Public Health Research Consortium

Estimating the costs to the NHS of smoking in pregnancy for pregnant women and infants

- Smoking in pregnancy imposes a considerable economic burden on society.
- The aim of this study was to estimate the additional costs to the NHS, during pregnancy and the year following birth, of a mother continuing to smoke during pregnancy.
- Costs to the NHS related to maternal increased risk of spontaneous abortion, ectopic pregnancy, placenta previa, abruptio placenta, preterm premature rupture of membranes and decreased risk of pre-eclampsia are estimated to be between £8-64 million per year based on different costing methodologies.
- Costs to the NHS related to infant (0-12 months) increased risk of preterm delivery, low birth weight, Sudden Infant Death Syndrome, perinatal mortality, asthma, otitis media, and upper and lower respiratory infections are estimated to be between £12-23.5 million per year.
- Positive economic cost savings could be generated with low-cost smoking cessation interventions. We estimate that spending between £13.60-£37.00 per pregnant smoker would yield positive cost savings for the NHS.
- Our cost estimates are conservative, being limited to NHS costs during pregnancy and the first year of life.
- Further research is needed to estimate the non-NHS and long-term costs of smoking in pregnancy, and the enhanced investment in smoking cessation interventions which would be cost effective within such an extended cost framework.

Background

Smoking in pregnancy is a major public health concern, posing risks to both mother and child. In the UK in 2005, around half of women who smoke quit just before or during pregnancy, but 17% of women smoke throughout pregnancy – exposing around 120,000 infants each year. Smoking in pregnancy also exhibits a strong social class gradient and contributes to health inequalities among mothers and children. Although the economic consequences of smoking in pregnancy have been studied fairly extensively in the USA, little is known about costs in the UK context.

This project aimed to estimate to estimate the increased costs to the NHS, during pregnancy and the year following birth, of a mother continuing to smoke through pregnancy.

Methods

The study comprised four phases:

1. A scoping review of the economic literature, in which we (a) developed a full list of the maternal and infant consequences of smoking in pregnancy and through the first year of the infant's life previously included in economic cost models and (b) described the costing methodologies and economic modelling approaches used in previous economic studies

2. A review of reviews of the effects of smoking in pregnancy, in which we established the magnitude of the impact of smoking in pregnancy for all outcomes established by an expert review

3. Evidence synthesis and cost estimation, in which we estimated the actual costs of all outcomes established in Phase I of the study.

4. Attribution of cases to smoking, in which we calculated attributable risks and estimated the economic costs of smoking in pregnancy for maternal and infant outcomes during pregnancy and in the year following birth

Full details of the review methods can be found on the PHRC website (www.york.ac.uk/phrc/).

Key findings

Costs of smoking during pregnancy

We focussed on the costs to the NHS in the UK related to the maternal and infant consequences of smoking in pregnancy.

Maternal outcomes related to smoking during pregnancy include an increased risk of spontaneous abortion, ectopic pregnancy, placenta previa, abruptio placenta, preterm premature rupture of membranes and decreased risk of pre-eclampsia.

Infant outcomes outcomes related to smoking during pregnancy include an increased risk of preterm delivery, low birth weight, Sudden Infant Death Syndrome, perinatal mortality, asthma, otitis media, and upper and lower respiratory infections.

The total annual cost of smoking during pregnancy is estimated to be approximately £8.1 million for maternal outcomes when using top level Health Resource Group (HRG) Reference Costs[1]. However, when more specific literature based costs are substituted the total cost rises to almost £64 million.

The total cost of infant outcomes is an estimated £23.5 million, with the majority of the cost (£22 million) being attributable to the care of low birth weight babies. However using an alternative methodology using pre-term births as the endpoint, the total cost

[1] An HRG is a group of clinically-similar treatments and care that require similar levels of health care resource.

falls to £12 million, due to the lower relative risk for preterm delivery.

These costs are based on an NHS perspective, and so represent a conservative estimate of the true economic cost.

It should be noted that the total societal cost of smoking in pregnancy extends beyond the first year, and potentially includes higher educational costs, costs to the judicial system, and costs of health care beyond the first year for mothers and children.

Smoking Cessation for pregnant women

The evidence base for the cost effectiveness of cessation services for pregnant smokers is very limited, although studies have demonstrated that the costs of these interventions can be very low. Consequently, effectiveness rates do not have to be high in order for these programmes to pay for themselves, whereby the costs of service provision more than outweigh the savings from the reduced rates of adverse outcomes as a result of smoking during pregnancy.

The estimates we use in this report are based upon the Cochrane review, *Interventions for promoting smoking cessation during pregnancy,* by Lumley et al (2004). The review was based on randomised and quasi-randomised trials of smoking cessation programmes implemented during pregnancy, which included 64 trials. Fifty-one RCTs covering 20,931 women and six cluster-randomised trials covering 7,500 women provided data on smoking cessation and/or perinatal outcomes. The studies included in the review varied in the intensity of the intervention and the extent of reminders and reinforcement through the pregnancy.

The pooled results from 48 trials demonstrated a significant reduction in smoking in the intervention groups. The relative risk was 0.94 with a 95% confidence interval ranging from 0.93 to 0.95. This suggests a 6% reduction in the number of women smoking during their pregnancy. A total of 36 trials also included biochemical validation of smoking status, and in these trials smoking cessation interventions had the same impact with a relative risk of 0.94 and a slightly wider 95% confidence interval from 0.92 to 0.95.

Smoking cessation interventions were shown to reduce the occurrence of low birth weight, with a relative risk of 0.81 (with a 95% confidence interval from 0.70 to 0.94). The impact upon preterm births was a relative risk of 0.84 (95% confidence interval from 0.72 to 0.98) suggesting a 16% reduction in preterm births..

Cessation studies reporting birth outcomes also demonstrated a 33 gram increase in mean birth weight (95% confidence interval from 11 g to 55 g). Changes in stillbirths, perinatal and neonatal mortality were not statistically significant due to the limited power of the studies.

Taking an effectiveness rate of 6%, and assuming that all pregnant smokers receive the intervention, the evidence suggests that the intervention will yield positive economic cost savings up to an outlay of £13.60 per smoker, based on the NHS Reference Cost scenario. This would represent approximately half an hour of practice nurse time (£23.00 per hour) plus £2.10 worth of materials, which could cover various printed self-help materials and booklets. However, it should be noted that when literature based costs are used in these calculations, net economic savings are experienced up to a programme cost of £37 per smoker, up to which point we would experience dominance in the presence of any positive health benefits (positive cost savings and positive health outcomes).

A range of different scenarios can be constructed using different cessation rates and NHS Reference Costs.

Assuming 50% of smokers receive smoking cessation help, positive economic benefits would be generated provided the effectiveness rate was at least 5.6%.

It should be noted that these estimates are made purely from an economic perspective (i.e savings to the NHS), and the estimation of economic benefits is confined solely to pregnancy and one year after birth. Therefore health care cost savings beyond the first year are excluded from these calculations. Wider societal benefits are also excluded. For example, we have not taken into account the impact of smoking in pregnancy on the health-related quality of life of mother and child and on years of potential life lost.

Conclusions

This study estimates, for the first time, the costs to the NHS of smoking in pregnancy.

Our cost estimates are conservative, being limited to NHS costs during pregnancy and the first year of life. As smoking in pregnancy has long-term effects on health, and may have wider costs to education, social work and judicial systems, the real costs to society are clearly much higher.

We found no evidence that the entrenched socioeconomic inequalities in smoking in pregnancy are associated with differential impacts of smoking, or indeed of differential effectiveness of smoking cessation interventions.

Further research is needed to estimate the non-NHS and long-term costs of smoking in pregnancy.

Reference

Lumley, J., et al., *Interventions for promoting smoking cessation during pregnancy.* Cochrane Database Syst Rev, 2004(4): p. CD001055.

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