legal standpoint. The people in Klesges et al's (1999) military training study may not be representative of the general population due to having a different working environment. It is not known to what extent the findings of Klesges et al can be applied to other settings.

The external environment (such as changes in government health policies) may also have an impact on workplace smoking cessation. To examine whether an environmental smoke-free policy was more effective than a workplace cessation treatment, Kadowaki et al (2006) compared the smoking prevalence in a radiator manufacturing company across two time-frames. Timeframe one was 1997-1999 when Japan had no smoke-free regulations in place. During this time, employees in the company were surveyed on their smoking status and smokers were approached by a doctor who spoke to them about the consequences of smoking. They were then asked to participate in a smoking cessation intervention where they underwent five months of support, received counselling (number of sessions unknown), and received pamphlets giving tips on quitting smoking. Participants also entered in

competitions as an incentive to remain quit. The control group were those who also received the initial meeting with the doctor and were not willing to participate in smoking cessation. The cessation rate for the experimental group was 8.4% (17 months following intervention) whereas the control group's rate was 3.4% (reported in Kadowaki 2000).

Timeframe two was 2002-2004. During this period, the Japanese government passed the Health Promotion Law (2002) which aimed to increase public awareness of health concerns. This led to many workplaces becoming smoke-free including the same radiator company that featured in timeframe one. Also, during timeframe two, Japan increased taxes on tobacco products. These environmental changes provide a novel way of measuring whether changes made in the environment are more effective in promoting smoking cessation than organised cessation initiatives. The second study found that 7.1% of smokers in the company had stopped smoking by the end of time frame two (year 2004). This difference was not significant. It seems that the low-intensity programme from timeframe one was just as effective as a forced intervention via environmental changes, however both were more effective than the "no intervention" quit rate of 3.4% (i.e. the control group of timeframe one). There were a number of design issues with this study. Both the studies were carried out in the same radiator manufacturing factory, which means that a large number of employees were exposed to the events that occurred in both timeframes. The study which was carried out during timeframe one (Kadowaki et al 2000) found that the intervention increased many participants' intention to quit in the future.

Research on changing the smokers' environment, both through legislation or through workplace changes, gives conflicting results. In New Zealand, the SEA (1990, and subsequent amendments) had the effect of mobilising people to take action and quit smoking (as seen by the increase in calls to the Quitline; Wilson et al 2005, Wilson et al 2007). Japan experienced no noticeable difference in efficacy with introducing environmental changes or a cessation intervention (Kadowaki et al 2006); and Klesges et al (1999) saw no improvement in quit rate when adding cessation intervention to an environmental change. Although these results seem contradictory, Klesges et al's study was carried out in a military setting which may not generalise to the public. Therefore, it may be effective to add additional cessation support to environmental changes such as banning smoking from the workplace. The Global Smokefree Partnership (2008) recommend implementing a total workplace smoking ban three months following the introduction of a cessation intervention, thus giving smokers a goal to work towards.

Studies that compare workplace programmes

In the experience of Tiede et al (2007), workplaces are reluctant to introduce a workplace smoking cessation programme due to the cost and time involved. Furthermore, in order for workplaces to implement a workplace initiative, they want the most effective treatment, that cuts least into work time, and keeps costs to a minimum. This section of the review examines the literature which compared two different intervention types together, and will then provide an overall summary of the different workplace interventions. Studies like these often use similar populations of people, and yet they trial different approaches. By using two groups of workers with similar characteristics (e.g. type of employment, education, socio-economic level), we may make best use of research resources to find out what works best for that group.

Computer and internet cessation interventions

Workplaces that are approached about cessation interventions for staff express concern that cessation interventions may cut into work hours. Internet and computer cessation programmes can allow a participant to make a quit attempt while remaining at the workplace and potentially saving time. Burling et al (1989) used a computer-based approach to smoking cessation. This approach is presumed to impact less on work hours while providing a more intensive cessation intervention. Administration employees who expressed an interest in quitting were randomly assigned into two groups. Both groups' interventions were five 5-weeks long and involved pamphlets, access to a telephone helpline, and a contest. The experimental group also had access to a computerised quit smoking programme. The computer programme required the participant to log in daily and record how many cigarettes they smoked, their subjective craving experience, and current brand of cigarettes being used. Participants were also required to record breath carbon dioxide (CO) levels. Using this information, the programme provided participants with nicotine phasing-out tips, for example, when to change to a lower-nicotine brand or reduce the number smoked. This study used 24-hour point prevalence and an expired breath CO level of less than 8 parts per million (ppm) to determine quit status directly following the intervention, 3-months, and 6-months later. Those who received the computer intervention had over double the quit rate of the control group ten days following treatment (48% and 21%, respectively), and at the 6-month point, there was still a 9% difference in favour of the intervention group (21% and 12%, respectively).

A more recent computerised workplace cessation intervention was also found to be successful. Graham et al (2007) gave International Business Machines (IBM) workers the choice of using a paper-based self-help quit programme or the QuitNet programme. QuitNet is an internet cessation programme which offers support such as: practical scientific advice for smokers, help with setting a quit date, social support through blogging, and advice on pharmacotherapies⁵. Seventy-two percent of the 8,688 people at IBM who smoked participated in the study, and of those, 27% used the QuitNet programme. The study found that those who used QuitNet had a quit rate of 43% (the quit rate for the self-help group was not reported in the article) using 7-day point prevalence twelve months following the intervention. When adjusting for intention-to-treat, the quit rate was still a high 12.8% when comparing it to a 2-3% success rate for those who attempt to quit unassisted (West 2006). This study (Graham et al 2007) found that the more frequently participants logged onto the QuitNet site; the more likely they were to be quit. For example, those who used the site four or more times were 1.7 times more likely to be abstinent (22%) than those who used the site fewer times (10%; OR = 1.74, 95% CI = 1.18-2.56; p<.05). Total time spent on the site was significantly positively correlated with abstinence. Use of the quit date and social support areas on the site were also associated with higher quit rates. Although this study had no biochemical verification (as the interviews were carried out over the internet and entirely confidential), the researchers concluded there was no reason to doubt respondents' reported quit status.

Social Support

Workplaces offer a social network which can provide support for anyone willing to quit smoking. In Jason et al's (1997) study, a support group was more effective than self-help alone. Willemsen et al (1998) found similar results but reported a negligible difference in quit rates (a 4% difference). This could be due to the smaller number of participants in the Willemsen study. McMahon and Jason (2000) attempted to find why a support network may be successful in increasing quit rates. This study used a wide variety of workplaces and randomly allocated the 63 worksites into three groups. Group one received orientation to the self-help manual, received six clinic sessions of cognitive-behavioural therapy, and information about the importance of social support; and a buddy system was established. This group also received 14 hour-long sessions and received \$1 for every day abstinent. Group two received the orientation and incentives, and group three received just the self-help manual and orientation. People who reported high positive social support were more

⁵ For more information on this programme visit <http://www.quitnet.com/>

likely to quit than people who reported negative social support⁶ (OR 4.19, $p < .05$; no quit rates reported). Participants reported that having somebody to talk to about the difficulties of quitting helped. This study also examined the relationship of stress, social support, and the interaction of the two on quitting. Stress did not mediate the effect of social support on quitting, thus theories which explain buddy support systems as beneficial due to alleviating stress were not supported. Instead the mechanism for the effectiveness of buddy systems seems to be that when people feel like they belong to a positive and supporting social network, they are more likely to quit regardless of stress (McMahon and Jason 2000). This study however had many other factors which could have influenced the results. Those who set up buddy programmes, and thus had more positive social support, also received Cognitive Behavioural Therapy whereas both other groups did not. Unfortunately, this study did not report quit rates. Many studies in this review mention social support as a positive factor in workplace smoking cessation, however the review found no studies which examined whether this assumption was correct. May et al (2000) carried out a review on buddy programmes in smoking cessation (not workplace initiatives). The review found some evidence for social support systems helping people stay quit, however, due to issues with the studies, such as using different measures of being quit and sample sizes, it was difficult to come to a definitive conclusion.

Group interventions also have added social support. Unfortunately, there seemed to be no literature comparing the effectiveness of individual therapy versus group therapy for smoking cessation in the workplace; however, group therapy has consistently been found to have higher success rates than self-help treatments. For example, a 33.1% versus 18.4% quit rate (12-month follow-up; Jason et al 1997), and 16% versus 12% quit rates (14-month follow-up; Willemsen et al 1998), for group and self-help interventions, respectively.

Nicotine replacement therapy

Not many of the workplace cessation interventions have used NRT, or have reported whether those who used NRT had increased cessation rates, however, evidence shows that NRT can double a quit rate (MoH, 2007). Both Ringen et al (2002) and Osinubi et al (2003) showed that adding NRT to a workplace cessation intervention can increase success of the intervention by a further 10%. Staff working in a hospital, who showed an interest in quitting smoking, received free NRT. At a 90-day follow-up, 31% of staff who requested NRT had quit using a self-report measure. Two-hundred-and-forty-five of those staff who

⁶ Negative social support is support perceived negatively by the participant.

received NRT also used other cessation methods (such as a quitline), however, this was their own choice and it was not promoted by the workplace (Wallace et al 2008).

Sutton and Hallett (1987) advertised for a smoking cessation intervention at a retail company. Three-hundred-and-thirty-four participants showed interest in the smoking intervention, and 270 of these workers were invited to participate. Those who were not invited served as the control group. The intervention group received two consultant sessions and a prescription for four boxes of subsidised nicotine gum. Sixty-four percent of the intervention group went to their first consultation; with the other 36% of participants analysed separately as a third group. Using self-report and confirmation of expired CO levels, 12% of the intervention group remained quit for a 12-month period, where only 1% of the other groups managed to remain quit. This study highlights the effectiveness of adding NRT to a very basic workplace intervention.

Workplace interventions that utilise incentives

Incentives are another tool that can be utilised in smoking cessation interventions. They can be in the form of money, free food, or competitions between workplaces or teams within workplaces. Incentives are often used to increase participation in workplace smoking cessation interventions (see section “Increasing participation to achieve greater workplace health benefit”), but there is mixed evidence as to whether the use of incentives is effective in increasing quit rates, and whether they need to be combined with other support to be most effective.

Glasgow et al (1993) carried out an intervention where employees received \$10 (USD) after every month they remained quit. The study showed that incentives alone do not increase cessation rates. Glasgow and colleagues aimed to make the intervention as simple as possible, therefore the intervention only involved monetary incentives at monthly checkups — the participants in this intervention received no formal support. Thus similar to Gunes et al (2007), and Schnoll et al (2005), who also had low quit rates (no change and 6% quit rate [without acknowledging intention-to-treat] respectively); the lack of effectiveness of this intervention highlights a need for additional support. Hennrikus et al (2002) examined whether adding incentives to treatment interventions already in place would increase cessation rates. Although incentives increased participation, they had no effect on the cessation rates of participants. Hennrikus et al (2002) used a \$30 (USD) incentive for participation, and prize draws of between \$125 and \$500 for remaining abstinent. The small

incentive or uncertainty of the prize draws may have been part of the reason that incentives had no effect on quit rates in this particular study.

Competitions are often used as a form of incentive to encourage people to quit. Klesges et al (1986) ran a competition between five financial institutions. The firm with the highest proportion of smokers abstinent at the end of the intervention won a dinner for all employees catered by the executives of the three losing banks. Firms also won other prizes such as \$100 (USD) total for the highest participation rate. Both the control firm and the four competition firms received the same intervention which comprised a six-week, controlled smoking, cognitive behavioural programme — this involved the gradual reduction of number of cigarettes smoked and the changing of cigarette brand to a brand with a lower nicotine level. The competition firms had reduced the number of smokers by 16%, whereas the control group had a 7% quit rate 6-months following treatment. This study also found that the non-abstainers in the competition group had much lower levels of expired CO than in the non-competition group. This showed that those who did not fully abstain made a more successful effort in the competition firms than the control firms (Glasgow et al 1988).

Jason et al (1990) had a very successful intervention where participants received \$1 (USD) per day of abstinence and an additional \$30 per month of abstinence. There were also group activities such as \$300 for the team with the highest proportion abstinent, and prizes for the non-smoking support buddies. The intervention involved group sessions which consisted of three-weeks' worth of quitting meetings, six weeks of maintenance sessions, and self-help manuals; with all active components carried out by trained staff at the workplace. Each participant had the choice of how much of the intervention they were willing to participate in. The success rate of this programme was high, where at one year 36% were abstinent, and 21% remained continuously abstinent throughout the whole period. Although the success of the intervention was attributed to the incentives, another reason for its success could be due to participants having the choice of how much of the intervention to participate in. It is unfortunate that this study did not record the dropout rate, or include those lost to follow-up in the final analysis.

The review shows that the use of incentives to help improve quit rates has varying success. Those who received incentives for participation alone tended to have lower success rates than those who received incentives and prizes for remaining quit. For example, Hennrikus et al (2002) gave incentives for participation, however these incentives had no effect on quit

rate, whereas the Jason et al (1990) study had a high quit rate when participants received money for each day abstinent. This was also backed up by research in the community where \$250 for six months of abstinence following the intervention and a further \$400 for an additional six months following the first cessation attempt, resulted in a 9.4% continuous quit rate at 15-18 months following intervention, which was confirmed by biological testing (compared to 3.6% in the no incentives group, $p < .05$; Volpp et al 2009). However, Jason et al (1997) found that incentives increased the quit rates for the duration of the intervention. Following the 6-month intervention, the incentives were removed, and the incentives group did not have significantly higher quit rates, thus showing that once incentives are removed, no effect is observed on quit rates. Rand et al (1989) also showed that incentives received for days quit, do not maintain quit status. In this study, participants were required to be quit for a week, following biochemical confirmation of this; they were randomly assigned to one of three groups. They could receive (Group A) two scheduled visits a week to measure breath CO levels, and \$4 (USD) for each breath CO level of less than 11ppm, (Group B) visits twice a week and received \$4 regardless of their breath CO levels, and (Group C) one random visit per month and \$40 regardless of their breath CO levels. The results showed that although Group A managed to remain quit for longer, after six months, participants in all three groups had relapsed where the difference between groups was not significant.

Summary of information presented so far

A wide variety of workplace cessation interventions have been shown to be effective across workplaces. Due to the differences in the types of studies, measures, and follow-up periods, it is difficult to identify the most effective methods for quitting. There is no strong evidence that any *single* method is more effective than another, however, there *is* evidence to support a need for professional support to aid and motivate people to quit. There is support for the use of professional counselling (either group or telephone) being more effective than one session of counselling/advice, education, or self-help. From the information above, medium-intensity interventions — those with a variety of different components such as NRT, group/telephone therapy and education — seem to be the most cost-effective, thus having good success rates but relatively lower costs. Implementing cessation programmes in New Zealand workplaces would be relatively easy given the availability of the publicly-funded Quitline, the accessibility of heavily-subsidised NRT, and the range of evidence-based print material produced by The Quit Group. However there would be some difficulties in smaller workplaces, such as farms, where social support and structure are not necessarily as available. Competitions, although more costly, can include the whole workplace thus

increasing social support and making quitting more enjoyable; however when implementing these, there should be support in place when competitions have finished to reduce relapse rates.

Socio-economic status and workplace smoking cessation programmes

The majority of workplaces that have smoking cessation programmes are classified as 'white-collar' workplaces (Sorenson 2001; Sorenson et al 2002). 'Blue-collar' workers have been found to work in environments less supportive of smoking cessation practices, and therefore less likely to have cessation policies or interventions (Giovino et al 2000). For the purposes of this review, blue-collar workers are defined as those who work in the manufacturing and construction areas, various types of shift work, and those employed on a wage and not a salary (Sorenson et al 2007). The lower prevalence of workplace cessation programmes in blue-collar workplaces could be due to the fact that these workplaces have a high number of shift workers or employees who work offsite such as construction workers (Sorenson 2001; Sorenson et al 2007). Although there seem to be fewer workplace cessation programmes in blue-collar workplaces, efforts need to be made to reduce smoking among blue-collar workers as they have a higher reported smoking prevalence than white-collar workers (in New Zealand about 33% of blue-collar workers smoke and about 20% of white-collar workers smoke) (MoH 2005b); their smoking prevalence tends to decline at a slower rate than that of white-collar smokers (Giovino et al 2000); and they are less likely to join a smoking cessation initiative in both the community and the workplace (Sorenson et al 1996). Similar to the situation with blue-collar workers, people who come from more deprived areas (as measured by the MOH 2006 NZDep Index; MOH 2008b) are also more likely to be smokers. Prevalence of smoking was three times higher in the quintile of greatest deprivation compared with the quintile of least deprivation. Smoking prevalences for men and women (respectively) in the quintile of greatest deprivation were 12.7 and 13.5 percentage points greater than the prevalences of the middle quintile (men 21.5%, women 18.7%). Many of the interventions mentioned above focussed on white-collar workplaces, due to the differences between the two types of workplaces and the difficulty and importance of utilising interventions in blue-collar workplaces. The following section provides an overview of workplace cessation interventions implemented in blue-collar workplaces.

Gaining access to blue-collar workers

The higher number of blue-collar smokers and lack of cessation programmes for them is an issue because blue-collar workers are often exposed to more hazards than white-collar workers, such as dangerous machinery or asbestos, which can increase their risk of smoking-related accidents or illnesses (Sorenson 2001; Sorenson et al 2007). As many blue-collar workers are shift workers, or work away from the workplace (such as builders), it is often difficult to implement an intervention which reaches a large number of workers. One method which is easy to apply to all blue-collar workplaces is implementing a smoke-free workplace. In a review by Fichtenberg and Glanz (2002), they found that this may reduce smoking prevalence in the workplace by about 3.8%. Glasgow et al (1997) found a similar result in their study where the introduction of designated smoking areas increased cessation attempts by 5% (compared with no policy), and workplaces disallowing smokers from being employed increased cessation attempts by a further 3.2%.

To reach a larger number of workers, Kadowaki et al (2000) provided factory workers with one mandatory counselling session. At this session, the workers were advised to sign a declaration stating they would attempt to quit smoking. Just under 50% of the smokers in the workplace signed the declaration and participated in five months of smoking cessation treatment such as periodic group sessions (carried out by a doctor or occupational health nurse), received brochures, and the chance to participate in a quit smoking marathon (i.e. a competition to be smoke-free for 42 days). This study achieved cessation rates of 12.9% for the group which signed the declaration, and 3.1% for those in the control ($p < .05$).

Another way of accessing blue-collar workers could be through unions or compulsory health checks (Barbeau et al, 2005 & 2006). This is because unions are a source of communication throughout the workplace, and are also trusted in the advice and information they give to the workers (Barbeau et al 2005). Some workplaces, such as those that work with asbestos, require their employees to have regular medical screening. This screening is compulsory and may provide an effective way to reach the whole workplace. Johnson et al (2006) found that asbestos workers, whose risk of getting cancer increases by 50% when exposed to both asbestos and cigarette smoke, do not take advice seriously enough when advised by a physician to quit smoking. The physician advice consisted of only a couple of minutes speaking about the benefits of quitting, and had no effect on the number of smokers at the next meeting with the physician which occurred the following year. This study highlights that

this is an effective method of reaching the entire workplace, but is not sufficient in itself for reducing smoking prevalence.

Lang et al (2000) used the same method as above, but introduced a follow-up interview. Thirty gas companies were randomly assigned into two groups. Employees at these workplaces also underwent mandatory health screening; the employees from the advice only group (AO) were asked their smoking status and given advice to quit. The other group (extended counselling group; EC) received the same counselling and were asked to create a quit date, received a phone call seven days following the quit date, and were visited a couple of months following that. One year following the intervention, 13.5% of the AO group and 18.4% of the EC group were quit ($p < .05$; using point prevalence of unknown days). One method of increasing the quit rates found in the interventions is a combination of a comprehensive talk about the hazards of workplace smoking along with physician advice.

Rodríguez-Artalejo et al (2003) recruited bus drivers into a cessation programme using a similar method to Johnson and colleagues (2006), and Lang et al (2000). The intervention included receiving brochures, three short counselling sessions, and subsidised NRT. The rate of continuous abstinence (using intention-to-treat) was 20.2% (OR = 2.58; 95% CI: 1.12-6.0; $p < .05$); and were 2.58 times more likely to have quit than the control group who received no treatment. This highlights that one session with a physician is not enough, but that a few more sessions may increase the success of an intervention.

A study by Sorenson et al (2002) found that making workers aware of the increased hazards in their working environment, compared with other working environments, can double cessation rates (from 5.9% to 11.8%; $p < .05$). This may work well in blue-collar settings as workers are consistently exposed to workplace hazards, and although they already know the risks, promotion of the risks to health (including smoking), may make health risks more salient and therefore motivate a worker to make a change (Sorenson et al, 2002).

The use of telephone-based assistance with blue collar workers

Sorenson and colleagues (2007) carried out an effective programme with construction workers which had relatively high participation and success rates. This cessation programme surveyed participants on their health and smoking habits, and asked whether they would be willing to participate in a low-intensity randomised study. The participation rate was 74%. Participants in the intervention group received four to six motivational interviewing

telephone calls — where they received up to four calls from a health advisor — and information on health and quitting smoking tailored to their responses at the initial survey. At the six-month follow-up, 8% of the control group was quit compared with 19% in the experimental group (self-reported 7-day point prevalence). This study highlighted that low-intensity interventions, when reaching a large number of participants, can be very effective.

The above study highlighted that telephone cessation counselling can be an effective intervention for blue-collar workers. This is because unlike group sessions and individual face-to-face counselling, the workers do not have to be at a set place at a set time, and can call back the counselling service should they miss a call (Osinubi et al 2003). The effectiveness of telephone counselling was shown in a pilot study by Ringen et al (2002) who advertised smoking cessation through a carpenters union. Advertising by means of brochures and a speaker at the union meetings, this study recruited 12.5% of 7,400 smokers. Participants had a choice of receiving either one phone call from a counsellor, or five phone calls. Participants could call the service as often as they liked and were encouraged to use NRT subsidised by a carpenters trust (75% used some form of cessation medication). Twenty-two percent were quit at twelve months (7-day point prevalence). Furthermore, those who opted for the five phone calls were more likely to quit (18.9% vs. 28.4%). Use of NRT increased quit rates from 20% to 30.7%.

Osinubi et al (2003) also effectively used telephone counselling services for blue-collar workers. Smokers were recruited when they received screening for asbestos-related illnesses, where they were divided into two groups, one which would receive physician advice only (PO), and a group that received FREE & CLEAR telephone counselling (PC). Not only did this study show the effectiveness of telephone services when quitting (PC 16.7% versus PO 6.9% quit rates), it also showed that participants were more likely to participate in a telephone-based intervention than physician-based intervention. Sixty-six percent of the PC group participated and signed up to the telephone counselling service, and 21% of the PO group had their follow-up session with the physician. Further, 40% of the PC group completed a significant part of the intervention. Thus mandatory screening can be a successful way to recruit smokers into a smoking cessation intervention, however, they are best assisted when given a proactive intervention to help become quit (e.g. the success of proactive telephone counselling described above).

Studies that have conducted cessation programmes in a variety of workplaces, including combinations of white-collar and blue-collar workplaces, may allow for a direct comparison of how to pair cessation interventions with workplaces. A study by Tanaka et al (2006) used twelve different workplaces — most of these were blue-collar workplaces with one white-collar workplace. This study found that the treatment, which consisted of smoke-free health promotion, counselling, and competitions, implemented over a 36-month period, was more effective with white-collar workers (23.6% quit rate) than with blue-collar workers (11.9% quit rate). This method appeared to increase the number of white-collar smokers who quit (from 12.7% in the control to 23.6% in the experimental group — although not statistically significant), and a small positive effect was found for the blue-collar workers (from 9.4% in the control to 11.9% in the experimental group). This lack of significance could be due to the smaller sample size of the white-collar workers (72 in the intervention) compared to the blue-collar workers (945 in the intervention group).

Due to the challenges facing blue-collar workplaces, these workplaces may need different types of interventions to white-collar workplaces. Recruiting participants through compulsory physician visits (or any other regular meetings could be used) is effective at reaching a high number of employees. The most effective and easy to implement intervention has been shown to be telephone-based interventions, where education around smoking harms and work-related hazards can also be used to increase motivation.

Increasing participation to achieve greater workplace health benefit

Workplace cessation interventions have the advantage of being set in a constant environment, where there is social support and structure, however, even with these beneficial factors, workplace cessation programmes are often faced with low participation and high attrition rates (i.e. number of people dropping out of the intervention). The success rate of a programme is dependent on two factors, the success of acquiring and keeping participants, and the success of the programme to promote smoking cessation. If a programme has a low participation rate or high attrition rate, then even if it is a successful programme, it benefits fewer people (Klesges et al 1988). For example, in a worksite with 100 smokers, a programme with a 20% success rate but only 20% participation rate has only reduced its number of smokers by four; whereas a programme with an 80% participation rate and a 10% success rate has double the number of people who have quit.

Competitions and incentives

Although incentives seem to have no significant effect on quit rates (Glasgow 1993), Graham (2007) states that the use of incentives can encourage people to join a cessation programme, even for those who are in the pre-contemplation stage of quitting.

Klesges and colleagues (1986) showed that having a competition between firms was effective for increasing participation rates. This increased participation from 53% of smoking employees in the control group (who received standard self-help information and some cognitive behavioural therapy), to 88% of smoking employees in the groups involved in the competition (who received the same treatment as control, but with the addition of a competition). Among those who participated in the interventions, 91% completed the full 6-week programme; however, this high retention rate was seen in both competition and non-competition firms.

Gottlieb and Nelson (1990) carried out a programme similar to Klesges et al. Their study involved twelve corporate workplaces in Texas, six of which were involved in a competition between each other and six controls. The six in the competition intervention were told that the firm with the most people — smokers and non-smokers — signing up to the cessation programme would win a cold turkey buffet. This method resulted in 70% of all employees in the competition groups joining the intervention programme, whereas only 17% of employees from the non-competition workplaces joined.

Competitions and incentives can increase participation but can be quite costly — for example, the cost of the cold turkey buffet mentioned above would be quite expensive to provide for entire workplaces. Furthermore, non-smokers who are not eligible for the prizes may feel left out (Tiede et al 2007), and interestingly Glasgow et al (1993) found that incentives did *not* increase participation, however this could be due to the low incentives (\$10 per month). There are less costly ways of encouraging participants to stay in cessation programmes. Barbeau et al (2006) used a variety of small, low-cost incentives and practices which retained participants. Participants were sent reminder cards when they had not returned surveys, and each person who completed a survey received a small (unspecified by the authors) monetary reward. Participants also received free lunch during group therapy which was held during working hours. Further, participants received free NRT. This design had an overall retention rate (completion of both before- and after-surveys) of 79% of smokers. Although the study did not measure the effectiveness of these interventions on

participation (as there was no control group to compare with), it can be assumed that having the therapy during working hours and putting on a free lunch would have increased the participation rate as shown by the reduced attrition rate.

Ease of accessing information and support

Other ways to increase participation includes making available published information on the topic, no-cost and no-obligation meetings, strong support from management, and granting time off work when doing the programme (Global Smokefree Partnership 2008). These characteristics were present in Barbeau et al's (2006) study. Information on quitting smoking, positive pressure and support from workmates increased intention to quit in the near future, or increased people's intentions to join a workplace quitting intervention (Gottlieb and Nelson 1990).

Participant satisfaction

Participant satisfaction with the cessation intervention may also increase retention in a workplace cessation programme. Cruse et al (2001) found that a relatively simple programme with few sessions and free NRT was generally satisfactory to participants. This was reflected in the 64% attendance rate. The attrition rate in this study was attributed to people doing shift work rather than dissatisfaction with the programme, thus highlighting the importance of flexible programmes which fit with the needs of those working inconsistent or unsociable hours. Tiede et al (2007) used a focus group to examine what employees and employers look for in a smoking cessation programme. Although often found to have the lowest participation rates, group formats were voted the most popular. People were also more likely to participate if the interventions were during work hours, however, employers in the focus groups were less willing to pursue this. One method of overcoming this issue is having sessions either during lunch hours or just as work has finished. Phone counselling has also been suggested as a popular intervention for smoking cessation, as highlighted by Ringen et al (2002), where 90% of participants were satisfied with the phone counselling service as a method of workplace cessation.

Proactive support

A more proactive personalised approach to asking people to join cessation programmes seems to be more effective than an anonymous approach. Lowe et al (1987) randomly divided a cohort of white-collar smokers, who indicated they may be interested in a smoking cessation programme, into two groups. Group one received a formal letter inviting them into

the cessation programme and asked them to telephone to schedule an appointment with the people running the cessation intervention. Group two received a phone call about joining the programme and were invited to schedule an appointment. No one from group one scheduled an appointment, whereas 51% of group two did (however, only 16% of group two kept the appointment). The New Zealand Smoking Cessation Guidelines (MoH 2007) is a best practice document that informs agencies and the public on the most effective methods of smoking cessation. This document recommends that proactive support is more effective than support sought by the client (MoH, 2007). For example, a quitline which rings the client will have more success at helping the client become quit, than if the client had to call the quitline for support (Stead et al 2006).

Other factors influencing participation

One study found that those more likely to participate in a workplace cessation programme tended to be older and heavier smokers (Glasgow et al 1988). Klesges et al (1988) used a variety of measures including questionnaires assessing smoking habit, level of nicotine dependence, stress level, and both workplace and personal opinion on smoking (such as whether it is okay to smoke in the workplace). This study showed that participation was predicted by level of abstinence following previous quit attempts, where it was assumed that those who had not managed to stay quit for a longer period of time were more likely to join a cessation intervention. Heavier smokers, and those who believed they were at high risk of a smoking-related illness in the future, were also more likely to join (Klesges et al 1988). Thus increasing people's awareness of risk of smoking-related illnesses may increase participation (as shown in the study by Sorenson et al 2002). Participants from Klesges et al's (1988) study who dropped out from the treatment were found to have lower initial expired CO levels in their breath, and were less likely to endorse more stringent smoking policies in the workplace. Additionally Schnoll et al (2005) found that younger, male, and heavier smokers were also more likely to drop out. Interestingly, the number of smoking co-workers was also positively related to participation; where those who had more smokers in the workplace were more likely to participate in smoking cessation (Klesges et al, 1988).

Approaching employees who smoke and perceived stress

Perceived workplace stress plays a role in smoking behaviour. One study found that it increased non-smokers' tendency to approach smokers about their smoking in a negative way, and smokers were also less likely to quit, and viewed these approaches as hostile (Gottlieb and Nelson 1990). It seems that approaching smokers in a non-aggressive way is

more likely to increase participation. Many studies report that those exposed to higher stress levels in the workplace are more likely to be smokers (e. g. Kouvonen et al 2005), and smokers often use a cigarette to relieve this negative affective state (Sarna et al 2005). Chan and Heaney (1997) found that workers who have higher levels of stress are more likely to respond that they would join a smoking cessation programme if offered. This was challenged in a study where focus groups of nurses perceived stress as a major barrier to participating in a smoking cessation programme (Sarna et al 2005).

High levels of participation in a workplace cessation programme are as important as the effectiveness of the programme. This point was discussed earlier under the heading 'Increasing participation to increase public health benefit'. There is little point in having a cessation intervention which few people participate in. The literature suggests that the most effective way to increase participation is via competitions, however these are not always cost-effective. Implementing programmes during work hours may increase participation, and extensive advertising of the negative effects of smoking to people's health may also increase a person's likelihood of joining a cessation programme. There is also evidence that a low- or medium-intensity intervention is appealing to potential participants (Cruse et al 2001). The results relating to the effect of stress on joining a cessation programme are mixed, however, people seem to smoke less in a relatively low-stress environment, and the inclusion of other strategies to boost wellbeing at work may make a programme more effective.

Costs and benefits to the workplace and economy of implementing a workplace cessation programme

When they are free to the client, workplace smoking cessation programmes may be more appealing, and have higher participation compared to cessation programmes held in the community. This is because workplace cessation programmes offer regular convenient support which is easily accessible. Many workplaces may be reluctant to implement workplace smoking programmes due to the cost (Tiede et al 2007). However an employer may face extra costs when employees smoke, for example, costs caused by absenteeism. Employees who smoke have around three times more sick days than people who have never been smokers (Halpern et al 2001). Absenteeism not only affects the production of the smoker themselves, but costs the company sick leave and creates a greater workload for other staff (Halpern et al 2001; Parrott et al 2000; Sorenson 2001). People who smoke are estimated to take half an hour a day more breaks than smoke-free employees (Health Canada 2008) which also leads to additional costs to the workplace.

Economic gain of a workplace smoking cessation programme

There is some research highlighting that the total savings due to lowered healthcare costs, less sick leave, and increased productivity as a result of having a workplace cessation programme, may outweigh the costs of implementing such programmes to both the local economy and the workplace (Halpern et al 2007). The Washington Economics Group Inc (2008) examined the cost of smoking to the economy against the costs of workplaces implementing a smoking cessation programme. This report found that the costs of smoking to the Florida economy were estimated to be around \$6,942 (USD or \$11,911.72 NZD⁷) per smoker due to reduced life-span, and medical expenses. This estimate did not include loss to the economy via sick-leave and reduced workplace productivity. Using a cessation programme costing an estimated \$1,200 to \$3,600 per year (\$2,060 – 6,180 NZD) in Florida, the return per dollar spent smoking cessation for a workplace was expected to be between \$1.90 and \$5.75 (\$3.26 - \$9.87 NZD). It is positive that the return from having invested in a workplace cessation programme exceeded the cost of implementation.

Estimated benefits for workplaces that invest in cessation

Workplaces which offer smoking cessation programmes may face costs such as hiring a counsellor/expert who can offer expert advice, reduced employee working hours due to the intervention taking time out of work hours, time taken in the planning and implementation of the programme, or of providing NRT. In New Zealand, these costs may be lower than other countries mentioned later in this section, as NZ offers a free, proactive, telephone-based cessation programme (i.e. Quitline) which also provides heavily subsidised NRT.

Halpern et al (2007) has examined the cost-benefits of a hypothetical workplace cessation intervention, finding that implementing a workplace smoking intervention will result in higher productivity and return for the company. Some studies have examined this effect experimentally. The costs of implementing the workplace cessation intervention run by Ringen et al (2002), which included phone counselling and free NRT (which, unlike the case in NZ, was not free to the union or companies involved), was \$91,250 total for the intervention. The most conservative quit rate for this study was 21.8% (using 7-day point prevalence at a 12-month follow-up). The cost of this programme per successful participant was \$1,025.28 per annum (\$2,014.09 NZD).

⁷ Converted to NZD on 15 April 2009.

As mentioned before, smokers take on average half an hour extra break per day. In the New Zealand workforce, where an average full-time employee is expected to work 48 weeks per year and 40 hours per week, this amounts to 120 hours of lost productivity per year. Calculating these losses at the median weekly salary (and wage) income of \$729 per week (or \$18.22/hour; Statistics New Zealand 2008)⁹, this could mean an annual loss to the workplace of \$2,190 per smoking employee. Compared to the overall cost of implementing a cessation programme, it would seem that it is less costly to run a workplace cessation programme per successful participant, than to *not* encourage smoking employees to quit. Further, the benefits of having a smoke-free worker increase with every year they are quit (Halpern et al 2007).

Tanaka et al (2006) calculated the full range of costs (including research costs) for their workplace intervention which was implemented over three years. This intervention involved counselling sessions, small competitions, brochures, posters, and free NRT. The cost per quitter in this study was ¥70,080 (\$1,435.49 NZD) for the intervention. The costs of such an intervention may be lower if external bodies provide some of the support as part of a government mandate. For example, as mentioned earlier, NZ provides subsidised NRT through the Quitline, medical doctors and prescribing health professionals (e.g. some optometrists), and Quit Card providers. Quitline also provides free cessation support which would remove the need to hire professionals.

Features of effective workplace cessation programmes

This review has highlighted practices and factors associated with effective smoking cessation programmes in the workplace. This section reiterates these points. Many of the studies mentioned in this review have different follow-up periods and use different measures of being quit. For this reason, it was difficult to compare studies and definitively state the features of the best methods.

Of the cessation interventions mentioned, group formats have been said to be the most popular (Tiede et al 2007), and are successful (for example, see Gottlieb et al 1990; Barbeau et al 2006; Moshhammer and Neuberger 2007); however, they generally have a lower participation rate (Henrikus et al 2002).

⁹ It is assumed that these figures refer to gross and not net amounts. This was not clear from the Statistics New Zealand (2008) document.

In workplaces where the work hours and work environment stays the same (e.g. white collar workplaces), group therapy would be a good option as it can reach a large number of people at a time, and only requires one professional to administer the therapy across a larger number of people. However, blue-collar workplaces would probably find this difficult to implement.

Blue-collar workplaces need to be specifically targeted due to the higher prevalence of smokers in this area, and due to the difficulty of implementing interventions and maintaining participation rate. Telephone-based interventions have also been shown to be successful in this area, and therefore can be implemented in the blue-collar workplace.

Of all the interventions mentioned, self-help alone, and minimal interventions (for example one meeting with a physician, or education alone) have been found to be least effective.

The proportion of workplaces that have a type of cessation programme in place is not known. Given other research, it is likely that white-collar workplaces are more likely to have one in place. The literature does not focus much on workplaces which have implemented cessation interventions of their own accord, rather the literature focuses on studies and interventions implemented by researchers.

Participation is also an important factor in workplace cessation programmes. To increase participation, the use of incentives has been most effective in boosting participation. This, however, may cause dissent among non-smokers. Klesges and colleagues' (1986) competition between workplaces, which also involved non-smokers as buddies was very successful at increasing participation (and quit rates). However, designs like these can be costly and difficult to implement. To increase participation, smaller incentives such as free lunches can be used. Further, the use of reminders and having an intervention which participants are satisfied with, will increase participation and retain participants.

Workplace cessation programmes are generally successful. There is a trend for more intensive interventions that incorporate follow-up being more successful. A cost-benefit analysis would be helpful in understanding which programmes work best for different workplaces. Overall, studies have shown that the benefits of most types of interventions outweigh the costs of implementing the programmes. Further, in the New Zealand setting, there are many resources available at minimal or no charge.

Tiede et al (2007) held focus groups with both smokers and employees/managers to find what would be the most appropriate steps employers should take when approaching smokers. Smokers stated that NRT and smoking support groups would be most helpful when quitting at work. Most smokers agreed that employers should encourage them to quit smoking and provide the resources, however, without being too forceful. Many employers understood the logic of encouraging smoking cessation, however, some felt it was not their business but rather the smokers' own choice. The managers of workplaces with health and safety programmes agreed that introducing a smoke-free component would be a good idea. The problems brought up by employers included getting people interested, including the non-smokers in competitions and incentives, and not creating a feeling that smokers were being targeted.

When implementing a workplace cessation programme, participants (e.g. smoking employees) need to be aware of the options available. This is because participants unaware of all the options and benefits to them may not make the most of these options. For example, Willemsen and de Vries (1995) carried out a well-structured and intensive smoking cessation intervention. A large part of the success of this study focussed on packages/letters which were tailored specifically to participants needs, highlighting the next steps to take to become quit. However, many of the people who underwent this intervention were unaware of the letters being personalised and for this reason missed out on a valuable aspect of the treatment. In the study mentioned earlier by Lowe et al (1987), personalised entry into the programme led to more people participating. If participants in the Willemsen study knew that the packages and letters were tailored to the individual, a similar effect may have occurred.

To make a cessation programme more successful for different groups of people, it has been suggested that programmes be created specifically for participants' needs (Klesges et al 1988). This is because various studies have found different effects of workplace interventions for heavy and light smokers, and different age groups (Klesges et al 1988; Willemsen et al 1998). Techniques for smokers of a different level of addiction include such things as nicotine phasing, and dosing of NRT, which have been shown to help heavier smokers (Klesges et al 1988). Thus, it seems best to have a stepped care approach to workplace smoking cessation (Willemsen et al 1998).

Application to New Zealand

Most studies in this review were carried out in the US, Europe or Asia. New Zealand, however, is a unique setting in which there is free public health, and subsidies on medications such as NRT. New Zealand also has the national freephone helpline, the Quitline. This service provides subsidised NRT and also has an internet web page (www.quit.org.nz) containing smoking cessation information and a blog. Telephone helplines have been shown to be successful at increasing smoking cessation in the workplace (e.g. Osinubi et al 2003), and participants who use blogging sites during a workplace intervention are also more likely to quit (Graham et al 2007). Implementing free services as part of a workplace cessation intervention, and adding workplace support may provide a very strong and cost-effective foundation for increasing quit rates in a variety of workplaces.

Another service offered in New Zealand is the training of Quit Card providers. Quit Cards are cards which can be exchanged at a pharmacy for subsidised nicotine gum, lozenges, or patches. Quit Card providers are trained free so that they can assess smokers, provide advice, and distribute Quit Cards for NRT of the required strength. Almost anyone in an organisation can be trained to become a provider, however, it is preferred that the occupational safety manager of the workplace or workplace health nurse undergoes the training (personal communication Tracey Pirihi, The Quit Group's Quit Cards Co-ordinator, 15 April 2009). Workplaces can have a Quit Card provider as part of their smoking cessation programme, providing staff with easy access to NRT. NRT has been found to improve workplace smoking cessation intervention by increasing the quit rate by about 10% (Osinubi et al 2003). Finally, The Quit Group currently also provides the public with a Quit@work service. This service provides interested workplaces with advice and support about workplace smoke-free policies, strategies to help staff who want to quit smoking, and smoking awareness resources for the workplace. In some cases, The Quit Group's Quit@work service can provide *en masse* training sessions for staff to become Quit Card providers. Quit@work is a relatively new programme which can be accessed by any interested workplace by visiting The Quit Group's website (<http://www.quit.org.nz/page/providers/QuitAtWork.php>) or by contacting the Quit Group Workplace Advisor on 0800 778 778.

Implementing a smoking cessation programme into the workplace would best be informed by seeking input from both staff and management (Tiede et al year 2007; Global Smokefree Partnership 2008). Both groups can meet and agree upon as best and fairest methods, what

incentives are fair (including how to include non-smokers), and make decisions about what will fit well into that particular workplace. These discussions can be used to gauge level of interest in a workplace cessation programme. Further, evaluating the intervention throughout the year can inform the company of how well the intervention is working, and what changes need to be made. This evaluation may include the following: measuring rates of absenteeism and sick leave, documenting how the programme is implemented and changed over time, measurement of continuous and point prevalence quit rates, changes in productivity, and also participants' satisfaction with the intervention (Global Smokefree Partnership 2008).

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Appendix 1: Measuring the success and outcome of a workplace cessation programme

The research mentioned in the review used a variety of methods to measure the success of workplace cessation programmes. The measures included: different follow-up periods, multiple definitions of quit, biological and self-report methods of measuring whether a person had quit, and different measures of participation and dropout rates. This section summarises the different measures used, and highlights the measures which would be optimal for workplaces to measure the success of their own cessation programmes.

The impact of the programme on employee smoking

Follow-up periods and measurement of outcomes

Follow-up is needed to show whether a programme works long-term. Many people will slip-up or relapse following the start of a programme. The relapse rate of smokers following a cessation programme is often high the first few months following the intervention. After a while, however, this relapse rate almost plateaus. This means that the use of longer follow-up periods, provide a more accurate success measure of the programme. According to Schwartz (1987), the best follow-up period is 6-months following a smoking cessation programme, as the majority of smokers will have relapsed by this period. This follow-up period is also recommended to workplaces, as staff turnover would not be expected to be as high in this timeframe as it would be in 12- or 24-months. Therefore, the direct benefits of the programme can usually be seen within a 6-month follow-up period.

Types of quit measures used

Most of the studies in this review use two types of smoking cessation measures: point prevalence and continuous abstinence. Point prevalence usually involves asking whether a participant has smoked in the past certain number of days; this number is usually seven. Point prevalence is used as a measure of current smoking status. The advantage of this measure is knowing whether a participant is currently quit, however, it does not tell us the path a participant took to become quit (i.e. whether slip-ups or relapse occurred). For example, a participant may have had a series of relapses or slip-ups between the end of the intervention and follow-up, therefore the point prevalence measure will give a more positive representation of the programme.

Continuous abstinence measures ask the participant whether they have had a cigarette since a certain long-term time-point, such as when the cessation programme was implemented or completed. Some continuous abstinence measures allow for slip-ups. A continuous abstinence measure produces conservative quit rates, whereas a point prevalence measure will produce a higher quit rate.

A combination of the two methods is the best way of obtaining an accurate representation of the effectiveness of a programme. Further, asking a person the number of cigarettes they have had following the completion of the programme can give an overall picture of whether a person has relapsed and resumed quitting, or has had a couple of slip-ups.

Some studies also use biological verification to analyse whether a person has given an accurate self-report. Studies using biological verification have been shown to indicate a 2-4% lower quit rate than the quit rate obtained using the self-report answers (Glasgow et al 1993). This does not usually alter the overall findings of the study (e.g. Glasgow et al 1993). Biological verifications can include cotinine samples or expired carbon-dioxide content. Although this method is accurate, the results can return false positives because of recent inhalation of second-hand smoke. The use of biologically derived continuous abstinence does not tell us whether participant had a slip-up in the course of the follow-up period. The cost of biologically verifying a person's quit status is a relatively expensive method. To get a strong indication of smoking status, anonymous self-report is generally sufficiently accurate.

Workplace productivity

Earlier in the review it was mentioned that people who smoke may have higher absenteeism, use more sick days, or may be less productive as a result of taking more breaks. Changes in absenteeism can be measured by calculating the number of sick days staff have had before a smoking cessation programme, and following the programme. It is worth noting however, that quitting smoking can be a stressful period in a person's life, therefore people who are quitting may take more sick leave (Sindelar et al 2005). For this reason, the measure of post-programme sick leave should be calculated for at least 6-months following completion of the programme.

Documenting participation and dropout

Participation and dropout

In order to thoroughly study the initial attractiveness of a programme, and the likelihood that participants will stay engaged with the cessation programme, every workplace that introduces a cessation programme should keep complete records of who expressed interest in the programme, who joined the programme, and how much time participants were engaged with the programme for. It would be ideal to know the number of employees who express interest in the programme and are invited to join, who accepts the programme, and the length of time that participants remain in it. These categories are necessary for performing intention-to-treat analyses.

To analyse participation, employers who are creating the programme could draw up a spreadsheet of employees who (1) express interest in the programme, (2) participate in the programme, (3) duration on the programme (e.g. participated for one month out of six, participated for full six months), and (4) calculate eventual dropout rate from programme. With this information, employers can examine what the reasons were for low-participation or high drop-out rates, and change the programme accordingly.

Intention-to-treat analysis

It is vital that records are kept on who joins a programme so that conservative quit rates can be calculated using an intention-to-treat approach. With any programme, there is likely to be drop-out to some degree. Various studies suggest that these people are likely to experience higher levels of addiction, or be those least prepared to quit. Measuring intention-to-treat involves calculating the overall success rate of a programme while treating those who dropped out of the study as still smoking. This gives a more conservative measure and it does not overstate the success of an intervention.

Appendix 2: Summary of reviewed articles

This appendix gives a short summary (in note form) of the major studies in this review — which have compared or assessed interventions — and the measures used.

Article	Description of workplace, methods, measures and outcome
Armitage (2007)	<p>Participants from an insurance company were randomised into an experimental and control group. Experimental group asked to write a quitting plan.</p> <p>All smokers participated, 6% were lost to follow-up. 93% completed baseline and two-month follow-up surveys.</p> <p>Intention-to-treat analysis was used. Results of the revised Fagerstrom Tolerance Questionnaire, self-report of having quit, and expired CO measurements were used to test quit rate at a two-month follow-up. 11.63% in experimental group and 2.14% in control group quit ($p < .05$).</p>
Barbeau et al (2006)	<p>Participants from an iron workers union were asked to participate in an intervention which involved education during apprenticeship classes, group sessions, free NRT, brochures, posters, and incentives.</p> <p>Participation of all smokers unknown, analysis was only carried out on those who completed both the baseline and final surveys.</p> <p>Study was a pre-post design. Measures included 7-day point prevalence, and number of days smoked in past 30 days. 19.4% of smokers were quit 30-days following intervention.</p>
Burling et al (1989)	<p>58 admin employees were randomly assigned to two conditions: the competition only group was involved in a smoke-free</p>

competition; the experimental group had an additional computerised nicotine fading intervention which gradually reduced their nicotine intake.

Only four dropped out of the study due to transferring workplaces; they were not included in the analysis.

Smoking status was measured through self-report having not smoked in last 24 hours, and verified by expired CO levels. Results at three follow-up periods were: at 10-days 48% and 21%; at 90-days 18% and 13%; at 180-days 21% and 12% for experimental and competition only group, respectively (all not significant [ns]).

Cruse et al (2001)

A mix of workplaces from GlaxoSmithKline were asked to participate in smoking cessation (participation rate unknown). Intervention involved creating a plan, free NRT, and review sessions.

31% were lost to follow-up and were not included in subsequent analysis. 64% attendance rate for all sessions.

No clear measures of quit status were mentioned. 15.4% self-reported being quit at 12-month follow-up, 5% had relapsed but were also quit at 12-months.

Glasgow et al (1984)

Thirty-six employees at a telephone company were asked to join a nicotine reduction cessation intervention. They were randomly assigned into three groups, cold turkey, gradual nicotine reduction, and gradual reduction with feedback.

Nine percent dropped out, largely from the cold turkey group.

Using intention-to-treat analysis, self-report of quit rates, and confirmatory expired CO levels; more people were quit in the

gradual group (30%; $p < .05$), additional feedback was not significantly different.

Glasgow et al (1993)

19 worksites were randomised into incentives or no-incentive conditions. Incentives condition received monetary rewards for remaining quit.

Participation in the surveys was 70%, 23% of smokers joined the intervention, contact was made with 99% of the employees who remained at the workplace at 2-year follow-up.

Both self-reported quit rate and expired CO levels were used to analyse quit rates. Rates for the incentives and no-incentives conditions, respectively, at 1-year 10.8% and 11.6%, and at 2-years 14.2% and 11.5%.

Graham et al (2007)

IBM workers were asked to participate in a computerised intervention which included advice, assessing motivation, blogging sites, problem-solving skills, and NRT. Also monetary incentives for participation.

72% of smokers joined the intervention, 31.7% failed to complete the 12-month follow-up survey.

Using a 7-day point prevalence measure and intention-to-treat, 12.8% were quit at 12-months. 42.2% of programme completers were quit.

Henrikus et al (2002) 24 workplaces were randomised into six conditions. Groups and results at 24 months (using 7-day point prevalence) as follows:

	Group sessions	Self-help	Choice of group or self-help
Incentives	10.4 – 23.3%	18.7 – 25.3%	15.7 – 23.3%
No incentives	10.9 – 25.8%	17.4 – 26.4%	15.6 – 28.2%

*NB: results were recorded across workplaces, overall results not reported.

81.7% returned the 24-month follow-up survey. Participation rates varied from 4.7%–36.7% across conditions (incentives increased participation).

Hymowitz et al (1991) Six white-collar workplaces randomly assigned into two groups. Enriched group received training for group leaders, and training to carry out health protocol, policies, and activities. Other group only received group training.

77% completed treatment (no difference between interventions).

Results at 12-month follow-up, using intention-to-treat analysis and expired CO levels had quit rate of enriched group at 18% and 22% for other intervention (ns).

Jason et al (1997) Twenty-one companies were randomly assigned to three groups. (1) self-help manuals, (2) self-help manuals and incentives for 6-months, and (3) maintenance manuals, incentives, and cognitive behavioural support groups (for 6-months).

High attrition rates (approximately 50%).

7-day point prevalence quit results at 12-month follow-up were (3) 33.1%, (2) 18.4%, and (1) 15.7% ($p < .05$). Group 3 remained significantly higher than the other conditions at all time

	<p>points except for 18 months following the start of the intervention.</p> <p>At 24-months (1) 25.6%, (2) 23.5%, and (3) 17.5% quit.</p>
Johnson et al (2006)	<p>Asbestos workers were warned about the adverse effects of smoking and were advised to quit by a physician at their compulsory check-up. The following year at check-up, only 3 of 34 people had quit smoking.</p>
Kadowaki et al (2006)	<p>Data from earlier study (information below) was compared with the quit rates of the same factory after the government had passed health policies which restricted smoking inside workplaces.</p> <p>There was no difference in the quit rates for the cessation intervention (see below), and the threeyear period following the government introduction of changes.</p>
Kadowaki et al (2000)	<p>All smokers in this factory were required to visit a physician who told them about the negative effects of smoking, and asked participant to sign a declaration which meant they would undergo some counselling sessions.</p> <p>47.7% signed declaration, 12.1% lost to follow-up.</p> <p>Measures were 30-day point prevalence and confirmatory expired CO levels. At 18-month follow-up, quit rate was 8.4% for those who signed declaration, and 3.4% for those who had not.</p>
Klesges et al (1988)	<p>Participants received access to memos, posters and pamphlets, and meetings involving advice on changing to a lower-nicotine cigarette brand, making a quit date, and Cognitive Behavioural strategies.</p>

67% of smokers agreed to participate, and 55% of these completed the intervention.

9% were quit (self-report verified by expired CO levels) at 6-month follow-up (using intention-to-treat calculated by the author).

Klesges et al (1999)

Troops who are undergo forced smoking cessation during 6-weeks of their military training were randomly assigned to receive extra cessation treatment (75% of troops) involving education, and a group session. The remaining 25% were subjected to the ban only.

The intervention and non-intervention groups had equal cessation rates at the 12-month point of 18% (self-reported quit rate).

Klesges et al (1986)

Four banks underwent a smoking cessation competition, where one other firm was used as a control group. Both groups received a basic cognitive-behavioural smoking intervention, the competition groups were in competition with each other, and within each firm; and also received incentives for remaining quit.

80% in the competition group joined (non-smokers included in this measure), 53% control. 91% completed the full intervention, with no difference between conditions.

Self-report and expired CO levels indicated the 6-month quit rates were 16% for competition group, and 6% for control.

Lang et al (2000)

30 electrical and gas companies were randomly assigned to a control and experimental condition. In both conditions, the employees were required to go to a compulsory physician check-up where the physician talked about the impact of smoking on health. The experimental condition set up a quit date and had

additional follow-up sessions.

One year following the intervention, 13.5% of the control group, and 18.4% of the intervention group were quit ($p=.53$; using point prevalence of unknown days).

Moshammer & Neuberger (2007) This study included people who had previously attended an Alan Carr seminar. Three years following intervention, 51.4% of those contacted were still quit (some breath cotinine measures taken which showed agreement with the self-reports of having remained quit).

Nerin et al (2005) Participants at a factory were asked to participate in an intervention which involved one individual interview, group sessions, and subsidised NRT.

19% of smokers joined, 8.5% lost to follow-up, and 20% did not complete treatment.

Measures were 6-month continuous abstinence and expired CO levels. Intention-to-treat analysis found that 57.5% of all participants were quit at 6-month follow-up.

Osinubi et al (2003) Anybody who comes into contact with asbestos in the workplace was asked to enroll in an intervention during their compulsory check-up. Participants were randomly assigned into two groups. Control received treatment as usual (30 minute conversation about smoking). Intervention group received 5-8 minute counselling, brochures, three phone calls, and NRT.

66% participation rate, 68% available for the 6-month follow-up interview.

21% of the control condition and 40% of the experimental condition completed the intervention.

	<p>Using intention-to-treat analysis, the quit rates were 16.7% in the experimental condition, and 6.9% for control (30-day point prevalence measure).</p>
<p>Rand et al (1989)</p>	<p>In this study, participants were required to be quit for a week, and following biochemical confirmation of this they were randomly assigned into three groups. They received (a) two scheduled visits a week to measure breath CO levels, and \$4 (USD) for each breath CO level of less than 11ppm, (b) visits twice a week and received \$4 regardless of their breath CO levels, or (c) one visit at random per month and \$40 (USD) regardless of their breath CO levels.</p> <p>Conducted a survival analysis of the CO results, after 6-months, participants in all three groups had relapsed and the difference between groups was not significant.</p>
<p>Ringen et al (2002)</p>	<p>Advertised smoking cessation through a carpenters union, recruited 12.5% of 7,400 smokers.</p> <p>Participants had a choice of receiving either one phone call from a counsellor or five, and were encouraged to use free NRT. 22% were quit at twelve months (7-day point prevalence). Further, those who opted for the five phone calls were more likely to quit (18.9% vs. 28.4%). Use of NRT increased quit rates from 20% to 30.7%.</p>
<p>Rodríguez-Artalejo et al (2003)</p>	<p>Participants in three blue-collar workplaces were randomly assigned to control and intervention groups. Control groups received 30-second conversation about smoking during their annual check-up; intervention group received 5-8 minutes of support, plus three follow-up visits, and self-help resources and NRT.</p> <p>All (n=217) participants were available for follow-up.</p>

Schnoll et al (2005)	<p>Intervention group had 20.2% continuous abstinence at 1-year follow-up, and 8.7% of the control group had quit ($p < .05$)</p> <p>Surveyed participants received tailored advice about quitting smoking (no control group included).</p> <p>20% survey response rate, high attrition rate at final survey.</p> <p>Had a 6.1% self-reported quit rate two years following intervention, did not report intention-to-treat analysis.</p>
Scott et al (1986)	<p>Twenty-nine nurses were recruited. Ten of these participants served in the control group and they were told they would receive the intervention in a few months' time. Nineteen participants underwent daily three-minute therapist sessions and provided expired CO measurements., They were also on a programme which provided suggestions to systematically reduce their nicotine intake.</p> <p>86% completed treatment and follow-up.</p> <p>Intervention group had a quit rate of 25% using intention-to-treat, compared with 0% in the control group at 6-, 9-, and 12-months.</p>
Sorenson et al (2007)	<p>Participants at a construction workplace were randomised into a control and intervention group. Participants in the intervention group received telephone calls and information on health and quitting smoking: the control group received information about quitting.</p> <p>The participation rate was 74%, 86% of participants completed the final survey.</p> <p>At the 6-month follow-up, 8% of the control group was quit</p>

	<p>compared with 19% in the experimental group (self-reported seven day point prevalence; $p < .05$).</p>
Sorenson et al (2002)	<p>15 blue-collar worksites were randomised into control and intervention groups. Both groups received health and smoking information. The intervention group received extra information on the hazards in their working environment known to increase when one smokes.</p> <p>Control group had a quit rate of 5.9%, intervention group was 11.8%; ($p < .05$) using self-report continuous abstinence at 6-months.</p>
Sutton et al (1987)	<p>334 participants at a retail company showed interest in a smoking cessation programme; 270 of these workers were invited to participate and comprised the intervention group. The remaining workers served as the control group. Intervention consisted of two consultant sessions and subsidised nicotine gum.</p> <p>64% of intervention group went to their first consultation, the remaining were used as another comparison group. 99% of participants were available for follow-up at 1-year following intervention.</p> <p>Two definitions of quit status. Either no cigarettes in the one year follow-up period (strict), or 20 cigarettes (lenient). This was confirmed with CO measures. In intervention group, the results were 12% (strict), 13% (lenient), control 1% (both strict and lenient); and in the group who did not go to the session 1% (strict), and 2% (lenient).</p>
Tanaka et al (2006)	<p>The twelve worksites were divided into control and experimental groups according to the preference of the companies' safety and health commission. The intervention group received posters and</p>

	<p>brochures advocating workplace cessation and educational messages about becoming quit; four short counselling sessions, and free NRT for those who requested it.</p> <p>12.3% participated in the intervention.</p> <p>At the end of the 36-month period, there was 12.1% versus 9.4% self-reported quit rate for the intervention and control groups, respectively.</p>
Wallace et al (2008)	<p>Staff at a hospital completed a survey, and those interested received free NRT.</p> <p>At 90-day follow-up, 31% of staff who requested NRT had quit using a self-report measure.</p>
Willemsen & de Vries (1995)	<p>Two telecommunication companies: one served as the control group and the other as the intervention group. The intervention participants had the choice of receiving self-help, group therapy, or both. They also had access to a quitline.</p> <p>12-month baseline survey had a response rate of 85% (intervention) and 62% (control). 90% read the self-help manual, 18% participated in a group course.</p> <p>7-day point prevalence quit rate for intervention was 9% and 8% for control group (ns). Within the intervention group, the quit rates for the self-help group were 7%, and 22% for people who chose the group treatment.</p>
Willemsen et al (1998)	<p>Eight worksites were divided into two groups. Minimal intervention (self-help only) or comprehensive intervention groups. The comprehensive group received group counselling, media, education, and workplace policies.</p>

83% response rate at 14-month follow-up.

16% in comprehensive group and 12% quit in minimal group using 7-day point prevalence and intention-to-treat analysis (using a prolonged 6-month abstinence measure, there was no difference between groups).
