

# **Effectiveness and cost-effectiveness of programmes to help people stop smoking and prevent smoking uptake at local level**

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## **Executive Summary**

- Reducing smoking prevalence is a priority and there are national initiatives to drive down the number of people who smoke.
- Action taken by local authorities to reduce smoking prevalence plays an essential role in driving down smoking rates. Popular local measures for reducing prevalence include reducing smoking initiation amongst young people and supporting local people to stop smoking, in particular through the commissioning of stop smoking services.
- There is strong evidence that stop smoking services are both effective at supporting people to stop smoking in the long term and cost-effective.
- Studies investigating the effectiveness of programmes which aim to prevent smoking initiation amongst young people have mixed results, with some studies finding that these programmes only serve to delay smoking initiation rather than prevent it entirely.
- Local authorities looking to reduce the impact of smoking in their community are advised to invest in programmes that support people already smoking with stopping because the evidence base for the stop smoking services is stronger than the evidence for smoking prevention programmes.

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### **1. Introduction**

There are a number of ways to reduce the harm caused by tobacco use, including reducing the amount of tobacco a person consumes and reducing the harmfulness of the tobacco products used. Large-scale, national interventions such as mass-media campaigns or increases in taxation are known to reduce smoking prevalence, but a significant reduction in tobacco use can also be achieved through local level interventions which either prevent people from starting to smoke or help people who smoke to quit. There is substantial evidence that interventions that help people stop smoking are both effective and highly cost-effective. However, the evidence for measures aiming to prevent smoking initiation is less clear. While there is evidence that some school-based interventions are effective and cost-effective, others, including interventions that use incentives or community-based multimodal interventions, have been less successful. Moreover, the long-term impact of interventions to reduce smoking initiation remains unclear. Importantly, tobacco control aims to both prevent the uptake of smoking and help people who smoke to quit. The evidence suggests that the benefits associated with smoking cessation will accrue not only more quickly, but will also be more pronounced, compared with the benefits associated with smoking prevention.

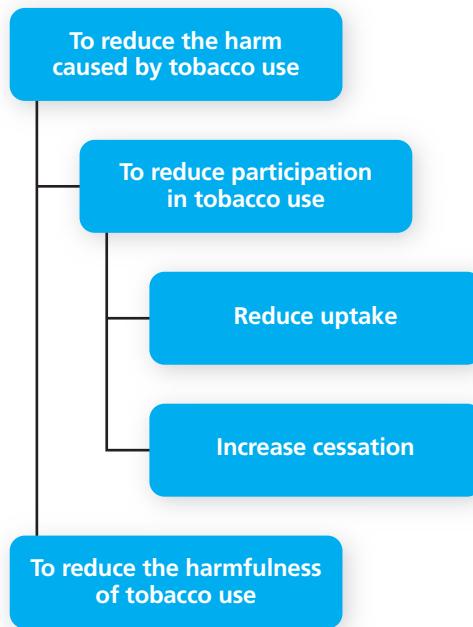
### **2. Background**

Tobacco control initiatives can be categorised as strategies based on legislation and policy, research, awareness raising and 'denormalisation', and intervention programmes;<sup>1</sup> with each of these strategies ranging along a continuum from an individual to a more population-based approach.<sup>2</sup>

There is not universal agreement about the ultimate aim of tobacco control. Some argue that the ultimate goal should be to eliminate addiction to nicotine, however most healthcare professionals agree that the first priority should be a reduction of the harm caused by tobacco. There are a number of ways to achieve this, as shown in Figure 1. At local level, this can involve interventions that focus either on reducing uptake or on increasing cessation. This briefing will discuss the relative merit of both.

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Figure 1: Schematic of the goals of tobacco control



### 3. Stop smoking services (SSS)

The goal of smoking cessation interventions is to ensure that the motivation to not smoke is greater than the motivation to smoke at all times when the opportunity to smoke exists.<sup>3</sup> The SSS in the UK provide complex behavioural support that runs over a number of weeks, employing behaviour change techniques that encompass building rapport, advice and encouragement, and activities designed to maximise motivation to quit, minimise the desire to smoke, develop alternative coping strategies and improve medication adherence.<sup>4</sup>

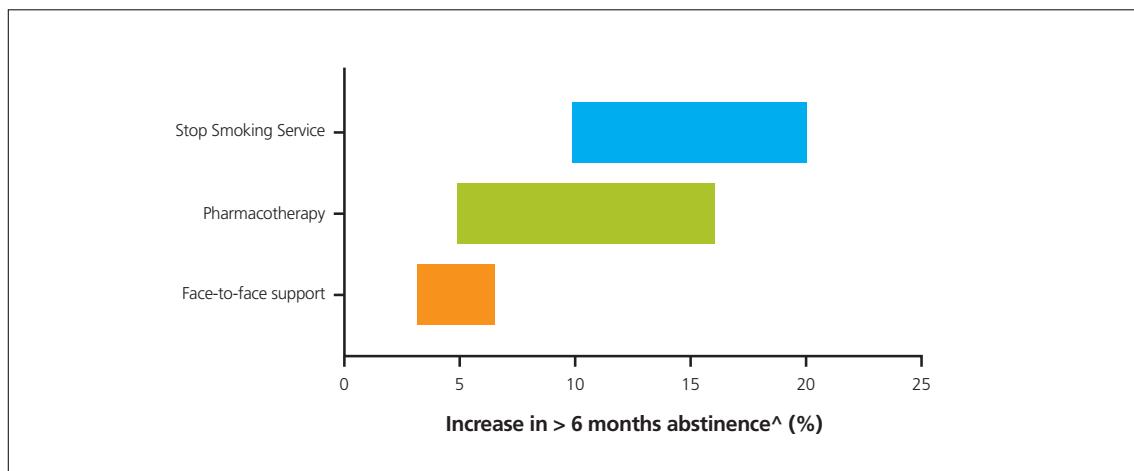
Typically this behavioural support will include a variety of components, including: provision of stop smoking aids and addressing concerns about their use, promoting appropriate identity change from 'smoker' to 'non-smoker', advising on alternative strategies to cope with stress, and avoiding or managing high-risk situations.<sup>5</sup> Key aspects of the programme structure should include a specified quit date and the recording of expired-air carbon monoxide (CO monitor test) to confirm abstinence.<sup>6</sup> Support sessions can be either for an individual or a group.

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### 3.1 Effectiveness

Face-to-face support delivered to individuals<sup>7</sup> and in groups<sup>8</sup> combined with stop smoking aids (including nicotine replacement therapy (NRT),<sup>9</sup> bupropion<sup>10</sup> and varenicline<sup>11</sup>) have been shown to be highly effective in improving long-term quit rates (see Figure 2). The combination of NRT with behavioural interventions has been shown to increase success rates.<sup>9</sup> The six-month abstinence rates for those treated in SSS are likely to be 10–20% higher than for those quitting without help<sup>12</sup> and around 7% compared with those receiving less intensive behavioural support such as brief advice or usual care.<sup>13</sup>

**Figure 2: Effectiveness of smoking cessation interventions\***



\* ^ Comparator is No support / Placebo; Data come from Cochrane reviews<sup>7-11</sup>

Based on a standard relapse curve,<sup>14</sup> the SSS more than triple abstinence rates in the long-term compared with people who quit smoking without support. Permanent cessation rates of SSS clients are 5–10% higher than for those quitting cold turkey.<sup>12</sup>

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### 3.2 Cost-effectiveness

Cost-effectiveness analysis usually focuses on the additional cost per additional unit of health gain created by one compared with another intervention: the incremental cost-effectiveness ratio.<sup>16</sup> This can be expressed as cost per life-years or disability / quality adjusted life years (D/QALY) gained,<sup>17</sup> the latter weighting years gained according to the perceived life quality in terms of a number of factors such as pain / discomfort, mobility and mental well-being.<sup>18</sup> The National Institute for Health and Care Excellence (NICE) has adopted a cost-effectiveness threshold of £20,000 – £30,000 per QALY above which interventions are unlikely to be recommended but it should be acknowledged that the correct level of this threshold is considered implicit rather than explicit<sup>19</sup> and varies enormously between countries.<sup>20</sup>

All currently available pharmacotherapy has been shown to be highly cost-effective<sup>21</sup> as have behavioural interventions and the combination of both.<sup>22</sup>

On its own, intensive behavioural support has been estimated to cost between £873<sup>23</sup> and €8,200<sup>24</sup> (or £4,800 based on UK data)<sup>25</sup> per D/QALY gained, depending on various factors. Despite large variation in estimates, this is significantly below the NICE threshold.

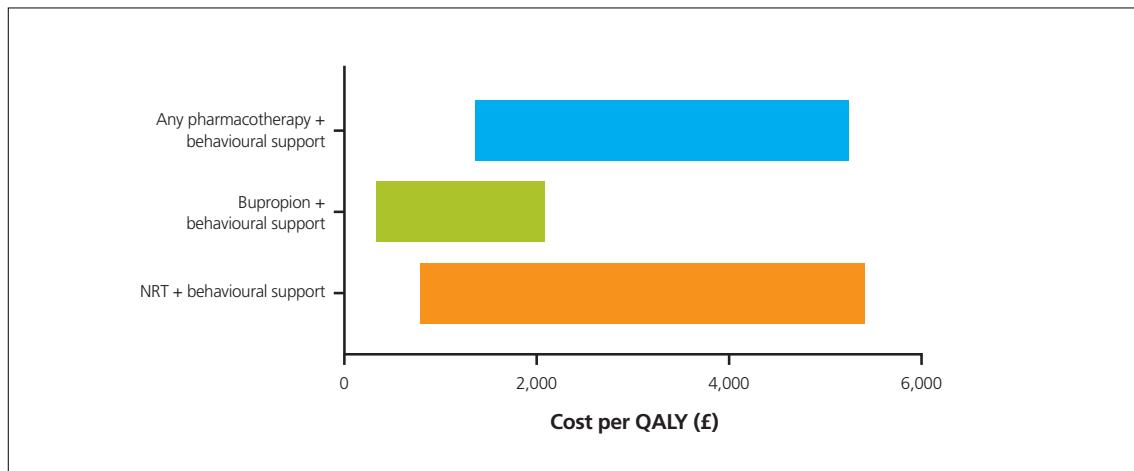
There is a near ten-fold range for NRT from £494 to £3,554 per D/QALY and for bupropion from £316 to £2,212 per D/QALY,<sup>26</sup> again substantially below existing cost-effectiveness thresholds.

Estimates for varenicline range from £950<sup>27</sup> to £1,140<sup>28</sup> per D/QALY gained. This depends on various assumptions, but these figures are also well below recommended guidelines.

As shown in Figure 3, the combination of various stop smoking aids with intensive behavioural support (similar to the treatment offered by the SSS) is therefore among the most cost-effective interventions available in the health care sector.<sup>29</sup> The SSS are recommended by NICE<sup>30</sup> and their Return On Investment tool for local authorities can provide estimates for different combinations of treatment at local level.<sup>31</sup> In fact, when considering long-term health-costs averted by smoking cessation, most interventions are dominant or cost-saving (i.e. are more effective and cost less than doing nothing).<sup>22</sup>

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**Figure 3: Cost-effectiveness of smoking cessation interventions\***



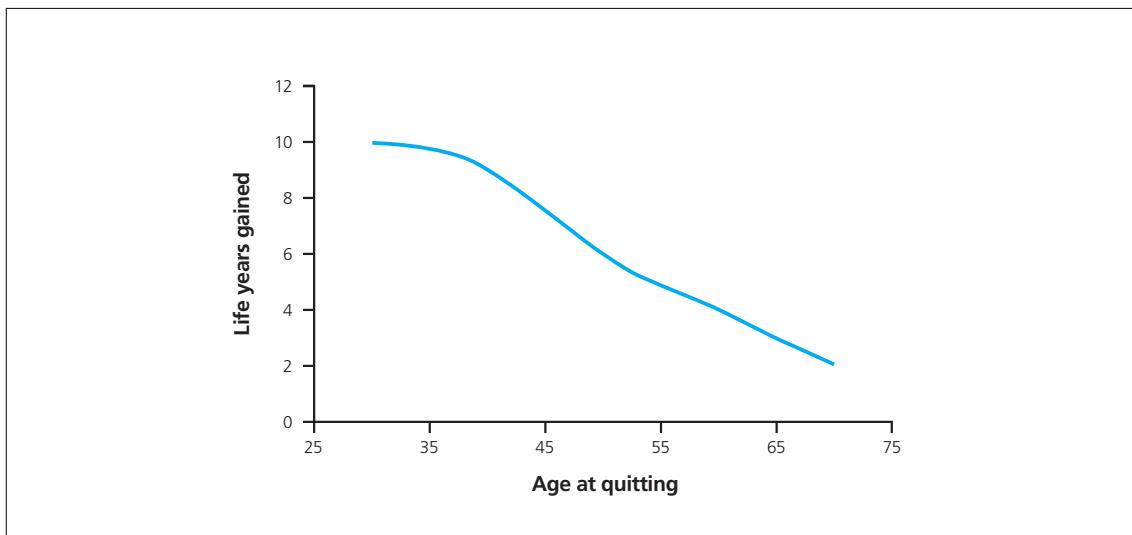
\* Data expressing cost-effectiveness compared with control condition (usual care / unsupported quit) were transferred into £ per D/QALY, where necessary, representing costs for average user at time of analysis; based on data from various analyses<sup>22;24;32;33</sup>

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## 4. Reduction of smoking uptake at local level

Another way to reduce the harm caused by tobacco is to prevent people from taking up smoking. Figure 4 shows that smoking-related risk tends to accumulate incrementally and so stopping smoking earlier in life, or preferably never starting to smoke regularly, is the most beneficial choice. A number of interventions of varying quality have been designed at local level that aim to dissuade young people from starting to smoke (please note that this excludes mass media interventions and point of sale interventions which tend to be national in scale, see Brinn et al<sup>34</sup> and NICE public health guidance 14<sup>35</sup> for details).

**Figure 4: Life-years saved by age of quitting smoking;** data from Doll et al<sup>36</sup>



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### **4.1 Effectiveness**

The most obvious route to prevent uptake of smoking at local level is to involve family members or peers in intervention programmes, as the behaviour of significant others is a strong determinant of adolescent smoking.<sup>37</sup> However, the quality of these programmes vary and there is little evidence that they are effective in the long term.

A Cochrane review of family-based interventions found that in four out of nine studies, fewer people took up smoking compared with control groups (i.e. no intervention) at long-term follow-up (ranging from three to seven years). Results indicate that the risk of smoking initiation is halved with odds ratios (OR) of around 0.5.<sup>38</sup> However, four further studies found no effect and one<sup>39</sup> even observed increased likelihood of smoking in the intervention group.

Multi-component community interventions provide equally mixed results. These interventions could involve media promotion, public policy, health care provider initiatives, schools, contests and so on, but all with a specific focus on the local community. The results suggest that effects are modest and, whilst significant for some individual interventions, are not significant overall with an OR 0.83 (95%CI 0.59–1.17) for weekly smoking rates at 2–15 year follow-up and OR 0.97 (95%CI 0.81–1.16) for monthly smoking rates.<sup>40</sup>

**Table 1: Overview of interventions to prevent uptake of smoking**

Intervention	Impact	Issues
<b>Family-based programmes</b>	+ / ?	Relatively limited literature; small but somewhat inconsistent effects in well-designed RCTs
<b>Community interventions</b>	+ / ?	Some evidence but effect weak and quality of studies is relatively poor
<b>School-based programmes</b>	+	Intermediate but no short-term effects; restricted to particular programme components; unclear if effect persists beyond school-age
<b>Incentives</b>	- / ?	Relatively little data of mixed quality

++ Good evidence for clinically significant effect; + Evidence suggestive of clinically significant effect;  
? Insufficient evidence to draw general conclusions; – Evidence suggestive of no clinically significant effect

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Some school-based programmes have been found to be effective, reducing uptake of smoking by an average of 12%.<sup>41</sup> Studies including more than 140,000 school children show that at longest follow-up (more than one year) interventions delivered in schools can be effective (OR 0.88, 95% CI 0.82–0.96); however, this is not the case when considering smoking uptake at one year or less (OR 0.94, 95%CI 0.85–1.05). Yet, there is little evidence that the effect is durable beyond school-age and it is unclear whether interventions simply delay the uptake of smoking.<sup>42</sup> In general, programmes which include social competence curricula, or combine social competence with social influence curricula, are effective. Those which solely deliver information or social influence components, or programmes which are multimodal (involving parents, teachers and the community), have not proven to be effective.<sup>41</sup> Indirect comparison suggests that interventions which have adult presenters are more successful than those with peer presenters.

Incentive schemes use rewards (financial or non-financial) to encourage behaviour change and represent a classic intervention strategy.<sup>43</sup> A number of studies in Europe have evaluated the *Smokefree Class Competition* in which an entire class of students commit to remaining smoke free for six months, with prizes awarded if more than 90% are non-smoking at the end of the six month period.<sup>44</sup> A Cochrane review of studies of this intervention (which also included a local American study that provided prizes for reduced smoking rates and improved knowledge on smoking risks<sup>45</sup>) finds no evidence that incentives can effectively prevent smoking initiation among children and adolescents (OR 1.00, 95% CI 0.77–1.30).<sup>46</sup>

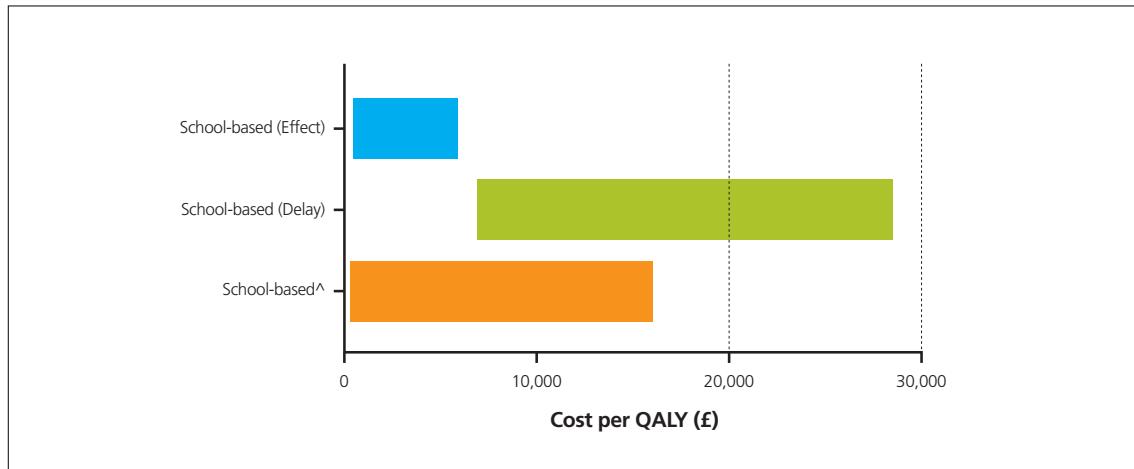
### **4.2 Cost-effectiveness**

The NICE guidance on school-based interventions for smoking prevention include two economic analyses (a cost-effectiveness review and a cost-effectiveness modelling exercise).<sup>47</sup> The review found only limited evidence of cost-effectiveness due to uncertainty surrounding estimates which are wide ranging (see Figure 5) and may or may not include deterioration of long-term effects. Moreover, most benefits are indirect and, as the studies were conducted in other countries, they are possibly not applicable to the UK.<sup>48</sup>

The study that modelled cost-effectiveness was based on two alternative assumptions: that school-based interventions only serve to delay the uptake of smoking; or that they are effective in decreasing rates of smoking uptake. This modelling shows that the interventions are likely to be cost-effective below the £30,000 per QALY willingness-to-pay threshold (but, for the delay model, not necessarily at the £20,000 per QALY threshold, see Figure 5).<sup>49</sup>

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Figure 5: Cost-effectiveness of school-based interventions to prevent smoking uptake\*



\* ^ data from review<sup>48</sup> otherwise from modelling report<sup>49</sup>

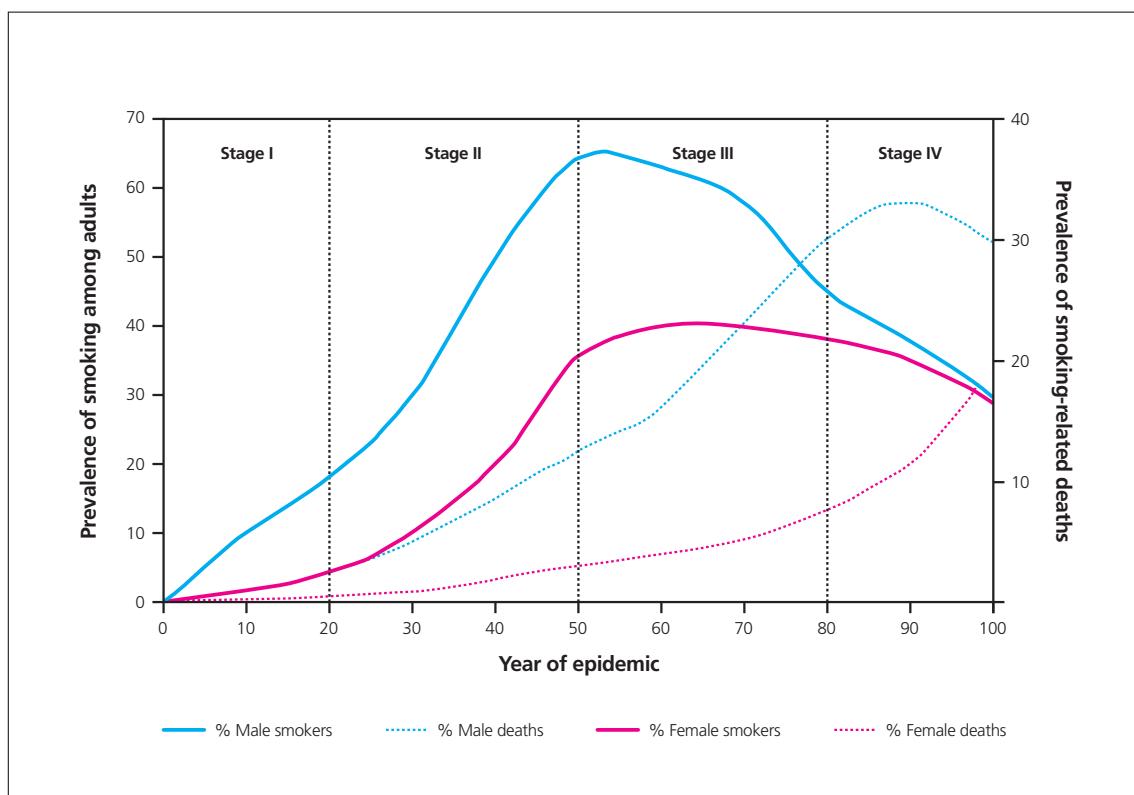
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## 5. Impact of prevention vs. smoking cessation

When comparing the effectiveness of smoking prevention programmes versus smoking cessation in reducing smoking-related mortality, it is necessary to consider the long-term impact when deciding where to focus efforts. This is especially true in times when resources are limited.

One of the main findings of long-term epidemiological studies, shown in Figure 6 below, is the delayed effect that changes in smoking prevalence have on reducing in smoking-related mortality, evidencing a time-lag of about 30 years.<sup>51;52</sup> This is most likely due to the gestation periods of smoking-related morbidities such as lung cancer.

**Figure 6: Stages of the tobacco epidemic** (adapted from Lopez et al<sup>50</sup>)



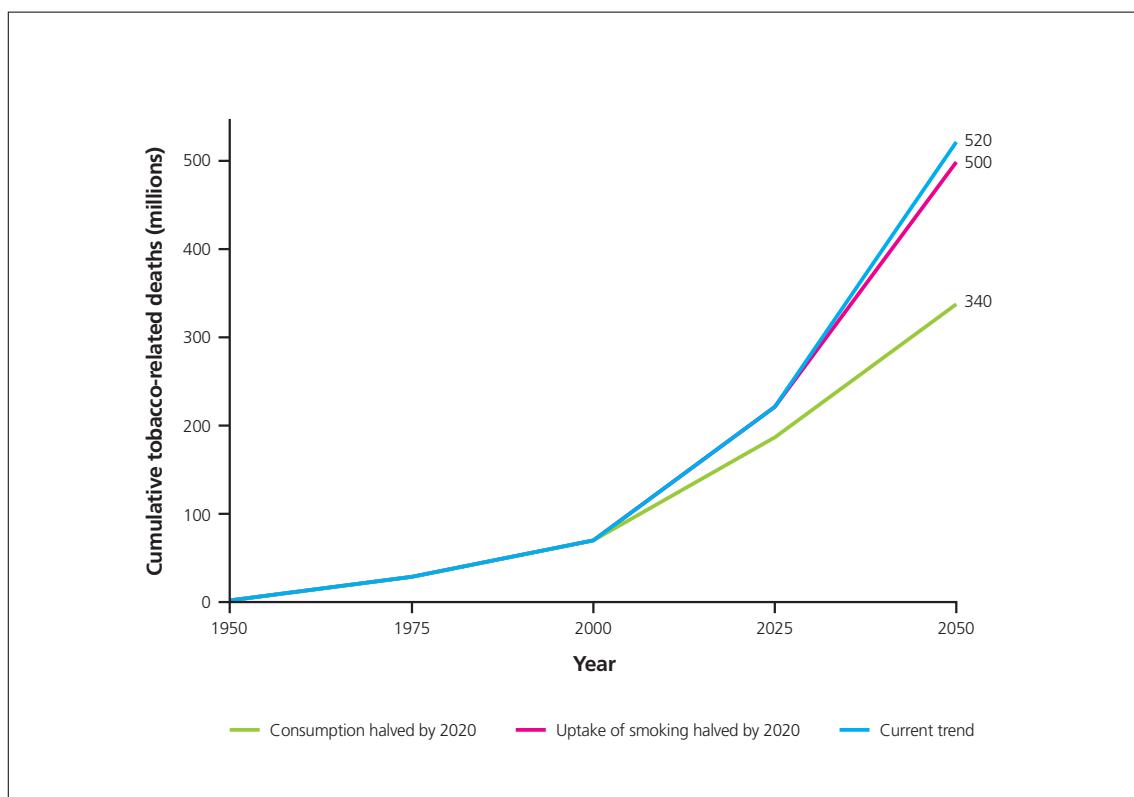
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By contrast, investing in smoking cessation can have an immediate effect on an individual's risk of developing a smoking-related disease, particularly coronary heart disease and chronic obstructive pulmonary disease, and also results in improvement in mental health.<sup>53</sup>

Therefore, reductions in smoking prevalence that would be achieved through preventing the uptake of smoking are unlikely to show an impact on smoking-related mortality rates until several decades later. In fact, modelling of the potential impact of smoking prevention (halving the uptake of smoking) vs. smoking cessation (halving consumption) indicates that achieving either aim by 2020 would make a significant difference in terms of averted mortality by 2050 (see Figure 7). However, increasing smoking cessation rates would have a far bigger and more immediate impact than smoking prevention.

**Figure 7: Estimated deaths from tobacco as a function of intervention strategy**

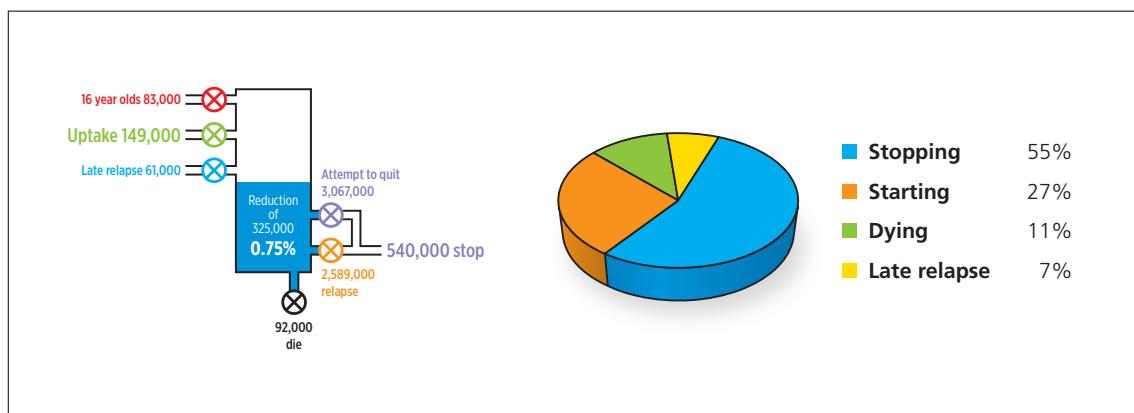
(adapted from Jha and Chaloupka<sup>54</sup>)



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Put differently, when the different paths that contribute to overall smoking prevalence are modelled, as is done in the Smoking Pipe Model in Figure 8, it is clear that people who stop smoking long-term make by far the biggest contribution to overall changes in smoking prevalence (55%) rather than people who have never smoked who would be prevented from starting (27%).

**Figure 8: The Smoking Pipe Model,** data are based on UK 2012–2013 estimates and come from Robert West ([www.smokinginengland.com](http://www.smokinginengland.com))



There are a myriad of reasons why young people take up smoking including family example, availability of cigarettes, high smoking rates amongst peers, socioeconomic status, tobacco marketing, and smoking in films and television.<sup>55</sup> However, evidence shows that the primary risk factor is having parents or siblings who smoke. Children with family members who smoke are up to three times more likely to start smoking themselves than children whose parents don't smoke.<sup>56</sup> It therefore follows that the most effective means of reducing smoking amongst young people is to reduce smoking amongst adults in the wider community.<sup>57; 58; 59</sup>

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### **6. Conclusions**

Reducing smoking prevalence should be a high priority for local authorities because of the terrible impact of tobacco on the community. In the current economic climate, limited resources place an obligation on local authorities to invest in initiatives that will have the greatest impact. This is not to say that every school-based initiative should stop, just that a cost-benefit ratio should be applied in the light of this evidence when committing funds.

Initiatives that aim to reduce the number of young people who take up smoking are not effective in the long term and may only serve to delay smoking initiation rather than prevent it.

The evidence shows that specialist stop smoking services, offering evidence-based behavioural support alongside effective stop smoking aids, provide people with highly effective treatment for tobacco dependence. These services are not only effective in supporting people to quit smoking but are highly cost-effective as well.

Local authorities looking to reduce the impact of smoking in their community are advised to invest in programmes that support people to stop smoking because the evidence-base for the stop smoking services is stronger than the evidence for smoking prevention programmes.

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