

<b>Title:</b> <b>Impact Assessment for the prohibition on the sale of tobacco from vending machines</b>	<b>Impact Assessment (IA)</b>
	IA No: 3062
	Date: 02/2012
	Stage: Final
	Source of intervention: Domestic
<b>Lead department or agency:</b> Department of Health	Type of measure: Secondary legislation
<b>Other departments or agencies:</b>	

## Summary: Intervention and Options

**What is the problem under consideration? Why is government intervention necessary?**

A significant proportion of young smokers buy cigarettes from vending machines – while, for under-age smokers, this is illegal, it is difficult to enforce the restriction. Government intervention is necessary to prevent the access that young people under the legal age of sale of 18 have to tobacco from this source. The current voluntary code of practice on the siting of cigarette vending machines to prevent underage access (the NACMO code of practice) has proved to be insufficiently effective in restricting the access young people have to this source of tobacco consumption.

**What are the policy objectives and the intended effects?**

The primary policy objective is to reduce smoking uptake, prevalence and/or cigarettes smoked by people under the age of 18, to generate public health benefits.

The policy will also create a more supportive environment for adults who are trying to quit.

**What policy options have been considered, including any alternatives to regulation? Please justify preferred option (further details in Evidence Base)**

- 1) 'Do nothing', maintaining the voluntary code of practice on the siting of vending machines.
- 2) Prohibit the sale of tobacco from vending machines.

The Health Act 2009 only provides regulation making powers to prohibit the sale of tobacco from vending machines. The Government remains concerned that vending machines continue to be an easy and often unsupervised source of tobacco for young people, and that the current voluntary code of practice has not achieved the intended effect of limiting access to tobacco from vending machines adequately.

**Will the policy be reviewed?** It will be reviewed. If applicable, set review date: 10/2016

**What is the basis for this review?** PIR. If applicable, set sunset clause date: N/A

<b>Are there arrangements in place that will allow a systematic collection of monitoring information for future policy review?</b>	Yes
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**SELECT SIGNATORY Sign-off** For final proposal stage Impact Assessments:

*I have read the Impact Assessment and I am satisfied that (a) it represents a fair and reasonable view of the expected costs, benefits and impact of the policy, and (b) the benefits justify the costs.*

Signed by the responsible SELECT SIGNATORY:  Date: 2/5/2012

# Summary: Analysis and Evidence

Policy Option 1

**Description:**

Do Nothing, maintaining the voluntary code of practice on the siting of vending machines.

Price Base Year N/A	PV Base Year N/A	Time Period Years N/A	Net Benefit (Present Value (PV)) (£m)		
			Low: 0	High: 0	Best Estimate: 0

COSTS (£m)	Total Transition (Constant Price) Years		Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
	Low	0		
High	0		0	0
Best Estimate	0		0	0

**Description and scale of key monetised costs by 'main affected groups'**  
Health affected by continued access to vending machines for young people and adults

**Other key non-monetised costs by 'main affected groups'**  
Morbidity affected by continued access to vending machines for young people and adults

BENEFITS (£m)	Total Transition (Constant Price) Years		Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
	Low	0		
High	0		0	0
Best Estimate	0		0	0

**Description and scale of key monetised benefits by 'main affected groups'**  
Convenience for adults when buying tobacco products

**Other key non-monetised benefits by 'main affected groups'**  
Convenience for retailers to maintain the status quo

<b>Key assumptions/sensitivities/risks</b>	<b>Discount rate (%)</b>	3.5
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<b>Direct impact on business (Equivalent Annual) £m:</b>			<b>In scope of OIOO?</b>	<b>Measure qualifies as</b>
Costs: 0	Benefits: 0	Net: 0	No	NA

## Enforcement, Implementation and Wider Impacts

What is the geographic coverage of the policy/option?	England				
From what date will the policy be implemented?	N/A				
Which organisation(s) will enforce the policy?	N/A				
What is the annual change in enforcement cost (£m)?	N/A				
Does enforcement comply with Hampton principles?	N/A				
Does implementation go beyond minimum EU requirements?	N/A				
What is the CO <sub>2</sub> equivalent change in greenhouse gas emissions? (Million tonnes CO <sub>2</sub> equivalent)	Traded:		Non-traded:		
Does the proposal have an impact on competition?					
What proportion (%) of Total PV costs/benefits is directly attributable to primary legislation, if applicable?	Costs:		Benefits:		
Distribution of annual cost (%) by organisation size (excl. Transition) (Constant Price)	Micro	< 20	Small	Medium	Large
Are any of these organisations exempt?	No	No	No	No	No

## Specific Impact Tests: Checklist

Set out in the table below where information on any SITs undertaken as part of the analysis of the policy options can be found in the evidence base. For guidance on how to complete each test, double-click on the link for the guidance provided by the relevant department.

Please note this checklist is not intended to list each and every statutory consideration that departments should take into account when deciding which policy option to follow. It is the responsibility of departments to make sure that their duties are complied with.

Does your policy option/proposal have an impact on...?	Impact	Page ref within IA
<b>Statutory equality duties<sup>1</sup></b> <a href="#">Statutory Equality Duties Impact Test guidance</a>	No	
<b>Economic impacts</b>		
Competition <a href="#">Competition Assessment Impact Test guidance</a>	No	
Small firms <a href="#">Small Firms Impact Test guidance</a>	No	
<b>Environmental impacts</b>		
Greenhouse gas assessment <a href="#">Greenhouse Gas Assessment Impact Test guidance</a>	No	
Wider environmental issues <a href="#">Wider Environmental Issues Impact Test guidance</a>	No	
<b>Social impacts</b>		
Health and well-being <a href="#">Health and Well-being Impact Test guidance</a>	No	
Human rights <a href="#">Human Rights Impact Test guidance</a>	No	
Justice system <a href="#">Justice Impact Test guidance</a>	No	
Rural proofing <a href="#">Rural Proofing Impact Test guidance</a>	No	
<b>Sustainable development</b> <a href="#">Sustainable Development Impact Test guidance</a>	No	

<sup>1</sup> Public bodies including Whitehall departments are required to consider the impact of their policies and measures on race, disability and gender. It is intended to extend this consideration requirement under the Equality Act 2010 to cover age, sexual orientation, religion or belief and gender reassignment from April 2011 (to Great Britain only). The Toolkit provides advice on statutory equality duties for public authorities with a remit in Northern Ireland.

# Summary: Analysis and Evidence

## Policy Option 2

### Description:

Prohibit the sale of tobacco from vending machines.

Price Base Year 2010	PV Base Year 2011	Time Period Years 10	Net Benefit (Present Value (PV)) (£m)		
			Low: £322m	High: £1388m	Best Estimate: £855m

COSTS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	Optional		Optional	£369m
High	Optional		Optional	£687m
Best Estimate	£23m		£50m	£528m

#### Description and scale of key monetised costs by 'main affected groups'

Immediate one-off cost: the total value of UK cigarette vending machines (57,934 machines at £375 each), plus the cost of bring forward disposal costs (57,934 x £27).

Average annual discounted costs - lost tobacco duty of £32m, £19m annual loss of consumer surplus (to legitimate adult smokers who no longer have the convenience of vending machines). The direct impact on business is explained in Annex 5.

#### Other key non-monetised costs by 'main affected groups'

BENEFITS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	Optional		Optional	£691m
High	Optional		Optional	£2,074m
Best Estimate			£138m	£1,383m

#### Description and scale of key monetised benefits by 'main affected groups'

Health benefits to young people based on a reduction in total cigarette consumption, valued at £919m (best estimate).

Health benefits to adults based on a reduction in total cigarette consumption, valued at £464m (best estimate).

#### Other key non-monetised benefits by 'main affected groups'

Reduced morbidity arising from reduced cigarette consumption

#### Key assumptions/sensitivities/risks

Discount rate (%) 3.5

Enforcement is fully effective. Benefits range is due to uncertainty in what proportion of tobacco sales would transfer to other retail sources versus those that would be lost altogether. As per DH Technical Guidance, future benefits are discounted on the assumption that the utility of health is invariant with income.

Direct impact on business (Equivalent Annual) (£m):				In scope of OIOO?	Measure qualifies as
Costs:	9.8	Benefits:	0	Net:	9.8
				Yes	IN

## Enforcement, Implementation and Wider Impacts

What is the geographic coverage of the policy/option?	England				
From what date will the policy be implemented?	01/10/2011				
Which organisation(s) will enforce the policy?	Local authorities (trading standards departments)				
What is the annual change in enforcement cost (£m)?	Nil or lower than present				
Does enforcement comply with Hampton principles?	Yes				
Does implementation go beyond minimum EU requirements?	Yes				
What is the CO <sub>2</sub> equivalent change in greenhouse gas emissions? (Million tonnes CO <sub>2</sub> equivalent)	Traded:		Non-traded:		
Does the proposal have an impact on competition?	No				
What proportion (%) of Total PV costs/benefits is directly attributable to primary legislation, if applicable?	Costs:		Benefits:		
Distribution of annual cost (%) by organisation size (excl. Transition) (Constant Price)	Micro	< 20	Small	Medium	Large
Are any of these organisations exempt?	No	No	No	No	No

## Specific Impact Tests: Checklist

Set out in the table below where information on any SITs undertaken as part of the analysis of the policy options can be found in the evidence base. For guidance on how to complete each test, double-click on the link for the guidance provided by the relevant department.

Please note this checklist is not intended to list each and every statutory consideration that departments should take into account when deciding which policy option to follow. It is the responsibility of departments to make sure that their duties are complied with.

Does your policy option/proposal have an impact on...?	Impact	Page ref within IA
<b>Statutory equality duties<sup>1</sup></b> <a href="#">Statutory Equality Duties Impact Test guidance</a>	Yes	Annex 2
<b>Economic impacts</b>		
Competition <a href="#">Competition Assessment Impact Test guidance</a>	Yes	Annex 2
Small firms <a href="#">Small Firms Impact Test guidance</a>	Yes	Annex 2
<b>Environmental impacts</b>		
Greenhouse gas assessment <a href="#">Greenhouse Gas Assessment Impact Test guidance</a>	No	
Wider environmental issues <a href="#">Wider Environmental Issues Impact Test guidance</a>	No	
<b>Social impacts</b>		
Health and well-being <a href="#">Health and Well-being Impact Test guidance</a>	Yes	p 15 -23
Human rights <a href="#">Human Rights Impact Test guidance</a>	Yes	Annex 2
Justice system <a href="#">Justice Impact Test guidance</a>	No	
Rural proofing <a href="#">Rural Proofing Impact Test guidance</a>	No	
<b>Sustainable development</b> <a href="#">Sustainable Development Impact Test guidance</a>	No	

<sup>1</sup> Public bodies including Whitehall departments are required to consider the impact of their policies and measures on race, disability and gender. It is intended to extend this consideration requirement under the Equality Act 2010 to cover age, sexual orientation, religion or belief and gender reassignment from April 2011 (to Great Britain only). The Toolkit provides advice on statutory equality duties for public authorities with a remit in Northern Ireland.

## Evidence Base (for summary sheets) – Notes

Use this space to set out the relevant references, evidence, analysis and detailed narrative from which you have generated your policy options or proposal. Please fill in **References** section.

### References

Include the links to relevant legislation and publications, such as public Impact Assessments of earlier stages (e.g. Consultation, Final, Enactment) and those of the matching IN or OUTs measures.

No.	Legislation or publication
1	Consultation on the future of tobacco control (31 May 2008): <a href="http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_085114">www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_085114</a>
2	Impact Assessments for the Health Bill 2009 (updated May 2009): <a href="http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/documents/digitalasset/dh_099759.pdf">www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/documents/digitalasset/dh_099759.pdf</a>
3	Consultation on proposed regulations including consultation stage Impact Assessment (November 2009): <a href="http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/documents/digitalasset/dh_109261.pdf">http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/documents/digitalasset/dh_109261.pdf</a>
4	The Protection from Tobacco (Sales from Vending Machines)(England) Regulations 2010 (including explanatory note): <a href="http://www.legislation.gov.uk/ukdsi/2010/9780111492048/contents">http://www.legislation.gov.uk/ukdsi/2010/9780111492048/contents</a>
5	Healthy Lives, Healthy People: A tobacco control plan for England (March 2011): <a href="http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_124917">http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_124917</a>

### Evidence Base

Ensure that the information in this section provides clear evidence of the information provided in the summary pages of this form (recommended maximum of 30 pages). Complete the **Annual profile of monetised costs and benefits** (transition and recurring) below over the life of the preferred policy (use the spreadsheet attached if the period is longer than 10 years).

The spreadsheet also contains an emission changes table that you will need to fill in if your measure has an impact on greenhouse gas emissions.

**Table 1: Annual profile of monetised costs and benefits\* - (£m) constant prices**

	Y <sub>0</sub>	Y <sub>1</sub>	Y <sub>2</sub>	Y <sub>3</sub>	Y <sub>4</sub>	Y <sub>5</sub>	Y <sub>6</sub>	Y <sub>7</sub>	Y <sub>8</sub>	Y <sub>9</sub>	Total	Average
Total Transition costs	23.3	-	-	-	-	-	-	-	-	-	23.3	
Total Annual recurring cost	58.6	56.6	54.7	52.9	51.1	49.4	47.7	46.1	44.5	43.0	504.5	50.45
Total annual costs	81.9	56.6	54.7	52.9	51.1	49.4	47.7	46.1	44.5	43.0	527.9	52.8
Total Transition benefits	-	-	-	-	-	-	-	-	-	-	-	-
Total Annual recurring benefits	152.1	148.8	145.6	142.5	139.5	136.5	133.6	130.8	128.1	125.4	1,382.8	138.3

Total annual benefits	152.1	148.8	145.6	142.5	139.5	136.5	133.6	130.8	128.1	125.4	1,382.8	138.3
Business transition costs	23.3	-	-	-	-	-	-	-	-	-	23.3	
Business annual recurring costs	8.6	8.1	7.7	7.3	6.9	6.5	6.1	5.9	5.7	5.5	68.4	
Business annual costs	31.9	8.1	7.7	7.3	6.9	6.5	6.1	5.9	5.7	5.5	91.7	
Business transition benefits*											-	
Business annual recurring benefits*											-	
Business total annual benefits*											-	

NOTE: Transition costs are undiscounted as they are assumed to be incurred at the beginning of the period. All other values are discounted, including those in year 0.

\* For non-monetised benefits please see summary pages and main evidence base section

# Evidence Base

## Introduction

1. The Protection from Tobacco (Sales from Vending Machines)(England) Regulations 2010 ("the regulations") were made on 17 March 2010, after being approved by each House of Parliament. The regulations prohibit the sale of tobacco from automatic machines, and have a coming into force date of 1 October 2011.
2. The Government is committed to bringing these regulations into force. In March 2011, the Government published *Healthy Lives, Healthy People: A Tobacco Control Plan for England*, which included the following commitment:

From 1 October 2011, tobacco products will no longer be sold from vending machines in England. As vending machines are self-service, they offer young people easy and poorly supervised access to tobacco. By ending this source of tobacco we will reduce the number of young people taking up smoking as well as extending a supportive environment for adult smokers who are trying to quit.
3. The legislation has been the subject of judicial review cases brought by the tobacco industry. Cases have been heard in the High Court and the Court of Appeal, and both have ruled that the legislation is lawful.
4. The Final Impact Assessment (IA) for the prohibition of the sale of tobacco products from vending machines appraised the impact of these regulations, and was made available at the time that the regulations were considered by Parliament.
5. This IA has been produced to update the Regulatory Policy Committee with the most current estimates of costs and benefits associated with the policy. This IA uses the same methodology as the January 2010 final Impact Assessment. The net benefits of the policy over the ten year period have changed, due to the use of newer and more appropriate evidence, and reflects the evidence that the Department of Health made available to the courts during the judicial review cases *inter alia*.

## Background

6. It is illegal to sell tobacco products to those under the age of 18. The age of sale for tobacco products was increased from 16 to 18 years on 1 October 2007. However, because of their automated and often unsupervised nature, vending machines continue to present a means for under-18s to purchase tobacco products.
7. In reflection of the often easy access that young people have to tobacco from vending machines, the Government worked with the National Association of Cigarette Machine Operators (NACMO) to develop a code of practice defining the siting arrangements of vending machines (the NACMO code of practice). The NACMO code of practice was set out in the 1998 *Smoking Kills White Paper* that said:

The new code provides clear guidance to machine operators on the siting arrangements expected. A machine should be sited in a monitored, supervised area so that staff can be sure of preventing its use by young people.... There is now no excuse for machine operators or pub, club and restaurant managers to site machines inappropriately.<sup>1</sup>

8. Information from NACMO suggests that 78% of machines are located in public houses, with 10% being located in clubs, 7% in hotels or restaurants, 3% in shops, 1% in bingo halls and 1%

<sup>1</sup>

HM Government (1998). *Smoking Kills: A White Paper on Tobacco*. TSO, London.



elsewhere.

9. Nonetheless, National Statistics survey evidence published in *Smoking, drinking and drug use among young people in 2008*<sup>2</sup> suggests that vending machines remain a source of tobacco for those aged 11 to 15 despite being comparatively more expensive than cigarettes from retail outlets. The importance of vending machines as a source of cigarettes for young people has decreased in recent years, and they are less commonly cited than other sources of tobacco (such as purchases from shops and being given cigarettes by friends). Although the minimum age of sale has now risen to 18, this is unlikely to have impacts on the ease of accessing tobacco from vending machines.
10. The other common sources of tobacco for young people are being addressed by other measures such as raising the age of sale, strengthening sanctions against retailers who sell to people under the legal age, increased activity to reduce the availability of illicit tobacco, enforcement activity by local authorities and through effective media communications campaigns.
11. As tobacco vending machines are estimated to account for 1% of the UK market in tobacco sales, it appears that a disproportionate number of young people under the minimum legal age for sale of tobacco purchase their cigarettes from vending machines.

## Rationale for further control on tobacco vending machines

12. Tackling tobacco use is a public health priority for the Government. Tobacco smoking is proven to cause serious harm to the health of the smoker. It also poses significant externalities to the rest of society and is a leading cause of health inequalities. Smoking prevalence is higher among routine and manual groups, and tobacco use is a significant cause of health inequalities. Treating smoking-related diseases is estimated to cost the NHS £2.7bn per annum. In 2008/09, nearly half a million hospital admissions in England among adults over 35 were attributable to smoking (5 per cent of all hospital admissions). Government tobacco policies seek both to support adult smokers to quit and to prevent young people taking up smoking in the first place.
13. Young people are uniquely vulnerable consumers, as they do not always have the capacity to make informed decisions, and society generally recognises this by providing greater protections for children than for adults. Nicotine addiction can develop extremely quickly in children. The National Statistics *General Household Survey* estimates that around two-thirds of smokers say they started smoking regularly before turning 18. In England, an estimated 200,000 young people aged 11-15 regularly smoke. The Royal College of Physicians has concluded that:

Compared with other addicting substances (including cocaine and heroin), initial use of nicotine is more likely to lead to addictive use, and the prevalence of addiction among all users is higher than that observed for other addictive substances.
14. Government intervention is justified to prevent young people from accessing tobacco. The Government believes that children can far too easily access tobacco from vending machines, and that action is necessary to prevent this. After being in place for over ten years, the current voluntary code of practice on the siting of tobacco vending machines to prevent underage access (the NACMO code of practice) has proved to be insufficiently effective in restricting the access young people have to this source of tobacco.
15. Data collected from English local authorities by the Local Authorities Coordinators of Regulatory Services (LACORS) on test purchasing from vending machines covers the 2008-09 period and shows that illegal sales to under-18s were made at the majority (58%) of vending machines tested across England during this period.<sup>3, 4</sup> Despite the NACMO voluntary code of practice on the siting of vending machines, LACORS found that 26.5% of vending machines checked in England over 2008-09 were located in unsupervised areas and nearly a third of vending machines checked were

<sup>2</sup> NHS Information Centre (2009). *Smoking, drinking and drug use among young people in 2008*. NHS Information Centre, Leeds.

<sup>3</sup> Test purchasing conducted on 634 vending machines across England over 2008-09, using volunteer "test purchasers" aged 11-16 years old.

assessed by trading standards officers as being *likely* to result in sales to under 18s.<sup>4</sup>

16. Results from the Local Government Group's Tobacco Control Survey 2010-11<sup>5</sup> show that access to tobacco from vending machines by young people remains problematic. Some 44% of local authorities responding to the survey carried out test purchasing operations of vending machines involving volunteer young people. In total for test purchase operations of vending machines, cigarettes were sold to children from 319 of the 574 vending machines tested (56 per cent of vending machines).
17. The UK is a party to the WHO Framework Convention on Tobacco Control (FCTC), the world's first public health treaty.<sup>6</sup> The treaty includes the following treaty obligations under Article 16 (sales to and by minors):

Each Party shall adopt and implement effective legislative, executive, administrative or other measures at the appropriate government level to prohibit the sales of tobacco products to persons under the age set by domestic law, national law or eighteen. These measures may include... ensuring that tobacco vending machines under its jurisdiction are not accessible to minors and do not promote the sale of tobacco products to minors.

When signing, ratifying, accepting, approving or acceding to the Convention or at any time thereafter, a Party may, by means of a binding written declaration, indicate its commitment to prohibit the introduction of tobacco vending machines within its jurisdiction or, as appropriate, to a total ban on tobacco vending machines.

18. The FCTC is elaborated through guidelines for parties. Under Article 13 (tobacco advertising, promotion and sponsorship), guidelines have been agreed and provided to parties that suggest that "vending machines should be banned because they constitute by their very presence a means of advertising or promotion under the terms of the Convention".
19. The World Health Organization's *European Strategy for Tobacco Control*<sup>7</sup> recommends that strategic national action should include "banning sales [of tobacco] through vending machines". According to the World Health Organisation, 22 countries in the WHO EURO region have banned the sale of tobacco through vending machines (10 since 2002). Of these 22 countries, 12 are European Union Member States.

## Analytical History

20. Below is a brief analytical history covering the previous five Impact Assessments on this policy, to provide context for this final Impact Assessment.
21. The first Impact Assessment on policy options relating to tobacco vending machines was undertaken as part of the Consultation on the Future of Tobacco Control in May 2008. This Consultation covered four main areas: reducing smoking rates and health inequalities caused by smoking; protecting children and young people from smoking; supporting smokers to quit; and helping those who cannot quit. The Consultation Impact Assessment considered three options: retaining the status quo, introducing age-restriction mechanisms and prohibiting the sale of tobacco from vending machines.

<sup>4</sup> LACORS (2010). *Comprehensive Tobacco Control and Council Trading Standards: Delivering outcomes 2008 and 2009*. London: LACORS.

<sup>5</sup> The Local Government Group's Tobacco Control Survey 2010-11 is a survey carried out with trading standards services across England of local tobacco control activities. The survey was completed by 150 out of 151 local authorities. The survey covered activities over the period 1 April 2010 to 31 March 2011

<sup>6</sup> Available at: [www.who.int/fctc](http://www.who.int/fctc)

<sup>7</sup> The European Strategy for Tobacco Control (ESTC) was adopted by the WHO Regional Committee for Europe at its fifty-second session in September 2002 and provides an evidence-based framework and guidance for effective national action and international cooperation. The ESTC sets out strategic directions for action in the Region, to be carried out through national policies, legislation and action plans.

22. The second Impact Assessment followed the responses to consultation, as the Government decided to include measures on the sale of tobacco from vending machines in the Health Bill 2009. This second Impact Assessment published in December 2008 assessed the same three options. Consideration was given to the costs and to the principal benefits related to the purpose of the policy, and responses to the previous consultation were considered. As the focus of the proposal was upon preventing smoking by children, the assessment of benefits was initially limited to those accruing to children whose smoking was inhibited.
23. The third Impact Assessment accompanied draft regulations under the Health Bill and was published in a consultation document on 12 October 2009. This analysed the costs and benefits of introducing mandatory age restriction mechanisms for all vending machines. This was in support of policy thinking at the time, which was to test whether such restrictions could be successful in eliminating underage purchases of tobacco from vending machines.
24. The fourth Impact Assessment followed an amendment to the Health Bill at Report Stage in the House of Commons in October 2009, which deleted the provision in the Bill to enable ministers to make regulations "imposing requirements" in relation to the sale of tobacco from vending machines. A revised consultation and supporting Impact Assessment published in November 2009 analysed the costs and benefits of retaining the status quo or prohibiting the sale of tobacco from vending machines.
25. The fifth Impact Assessment in January 2010, was a Final Impact Assessment carried out in respect of the Regulations in their final form as laid in Parliament, which also analysed the costs and benefits of retaining the status quo or prohibiting the sale of tobacco from vending machines. In this Impact Assessment, all relevant consultation submissions and comments from stakeholders were taken into account and errors were corrected.
26. The regulations have been subject to judicial review from the tobacco industry; the Impact Assessments were closely examined during the litigation process, and the Department filed evidence correcting or updating certain figures previously used. This Impact Assessment reflects the evidence filed by the Department in these judicial reviews and thereafter.

## Policy options

27. The following policy options are considered:

- *Option 1:* 'Do nothing', maintaining the voluntary code of practice on the siting of vending machines.
- *Option 2:* Prohibit the sale of tobacco from vending machines.

### **Option 2: Impacts, costs and benefits of prohibiting the sale of tobacco from vending machines.**

Costs: One-off

28. The one-off cost of option 2 to vending machine companies is calculated as the total value of the machines currently used in England. The rationale is that the value of an asset is equivalent to the expected future profit stream of that asset. (The relevant profit stream is net of the costs of monitoring, stocking and operating, and eventually disposing of the machines, and of the opportunity cost of the space that they occupy, and is net of tax. It is discounted at the companies' own cost of capital). There are an estimated 57,934 machines in the UK minus Scotland.<sup>8</sup> A search of the market

<sup>8</sup> NACMO provided an email to the Department on 15 June 2009

for second hand vending machines provided an upper estimate of £375. Research on the internet provided up to date, direct primary evidence of current prices paid for second hand vending machines. It was conducted before the initial consultation and the First Impact Assessment in April 2008, i.e. before the sale price would have been affected by the announcement of the policy change. This method was chosen to provide real time up-to-date information about the second hand value of the machines. The value estimated from the second hand market was checked and proved consistent with the estimated depreciated value of a machine which is half way through its life. Consultation responses have not controverted the estimate of machine value. Hence, bearing in mind that the average machine is not new, a one-off cost of £21.7m million is estimated. It is likely that the one-off cost would be incurred very soon after the coming into force of the regulations.

29. Additionally, the cost of disposal of cigarette vending machines will be incurred at some point in time, irrespective of policy, but (due to the policy) this would occur sooner than would otherwise have been the case in order to release the space for other uses. We have estimated the cost of disposal for a vending machine to be £100.<sup>9</sup> Since the existing machines would be disposed at some point in the future even if they remained in operation (we take five years as the average life expectancy of the stock of vending machines), the impact of the ban is restricted to bringing forward these costs. The difference between incurring a cost of £100 now or in five years' time, at a 5% real cost of capital, is £27.6 per machine. Multiplying this by 57,934 (total number of machines) results in an additional £1.6m one-off cost to business. Therefore, a **total one-off cost of £23 million is estimated.**
30. We derive a figure for the Equivalent Annual Net Cost to Business (EANCB) associated with the scrapping of vending machines of £3m for the purposes of One In One Out (Annex 5). While the cost benefit analysis does not include an impact on the profits of vending machine operators as it is assumed that expenditure on cigarettes from vending machines will be re-allocated to other goods and services, an allowance for lost profits is made for the purposes of OIOO. The EANCB of £6.8m associated with these profits is also explained in Annex 5.
31. The following points refer to annual costs:
- a. Although they represent a small proportion of tobacco sales, if purchases from cigarette vending machines are not fully offset by an increase in cigarette sales elsewhere, this will result in a revenue loss to the Exchequer. Duty revenue is a transfer of benefit from tobacco consumers to the community (the Exchequer). Lost duty revenue is treated as an economic cost in this Impact Assessment as smokers may no longer buy as much tobacco, and part of the transfer to the Exchequer ceases.
  - b. The total duty per packet of cigarettes sold through vending machines is estimated at £3.09, which summates to £76.4m when considering the total volume of cigarette sales through vending machines. Lost VAT revenue is not considered, as this will likely be offset by increased expenditure on other VAT-eligible products. There is uncertainty over how much demand will be diverted to other sources, so a range of estimates consistent with the benefits calculations is presented here. Assuming that 25% to 75% of vending machine cigarette sales are not offset by increased sales elsewhere, the impact on the Exchequer as a result of this policy option is £19 million to £57 million per annum (undiscounted), equalling £16 million to £48 million annual discounted average cost per annum (over the ten year period).

<sup>9</sup> £100 is a central estimate based on contact with Wandsworth Household Waste and Recycling Centre. This confirmed that general waste (including a tobacco vending machine) delivered in a car can be disposed free of charge, whereas general waste delivered in a larger vehicle (e.g. a van) is considered trade waste. This has a minimum charge of £67 for a load of 540kg, increasing relative to weight up to £123 for 1000kg (though, it is very unlikely that a tobacco vending machine will weigh more than the minimum trader fee weight of £67). Considering potential transport costs (e.g. petrol, van hire, an hour or two labour time), £100 is a reasonable central estimate of this cost considering that some will only have to pay transport costs (with free disposal, likely to cost under £100), whereas others will have to pay the trader fee and higher transport costs (likely to be over £100).

Table 2: Bottom up (per pack) tax revenue calculation

Price (£)	6.2	7.2	Calculation
1) Ad valorem rate	24.0%	24.0%	
2) Specific rate per 1,000 cigs	119.03	119.03	
3) Cigarettes/pack	20	16	
4) Ad valorem duty per pack (£)	1.49	1.19	£1.49 = 24.0% (ad valorem) * Price £1.19 = (16 / 20) * 1.49
5) Specific duty per pack (£)	2.38	1.90	(119.03 (specific per 1000) * cigs/pack) / 1000
6) Total duty (£)	3.87	3.09	Ad valorem per pack + specific duty per pack

Table 3: Total duty revenue to the Exchequer from cigarettes sold through vending machines

Variable	Total tax revenue	Calculations
No cigs 1%	394,800,000	47bn <sup>10</sup> cigarettes sold annually (2007) * 0.84 (England scaling factor) * 1%
Packs VM	24,675,000	394,800,000 / 16
Duty VM packs	£76,366,164	£3.09 (Total duty per pack) * 24,675,000

Table 4: Total duty from cigarettes lost due to vending machine prohibition, in relation to range of cigarettes bought from alternative sources

	Min	Central	Max
Cigarette sales NOT replaced elsewhere	25%	50%	75%
Total reduction in duty to the exchequer (£) – undiscounted	19,091,541	38,183,082	57,274,623
Total reduction in duty to the exchequer (£m) – Average annual discounted figures	15,877,681	31,755,362	47,633,043

- c. This option will result in lost utility to legitimate cigarette machine users; cigarette vending machines are clearly a convenience for which some consumers are willing to pay. The Tobacco Manufacturers Association<sup>11</sup> state that (in 2007) 47 billion duty-paid cigarettes were consumed in the UK. For England only (using a scaling factor of 0.84) this gives 39.5 billion cigarettes and 1% of these (i.e. 395 million cigarettes) would have been sold in vending machines. However, the Department does not value consumer surplus gained through illegal activity, so any surplus lost to children is not counted. Vending machine cigarette packets typically contain 16 cigarettes, so consumer surplus loss is based on the reduction in total cigarettes sold to adults (360 million). This is calculated by taking the total 395 million cigarettes sold through vending machines minus the 35 million sold to children (see paragraph 63), which is consistent with the benefits calculation based on 3% of young people buying their cigarettes from vending machines. Therefore, total number of packs consumed by adults from vending machines equates to 22 million. Calculation

<sup>10</sup> <http://www.the-tma.org.uk/tma-publications-research/facts-figures/uk-cigarette-consumption/>

<sup>11</sup> See: [www.the-tma.org.uk/uk-cigarette-consumption.aspx](http://www.the-tma.org.uk/uk-cigarette-consumption.aspx)

of loss of utility is not straightforward. In circumstances such as this, in which a good is effectively removed from the market, it is extremely difficult to place a monetary value on the loss of utility. There is no market evidence of the scale of this loss. It is conjectured that £1 is a reasonable additional payment that smokers would, on average, not regret paying for access to cigarettes via a vending machine over and above the purchase price; this additional payment would represent lost utility. (Note that the £1-2 mark-up on vending machine cigarettes does not feed directly into an assessment of the loss in consumer utility attributable to the removal of vending machines. The consumer is evidently willing to pay the additional mark up in order to satisfy his or her immediate urge for a cigarette – but there is a cost of supplying that need, which, assuming supply through vending machines is competitive, is also precisely reflected in the mark-up. We need to estimate the additional amount that smokers would reasonably be willing to pay – but do not wish to include a sum so high that in retrospect a smoker would regret having paid so much to satisfy a momentary urge.) Using £1 per packet as a proxy for the lost consumer surplus gives an **annual cost to adult smokers of £22m per annum** (undiscounted).

32. The following costs are not quantified; they are unlikely to be significant enough to shift the judgements this Impact Assessment is designed to inform:
- a. A marginal increase in the cost of current enforcement visits could result in the short term to assist with compliance building. Such visits would now take note if a vending machine were still in operation. However, this would be offset because there would be no further need to undertake test purchasing enforcement activity with vending machines.
  - b. Lost manufacturers' profit from reduced tobacco sales. This is largely not an economic cost, as it would likely be offset by increased expenditure (and profit) elsewhere in the economy, though it is noted (through stock market data) that the tobacco industry return on capital employed (ROCE) may be higher than average. However, much of this additional profit stream may be attributable to branding costs included in the measure of capital employed. Any remaining super-normal profits would accrue in good measure to overseas shareholders, and therefore not be appropriate for inclusion in this cost benefit assessment.
  - c. There would be some cost inherent in the retraining/reconfiguration of labour and capital currently used by the tobacco industry (so that it can be used elsewhere). Additionally, some resources may be less productive in their new alternative use (or they may not have an alternative use) due to their specificity to the tobacco context. These costs are not quantified due to lack of data. The geographical distribution of the jobs involved is wide and redundancy is unlikely to be concentrated at one particular time because it is unlikely that all vending machines would be removed at the exact time of the prohibition. This is because knowledge of the impending ban is likely to influence the decisions regarding vending machines, for example, contract renewals and replacement/repair of existing vending machines. Therefore, much of the redeployment is likely to occur with no additional cost, as many employees find alternative work in anticipation of redundancy.
33. Overall, the costs of option 2 include a one-off cost of £23 million plus the (undiscounted) annual costs of £42 million to £80 million (consumer surplus loss plus tax cost loss). **Discounted over ten years, the total cost ranges from £369 million to £687 million** (central estimate £528). See Table 5 below for details. The lower, central and upper estimates are defined by the minimum, central and maximum number of cigarette sales *not* replaced elsewhere (e.g. 25% sales are *not* replaced, so 75% occur elsewhere instead, resulting in minimum possible reduction in tax revenue). The rationale for these replacement rate percentages is explained in the health benefit section for each group (children and adult quitters respectively). These are based on discounting the figures in Table 4 over the 10 year period, then adding to the one-off costs of the legislation and discounted consumer surplus costs.

Table 5a: Cost calculations (discounted)

Time	A) Lost consumer surplus	B) tax revenue lost, minimum	C) Tax revenue lost, central	D) Tax revenue lost, maximum	E) One-off cost, undiscounted
1	21,721,778	18,445,933	40,167,711	55,337,800	23,325,966
2	20,987,225	17,822,158	38,809,383	53,466,473	
3	20,277,512	17,219,476	37,496,988	51,658,428	
4	19,591,799	16,637,175	36,228,974	49,911,525	
5	18,929,274	16,074,565	35,003,840	48,223,696	
6	18,289,154	15,530,981	33,820,135	46,592,943	
7	17,670,680	15,005,779	32,676,459	45,017,336	
8	17,073,121	14,498,337	31,571,458	43,495,011	
9	16,495,769	14,008,055	30,503,824	42,024,165	
10	15,937,941	13,534,353	29,472,294	40,603,058	
<b>Total recurring costs</b>	<b>186,974,253</b>	<b>158,776,811</b>	<b>345,751,064</b>	<b>476,330,434</b>	

Table 5b: Total cost calculations (discounted)

Time	F) Total cost - minimum, (A+B+E)	G) Total cost - central, (A+C+E)	H) Total cost - maximum, (A+D+E)
1	40,167,711	58,613,644	77,059,578
2	38,809,383	56,631,540	74,453,698
3	37,496,988	54,716,464	71,935,940
4	36,228,974	52,866,149	69,503,324
5	35,003,840	51,078,405	67,152,970
6	33,820,135	49,351,116	64,882,097
7	32,676,459	47,682,237	62,688,016
8	31,571,458	46,069,795	60,568,131
9	30,503,824	44,511,879	58,519,934
10	29,472,294	43,006,646	56,540,999
Total recurring costs	345,751,064	504,527,876	663,304,687
<b>Total Costs (recurring +one off)</b>	<b>369,077,030</b>	<b>527,853,842</b>	<b>686,630,653</b>

## Benefits

34. The health benefits of policy option 2, through preventing children from smoking and reducing the number of cigarettes smoked by adults, can be estimated and monetised. This Impact Assessment aims to estimate the effects of the prohibition of vending machines on successive cohorts of 17 year olds and adults.
35. The following sections explain the methodology for estimating the monetised benefit of smoking one fewer cigarette per day. This is then applied to a possible range of outcomes for the effectiveness of the option in terms of reducing child and adult smoking.

## Quantifying the monetised benefit of smoking one fewer cigarette per day

36. The analysis in Annex 3 identifies (i) the discounted number of life-years saved from each young person who does not start smoking, and (ii) the number of life-years saved for an average adult smoker who quits smoking. The estimates are adjusted as smokers may quit anyway in the future.
37. It is suggested that the mortality impact of smoking increases linearly (from zero) with each cigarette smoked per day. The National Statistics *General Household Survey 2006* found that the average number of cigarettes smoked per day equals 15 per day for men and 13 per day for women. It is possible to calculate the number of life-years saved by smoking one fewer cigarette per day from a young age, given that the individual may quit in the future. For men it is one fifteenth of the male value presented in Annex 3. For women, it is one thirteenth of the female value presented in Annex 3.
38. The same method can be used to estimate adult life-years saved. The number of life-years saved by an average adult smoking one fewer cigarette per day, given that they may quit in future, is equal to one fifteenth of the male value presented in Annex 3 (for men). For women, it equals one thirteenth of the female value presented in Annex 3.
39. The male and female results are averaged to give an overall value.
40. The results are as follows:
- i. Smoking one fewer cigarette per day from a young age: 0.11 life years gained (£6,600)
  - ii. Smoking one fewer cigarette per day (average adult): 0.09 life years gained (£5,400)
41. The following paragraphs explain the derivation of the estimates for (i) and (ii) above. A detailed description of the calculations is provided in the Annex, including references for all sources of data. The values are discounted in line with Green Book principles and a standard £60,000 value per quality-adjusted life-year (QALY) is applied to each.
42. The calculations begin with data from the *General Household Survey 2006* on smokers' ages, smoking prevalence and smoking status (i.e. whether the respondents are current smokers, former smokers or those who have never smoked). The proportion of smokers who have quit as they get older is found to increase at a fairly steady and constant rate (with roughly an extra 1% of smokers quitting at every year of age; 18% of those who have ever smoked by age 16 have already stopped at that age).
43. The seminal 50-year study of smoking mortality in British doctors by Doll *et al.*<sup>12</sup> is used to obtain mortality rates for the following categories of smoker:
- (i) those who have quit between ages 35-44,
  - (ii) those who have quit between ages 45-54,
  - (iii) those who have quit between ages 55-64, and
  - (iv) those who continue to smoke beyond age 65
44. Non-smokers' mortality rates are also obtained from this study. The results are combined with smoking prevalence data for the above age groups and Office for National Statistics population mortality data to produce eight sets of paired life tables: one life table for non-smokers, and one for the category of smoker under consideration ((i) to (iv) above, for both males and females). The differences between each pair of life tables indicate how the smokers' life expectancy loss is distributed between different years of age. The figures are discounted appropriately to take account of the fact that benefits accrued in the future are worth less than benefits accrued today.
45. The results of these calculations are presented in the table below, and are used to calculate the final estimates:

<sup>12</sup> Doll, R. *et al.* (2004). "Mortality in relation to smoking: 50 years' observations on male British doctors" in *BMJ*, 26 June 2004.



Table 6: Life years lost due to smoking

Quit age band	Percentage of smokers in this band	Change in life years lived for this band (discounted, male)	Change in life years lived for this band (discounted, female)
Under 35	38.2%	0.00	0.00
35 to 44	10.5%	-0.85	-0.66
45 to 54	10.5%	-2.75	-2.34
55 to 64	10.5%	-3.48	-3.03
65 or over	30.2%	-4.49	-4.15

46. For each sex, the number of life years saved for each young smoker (given that they may have quit anyway in future) is calculated by weighting the number of life years lost in each quit age band by the percentage of smokers who quit in that age band.
47. For each sex, the estimated monetary benefit for each adult who is induced to quit smoking (as opposed to each child who does not start smoking) is derived by a similar calculation. Calculations are made for each age band, and the results are then weighted by the percentage of smokers in each age band in order to give a final figure.
48. The calculations described in the two paragraphs above deliver two results: one for men, and one for women. Each result is adjusted downwards to take account of the fact that the doctors in the study by Doll *et al*<sup>12</sup> consumed a median of 18 cigarettes per day; current average consumption is less than this, at 15 per day for men and 13 per day for women.
49. A full discussion is presented in the Appendix, but the above calculations are argued to be conservative. For example, improvements in the quality of life from quitting smoking (or never starting to smoke) – such as avoiding the morbidity associated with various smoking-related diseases – are not taken account of in the above calculations. Other limitations of the analysis are also discussed in the Appendix.

### *Quantifying the benefits of policy option 2*

#### *Benefits generated from a reduction of smoking in young people*

50. The Information Centre provides a survey of sources of cigarettes for 11-15 year old regular smokers. The survey asks "Where do you usually get your cigarettes from?" with respondents asked to select more than one option (of 14 in total) if they often got their cigarettes from different people or places.<sup>13</sup> For the purposes of this analysis, we are interested in regular smokers, defined in the survey as those who smoke at least once a week. The survey contains 476 regular smokers, of whom 58 (12%) identified vending machines as one source of supply. The table below indicates how many other sources were used by those who did and did not use vending machines (the maximum number recorded being 12). It was assumed that, for every 100 cigarettes smoked, the number bought from vending machines by users of this source was proportional to the number of sources identified (1/3 if two other sources were recorded). It is also assumed that users of vending machines smoke the same amount as those who do not use vending machines. These assumptions enable us to estimate the proportions of total cigarette consumption accounted for by users of vending machines (column 5 of the table), by users of vending machines sourced from vending machines (column 6) and by those who do not use vending machines (column 7). The total proportion of cigarettes smoked in this age group which are bought from vending machines equals 3%.

<sup>13</sup> Smoking, drinking and drug use among young people in England 2008.: <http://www.ic.nhs.uk/pubs/sdd08fullreport>

Table 7: Proportion of cigarettes sourced from vending machines

Number of alternative sources to vending machines	Young people NOT using VMs as a regular source	Young people using VMs as a regular source	For each 100 cigarettes smoked by each respondent, how many from VM?	Total smoked by 58 vending VM users	Total smoked by VM-users sourced from VMs	Total smoked by non-VM users	VM sourced cigarettes as proportion of total
0	0	1	100.0	100	100.0	0	
1	185	5	50.0	500	250.0	18500	
2	84	11	33.3	1100	366.7	8400	
3	58	10	25.0	1000	250.0	5800	
4	49	11	20.0	1100	220.0	4900	
5	23	2	16.7	200	33.3	2300	
6	4	6	14.3	600	85.7	400	
7	11	4	12.5	400	50.0	1100	
8	2	5	11.1	500	55.6	200	
9	1	0	10.0	0	0.0	100	
10	1	1	9.1	100	9.1	100	
12	0	2	7.7	200	15.4	0	
Total	418	58	309.7	5800.0	1435.7	41800.0	3.0%

Note: This table concerns the sources of consumption for each 100 cigarettes smoked per child

51. The best estimate available of current smoking prevalence among 17 year olds is 18%. This is the average over 24 months, based on figures from the underlying Smoking Toolkit<sup>14</sup> dataset. The figures relate to smoking prevalence after the increase in minimum age of sale in October 2007. Given that definitions of prevalence can be affected by the definition of "smoking" used, it is important to use the same definition for estimating both prevalence and intensity. The Smoking Toolkit Study uses a sample size large enough to allow us to make a reliable estimate of 17 year old smoking intensity, defined as the average number of cigarettes smoked per day. This results in an estimate of 10 cigarettes smoked by 17 year olds each day. A 3% reduction in this figure would lead to, on average, 0.3 fewer cigarettes per day. This figure is an average as some children may completely stop smoking, whereas others may not reduce their smoking at all.
52. This average reduction in daily cigarette consumption, if it persists throughout a cohort's life, and taking an average of the male and female estimates provided in the previous section, results in 0.03 life years (0.3 x 0.11) saved per person.
53. Using a birth cohort size of 650,000 per annum and a smoking prevalence of 18% for 17 year olds (as taken from the Smoking Tool Kit), 117,000 smokers per year would be affected by the proposed policy. 3,861 life years would be saved per annum (i.e. per cohort). Taken over a 10 year period this will account for new smokers entering the age group in question and smoking at reduced levels.
54. The reduction in smoking needs to persist throughout the cohort's lifetime to generate these health benefits. It is likely that this will be the case for some individuals, especially those who are prevented by the policy from starting to smoke, but it may not be the case for all individuals. There is also the possibility that young people will be able to find alternative sources of cigarettes (thus blunting the policy benefits), although recent changes (such as the new minimum age of sale) will make this more difficult for them.
55. The Schneider et al (2009) study<sup>15</sup> provides some indirect evidence on this question, by presenting observed changes in the total number of vending machines in 2 areas of Cologne (Germany) following the mandatory introduction of age restriction mechanisms (January 2007), and the impact this has on how adolescents buy cigarettes. This is relevant because there has been a reduction in

<sup>14</sup> The Smoking Toolkit is a monthly series of national surveys in England starting in November 2006 designed to provide up-to-date and accurate information on smoking cessation patterns. It is funded by the Department and by Cancer Research UK and is administered by University College London, who own the dataset and control access to it. The results of the Smoking Toolkit Study are available to the Department.

<sup>15</sup> <http://tobaccocontrol.bmj.com/content/18/4/294.full.pdf>

the total number of vending machines due to this measure, so it provides an indication of the impact of this removal on young smokers. The study suggests that 74% of 11-15 year olds who were smoking at the time of the survey had found a way to replace some portion of the cigarettes previously obtained without restriction from vending machines. Amongst this group, there seems to have been some reduction in intensity of use.<sup>16</sup> In any case, the survey implies that the remaining 26% of young smokers had been unable to replace cigarettes previously sourced from vending machines. This is not directly applicable to the expected impact of the policy in England, though it provides some support to a conclusion that a maximum of 75% of vending machine sales would be replaced.

56. There are also theoretical consideration to support the conclusion that a good proportion of vending machine sales to children would not be replaced. There is some evidence that those on lower incomes have a higher price elasticity of consumption of cigarettes.<sup>17</sup> Under 18 year olds are therefore likely to have a high price elasticity of demand for cigarettes considering their lower disposable income on average compared to adults. This may mean that they are more likely to forego cigarettes than replace them if supply is constrained in other ways.
57. Furthermore, cigarettes bought from vending machines are significantly more expensive. Considering the higher price, vending machines may often represent a source of last resort for young people who cite using alternative sources, as it could be argued that if another cheaper option is sometimes available to them, the vending machines may offer the only credible option in a particular instance. As removing them altogether could not result in them using existing cheaper sources, they would be forced to reduce prevalence or smoking intensity.
58. This discussion is not informed by quantitative evidence that demonstrates the effectiveness of the policy, apart from the Schneider study, though the Department has done an extensive literature search and discussed the topics with experts<sup>18</sup>. Evidence is also difficult and costly to generate. Therefore, following the discussion in paragraphs 54-57 and lack of direct evidence available around how many cigarettes young people will be able to supplement purchases elsewhere, we consider that a central estimate of 50% is appropriate. To reflect the uncertainty of this estimate, benefits are presented as a range, derived using 25% and 75% rates of replacement of cigarettes purchased from vending machines. The minimum of the range reflects the evidence from the Schneider study and the 50% central estimate indicates that the policy is likely to be more effective in England as it introduces complete prohibition.
59. Using *Health Survey for England 2008* data, on the average health related quality of life at different ages, gives a weighting of 0.86 that can be applied to the estimated expected number of life years gained as a result of the policy option
60. Overall, the estimated (health) benefits to children range between £50 million to £149 million per annum (undiscounted), or **£459 million to £1,378 million** (central £919 million) when discounted over ten years. See Table below for details.

Table 8a: Total Health Benefits to Children Step by Step Calculations, without replacement purchases

Child benefits	Value	Calculation
1) Vending machine regular source of supply for young people	12%	See paragraph 50
2) Scaled down to account for multiple answers	3.0%	See paragraph 50
3) Average cigarettes smoked per day	10.0	See paragraph 51

<sup>16</sup> Private communication from Prof. Dr. Schneider.

<sup>17</sup> <http://www.ncbi.nlm.nih.gov/pubmed/21737858>

<sup>18</sup> Discussions with Robert West (Professor of Health Psychology and Tobacco Studies at University College London) and Marc Suhrcke (Professor in Public Health Economics at University of East Anglia) confirmed that, considering the lack of direct evidence, 50% is a reasonable central estimate (within a range of 25% to 75%) for replacement rates for adults and children).

4) Life years saved per young person smoking one fewer cig per day	0.11	See Annex 3
5) Number of life years saved	0.033	See Annex 3
6) Cohort size	650,000	See paragraph 53
7) Smoking prevalence in 16 to 19 year olds	18%	See paragraph 51
8) Cohort affected per year	117,000	Step 6 * step 7
9) Reduction in number of cigs	0.30	Step 2 * step 3
10) Assumed number of cigarettes reduced by	35,100	Step 8 * step 9
11) Total annual benefits	3,861	Step 8 * Step 5
12) Value of a QALY	£60,000	
13) Monetised annual benefits, undiscounted (assuming all young people smoking from vending machines is stopped)	231,660,000	Step 11 * step 12
<b>14) Monetised undiscounted annual benefits scaled down</b>	<b>199,227,600</b>	<b>Step 13 * 0.86 (see paragraph 59)</b>

Table 8b: Total Health Benefits to Children Calculations (discounted with range)

Time	Minimum (25%)	Maximum (75%)	Central (50%)
1	49,070,837	147,212,512	98,141,675
2	48,345,653	145,036,958	96,691,305
3	47,631,185	142,893,555	95,262,370
4	46,927,276	140,781,827	93,854,551
5	46,233,769	138,701,308	92,467,538
6	45,550,512	136,651,535	91,101,023
7	44,877,351	134,632,054	89,754,703
8	44,214,139	132,642,418	88,428,278
9	43,560,728	130,682,185	87,121,456
10	42,916,974	128,750,921	85,833,947
<b>Total</b>	<b>459,328,424</b>	<b>1,377,985,271</b>	<b>918,656,848</b>

### *Benefits generated from a reduction of smoking in adults*

61. Policy option 2 is likely to have a positive health impact on adults. The number of cigarettes smoked by adults may fall and therefore there would be an associated health gain. The rationale for attributing value to the gains to adult health notwithstanding that these would be obtained by frustrating the satisfaction of adult preferences is as follows. Welfare is generally measured by estimating the satisfaction of consumer preferences, where preferences are paradigmatically revealed in consumer choices. This poses significant problems in appraising proposals designed to affect addictive behaviour, where preferences revealed in choices and underlying preferences (reflecting welfare) seem to diverge. It is clear that a proportion of adult smoker choices should, like those of children, be regarded as unreliable guides to true preferences, given the empirical literature on time inconsistency in smokers' choices and prevalence of smokers' desires to quit. Hence, it is appropriate to quantify health benefits to those adult smokers who were assisted by the policy in their efforts to reduce tobacco consumption or to quit. It is likely that it is particularly these smokers (rather than those who have no desire to quit) that would not bother to find replacement sources for their cigarettes.

62. As for benefits to young people, the lack of direct evidence and uncertainty around impact of the policy on adults requires a range to reflect this. It could be argued that adults will find it easier to replace cigarettes from vending machines as they are legally allowed to buy. However, 63%<sup>19</sup> of adult smokers in Britain want to quit and this may help them do so by making it less convenient to buy cigarettes. Due to the lack of direct evidence, a 50% central estimate is appropriate and a range of 25% and 75% of vending machine sales is suggested as a reasonable reflection of this uncertainty. Vending machine sales equate to 1% of the overall cigarette market and therefore this equates to a reduction in overall cigarette consumption of between 0.25% and 0.75%.
63. The estimated number of cigarettes sold annually in England is 39.48bn. 1% of these (i.e. 395 million cigarettes) would have been sold in vending machines. In a cohort of 17 year olds, the estimated reduction in smoking by young people of 0.3 cigarettes per day, multiplied by 117,000 smokers in the cohort gives an average daily reduction in cigarettes smoked by young people of 35,100 per cohort. Multiplying this by 365 gives an estimate of the total reduction of smoking by 17 year olds of 12.8 million cigarettes. We also take account of smoking in the 11-15 age group, for whom we have information from the survey of 'Smoking, drinking and drug use in young people in England', and in 16 year olds. We assume that smoking prevalence in 16 year olds is the average of that in 15-17 year olds and that smoking intensity in 16 year olds is the same as that in 17 year olds (10 cigarettes per day). From the information presented in the table below, the reduction in cigarettes bought from vending machines by adults can be estimated at 360 million (395m minus 35m). The range of 25%-75% for the proportion of cigarettes replaced (paragraph 62) gives a reduction in the number of cigarettes smoked by adults annually of between 90 million and 270 million per year.

Table 9: Cigarettes purchased from vending machines by young people and adults

Age	11-15	16	17	Total
Cohort size (m)	3.02	0.63	0.65	
Prevalence	6%	17%	18%	
Cigarettes/day	5.4	10	10	
% from vending machines (VMs)	3%	3%	3%	
Annual cigarette nos from VMs 11-17s	10.81	11.46	12.81	35.09
Total cigarettes sold from VMs				394.8
Cigarettes bought by adults from VMs (m)				359.71

64. This equates to between 10 and 31 fewer cigarettes per adult smoker, per year (assuming 21% prevalence of smoking and approximately 42 million adults, according to National Statistics data). This is equivalent to between 0.03 and 0.08 fewer cigarettes per adult smoker per day.
65. An average adult smoker gains 0.09 life-years from smoking one fewer cigarette per day over their life-time. Applying the quality of life weighting of 0.86 in paragraph 59 above (Health Survey for England) yields a lifetime gain of 0.08 QALYs per smoker. Given that the effect of this option will be a reduction of between 0.03 and 0.08 cigarettes per adult per day, the QALY gain per adult smoker amounts to between 0.002 and 0.007 QALYs. Across the population of smokers (around 8.7 million), a QALY gain of between 19,070 and 57,209 is obtained. Monetising these figures using a QALY value of £60,000 gives an estimate of between £1,144m and £3,433m (undiscounted) lifetime benefits.
66. To derive an annual adult benefit figure commensurate with the annual estimate for young people, we divide these monetary estimates by the average remaining life expectancy of an adult smoker. For an adult smoker of average age (37), the remaining life expectancy is approximately 41 years (based on National Statistics Life Tables for the general population and the calculated loss of life years presented here). **This gives an annual undiscounted benefit to smokers of between £28m and £84m** (life-time benefit divided by expected life years, step 23 in Table 10c below). There will be a very small addition (not quantified) to this each year to account for children turning 18 and the reduction in their taking up smoking, through this policy option.

Table 10a: Total Health Benefits to Adults Calculations, without replacement purchases

Adult health benefits	Value	Calculation
1) QALY value	£60,000	
2) Life year gain for an adult smoking one less cigarette per day	0.09	See Annex 3
3) QALY downscale	0.86	See paragraph 59
4) QALYs gained for adult smoking one less cigarette per day	0.08	Step 2 * step 3
5) Value of QALY gained from smoking one less cigarette per day	4644	Step 1 * step 4
6) Number of cigarettes sold annually in the UK	47,000,000,000	Tobacco Manufacturers Association 2007 <sup>20</sup>
7) England Scaling Factor	0.84	Mid 2009 ONS estimates
8) Number of cigs sold in England	39,480,000,000	Step 6 * step 7
9) Proportion of cigarette sales from vending machines	1%	NACMO
10) Number of cigarettes through vending machines per year	394,800,000	Step 8 * Step 9
11) Reduction in number of cigarettes sold to children	35,087,362	Total 11 – 16 year olds, plus 17 year old smokers. See paragraph 63
<b>12) Reduction in number of cigs to adults</b>	<b>359,712,638</b>	<b>Step 10 – Step 11</b>

Table 10b Total number of adult smokers

13) Proportion of adults who smoke	21%	2007, based on Stats smoking in England 2009
14) Number of adults	41,554,278	Mid 2009 ONS estimates
<b>15) Number of adult smokers</b>	<b>8,726,398</b>	<b>Step 13 * step 14</b>

Table 10c: Total Health Benefits to Adults Calculations

Step	Minimum	Maximum	Calculation
16) Proportion of vending machine cigarettes no longer consumed	25%	75%	
17) Reduction in number of cigarettes sold to adults per year	89,928,160	269,784,479	Step 12 * step 16
18) Fewer cigarettes smoked by adult smoker per year	10	31	Step 17 / step 15

19) Fewer cigarettes smoked by adult smoker per day	0.03	0.08	Step 18 / 365
20) QALYS gained per adult smoker	0.002	0.007	Step 4 * Step 19
21) Lifetime QALYS gained by all smokers smoking one less cigarette per day	19,070	57,209	Step 20 * step 15
22) Monetised years of remaining life expectancy	1,144,181,843	3,432,545,530	Step 21 * step 1
23) Annual benefit to smokers	27,906,874	83,720,623	See paragraph 66 (step 19 / 41)

Table 10d: Total Health Benefits to Adults Calculations (discounted)  
(Step 23 above \* relevant %)

Time	Minimum (maximum replacement (75%))	Maximum (minimum replacement rate 25%)	Central (50% replacement rate)
1	26,963,164	80,889,491	53,926,327
2	26,051,366	78,154,097	52,102,731
3	25,170,402	75,511,205	50,340,803
4	24,319,229	72,957,686	48,638,457
5	23,496,839	70,490,518	46,993,679
6	22,702,260	68,106,780	45,404,520
7	21,934,551	65,803,653	43,869,102
8	21,192,803	63,578,408	42,385,606
9	20,476,138	61,428,414	40,952,276
10	19,783,708	59,351,125	39,567,416
<b>Total</b>	<b>232,090,459</b>	<b>696,271,376</b>	<b>464,180,917</b>

67. Therefore, the health benefits to adults are between £232m and £696m over the 10 year discounted period. This gives total benefits to adults and children for this option over the discounted ten year period of between £691m and £2,074m (central estimate of £1,383m).

68. The health benefit calculations are considered to be conservative for the following reasons and assumptions.<sup>21</sup>

- Calculations do not take account of the improved quality of life that results from quitting smoking. For example, a quitter may escape diseases that reduce their quality of life as well as reduce their life expectancy (such as chronic obstructive pulmonary disease).
- No harm is assumed by smoking over the age of 84.
- No harm is assumed by smoking under the age of 35. Again, there is likely to be a benefit from not smoking at this age, but there is a lack of precise data.
- Quitting after the age of 65 is assumed to yield no health benefit. There is also likely to be a small benefit here, but again, there is a lack of precise data.
- The estimates do not take account of the fact that the resulting reduced smoking prevalence would reduce demand for stop-smoking goods and services. The economic resources saved could be used for other purposes.
- It is very important to note that the results obtained for the 10 year discounted total health benefits are benefits expected from 10 consecutive years following prohibition of vending

<sup>21</sup> For more information on why these assumptions have been made, please see the technical annex for details on health benefit calculations.

machines. These health benefits are expected to increase into the long term over however many years the policy will be in force. For each year in excess of the 10 year period, the health benefits are likely to accumulate further, without incurring any further costs to business (as these are one-off).

69. The aforementioned points will result in an underestimation of benefit per smoker, providing a counterbalance to the lack of adjustment for confounding factors (see paragraph 103), which may overstate the survival penalty of smoking.

## Implications of the cost-benefit analysis

70. The present value of the net benefit ranges from £322m and £1,388m for this option. To calculate the low end of the net benefit range (£322m) the low end of the cost range is subtracted from the low end of the benefit range. This is because the costs and benefits move together due to the varying assumptions about the proportion of cigarettes previously purchased from vending machines, which are no longer consumed. The same approach is applied to the upper end of the range. There is uncertainty over the magnitude of the effects of the policy so the midpoint of this range is taken as the best estimate: £855 million.
71. Sensitivity analysis has shown that even if 90% of young people and adults are successful in finding an alternative source of cigarettes for those originally sourced through vending machines, the policy will still offer a net benefit over the ten year discounted period. Over 90% of adults and young people would need to replace cigarettes bought from vending machines at alternative sources for this policy to no longer have a positive net present value over 10 years. It is reasonable to assume that this will not be the case considering the discussion in paragraphs 54-58 and 61-62.

**Table 11: summary costs and benefits**

Table : Costs and benefits and other factors associated with the short listed options							
OPTIONS (against Option 1)	COSTS (£)		BENEFITS (£)		NET BENEFITS (£)	Equality/ Other Impacts	QIPP Compliance
	Central	Worst	Central	Worst			
Option 2: ***	528m		1,383m		855m		



## Annexes

Annex 1 should be used to set out the Post Implementation Review Plan as detailed below. Further annexes may be added where the Specific Impact Tests yield information relevant to an overall understanding of policy options.

### Annex 1: Post Implementation Review (PIR) Plan

A PIR should be undertaken, usually three to five years after implementation of the policy, but exceptionally a longer period may be more appropriate. If the policy is subject to a sunset clause, the review should be carried out sufficiently early that any renewal or amendment to legislation can be enacted before the expiry date. A PIR should examine the extent to which the implemented regulations have achieved their objectives, assess their costs and benefits and identify whether they are having any unintended consequences. Please set out the PIR Plan as detailed below. If there is no plan to do a PIR please provide reasons below.

<b>Basis of the review:</b> Post implementation review five years after coming into force of regulations (October 2016)
<b>Review objective:</b> Review will consider whether the legislation has meet its primary policy objective to reduce smoking uptake, prevalence and/or cigarettes smoked by people under the age of 18.
<b>Review approach and rationale:</b> Review of data on smoking by young people in England
<b>Baseline:</b> (a) smoking rates by young people in 2011, (b) sources of tobacco for young people in 2011, (c) local authority tobacco sales enforcement/compliance data 2010-11.
<b>Success criteria:</b> (a) Prohibition of sales of tobacco from vending machines, (b) reduction in smoking uptake, prevalence and/or cigarettes smoked by people under the age of 18.  If prohibition of sales of tobacco from vending machines not universal, further efforts to improve compliance will be considered.
<b>Monitoring information arrangements:</b> (a) Annual NHS Information Centre's <i>Smoking, Drinking and Drug Use Among Young People in England</i> survey, (b) University College London's <i>Smoking Toolkit</i> survey, (c) local authority enforcement/compliance data.
<b>Reasons for not planning a review:</b> N/A

## **Annex 2: Specific Impact Tests**

### **Competition**

72. Option 2 would limit the range of suppliers, in that cigarettes could now only be purchased from suppliers who do not use vending machines. It should nonetheless be noted that only 1% of UK cigarettes are purchased from vending machines.
73. Aside from the obvious implication that vending machine operators will no longer be able to compete, option 2 is unlikely to further limit the ability of cigarette manufacturers and/or suppliers to compete.
74. Option 2 is unlikely to limit the incentive for suppliers to compete vigorously.
75. Option 2 could have a greater impact on competition than option 1, but tobacco sold from vending machines is usually more expensive and sold in smaller packs compared to tobacco sold from other retail outlets.

### **Small firms impact test**

#### *Consultation*

76. The proposed option is likely to impact upon small businesses as there would be costs in complying with the option. The Government has engaged with, and received information and estimates from, representatives of small businesses (such as the National Association of Cigarette Machine Operators, which represents small vending machine operators) prior to the publication of consultations regarding vending machines. It has also received consultation responses from them and from individual vending machine operators.

#### *Timing*

77. Businesses have been aware of the planned implementation date for this legislation for a number of years. Throughout the passage of the Health Act 2009 through Parliament, Ministers stated that any regulations that are made would be implemented in October 2011. The regulations will come into effect on a common commencement date (1st October) and communications to make relevant parties aware of the legislation coming into force, as well as advice on how to comply with the legislation will be made available shortly, particularly aimed at businesses where vending machines are located. The Department of Health has also made arrangements to provide support to local authorities (those who will act as the enforcement authorities for the legislation), through the provision of guidance and training, to support their efforts to build compliance and enforce the legislation once it comes into force. This would follow the example set by smokefree legislation, where guidance and advice was made available to relevant businesses and to enforcement authorities.

### **Health**

78. The proposed policy may result in a reduction in the number of cigarettes smoked by under-18s. As stated (and quantified) in the cost-benefit analysis above, this reduction would have a beneficial impact on the health of the population by reducing the incidence of smoking related morbidity and mortality. It may also have a wider impact on the general well being of the population by children taking less time off school and adults taking less time of work due to smoking related illness.

## Age

79. The proposed policy is likely to impact differently on people on grounds of their age.
80. A prohibition on the sale of tobacco from vending machines would prevent all smokers from purchasing their tobacco from vending machines. Whereas adult smokers would be able to purchase tobacco from other sources, such as supermarkets and newsagents, such retail outlets would be breaking the law and be liable to enforcement action if they sold tobacco to children and young people under the age of 18 years. Enforcement action can include court-imposed restricted sales orders for businesses and/or individuals found to persistently sell tobacco to young people.
81. The differential impact of the proposal policy on young people under the age of 18 years would be a positive impact because it would help to reduce smoking levels amongst this age group.

## Race and ethnicity

82. The proposed policy is not likely to impact differently on people on grounds of their race or ethnicity. The proposed policy is population-wide and will affect all adult smokers equally—it does not differentiate on the grounds of race or ethnicity.
83. Some ethnic and racial groups have higher smoking rates than the general adult population, for example Bangladeshi men.<sup>1</sup> However, there is no evidence of certain ethnic or racial groups purchasing their tobacco from vending machines more frequently than the population as a whole.
84. A policy that prohibits the sale of tobacco from one particular source could, in theory, have more impact on ethnic or racial groups with higher smoking rates than the general population as a whole. However, adult smokers in these ethnic and racial groups could purchase their tobacco from other sources, such as supermarkets and newsagents and it therefore should not have a differential impact.
85. The National Statistics survey used to establish smoking prevalence amongst young people aged between 11 and 15 years (*Smoking, drinking and drug use in England*) does not collect data on the smoking rates of various ethnic and racial groups. It is therefore not possible to assess whether the proposed policy of prohibiting the sale of tobacco from vending machines will impact differently on people under the age of 18 years on grounds of race or ethnicity. There is also no evidence available on whether smokers in certain ethnic or racial groups under the age of 18 years access vending machines more frequently than other ethnic or racial groups. In any event, any impact will be a beneficial impact by reducing the rates of smoking and the uptake of smoking within that racial or ethnic group.

## Gender

86. The proposed policy is not likely to impact differently on people over the age of 18 years on grounds of their gender for the same reasons set out in more detail above in relation to age, ethnicity and race. Briefly, the reasons are that there is no evidence of one gender purchasing tobacco from vending machines more frequently than the other gender. With a prohibition on the sale of tobacco from vending machines adult smokers could purchase their tobacco from alternative sources. The proposed policy would affect all adult smokers equally and does not differentiate on grounds of gender.

<sup>1</sup> NHS Information Centre (2006). *Health Survey for England 2004* (vol 1: the health of minority ethnic groups). NHS Information Centre, Leeds.

87. However, the proposed policy is likely to impact differently on people under the age of 18 years on grounds of their gender. Girls aged 11 to 15 years are more likely to be regular smokers than boys in the same age group (although boys and girls smoke at broadly the same levels by their mid-late teens). Therefore, a proposed policy that prohibits access to tobacco for people under the age of 18 may affect more girls than boys. However, this differential impact will be a beneficial one in helping to reduce smoking levels amongst young people, in particular young females.

**Disability, transgender, religion or belief, marriage and civil partnership, pregnancy and maternity and sexual orientation**

88. The proposed policy is not likely to impact differently on people on grounds of their disability, transgender, religion or belief, marriage and civil partnership, pregnancy and maternity or sexual orientation. The proposed policy is a population wide policy that affects all adult smokers equally and does not differentiate on grounds of disability, transgender, religion or belief, marriage and civil partnership, pregnancy and maternity or sexual orientation.

**Human Rights**

89. The proposed policy is to prohibit access to tobacco from vending machines. The Government believes that any interference with property interests under the ECHR is justified by the benefits to public health of regulations to prohibit the sale of tobacco from vending machines.

## Annex 3: Technical

90. This Technical Appendix describes the method and data sources behind the estimation of:

- The discounted number of life years saved for each young person who does not take up smoking.
- The discounted number of life years saved for a randomly chosen adult who quits smoking today. This figure is lower, as some harm may already have been done by past smoking.

91. For the purposes of this IA, we estimate the benefits of a reduction in cigarettes smoked rather than the benefits of more adults quitting or fewer young people taking up smoking (although the reduction in the average number of cigarettes smoked will derive from a range of responses which could include quitting). We estimate the benefits of a one cigarette per day reduction in consumption as follows: if the benefits of total abstinence (i.e. quitting/not starting) are associated with a reduction in consumption of, say, 15 cigarettes per day, then the benefits of a one cigarette per day reduction in consumption are equivalent to 1/15 of the benefits of abstinence. In this IA, the health gains are generated from reductions in cigarettes smoked rather than a reduction in smokers. However, estimates of benefit in adults and young people take account of the fact that many smokers quit during their lifetime.

92. Evidence on quality of life from the Health Survey for England is used to convert life years into QALYs. To express QALYs in monetary terms, a standard value of £60,000 per QALY is applied. This is an estimate of the average marginal rate of substitution between wealth and health impacts (in QALYs) across the population. It is based, for example, on responses to questions regarding how much individuals would be willing to pay to secure a more rapid recovery from an accident.

93. The following main sources of data are used:

- *General Household Survey 2006* (GHS 2006) source data: Used to identify the age distribution of smokers and the relationship between age and the percentage of smokers who have quit.
- Doll *et al.*: Reports the impact of smoking on mortality, split by age of quitting smoking (if applicable).<sup>10</sup>
- Office for National Statistics (ONS) period life tables, United Kingdom, 2004-06:<sup>2</sup> Reports population mortality estimates and used to transform the outputs of the doctors' study into life years saved.

94. The steps common to both estimates are listed below:

- **Identify an estimate of the percentage of smokers who have quit by each year of age.** Data from GHS (2006)<sup>3</sup> is used here. The percentage who have quit increases at a fairly steady and constant rate as age increases. A linear relationship was therefore identified between age and the percentage who have quit; the results imply that 18.2% of 'ever-smokers' have already quit by age 16, with 1.05% quitting in each year thereafter up to age 94.

<sup>2</sup> Available at [www.statistics.gov.uk/StatBase/Product.asp?vlnk=14459&Pos=&ColRank](http://www.statistics.gov.uk/StatBase/Product.asp?vlnk=14459&Pos=&ColRank)

<sup>3</sup> Variables 'age' and 'cigsmk1' were used – the latter identifies 'ex-smokers', 'current smokers' and 'never smokers'. For each year of age, the percentage of smokers who have quit equals the number of 'ex-smokers' divided by the sum of 'ex-smokers' and 'current smokers'.

- **Identify an estimate of the prevalence of smoking at each year of age.** Data from GHS (2006) is used here.<sup>4</sup>
- **Identify an age distribution for the smoking population.** Data from GHS (2006) is used here.<sup>5</sup>
- **Identify mortality data (by year of age) for non-smokers and for four categories of smoker (as defined by quit age).** Mortality data are taken from table 5 of Doll *et al.*,<sup>10</sup> which lists number of deaths per 1,000 people at ages 34-44, 45-54, 55-64, 65-74 and 75-84. (These are referred to below as the five age bands). This information is presented at each age band for lifelong non-smokers, as well as:
  - (i) those who have quit between age 35-44,
  - (ii) those who have quit between age 45-54,
  - (iii) those who have quit between age 55-64, and
  - (iv) those who continue to smoke beyond age 65
- These categories of smoker are used throughout the calculations, and are referred to as quit age bands (alongside an 'age under 35' band). The data are converted into relative risks by dividing the number of deaths per 1,000 in each of these four categories by the equivalent number of deaths (i.e. the number of deaths in the same age band) for the lifelong non-smokers. The following formulae are then applied, which calculate mortality rates at each year of age (from 0 to 100) for smokers and non-smokers respectively.
  - Smokers' mortality at age  $x = M * ( r / ( pr + 1 - p ) )$
  - Non-smokers' mortality at age  $x = M * ( 1 / ( pr + 1 - p ) )$
  - Where M is the mortality estimate from the ONS life tables for age x, r is the relative risk at age x, and p is the prevalence (expressed as a proportion) at age x.
  - The above formulae are calculated for each year of age, for each sex and for each of the four categories of smoker, as the relative risks differ between quit age categories and population mortality differs between the sexes.
- **Identify the number of life years lost (by year of age) for each combination of sex and the four categories of smoker.** For each combination of quit age band and sex<sup>6</sup>, two life tables are calculated following the method of Chiang (1984)<sup>7</sup>. One of the two life tables starts with the smokers' mortality figures and the other starts with the non-smokers' mortality figures (both for each year of age, and as calculated above). Each life table models a birth cohort of 100,000 children; one column in particular measures the total number of life years lived by the cohort for each year of age. For each year of age, the difference in this column between the two life tables is calculated and divided by 100,000 to convert the value into the expected number of life years lost per capita (for that age). The sum of these values across all years of age (from 0 to 100) equals the number of life years lost by the specified combination of quit age band and sex.
- **Discount the numbers of life years lost, as calculated in the previous step.** As the life years lost occur in future years of the cohort's life, they should be discounted appropriately. The discount rate used is 1.5% p.a. Following Green Book guidance, this is the social rate of time preference applicable to goods whose marginal value, like health, is invariant with expected increases in national income (and therefore immune to the diminishing marginal utility of consumption). The sum of the discounted numbers of life years lost at each year of age equals the discounted number of life years lost by the specified combination of quit age band and sex.

<sup>4</sup> Prevalence at each year of age was defined as the number of current smokers (as indicated by the variable 'cigsmk1') at each age, divided by the total number of individuals of that age in the sample.

<sup>5</sup> The variable 'age' was used on the subset of respondents who are current smokers (as indicated by the variable 'cigsmk1').

<sup>6</sup> For example, one combination considers male smokers who quit between the ages of 35-44.

<sup>7</sup> Chiang CL (1984), "The Life Table and its Applications". Malabar (FL): Robert E Krieger Publishing.

95. The end results of these calculations are presented in the following table. The identified relationship between age and the percentage of smokers who have quit is used to calculate the percentages in the second column.

Table 12: Life years lost due to smoking

Quit age band	Percentage of smokers in this band	Change in life years lived for this band (discounted, male)	Change in life years lived for this band (discounted, female)
Under 35	38.2%	0.00	0.00
35 to 44	10.5%	-0.85	-0.66
45 to 54	10.5%	-2.75	-2.34
55 to 64	10.5%	-3.48	-3.03
65 or over	30.2%	-4.49	-4.15

96. The benefit (in discounted life-years) for each child who does not take up smoking is estimated as follows:

- A weighted average of the number of life-years saved for male children is calculated, with the percentage of smokers who quit in each quit age band being used to weight the life expectancy penalties for those bands.
- A similar weighted average is calculated for female children.
- The resulting male and female estimates are then downscaled to 83% and 72% of their calculated value respectively. This reflects the fact that the median doctor from the doctors' study smoked 18 cigarettes per day, whereas current averages for men and women are lower: 15 and 13 respectively (GHS 2006<sup>8</sup>). Current smokers can therefore be expected to experience less harm.

97. Therefore: Benefit for each child who does not take up smoking:

- Males: 1.75 life years
- Females: 1.36 life years

98. The benefit per child who has a one cigarette per day reduction in consumption is 0.11 years.

99. The benefit (in discounted life-years) for a randomly chosen adult who quits smoking is estimated as follows:

- The aforementioned five age bands for adult smokers are also used here: those aged (i) under 35, (ii) 35-44, (iii) 45-54, (iv) 55-64, and (v) over 65. The percentage of smokers that quit in each quit age band is then considered, *given that the smoker has already reached one of age categories (i) to (v) above*. For example, 10.5% of smokers quit in the 55-64 age band, whereas 30.2% go on to become lifetime smokers. For an individual who is already aged 55 to 64, it must be that  $(10.5\% / (10.5\% + 30.2\%)) = 25.9\%$  will quit in the 55 to 64 age band, whereas the remaining 74.1% continue to smoke over the age of 65.
- For each category of smoker age, the percentage of smokers who quit in each quit age band (as adjusted above) is multiplied by the life year penalty associated with each quit age band. Obviously, as we move towards the older age bands, fewer and fewer quit age bands enter into the calculation (as it is not possible, say, to quit smoking at 35-44 if you are already aged 45-54). This calculation gives the expected number of life years lost given that the smoker may quit at some point in the future. The calculated values for the older age

<sup>8</sup> ONS (2006). *Smoking and drinking amongst adults 2006*. (p.9). Available at: [www.statistics.gov.uk/downloads/theme\\_compedia/GHS06/Smokinganddrinkingamongadults2006.pdf](http://www.statistics.gov.uk/downloads/theme_compedia/GHS06/Smokinganddrinkingamongadults2006.pdf)

groups are larger, as they are more likely to become lifelong smokers.

- For each age band, the previous table indicates the number of life years that would be lost anyway if the smoker were to quit at their current age. This number is higher for the older age groups, as more harm has already been done. For each age band, these values are subtracted from the numbers calculated in the previous bullet. This gives the number of life-years that could be reclaimed if the smoker were to stop smoking at their current age.
- GHS (2006) data on the age distribution of smokers is used to weight the number of life years that could be saved in each age band. This yields a final estimate of the number of life years that could be saved if a random smoker were to quit today.

100. Therefore, the benefit for each adult who decides to quit smoking:

- Males: 1.36 life years
- Females: 1.12 life years

101. The benefit for an adult who has a one cigarette per day reduction in consumption is 0.09 years.

102. For the following reasons, the benefit estimates described above are conservative:

- It is assumed that no harm is incurred by smoking over the age of 84. There is likely to be some harm here (which would increase the measured benefits if counted), but there is a lack of precise data. In any case, as the cohort is fairly small by this age, the results are not particularly sensitive to this assumption. Even assuming that the relative risk for those aged 84 also holds for those who are aged 84 and over, the discounted 'child who does not start smoking' benefits increase by less than 5%.
- It is assumed that no harm is incurred by smoking under the age of 35. Again, there is likely to be a benefit from not smoking at this age, but there is a lack of precise data.
- It is assumed that quitting after the age of 65 yields no health benefit. There is also likely to be a small benefit here, but again, there is a lack of precise data.
- The estimates do not take account of the fact that the resulting reduced smoking prevalence would reduce demand for stop-smoking goods and services. The economic resources saved could be used for other purposes.

103. Other limitations of the estimate include:

- It is assumed that the same smoking mortality impacts hold for both men and women. The Doll *et al.*<sup>10</sup> study only covers male doctors.
- It is assumed that the average daily number of cigarettes smoked throughout life is linearly related to the number of life years lost. The relationship is unlikely to be perfectly linear in practice.
- The Doll *et al.*<sup>10</sup> study does not explicitly adjust for confounding factors (although it does control for social class, given that its sample consists only of doctors). For example, if smokers are also more likely to drink heavily, this may exaggerate the mortality impact of smoking. However, a similar cohort study (based in The Netherlands)<sup>9</sup> does adjust for a long list of confounding factors, including socioeconomic status, alcohol use and body mass index. The authors conclude that adjusting for confounding factors reduces the estimated number of (undiscounted) life-years lost due to smoking by half a year. This is a fairly small effect given that the estimated life expectancy loss to smokers (including the adjustment for

<sup>9</sup>

Streppel *et al.* (2007), "Mortality and life expectancy in relation to long-term cigarette, cigar and pipe smoking: the Zutphen Study" in *Tobacco Control*, 2007;16, pp.107-113. The Zutphen Study, based in Zutphen, The Netherlands, covers 1,373 men born between 1900 and 1920 and studied between 1960 and 2000.



potential confounders) is still equal to seven years. Given that the estimates presented in this annex are discounted and take account of future quit propensities, any reduction to take account of confounding factors would be considerably less than half a life year.

## Annex 4: Amendments to January 2010 Impact Assessment\*

Calculation amended	Jan 2010 IA	February 2012 IA	Explanation for change
Cost: one-off to business	£22m	£23m	The January 2010 IA did not quantify the cost to businesses of bringing the disposal costs forward. This has been quantified in the October 2011 IA.
Equivalent annual net cost to business	£22m (undiscounted)	£9.8m	The £23m one-off cost has been annualized (£3m) and an allowance for lost profits made in the February 2012 IA. Please see Annex 5.
Cost: Annual tax revenue to the exchequer	£38m - £115m	£16m - £48m	<p>The January 2010 IA used the HMRC forecast for total cigarette duties to the UK of £7.6bn for 2008/09.</p> <p>The October 2011 IA uses a bottom up approach, working up from tax revenue per pack.</p> <p>The Department no longer uses the 2.4 multiplier for policies that are purely regulatory, so this has been removed.</p>
Cost: Loss in consumer surplus	£24m (undiscounted)	£22m (undiscounted)	The January 2010 IA calculated lost consumer surplus for all those affected by the prohibition. The Department should not have included consumer surplus lost to children, as surplus gained by illegal activity is not counted in government appraisal. This has been corrected.
Health benefits to young people, 10 year discounted total	£183m - £918m	£459m - 1,378m	<p>In some cases, young people will be able to buy cigarettes from alternative sources. The January 2010 IA used a range of 10% - 50% to reflect uncertainty around the reduction in total cigarettes bought (e.g. 10% of young people will not be able to find an alternative source is the minimum end of range).</p> <p>1) The October 2011 IA amends this range so it is consistent with our assumptions for adults (25% - 75%). Ranges for both groups have since been validated by experts.</p> <p>2) The estimated number of cigarettes smoked per day by 17 year olds was revised up from 6 to 10 using new evidence.</p> <p>3) The estimated prevalence of 17 year old smokers was reduced from 20% to 18% using new evidence.</p> <p>4) The estimated number of cigarettes bought by young people from vending machines has been reduced from 4.5% to 3%.</p>

Health benefits to adults, 10 year discounted total	£213m - £640m	£232m - £696m	<p>The combined effects:</p> <ul style="list-style-type: none"> <li>• amendments to smoking prevalence and intensity among 17 year olds explained in paragraph 51, and a correction to the numbers of 17 year olds affected</li> <li>• reduction in the proportion of cigarettes bought from vending machines by young people (from 4.5% to 3%)</li> <li>• allowance for the purchase of cigarettes bought from vending machines by 11-16 year olds</li> </ul> <p>These adjustments mean that a smaller proportion of the 1% of total cigarette sales through vending machines are bought by young people (compared to the January 2010 IA). This corresponding increase in the proportion of cigarettes sold through vending machines to adults results in an increase in health benefits for this group.</p>
Net Benefit (Present Value) Option 2	£116m	£855m	Accumulation of the above.

\* Note: All figures in the table are discounted unless otherwise stated.

## Annex 5: One In One Out

104. To reach a figure for One In One Out (OIOO) of this policy, it is necessary to estimate the direct costs on business. The July 2011 OIOO guidance states that "OIOO is based on direct costs and benefits on business and civil society organisations only. Direct impacts are those that can be identified as resulting directly from the implementation or removal/simplification of the regulation. A first order cost/benefit occurs as a direct effect of the regulation. If the effect happens after something else happening first (as a result of the regulation) it is considered a second order effect." In the case of vending machines, although the full economic costs upon business are as estimated in the main body of the Impact Assessment, the direct costs on business are considered to include the following:
- a. Loss of asset value of vending machines;
  - b. Cost of bringing disposal of these machines forward;
  - c. Loss to the market for tobacco vending machine operators and producers in England, in terms of the lost stream of profits and the loss of non re-deployable capital (to producers).
105. Costs (a) and (b) are calculated in the main body of the Impact Assessment – see paragraphs 28 and 29.
106. Cost (a) is estimated at £21.7m. This is calculated by multiplying the estimated 57,934 machines in the UK minus Scotland by the upper estimate of the value of a second hand machine of £375. The rationale is that the value of an asset is equivalent to the expected future profit stream of that asset. See paragraph 28 for details.
107. Cost (b) is estimated at £27.6 per machine multiplied by 57,934 (total number of vending machines) to give a total cost of £1.6m. We have estimated the cost of disposal for a vending machine to be £100. Since the existing machines would be disposed of at some point in the future even if they remained in operation (we take five years as the average life expectancy of the stock of vending machines), the impact of the ban is restricted to bringing forward these costs. The difference between incurring a cost of £100 now or in five years' time, at a 5% real cost of capital, is £27.6 per machine. **The costs of (a) plus (b) combined equal an estimated £23 million.** See paragraph 29 for details.
108. To estimate cost (c) the nature of the vending machine operators' market in *England* needs to be considered. There has been no evidence presented to suggest that tobacco vending machines are manufactured in the United Kingdom. According to the industry, tobacco vending machines are manufactured and imported from a small number of companies based in Spain and Germany, so losses in profits to vending machine *producers* are out of scope for this Impact Assessment. Around 40% of the vending machine operations market was controlled by one large company, Sinclair Collis, which is a wholly owned subsidiary of Imperial Tobacco PLC (one of the world's four largest tobacco companies). The other 60% of the market was divided between around 200 small to medium size companies employing less than 600 people. This competitive market consisted of operations to import the vending machines, locate and distribute them to complying businesses, and stock and maintain the machines as necessary. This industry provided a service to other businesses (mainly in the leisure industry, e.g. licensed public houses) by giving their customers convenient access to tobacco products, while generating a profit stream to the vending machine operators and owners of the business where the machines were installed. Vending machine operators saw their share of the cigarette market decline in recent years from above 2% in 2005, to around 1% or less at the time the ban came into effect. Before we can estimate the impact on business of the ban on cigarette sales from vending machines, the ways in which the industry might respond to the legislation need to be considered.
109. There is a range of possible responses by vending machine operators to the legislation:
- i. Dispose of the machine;
  - ii. Negotiate with businesses to move the vending machine behind the bar to act as a 'secure storage unit';
  - iii. Convert the machines to another use (e.g. to sell another product);

iv. Sell machines abroad on the international second hand market.

110. We consider these responses below and their impact on costs to business:

- i. Dispose of the machine. This results in costs (a) and (b) above.
- ii. Conversion to 'secure storage units'. The vast majority of locations for vending machines are licensed service businesses (e.g. public houses), where it is legal to sell cigarettes behind the bar. Some vending machine operators are trying to convince these businesses to move their vending machines behind the bar, so they can act as a 'secure storage unit' accessible only to staff members. While this option may occur in certain circumstances, maintaining some profits for operators, there is no evidence to suggest, at this stage, that the conversion of vending machines into 'secure storage units' will be widespread. Furthermore, the convenience benefits of having a vending machine are largely lost with a 'secure storage unit', as it takes up staff serving time. If current payment mechanisms remain in place, staff will need to deal in loose change (from customers or tills), work and storage space will be taken up and there will be the requirement for managers and staff to comply with other tobacco sales legislation (e.g. age of sale restrictions). Hence, the marginal cost per packet of cigarettes sold via a 'secure storage unit' is higher than via an unmanned vending machine. This reduces what are already likely to be small profits for licensed premises from the sale of cigarettes, reducing the ability of vending machine operators to negotiate such arrangements.
- iii. Convert the machines to another use (e.g. to sell another product). There are a few examples of vending machines being converted to sell other products, or sell products of a similar size and shape to cigarette packets (so conversion is not required). Evidence from the tobacco vending machine industry is that many trials have taken place to sell other products (including snack foods and nicotine replacement therapy medicines) from converted tobacco vending machines, but that these have generally proved unsuccessful.
- iv. Sell machines abroad on the international second hand market. This is considered a remote possibility due to the costs involved in transportation of heavy machines and the varying legislation abroad placing restrictions on vending machines (e.g. in Germany and Italy there are electronic locking mechanisms on vending machines, requiring a form of identification, such as a driving licence, to access the product). The costs involved in logistics, transport and conversion make this an unrealistic response.

111. The above discussion suggests that, due to the lack of direct evidence on costs (ii) - (iv) and the expected lack of uptake of these options, most vending machines are likely to be scrapped. In order to provide a central estimate of the direct costs on business of the legislation, the best representation of the IN related to the scrapping of vending machines is the one-off cost of the policy (£23m) annualised over the 10 year period (the equivalent annual net cost to business) presented in Table 1. This is considered a *central* estimate since there is the potential, on the one hand, for some overstatement of costs and, on the other, for some understatement of costs. It will overestimate costs to the extent that vending machines are redeployed as 'secure storage units' which provide a continuing flow of profits to vending machine operators. However, it will underestimate costs to the extent that transitional costs incur while staff redeploy their skills (e.g. electronic device maintenance, driving, delivery, restocking, operations management) to another part of the wider tobacco industry, the wider vending industry or to other completely different industries. We consider the general skills involved in the vending machine operations industry in England to be re-deployable. Their loss from the vending machine industry should not therefore represent a long term cost to the economy. As we have already indicated, any loss of profits to the manufacturers of vending machines will be incurred abroad (as the machines in England have been predominately manufactured in Germany and Spain) so are out of scope of this Impact Assessment. To the extent that there are excess or supernormal profits to vending machine operators in what is a competitive market, their loss is unlikely to represent a permanent net loss to the economy. Nevertheless, a loss of profit not captured in the value of the vending machines is potentially a direct impact on business and relevant for OIOO.

Table 1: IN from the scrapping of vending machines for Statement of New Regulation 3 (February 2012)

Component of EANCB	Value	Calculation
1) Number of vending machines	57,934	See Paragraph 28
2) Vending machine asset value	£375	See Paragraph 28
3) Total asset value	£21,725,250	Step 1 * Step 2
4) Cost of disposal per machine	£100	See Footnote 9 to Paragraph 29
5) Cost of bringing disposal forward	£1,600,610	$(100 * 1.05^5 - 100) * \text{Step 1}$
6) Total one-off cost to vending machine operators in England	£23,325,860	Step 3 + Step 5
7) EANCB conversion factor	0.72	$(1 - 1/1.05^{10})/0.05$
<b>8) IN – EANCB</b>	<b>£3.0m</b>	<b>Step 6 * Step 7</b>

112. It has been agreed that the vending machine regulations should be assessed for OIOO for their direct impact upon vending machine (VM) operators; impact upon tobacco manufacturers and distributors and upon providers of replacement goods and services are deemed indirect and out of scope. Our initial estimate of the equivalent annual net cost to business (EANCB) for VM operators of £3m and based on the cost of disposal for VMs in England contrasts with an estimate obtained by the RPC of £85.9m. £85.7m of this is based on a £102m 'gross margin' figure reported by the National Association of Cigarette Machine Operators (NACMO), adjusted to England. While the precise basis for the £102m is unknown, a witness statement prepared for the Judicial Review of the ban on tobacco sales from vending machines by the Chair of NACMO cites a gross profit for the tobacco vending machine industry in excess of £100 million for 2004. This was based on sales of 93.75m packs, over four times the number relevant for this Impact Assessment, and is therefore inappropriate as a measure of lost profit for this IA.

113. RPC have taken issue with our initial view that all the impact on profits for the VM operators is wrapped up in the price of the machines. We acknowledged that there might have been some local monopoly profits invested in each machine in situ which would not be reflected in the price of purchasing the machines, and that this may have been extracted by the VM operators.

114. In addition, we understand that, within the concept of Direct impacts under OIOO, the loss of normal profits arising from the running of cigarette machine operator businesses is to be counted as an IN, notwithstanding that this profit stream will be replaced in due course as resources are redeployed to meet replacement consumer needs (whether for tobacco or for other goods).

115. We demonstrate why the figure of £85.9m is an overestimate as a measure of the EANCB to VM operators and produce a revised estimate of their lost profits (normal and super-normal). We do this by considering the total revenue stream from VMs adjusted for the amount paid to the tobacco companies (which has been agreed to be out of scope) and for the costs of VM operators.

### VM packs: private sector revenue

116. Revenue to the private sector is simply determined by the difference between the price of a VM pack and the amount taken by the government in the form of excise duty and VAT. Table 2 reports the duty plus VAT per pack for a £7.20 VM pack and the equivalent sums for a pack sold in retail outlets at £6.20. We apply the 2010/11 rates of excise duty and the rate of VAT of 17.5% for 2010 (the last full year of operation for VMs).

**Table 2: revenues from the sale of a VM pack and a conventional pack**

	Standard pack	VM pack
Price	6.20	7.20
Ad valorem duty (%)	24%	See Note
Specific duty/1000 sticks	119.03	119.03
VAT (%)	17.5%	17.5%
Cigarettes/pack	20	16
Ad valorem duty/pack (£)	1.49	1.19
Specific duty/pack (£)	2.38	1.90
VAT/pack (£)	0.92	1.07
VAT + duty/pack (£)	4.79	4.17
Revenue/pack after duty + VAT (£)	1.41	3.03

Note: ad valorem duty on a pack of non-standard size is pro rated on the basis of the duty on a pack of 20.

117. On the basis of revenue per pack after duty and VAT for a VM pack of £3.03, and sales to adults of 359.7m cigarettes (item 12 of Table 10a in the body of this IA), or 22.5m packs, total revenue available to be shared by tobacco companies and VM operators is estimated at £68.2m, well below the RPC's EANCB figure.

118. To arrive at a figure for profits, we need to adjust the £68.2m to account for:

- revenues received by the tobacco companies which are out of scope;
- other costs to the VM operators.

### Revenues to the VM operators

119. Total revenues to the private sector relating to the 60% of the market controlled by independent VM operators are given by 60% of £68.2m, or £40.9m. On a per pack basis, we assume that the share of the price of a VM pack earned by the VM operator is made up of:

- 50% of the difference between the revenue after duty plus VAT from a VM pack as opposed to a shop pack; this is based upon an assumption that the monopoly profits are split equally between machine operators and tobacco suppliers;
- the amount which would be received by the retailer for a pack sold in a shop (the retailer's margin).

120. The first of these is equal to £0.81, while we assume that the retailer's margin is equal to 5% of the price of a pack sold in a shop (£6.20), or £0.31. We assume that retailers recover the costs associated with stocking and selling cigarettes from the retailer's margin. In total, VM operators receive £1.12 per pack. It is not possible retrospectively to establish precisely how the additional revenue from a VM pack as opposed to a retail pack, due to high prices and lower ad valorem duty on a non-standard pack of 16 (calculated pro rata on the basis of the duty levied on a pack of 20) was shared between VM operators and tobacco companies. We have been unable to observe the price paid by VM operators for VM packs of 16 as they appear not to have been supplied through the regular channels. A search of the websites of two major retailers and one major cash and carry operator failed to find any indication that they were supplied through these routes, nor were they available in shops. However, we believe that VM operators, due to a lack of market power, would have been able to appropriate only part of the additional revenue from a VM pack compared with a retail pack. As evidence of the potential for tobacco manufacturers to command a share of this additional revenue, we cite the concentration of the tobacco industry in the UK. In 2008, it was estimated that Imperial Tobacco Group and Japan Tobacco Group had 43.9% and 38.8% shares of the UK cigarette market, respectively. Of the remainder, the majority was accounted for by Philip Morris International and British American Tobacco who jointly shared over 14% of the market<sup>10</sup>. On the basis of these findings, we suggest that 50% of the monopoly profits from a VM pack being captured by the VM operator is perhaps a generous estimate.

<sup>10</sup> Gilmore A B, Branston J R, Swenor D (2010). The case for OFSMOKE: how tobacco price regulation is needed to promote the health of markets. Government revenue and the public. Tobacco Control 19:423-430.

## Costs of sourcing VM packs – independent VM operators

121. After allowing for duty plus VAT and revenue to the VM operator, the sum of £1.91 remains from the price of a VM pack. We take this to be the cost to VM operators of sourcing supplies of cigarettes from tobacco companies. For the 60% of the market controlled by independent VM operators, the total cost of purchasing VM packs is £25.8m.

## Costs of VM operations: independent operators

122. From their £40.9m revenue, independent VM operators must cover the £25.8m payments to cigarette suppliers and the costs of stocking the VMs. Inputs to the calculation of re-stocking costs are presented in Table 3.

Table 3: Inputs to the calculation of re-stocking costs

Inputs	Value	Source
Annual restocking visits/VM	12	Assumption
Annual hours restocking/VM	12	Assumption
Hourly wage rate	8.63	Annual Survey of Hours and Earnings 2010 <sup>1</sup>
Uplifted by 30%	11.22	
Miles travelled/visit	5	Assumption
Annual miles travelled/VM	60	
Cost per mile (£)	1.007	The AA <sup>2</sup>

Notes:

<sup>1</sup> <http://www.ons.gov.uk/ons/publications/re-reference-tables.html?edition=tcm%3A77-238620>

<sup>2</sup> [http://www.theaa.com/allaboutcars/advice/advice\\_rcosts\\_petrol\\_table.jsp](http://www.theaa.com/allaboutcars/advice/advice_rcosts_petrol_table.jsp).

### Re-stocking: labour costs

123. We assume that each VM would be re-stocked once a month, requiring one hour's labour on each occasion. The hourly gross pay for 'Elementary Goods Storage Occupations' from the Annual Survey of Hours and Earnings (ASHE), uprated by 30% to allow for on-costs, gives a cost of £11.22 per hour. Total labour costs associated with re-stocking for independent VM operators are £4.7m per annum.

### Re-stocking: transport costs

124. It is assumed that a restocking trip for each VM requires five miles of travel. For the cost per mile, we used the AA's figure of £1.007 for the standing charges and running costs associated with a petrol car which has a cost when new of £16,000-£20,000, doing 5,000 miles per year (this allows for the servicing of 4-5 vending machines per vehicle per day). The total transport costs for independent VM operators are estimated to be £2.1m per annum.

## Profits: independent VM operators

125. Table 4 summarises the cost and revenue calculation for independent VM operators. In accordance with current methods, we have taken pre-tax profits as the relevant measure for OIOO. We note that the impact of the EANCBS of the IN would be mitigated by reduced corporation tax payments.



Table 4: Independent VM operators' costs and revenues

Costs and revenues	£m per annum
<i>Manufacturing and distribution costs as paid by retailers</i>	25.8
<i>Re-stocking: labour costs</i>	4.7
<i>Re-stocking: transport costs</i>	2.1
<i>Total costs</i>	32.5
<i>Total revenue</i>	40.9
<i>Profits before tax</i>	8.4

### Profits for Sinclair Collis (SC)

126. We calculate costs and revenues for SC in the same way as for independent VM operators. Given that SC controlled 40% of the market, their pre-tax profit is calculated as 2/3 of the pre-tax profit figure for independents.
127. We assume that only 10% of the shares of SC, a wholly owned subsidiary of Imperial Tobacco, are held by UK residents (compared with a reference point of the proportion of UK GDP in world GDP of around 3%). Annual pre-tax profits of benefit to the UK are estimate to be £0.6m.

### EANCB for One In One Out (OIOO)

128. We calculate the EANCB by discounting the annual stream of lost profits over a ten year period at a 3.5% discount rate. We assume that the proportion of the cigarette market accounted for by vending machine sales would have remained constant at 1% but adjust for a decline in smoking prevalence from 21.2% to 18.5% by the end of 2015. Table 5 presents the calculations.

Table 5: Calculation of EANCB

Year	Discount factor	Prevalence	Adjusted profits - independents	Adjusted profits - Sinclair Collis
1	0.97	21.2%	8,077,737	538,516
2	0.93	20.8%	7,638,914	509,261
3	0.90	20.3%	7,220,532	481,369
4	0.87	19.9%	6,821,711	454,781
5	0.84	19.4%	6,441,606	429,440
6	0.81	19.0%	6,079,408	405,294
7	0.79	18.5%	5,734,341	382,289
8	0.76	18.5%	5,540,426	369,362
9	0.73	18.5%	5,353,068	356,871
10	0.71	18.5%	5,172,047	344,803
Total			64,079,790	4,271,986

129. Total lost profits to the VM operators are estimated to be £68.4m over 10 years, giving an EANCB of £6.8m. Together with the previous EANCB figure of £3m, the total IN from the banning of sales of tobacco from vending machines is put at £9.8m.

