

## **It pays to quit: a review of evidence about how financial incentives may improve smoking cessation during pregnancy**

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### **Abstract**

Helping women to stop smoking during pregnancy is a major priority for health professionals and evidence suggests that financial incentives can be effective. With the aim of maximising the benefits and minimising unintended negative consequences, this paper gives a brief review of evidence about using financial incentives for smoking cessation during pregnancy, with a special emphasis on *how* financial incentives work. The review showed that financial incentives can increase pregnant women's capability, opportunity and motivation to stop smoking. The evidence supports five specific recommendations about how financial incentives should be used in future to reduce smoking during pregnancy, including measures to increase public acceptability. These recommendations can contribute to updating published UK policy for smoking cessation during pregnancy, including the National Institute for Health and Care Excellence (NICE) guideline on stopping smoking in pregnancy and after childbirth (PH26).

### **Introduction**

Smoking during pregnancy increases the risks of miscarriage, stillbirth, ectopic pregnancy, pre-term birth, low birth weight, heart defects and Sudden Infant Death Syndrome, but stopping smoking during pregnancy reduces those risks (Horne et al., 2014; Marufu et al., 2015; Royal College of Midwives, 2019; Royal College of Physicians, 2010). Also, a woman who gives up smoking during pregnancy and sustains the cessation will probably reverse almost all the reduction in life-expectancy that would have occurred if she had continued to smoke (Doll et al., 2004; Tappin, 2016). Support for smoking cessation is currently offered in the UK on an opt-out referral basis for women who are pregnant and smoking, making pregnancy an opportune time to quit (Tappin, 2016).

Fewer women smoke during pregnancy now than during the 1980s (Cnattingius, 2004) but the reduction is not equal across socio-economic groups (Boucher & Konkle, 2016). For example, in 2019, Blackpool had a smoking during pregnancy rate of 25.7 per cent, much higher than the national average of 10.6 per cent (NHS, 2019). This reflects socio-economic differences in smoking generally, for people in more deprived areas are

more likely to smoke and more likely to experience smoking-related effects to their health (Whitehead, 2019).

The UK National Health Service (NHS) and its partners set a national target to reduce the percentage of women who smoke during pregnancy to six per cent by 2022 (NHS, 2019). However, a review of progress reported that although the numbers of women who smoke had reduced over a long period to reach 10.6 per cent in 2018/19, the trajectory would need to improve to reach the 2022 target (NHS, 2020, p. 15). Updated guidance noted that referral to and uptake of smoking cessation services was poor, and that greater use should be made of carbon monoxide testing to identify pregnant women with elevated levels, who should be referred to trained stop smoking specialists (NHS England, 2019, pp. 14, 23). However, carbon monoxide testing had to be paused during the Covid-19 pandemic and in October 2020, the World Health Organisation issued a briefing calling for smoking cessation measures to be supported and strengthened (WHO, 2020).

Interventions for smoking cessation during pregnancy should consider the barriers that women of lower socio-economic status experience, including problems with transport to sessions, childcare issues, psycho-social barriers, lack of knowledge of health risks and lack of social support to quit (Boucher & Konkle, 2016). Women of lower socio-economic status often have more emotional, psychological and financial problems as well as less social support and less residential stability (Woodby et al., 1999). A systematic review of socio-economic inequalities in experiences of using smoking cessation services in the UK suggested that given the barriers that disadvantaged smokers face when trying to stop smoking, relying on mainstream interventions is likely to worsen existing inequalities (Smith et al., 2018).

Financial incentives are a form of contingency management (Higgins et al., 2007). Applied to smoking cessation during pregnancy, they usually consist of shopping vouchers typically worth £400-£750 in total, broken down into smaller amounts per session if smoking cessation is confirmed. Two reviews both concluded that financial incentives significantly increase smoking cessation during pregnancy (Likis et al., 2014; Notley et al., 2019). For example, by comparison with control groups, financial incentives led to cessation rates that were between 14.7 per cent and 27 percent higher than among control groups (Baker et al., 2018; Higgins et al., 2010; Ierfino et al., 2015; Radley et al., 2013; Tappin et al., 2015). One study found that financial incentives were also highly cost-effective, with an incremental cost of £482 per 'quality-adjusted life year' (QALY). This is well below the UK cost-effectiveness threshold for health interventions of £20,000/QALY and is at least as cost-effective as interventions such as cognitive behavioural strategies, clinic-based counselling and group sessions for smoking cessation during pregnancy (Boyd et al., 2016; Taylor, 2009). Larger scale trials including economic evaluations are presently underway (McMeekin et al., 2020; Sinclair et al., 2020).

One review identified financial incentives as a promising addition to smoking cessation services during pregnancy and proposed that women from disadvantaged backgrounds who smoke should be involved in the development of these programs in order to increase uptake and engagement among disadvantaged pregnant women who smoke (Smith et al., 2018). In 2010, the National Institute for Health and Care Excellence (NICE) published Public Health guideline PH26 on stopping smoking during pregnancy and after

childbirth, which did not recommend using financial incentives but did recommend further research to address several questions about smoking cessation during pregnancy, including:

*“Within a UK context, are incentives an acceptable, effective and cost-effective way to help women who smoke to quit the habit when they are pregnant or after they have recently given birth? Compared with current services, do they attract more women who smoke, do they lead to more of them completing the stop-smoking programme and do more of them quit for good? What level and type of incentive works best and are there any unintended consequences?”* (NICE, 2010, p. 27).

This paper therefore adopts a health psychology perspective to:

- Review evidence about how financial incentives aid smoking cessation during pregnancy;
- Identify factors that can influence the effectiveness of financial incentives;
- Make recommendations for updating the PH26 guidelines about financial incentives for smoking cessation during pregnancy.

### **Review of evidence**

Financial incentives are sometimes framed within behavioural economic models (Vlaev et al., 2019), but the COM-B model of behaviour change (Michie et al., 2011) has been chosen as a framework for the present review because it can integrate factors at multiple levels, including contextual or environmental factors, and also because it lends itself to attempts to understand *how* financial incentives are effective (that is, whether they are effective by influencing capability, opportunity and/or motivation). The model suggests that an individual’s capability (C) and opportunity (O) to perform a behaviour (B) influence their motivation (M) to carry out the behaviour. All three of these factors influence actual behaviour, and behaviour can then influence the individual’s capability, opportunity and motivation to perform the behaviour again (Michie et al., 2011; Michie et al., 2014). The Behaviour Change Wheel (Michie et al., 2015) suggests that incentives can work by directly affecting motivation to change a behaviour, but this article will also review evidence that suggests financial incentives may also impact capability and opportunity, thereby strengthening their potential effect on behaviour change.

### **Capability**

Some women find it easy to give up smoking when pregnant, especially in the first trimester when morning sickness can make the smell and taste of cigarettes aversive (Graham et al., 2012). However, many find it very difficult to give up, especially as pregnancy can bring extra stress that can make smoking cessation more difficult (Hauge et al., 2012). Women need to feel that they are capable of quitting and one important factor in capability is “self-efficacy,” which is an individual’s belief that they will be able to make the behaviour change (Bandura, 1977).

A path analysis found that the effects of financial incentives on smoking cessation were mediated by higher self-efficacy (van den Brand et al., 2020). Van den Brand and colleagues suggested that a potential explanation for the mediation of financial incentives

by self-efficacy might be that financial incentives encourage people to visualise achieving the goal of stopping smoking and receiving the reward, because visualisation was previously shown to increase self-efficacy (Bandura, 1989; van den Brand et al., 2020). Other behaviour change techniques (BCTs) such as setting goals, agreeing a contract with a support worker, monitoring behaviour, and receiving positive feedback from others, could also increase self-efficacy (Johnson & Snieihotta, 2010; Michie et al., 2015) and having an added financial incentive may increase the uptake of support services which may include these BCTs (Mantzari et al., 2012; van den Brand et al., 2017).

In theory, financial incentives could potentially improve cognitive capability to engage with other BCTs for smoking cessation, by increasing brain activity associated with deliberative decision-making processes, attention, problem solving and response planning (Müller et al., 2007; Powell et al., 2002; Regier & Redish, 2015), especially as cigarette smoking itself can affect brain activity in ways that impair memory and learning (Akkermans et al., 2017; Karama, 2020; Karama et al., 2015). However, the frontal cortex and other parts of the brain involved in those effects are among the most highly complex areas of the brain and their role in addiction is still being explored. Therefore, it is important to be extremely cautious about any potential mediation of the effects of financial incentives by altered brain activity.

### ***Opportunity***

According to the COM-B model, social opportunity is an important factor in behaviour change (Michie et al., 2011). Smoking during pregnancy is generally disapproved of, but for some pregnant women who smoke, especially those from poorer socio-economic backgrounds, smoking may be a social norm and an integral part of their lives and culture (Campbell et al., 2018). The partners of pregnant women who smoke could therefore have a significant impact on successful quit rates (Bauld et al., 2017; Bortoff et al., 2006). In one study, many pregnant women reported that their partners did not support their attempt to quit smoking, and most partners continued to smoke, which made it harder for the woman to stop smoking (Ingall, 2011).

Most incentive schemes reward the individual, but some have tried to incentivise support from the individual's social network (Donatelle et al., 2000; Jochelson, 2017). One scheme for pregnant women with low incomes offered financial rewards for both the woman and her supporter for each month the woman was smoke-free. The reward for the supporter encouraged them to actively help the woman give up smoking, and this combination of direct incentives and reinforced social support significantly increased quit rates among the pregnant women (Donatelle et al., 2000). Including partners or supporters in incentive schemes may improve their effectiveness but it may be difficult to audit the specific contribution of partners or supporters to the pregnant woman's attempt to stop smoking. It is also difficult to predict what the implications would be of including partners or supporters in larger-scale national incentive schemes for smoking cessation during pregnancy.

Financial incentives may also increase women's determination to successfully give up, which may in turn encourage them to engage with or seek out further smoking cessation support. When financial incentives for smoking cessation were offered without any smoking

cessation support, participants reported using the internet to find help to quit smoking or using quitting smoking telephone support lines (Etter et al., 2016; Fraser et al., 2017). In other studies, financial incentives increased participants' use of smoking cessation medications or nicotine replacement therapy compared with control groups (Etter et al., 2016; Mantzari et al., 2012; van den Brand et al., 2020). This suggests that women who anticipate a financial reward for stopping smoking may engage more actively in quitting and make greater use of available opportunities for support. Furthermore, research has shown that barriers to attending smoking cessation services included a lack of transport and childcare (Bauld et al., 2017; Borland et al., 2013; Tod, 2003). Provision of financial rewards could therefore encourage more women to engage in smoking cessation services because this would help to reimburse costs of travel and childcare.

### ***Motivation***

Financial incentives have the potential to influence motivation to stop smoking. Financial incentives can act on the same reward pathways as smoking (Knutson et al., 2001), so they could increase motivation to abstain from smoking by providing a focus for resisting urges to smoke. Incentives that reward desired behaviour more immediately also appear to increase self-efficacy, which should enhance a person's perceived capability to maintain the behaviour change (Jochelson, 2017).

Financial incentives could also help to create a positive attitude towards smoking cessation, which is important because positive affect has also been found to increase motivation to change behaviour and maintain the change (Van Cappellen et al., 2018). However, it is important that financial incentives are gain-framed (as a positive prize for successful cessation), rather than loss-framed (as an offer that could be lost or withdrawn if the quit attempt failed), because gain-framed incentives are more effective for maintaining smoking cessation (Romanowich & Lamb, 2013).

Marteau et al. (2009) suggested that financial incentives that are offered as gains and help people achieve outcomes that they already desire can increase autonomy because they prompt people to act consistently with their values. The anticipation of reward leads to dopamine release in the brain and increases self-reported happiness (Knutson et al., 2001). This could be particularly important for women of low socio-economic status as financial rewards for successful cessation could help reduce financial stressors and help prepare for the arrival of the new baby (Tappin et al., 2015). The money the individual saves by not buying cigarettes could also provide ongoing motivation to quit (Gallus et al., 2013), particularly if quantified and presented to participants alongside the direct financial incentive. These factors could potentially also increase the individual's capability to abstain from smoking by alleviating stress, for financial stress has been shown to make successful smoking cessation less likely (Siapush & Carlin, 2006).

### ***Intrinsic Motivation***

Stopping smoking during pregnancy is often viewed by pregnant women as a short-term action focused on the health of their baby rather than their own health (Ingall, 2011). Unfortunately, relapse postpartum is common, with studies showing that between 30–46 per cent of women who quit before or during pregnancy relapse 6–12 months after giving

birth (Cooper et al., 2017; Hemsing et al., 2012; Jones et al., 2016). Deci et al. (1999) suggested that using financial incentives to promote health behaviour change would undermine intrinsic motivation and that once the incentive, which acts as an external motivator, is removed, individuals will relapse back into the original behaviour. From the point of view of preventing harm to the unborn child, stopping smoking during pregnancy and relapsing after birth is a better outcome than continuing to smoke throughout pregnancy, but Deci et al.'s point is important to consider when designing policy, since it would suggest that financial incentives alone may weaken intrinsic motivation and limit the long-term effectiveness of the intervention. However, one analysis concluded there was "no reason to accept the claim that rewards have pervasive negative effects on people's intrinsic motivation" (Cameron & Pierce, 2002, p. 232, cited in Donatelle et al., 2004, p. S175), and a meta-analysis showed that providing feedback about competence alongside financial incentives can have a positive effect on intrinsic motivation by reinforcing the individual's sense of autonomy (Cameron et al., 2001). Jochelson's (2017) review of health interventions using financial incentives reinforced this, finding that "interventions that offered training to improve self-efficacy and other life skills, as well as a reward, reported better long-term outcomes, possibly because they reinforced intrinsic motivation" (p. 9). Notley et al.'s (2019) systematic review showed that interventions using financial incentives for smoking cessation during pregnancy improved long-term cessation rates.

The COM-B model describes motivation as both automatic and reflective but does not differentiate between intrinsic and extrinsic motivation in the way that Self Determination Theory does (Deci & Ryan, 2012). Viewing financial incentives for stopping smoking during pregnancy from the perspective of Self Determination Theory reinforces the importance of using incentives alongside other behaviour change mechanisms that will increase autonomy.

### **Gaming and public acceptability**

Two important factors to be considered in policy for incentive schemes are 'gaming' and public acceptability. Gaming was defined as the false reporting of smoking status (non-smokers acting as smokers to qualify for the incentive or smokers acting as non-smokers to receive the incentive) (Ierfino et al., 2015). If gaming reached significant levels, the success rates of schemes would be overstated and public confidence in them could be undermined. For example, one media commentator argued that paying pregnant women to stop smoking sends a 'damaging moral message' and speculated that financial incentive schemes could make it worthwhile for women to take up smoking just before pregnancy so they can be paid to 'give up' (Kite, 2015). Another unintended consequence of offering incentives might be that people delay giving up so they can do so while in an incentive scheme (Ierfino et al., 2015).

In fact, biochemical verification methods show very low levels of cheating or gaming in smoking cessation incentive schemes. In one study, the rate of false reporting of smoking status was only four per cent (Ierfino et al., 2015). In another, test results showed that 80 per cent of those defined as quitters had truly quit smoking and were not gaming the system (Tappin et al., 2015).

However, even if the fears of commentators like Kite (2015) were overstated, we should expect some changes in how people respond to incentive schemes if they were extended to the point where they become an expected norm. Perceptions of fairness can also influence public acceptability, which is important for any health intervention that becomes adopted policy.

Qualitative research suggested that financial incentives will be more publicly acceptable if they are (a) proven to be effective and cost-effective; (b) monitored closely and properly evaluated; and (c) delivered alongside education on how and why to change healthy behaviours (Giles et al., 2015). Experimental research also found that acceptance of financial incentives increased with the effectiveness of the intervention, and that vouchers for food or essential items were more acceptable than cash rewards (Promberger et al., 2012).

One other important aspect of public acceptability is the need to increase uptake and engagement by socio-economically deprived pregnant women in smoking cessation interventions, in order to reduce the current socio-economic inequalities in smoking during pregnancy. Research shows that patient and public involvement increases enrolment and retention in clinical trials (Crocker et al., 2018), so involving pregnant women from lower socio-economic backgrounds in the design of interventions with financial incentives could help to improve their wider social impact.

### **Conclusions and recommendations**

The reviewed evidence shows that financial incentives as part of smoking cessation interventions for pregnant women can increase participants' motivation to stop smoking and also positively impact their capability and opportunity to quit. These factors have been shown to be key for behaviour change and may explain why using financial incentives for smoking cessation in pregnancy has been successful in empirical trials (Notley et al., 2019; see introduction for a brief review of trials). Based on the evidence, we propose the following recommendations for how financial incentives could be used most effectively in future interventions for smoking cessation during pregnancy, and for how the NICE PH26 guidelines should be updated:

- Financial incentives should be used alongside interventions that apply behaviour change techniques to increase self-efficacy and autonomy, such as goal setting, positive feedback, and self-monitoring.
- Financial incentives should be gain-framed not loss-framed, to encourage positive affect and autonomy and promote maintenance of smoking cessation.
- Financial incentives for the partners or supporters of pregnant women could be considered, to increase their motivation to support the pregnant woman's cessation attempt. This might include encouraging significant others to attend smoking cessation services alongside the pregnant woman, where they would be able to access the same information, tools and support, and might attempt to give up smoking themselves.
- Pregnant women from low socio-economic backgrounds should be involved in the design of interventions with financial incentives, to increase uptake and engagement amongst this demographic so that current socio-economic disparities are not exacerbated by the interventions.

- To increase public acceptability, cessation rates or other measures of success should be publicised, and vouchers rather than cash should be the primary method for financial incentivisation.

To conclude, there is strong empirical research, supported by psychological theory, to show that financial incentives can be an effective and cost-effective addition to a multi-faceted smoking cessation programme for pregnant women who smoke, especially among socio-economically deprived communities. The context in which financial incentives are used is important and should always be taken into account. It is also important to understand the effectiveness of financial incentives combined with behaviour change techniques by comparison with other types of intervention, for example current treatment as usual, nicotine replacement therapies, or e-cigarettes combined with behaviour change techniques. Based on the evidence reviewed here, however, we recommend that financial incentives for smoking cessation during pregnancy continue to be used and that their use should continue to be researched and refined to maximise their effectiveness.

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