

QIIP

Quest for
Quality and
Improved
Performance

Paying the patient: does it work?

A review of patient-
targeted incentives

**Kim Sutherland,
University of Cambridge**

**Sheila Leatherman,
University of North Carolina**

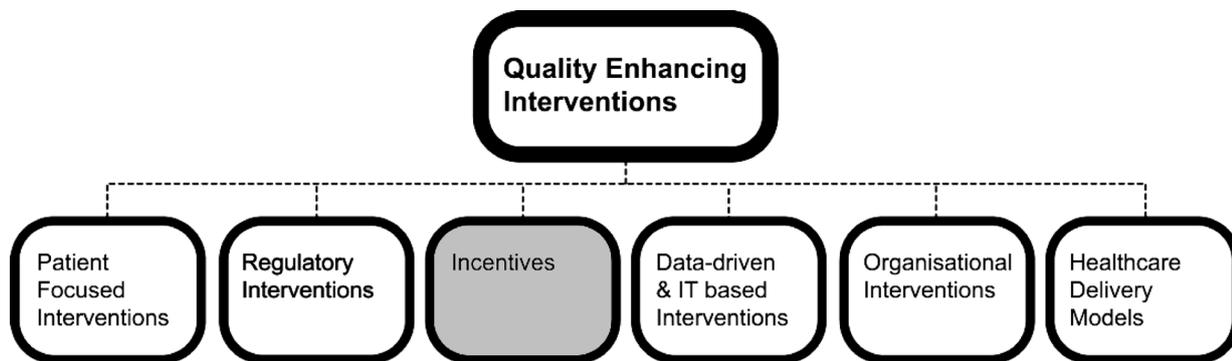
**Jon Christianson,
University of Minnesota**

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QQUIP and the Quality Enhancing Interventions (QEI) project

QQUIP (Quest for Quality and Improved Performance) is a five-year research initiative of The Health Foundation. QQUIP provides independent reports on a wide range of data about the quality of healthcare in the UK. It draws on the international evidence base to produce information on where healthcare resources are currently being spent, whether they provide value for money and how interventions in the UK and around the world have been used to improve healthcare quality.

The Quality Enhancing Interventions (QEI) component of the QQUIP initiative provides a series of structured evidence-based reviews of the effectiveness of a wide range of interventions designed to improve the quality of healthcare. The six main categories of QEI for which evidence will be reviewed are shown below.



For more information visit www.health.org.uk/quip

Published by:

The Health Foundation
90 Long Acre
London WC2E 9RA
Telephone: 020 7257 8000
Facsimile: 020 7257 8001

www.health.org.uk

Registered charity number 286967
Registered company number 1714937

First published 2008

ISBN 978-1-906461-04-1

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1. Overview

Evidence summary

Most of the evidence on the contribution of patient incentives to quality improvement is focused on two areas of behaviour change: improving public health and increasing patient compliance with recommended care.

The evidence indicates that patient incentives can be effective in helping to secure simple, well-defined episodes of behaviour change (for example, vaccinations and cancer screening). Relatively modest rewards can encourage one-off changes in patient behaviour.

For complex and sustained behaviour change such as smoking cessation there is insufficient evidence to declare that patient incentives are effective as quality enhancing interventions. However, where direct costs are perceived to be a barrier to behaviour change (for example, transportation costs, cost of nicotine replacement therapy), offsetting those costs can contribute to behaviour change in motivated patients.

The bulk of the evidence concerning discrete or simple behaviour change is drawn from disadvantaged groups while interventions focused on more complex behaviour change tend to be focused on middle class populations, often through workplace-based programmes.

There is very little evidence available that explicitly evaluates the role of non-financial patient incentives.

In common with evaluations of public health interventions generally, studies into the effectiveness of incentives are often confounded by methodological difficulties. In particular, incentives are often introduced as part of a multifaceted intervention, making it difficult to identify whether incentives alone worked to bring about change. Furthermore, many studies have weak or non-existent controls.

1.1 Background

Incentives and disincentives are powerful instruments that, set at the right level, can secure significant behaviour change on the part of individuals and organisations. Healthcare incentives can be targeted at professionals, organisations and patients. This document focuses on patient-targeted incentives and complements a report by the same authors entitled *Financial Incentives for Healthcare Providers and Quality Improvement: A review of the evidence* (Christianson *et al*, 2007).

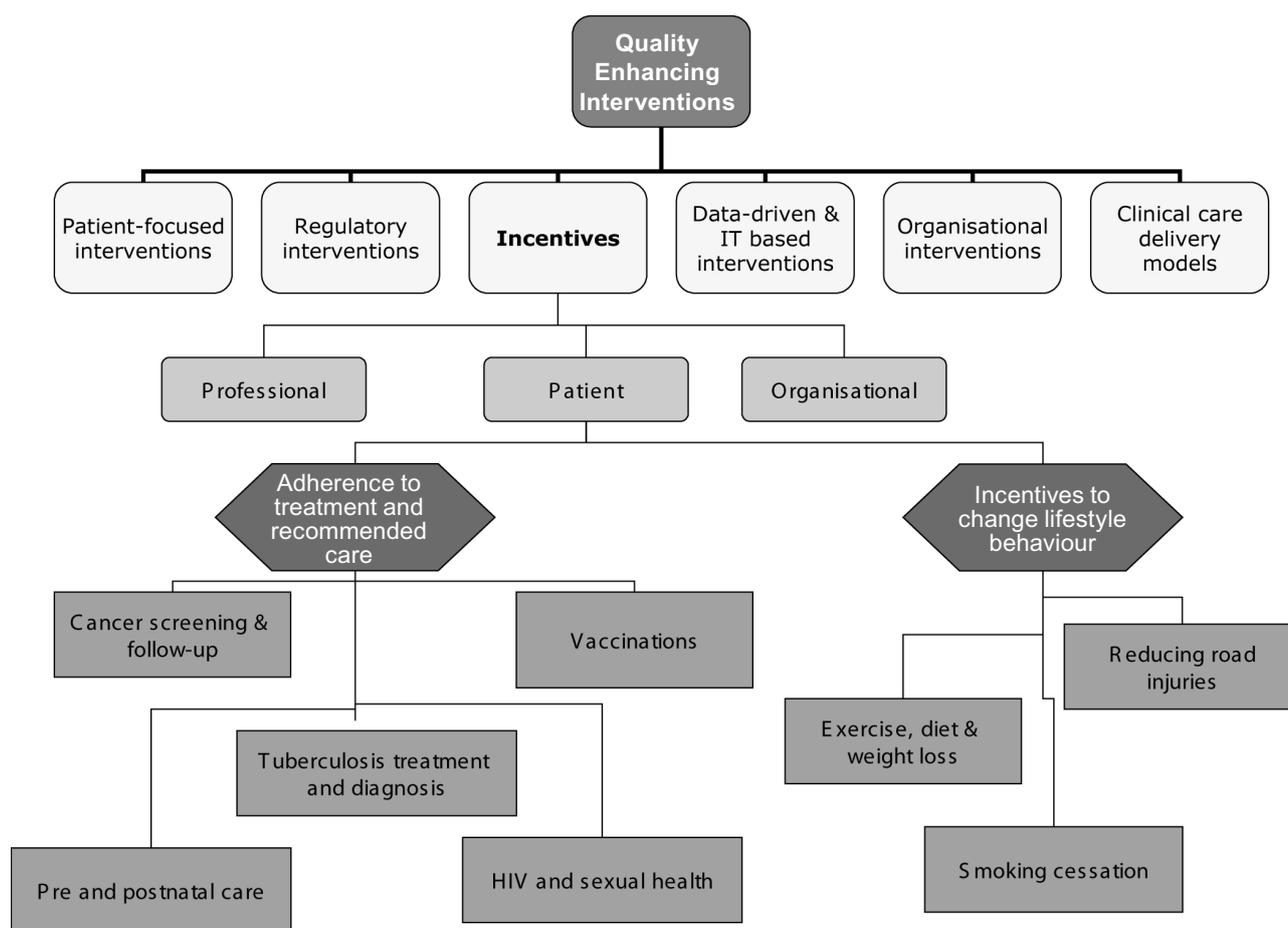
Patient incentives can be financial (that is, behaviour change results in a prize, payment, voucher or the chance of winning such monetary rewards) or non-financial (that is, behaviour change results in improved quality of life, enhanced self-esteem or other non-monetary benefits). The literature on patient incentives is dominated by financial incentives. The attraction of non-financial incentives – not least the potential for longer life and higher quality of life – is undoubtedly significant. Finding ways to incentivise change via non-financial rewards is central to health promotion approaches. However, the impact of non-financial incentives is not well demarcated in the literature. We found few studies that examined the mechanisms through which non-financial incentives motivate enduring behavioural change.

The wider question of the relative effectiveness of public health interventions is beyond the scope of this review. However, this topic has been reviewed elsewhere – for example, see National Institute for Health and Clinical Excellence (NICE, 2007a).

1.2 About this review

As part of The Health Foundation’s Quality Enhancing Interventions (QEI) initiative, this document summarises available evidence on the effectiveness of patient incentives in improving quality of healthcare. Most of the evidence is focused on securing change in patient-related behaviours with two main aims: increasing patient adherence to recommended care and improving public health through changing lifestyle behaviours. We have organised the report according to the main themes that emerged from the literature (see Figure 1).

Figure 1: Topics within patient-targeted incentives



Patient non-adherence is a major problem across healthcare systems. Common examples are a failure to use medication as prescribed, inadequate compliance with recommended self-care and incomplete follow-through with appointments. Lack of adherence is associated with poor clinical outcomes, increased hospitalisations, lower quality of life and higher overall healthcare costs (Gold and McClung, 2006; Simpson *et al*, 2006). Incentives are one of a range of interventions that have been used to increase patient adherence.

Public health interventions often seek to secure complex behaviour change on the part of individuals. The behaviour change is a process event that is necessary to achieve the desired final outcome: improved health status. The interventions can be either ‘upstream’ or ‘downstream’ (Kelly *et al*, 2005). Downstream interventions seek to alter adverse health behaviours (such as smoking) while upstream interventions are focused on the wider circumstances that produce adverse health behaviours

(social conditions, employment and so on). Most of the available evidence focuses on downstream interventions, of which incentives are one example (Kane *et al*, 2004).

Unlike pharmaceutical or technological interventions, public health and patient compliance initiatives are often multifaceted. Incentives are often used in combination with other interventions such as education, reminders and social marketing. This can make it difficult to isolate and analyse the impact of incentives. In particular, patient education and communication play a key role in bringing about changes in patient behaviour and these are reviewed elsewhere in a separate QEI report (Coulter and Ellins, 2006).

The literature contains two distinct approaches: incentives used to promote positive change and incentives used to remove financial barriers to change. In the evidence summaries at the beginning of each section we have tried to distinguish between these two approaches.

Incentives (and disincentives) are also widely used to influence utilisation of health services. This review focuses on the impact of interventions on quality; the impact on utilisation rates is beyond its scope. However, research does suggest that affecting utilisation rates via incentives can have implications for quality of care, particularly in the context of the US healthcare system (for example, see Brook *et al*, 1983; Lohr *et al*, 1986; Lurie *et al*, 1984; Newhouse *et al*, 1993; Rasell, 1995; Stuart and Zacker, 1999; Tamblyn *et al*, 2001; Huskamp, 2003; Rice and Matsuoka, 2004; Davis, 2004; Gibson *et al*, 2005).

1.3 Format

We have structured the data to try and answer three distinct questions:

1. Do patient-targeted incentives work? We have collated generic reviews and individual studies on the effectiveness of incentives in securing change in behaviour and outcomes.
2. Which clinical and public health issues have seen patient-targeted incentives implemented and evaluated? We have separated the incentive studies into discrete sections, focusing on particular areas of clinical and public health activity.
3. How well do patient-targeted incentives work, relative to other types of interventions? Within each section, we have included generic reviews on effectiveness of a wider range of interventions. So, for example, reviews that ask 'what works to increase cancer screening uptake' are included if they explicitly address the effectiveness of incentives compared with other interventions.

For each section we have included:

- evidence in brief: distillations of the available evidence preceding subsections on generic use of incentives and the use of incentives within particular clinical and public health areas of activity
- evidence summaries: these are provided for each publication included in the review and contain methodological details, research conclusions and, where available, independent assessments of rigour and validity – these summaries will be available on the QQUIP website (www.health.org.uk/qquip) within a searchable database
- evidence tables: these provide readers with a way to compare studies within and between particular subject areas (see Appendix 1)
- background and context boxes: these outline the clinical and public health context within which incentives have been used.

1.4 Methods

In line with the search strategy adopted across the QEI series, we used a 'best available evidence' approach to conduct our review, initially searching for systematic reviews and meta-analyses. If reviews were sparse or out-of-date we searched for individual studies within the following hierarchy of evidence:

- randomised controlled trial (RCT)
- quasi-experimental study
- controlled observational study (for example, cohort or case-control study)
- observational study without control group (for example, cross-sectional study, before-and-after study, or case series).

Appendix 2 documents the search terms that we used.

Of the 1787 articles that were retrieved by the searches, 339 addressed patient-focused incentives. Based on a review of titles and abstracts, 82 were retrieved for full review. Sixty-nine articles underwent abstraction using a specifically designed data abstraction form. Of these, 26 were systematic reviews. Reference lists were also searched for relevant studies. Each included article is listed with a structured summary of its findings and evidence.

Where available, the independent assessments of systematic reviews or economic appraisal articles, conducted by the Centre for Reviews and Dissemination at the University of York, accompany the research summaries. Cochrane systematic reviews are not independently assessed because of their tight controls and high quality.

In practice, the 'best available evidence' approach has meant that if a topic has been covered by a systematic review, we report the findings of the review and have not included the individual studies cited therein, nor searched the literature prior to the search dates of that review. If more recent studies are available, using RCT or quasi-experimental design, we have included them, noting any methodological limitations.

We excluded studies that:

- focused on incentives for organ donation
- focused on incentives to increase participation in research and/or surveys
- were based on research designs that used multiple interventions and precluded identification of the effect of incentives separate from other interventions
- used psychosocial interventions for drug and alcohol treatment (contingency)
- focused on co-payments as incentives for utilisation changes.

This report is a narrative account of available evidence in a number of healthcare areas, underpinned by systematic searches of the literature. There has been no attempt to combine primary studies or synthesise data.

2. Existing wide-ranging studies on incentives

Evidence in brief

We found two systematic reviews and one randomised trial (conducted subsequent to the reviews) that looked at the impact of incentives on a range of patient behaviours.

Promote positive change

- Incentives can be effective in encouraging simple preventive care and distinct behavioural goals that are well defined
- There is insufficient evidence to say whether incentives are effective at promoting complex and long term lifestyle changes

Reduce barriers to change

- Subsidising the costs incurred in behaviour change can be effective in promoting adherence to recommended care

As well as reporting here the overall findings of overviews on the impact of incentives on quality of care, we have also parsed out the constituent findings into the relevant sections in the remainder of this report.

Evidence summaries

Kane *et al* (2004) undertook a systematic review of economic incentives for preventive care. The review included both provider and consumer incentives; the findings for provider incentives are summarised in an accompanying QEI study (Christianson *et al*, 2007). Primary research studies with preventive care or health promotion as the primary outcome measure, and with the following research designs, were included: RCTs, time series and prospective quasi-experimental studies. Searches were made of MEDLINE, Cochrane Library, EconLit, Business Source Premier and PsycINFO for articles published up to October 2002; 47 articles that focused on patient/consumer incentives met the inclusion criteria. The interventions were classified as:

- 'simple prevention': immunisation (7 studies), cancer screening (2), prenatal care (2), attendance at educational sessions for HIV/STD prevention (3) and recruitment for smoking cessation programme (1), and 'preventive care follow-up': cholesterol screening (1), tuberculosis screening (2), cancer screening (4) and postpartum examinations (2)
- 'complex preventive care' (that is, requires sustained effort over time on the part of the consumer/patient): smoking cessation (10), exercise (2), obesity and weight loss (7), breastfeeding (1), nutrition (1), cardiovascular disease prevention (1) and cholesterol management (1).

Different incentive types included lotteries, gifts, cash, coupons and retention of benefits.

The review found that vulnerable populations (for example, active drug users, teenage mothers) and those with low socio-economic status are the most frequently studied populations for simple preventive care such as immunisations and cancer screening and follow-up. In contrast, relatively healthy middle class populations are the most likely to be targeted for complex health promotion lifestyle changes. They are often recruited via workplace-based programmes.

The review reported a number of positive findings (see Table 1).

Table 1: The number and percentage of studies that reported positive findings from the use of patient incentives in preventive care

Behaviour change	Lottery	Gift	Cash	Coupon	Free/reduced medical costs	Punishment*	TOTAL
Simple	2 of 5 studies [2/5] (40%)	2/5 (40%)	5/5 (100%)	10/12 (83%)	3/4 (75%)	3/3 (100%)	25/34 (74%)
Complex	4/5 (80%)	2/2 (100%)	3/6 (50%)	2/3 (67%)	1/2 (50%)	6/7 (86%)	18/25 (72%)
TOTAL	6/10 60%	4/7 57%	8/11 73%	12/15 80%	4/6 67%	9/10 90%	43/59 73%

* the opportunity to avoid punishment such as loss of benefits or reduced access to services

Kane et al concluded that, in the short run, economic incentives are effective for simple preventive care and distinct behavioural goals that are well defined. Relatively modest incentives were found to be effective and the 'threshold dose' (that is, the level at which behaviour change takes place) appeared low. There is insufficient evidence to say that incentives are effective at promoting complex and long-term lifestyle changes, for example, smoking cessation.

Research design: systematic review (Agency for Healthcare Research and Quality evidence review)

Giuffrida and Torgerson (1997) conducted a systematic review of the effects of financial incentives directed towards patients. Incentives included cash, vouchers, lottery tickets or gifts. The effect on compliance with medication, medical advice or medical appointments was reviewed. The following databases were searched for publications up to April 1997: Cochrane Database of Clinical Trials, MEDLINE, EMBASE and PsycLIT. Eleven studies were included in the review; all were conducted in the USA. The initiatives on which the studies were based sought to improve patient adherence to anti-tuberculosis treatment (2 studies), enhance compliance with postpartum appointments by indigent adolescents (2), encourage participation in a treatment programme for cocaine dependency (1), increase compliance with antihypertensive treatment (1) and improve attendance at a weight-reducing programme (1). Several studies focused on incentives for parents, encouraging them to seek dental care for their children (2), attend paediatric outpatient clinics (1) and childhood immunisation (1).

Ten out the eleven studies showed that some sort of financial incentive promoted compliance better than any alternative (including prompts, counselling, peer support, increased opening times, behavioural therapy).

Research design: systematic review

CRD commentary: This is a comprehensive literature search and conclusions seem appropriate; note that sample size of included studies is very small.

Morris et al (2004) conducted a cluster randomised trial on the impact of monetary incentives on the use of preventive healthcare interventions in rural Honduras. The study was carried out in 70 municipalities with the highest rates of malnutrition. Municipalities were randomly allocated to four groups: money to households (contingent on keeping up-to-date with preventive health services), resources to local health teams combined with a community-based nutrition intervention, both packages and neither (that is, standard services). Evaluation surveys of about 5600 households were undertaken at baseline and approximately two years later. Pregnant women and mothers of children aged less than three years were asked about their use of health services, immunisation uptake and growth monitoring. Data on vaccination and child weigh-ins were collected from children's Road to Health cards. The household incentive had a significant impact on antenatal care and well-child check ups (18–20 per cent increase; $p < 0.01$) and growth monitoring (15–21 per cent; $p < 0.01$). Uptake of first dose diphtheria–tetanus–pertussis (DTP) also increased (7 per cent; $p > 0.01 < 0.05$). Postpartum checks, measles and mothers' tetanus vaccinations were not affected. The size of the incentive was relatively large: approximately three-quarters of the families covered by the programme were surviving on less than £1 per person per day, and the average entitlements from the programme exceeded £60 per household per annum.

Research design: randomised trial (limitations noted by authors included legal difficulties with transferring resources to local health teams, lack of blinding in research design)

3. Promoting adherence to treatment and recommended care

3.1 Introduction

Improved adherence to treatment and compliance with recommended care processes has the potential to improve significantly the quality of care. There have been a number of reviews of interventions designed to enhance patient adherence in general (Kripalani *et al*, 2007; Haynes *et al*, 2005; Peterson *et al*, 2003; Roter *et al*, 1998). Few of the included studies examined incentives and instead focused more heavily on interventions such as packaging, education, more convenient care, information, reminders, self-monitoring, reinforcement, counselling, family therapy, psychological therapy, crisis intervention, manual telephone follow-up and supportive care. Haynes *et al* (2005) concluded that improving short-term adherence is relatively successful with a variety of simple interventions.

For several specific healthcare processes, relevant studies that investigate the impact of incentives on adherence to recommended care are available. Summarised in the following sections, these include:

- vaccinations
- cancer screening
- tuberculosis diagnosis and treatment
- prenatal and postnatal care
- HIV and sexual health interventions.

Additionally, incentives are used as leverage to improve adherence in psychiatric care. As well as explicit payments, housing entitlements or social security payments are sometimes linked to care adherence within a framework of 'mandated' community treatment (Monahan *et al*, 2001; 2005). This is an area of current debate and controversy (Burns, 2007; Shaw, 2007), but there is little research on effectiveness. Incentives have also been widely used in the context of psychosocial approaches to drug and alcohol dependency. As such, incentives are used as part of a therapeutic intervention and so they have not been included in this review. For completeness, Figure 2 provides a brief outline of the current evidence base.

3.2 Patient adherence and incentives – general studies

We found one systematic review of interventions to improve patient adherence which included incentives; and one observational study on the use of incentives to attend therapy appointments among patients with depression.

Van Dulmen *et al* (2006) conducted a review of reviews of interventions to improve patient adherence to medical treatment. The following databases were searched for studies published between 1990 and 2005: MEDLINE, EMBASE, Cochrane Library and PsycINFO. Thirty-eight systematic reviews were included. The authors found that technical adherence measures (for example, packaging) were effective in seven reviews, behavioural interventions (for example, incentives and reminders) were effective in five reviews, educational approaches were effective in five reviews and multi-faceted interventions were effective in four reviews. Specifically on incentives, this report draws on the review by Guiffrida and Torgerson (see Section 2).

Research design: review of systematic reviews

Post *et al* (2006) conducted an observational study to investigate the effect of a \$10 incentive payment on attendance at therapy appointments among 54 low income African Americans with depression. Attendance was tracked for three consecutive 12-week periods: prior to introduction of incentive, while the incentive was in place and after discontinuation. Of the 54 patients enrolled, 4 discontinued care at the clinic before the incentives began (these 4 were excluded from statistical analyses). Twenty-seven out of 50 participants (54 per cent) had improved adherence during the incentive period, 12 (24 per cent) were unchanged (7 of whom had unchanged perfect attendance) and 11 (22 per cent) had reduced adherence. The sample as a whole kept 79 per cent of appointments made in the pre-incentive period, 86 per cent made in the incentive period and 69 per cent made in the post-incentive period.

Research design: observational study

Figure 2: Treating substance abuse – the use of incentives

Substance dependence is a major social and public health problem. The total annual economic and social costs attributed to misuse of Class A drugs in England and Wales is estimated to be £10.1–17.4bn (Godfrey *et al*, 2002), while in the USA the National Institute on Drug Abuse (NIDA) estimates that substance abuse (including alcohol and tobacco as well as Class A drugs) costs more than \$484bn per year (for more information go to www.nida.nih.gov/about/welcome/aboutdrugabuse/magnitude/).

Pharmacological approaches are the primary treatment option for opiate misuse, often supported by psychosocial interventions within the overall treatment package. Pharmacological treatments for stimulant and cannabis misuse are not well developed and psychosocial interventions represent the basis of effective treatment (NICE, 2007b).

Contingency management is a psychosocial approach that has been used to reinforce a variety of behaviours including abstinence from drugs (Higgins *et al*, 1993), reduction in drug use (Elk *et al*, 1995) and ensuring compliance with physical health interventions among substance abusers (Malotte *et al*, 1998). Contingency management is based on a system of incentives that come into operation when a service user submits a biological sample (for example, urine, saliva) to prove that behaviour change has occurred.

NICE (2007b) is in the process of developing guidelines for psychosocial management of drug misuse and has reviewed the available literature on contingency management (alongside other types of interventions beyond the scope of this QEI). The review describes four main methods for delivering incentives:

- vouchers for biological samples (usually urine) that are negative for the tested drugs: vouchers may escalate in value as the number of uninterrupted negative samples increases. Voucher systems have a high level of acceptability among service users; fewer than 5 per cent refused to participate in trials (Petry 2000).
- monetary incentives used primarily to promote compliance with tuberculosis testing (Malotte *et al*, 1998; Malotte *et al*, 1999) and for hepatitis B vaccinations (Seal *et al*, 2003): it appears that low value (for example, £1.50/\$3) incentives are as effective as higher value (for example, £10/\$20) incentives.

- awards, also referred to as the 'variable magnitude of reinforcement procedure' (Prendergast *et al*, 2006): on providing a negative biological specimen, participants receive the opportunity to participate in draws, often from a number of slips of paper kept in a bowl. Often the number of draws increases with the submission of continuous negative samples (Petry, 2005).
- clinic privileges such as take-home methadone doses for patients undergoing methadone maintenance therapy (MMT) (Stitzer *et al*, 1992): these can include access to a rapid dosing line, reserved parking space for a specific duration or a special food item in a clinic cafeteria (Petry and Simcic, 2002).

The available evidence suggests that all of the above reinforcement systems can be effective, with some evidence to suggest a slight but not significant advantage for monetary incentives over the other methods.

3.3 Vaccinations

Evidence in brief

We found five systematic review articles and one subsequent individual study that specifically addressed the impact of incentives on vaccination rates.

Overall, four reviews found that incentives were effective and one (on pneumococcal, influenza and hepatitis B vaccination only) found insufficient evidence to determine effectiveness. The only RCT, published subsequently to review cut-offs, found incentives were effective.

Those reviews that compared different methods of improving vaccination rates found that, while incentives were effective, alternative strategies (such as patient reminders or organisational change) were more effective.

Promote positive change

- Modest incentives may improve vaccination rates in vulnerable communities.

Reduce barriers to change

- Reducing out-of-pocket costs can contribute to an increase in the uptake of vaccinations.

Context and background

Vaccines produce their protective effect against infection by inducing a response from an individual's immune system (so-called active immunity) and by providing immunological memory. Immunological memory enables the immune system to recognise and respond rapidly to exposure to natural infection at a later date and thus to prevent or modify disease (Department of Health, 2006).

After clean water, vaccination is the most effective public health intervention in the world for saving lives and promoting good health (for more information go to www.hpa.org.uk/infections/topics_az/vaccination/vacc_menu.htm).

International comparisons for vaccination rates are compiled and released by the WHO (see www.who.int/vaccines-documents/GlobalSummary/GlobalSummary.pdf).

Evidence summaries

Ndiaye et al (2005) undertook a review of interventions to improve influenza, pneumococcal and hepatitis B vaccination among high-risk adults. The following databases were searched for publications between 1980 and August 2001: MEDLINE, EMBASE, PsycLIT, Sociological Abstracts, CABHealth, HealthSTAR, AIDSLINE, Occupational Safety and Health Database, ERIC, PsycINFO, Dissertation Abstracts and Conference Papers Index. Overall, 35 studies were included. Of those, 23 studies evaluated interventions implemented in combination. Overall, there is strong evidence that provider reminder systems (as a single intervention) are effective in increasing targeted vaccination coverage. For combined interventions, there is strong evidence of effectiveness when interventions to enhance access to vaccination services are combined with provider- or system-based interventions (for example, reminder systems, standing orders) and/or interventions to increase client or community demand for vaccinations (for example, client reminders, education). Specifically on incentives, one study evaluated the effectiveness of client incentives when implemented alone and reported an improvement over the baseline of 35 per cent. However, a single study was regarded to be insufficient evidence to determine effectiveness.

Research design: systematic review

Kane et al (2004) conducted a wide-ranging review of incentives for preventive care (see Section 2 for details). It included 7 studies on incentives for vaccination. All had statistically significant results. Incentives included cash prizes, free evening day care; free flu shots and loss of benefits for non-immunisation of children.

Research design: systematic review

Stone et al (2002) undertook a meta-analysis of interventions that seek to increase adult immunisation and cancer screening services. The following databases were searched for publications up to 1999: MEDLINE, the Cochrane Effective Practice and Organisation of Care Review Group register and the Medicare Health Care Quality Improvement Project database. There were 108 articles that met the inclusion criteria. To assess the effect of interventions, meta-regression models were developed, with usual care or control group. Overall, the most effective interventions were those that were based on organisational change (AOR 2.47–17.6). The second most effective intervention was patient incentives (these included reduction in co-payments) (AOR 1.82–3.42). Table 2 illustrates the relative impact of the various interventions on immunisation uptake (for comparable data on the impact of incentives for cancer screening, see Section 3.4).

Research design: meta-analysis

CRD commentary: There is a clear review question and inclusion criteria, and publication bias is formally assessed. It is unclear whether non-English papers were included. Studies appear sensibly combined and data were subject to sensitivity analysis. The authors' conclusions are likely to be reliable.

Table 2: Interventions to increase adult immunisation (29 studies)

Intervention	Adjusted OR [•]	95% CI
Organisational change	16.0	11.2–22.8
Provider reminder	3.80	3.31–4.37
Patient financial incentive	3.42	2.89–4.06
Provider education	3.21	2.24–4.61
Patient reminder	2.52	2.24–2.82
Patient education	1.29	1.14–1.45
Provider financial incentive	1.26	0.83–1.90 [♦]
Feedback	1.23	0.96–1.58*

• OR=odds ratio; from meta-regression

♦ Faecal occult blood test

* that is, no significant improvement

Briss et al (2000) undertook a systematic review of interventions to improve vaccination coverage. The following databases were searched for publications between 1980 and 1997: MEDLINE, EMBASE, PsycLIT, CAB Health and Sociological Abstracts. Overall, 184 articles were included. In the section on client or family incentives, three studies met the review's inclusion criteria. However, there was insufficient evidence to assess effectiveness. Interventions that reduced out-of-pocket costs were also reviewed and 19 studies met the review's inclusion criteria. The median percentage point change was 15 per cent (range -8 to 47 per cent). The review found one economic evaluation of free or discounted vaccinations that calculated that the adjusted cost-effectiveness of a multi-component intervention compared with no intervention was \$43 per additional vaccination. Reducing out-of-pocket costs was strongly recommended on the basis that this improves vaccination coverage in children and adults, in a range of settings and populations, when applied at different levels of scale from individual clinical settings to national efforts, and whether used alone or as part of a multi-component intervention. The authors concluded that there is strong evidence to suggest that reducing out-of-pocket costs for vaccinations is effective at improving vaccination coverage.

Research design: systematic review

CRD commentary: aims were stated and inclusion criteria defined in terms of study design and quality, intervention, participants and outcome. The studies were identified from several sources and attempts were made to locate unpublished studies. By limiting included studies to those published in the English language, some other relevant studies may have been omitted; a formal assessment of validity was undertaken and only higher quality studies included. The evidence supports the authors' conclusions.

Giuffrida and Torgerson (1997) conducted a wide-ranging review of patient-targeted incentives (see Section 2 for details). It included one study which found that monetary incentives (when combined with specific prompts) to be more effective at increasing vaccination uptake than a general prompt, a more client-specific prompt, a specific prompt and increased public health clinic access, contact control or no contact control.

Research design: systematic review

Seal et al (2003) undertook an RCT to compare the impact of a monetary incentive (\$20) to that of an outreach programme on adherence to hepatitis B vaccination among intravenous drug users in San Francisco. All participants in the study (n=96) received the first of three required vaccine doses and

were then allocated into two groups: monthly monetary incentive or weekly contact with outreach worker during the six-month vaccine series. All three doses of the vaccine were received by 69 per cent (n=33) of those in the incentive group and by 23 per cent (n=11) of those in the outreach group (OR=13.8; 95% CI 2.9–128). Using intention to treat methods, the monetary incentive intervention was calculated to cost \$220 per participant compared with \$590 per participant for outreach.

Research design: RCT (note that there was no 'usual care' control in this study)

3.4 Cancer screening

Evidence in brief

We found four review articles and one subsequent individual study that specifically addressed the impact of incentives on screening uptake. Overall the reviews found that offsetting costs appeared to have a greater impact than direct incentives (prizes and so on) to promote behaviour change.

The reviews that compared different methods of improving screening uptake found that while incentives were effective, alternative strategies (such as patient reminders or organisational change) were more effective.

Promote positive change

- Modest incentives may improve vaccination rates in vulnerable communities but the evidence is stronger on the effectiveness of reducing barriers to change.

Reduce barriers to change

- Offsetting direct costs to patients can increase uptake of screening and follow-up.

Context and background

Each year 10.9 million people worldwide are diagnosed with cancer (Ferlay *et al*, 2004). Estimates of the premature deaths that could have been avoided through screening vary from 3 to 35 per cent. In addition to the potential for reducing avoidable mortality, screening can also reduce morbidity because treatment for earlier-stage cancers is often less aggressive than that for more advanced-stage cancers (for more information go to www.cancer.gov/cancertopics/pdq/screening/overview/healthprofessional).

Screening is a means of detecting disease early in asymptomatic people. Positive results of screening tests are usually not diagnostic but identify persons at increased risk for the presence of cancer who warrant further evaluation. Diagnosis is confirmation of disease by biopsy or tissue examination in the work-up following positive screening tests. Screening tests are in widespread use for cancers of the breast and cervix in women, and the colorectum (bowel) in both men and women.

Breast cancer accounts for one in ten of all new cancers diagnosed, and almost one in four cancers diagnosed in women worldwide. It is the most common cause of death from cancer in women globally. More than 1.1 million women are diagnosed each year and the numbers of women being diagnosed annually worldwide has almost doubled since 1975. Screening is generally carried out via mammography.

Cervical cancer is the fifth most common cancer in women worldwide and is a leading cause of cancer-related death in women in underdeveloped countries. Worldwide, approximately half a million cases of cervical cancer are diagnosed each year. Screening is carried out via a Papanicolaou (Pap) smear test. A vaccine for the causative agent Human Papilloma Virus (HPV) has recently become available.

Bowel cancer accounts for approximately 9 per cent of all new cases of cancer; worldwide, 1 million people are diagnosed with the disease and it is the fourth most common cause of death from cancer, accounting for 8 per cent of cancer deaths. There have been steady increases in the numbers of people being diagnosed with bowel cancer over the last 25 years. Screening is conducted most commonly by the Faecal Occult Blood (FOB) test or colonoscopy.

Evidence summaries

Kane et al (2004) conducted a wide-ranging review of incentives for preventive care (see Section 2 for details). It included 7 studies on incentives for cancer screening. Of these, 4 had statistically significant findings. Incentives included cost offsets (bus passes and postage costs) and reductions in clinic visit charges, and small gifts (nutritional information package).

Research design: systematic review

Stone et al (2002) undertook a meta-analysis of interventions that seek to increase adult immunisation and cancer screening services. The following databases were searched for publications up to 1999: MEDLINE, the Cochrane Effective Practice and Organisation of Care Review Group register and the Medicare Health Care Quality Improvement Project database. In total, 108 articles met the inclusion criteria. To assess the effect of interventions, meta-regression models were developed, with usual care or control group. Overall the most effective interventions were those that were based on organisational change (AOR 2.47–17.6). Second most effective were patient incentives (these included reduction in co-payments) (AOR 1.82–3.42). Table 3 illustrates the relative impact of the interventions in screening (for data on immunisation uptake, see Section 3.3).

Research design: meta-analysis

CRD commentary: There is a clear review question and inclusion criteria and publication bias are formally assessed. It is unclear whether non-English papers were included. Studies appear sensibly combined and data were subject to sensitivity analysis. The authors' conclusions are likely to be reliable.

Table 3: Relative impact of interventions in screening for cancer

Mammography (33 studies)		Cervical cytology (27 studies)		FOB♦ for colon cancer (19 studies)	
Intervention	Adjusted OR• (95% CI)	Intervention	Adjusted OR• (95% CI)	Intervention	Adjusted OR• (95% CI)
Patient financial incentive	2.74 (1.78–4.24)	Organisational change	3.03 (2.56–3.58)	Organisational change	17.6 (12.3–25.2)
Organisational change	2.47 (1.97–3.10)	Patient financial incentive	2.82 (2.35–3.38)	Provider education	3.01 (1.98–4.56)
Patient reminder	2.31 (1.97–2.70)	Patient reminder	1.74 (1.58–1.92)	Patient reminder	2.75 (1.90–3.97)
Provider education	1.99 (1.58–2.51)	Provider education	1.72 (1.39–2.13)	Patient financial incentive	1.82 (1.35–2.46)
Feedback	1.76 (1.44–2.15)	Patient education	1.53 (1.30–1.81)	Provider reminder	1.46 (1.15–1.85)

Provider reminder	1.63 (1.39–1.92)	Provider reminder	1.37 (1.25–1.51)	Patient education	1.38 (0.84–2.25)*
Patient education	1.31 (1.12–1.52)	Feedback	1.10 (0.93–1.31)*	Feedback	1.18 (0.98–1.43)*

•OR= Odds ratio; from meta-regression ♦ Faecal occult Blood test * that is, no significant improvement

Abercrombie (2001) undertook a critical review of studies focusing on interventions to improve follow-up after an abnormal Pap smear test. MEDLINE was searched for publications between 1985 and 1999. Strategies that were found to improve follow-up included telephone counselling, education, and incentives. Offsetting out-of-pocket expenses such as transportation costs was successful at improving adherence among women who were socio-economically disadvantaged.

Research design: structured review

Jepson et al (2000) conducted a systematic review of the literature on determinants of screening uptake and interventions to increase screening uptake. Twenty-three databases of both published and grey literature were searched up to October 1998. The review of interventions to increase screening uptake included 190 studies; 14 of those (10 RCTs and 4 quasi-RCTs) evaluated economic interventions aimed at individuals, which either removed or reduced financial barriers to screening or offered rewards and incentives. Thirteen studies were undertaken in the USA and one in Australia. Overall, the removal of financial barriers seemed to be effective, with eight of nine studies reporting increased uptake. Offering direct rewards or incentives was found to be ineffective with only two of five studies reporting increased uptake.

Research design: systematic review

CRD commentary: This is a very good review with clearly stated objectives and inclusion and exclusion criteria. The literature search is very thorough and attempts have been made to find unpublished literature and contact experts in this topic of research. The authors' conclusions appear to follow from the results of the review.

Slater et al (2005) conducted a RCT, Subjects (n=145,467) were low-income women in Minnesota, aged 40–63 years (eligible for free mammograms) allocated into three groups: direct mail, direct-mail-plus-incentive (\$10 for a completed mammogram), and control. The primary outcome was mammogram within 13 months of the intervention. Direct mail letters had toll free number to call. More than 4 times as many calls came to the mail-plus-incentive number than to the mail-only number (1,611 vs 400 calls). After 1 year, both the mail-plus-incentive group and the mail-only intervention groups had significantly higher mammography rates than controls (increases of 0.75 per cent and 0.23 per cent respectively beyond the control rate of 0.83 per cent).

Research design: RCT

3.5 Tuberculosis treatment and diagnosis

Evidence in brief

We found three review articles and three individual studies (published subsequent to the reviews) that addressed the use of incentives in promoting adherence to tuberculosis treatment and diagnosis.

Promote positive change

- Incentives can work to improve patients' completion rate of antibiotic treatment regimens (particularly in disadvantaged patient groups).
- Studies on interventions to encourage people to return for skin test readings indicate that people are more likely to return if they are offered money, helped by community health workers, telephoned at home or if they sign a written contract to return.

Reduce barriers to change

- There are no specific findings.

Context and background

Tuberculosis (TB) is a bacterial infection caused by the bacteria *Mycobacterium tuberculosis*. TB usually causes disease in the lungs (pulmonary), but can also affect other parts of the body (extra-pulmonary). Nine million new cases of TB, and nearly two million deaths from TB, are estimated to occur around the world every year. TB is the leading cause of death among curable infectious diseases. The WHO declared TB a global emergency in 1993 (HPA, 2007).

TB is curable with a combination of specific antibiotics, but treatment must be continued for at least six months. It has been estimated that between 20 and 50 per cent of TB patients do not complete treatment within a 24-month period; failure to complete therapy can result in prolonged infectiousness, relapse, drug resistance and death (Cuneo and Snider, 1989). Drug users are at increased risk for latent tuberculosis infection and also at increased risk for non-completion of medication regimens for treatment of disease. Incomplete treatment poses a serious risk for both the individual patient and the wider community and contributes to failure in eradicating the disease globally (Volmink and Garner, 2000).

Incentives are one intervention that has been tried to encourage patients to adhere to recommended treatment. Tulskey *et al* (2004) compared the impact of cash with non-cash (fast-food or grocery store coupons, telephone cards or bus tokens) incentives on adherence to TB treatment among homeless adults and found no significant difference between them.

Evidence summaries

Kane *et al* (2004) conducted a wide-ranging review of incentives for preventive care (see Section 2 for details). It included 5 studies on incentives for TB skin test reading. Incentives ranged from US \$5 to \$10. All of the studies reported statistically significant findings that incentives were effective.

Research design: systematic review

Volmink and Garner (2000) undertook a systematic review of the literature on interventions aimed at promoting adherence to anti-tuberculosis treatment and completion of TB diagnostic protocols. The following databases were searched for publications up to 2000: Cochrane Controlled Trials Register, the

Cochrane Infectious Diseases Group Trials Register, MEDLINE, EMBASE and LILACS. Fourteen trials met the inclusion criteria. A monetary incentive of \$5 was effective (combined RR 2.10, 95% CI 1.74 to 2.53) for promoting adherence to an initial appointment for TB evaluation both in homeless people with positive tuberculin test results and in a population of drug users required to return for a reading of their tuberculin tests. The authors concluded that the following improved patients' completion rate: reminder cards sent to their home when they missed treatments; and cash (about \$5) given each time they attended a clinic. One study found that directly observing patients taking their treatment resulted in more patients being cured than if they were given the drugs to take at home, but another found there was no difference. Studies to encourage people to return for a skin test reading found that people are more likely to return if they are offered money, helped by community health workers, telephoned at home or if they sign a written contract to return.

Research design: Cochrane Systematic Review (due to be updated shortly)

Giuffrida and Torgerson (1997) conducted a wide-ranging review of patient-targeted incentives (see Section 2 for details). It included two studies of incentives to improve the rates of patients' adherence to antituberculosis medical regimen. Incentives ranged from US\$5 to \$10. Both found that the impact of incentives on adherence was statistically significant.

Research design: systematic review

Kominsky et al (2007) report on an RCT that studied the impact of an incentive-based programme to promote adolescents' compliance with treatment for latent tuberculosis. The study involved 794 adolescents (aged 11–19 years) allocated into 4 groups: usual care, peer counselling, contingency contracting, combined peer counselling and contingency contracting. Contingencies comprised rewards negotiated with the subjects' parents and included clothing, special meals and outings. Outcomes were completion of isoniazid therapy, costs and TB-related costs per quality adjusted life year (QALY). The percentages of adolescents completing treatment were usual care (75.9 per cent), peer counselling (75.4 per cent), contingency 73.9 per cent, and combined peer and contingency (83.8 per cent). No interventions were significantly better than usual care (at the level of 5 per cent). The authors state that their results 'support the conclusion that incentives when combined with peer counselling are a cost-saving strategy to enhancing care completion, resulting in better outcomes at an average cost of \$209 per QALY' (p 67). However, this conclusion has been questioned by experts at CRD.

Research design: RCT

CRD commentary: The readers' attention is drawn to the final conclusions which suggest that incentives are cost-saving when combined with peer counselling, although the results did not support this conclusion as additional health benefits were shown to be attainable only at an increased cost.

Mallotte et al (2001) conducted an RCT to compare the independent and combined effects of monetary incentives and outreach worker provision of directly observed therapy (DOT) for latent TB infection in a sample of active drug users. Participants consisted of a volunteer sample of 163 active injection drug and crack cocaine users placed on twice weekly DOT. Patients were randomly assigned to one of three treatment arms:

1. provision of DOT by an outreach worker at a location chosen by the participant (active outreach) and a \$5 per visit incentive
2. active outreach with no monetary incentive
3. provision of DOT at the study community site and a \$5 per visit incentive.

The main outcome measures were percentage of medication taken as prescribed and completion of medication regimen. The percentage of prescribed medication taken was higher for those who received incentives, either with (71 per cent) or without (68 per cent) active outreach, compared to those who

received active outreach alone (13 per cent). Only 4 per cent of participants assigned to Group 2 completed treatment, compared with 53 per cent of Group 1 participants and 60 per cent of Group 3 participants. The authors concluded that monetary incentives were clearly superior to active outreach. Active outreach in combination with monetary incentives did not increase adherence over incentives alone.

Research design: RCT

Perlman et al (2003) conducted a before-and-after comparison of the impact of introducing monetary incentives for adherence to referral for chest x-rays among injection drug users undergoing syringe exchange-based tuberculosis screening in New York City. From 1995 to 1998 there were 119 intravenous drug users referred for chest x-rays based on tuberculin skin testing at the syringe exchange programme. From 1999 to 2001, there were 58 users referred for x-rays with a \$25 incentive based on adherence. Adherence to x-ray referral within seven days was 46 out of 58 users (79 per cent) among individuals who received the monetary incentive versus 17 out of 119 (14 per cent) prior to the implementation of the monetary incentive ($p < 0.0001$; OR=23; 95% CI 9.5–57). The median time to obtaining a chest x-ray was significantly shorter among those given the incentive than among those referred without the incentive (2 versus 11 days, $p < 0.0001$). In multivariate logistic regression analysis, use of the incentive was highly independently associated with increased adherence (OR=22.9; 95 per cent CI 10–52). The authors concluded that monetary incentives are highly effective in increasing adherence to referral for screening chest x-rays to exclude active tuberculosis after syringe exchange-based tuberculin skin testing.

Research design: observational study (uncontrolled before-and-after)

3.6 Prenatal and postnatal care

Evidence in brief

We found two review articles that considered the impact of incentives on adherence to recommended prenatal and postnatal care appointments (both were wider reviews focused on the relationship between incentives and preventive care and patient adherence generally). One additional review article focused on interventions for promoting smoking cessation during pregnancy. We found one additional RCT (on interventions to encourage better prenatal nutrition) that was published subsequent to those reviews.

Promote positive change

- Vouchers and gifts may motivate low income women to attend prenatal and postnatal appointments.
- Rewards (provided alongside social support) resulted in significantly greater levels of smoking reduction among pregnant women than other strategies.
- There is some evidence to suggest that provision of free orange juice may improve prenatal nutrition.

Reduce barriers to change

- Offsetting transportation costs may promote prenatal check attendance.

Context and background

Current models of antenatal care originated in the early decades of the 20th century. In the UK, current guidelines recommend a series of seven to ten prenatal, and one postnatal, appointments (Royal College of Obstetricians and Gynaecologists, 2003). A review of prenatal care and incentives across Europe found that incentives for prenatal care are widespread. These include paid maternity leave, entitlement to time off work for antenatal care appointments and transportation benefits (McQuide *et al*, 1998).

However, there are groups of the population who, despite such systemic incentives, are less likely to access recommended prenatal and postnatal care. These women are generally from lower socio-economic groups and are the main focus for the targeted incentive schemes reviewed below.

The role played by explicit expectations in the use of incentives in this area is demonstrated by a study by Higgins *et al* (2004). They compared contingent and non-contingent vouchers (worth around \$300–400) for smoking cessation allocated during pregnancy and for 12 weeks postpartum. Those in the contingent group were subject to abstinence monitoring. Contingent vouchers increased 7-day point prevalence at the end of pregnancy (37 per cent versus 9 per cent), at 12-week postpartum (27 per cent versus 0 per cent) and at 24-weeks postpartum (27 per cent versus 0 per cent).

Evidence summaries

Lumley *et al* (2004) undertook a systematic review of interventions for promoting smoking cessation during pregnancy. The following databases were searched for publications between January 2002 and July 2003: Cochrane Pregnancy and Childbirth Group trials register, the Cochrane Tobacco Addiction Group trials register, MEDLINE, EMBASE, PsycLIT, CINAHL and AUSTHEALTH. The review included 64 trials covering a range of interventions. The intervention strategy that resulted in a significantly greater smoking reduction than other studies was rewards plus social support (RR 0.77; 95% CI 0.72–0.82).

Research design: Cochrane Systematic Review

Kane *et al* (2004) conducted a wide-ranging review of incentives for preventive care (see Section 2 for details). It included 7 studies on incentives for prenatal and postnatal checks. Of these, 3 had statistically significant findings. Incentives in the studies that found a significant effect were:

- coupon for baby milk formula
- offset of transportation costs
- baby toy.

Those that did not have a significant effect were:

- \$5 and \$100
- gifts (jewellery, baby blanket).

Research design: systematic review

Giuffrida and Torgerson (1997) conducted a wide-ranging review of patient-targeted incentives (see Section 2 for details). It included two studies specifically focused on incentives for postnatal checks

among low income teenage mothers in the USA. The incentives were coupons for baby milk or a gift for the mother. Both studies reported that incentives significantly increased appointment keeping. One study compared coupons for baby milk with a gift for the mother and found the coupons to be more effective. Note that both primary studies were included in Kane *et al*, 2004.

Research design: systematic review

Burr *et al* (2007) conducted an RCT of interventions to improve nutrition in pregnant women in a deprived area of the USA. Pregnant women (17 years of age or older; n=190) were allocated into 3 groups: advice group (given advice and leaflets promoting fruit and fruit juice consumption), voucher group (given vouchers redeemable for fruit juice) and control (given usual care). Frequency of fruit consumption declined during pregnancy in all groups. Consumption of fruit juice increased substantially in the voucher group. Serum beta-carotene levels increased in the voucher group from 106.2 to 141.8 $\mu\text{mol/l}$, were unchanged in the advice group and decreased from 120 to 99.8 $\mu\text{mol/l}$ in the control group. The cost of the intervention was the juice: £75 per person (n=63) for 30 weeks, which amounted to £4725.

Research design: RCT

3.7 HIV and sexual health

Evidence in brief

We found one review article that considered the impact of incentives on adherence to recommended HIV and sexual healthcare. We found three additional articles reporting quasi-experiments that were published subsequent to the review.

Promote positive change

- Cash incentives may encourage attendance at risk reduction education and counselling sessions.
- One study found that cash incentives were ineffective at encouraging patients to return for retesting following treatment for sexually transmitted infections (STIs). It found that reminder telephone calls were more effective (although evidence was weak).

Reduce barriers to change

- Discounting the costs of condoms may promote purchase.

Context and background

Sexual health remains a serious concern in many countries. The UK has seen a deterioration over the last 12 years, with large increases in many STIs. The diagnosis of chlamydia has increased by over 300 per cent (from 32,288 in 1995 to 104,155 in 2004), and gonorrhoea by over 200 per cent (from 10,580 in 1995 to 22,335 in 2004). In addition, the incidence of HIV has increased more than threefold, from 2500 cases diagnosed in 1995 to just over 7000 in 2005. Overall, the number of STIs and other conditions diagnosed in sexual health (genitourinary medicine – GUM) clinics in the UK increased by 3 per cent between 2004 and 2005 (from 751,282 to 790,387) (for more information see www.hpa.org.uk/infections/topics_az/hiv_and_sti/epidemiology/sti_data.htm).

In the USA, the Centers for Disease Control and Prevention (CRD) estimate that 19 million new infections occur each year – almost half of these are among young people aged 15 to 24 years (for more information see www.cdc.gov/std/stats/trends2005.htm).

Although not directly relevant to this review (it is a cost-effectiveness study with no controls), Borghi *et al* (2005) found that a voucher scheme to reduce STIs in Nicaragua offered an effective and efficient means of targeting and effectively curing STIs in high-risk groups.

Evidence summaries

Kane *et al* (2004) conducted a wide-ranging review of incentives for preventive care (see Section 2 for details). It included 4 studies on interventions to prevent STIs. Incentives included:

- cash (ranging from \$15 to \$35 to participate in education for STI and AIDS prevention)
- grocery vouchers worth \$35 (for attendance at education programme)
- 75% discount on condoms (to encourage purchase).

All of the studies showed that the incentives had a statistically significant impact.

Research design: systematic review

Carey *et al* (2005) conducted a quasi-experiment to evaluate the effects of a financial incentive on attendance at a sexual risk reduction workshop in New York. The study included 107 patients recruited from an urban STI clinic who reported risky sexual behaviour. The study was conducted in two phases: the control group (no incentive) were recruited in phase 1 (n=55) and the test group (offered a \$30 incentive to attend the workshop) were recruited in phase 2 (n=52). Attendance at the workshop was significantly higher for the incentive group (38%) compared with the non-incentive group (9%). Logistic regression analysis indicated that incentive (AOR 7.59, $p < .001$) predicted attendance after controlling for two other significant predictors: employment status (AOR 3.04, $p < .05$) and age (AOR 1.07, $p < .05$).

Research design: quasi-experiment

Haukoos *et al* (2005) conducted a quasi-experiment to evaluate the effect of financial incentive on adherence to outpatient HIV testing referrals from an emergency department (ED) in Colorado. The study was divided into 3 periods: no financial incentive during first and third, but a financial incentive of \$25 was offered during the second. The study included 372 patients presenting at the ED and identified as at-risk for HIV. During control periods, 8% (20/252) of patients completed HIV counselling and testing compared with 23% (27/120) while the incentive was in operation (OR 3.4; 95% CI 1.8–6.3). No recruits tested positive.

Research design: quasi-experiment

Malotte *et al* (2004) undertook a quasi-experiment that compared various methods of encouraging patients to return for retesting after completion of treatment for gonorrhoea and Chlamydia. In two separate studies participants were randomly assigned to five groups: brief recommendation to return, recommendation plus incentive, recommendation plus motivational counselling and telephone reminder, recommendation plus telephone reminder, recommendation plus motivational counselling. The study included 498 patients. Using multiple logistic regression, the OR for recommendation plus incentive, compared with recommendation alone was 1.2 (95%CI 0.6 – 2.5); for recommendation plus motivational counselling and telephone reminder was 2.6 (95% CI 1.3 – 5.0); for recommendation and telephone reminder was 18.1 (95% CI 1.7 – 193.5); and for recommendation plus motivational counselling was 4.6

(95% CI 0.4 – 58.0). The monetary incentive did not increase return rates; a reminder telephone call seemed the most effective intervention (although note the wide confidence interval).

Research design: quasi-experiment

4. Incentives to change lifestyle behaviours

4.1 Introduction

There is a wide range of interventions and activities that seek to improve public health by promoting healthy lifestyle or reducing the risk of developing a disease or condition. Incentives are only one of many possible interventions. We report on specific findings in three key areas:

- exercise, diet and weight loss
- smoking cessation
- reducing road injuries: belt and booster seat use.

4.2 Exercise, diet and weight loss

Evidence in brief

We found seven review articles and two individual studies (published subsequent to the reviews) addressing incentives for exercise, diet and weight loss.

Promoting positive change

- There is evidence available to suggest short-term effects of incentives on dietary behaviour but these diminish over longer periods.
- Monetary incentives may help to motivate individuals to lower cholesterol levels in the short-term (over a six-month period).
- There is inconclusive evidence on the effect of incentives on physical activity.

Reducing barriers to change

- Reducing prices of healthy options in cafeterias and vending machines can promote modifications in diet.

Context and background

Obesity is now seen as one of the greatest public health challenges of the 21st century. Its prevalence has tripled in many countries in Europe since the 1980s and the numbers of those affected continue to rise at an alarming rate, particularly among children. Excessive body weight has been shown to predispose to various diseases, particularly cardiovascular diseases, Type 2 diabetes, sleep apnoea and osteoarthritis. Obesity is responsible for 2 to 8 per cent of health costs and 10 to 13 per cent of deaths in various parts of Europe (for more information go to www.euro.who.int/obesity).

Across OECD countries the percentage of the population aged 15 years and above who are clinically obese (that is, a body mass index >30) range from Japan (3.2 per cent), Korea (3.2 per cent) and Switzerland (7.7 per cent) through to the UK (23 per cent), Mexico (24.2 per cent) and the USA (30.6 per cent) (OECD Health Data, 2006).

There are a number of reviews available on the effectiveness of various treatments for obesity (Jain, 2004; Katz *et al*, 2005). Kahn *et al* (2002) have published a review of interventions to increase physical activity.

Evidence summaries

Goodman and Anise (2006) undertook a review of economic instruments to reduce consumption of energy-dense and high-fat foods that included policy interventions (taxes, subsidies enacted by government) and local interventions (price reductions and incentives implemented in specific sites – schools, cafeterias, workplaces and so on). The following databases were searched up until May 2006: MEDLINE, Cochrane Library, DARE, Health Technology Assessment (HTA), CINAHL, Allied and Alternative Medicine, EMBASE and the World Health Organization (WHO) database. There were no systematic reviews, RCTs or other intervention-based studies that yielded direct evidence on the impact of policy interventions. For local interventions, 20 studies (including 11 RCTs, three non-RCTs, and six time series or other studies without concurrent controls) were included in the review. The authors conclude that available evidence suggests – but does not demonstrate – that the introduction of policy-related economic instruments, particularly in the form of taxes and price policies, could reduce consumption of high saturated fat and other energy-dense foods, and increase the purchasing of healthy foods. On incentives, there is a small body of evidence that indicates that reducing the price of fruits, vegetables and other healthy snacks at the point of purchase (vending machines, cafeterias) increases their consumption. Another small body of evidence that includes several RCTs shows that financial incentives may result in temporary weight change.

Research design: WHO evidence review

Wall et al (2006) conducted a systematic review of RCTs of the effect of monetary incentives on dietary behaviour. The following databases were searched up until April 2005: MEDLINE, Cochrane Control Trials Register, EMBASE, CINAHL and PsycLIT. Five publications from four studies were included in the review. Incentives reported on were either reduced financial barriers (discounts or coupons on healthy foods) or payment contingent on weight loss. Incentives comprised:

- \$2.50 to \$25 per week contingent on weight loss
- free pre-packaged meals
- 10, 25 and 50 per cent discounts on low-fat snacks from vending machines
- farmers' market \$20 coupons for fruit and vegetables.

Standard behavioural therapy was used as a separate test arm and as an adjunct to incentives in the weight loss studies.

All four studies found a positive effect of incentives on healthy eating or weight loss compared with controls. The evidence in support of sustained effect is more tenuous with most studies reporting that participants regain some weight at follow-up and revert to original purchasing patterns once discounts were removed. Only one study found a dose–response relationship: price reductions on healthy choice vending machine snacks.

Studies had methodological limitations: small sample size, methods of randomisation not given and measures of precision (confidence interval – CI – or standard deviation – SD) not given. One study restricted analysis to participants who completed all assessments rather than intention to treat.

Research design: systematic review (no independent assessment found)

Matson-Koffman et al (2005) reviewed the literature on policy and environmental interventions that promote physical activity and nutrition for cardiovascular health. The following databases were searched up until 2003: MEDLINE, PsycINFO, Chronic Disease Prevention Database, ERIC, Web of Science, US Department of Transport database and the US Department of Agriculture database. The review included 129 intervention studies. Detailed descriptions of studies conducted from 1990 to 2003 (n=64) are

provided. Of these, six studies measured the impact of incentives to improve nutrition and two studies focused on the impact of incentives on physical activity. In general, the following interventions provided the strongest evidence for influencing nutrition and physical activity levels:

- prompts to increase stair use
- access to places and opportunities for physical activity
- school-based physical education
- comprehensive workplace approaches
- availability of nutritious foods
- point-of-purchase strategies (for example, nutrition information, aisle displays)
- systematic reminders and training of healthcare providers to offer nutritional advice.

Findings from the incentive studies indicated that price reductions and the distribution of coupons can increase healthier food purchases (although education combined with coupons had a greater impact).

The authors note methodological problems with many of the primary studies: no control groups, short-term evaluation periods and reliance on self-reporting for outcomes.

Research design: systematic review (no independent assessment found)

Hardeman *et al* (2000) conducted a systematic review on psychological models and behaviour change models to prevent weight gain. The following databases were searched for publications up until 1999: MEDLINE, Cochrane Library, EMBASE, PsycLIT, Current Contents (Life Sciences), ERIC, HealthStar and Social Science Citation Index. Eleven publications describing nine distinct interventions were included in the review. Interventions investigated included education plus a lottery incentive, education only, school-based programmes to improve knowledge of nutrition, increases in activity and promoting an active lifestyle. Only one of the five studies that were based on an RCT design reported a significant effect on weight. It involved a correspondence programme and a mix of behaviour change methods including goal setting, self-monitoring and contingencies (that is, incentives). The review concluded that it was not possible to be definitive about which elements of the interventions were associated with an increased effect.

Research design: systematic review

CRD commentary: This is a reasonable review of the area. The authors' conclusions follow from the results presented.

Kane *et al* (2004) conducted a wide-ranging review of incentives for preventive care (see Section 2 for details). The review included 13 studies on diet modification/exercise/weight loss. Of those, 8 reported that incentives had a significant effect. Effective incentives included return of contracted cash amounts (\$5–30) on attendance at weight loss sessions or achievement of weight-loss goals, farmer's market coupons to improve nutrition, \$100 lottery draws for cholesterol lowering and for returning nutrition postcards.

Research design: systematic review

NHS Centre for Reviews and Dissemination (1997) conducted a review of interventions to prevent and treat obesity. The following databases were searched: MEDLINE, EMBASE, Bath Information and Data Services (BIDS) and PsycLIT (dates not provided). Ninety-nine studies were included, only one of which addressed incentives specifically. Overall conclusions were:

- progression of obesity in children may be prevented by family therapy
- prevention of obesity in adults may be achieved by community-based education programmes linked with financial incentives
- interventions to reduce sedentary behaviour can reduce children's excess weight
- behavioural, diet, exercise and drug treatments have all been shown to be effective to some extent in treating obesity in adults (particularly when used in combination)
- most people begin to regain weight a few months after treatment
- surgery is the most effective approach for those with severe obesity.

Many of the studies had methodological problems including small sample sizes, high rates of attrition and self-selection for participation.

Research design: systematic review

Herman et al (2006) report an observational study on the effects of a \$150 cash incentive to participate in an online physical activity programme (VFC – virtual fitness centre) provided to IBM employees (as measured by an abridged University of Michigan health risk appraisal tool). To qualify for the rebate, participants needed to engage in at least 20 minutes of physical activity 3 days per week, for 10 out of 12 consecutive weeks. In the year prior to the introduction of the rebate in 2004, 13 per cent (16,777 out of a total of 129,628) of eligible employees participated in the VFC. This increased to 53 per cent when the cash incentive was introduced. Seventy-four per cent of the VFC participants completed sufficient exercise to receive the rebate (49,568 or 39 per cent of total employees). Baseline prevalence values for health risks were significantly lower for VFC participants (measures of weight, stress, physical activity, life satisfaction, blood pressure, perceived health, disease, illness days, smoking status) with the exception being cholesterol levels (this suggests self-selection). Risk status among those who received the rebate changed significantly over a 12-month period for all measures except weight and illness days. Significant differences in risk status between participants who received the rebate and those who did not log sufficient activity to qualify were found in activity levels, weight and illness days.

Research design: observational study

Bloch et al (2006) conducted an RCT on the effect of monetary incentives, a nurse-led multidisciplinary educational programme and usual care on the reduction of low-density lipoprotein cholesterol (LDL-C) levels among US employees with raised baseline levels. The incentive was \$100 if LDL-C levels decreased by 15 per cent (as measured by a blood test) after six months. Intention to treat analysis showed that both the incentive and the nurse educator groups saw reductions of 11 per cent on LDL-C compared with a 4 per cent reduction in the usual care group. The proportion of participants in each group that achieved the 15 per cent reduction goal was: 38 per cent of participants in the incentive group, 35 per cent in the nurse educator group and 15 per cent for usual care. The study did not ascertain whether the subjects were on lipid modifying medication.

Research design: RCT

Blue and Conrad (1995) summarised and critiqued the literature on workplace exercise interventions that sought to increase adherence to exercise. The following databases were searched for publications from 1980: MEDLINE, CINAHL, Sport and Leisure Index, Sociology of Leisure and Sport Abstracts, Physical Fitness (Sports Medicine), Psychological Abstracts, ABI/INFORM and National Institute for Occupational Safety and Health (NIOSH). Incentives were only one among many interventions reviewed (for example, annual health screen, counselling, seminars, supervised and unsupervised exercise, public displays and prompts, monitoring with logs, telephone contact and/or reminders). Participants were primarily white collar workers; only one study involved blue collar workers. Two RCTs were included (with 136 worksite employees), 3 quasi-experimental studies (with 3860 worksite employees) and 5

pre-experimental studies (with 1398 worksite employees). Varying time frames, samples and measures made comparisons across studies difficult and only general observations were made. Nine of the ten included studies showed that exercise adherence strategies worked to increase or improve exercise behaviour. The most impressive results came from programmes having multiple interventions.

Research design: systematic review

CRD commentary: This is a well-written review with an assessment of the limitations of the primary studies. It cannot be concluded that any single intervention strategy is superior due to the limitations discussed by the author, the multiplicity of interventions directed at the participants, the lack of validity criteria and the lack of costing the interventions studied.

4.3 Smoking cessation

Evidence in brief

We found eight review articles and seven individual studies (published subsequent to the reviews) addressing incentives for smoking cessation.

Incentives have not been found to alter population smoking cessation rates significantly.

There is some evidence that incentives can:

- improve recruitment rates for quit programmes
- improve quit rates in the short term (although once withdrawn a normal pattern of relapse occurs).

Offsetting the costs of smoking cessation treatment can be effective in increasing the number of people participating in smoking cessation attempts, as well as increasing abstinence rates.

Workplace-mediated incentives may increase attempts to stop smoking, although there is no evidence to suggest they are effective in increasing abstinence rates.

Quit and Win contests

- The majority of individual studies report significantly higher quit rates in Quit and Win participants than in controls at 12-month assessment.
- There is little evidence to support a population impact on smoking rates.
- Levels of gaming and deception, where measured, were high.
- Programme reports and survey data suggest that international Quit and Win contests may be effective, particularly in developing countries – however, there are no controlled studies available.
- Quit and Win contests can capitalise on the intrinsic motivation of people in the community contemplating quitting.

Context and background

Smoking is responsible for the death of one in ten adults worldwide – about five million deaths each year. It has been estimated that around 650 million people – that is, half of current smokers – will eventually be killed by tobacco.

Cigarette smoking causes a wide range of diseases including cancer, respiratory disease, coronary heart and other circulatory diseases, stomach/duodenal ulcers, osteoporosis, cataracts and age-related macular degeneration, and periodontitis. It can also lead to impotence and infertility, complications in pregnancy and low birthweight babies. Following surgery it can lower survival rates, delay wound healing and cause post-operative respiratory complications.

In addition to the high costs of treating tobacco-related diseases, tobacco kills people at the height of their productivity, with significant economic consequences for families and economies. A 1994 report estimated that the use of tobacco resulted in an annual global net loss of \$200,000m, a third of this loss being in developing countries (for more information see www.who.int/tobacco/health_priority/en/index.html).

There are a number of cost-effective tobacco control measures that can have a significant impact on tobacco consumption including bans on direct and indirect tobacco advertising, tobacco tax and price increases, smoke-free environments in all public and workplaces and large clear graphic health messages on tobacco packaging. As well as public policy interventions, interventions that promote smoking cessation also have an important role to play. Smoking cessation treatment increases the number of successful quitters (Hughes *et al*, 1997; Stead and Lancaster, 2005; Silagy *et al*, 2004). Without treatment, around 3 per cent of quitters remain abstinent after 1 year (West *et al*, 2000).

In England, smoking is the main cause of preventable morbidity and premature death; between 1998 and 2002 some 86,500 annual deaths were a result of smoking (Twigg *et al*, 2004). Smoking is estimated to cost the NHS approximately £1.5 billion per year (Raw *et al*, 1998). This figure does not take into account other substantial indirect costs such as sickness and invalidity benefits, and loss of economic activity. In the UK, smoking prevalence has dropped sharply since the 1970s, but this decline has been much less pronounced in the last decade with recent estimates suggesting a 0.4 per cent decline per year (Sproston and Primatesta, 2003; West, 2005). NICE is currently developing guidance for smoking cessation services and has commissioned a number of studies on the effectiveness (including cost) of mass media interventions, NHS treatments, non-NHS treatments and workplace policies. This work contextualises the role that incentives may play in smoking cessation (for more information see www.nice.org.uk/page.aspx?o=404107).

Quit and Win contests were first developed by the Minnesota Heart Health Program (MHHP) in the 1980s. The MHHP programme was widely lauded, with reported participation rates of between 1 and 7 per cent and follow-up abstinence rates (non-verified participant self-report) at six to eight months of between 21 and 24 per cent. These results prompted widespread adoption of similar contests. Most share a number of key features:

- participants must be over 18 years of age and current daily smokers
- entrants who have completely abstained from smoking and tobacco for at least four weeks after the quit date are eligible for prizes
- smoking status is validated prior to entry and quitting is biochemically validated among potential winners
- a large grand prize is offered (for example, a family holiday to Disneyworld) plus several smaller prizes (for example, bicycles, health club membership)
- contests are heavily promoted through the media, schools, and community organisations and workplaces
- health professionals and community leaders support the programme.

In 1994, WHO conducted the first international contest – 13 countries participated. The contest has been run every two years since then and has grown considerably over time. In 2006, the grand prize was \$10,000; the contest attracted some 700,000 participants from 80 countries. Despite the wide application of Quit and Win contests, there are few rigorous evaluations of impact. Although a number of studies have examined cost-effectiveness of Quit and Win, a systematic review (Hey and Perera, 2005b, see below) concluded that methodological heterogeneity precluded any meaningful between-trial comparisons and synthesis.

Evidence summaries

Hey and Perera (2005a) conducted a systematic review on the effectiveness of competitions, contests and incentives in reducing the prevalence of smoking and relapse. The following databases were searched for publications up to September 2004: Cochrane Tobacco Addiction Group Specialised Register, MEDLINE, EMBASE, CINAHL and PsycINFO. Fifteen studies were included in the review. Five were set in health centres or clinics and ten in workplaces. Studies were undertaken in the USA (10), the UK (3), Australia (1) and USA/Canada (1). None of the studies demonstrated significantly higher quit rates for the incentives group than for the control group beyond six-month assessment. There was no clear evidence that any particular types of incentive were more or less effective. Although incentives were not found to alter cessation rates significantly, there is some evidence that recruitment rates can be improved by rewarding participation. The included studies were often small and of variable quality. Only two studies addressed costs (these two studies also found statistically significant effects at six months but both paid final reward at six months and may have biased results). Both found the smoking cessation interventions they studied to be cost-effective. A consistent picture emerges from the review that incentives may work while they are in place, but once they are withdrawn the normal pattern of relapse is established. The authors concluded that there is no clear evidence that competitions or incentives make a lasting difference to smoking behaviour over and above the baseline community quit rate.

Research design: Cochrane systematic review

Hey and Perera (2005b) conducted a systematic review on the effectiveness of Quit and Win contests for smoking cessation. The following databases were searched for publications up to September 2004: Cochrane Tobacco Addiction Group Specialised Register, MEDLINE, EMBASE, Cinahl and PsycINFO. Four studies were included in the review. Three demonstrated significantly higher quit rates (8 to 20 per cent) for the intervention group than for the control group at the 12-month assessment. The population impact measure, where available, suggests that the effect of contests on community prevalence of smoking is small, with fewer than 1 in 500 smokers quitting because of the contest. Levels of deception where they could be quantified were high. Although there are programme reports and surveys that suggest that international Quit and Win contests may be effective, especially in developing countries, the lack of controlled studies precludes any firm conclusions. The two elements that appear to lead to success in a Quit and Win contest are a support network of friends, family and workmates, and abrupt quitting or going 'cold turkey'.

Research design: Cochrane systematic review

Kaper *et al* (2005) undertook a systematic review of healthcare financing systems for increasing the use of tobacco dependence treatment (pharmacotherapy or counselling or both). The following databases were searched for publications up to August–October 2003: Cochrane Tobacco Addiction Group Specialised Register, MEDLINE, EMBASE and the Cochrane Central Register of Controlled Trials (CENTRAL). The review included interventions aimed at patients (changes to the level of health insurance coverage and co-payments, changes to premiums or user fees and changes to direct costs to patients, for example, free prescriptions) and at providers (reviewed in an accompanying QEI – see Christianson *et al*, 2007).

The findings are summarised below.

Financial interventions and abstinence

The main points include:

- Four studies assessed the effects of a full benefit (insurance) compared with no benefit on the number of smokers who quit. Two studies documented the self-reported continuous abstinence rate at twelve months and two studies presented self-reported point prevalence abstinence rate at six months. In all four studies the abstinence rate in the treatment group was higher than that in the control group. Pooling of the data resulted in an odds ratio of 1.48 (95% CI 1.17–1.88).
- Two studies compared a full benefit with a partial benefit – both found that more participants quit smoking at six months in the full benefit group. The pooled odds ratio (OR) for the self-reported point prevalence abstinence in the full benefit group compared with the partial benefit group was 2.49 (95% CI 1.59–3.90).

Financial interventions and participation in smoking cessation

Four studies assessed the effects of a full benefit compared with no benefit on the number of participants who tried to quit. In all four there was increased participation in the intervention group (pooled OR 1.32; 95% CI 1.18–1.49).

Financial interventions and smoking cessation treatments

There were three main findings:

- five studies assessed the effects of covering the cost of nicotine replacement therapy (NRT) – all showed increases in the use of NRT; the pooled OR was 2.92 (95% CI 1.49–5.71)
- two studies assessed the effects of covering the cost of using the medication bupropion – pooled OR was not significant
- two studies recorded the number of smokers who participated in a behavioural programme – pooled OR was not significant when costs of the programme were covered.

Cost-effectiveness

Three studies presented data on costs. With full coverage the average costs per quitter ranged from \$716 to \$1247.

Increasing the level of health insurance coverage or reducing direct costs of smoking cessation treatments may increase the number of smokers who quit successfully, as well as the number of quit attempts and the use of treatment. Methodological problems mean that results should be interpreted with care.

Research design: Cochrane systematic review

Moher et al (2005) conducted a systematic review of workplace interventions for smoking cessation. The following databases were searched for publications up to October 2004: Cochrane Tobacco Addiction Group Specialised Register, MEDLINE, EMBASE and PsycINFO. The review examined a range of smoking cessation interventions targeted at the individual and at the workplace. Of interest

here are the five studies of incentives and competitions that were included. The review concluded that incentives can increase attempts to stop smoking, although absolute quit rates are not significantly affected.

Research design: Cochrane systematic review

Kane et al (2004) conducted a wide-ranging review of incentives for preventive care (see Section 2 for details). The review encompassed 12 studies on smoking cessation. Incentives included travel packages, meals, ceramic mugs, cash (from \$5–\$50/month, also \$5/month penalty), and free or reduced price nicotine replacement patches. Overall, 8 out of the 12 studies showed that the incentives had a statistically significant impact.

Research design: systematic review

Smedslund et al (2004) conducted a meta-analysis of workplace smoking cessation programmes. The following databases were searched for publications from 1989 to 2001: ABI Inform, BRS, CHID, Dissertation Abstracts International, ERIC, MEDLINE, Occupational Health and Safety Database, SSCI and Sociological Abstracts. Overall, 19 studies were included. On incentives specifically, there were six studies (and one study with incentives as part as a multi-component intervention). Overall, smoking cessation interventions at workplaces showed initial effectiveness, but the effect decreased over time and was not present beyond 12 months. For incentives specifically, the six included studies had higher quit rates in the intervention group than the control. Quit rates varied widely across the studies.

Research design: meta-analysis

CRD commentary: The review question was clear in terms of the study design, intervention, participants and outcomes. Many relevant sources were searched, attempts were made to minimise publication bias and the potential for publication bias was assessed. However, there were limitations to the validity assessment and details of the individual studies. As the quality of the included studies was not adequately reported, it is difficult to comment on the strength of the evidence underpinning the authors' conclusions.

Eriksen et al (1998) undertook a systematic review of the health impact of smoking control at the workplace. The following databases were searched for publications between 1968 and 1994: MEDLINE, EMBASE, AIDSLINE, Psychological Abstracts, Combined Health Information Database (CHID), Employee Benefits Infosource, National Prevention Evaluation Research Collection, NTIS and the Substance Abuse Information Database. Fifty-two smoking cessation programme evaluations were included. The literature was judged to be 'suggestive' for group and incentive interventions. Competitions were found to have the potential to increase programme participation. Weaknesses in research methodology were noted and included weak designs, a lack of controls, poor reporting of participation and attrition rates, and volunteer bias.

Research design: systematic review

CRD commentary: comprehensive search, conclusions seem appropriately cautious given the limitations of the included studies

Bains et al (1998) reviewed published literature on population-based smoking cessation interventions (that is, community-based, statewide or national programmes) that involve incentives (for example, cash incentives, cash and holiday prizes), focusing on whether such interventions are effective in reducing the prevalence of smoking. The following databases were searched for publications up to May–July 1997: MEDLINE, Health, CINAHL and PsycINFO. Seventeen studies were included in the review. Studies that were based on RCTs, quasi-experimental studies and non-experimental designs published between 1975 and 1997 were included. Worksite interventions and evaluations/interventions that targeted a specific group (hospitalised persons, pregnant women) were excluded. Cessation follow-up periods

ranged from one month to one year. The review found that 1–2 per cent of the target population were attracted by the incentive-based interventions, regardless of the publicity or recruitment tactics used. No specific type of recruitment strategy was shown to be consistently more effective than others. One study had a participation rate of 9.5 per cent, which was achieved through making the recruitment period more flexible. This contest produced the greatest impact although the actual sustained quit rate was low (13 per cent). The quit rates for the programmes ranged from 13 to 45 per cent and varied according to length of follow-up, with lower quit rates more likely to be reported when this time was prolonged. The evidence presented in the review was limited by the fact that most studies used a quasi-experimental or non-experimental design. Only one RCT was identified, and of the remaining studies only five compared the quit rates of participants with non-participants while seven others reported a pre-intervention measure of smoking in the community. Estimates of the cost per quitter ranged from less than \$20 to over \$400.

Research design: systematic review

CRD commentary: a clearly presented review, a thorough search of the literature and appropriate list of search terms. Review was limited to only English-language articles; authors failed to describe how decisions were made on the relevance and validity of studies, although they did discuss validity issues. From the evidence presented, the authors' conclusions and statements highlighting the need for further and more methodologically rigorous studies appear to be justified.

O'Connor et al (2006) report on the results of 11 Quit and Win contests held in New York State between 2001 and 2004. The contests involved 5504 adult smokers; participants were surveyed 4 to 6 months after the contest ended. On average, 0.55 per cent of smokers were recruited to join contests across the 11 sites. Among smokers who enrolled in a contest, 90 per cent reported making a quit attempt, and between 53 and 72 per cent reported quitting for the full month of the contest. At 4 to 6 months follow-up, self-reported quit rates (seven-day point prevalence) among contestants averaged 31 per cent (range 22 to 49 per cent). However, if the participants lost to follow-up are assumed to be smoking (as is the norm in intention to treat analyses) quit rates would range from 12 to 29 per cent. Compared to a statewide population survey, 8 of the 11 programmes showed quit rates that were significantly higher ($p < 0.001$ by Wilcoxon rank-sum test) than the estimated quit rate of 21 per cent seen among smokers making a quit attempt in the past year. Expenditures for promoting contests varied from \$4345 to \$91,441; estimated programme costs per quit ranged from \$97 to \$398.

Research design: quasi-experimental study

CRD commentary: The external validity of the study appears low and the study results should be considered relevant only for a US context. The issue of the generalisability of study results was not addressed and no sensitivity analysis was performed. Key issues of the study appear to have been the lack of a standard control group as in a clinical trial, the short follow-up period to evaluate quit rates among smokers, and the limited details given around the economic analysis.

Cummings et al (2006a) compared three programmes within New York State that either:

- provided vouchers for a one-week supply of nicotine patches or gum
- provided a one- to two-week supply of patches directly to quitters at home
- provided a six-week supply of patches and a follow-up telephone call.

Quit rates for these programmes were compared to historical quit patterns. Free patches or gum were sent to around 2.9 per cent of eligible heavy smokers (those who smoked ten or more cigarettes per day). Self-reported quit rates ranged from 21 to 35 per cent in the groups sent nicotine replacement therapy compared with 12 per cent in the historical sample.

Research design: quasi-experimental study

CRD commentary: The study was subject to a number of potential sources of bias including the use of a historical control group and a short follow-up period. It also lacked details on the economic analysis. Caution is required when interpreting the results of the analysis, especially over a long-term perspective.

Cummings et al (2006b) compared the 12-month quit rates of recipients of a 6-week supply of free nicotine patches in New York to Quitline callers from the previous year. Data was collected from a random sample (n=1597) via 2 telephone surveys at 4 months and 12 months (number of respondents was 884 and 581 respectively). At the 4-month follow-up interview, 90 per cent of those who received the patches reported making a quit attempt and 34 per cent claimed they were not smoking. At 12 months, 33 per cent of participants were no longer smoking and 23 per cent reported continuous abstinence. The 7-day non-smoking prevalence rate at 12 months was 1.78 times higher for those who received patches (95% CI 1.19–2.66) compared with historical controls.

The use of historical controls (especially in the context of a smoking ban introduced in New York) and unconfirmed self-reporting of smoking status mean that the results should be interpreted with care.

Research design: quasi-experimental study

Volpp et al (2006) conducted an RCT to investigate the impact of incentives on smoking cessation; 179 smokers in Philadelphia were offered a smoking cessation programme and were randomised into incentive and non-incentive groups. The incentive comprised \$20 for each class attended and \$100 if the attendee quit smoking within 30 days after completion of the programme. Outcomes were self-reported smoking cessation (confirmed with urine cotinine test) at six months post intervention. The incentive group had higher rates of programme enrolment (43.3 per cent versus 20.2 per cent; $p < 0.0001$) and completion (25.8 per cent versus 12.2 per cent; $p = 0.02$). Quit rates at 75 days were 16.3 per cent in the incentive group and 4.6 per cent in the control group ($p = 0.01$). At six months, quit rates in the incentive group were not significantly higher than in the control group (6.5 per cent versus 4.6 per cent, $p > 0.20$).

Research design: RCT

Bauer et al (2006) evaluated two population-based promotions for free cessation products:

- press announcement urging smokers to call a quitline to receive a voucher for a two-week supply of nicotine replacement therapy (gum or patches)
- comparison of responses to two newspaper advertisements for a quitline, one of which offered a free stop smoking guide and one that offered the guide plus a free stop smoking aid (BetterQuit).

The voucher promotion increased median call volume by 25 times compared to pre-promotion levels. The self-reported quit rate at 4 to 6 months in the voucher group was 22 per cent compared to a rate of 12 per cent among quitline callers who did not receive the voucher (OR=1.77; 95% CI 1.17–2.68).

Research design: quasi-experimental study

CRD commentary: The design in using historical controls is non-randomised and therefore open to selection bias. The substantial loss to follow-up may have adversely affected the degree to which the study sample was representative of the study population. It was unclear whether the length of follow-up was appropriate. The impact of time differences between groups (especially with respect to the historical control) could have introduced some time-related bias. Another limitation of the analysis was the use of self-reported data, which were not validated using objective measures. Finally, the analysis was restricted only to people who completed the treatment.

Hahn et al (2005) undertook a quasi-experimental study of a Quit and Win contest in Kentucky, USA. Tobacco quit rates were measured at three, six and twelve months after the 30-day quit period.

The intervention group consisted of a volunteer sample of 494 Quit and Win contest registrants and the control group consisted of 512 randomly selected tobacco users not exposed to the promotional media campaign which accompanied the contest. Confirmed one-year quit rates were 7.3 per cent for the treatment group and 0.6 per cent for the controls. After adjusting for baseline differences in demographics, tobacco use and stage of change, those in the treatment group were 5.3 times (95% CI 2.3–12.5) more likely to experience a biochemically confirmed quit during the post-intervention period, relative to controls. At 12-month follow-up, the self-reported quit rate for treatment participants remained higher than controls. However, this difference was not statistically significant after adjusting for demographics and stage of change.

Research design: quasi-experimental study

Miller *et al* (2005) investigated the effectiveness of a large scale distribution programme of free nicotine patches. Eligible smokers (n=34,090; around 5 per cent of all adults in New York City who smoked 10 or more cigarettes daily) who telephoned a toll-free quitline were sent a 6-week course of nicotine replacement therapy (NRT). At 6 months smoking status was assessed for 1305 randomly sampled NRT recipients and a non-randomly selected comparison group (n=506) who, because of mailing errors, did not receive the treatment. NRT recipients were also compared with local survey-derived data for heavy smokers. At 6-month follow-up, more NRT recipients than comparison group members reported that they had successfully quit smoking (33 per cent versus 6 per cent; $p < 0.0001$). Assuming that every 6-month follow-up non-respondent continued to smoke, the quit rate among NRT recipients was 20 per cent. At least 6038 successful quits were attributed to NRT receipt and the cost was calculated to be \$464 per quitter.

Research design: quasi-experimental study

4.4 Reducing road injuries: belt and booster seat use

Evidence in brief

We found two review articles that addressed the use of incentives in promoting the use of safety belt and booster seat use in cars.

Promote positive change

- Incentives can lead to substantial increases in safety belt use in the short term with smaller, although positive, long-term effects.

Reduce barriers to change

- Discount coupons, gift certificates or distribution of free booster seats have a marked beneficial impact on acquisition and use of child booster seats.

Context and background

Road traffic injuries are ranked tenth in the leading causes of death globally (Murray, 1996). The WHO estimates that over 1.1 million people are killed and around 50 million injured or disabled in road traffic accidents annually (WHO, 2004). It is projected that without renewed emphasis on effective preventive interventions, road deaths will become the third leading cause of the global burden of disease by 2020 (WHO, 2004).

The estimated direct annual costs of road traffic crashes range from 0.3 per cent of GNP in Vietnam to almost 5 per cent in the USA (Jacobs *et al*, 2000). Among children aged between four and eight years, car crashes are the leading cause of death from unintentional injuries. In this age group, children have outgrown infant and toddler safety seats and often travel unrestrained or are placed prematurely in

adult seat belts. This increases their risk for crash-related injuries. To mitigate this, booster seats are recommended by public health and transport agencies.

In the UK, NICE has recently released a review of effectiveness of road safety interventions (Stead *et al*, 2006). The report concluded that when incentives are combined with education they can be successful at increasing bicycle helmet use.

Evidence summaries

Ehiri *et al* (2006) conducted a systematic review on the effectiveness of interventions for promoting car booster seat use in four- to eight-year-old children. The following databases were searched for publications up to April 2005: Cochrane Injuries Group Specialised Register, CENTRAL, MEDLINE, EMBASE, National Research Register, Transport, PsycINFO, ERIC, SPECTR, Science Citation Index, Dissertation Abstracts and Web of Science. Five studies met the inclusion criteria. Four intervention types were examined:

- education versus no intervention
- distribution plus education versus no intervention
- incentives plus education versus no intervention
- enforcement versus no intervention.

Combined data from included studies showed a beneficial effect in the treatment arms: education (relative risk – RR – 1.32; 95% CI 1.16–1.49), distribution plus education (RR 2.34; 95% CI 1.50–3.63), incentives plus education (RR 2.75; 95% CI 2.41–3.13) and enforcement (RR 1.04; 95% CI 1.12–4.23). All interventions were found to increase the use of booster seats; however, combining incentives or distribution of free seats combined with education had a marked beneficial effect.

Research design: Cochrane Systematic Review

Hargenzieker *et al* (1997) undertook a meta-analysis of incentive programmes to encourage safety belt use. The following databases were searched for publications up to 1996: IRRD and PsycINFO. Thirty-four articles were included in the review. The incentives included promotional items such as stickers and t-shirts or a chance to win a contest or lottery. Values of the reward ranged from one to several thousand dollars. There was a mean short-term increase in safety belt usage rates of 20.6 per cent; the mean long-term effect was 13.7 per cent. Large-scale studies reported smaller effect sizes than small-scale studies; when studies were weighted by the estimated number of observations, the weighted mean effect sizes were 12 and 9.6 per cent for short- and long-term studies. The largest effect sizes were obtained in elementary (primary) school-based campaigns, in campaigns where incentives were delivered immediately and where there were relatively low baseline levels of safety belt usage. The authors concluded that incentives can lead to substantial increases in safety belt use in the short term with smaller long-term effects. Follow-up measurements after withdrawal of the incentive were generally higher than the initial baseline.

Research design: systematic review

CRD commentary: There is a clear statement of the research question and inclusion/exclusion criteria and a good literature search (although authors may have found additional studies by searching other databases). There are no details on quality assessment of studies. The authors' conclusions appear to follow from results.

5. Discussion and recommendations

5.1 Discussion

The available evidence indicates that:

- financial incentives can work to bring about discrete, one-off changes in patient behaviour
- there is insufficient evidence to say that financial incentives can affect complex behaviour change, although there is some evidence for temporary improvements
- removing perceived economic barriers can contribute to securing behaviour change in those patients who are already motivated but discouraged by cost concerns.

It is important to note that the literature on patient incentives focuses almost exclusively on whether incentives work to change behaviour, rather than addressing the question of why they do, or do not, work. Quite modest patient incentives have been shown to produce finite changes in behaviour but few studies define what size incentive is required to yield a major, sustained effect. The available evidence indicates that the relationship between extrinsic motivators (such as rewards and penalties) and behaviour change is not a straightforward one. For example, Melnikow *et al* (1997) showed that vouchers for free taxi rides improved compliance with a first prenatal appointment, although only one of 34 vouchers issued was redeemed.

The impact of incentives does not appear to be explained by economic impact alone. Psychologists argue that monetary incentives can crowd out or dampen intrinsic motivations such as altruism, civic duty and self-worth (Titmuss, 1970; Deci and Ryan, 1985; Frey and Oberholzer-Gee, 1997). In other words, intrinsic motivation for individual behaviour change can be undermined by monetary or extrinsic rewards. Curry *et al* (1991) explored this effect in an RCT which evaluated the impact of personalised feedback (reinforcing intrinsic motivation) and a financial incentive (providing extrinsic motivation) as adjuncts to self-help materials for smoking cessation. Follow-up at three and twelve months showed that the financial incentive increased the use of self-help materials but did not increase the quit rates and was associated with higher relapse rates. Those who received the intrinsically-based personalised feedback had twice the rate of biochemically confirmed abstinence at 12-month follow-up than the other groups (10 per cent intrinsic only, 4 per cent extrinsic only, 4 per cent both, 5 per cent control).

These findings help explain the idea that the removal of perceived financial barriers can be effective at securing behaviour change. Intrinsic motivation remains intact and the financial gain can be regarded as an 'enabler' rather than as a motivator. They also highlight a problem with the disjunction in the literature. Aside from Curry *et al* (1991), it is very rare for studies to juxtapose financial and non-financial motivation for securing changes in patient behaviour. Given the complex nature of the relationship between intrinsic and extrinsic factors, this represents a serious problem.

The evidence from the literature on patient incentives and from wider psychological and economic studies (for example, Gneezy and Rustichini, 2000) indicates that the relationship between financial incentives and behaviour change is a highly complex and multi-factorial one. Incentives can also act as powerful messengers. Marcus *et al* (1992) found that transportation incentives improved follow-up rates after abnormal cervical smears among socio-economically disadvantaged women, even though the women did not always use the incentives. Instead, they were reported to consider them to be a message from the healthcare system that follow-up was important.

5.2 Recommendations

1. **Use of incentives:** More policy attention should be placed on the subject of incentives designed to influence and change patient behaviour. Incentives are a major policy emphasis in numerous countries but primarily focus on providers (individual clinicians and hospitals).

Healthcare systems should adopt a targeted approach to the use of patient incentives. Analysis of data on adherence levels, the socio-economic profile of patients from whom behaviour change is sought and information on whether simple or complex behaviour modification is required can be used to inform whether incentives are an appropriate intervention to employ in a particular context. Some areas for consideration include:

- enhancing uptake of cancer screening and vaccinations (focused particularly on those sections of the community that currently have poor levels of adherence)
- encouraging attendance at diabetes or asthma clinics (particularly children and adolescents)
- enhancing participation in antenatal care (particularly for teenage pregnancies)
- increasing adherence in critical treatment regimens (for example, tuberculosis).

2. **Removal of economic barriers:** Offsetting direct costs to patients can secure behaviour change in those who are already motivated to change their behaviour and should be considered for specific groups and healthcare processes. Examples for consideration in key areas affecting patient outcomes and health expenditures are medication adherence and smoking cessation programs.

3. **Research needs:** The evidence base needs strengthening, both in terms of well-designed effectiveness studies, and understanding the role of motivation in behaviour change and translating psychological research into a health services research context. Specifically, we need better understanding of the relationship between intrinsic and extrinsic motivation in improving healthcare. Without better understanding of how incentives motivate sustained behaviour change, and better knowledge about dose effects, policy-makers will be unable to implement incentive-based interventions for predictable improvement in quality of care.

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7. Appendices

Appendix 1: Evidence tables

REVIEW ARTICLES – GENERAL OVERVIEWS AND PREVENTIVE CARE						
Author(s)/Date of publication	Size/type of incentive	Databases searched	Dates searched	Inclusion/exclusion criteria Outcomes	Studies Included	Conclusions
Kane <i>et al</i> , 2004 (same study also published as Town <i>et al</i> , 2004)	<p>A review of economic incentives for preventive care (including both provider and patient/consumer incentives).</p> <p>For patients/ consumers incentives were highly varied in type and size (from \$2 up to \$500) – included lotteries, gifts, cash, coupons, and retention of benefits.</p>	MEDLINE Cochrane Library EconLit Business Source Premier PsycINFO	1966–2002	<p>Include</p> <ul style="list-style-type: none"> ◆RCTs ◆time series ◆prospective quasi-experimental designs ◆address primary preventive care ie vaccination, screening, and health promotion behaviours such as smoking cessation and weight loss ◆industrialised country ◆written in English <p>Exclude</p> <ul style="list-style-type: none"> ◆patient adherence to drug therapy ◆rewards for research participation ◆multiple component studies ◆payment forms provided by more than one payment system <p>Outcomes</p> <p>Target behaviour (eg vaccination) or target outcome (weight loss)</p>	<p>56 articles overall – 47 on patient-targeted incentives</p> <p>Targeted behaviours were: immunisation (7 studies), cancer screening (2), prenatal care (2), attendance at educational sessions for HIV/ STD prevention (3), recruitment for smoking cessation programme (1), also ‘preventive care follow-up’: cholesterol screening (1), tuberculosis screening (2), cancer screening (4), postpartum examinations (2), smoking cessation (10), exercise (2), obesity and weight loss (7), breastfeeding (1), nutrition (1), cardio-vascular disease prevention (1) and cholesterol management (1).</p>	<p>In the short run, economic incentives are effective for simple preventive care and distinct behavioural goals that are well defined. Relatively modest incentives were found to be effective and the ‘threshold dose’ (i.e. the level or ‘dose’ at which behaviour change takes place) appeared low. There is insufficient evidence to say that incentives are effective at promoting long-term lifestyle changes.</p>

REVIEW ARTICLES – GENERAL OVERVIEWS AND PREVENTIVE CARE						
Author(s)/Date of publication	Size/type of incentive	Databases searched	Dates searched	Inclusion/exclusion criteria Outcomes	Studies Included	Conclusions
Giuffrida and Torgerson, 1997	Financial incentives defined as cash, vouchers, lottery tickets, or gifts, ranged in size from \$5–\$1000.	Cochrane Database of Clinical Trials MEDLINE EMBASE PsycLIT	Up to April 1997	<p>Include</p> <ul style="list-style-type: none"> ◆RCTs ◆studies that provide adequate information, study design, target population, response rates and outcome <p>Exclude</p> <ul style="list-style-type: none"> Reimbursement payments such as travel expenses <p>Outcomes</p> <ul style="list-style-type: none"> Patient compliance 	11 – including studies that sought to improve patients' adherence to anti-tuberculosis treatment (2 studies), enhance compliance with postpartum appointments by indigent adolescents (2), encourage participation in treatment programme for cocaine dependency (1), compliance with anti-hypertensive treatment (1) and attendance at weight-reducing programme (1). Several studies focused on incentives for parents, encouraging them to seek dental care for their children (2), attend paediatric outpatient clinics (1) and childhood immunisation (1).	<p>Financial incentives can improve patient compliance.</p> <p>Ten of the 11 studies showed that some sort of financial incentive promoted compliance better than any alternative (alternatives included prompts, counselling, peer support, increased opening times, behavioural therapy).</p>

INDIVIDUAL STUDIES – GENERAL OVERVIEWS AND PREVENTIVE CARE			
Author(s)/Date of publication	Design (with follow-up period)	Size/type of incentive	Results
Morris <i>et al</i> , 2004	<p>Cluster randomised trial on impact of monetary incentives on the use of preventive healthcare interventions in rural Honduras.</p> <p>70 municipalities (total population 660,000) randomly assigned to four groups: money vouchers to households (contingent on keeping up-to-date with preventive health services and school attendance), resources to local health teams combined with a community-based nutrition intervention, both packages and neither (ie standard services).</p> <p>Outcomes Rates of use of preventive services (antenatal checks, postpartum checks, child health clinic attendance), child immunisation and growth monitoring rates</p> <p>Evaluation surveys of about 5600 households were undertaken at baseline and roughly two years later. Pregnant women and mothers of children <3 years old were asked about their use of health services, immunisation uptake and growth monitoring. Data on vaccination and child weigh-ins were collected from children's Road to Health cards.</p>	<p>£2.50 per month per pregnant woman and children <3 years plus £3.70 per month for children aged 6–12 years who were enrolled in primary school.</p> <p>The size of the incentive was relatively large: approximately three-quarters of the families covered by the programme were surviving on less than £1 per person per day. Average entitlements from the programme exceeded £60 per household per annum.</p>	<p>The household incentive had a significant impact on antenatal care and well-child check-ups (18–20% increase; $p < 0.01$) and growth monitoring (15–21%; $p < 0.01$). Uptake of first dose diphtheria-tetanus-pertussis (DTP) also increased (7%; $p > 0.01 < 0.05$). Antepartum check-ups, measles and mothers' tetanus vaccination were not affected.</p>

REVIEW ARTICLES – ADHERENCE TO MEDICAL TREATMENT						
Author(s)/Date of Publication	Size/type of incentive	Databases searched	Dates searched	Inclusion/exclusion criteria Outcomes	Studies included	Conclusions
Van Dulmen <i>et al</i> , 2006	A wider review of reviews on interventions to improve patient adherence to medical treatment	MEDLINE EMBASE Cochrane Library PsycINFO	1990–2005	<p>Include</p> <ul style="list-style-type: none"> ◆systematic reviews ◆focus of review is patient adherence to medical treatment ◆effectiveness of adherence interventions is main research question ◆quantifiable results reported <p>Exclude</p> <ul style="list-style-type: none"> ◆descriptive reviews ◆primary prevention studies ◆guideline adherence by health professionals ◆reviews reporting health outcomes without adherence measures <p>Outcomes</p> <ul style="list-style-type: none"> ◆direct observable behaviour, self-reports, monitoring of medication usage, physiological/ biomedical measures <p>Follow-up</p> <ul style="list-style-type: none"> Only 2 reviews had a follow-up of 6 months or more 	38 systematic reviews	<p>General findings</p> <p>Comparisons between various interventions were adjudged difficult because of differences in study populations and measures. The authors found that 'technical' adherence measures (eg packaging) were found to be effective by 7 reviews, behavioural interventions (eg incentives and reminders) were effective in 5 reviews, educational approaches were effective in 5 reviews and multi-faceted interventions were effective in 4 reviews.</p> <p>Incentives</p> <p>This review of reviews draws on the systematic review conducted by Guiffrida and Tongerson (1997).</p>

INDIVIDUAL STUDIES – ADHERENCE TO MEDICAL TREATMENT			
Author(s)/Date of Publication	Design (with follow-up period)	Size/type of incentive	Results
Post <i>et al</i> , 2006	<ul style="list-style-type: none"> ◆observational study ◆tracking the effect of incentive on attendance at therapy sessions among 54 low income African-Americans with depression ◆attendance tracked for 3 consecutive 12-week periods: prior to introduction of incentive, while incentive was in place and after discontinuation 	\$10 given at regular appointments	<p>Of the 54 patients enrolled, 4 discontinued care at the clinic before the incentives began (these 4 were excluded from statistical analyses). Out of 50 participants, 27 (54%) had improved adherence during the incentive period, 12 (24%) were unchanged (7 of whom had unchanged perfect attendance) and 11 (22%) had reduced adherence. The sample as a whole kept 79% of appointments made in the pre-incentive period, 86% of appointments in the incentive period and 69% in the post-incentive period.</p>

REVIEW ARTICLES – VACCINATION						
Author(s)/ Date of Publication	Size/type of incentive	Databases searched	Dates searched	Inclusion/ exclusion criteria Outcomes	Studies included	Conclusions
Ndiaye <i>et al</i> , 2005	A wider review of interventions to improve influenza, pneumo-coccal and hepatitis B vaccination among high-risk adults Included incentive study of \$10 for hepatitis B vaccination	MEDLINE EMBASE PsycLIT Sociological Abstracts CABHealth HealthSTAR AIDSLINE	1980– August 2001	<p>Include ♦articles in English ♦evaluation of intervention to deliver influenza, pneumococcal polysaccharide, or hepatitis B vaccinations in a population at risk, or included information on risk populations (subsets) as part of a larger vaccination effort</p> <p>Exclude Not specified</p> <p>Outcomes Vaccination coverage</p>	<p>35 studies – of those, 23 evaluated interventions implemented in combination</p> <p>1 study evaluated the effectiveness of client incentives when implemented alone</p>	<p>General findings There was strong evidence that provider reminder systems (as a single intervention) are effective in increasing targeted vaccination coverage.</p> <p>For combined interventions, there was strong evidence of effectiveness when interventions to enhance access to vaccination services were combined with provider- or system-based interventions (eg reminder systems, standing orders) and/or interventions to increase client or community demand for vaccinations (eg client reminders, education).</p> <p>Incentives The one study included reported an improvement over baseline of 35%. However a single study was regarded to be insufficient evidence to determine effectiveness. The authors found no studies evaluating the effectiveness of reducing client out-of-pocket costs.</p>
Kane <i>et al</i> , 2004	A WIDER STUDY OF INCENTIVES FOR PREVENTIVE CARE – FOR DETAILS SEE SECTION 2					This included 7 studies on incentives for vaccination. All had statistically significant results. Incentives included cash prizes, free evening day care; free flu shots and loss of benefits for non-immunisation of children.

REVIEW ARTICLES – VACCINATION						
Author(s)/ Date of Publication	Size/type of incentive	Databases searched	Dates searched	Inclusion/ exclusion criteria Outcomes	Studies included	Conclusions
Stone <i>et al</i> , 2002	A meta-analysis of interventions that seek to increase adult immunisation and cancer screening services Size of incentive not reported	MEDLINE Cochrane Effective Practice and Organisation of Care Review Group register Medicare Health Care Quality Improve- ment Project database	Up to February 1999	<p>Include</p> <ul style="list-style-type: none"> ◆studies of interventions to increase immunisation for influenza and pneumococcal pneumonia and screening for colon, breast and cervical cancer ◆RCTs ◆controlled clinical trials (CCTs) <p>Exclude</p> <p>Studies on the use of colon visualisation and mass mailing studies</p> <p>Outcomes</p> <p>Percentage of patients who received the service before the intervention (if available) and the percentage who received the service after the intervention</p>	108 articles – 95 RCTs and 13 CCTs	<p>Meta-regression models were used to estimate adjusted odds ratios (AOR) for evaluating the effectiveness of different intervention components.</p> <p>General finding</p> <p>The most effective interventions were those that were based on organisational change (AOR range 2.47–17.6). Second most effective were patient incentives (these included reduction in co-payments) (AOR 1.82–3.42).</p> <p>In the case of immunisations, the 4 most effective interventions were organisational change (AOR 16; 95% CI 11.2–22.8), provider reminder (AOR 3.80; 95% CI 3.31–4.37), patient incentives (AOR 3.42; 95% CI 2.89–4.06) and provider education (AOR 3.21; 95% CI 2.24–4.61). For details and information on cancer screening interventions see Section 3.4.</p>
Briss <i>et al</i> , 2000	A wider review of inter-ventions to improve vaccination coverage Incentives ranged from lottery tickets for \$25 to \$100 prizes; \$10 gift certificates and off-setting the costs incurred	MEDLINE EMBASE CINAHL PsycLIT CAB Health Sociological Abstracts	1980– 1997	<p>Include</p> <ul style="list-style-type: none"> ◆address universally recommended vaccination ◆studies conducted in industrialised countries ◆written in English ◆studies with controls <p>Exclude</p> <p>Not specified</p> <p>Outcomes</p> <p>Vaccination rates</p>	184 articles including 3 studies on rewards and 19 on reduction of out-of-pocket costs	<p>There was insufficient evidence to assess effectiveness of client or family incentives.</p> <p>Reducing out-of-pocket costs were strongly recommended on the basis that they improved vaccination coverage in children and adults, in a range of settings and populations; when applied at different levels of scale from individual clinical settings to national efforts and whether used alone or as part of a multi-component intervention.</p>

REVIEW ARTICLES – VACCINATION						
Author(s)/ Date of Publication	Size/type of incentive	Databases searched	Dates searched	Inclusion/ exclusion criteria Outcomes	Studies included	Conclusions
Giuffrida and Torgerson, 1997	A WIDER STUDY OF FINANCIAL INCENTIVES TO ENHANCE PATIENT ADHERENCE TO RECOMMENDED CARE AND TREATMENT – FOR DETAILS SEE SECTION 2					<p>Of the 11 studies, 10 showed that some sort of financial incentive promoted compliance better than any alternative (alternatives included prompts, counselling, peer support, increased opening times and behavioural therapy).</p> <p>One study focused on improving immunisation rates. It found monetary incentives (when combined with specific prompts) to be more effective than a general prompt, a more client-specific prompt, a specific prompt and increased public health clinic access, contact control or no contact control.</p>

INDIVIDUAL STUDIES – VACCINATION			
Author(s)/Date of publication	Design (with follow-up period)	Size/type of incentive	Results
Seal <i>et al</i> , 2003	<p>◆RCT</p> <p>◆hepatitis-B susceptible intravenous drug users (IDUs) were recruited—all (n=96) received the first of 3 required vaccine doses and were then allocated into 2 groups: monthly monetary incentive or weekly contact with outreach worker during the 6-month vaccine series</p> <p>Outcome</p> <p>◆completion of vaccination serie</p>	\$20	<p>All three doses of the vaccine were received by 69% (n=33) of those in the incentive group and by 23% (n=11) of those in the outreach group (OR=13.8; 95% CI 2.9–128).</p> <p>Using intention to treat methods, the monetary incentive intervention was calculated to cost \$220 per participant compared with \$590 per participant for outreach.</p>

REVIEW ARTICLES – CANCER SCREENING						
Author(s)/Date of publication	Size/type of incentive	Databases searched	Dates searched	Inclusion/exclusion criteria Outcomes	Studies included	Conclusions
Kane <i>et al</i> , 2004	A WIDER STUDY OF INCENTIVES FOR PREVENTIVE CARE – FOR DETAILS SEE SECTION 2.1					This included 7 studies on incentives for cancer screening. Of these, 4 had statistically significant findings. Incentives included cost offsets (bus passes and postage costs) and reductions in clinic visit charges, and small gifts (nutritional information package).
Stone <i>et al</i> , 2002	A WIDER STUDY OF IMMUNISATION AND CANCER SCREENING – FOR DETAILS SEE SECTION 3.3					<p>General findings</p> <p>The most effective interventions were those that were based on organisational change (AOR 2.47–17.6). Second most effective were patient incentives (these included reduction in co-payments) (AOR range 1.82–3.42). In the case of cancer screening, the review examined mammography, cervical cytology and colon cancer screening.</p> <p>For mammography, the three most effective interventions were: financial incentives (AOR 2.74; 95% CI 1.78–4.24), organisational change (AOR 2.47; 95% CI 1.97–3.10), reminder (AOR 2.31; 95% CI 1.97–2.70). Most effective for cervical cytology were organisational change (AOR 3.03; 95% CI 2.56–3.58), financial incentives (AOR 1.74; 95% CI 1.58–1.92) and patient reminders (AOR 1.74; 95% CI 1.58–1.92) .</p> <p>For colon cancer screening, the three most effective interventions were organisational change (AOR 17.6; 95% CI 1.98–4.56), provider education (AOR 3.01; 95% CI 1.98–4.56) and patient reminders (AOR 2.75; 95% CI 1.90–3.97). Note that financial incentives were fourth most effective (AOR 1.82; 95% CI 1.35–2.46).</p>
Abercrombie, 2001	A review of interventions to improve follow-up after an abnormal Pap smear	MEDLINE	1985–1999	Include/exclude Not specified	9 studies – 7 were RCTs and 2 included incentives as an intervention	Strategies that were found to improve follow-up included: telephone counselling, education and incentives. Offsetting out of pocket expenses such as transportation costs were successful at improving adherence amongst women who were socio-economically disadvantaged.

REVIEW ARTICLES – CANCER SCREENING						
Author(s)/Date of publication	Size/type of incentive	Databases searched	Dates searched	Inclusion/exclusion criteria Outcomes	Studies included	Conclusions
Jepson <i>et al</i> , 2000	A wider review of interventions for increasing screening uptake	MEDLINE BIDS Econlit EMBASE CANCERLIT DHSS data Dissertation Abstracts ERIC HealthSTAR ASSIA Pascal SIGLE CINAHL Sociofile PsycINFO SHARE (King's Fund) Library of Congress DARE Cochrane Library National Research Register	Up to October 1998	<p>Include</p> <ul style="list-style-type: none"> ◆RCTs ◆quasi-RCTs ◆controlled studies ◆universal, selective and opportunistic screening programmes <p>Exclude</p> <ul style="list-style-type: none"> ◆studies of self-examination procedures ◆studies that report intermediate measures (booking of appointments, intention to uptake) <p>Outcomes Screening uptake</p>	190 studies – 14 (10 RCTs and 4 quasi-RCTs) evaluated economic interventions aimed at individuals (either reducing financial barriers or offering rewards)	<p>General findings Effective interventions were invitation appointments, letters and telephone calls, telephone counselling and removal of financial barriers.</p> <p>Incentives The removal of financial barriers seemed to be effective, with 8 of 9 studies reporting increased uptake. Offering rewards was found to be ineffective with only 2 of 5 studies reporting increased uptake.</p>

INDIVIDUAL STUDIES – CANCER SCREENING			
Author(s)/Date of publication	Design (with follow-up period)	Size/type of incentive	Results
Slater <i>et al</i> , 2005	<ul style="list-style-type: none"> ◆ RCT ◆ low-income women aged 40–63 years (eligible for free mammograms) allocated into three groups: direct mail, direct-mail-plus-incentive, control ◆ n=145,467 ◆ primary outcome was mammogram within 13 months of intervention 	\$10 for women who had mammogram within 1 year	<p>Direct mail letters had toll free number to call; more than 4 times as many calls came to the mail-plus-incentive number than to mail-only number.</p> <p>After 1 year, both the mail-plus-incentive group and the mail-only intervention groups had significantly higher mammography rates than controls (increases of 0.75% and 0.23% respectively beyond the control rate of 0.83%).</p>

REVIEW ARTICLES – TUBERCULOSIS TREATMENT AND DIAGNOSIS						
Author(s)/Date of publication	Size/type of incentive	Databases searched	Dates searched	Inclusion/exclusion criteria Outcomes	Studies included	Conclusions
Volmink and Garner, 2000	A wider review of interventions to promote adherence to tuberculosis management Incentives ranged from \$5 to \$10	Cochrane Controlled Trials Register Cochrane Infectious Diseases Group Trials Register MEDLINE EMBASE LILACS	Up to 2000	<p>Include</p> <ul style="list-style-type: none"> ◆RCTs ◆quasi-randomised studies ◆focused on interventions to promote adherence with curative or preventive chemotherapy and diagnostic protocols for tuberculosis <p>Exclude</p> <p>No other criteria specified</p> <p>Outcomes</p> <ul style="list-style-type: none"> ◆treatment adherence promotion (cure, completion of treatment) ◆keeping outpatient appointment(s) ◆diagnostic test re-attendance 	<p>14 studies – interventions examined were:</p> <ul style="list-style-type: none"> ◆prompts such as telephone reminders to keep clinic appointments (1 study) ◆contracts (1) ◆patient education and counselling (3) ◆patient incentive (4) ◆patient incentive and education (2) ◆defaulter action (2) ◆direct observation of treatment (2) ◆peer assistance through community health workers (2) ◆intensive staff supervision (1) 	<p>General findings</p> <p>This review showed that the following improved people's treatment completion rate: reminder cards sent to their home when they missed treatments and cash (\$5) given each time they attended clinic.</p> <p>Directly observing patients taking their treatment resulted in more patients being cured than if they were given the drugs to take at home in one study, but made no difference in another.</p> <p>Studies to encourage people to come back to clinic to have skin tests read to help diagnose TB showed that people were more likely to return if they were offered money, helped by community health workers, telephoned at home or signed a written contract to return.</p> <p>Incentives</p> <p>Modest monetary incentives were effective for promoting adherence to an initial appointment for TB evaluation both in homeless people with positive tuberculin test results and for drug users required to return for reading of their tuberculin tests.</p>
Kane <i>et al</i> , 2004	A WIDER STUDY OF INCENTIVES FOR PREVENTIVE CARE – FOR DETAILS SEE SECTION 2					This included 5 studies on incentives for TB skin test reading. All had statistically significant findings that incentives were effective. Incentives ranged from \$5 to \$10.
Giuffrida and Torgerson, 1997	A WIDER STUDY OF FINANCIAL INCENTIVES TO ENHANCE PATIENT ADHERENCE TO RECOMMENDED CARE AND TREATMENT – FOR DETAILS SEE SECTION 2					Review included two studies of incentives to improve the rates of patients' adherence to antituberculosis medical regimen. Both found that the impact of incentives on adherence was statistically significant. Incentives ranged from \$5 to \$10.

INDIVIDUAL STUDIES –TUBERCULOSIS TREATMENT AND DIAGNOSIS			
Author(s)/Date of publication	Design (with follow-up period)	Size/type of incentive	Results
Kominski <i>et al</i> , 2007 (same cohort and design published as Morisky, 2001)	<ul style="list-style-type: none"> ◆RCT ◆conducted in USA ◆studied impact of incentive-based programme to promote adolescents' compliance with treatment for latent TB ◆n=794 (aged 11–19 years) ◆allocated into 4 groups: usual care, peer counselling, contingency contracting, combined peer counselling and contingency contracting ◆outcomes were completion of isoniazid therapy, costs and TB-related costs per quality adjusted life year (QALY) 	Incentive negotiated with parent (eg clothing, special meals, family outing)	The percentages of adolescents completing treatment were usual care (75.9%), peer counselling (75.4%), contingency (73.9%), and combined peer and contingency (83.8%). No interventions were significantly better than usual care (at the 5% level).
Perlman <i>et al</i> , 2003	<ul style="list-style-type: none"> ◆before-and-after design ◆conducted in USA ◆studied the impact of monetary incentives on adherence to referral for chest x-rays among intravenous drug users ◆adherence within 7 days and median time to chest x-ray was measured and reported ◆pre-incentive cohort (n=119) 1995–1998, incentive cohort (n=58) 1999-2001 	\$25	Adherence to x-ray referral within 7 days was 46/58 (79%) among individuals who received the monetary incentive versus 17/119 (14%) prior to the implementation of the monetary incentive (P<.0001; OR = 23; 95% CI 9.5–57). The median time to obtaining a chest x-ray was significantly shorter among those given the incentive than among those referred without the incentive (2 versus 11 days, P<.0001). In multivariate logistic regression analysis, use of the incentive was highly independently associated with increased adherence (OR=22.9; 95% CI 10–52).
Malotte <i>et al</i> 2001	<ul style="list-style-type: none"> ◆RCT ◆conducted in USA ◆volunteer sample of 163 active injection drug and crack cocaine users placed on directly observed therapy (DOT) ◆allocated into 3 groups: DOT provided by outreach worker at location chosen by participant (active outreach) plus incentive, active outreach only, DOT at study centre plus incentive <p>Outcome Percentage of medication taken as prescribed and completion of regimen</p>	\$5 per visit	<p>The percentage of prescribed medication taken was higher for those who received incentives, either with (71%) or without (68%) active outreach compared with those who received active outreach alone (13%).</p> <p>The rates of completed treatment were 53% of participants on active outreach plus incentive, 4% on active outreach alone and 60% of those seen at the study centre plus incentive. Note that the self-selecting sample may bias results.</p>

REVIEW ARTICLES – PRENATAL AND POSTNATAL CARE						
Author(s)/Date of publication	Size/type of incentive	Databases searched	Dates searched	Inclusion/exclusion criteria Outcomes	Studies included	Conclusions
Kane <i>et al</i> , 2004	A WIDER STUDY OF INCENTIVES FOR PREVENTIVE CARE – FOR DETAILS SEE SECTION 2					<p>General findings Economic incentives are effective in the short run and for simple preventive care and distinct behavioural goals that are well-defined.</p> <p>The publication included 7 studies on incentives for prenatal and postnatal checks. Of these, 3 had statistically significant findings. Incentives in the studies that found a significant effect were:</p> <ul style="list-style-type: none"> ◆ coupon for baby milk formula ◆ offset of transportation costs ◆ baby toy. <p>Those that did not have a significant effect were:</p> <ul style="list-style-type: none"> ◆ \$5 and \$100 ◆ gifts (jewellery, baby blanket).

REVIEW ARTICLES – PRENATAL AND POSTNATAL CARE						
Author(s)/Date of publication	Size/type of incentive	Databases searched	Dates searched	Inclusion/exclusion criteria Outcomes	Studies included	Conclusions
Lumley <i>et al</i> , 2004	Wider study of interventions for smoking cessation in pregnancy	Cochrane Pregnancy and Childbirth Group trials register Cochrane Tobacco Addiction Group trials register MEDLINE EMBASE PsycLIT CINAHL AUSTHEALTH	Up to July 2003 January 2002– July 2003	Include ◆RCT ◆quasi-randomised trials Outcomes ◆smoking cessation/reduction self-reported and validated ◆birthweight ◆gestation at birth ◆perinatal mortality ◆method of delivery ◆proportion of women initiating breastfeeding (and after 3 and 6 months) ◆measures of anxiety, depression and maternal health status ◆participants' views of the interventions ◆measures of family functioning ◆measures of knowledge, attitudes and behaviour of health professionals with respect to facilitating smoking cessation in pregnancy	64 studies – interventions included: ◆information and advice ◆counselling ◆peer support ◆monitoring and feedback ◆nicotine replacement therapy and rewards as adjunct to advice	Overall, pooled data from 48 trials revealed a significant reduction in continued smoking in late pregnancy in the intervention groups (pooled relative risk – RR – 0.94; 95% CI 0.93 to 0.95). This equates to an absolute difference in the proportion continuing to smoke of 6%. Incentives (combined with social support) were studied in two trials and resulted in a significantly greater smoking reduction than other strategies (RR 0.77; 95% CI 0.72–0.82).

REVIEW ARTICLES – PRENATAL AND POSTNATAL CARE						
Author(s)/Date of publication	Size/type of incentive	Databases searched	Dates searched	Inclusion/exclusion criteria Outcomes	Studies included	Conclusions
Giuffrida and Torgerson, 1997	A WIDER STUDY OF FINANCIAL INCENTIVES TO ENHANCE PATIENT ADHERENCE TO RECOMMENDED CARE AND TREATMENT – FOR DETAILS SEE SECTION 2					<p>General findings</p> <p>Ten out of the 11 included studies showed that some sort of financial incentive promoted compliance better than any alternative (alternatives included prompts, counselling, peer support, increased opening times, behavioural therapy).</p> <p>It included two studies specifically focused on incentives for postnatal checks among low income teenage mothers in the USA. The incentives were coupons for baby milk or a gift for the mother. Both studies reported that incentives significantly increased appointment keeping. One study compared coupons for baby milk with a gift for the mother and found the coupons to be more effective.</p> <p>Note that both primary studies were included in Kane <i>et al</i>, 2004.</p>

INDIVIDUAL STUDIES – PRENATAL AND POSTNATAL CARE			
Author(s)/Date of publication	Design (with follow-up period)	Size/type of incentive	Results
Burr <i>et al</i> , 2007	<ul style="list-style-type: none"> ◆RCT ◆pregnant women (≥ 17 years of age; n=190) were allocated into 3 groups: advice group (given advice and leaflets promoting fruit and fruit juice consumption), voucher group (given vouchers redeemable for fruit juice), control (given usual care) ◆conducted in deprived area of Wales <p>Outcomes</p> <ul style="list-style-type: none"> ◆self-reported diet at ~16, 20 and 32 weeks of pregnancy ◆serum β-carotene at 16 and 32 weeks 	Vouchers for fruit juice	<p>Frequency of fruit consumption declined during pregnancy in all groups. Consumption of fruit juice increased substantially in the voucher group. Serum β-carotene levels increased in the voucher group from 106.2 to 141.8 $\mu\text{mol/l}$, were unchanged in the advice group and decreased from 120.0 to 99.8 $\mu\text{mol/l}$ in the control group.</p> <p>The cost of the intervention was the juice: £75 per person for 30 weeks (n=63; total cost £4725).</p>

REVIEW ARTICLES – HIV AND SEXUALLY TRANSMITTED INFECTIONS (STIS)						
Author(s)/Date of publication	Size/type of incentive	Databases searched	Dates searched	Inclusion/exclusion criteria	Studies included	Conclusions
Kane <i>et al</i> , 2004	A WIDER STUDY OF INCENTIVES FOR PREVENTIVE CARE – FOR DETAILS SEE SECTION 2.1					<p>This included 4 studies on interventions to prevent STIs. Incentives included:</p> <ul style="list-style-type: none"> ◆ cash (ranging from \$15 to \$35 to participate in education for STI and AIDS prevention) ◆ grocery vouchers worth \$35 (for attendance at education programme) ◆ 75% discount on condoms (to encourage purchase). <p>All of the studies showed that the incentives had a statistically significant impact.</p>

INDIVIDUAL STUDIES – HIV AND STIS			
Author(s)/Date of publication	Design (with follow-up period)	Size/type of incentive	Results
Carey <i>et al</i> , 2005	<ul style="list-style-type: none"> ◆quasi-experimental design ◆evaluate the effects of a financial incentive on attendance at a sexual risk reduction workshop in New York ◆n=107 <p>Outcome Attendance at workshop</p>	\$30 for attendance	Attendance at the workshop was significantly higher for the incentive group (38%) compared with the non-incentive group (9%). Logistic regression analysis indicated that incentive (AOR 7.59, $p < .001$) predicted attendance after controlling for two other significant predictors: employment status (AOR 3.04, $p < .05$) and age (AOR 1.07, $p < .05$).
Haukoos <i>et al</i> , 2005	<ul style="list-style-type: none"> ◆quasi-experiment ◆evaluate the effect of financial incentive on adherence to outpatient HIV testing referrals from an emergency department (ED) in Colorado ◆study divided into 3 periods: no financial incentive during first and third, but financial incentive offered during the second ◆n=372 (ED patients identified as at-risk for HIV) ◆outcome was attendance for HIV counselling and testing 	\$25	During control periods, 8% (20/252) of patients completed HIV counselling and testing compared with 23% (27/120) while the incentive was in operation (OR 3.4; 95% CI 1.8–6.3). None tested positive.
Malotte <i>et al</i> , 2004	<ul style="list-style-type: none"> ◆quasi-experiment ◆compared various methods of encouraging patients to return for retesting after completion of treatment for gonorrhoea and Chlamydia ◆In two separate studies participants were randomly assigned to five groups: brief recommendation to return, recommendation plus incentive, recommendation plus motivational counselling and telephone reminder, recommendation plus telephone reminder, recommendation plus motivational counselling ◆n=498 	US\$20	Using multiple logistic regression, the OR for recommendation plus incentive, compared with recommendation alone was 1.2 (95%CI 0.6 – 2.5); for recommendation plus motivational counselling and telephone reminder was 2.6 (95% CI 1.3 – 5.0); for recommendation and telephone reminder was 18.1 (95% CI 1.7 – 193.5); and for recommendation plus motivational counselling was 4.6 (95% CI 0.4 – 58.0). The monetary incentive did not increase return rates; a reminder telephone call seemed the most effective intervention (although note the wide confidence interval).

REVIEW ARTICLES – EXERCISE, DIET AND WEIGHT LOSS						
Author(s)/Date of publication	Size/type of incentive	Databases searched	Dates searched	Inclusion/exclusion criteria Outcomes	Studies included	Conclusions
Goodman and Anise, 2006	Economic instruments to reduce consumption of energy-dense and high fat foods. Includes policy interventions (taxes, subsidies enacted by government), and local interventions (price reductions, incentives implemented in specific sites – schools, cafeterias, worksites etc). Size of incentives not noted.	MEDLINE Cochrane Library DARE HTA CINAHL Allied and Alternative Medicine EMBASE WHO Grey literature	Up to May 2006	<p>Include</p> <ul style="list-style-type: none"> ◆systematic reviews ◆RCTs ◆interventional studies ◆observational studies (eg longitudinal and cross-sectional studies) ◆modelling analyses <p>Exclude</p> <ul style="list-style-type: none"> ◆case/anecdotal studies <p>Outcomes</p> <ul style="list-style-type: none"> ◆food purchasing patterns ◆weight loss 	<p>Policy interventions</p> <p>No systematic reviews, RCTs or other interventional studies that yielded direct evidence.</p> <p>Local interventions</p> <p>20 studies including 11 RCTs, 3 non-RCTs, and 6 time series or other studies without concurrent controls.</p> <p>Follow-up</p> <p>Ranged from 3 weeks to 18 months.</p>	<p>In general</p> <p>Available evidence suggests – but does not demonstrate – that introduction of policy-related economic instruments, particularly in the form of taxes and price policies, could reduce consumption of high saturated fat and other energy-dense foods, and increase the purchasing of healthy foods.</p> <p>On incentives</p> <p>A small body of evidence indicates that reducing the price of fruits, vegetables and other healthy snacks at the point of purchase (vending machines, cafeterias) increases their consumption. Another small body of evidence that includes several RCTs shows that financial incentives may result in temporary weight change.</p>

REVIEW ARTICLES – EXERCISE, DIET AND WEIGHT LOSS						
Author(s)/Date of publication	Size/type of incentive	Databases searched	Dates searched	Inclusion/exclusion criteria Outcomes	Studies included	Conclusions
Wall <i>et al</i> , 2006	Payments Competitions Lotteries Raffles Prizes Coupons Opportunity to avoid disincentives (eg taxes) Aimed at modifying dietary behaviour.	MEDLINE EMBASE CINAHL Cochrane (Controlled Trials Register) PsycINFO	1966–April 2005 1980–2005 1982–April 2005 To 2005 1972–April 2005	<p>Include</p> <ul style="list-style-type: none"> ◆ RCTs ◆ community-based populations ◆ incentive as central component of study <p>Exclude</p> <ul style="list-style-type: none"> ◆ hospitalised or institutionalised participants ◆ multi-component interventions <p>Outcomes</p> <ul style="list-style-type: none"> ◆ measured immediately (for purchasing behaviour effects from vending machines and self-reported behaviour at farmers' markets) ◆ measured at 6, 12, 18 and 30 months (for weight loss outcomes) 	<p>5 articles (from 4 studies)</p> <ul style="list-style-type: none"> ◆ published 1993–2001 ◆ all in USA <p>Incentives either:</p> <ul style="list-style-type: none"> ◆ reduced financial barriers (discount on healthy snacks, farmers' market coupons) ◆ were paid contingent on weight loss 	<p>All 4 studies found a positive effect of incentives on healthy eating or weight loss compared to controls. The evidence in support of sustained effect is more tenuous with most studies reporting regain of some weight at follow-up and reversion to original purchasing patterns at removal of discounts.</p> <p>Only one study found a dose response relationship (price reductions on healthy choice vending machine snacks).</p> <p>Studies had methodological limitations: small sample size, methods of randomisation not given, measures of precision (CI or SD) not given. One study restricted analysis to participants who completed all assessments rather than intention to treat.</p> <p>Incentives comprised:</p> <ul style="list-style-type: none"> ◆ \$2.50–25 per week contingent on weight loss ◆ free pre-packaged meals ◆ 10%, 25% and 50% discounts on low-fat snacks from vending machines ◆ farmers' market \$20 coupons for fruit and vegetables <p>* Standard behavioural therapy was often used as a separate test arm and as an adjunct to incentives.</p>

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Author(s)/Date of publication	Size/type of incentive	Databases searched	Dates searched	Inclusion/exclusion criteria Outcomes	Studies included	Conclusions
Kane <i>et al</i> , 2004	A WIDER STUDY OF INCENTIVES FOR PREVENTIVE CARE – FOR DETAILS SEE SECTION 2.1					Included 13 studies on diet modification/exercise/weight loss. Of those, 8 reported that incentives had a significant effect. Effective incentives included return of contracted cash amounts (\$5–30) on attendance at weight loss sessions or achievement of weight-loss goals, farmer's market coupons to improve nutrition, \$100 lottery draws for cholesterol lowering and for returning nutrition postcards.

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Hardeman <i>et al</i> 2000	A wider review of interventions aimed at the prevention of weight gain	MEDLINE EMBASE PsycLit Cochrane Library Current Contents (Life Sciences) ERIC HealthStar Social Science Citation Index (limited to English)	1966–present* 1980–present* 1974–present Not specified Not specified Not specified Not specified * 'present' assumed to mean 1999	<p>Include All designs</p> <p>Exclude ♦ interventions in specific subgroups, such as those stopping smoking ♦ multifactorial interventions aimed at specific disease (eg diabetes, CHD) ♦ interventions aimed at weight loss (or were ambiguous in focus eg weight control)</p> <p>Outcomes BMI, skinfold thickness, self-reported diet and exercise, blood pressure, fitness levels, physical activity level, peak aerobic capacity, smoking and blood chemistry</p> <p>Follow-up Ranged from 6 weeks to 3 years</p>	11 publications describing 9 interventions (5 in junior schools, 4 in wider community): ♦ 5 studies were RCTs ♦ 7 interventions in USA, 2 in Italy ♦ 3 studies included incentives/contingencies	<p>Only one of the five studies that were based on an RCT design reported a significant effect on weight. It involved a correspondence programme and a mix of behaviour change methods including goal setting, self monitoring and contingencies (ie incentives).</p> <p>No definitive statement about dose–response effect could be made.</p>

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Matson-Koffmann <i>et al</i> , 2005	A wider review of interventions that promote physical activity and nutrition for cardiovascular health	MEDLINE PsycINFO Chronic disease prevention database ERIC Web of Science US Department of Transport US Department of Agriculture	1970–2003 1990–2003	<p>Include Studies that address policy or environmental interventions to promote physical activity and/or good nutrition</p> <p>Exclude ◆inadequate description of intervention Studies of: ◆determinants research ◆individual level interventions only ◆media-only campaigns ◆links between built environment and physical activity</p> <p>Outcomes Behavioural, physiological or organisational change outcomes</p> <p>Follow-up ◆overall ranged from 4 weeks to 10 years ◆incentive studies ranged from 1 week to 2 months</p>	129 intervention studies. Detail is provided for those conducted 1990–2003 (n=64). Of these: ◆6 studies measured the impact of incentives to improve nutrition ◆2 studies focused on the impact of incentives on physical activity	<p>In general, the following interventions provided the strongest evidence for influencing nutrition and physical activity levels:</p> <ul style="list-style-type: none"> ◆prompts to increase stair use ◆access to places and opportunities for physical activity ◆school-based physical education ◆comprehensive workplace approaches ◆availability of nutritious foods ◆point-of-purchase strategies (eg nutrition information/aisle displays) ◆systematic reminders and training of healthcare providers to offer nutritional advice. <p>Incentive studies ◆price reductions and the distribution of coupons increased healthier food purchases (education combined with coupons had a greater impact)</p> <p>Methodological problems with many of the primary studies: no control groups, short-term evaluation periods and reliance on self-report for outcomes</p>

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Author(s)/Date of publication	Size/type of incentive	Databases searched	Dates searched	Inclusion/exclusion criteria Outcomes	Studies included	Conclusions
NHS Centre for Reviews and Dissemination, 1997	A wider review of interventions for the prevention and treatment of obesity	MEDLINE EMBASE BIDS PsycLIT	Not provided (from reference list, assumed up to 1996)	<p>Include</p> <ul style="list-style-type: none"> ◆RCTs ◆non-randomised trials (for prevention or alternative therapies) ◆minimum 1-year observation <p>Exclude</p> <p>Not specified</p> <p>Outcomes</p> <p>Not specified (assumed weight loss)</p>	99 studies including 1 using incentives to prevent weight gain in adults	<p>Overall conclusions were:</p> <ul style="list-style-type: none"> ◆progression of obesity in children may be prevented by family therapy ◆prevention of obesity in adults may be achieved by community-based education programmes linked with financial incentives ◆interventions to reduce sedentary behaviour can reduce overweight in children ◆behaviour, diet, exercise and drug treatments have all been shown to be effective to some extent in treating obesity in adults (particularly when used in combination) ◆most people begin to regain weight a few months after treatment ◆surgery is the most effective approach for those with severe obesity. <p>Many of the studies had methodological problems, including small sample sizes, high rates of attrition and self-selection for participation.</p>

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Author(s)/Date of publication	Size/type of incentive	Databases searched	Dates searched	Inclusion/exclusion criteria Outcomes	Studies included	Conclusions
Blue <i>et al</i> , 1995	A summary of the broader literature on workplace exercise interventions that seek to increase adherence to exercise	MEDLINE CINAHL Sport and Leisure Index Sociology of Leisure and Sport Abstracts Physical Fitness (sports medicine) Psychological Abstracts ABI/INFORM NIOSH	1980–1994	<p>Include</p> <ul style="list-style-type: none"> ◆RCTs, quasi-experimental, time series and pre-experimental studies ◆worksite exercise programmes ◆strategies to improve exercise adherence ◆studies examining actual exercise behaviour ◆studies where adherence to exercise was listed as one objective of workplace exercise programmes <p>Exclude</p> <p>Studies reporting changes in 'intent to exercise'</p> <p>Outcomes</p> <p>Exercise performed, fulfilment of pre-determined goals, attendance or participation in exercise class, and direct observation</p> <p>Follow-up</p> <p>Ranged from 16 weeks to 12 years.</p>	<p>10 studies were included</p> <ul style="list-style-type: none"> ◆2 RCTs ◆3 quasi-experimental studies ◆5 pre-experimental studies 	<p>Varying time frames, samples and measures made comparisons across studies difficult and only general observations were made. Nine of the 10 included studies showed that exercise adherence strategies worked to increase or improve exercise behaviour. The most impressive results came from programmes having multiple interventions.</p> <p>Methodological problems noted by the authors in the primary studies: the possibility of selection bias, differential attrition rates for different treatment groups, the lack of accounting for people exercising on their own and not recording these episodes, low statistical power resulting from small sample size, lack of reliability of the measures used to assess participation in exercise programmes, exercise patterns or physical fitness, compensatory rivalry, lack of control of extraneous variables, lack of long-term results and the preponderance of studies on 'white collar' workers.</p>

INDIVIDUAL STUDIES – DIET, EXERCISE AND WEIGHT LOSS			
Author(s)/Date of Publication	Design (with follow-up period)	Size/type of incentive	Results
Bloch <i>et al</i> , 2006	<ul style="list-style-type: none"> ◆ RCT ◆ comparison of monetary incentive, nurse educator or usual care in treatment of dyslipidaemia in 171 employees (of 21 employers in one US state) ◆ employees with low-density lipoprotein cholesterol (LDL-C) levels >130mg/dL were eligible ◆ all subjects received online educational materials ◆ no formal assessment of 'readiness to change' <p>Outcomes LDL-C levels measured at 6 months</p>	\$100 if LDL-C levels decreased by 15% (as measured by blood test) after 6 months	<p>Intention to treat analysis showed that both the incentive and the nurse educator groups saw reductions of 11% on LDL-C, compared with a 4% reduction in the usual care group. The proportion of participants in each group that achieved the 15% reduction goal were: 38% participants in incentive group, 35% in nurse educator group and 15% for usual care group.</p> <p>The study did not ascertain whether the subjects were on lipid modifying medication.</p>

INDIVIDUAL STUDIES – DIET, EXERCISE AND WEIGHT LOSS			
Author(s)/Date of Publication	Design (with follow-up period)	Size/type of incentive	Results
Herman <i>et al</i> , 2006	<p>Observational study</p> <p>Outcomes</p> <ul style="list-style-type: none"> ◆uptake of online physical activity programme (VFC – virtual fitness centre) provided to IBM employees ◆health risk levels as measured by an abridged University of Michigan health risk appraisal (HRA) tool (at 2 periods) 	\$150 cash rebate to employees for participation in VFC – participants needed to engage in at least 20mins of physical activity 3 days/week, for 10 out of 12 consecutive weeks to qualify for the rebate	<p>In the year prior to the introduction of the rebate in 2004, 13% (16,777/129,628) of eligible employees participated in the VFC. This increased to 53% (67,324/126,372) when the cash incentive was introduced. In total, 74% of the VFC participants completed sufficient exercise to receive the rebate (49,568 or 39% of employees).</p> <p>With the exception of cholesterol levels, baseline prevalence values for health risks were significantly lower for VFC participants (measures of weight, stress, physical activity, life satisfaction, blood pressure, perceived health, disease, illness days, smoking status).</p> <p>Risk status among those who received the rebate changed significantly over a 12-month period for all measures except weight and illness days.</p> <p>Significant differences in risk status between participants who received the rebate and those that did not log sufficient activity to qualify were found in activity levels, weight and illness days.</p>

REVIEW ARTICLES – SMOKING CESSATION						
Author(s)/Date of publication	Size/type of incentive	Databases searched	Dates searched	Inclusion/exclusion criteria Outcomes	Studies included	Conclusions
Hey and Perera, 2005	Lottery draw known as Quit & Win contest – to be eligible for draw, participants must quit smoking Grand prize up to \$10,000 and six regional prizes of \$2500	MEDLINE Cochrane Tobacco Addiction Group register EMBASE CINAHL PsycINFO	Up to Sept 2004 Up to June 2004	<p>Include</p> <ul style="list-style-type: none"> ◆RCTs ◆controlled studies with baseline and post-intervention measures <p>Outcomes</p> <ul style="list-style-type: none"> ◆cessation rates, point prevalence and sustained abstinence for a minimum of 6 months from the start of the intervention (whether or not biochemically validated) <p>Follow-up</p> <ul style="list-style-type: none"> 1-year survey 	4 studies	<p>Controlled trials suggest that Quit and Win contests may help some smokers to quit. Three studies demonstrated significantly higher quit rates (8–20%) for the intervention group than for the control group at the 12-month assessment. The population impact measure where available suggests that the effect of contests on community prevalence of smoking is small, with fewer than 1 in 500 smokers quitting because of the contest.</p> <p>Levels of deception where they could be quantified were high. Although there are programme reports and surveys that suggest that international Quit and Win contests may be effective, especially in developing countries, the lack of controlled studies precludes any firm conclusions.</p> <p>The two elements which appear to lead to success in Quit and Win contests are support network of friends, family and workmates, and abrupt quitting or ‘cold turkey’.</p>

REVIEW ARTICLES – SMOKING CESSATION						
Author(s)/Date of publication	Size/type of incentive	Databases searched	Dates searched	Inclusion/exclusion criteria Outcomes	Studies included	Conclusions
Hey and Perera, 2005	Contests Competitions Incentive schemes Lotteries Raffles Contingent payments to reward smoking cessation and continuous abstinence Incentives/prizes ranged in size from \$20 (with a chance to win \$500 in a prize draw) to \$240 (over 6 months) for individuals; and from \$15 per person to a \$1830 shared grand prize	MEDLINE Cochrane Tobacco Addiction Group register EMBASE CINAHL PsycINFO	Up to Sept 2004 Up to June 2004	<p>Include</p> <ul style="list-style-type: none"> ◆RCTs (with individuals, workplaces, groups within workplaces or communities allocated to experimental or control groups) ◆controlled studies with baseline and post-intervention measures <p>Exclude</p> <ul style="list-style-type: none"> No explicit criteria given <p>Outcomes</p> <ul style="list-style-type: none"> Cessation rates, point prevalence and sustained abstinence for a minimum of 6 months from the start of the intervention (whether or not biochemically validated) <p>Follow-up</p> <ul style="list-style-type: none"> 6 months to 2 years 	15 studies	<p>None of the studies demonstrated significantly higher quit rates for the incentives group than for the control group beyond 6-month assessment. There was no clear evidence that any particular types of incentive were more or less effective. Although incentives were not found to alter cessation rates significantly, there is some evidence that recruitment rates can be improved by rewarding participation.</p> <p>The included studies were often under-powered and of variable quality.</p> <p>Incentives may work while they are in place but once they are withdrawn the normal pattern of relapse is established. The authors conclude that there is no clear evidence that competitions or incentives make a lasting difference to smoking behaviour over and above the baseline community quit rate.</p>

REVIEW ARTICLES – SMOKING CESSATION						
Author(s)/Date of publication	Size/type of incentive	Databases searched	Dates searched	Inclusion/exclusion criteria Outcomes	Studies included	Conclusions
Moher <i>et al</i> , 2005	Workplace interventions for smoking cessation Incentives ranged from US\$25–\$200 (2 studies also included a lottery element with prizes of \$500 and AUD\$1000)	MEDLINE Cochrane Tobacco Addiction Group register EMBASE PsycINFO	Up to October 2004	<p>Include Studies of adults >18 years of age, in employment, who smoked For interventions aimed at individuals: ◆RCTs (allocating individuals, workplaces or companies to intervention or control conditions) For studies of restrictions and bans: ◆RCTs ◆controlled trials with baseline and post-intervention outcomes ◆ interrupted times series studies</p> <p>Exclude: Studies <6-month follow-up</p> <p>Outcomes Employee smoking behaviour</p> <p>Follow-up From 6 to 24 months</p>	31 studies on individual-focused interventions, 33 studies on workforce-focused interventions were included and 5 studies of incentives and competitions	<p>General findings Interventions directed at individual smokers increase the likelihood of quitting smoking (advice from professional, counselling, pharmacological treatments). Self-help treatments are less effective. Although people taking up the interventions are more likely to quit, absolute number of quitters is low.</p> <p>Consistent evidence that workplace bans and policies can decrease tobacco consumption and non-smoker exposure to smoke, but conflicting evidence on impact on prevalence of smoking or overall consumption.</p> <p>Incentives There is limited evidence that participation in smoking cessation programmes can be increased by competitions and incentives organised by the employer. Incentives can increase attempts to stop smoking although absolute quit rates are not significantly affected.</p>

REVIEW ARTICLES – SMOKING CESSATION						
Author(s)/Date of publication	Size/type of incentive	Databases searched	Dates searched	Inclusion/exclusion criteria Outcomes	Studies included	Conclusions
Kaper <i>et al</i> , 2005	A wider review of financial interventions to promote smoking cessation The review included interventions aimed at patients (changes to the level of health insurance coverage and co-payments, changes to premiums or user fees and changes to direct costs to patients eg free prescriptions) and to providers Incentive studies focused on the provision of free nicotine replacement therapy (NRT) or patches	Cochrane Tobacco Addiction Group register MEDLINE EMBASE CENTRAL	Up to August/October 2003	<p>Include</p> <ul style="list-style-type: none"> ◆ RCTs, controlled trials, interrupted time series ◆ trials that studied the effects of healthcare financing interventions directed at patients or providers for increasing the use of smoking cessation treatment <p>Exclude</p> <p>Not specified</p> <p>Outcomes</p> <ul style="list-style-type: none"> ◆ abstinence from smoking was primary outcome ◆ secondary outcomes were number of participants making a quit attempt, use of smoking cessation treatments <p>Follow-up</p> <p>At least 6 months</p>	5 RCTs and 2 controlled trials On incentives, 5 studies assessed the effect of covering the cost of NRT	<p>General findings</p> <p>There is some evidence that healthcare financing systems directed at smokers which offer a full financial benefit can increase the self-reported prolonged abstinence rates at relatively low costs when compared with a partial or no benefit.</p> <p>Incentives</p> <p>Five studies assessed the effects of covering the cost of using NRT. All of them showed an increased use of NRT. The pooled OR was 2.92 (95% CI 1.49–5.71) and the pooled RD was 0.12 (95% CI 0.05–0.19). There was no statistically significant difference in self-reported abstinence in the one study that compared nicotine gum at a reduced price to gum at usual price (OR 0.69; 95% CI 0.11–4.37; RD -0.02; 95% CI -0.14–0.09).</p>

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Author(s)/Date of publication	Size/type of incentive	Databases searched	Dates searched	Inclusion/exclusion criteria Outcomes	Studies included	Conclusions
Kane <i>et al</i> , 2004	A WIDER STUDY OF INCENTIVES FOR PREVENTIVE CARE FOR DETAILS SEE SECTION 2.1					Included 12 studies on smoking cessation. Incentives included: <ul style="list-style-type: none"> ◆travel packages ◆meals ◆ceramic mug ◆cash (from \$5–\$50/month, also \$5/month penalty) ◆free or reduced price nicotine replacement patches. 8 out of the 12 studies showed that the incentives had a statistically significant impact.
Smedslund <i>et al</i> , 2004	A wider meta-analysis of workplace smoking cessation programmes	ABI Inform BRS CHID Dissertation Abstracts International ERIC MEDLINE Occupational Health & Safety Database SSCI Sociological Abstracts	1989–2001	<p>Include</p> <ul style="list-style-type: none"> ◆controlled studies of smoking cessation interventions in the workplace ◆study-reported quit rates <p>Exclude</p> <ul style="list-style-type: none"> Studies with <6-month follow-up <p>Outcomes</p> <ul style="list-style-type: none"> Quit rates at 6, 12, and/or >12 months <p>Follow-up</p> <ul style="list-style-type: none"> ◆6 months or more 	19 studies – on incentives, there were 6 studies (and 1 study with incentives as part of a multi-component intervention)	<p>General findings</p> <p>Smoking cessation interventions at worksites showed initial effectiveness but the effect decreased over time and was not present beyond 12 months.</p> <p>Incentives</p> <p>The 6 included studies had higher quit rates in the intervention group than the control group. Quit rates varied widely across the studies. [Overlap with Moher <i>et al</i>, 2005 – the 2 reviews have 3 studies on incentives in common. Moher excluded a number of studies due to lack of randomisation].</p>

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Bains <i>et al</i> , 1998	A review of population-based smoking cessation interventions that involve incentives	MEDLINE HEALTH CINAHL PsycINFO	Up to May/ July 1997	<p>Include</p> <ul style="list-style-type: none"> ◆RCTs, quasi-experimental studies and non-experimental studies ◆smoking cessation interventions that were both incentive-based and population-based <p>Exclude</p> <ul style="list-style-type: none"> Workplace interventions <p>Outcomes</p> <ul style="list-style-type: none"> Percentage quit rates or participation rates <p>Follow-up</p> <ul style="list-style-type: none"> Ranged from 1 month to 1 year 	17 studies – 1 RCT, 5 quasi-experimental studies and 11 non-experimental studies	The review found that 1–2% of the target population was attracted by the incentive-based interventions, regardless of the publicity or recruitment tactics used. No specific type of recruitment strategy was shown to be consistently more effective than others. One study had a participation rate of 9.5%, which was achieved through making the recruitment period more flexible. This context produced the greatest impact although the actual sustained quit rate was low (13%). The quit rates for the programmes ranged from 13–45% and varied according to length of follow-up, with lower quit rates more likely to be reported when this time was prolonged. The evidence presented in the review was limited by the fact that most studies used a quasi-experimental or non-experimental design.

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Eriksen <i>et al</i> , 1998	A wider review of the health impact of smoking control at the workplace	MEDLINE EMBASE AIDSLINE Psychological Abstracts Combined Health Information Database Employee Benefits Infosource National Prevention Evaluation Research Collection NTIS Substance Abuse Information Database	1968–1994	<p>Include:</p> <ul style="list-style-type: none"> ◆RCTs, controlled trials and observational studies <p>Exclude</p> <p>Not specified</p> <p>Outcomes</p> <ul style="list-style-type: none"> ◆self-reported cessation and quit attempts ◆biochemical measures ◆self-reported daily cigarette consumption ◆unobtrusive observation ◆drop-out rates ◆participation rates ◆number of people smoking ◆reported health indicators (cough/ weight/ dyspnoea) <p>Follow-up</p> <p>Not specified</p>	52 smoking cessation programme evaluations; 5 specifically on incentives	<p>Smoking cessation group programmes were found to be more effective than minimal treatment programmes, although less intensive treatment, when combined with high participation rates, can influence the total population.</p> <p>Tobacco policies were found to reduce cigarette consumption at work and workplace environmental tobacco smoke exposure.</p> <p>The literature was rated 'suggestive' for group and incentive interventions; 'indicative' for minimal interventions, competitions, and medical interventions, and 'acceptable' for the testing of incremental effects. Methodological weaknesses in primary studies were noted: lack of controls, weak design, lack of reporting of participation and attrition rates, volunteer bias, infrequent specification of treatment and treatment fidelity.</p>

INDIVIDUAL STUDIES – SMOKING CESSATION			
Author(s)/Date of publication	Design (with follow-up period)	Size/type of incentive	Results
Volpp <i>et al</i> , 2006	<ul style="list-style-type: none"> ◆RCT ◆179 smokers in Philadelphia were randomised into incentive and non-incentive arms ◆both groups were offered smoking cessation programme ◆self-reported smoking cessation was confirmed with urine cotinine test ◆6-month follow-up 	\$20 for each class attended and \$100 if quit smoking 30 days post-programme completion	The incentive group had higher rates of programme enrolment (43.3% vs 20.2%; $p < .0001$) and completion (25.8% vs 12.2%; $p = 0.02$). Quit rates at 75 days were 16.3% in the incentive group, and 4.6% in the control group ($P = 0.01$). At 6 months, quit rates in the incentive group were not significantly higher than in the control group (6.5% vs 4.6%, $P > 0.20$).
O'Connor <i>et al</i> , 2006	<p>Quasi-experimental study of 11 Quit and Win contests involving 5,504 adult smokers</p> <p>Follow-up 4–6 months (self-reported quit rates)</p>	<p>Out of the 11 contests studied:</p> <ul style="list-style-type: none"> ◆10 offered a \$1000 prize ◆1 offered \$2000 with \$1000 as 2nd prize and 4 county prizes of \$500 each 	<p>On average, 0.55% of smokers were recruited to join contests across the 11 sites. Among smokers who enrolled in a contest, 90% reported making a quit attempt and between 53% and 72% reported quitting for the full month of the contest. At 4 to 6 months follow-up, self-reported quit rates (7-day point prevalence) among contestants averaged 31% (range 22% to 49%). If the participants lost to follow-up are assumed to be smoking, however (as is the norm in intention to treat analyses), quit rates would range from 12–29%. Compared to a statewide population survey, 8 of the 11 programmes showed quit rates that were significantly higher ($P < .001$ by Wilcoxon rank-sum test) than the estimated quit rate of 21% seen among smokers making a quit attempt in the past year. Expenditures for promoting contests varied from \$4345 to \$91,441; estimated programme costs per quit ranged from \$97 to \$398.</p> <p>Note that the independent quality assessment by CRD states that the external validity of the study appears low and the study results should be considered relevant only for a US context.</p>
Cummings <i>et al</i> , 2006a	<ul style="list-style-type: none"> ◆quasi-experimental study ◆compared 3 programmes within New York State that either: provided vouchers for a 1-week supply of nicotine patches or gum; provided 1–2 week supply of patches directly to quitters at home, or a 6-week supply of patches and a follow-up telephone call. Quit rates for these programmes were compared with historical quit patterns. 	Free nicotine replacement therapy	<p>free patches or gum were sent to around 2.9% of eligible heavy smokers (10+ cigarettes/day). Self-reported quit rates ranged from 21–35% in the groups sent nicotine replacement therapy; compared to 12% in the historical sample.</p> <p>Note that independent quality assessment by CRD states that this study was subject to a number of potential sources of bias: the use of a historical control group, short follow-up period and lacked details on the economic analysis. Caution is required when interpreting the results of the analysis, especially over a long-term perspective.</p>

INDIVIDUAL STUDIES – SMOKING CESSATION			
Author(s)/Date of publication	Design (with follow-up period)	Size/type of incentive	Results
Cummings <i>et al</i> , 2006b	<ul style="list-style-type: none"> ◆quasi-experimental design ◆compared the 12-month quit rates of recipients of free nicotine patches in New York to Quitline callers from the previous year ◆data was collected from a random sample (n=1597) via 2 telephone surveys at 4 months and 12 months (number of respondents was 884 and 581 respectively) 	6-week supply of nicotine patches	<p>At the 4-month follow-up interview, 90% of those who received the patches reported making a quit attempt and 34% claimed they were not smoking. At 12 months, 33% of participants were no longer smoking and 23% reported continuous abstinence. The 7-day non-smoking prevalence rate at 12 months was 1.78 times higher for those who received patches (95% CI 1.19–2.66), as compared to historical controls.</p> <p>Note that the use of historical controls (especially in the context of an introduced smoking ban in New York) and unconfirmed self-reporting of smoking status mean that the results should be interpreted with care.</p>
Bauer <i>et al</i> , 2006	<ul style="list-style-type: none"> ◆quasi-experimental design ◆evaluated two population-based promotions for free cessation products in New York: <ol style="list-style-type: none"> 1. press announcement urging smokers to call a quitline to receive a voucher for a 2-week supply of nicotine replacement therapy (gum or patches) 2. comparison of response to two newspaper advertisements for a quitline, one of which offered a free stop-smoking guide and one that offered the guide plus a free stop smoking aid (BetterQuit) 	Voucher for 2-weeks supply of nicotine replacement therapy	<p>The voucher promotion increased median call volume 25-fold compared to pre-promotion levels. The self-reported quit rate at 4-6 months in the voucher group was 22% compared to a rate of 12% among quitline callers who did not receive the voucher (OR=1.77; 95% CI 1.17 – 2.68).</p> <p>Note that independent quality assessment by CRD states that the use of historical controls is non-randomised and therefore open to selection bias. The substantial loss to follow-up may have adversely affected the degree to which of the study sample was representative of the study population. It was unclear whether the length of follow-up was appropriate. The impact of time differences between groups (especially with respect to the historical control) could have introduced some time-related bias. Another limitation of the analysis was the use of self-reported data, which were not validated using objective measures. Finally, the analysis was restricted to treatment completers only.</p>
Miller <i>et al</i> , 2005	Quasi-experimental study eligible smokers (n=34,090; ~5% of all adults in New York City who smoked ≥10 cigarettes daily) who telephoned a toll-free quitline were sent a 6-week course of nicotine replacement therapy (NRT). At 6-months smoking status was assessed for 1305 randomly sampled NRT recipients and a non-randomly selected comparison group (n=506) who because of mailing errors did not receive the treatment.	Free nicotine replacement therapy	At 6-month follow-up more NRT recipients than comparison group members reported that they had successfully quit smoking (33% versus 6%; p<0.0001). Assuming that every 6-month follow-up non-respondent continued to smoke, the quit rate among NRT recipients was 20%.

INDIVIDUAL STUDIES – SMOKING CESSATION			
Author(s)/Date of publication	Design (with follow-up period)	Size/type of incentive	Results
Hahn <i>et al</i> , 2005	<ul style="list-style-type: none"> ◆quasi-experimental study ◆Quit and Win contest in Kentucky, USA ◆Tobacco quit rates were measured at 3, 6 and 12 months after the 30-day quit period (quit rates measured by 7-day point prevalence for tobacco use. Urine cotinine measurements confirmed self-reported quitting). <p>The intervention group consisted of a volunteer sample of 494 Quit and Win contest registrants and the control group consisted of 512 randomly selected tobacco users not exposed to the promotional media campaign which accompanied the contest</p>	Quit and Win lottery prize of US\$2500 plus 5 prizes of \$500	Confirmed one-year quit rates were 7.3% for the treatment group and 0.6% for the control. After adjusting for baseline differences in demographics, tobacco use and stage of change, those in the treatment group were 5.3 times (95% CI 2.3–12.5) more likely to experience a biochemically confirmed quit during the post-intervention period, relative to the control group. At 12-month follow-up, the self reported quit rate for treatment participants remained higher than controls; however, this difference was not statistically significant after adjusting for demographics and stage of change.

REVIEW ARTICLES – ROAD SAFETY						
Author(s)/ Date of Publication	Size/type of incentive	Databases searched	Dates searched	Inclusion/ exclusion criteria Outcomes	Studies included	Conclusions
Ehiri <i>et al</i> , 2006	Ranged from prize draw for gift certificate to \$30 coupon to free booster seat	Cochrane Injuries Group Specialised Register CENTRAL MEDLINE EMBASE National Research Register Transport PsycINFO ERIC SPECTR Science Citation Index Dissertation Abstracts Web of Science	Up to April 2005	<p>Include</p> <ul style="list-style-type: none"> ◆RCTs ◆controlled before-and-after studies <p>Exclude</p> <p>Those outside age range 4–8 years</p> <p>Outcomes</p> <ul style="list-style-type: none"> ◆crash-related deaths in intervention groups versus control groups ◆crash-related injury rates ◆observed booster seat use ◆reported use of booster seat <p>Follow-up</p> <p>Ranged from 2 weeks to 15 months</p>	5 studies	<p>All interventions were found to increase the use of booster seats; however, combining incentives or distribution of free seats combined with education had a marked beneficial effect.</p> <p>Effect sizes were: education only (RR 1.32; 95% CI 1.16–1.49), distribution + education (RR 2.34; 95% CI 1.50–3.63), incentives + education (RR 2.75; 95% CI 2.41–3.13) and enforcement (RR 1.04; 95% CI 1.12–4.23).</p> <p>There were limitations: 2 studies were based on observation and 3 on self-reporting which introduced a potential source of bias. Attrition rates were high in some primary studies.</p>
Hargenzeiker <i>et al</i> , 1997	Value of reward ranged from \$1– 10,000 Probability of receiving a reward ranged from almost zero to almost 1	IRRD (International Road Research Documentation) PsycINFO	Up to June 1996	<p>Include</p> <p>Experimental studies</p> <p>Exclude studies where</p> <ul style="list-style-type: none"> ◆incentives not given to individuals ◆incentives were intangible ◆enforcement was combined with incentives ◆no behavioural measures were included 	34 studies	<p>There was a mean short-term increase in safety belt usage rates of 20.6%; the mean long-term effect was 13.7%. Large-scale studies reported smaller effect sizes than small-scale studies. The largest effect sizes were obtained in elementary school (primary school) based campaigns, when incentives were delivered immediately and where there were relatively low baseline levels of safety belt usage. The authors conclude that incentives can lead to substantial increases in safety belt use in the short term with smaller long-term effects. Follow-up measurements after withdrawal of the incentive were generally higher than initial baseline.</p>

Appendix 2: Search strategy

Searches were conducted by Centre for Reviews and Dissemination at the University of York. The searches combined literature on organisational, professional and patient targeted incentives (see Christianson *et al*, 2007). Search strategies are shown below.

Database of Abstracts of Reviews of Effects (DARE) (CRD administration database)

Searched on 7/12/2005 (supplementary search August 2007)

Publication dates: 1995 onwards

No language or country limits were used.

Retrieved 110 hits

Search strategy:

- | | | | |
|----|--|----|--|
| 1 | s incentiv\$ | 39 | s fringe(w)benefit\$ |
| 2 | s competition\$ | 40 | s performance(w)report\$ |
| 3 | s contest\$ | 41 | s revenue(3w)enhance\$ |
| 4 | s lotter\$ | 42 | s revenue(3w)maximi\$ |
| 5 | s reward\$ | 43 | s revenue(3w)increas\$ |
| 6 | s prize\$ | 44 | s income(3w)enhance\$ |
| 7 | s bonus\$ | 45 | s income(3w)maximi\$ |
| 8 | s token(w)economy | 46 | s income(3w)increas\$ |
| 9 | s salary(w)based(w)compensation | 47 | s recognition(w)award\$ |
| 10 | s compensatory(w)plan\$ | 48 | s gp\$(w)contract\$ |
| 11 | s target(w)pay\$ | 49 | s consultant\$(w)contract\$ |
| 12 | s pay\$(3w)result\$ | 50 | s general(w)practitioner\$(w)contract\$ |
| 13 | s reimbursement | 51 | s salary |
| 14 | s pay\$(3w)performance | 52 | s salaries |
| 15 | s contingent(w)pay\$ | 53 | s inducement\$ andnot (pregnan\$ or labor or labour or deliver\$) |
| 16 | s deposit(w)contract\$ | 54 | s quit(3w)win |
| 17 | s clinical(w)productivity(w)compensation | 55 | s voucher\$ |
| 18 | s capitation | 56 | s social(w)market\$ |
| 19 | s fundhold\$ or fund(w)hold\$ | 57 | s social(w)franchis\$ |
| 20 | s merit(w)award\$ | 58 | s s1 or s2 or s3 or s4 or s5 or s6 or s7 or s8 or s9 or s10 or s11 or s12 or s13 or s14 or s15 or s16 or s17 or s18 or s19 or s20 or s21 or s22 or s23 or s24 or s25 or s26 or s27 or s28 or s29 or s30 or s31 or s32 or s33 or s34 or s35 or s36 or s37 or s38 or s39 or s40 or s41 or s42 or s43 or s44 or s45 or s46 or s47 or s48 or s49 or s50 or s51 or s52 or s53 or s54 or s55 or s56 or s57 |
| 21 | s reputation | 59 | s 1995:2005/xyr |
| 22 | s profession\$(3w)standing | 60 | s s59 and s58 |
| 23 | s profession\$(3w)status | | |
| 24 | s profession\$(3w)recog\$ | | |
| 25 | s career(w)mobility | | |
| 26 | s career\$(3w)develop\$ | | |
| 27 | s staff(3w)develop\$ | | |
| 28 | s job(3w)develop\$ | | |
| 29 | s job(3w)satisfaction | | |
| 30 | s rating(w)system\$ | | |
| 31 | s report\$(3w)physician(w)performance | | |
| 32 | s earned(w)autonomy | | |
| 33 | s market(w)share | | |
| 34 | s clinical(w)volume | | |
| 35 | s case(w)load | | |
| 36 | s work(w)relative(w)value(w)unit\$ | | |
| 37 | s clinical(w)productivity | | |
| 38 | s patient(w)volume | | |

Cochrane Database of Systematic Reviews (CDSR)

Issue 4 2005

Searched on 6/12/2005 (supplementary search August 2007)

No language or country limits were used.

Publication dates: no limits

Retrieved 31 hits

Search strategy:

- | | |
|--|--|
| #1 MeSH descriptor Employee Incentive Plans, this term only in MeSH products | #24 capitation in Record Title or capitation in Abstract |
| #2 MeSH descriptor Salaries and Fringe Benefits explode all trees in MeSH products | #25 fundhold* or "fund hold*" in Record Title or fundhold* or "fund hold*" in Abstract |
| #3 MeSH descriptor Reimbursement, Incentive, this term only in MeSH products | #26 "merit award*" in Record Title or "merit award*" in Abstract |
| #4 MeSH descriptor Reward explode all trees in MeSH products | #27 reputation in Record Title or reputation in Abstract |
| #5 MeSH descriptor Physician Incentive Plans, this term only in MeSH products | #28 profession* near/3 standing in Record Title or profession* near/3 standing in Abstract |
| #6 incentiv* in Record Title or incentiv* in Abstract | #29 profession* near/3 status in Record Title or profession* near/3 status in Abstract |
| #7 competition* in Record Title or competition* in Abstract | #30 profession* near/3 recog* in Record Title or profession* near/3 recog* in Abstract |
| #8 contest* in Record Title or contest* in Abstract | #31 "career mobility" in Record Title or "career mobility" in Abstract |
| #9 lotter* in Record Title or lotter* in Abstract | #32 career* near/3 develop* in Record Title or career* near/3 develop* in Abstract |
| #10 reward* in Record Title or reward* in Abstract | #33 staff near/3 develop* in Record Title or staff near/3 develop* in Abstract |
| #11 prize* in Record Title or prize* in Abstract | #34 job near/3 develop* in Record Title or job near/3 develop* in Abstract |
| #12 bonus* in Record Title or bonus* in Abstract | #35 job near/3 satisfaction in Record Title or job near/3 satisfaction in Abstract |
| #13 MeSH descriptor Capitation Fee, this term only in MeSH products | #36 "rating system*" in Record Title or "rating system*" in Abstract |
| #14 "token economy" in Record Title or "token economy" in Abstract | #37 report* near/3 "physician performance" in Record Title or report* near/3 "physician performance" in Abstract |
| #15 "salary based compensation" in Record Title or "salary based compensation" in Abstract | #38 "earned autonomy" in Record Title or "earned autonomy" in Abstract |
| #16 "compensatory plan*" in Record Title or "compensatory plan*" in Abstract | #39 "market share" in Record Title or "market share" in Abstract |
| #17 "target pay*" in Record Title or "target pay*" in Abstract | #40 "clinical volume" in Record Title or "clinical volume" in Abstract |
| #18 pay* near/3 result* in Record Title or pay* near/3 result* in Abstract | #41 "case load" in Record Title or "case load" in Abstract |
| #19 reimbursement in Record Title or reimbursement in Abstract | #42 "work relative value unit*" in Record Title or "work relative value unit*" in Abstract |
| #20 pay* near/3 performance in Record Title or pay* near/3 performance in Abstract | #43 "clinical productivity" in Record Title or "clinical productivity" in Abstract |
| #21 "contingent pay*" in Record Title or "contingent pay*" in Abstract | #44 "patient volume" in Record Title or "patient volume" in Abstract |
| #22 "deposit contract*" in Record Title or "deposit contract*" in Abstract | |
| #23 "clinical productivity compensation" in Record Title or "clinical productivity compensation" in Abstract | |

- #45 “fringe benefit*” in Record Title or “fringe benefit*” in Abstract
- #46 “performance report*” in Record Title or “performance report*” in Abstract
- #47 revenue near/3 enhance* in Record Title or revenue near/3 enhance* in Abstract
- #48 revenue near/3 maximi* in Record Title or revenue near/3 maximi* in Abstract
- #49 “revenue near/3 increas*” in Record Title or “revenue near/3 increas*” in Abstract
- #50 income near/3 enhance* in Record Title or income near/3 enhance* in Abstract
- #51 income near/3 maximi* in Record Title or income near/3 maximi* in Abstract
- #52 income near/3 increas* in Record Title or income near/3 increas* in Abstract
- #53 “recognition award*” in Record Title or “recognition award*” in Abstract
- #54 MeSH descriptor Awards and Prizes explode all trees in MeSH products
- #55 “gp* contract*” in Record Title or “gp* contract*” in Abstract in all products
- #56 “consultant* contract*” in Record Title or “consultant* contract*” in Abstract
- #57 “general practitioner* contract*” in Record Title or “general practitioner* contract*” in Abstract
- #58 salary in Record Title or salary in Abstract
- #59 salaries in Record Title or salaries in Abstract
- #60 inducement* not (pregnan* or labor or labour or deliver*) in Record Title or inducement* not (pregnan* or labor or labour or deliver*) in Abstract
- #61 quit near/3 win in Record Title or quit near/3 win in Abstract
- #62 voucher* in Record Title or voucher* in Abstract
- #63 “social market*” in Record Title or “social market*” in Abstract
- #64 “social franchis*” in Record Title or “social franchis*” in Abstract
- #65 MeSH descriptor Social Marketing, this term only in MeSH products
- #66 (#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17 OR #18 OR #19 OR #20 OR #21 OR #22 OR #23 OR #24 OR #25 OR #26 OR #27 OR #28 OR #29 OR #30)
- #67 (#31 OR #32 OR #33 OR #34 OR #35 OR #36 OR #37 OR #38 OR #39 OR #40 OR #41 OR #42 OR #43 OR #44 OR #45 OR #46 OR #47 OR #48 OR #49 OR #50 OR #51 OR #52 OR #53 OR #54 OR #55 OR #56 OR #57 OR #58 OR #59 OR #60 OR #61 OR #62 OR #63 OR #64 OR #65)
- #68 (#66 OR #67)

MEDLINE – Winspears

1995–2005 week 10

Searched on 6/12/2005 (supplementary search August 2007)

No language or country limits were used.

Publication dates: 1995 onwards

Retrieved 6558 hits

Search strategy:

1. "Employee-Incentive-Plans"/ all subheadings
2. explode "Salaries-and-Fringe-Benefits"/ all subheadings
3. "Reimbursement-Incentive"/ all subheadings
4. explode "Reward"/ all subheadings
5. "Physician-Incentive-Plans"/ all subheadings
6. incentiv* in ab,ti
7. competition* in ab,ti
8. contest* in ab,ti
9. lotter* in ab,ti
10. reward* in ab,ti
11. prize* in ab,ti
12. bonus* in ab,ti
13. "Capitation-Fee"/ all subheadings
14. (token adj economy) in ab,ti
15. (salary adj based adj compensation) in ab,ti
16. (compensatory adj plan*) in ab,ti
17. (target adj pay*) in ab,ti
18. (pay* near3 result*) in ab,ti
19. reimbursement in ab,ti
20. (pay* near3 performance) in ab,ti
21. (contingent adj pay*) in ab,ti
22. (deposit adj contract*) in ab,ti
23. (clinical adj productivity adj compensation) in ab,ti
24. capitation in ab,ti
25. fundhold* or (fund adj hold*) in ab,ti
26. (merit adj award*) in ab,ti
27. reputation in ab,ti
28. (profession* near3 standing) in ab,ti
29. (profession* near3 status) in ab,ti
30. (profession* near3 recog*) in ab,ti
31. (career adj mobility) in ab,ti
32. (career* near3 develop*) in ab,ti
33. (staff near3 develop*) in ab,ti
34. (job near3 develop*) in ab,ti
35. (job near3 satisfaction) in ab,ti
36. (rating adj system*) in ab,ti
37. (report* near3 (physician adj performance)) in ab,ti
38. (earned adj autonomy) in ab,ti
39. (market adj share) in ab,ti
40. (clinical adj volume) in ab,ti
41. (case adj load) in ab,ti
42. (work adj relative adj value adj unit*) in ab,ti
43. (clinical adj productivity) in ab,ti
44. (patient adj volume) in ab,ti
45. (fringe adj benefit*) in ab,ti
46. (performance adj report*) in ab,ti
47. (revenue near3 enhance*) in ab,ti
48. (revenue near3 maximi*) in ab,ti
49. (revenue near3 increas*) in ab,ti
50. (income near3 enhance*) in ab,ti
51. (income near3 maximi*) in ab,ti
52. (income near3 increas*) in ab,ti
53. (recognition adj award*) in ab,ti
54. explode "Awards-and-Prizes"/ all subheadings
55. (gp* adj contract*) in ab,ti
56. (consultant* adj contract*) in ab,ti
57. (general adj practitioner* adj contract*) in ab,ti
58. salary in ab,ti
59. salaries in ab,ti
60. (inducement* not (pregnan* or labor or labour or deliver*)) in ab,ti
61. (quit near3 win) in ab,ti
62. voucher* in ab,ti
63. social market* in ab,ti
64. social franchis* in ab,ti
65. "Social-Marketing"/ all subheadings
66. #1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15 or #16 or #17 or #18 or #19 or #20 or #21 or #22 or #23 or #24 or #25 or #26 or #27 or #28 or #29 or #30
67. #31 or #32 or #33 or #34 or #35 or #36 or #37 or #38 or #39 or #40 or #41 or #42 or #43 or #44 or #45 or #46 or #47 or #48 or #49 or #50 or #51 or #52 or #53 or #54 or #55 or #56 or #57 or #58 or #59 or #60 or #61 or #62 or #63 or #64 or #65
68. #66 or #67
69. review in ab
70. review in pt
71. meta-analysis in ab
72. meta-analysis in pt
73. meta-analysis in ti
74. #69 or #70 or #71 or #72 or #73
75. letter in pt

76. editorial in pt
77. comment in pt
78. #75 or #76 or #77
79. #74 not #78
80. (retrospective* near2 review*) in ab,ti,mesh
81. (case* near2 review*) in ab,ti,mesh
82. (record* near2 review*) in ab,ti,mesh
83. (patient* near2 review*) in ab,ti,mesh
84. (patient* near2 chart*) in ab,ti,mesh
85. (peer* near2 review*) in ab,ti,mesh
86. (rat or rats or mouse or mice or hamster or hamsters or animal or animals or dog or dogs or cat or cats or bovine or sheep) in ab,ti,mesh
87. #80 or #81 or #82 or #83 or #84 or #85 or #86
88. #79 not #87
89. animals in tg
90. humans in tg
91. #89 not (#89 and #90)
92. #88 not #91
93. #92 and #68

EMBASE

1988–2005 week 49

Searched on 8/12/2005 (Supplementary search August 2007)

No language or country limits were used.

Publication dates: 1995 onwards

Retrieved 1256 hits

Search strategy:

- 1 exp Income/
- 2 Reward/
- 3 incentiv\$.ab,ti.
- 4 competition\$.ab,ti.
- 5 contest\$.ab,ti.
- 6 lotter\$.ab,ti.
- 7 reward\$.ab,ti.
- 8 prize\$.ab,ti.
- 9 bonus\$.ab,ti.
- 10 Capitation-Fee/
- 11 token economy.ab,ti.
- 12 salary based compensation.ab,ti.
- 13 compensatory plan\$.ab,ti.
- 14 target pay\$.ab,ti.
- 15 pay\$ adj3 result\$.ab,ti.
- 16 reimbursement.ab,ti.
- 17 pay\$ adj3 performance.ab,ti.
- 18 contingent pay\$.ab,ti.
- 19 deposit contract\$.ab,ti.
- 20 clinical productivity compensation.ab,ti.
- 21 capitation.ab,ti.
- 22 fundhold\$.ab,ti. or fund hold\$.ab,ti.
- 23 merit award\$.ab,ti.
- 24 reputation.ab,ti.
- 25 profession\$ adj3 standing.ab,ti.
- 26 profession\$ adj3 status.ab,ti.
- 27 profession\$ adj3 recog\$.ab,ti.
- 28 career adj mobility.ab,ti.
- 29 career\$ adj3 develop\$.ab,ti.
- 30 staff adj3 develop\$.ab,ti.
- 31 job adj3 develop\$.ab,ti.
- 32 job adj3 satisfaction.ab,ti.
- 33 rating adj system\$.ab,ti.
- 34 report\$ adj3 physician performance.ab,ti.
- 35 earned autonomy.ab,ti.
- 36 market share.ab,ti.
- 37 clinical volume.ab,ti.
- 38 case adj load.ab,ti.
- 39 work relative value unit\$.ab,ti.
- 40 clinical productivity.ab,ti.
- 41 patient volume.ab,ti.
- 42 fringe benefit\$.ab,ti.
- 43 performance report\$.ab,ti.
- 44 revenue adj3 enhance\$.ab,ti.
- 45 revenue adj3 maximi\$.ab,ti.
- 46 revenue adj3 increas\$.ab,ti.
- 47 income adj3 enhance\$.ab,ti.
- 48 income adj3 maximi\$.ab,ti.
- 49 income adj3 increas\$.ab,ti.
- 50 recognition award\$.ab,ti.
- 51 gp\$ contract\$.ab,ti.
- 52 consultant\$ contract\$.ab,ti.
- 53 general practitioner\$ contract\$.ab,ti.
- 54 salary.ab,ti.
- 55 salaries.ab,ti.
- 56 inducement\$.ab,ti. not (pregnan\$ or labor or labour or deliver\$).ab,ti.
- 57 quit adj3 win.ab,ti.
- 58 voucher\$.ab,ti.
- 59 social market\$.ab,ti.
- 60 social franchis\$.ab,ti.
- 61 Social-Marketing/
- 62 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30
- 63 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 or 42 or 43 or 44 or 45 or 46 or 47 or 48 or 49 or 50 or 51 or 52 or 53 or 54 or 55 or 56 or 57 or 58 or 59 or 60 or 61
- 64 62 or 63
- 65 exp meta analysis/
- 66 meta-analys\$.ti,ab.
- 67 metaanalys\$.ti,ab.
- 68 meta analys\$.ti,ab.
- 69 review\$.ti.
- 70 overview\$.ti.
- 71 (synthes\$ adj3 (literature\$ or research\$ or studies or data)).ti,ab.
- 72 pooled analys\$.ti,ab.
- 73 ((data adj2 pool\$) and studies).mp.
- 74 (medline or medlars or embase or cinahl or scisearch or psychinfo or psycinfo or psychlit or psyclit).ti,ab.
- 75 ((hand or manual or database\$ or computer\$) adj2 search\$).ti,ab.

76	((electronic or bibliographic\$) adj2 (database\$ or data base\$)).ti,ab.	88	79 or 80 or 81 or 82 or 83 or 84 or 85 or 86 or 87
77	((review\$ or overview\$) adj10 (systematic\$ or methodologic\$ or quantitativ\$ or research\$ or literature\$ or studies or trial\$ or effective\$)).ab.	89	78 not 88
78	65 or 66 or 67 or 68 or 69 or 70 or 71 or 72 or 73 or 74 or 75 or 76 or 77	90	editorial.pt.
79	(retrospective\$ adj2 review\$).ti,ab,sh.	91	letter.pt.
80	(case\$ adj2 review\$).ti,ab,sh.	92	90 or 91
81	(record\$ adj2 review\$).ti,ab,sh.	93	89 not 92
82	(patient\$ adj2 review\$).ti,ab,sh.	94	animal/
83	(patient\$ adj2 chart\$).ti,ab,sh.	95	human/
84	(peer adj2 review\$).ti,ab,sh.	96	94 or 95
85	(chart\$ adj2 review\$).ti,ab,sh.	97	human/
86	(case\$ adj2 report\$).ti,ab,sh.	98	96 not (96 and 97)
87	(rat or rats or mouse or mice or hamster or hamsters or animal or animals or dog or dogs or cat or cats or bovine or sheep).ti,ab,sh.	99	93 not 98
		100	64 and 99
		101	Limit 1995-2005

We subsequently undertook a second phase of searches which focused on fewer search terms but was more inclusive in terms of research design. However, it was considered desirable to try and filter out as many general articles as possible and so we used a study filter.

The advantage of using a filter is that it can help to reduce the hits retrieved to a manageable number by excluding irrelevant material. This was particularly desirable for this topic, since initial searches (without the study filter) indicated that there is a vast amount of literature available, and that much of it would not be relevant.

There has been much research done on the effectiveness of filters to identify RCTs on MEDLINE but very little on the identification of other types of primary research. One problem with searching for other types of studies is that the type of study used is often poorly reported in articles. A second issue is that study types are poorly indexed in most databases. As a result, any attempt to limit a search by study type runs the risk of accidentally excluding relevant material. For this reason, filters should be used with care.

The following databases were searched in July 2006 (with a supplemental search in August 2006 prompted by new publications coming to light). These databases were searched from inception to the date of the search.

No language or country limits were used.

Cochrane Central Register of Controlled Trials (CENTRAL)

Issue 2 2006

Searched on 05/07/2006

Retrieved 906 hits

(CENTRAL consists solely of reports of trials so it was not necessary to use a study filter)

Search strategy:

- | | |
|--|--|
| #1 (incentiv*):ti or (incentiv*):ab in Clinical Trials | #6 (earned near/3 autonomy):ti or (earned near/3 autonomy):ab in Clinical Trials |
| #2 (disincentiv*):ti or (disincentiv*):ab in Clinical Trials | #7 (#1 OR #2 OR #3 OR #4 OR #5 OR #6) |
| #3 (lottery or lotteries or reward* or bonus* or prize*):ti or (lottery or lotteries or reward* or bonus* or prize*):ab in Clinical Trials | #8 (letter or editorial or comment):pt in Clinical Trials |
| #4 (pay near/3 performance):ti or (pay near/3 performance):ab in Clinical Trials | #9 (#7 AND NOT #8) |
| #5 (merit award*):ti or (merit award*):ab in Clinical Trials | |

MEDLINE

1966–2006 June, week 3

Searched on 05/07/2006

Retrieved 6982 hits

Search strategy:

- | | | | |
|----|---|----|--|
| 1 | incentiv\$.ti,ab. | 23 | Follow-up.ti,ab. |
| 2 | disincentiv\$.ti,ab. | 24 | (Intervention stud\$ or Intervention trial\$).ti,ab. |
| 3 | (lottery or lotteries or reward\$ or bonus\$ or prize\$).ti,ab. | 25 | (Multicentre or multicenter).ti,ab. |
| 4 | (pay adj3 performance).ti,ab. | 26 | (Open stud\$ or open trial\$).ti,ab. |
| 5 | merit award\$.ti,ab. | 27 | Observational.ti,ab. |
| 6 | (earned adj3 autonomy).ti,ab. | 28 | Feasibility stud\$.ti,ab. |
| 7 | or/1-6 | 29 | Pilot project\$.ti,ab. |
| 8 | clinical trial.pt. | 30 | Sampling stud\$.ti,ab. |
| 9 | randomised.ab. | 31 | Empirical.ti,ab. |
| 10 | placebo.ab. | 32 | Cross-over.ti,ab. |
| 11 | randomly.ab. | 33 | Matched pair.ti,ab. |
| 12 | trial.ab. | 34 | retrospective.ti,ab. |
| 13 | groups.ab. | 35 | Multivariate analysis.ti,ab. |
| 14 | (case reports or clinical trial phase i or clinical trial phase ii or multicenter study or clinical trial phase iii or clinical trial phase iv or controlled clinical trial or RCT or twin study or validation studies).pt. | 36 | Regression.ti,ab. |
| 15 | Case control.ti,ab. | 37 | Correlat\$.ti,ab. |
| 16 | Cohort\$.ti,ab. | 38 | Quality.ti,ab. |
| 17 | Prospective.ti,ab. | 39 | outcome\$.ti,ab. |
| 18 | Quantitative.ti,ab. | 40 | or/8-39 |
| 19 | Longitudinal.ti,ab. | 41 | 40 and 7 |
| 20 | Comparator.ti,ab. | 42 | animals/ not (animals/ and humans/) |
| 21 | (Evaluation stud\$ or Evaluation trial\$).ti,ab. | 43 | (letter or editorial or comment).pt. |
| 22 | comparators.ti,ab. | 44 | 42 or 43 |
| | | 45 | 41 not 44 |

EMBASE

1980–2006 week 26

Searched on 5/7/2006

Retrieved 6742 hits

Search strategy:

- | | |
|--|---|
| <p>1 incentiv\$.ti,ab.
 2 disincentiv\$.ti,ab.
 3 (lottery or lotteries or reward\$ or bonus\$ or
 prize\$).ti,ab.
 4 (pay adj3 performance).ti,ab.
 5 merit award\$.ti,ab.
 6 (earned adj3 autonomy).ti,ab.
 7 or/1-6
 8 clinical trial.pt.
 9 randomised.ab.
 10 placebo.ab.
 11 randomly.ab.
 12 trial.ab.
 13 groups.ab.
 14 Case control.ti,ab.
 15 Cohort\$.ti,ab.
 16 Prospective.ti,ab.
 17 Quantitative.ti,ab.
 18 Longitudinal.ti,ab.
 19 Comparator.ti,ab.
 20 (Evaluation stud\$ or Evaluation trial\$).ti,ab.
 21 comparators.ti,ab.
 22 Follow-up.ti,ab.
 23 (Intervention stud\$ or Intervention trial\$).ti,ab.
 24 (Multicentre or multicenter).ti,ab.
 25 (Open stud\$ or open trial\$).ti,ab.
 26 Observational.ti,ab.
 27 Feasibility stud\$.ti,ab.</p> | <p>28 Pilot project\$.ti,ab.
 29 Sampling stud\$.ti,ab.
 30 Empirical.ti,ab.
 31 Cross-over.ti,ab.
 32 Matched pair.ti,ab.
 33 retrospective.ti,ab.
 34 Multivariate analysis.ti,ab.
 35 Regression.ti,ab.
 36 Correlat\$.ti,ab.
 37 Quality.ti,ab.
 38 outcome\$.ti,ab.
 39 or/8-39
 40 39 and 7
 41 animal/ not (animal/ and human/)
 42 (letter or editorial or note).pt.
 43 41 or 42
 44 40 not 43</p> |
|--|---|

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1969–2006

Searched on 3/7/2006

Retrieved 874 hits

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- 2 disincentiv\$.mp
- 3 lottery or lotteries or reward\$ or prize\$ or voucher\$.mp
- 4 pay and performance.mp
- 5 health or healthcare or NHS.mp
- 6 outcome\$ or data or performance or quality or ratio\$ or rate\$ or empirical or experiment\$ or randomi\$. Mp
- 7 1 or 2 or 3 or 4
- 8 7 and 5 and 6

ECONLIT

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- 2 fee for service.mp
- 3 reimburs\$.mp
- 4 health or healthcare or NHS
- 5 1 or 2 or 3
- 6 5 and 4