WORKING TOWARDS A SMOKE-FREE NETHERLANDS

Economic assessment of the target of the National Prevention Agreement to reduce adult smoking prevalence to below 5% by 2040

A report prepared for Philip Morris Benelux
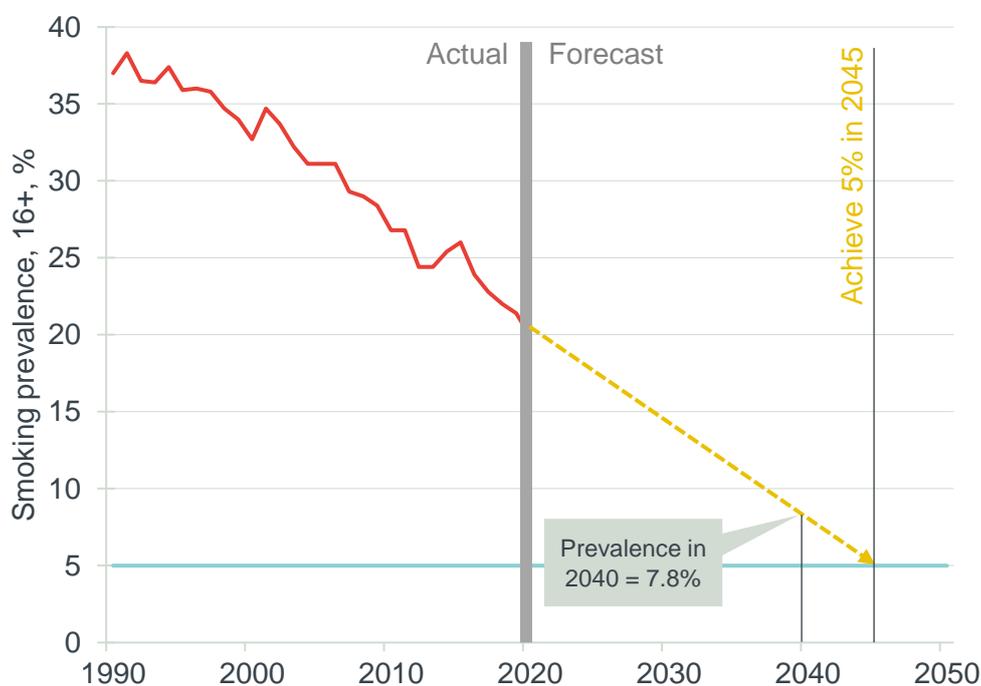
May 2021

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EXECUTIVE SUMMARY

Frontier Economics was asked by Phillip Morris (PM) Benelux to investigate the likely path of adult smoking prevalence in the Netherlands from now to 2040 and beyond, including the impact of the new anti-smoking policies introduced as part of the National Prevention Agreement (NPA).[1] We were also asked to consider the extent to which innovative products can help achieve a smoke-free society.

This report updates analysis first published in 2019[2], both to account for how the NPA policies have been implemented over 2020, and to make use of the most up-to-date data available.

Our key findings are that:

- Under our modelling assumptions, the new NPA anti-smoking policies will reduce prevalence relative to a counterfactual of no new policy.
- The impact will not be sufficient to meet the Dutch government's target of 5% prevalence by 2040. By 2040 we expect prevalence to fall to 7.8% (Figure 1).
- Reducing prevalence further to 5% in 2040 would require an additional 430,000 adult smokers to quit.
- Our analysis suggests that a 5% prevalence rate will be reached in 2045, 5 years later than the target date.

Figure 1   Smoking prevalence forecast for the Netherlands up to 2050
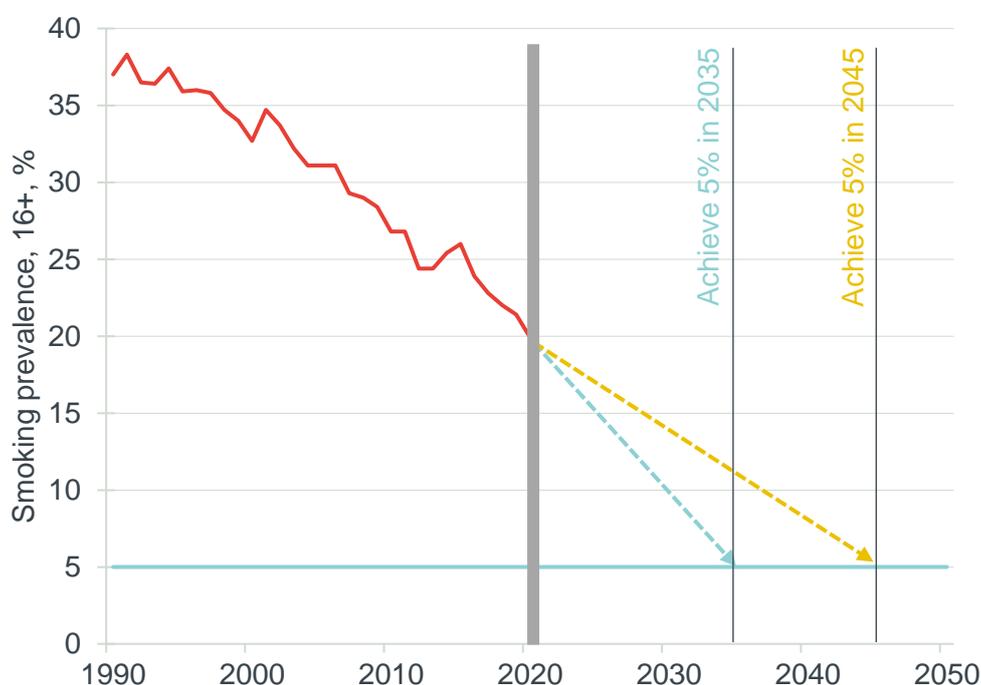

Source: Statistics Netherlands (CBS), Frontier calculations

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[1] https://www.rijksoverheid.nl/documenten/convenanten/2018/11/23/nationaal-preventieakkoord
[2] https://www.frontier-economics.com/media/3200/working-towards-a-smoke-free-netherlands-full-report-english.pdf

- Our prevalence forecast is based on the continuation of the historical average annual decline in smoking prevalence, driven by demographic factors and the introduction of new anti-smoking policies. We also include the impact of the NPA policies over and above this trend.

- Reaching the 5% target by 2040 would require a large acceleration in the annual rate of prevalence decline compared with the historical trend, over and above the expected impact of the NPA anti-smoking policies.

- This would require significant changes, such as:
  - Finding new and effective ways to persuade smokers to quit; and/or
  - A rapid increase in the number of smokers switching to smoke-free alternatives, including e-cigarettes.

- If the Netherlands experienced the same acceleration in prevalence reduction as seen in England the target could be met earlier.
  - Between 2012 and 2019, significant numbers of smokers in England switched to e-cigarettes. Prevalence fell much faster year-on-year than it had previously.
  - If this pattern were repeated in the Netherlands, the 5% target could be met as early as 2035, 5 years earlier than the government's target (Figure 2).
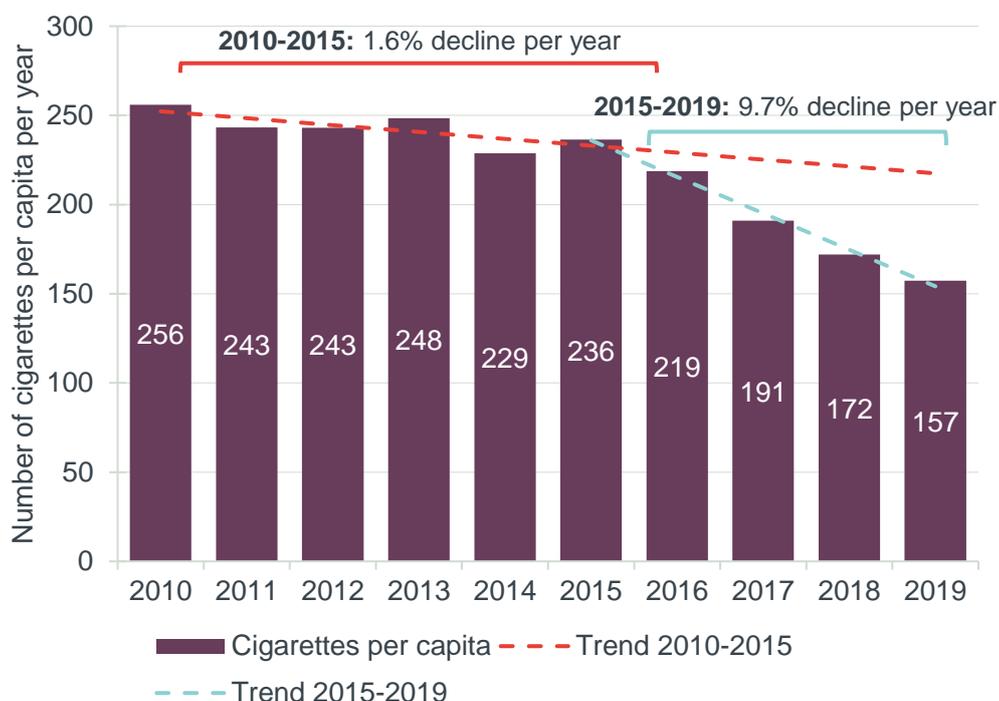 - This would mean over 900,000 fewer smokers in 2035 compared with our central forecast.

Figure 2   Case study: smoking prevalence in the Netherlands if the rate of decline accelerates as it did in England

Source: Statistics Netherlands (CBS), Frontier calculations

- Smokers who have not considered earlier generations of lower-risk alternative products may see new, innovative products as a viable alternative.
  - Evidence from Japan suggests that heated tobacco products have the potential to encourage smokers to substitute away from cigarettes.
  - Academic research has shown that the introduction of heated tobacco products in Japan has likely contributed to recent rapid falls in cigarette sales. The rate of annual decline in nationwide cigarette sales has accelerated since 2015 when heated tobacco products were introduced to the Japanese market (Figure 3).
  - Recent data on the prevalence of different tobacco products in Japan show that a significant percentage of respondents use heated tobacco products only, and no cigarettes. There has been a large fall in the share of adults smoking cigarettes over the 4 years after 2015, when HTPs entered the market.

Figure 3   Cigarette sales per capita in Japan, 2010 to 2019

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[3] https://www.tioj.or.jp/data/index.html

[4] https://data.worldbank.org/indicator/SP.POP.1564.TO.ZS?locations=JP

[5] https://data.worldbank.org/indicator/SP.POP.TOTL?locations=JP

1 INTRODUCTION

1.1 The National Prevention Agreement (NPA)

In November 2018 the Dutch government signed the National Prevention Agreement (NPA): a set of new policies to improve public health in the Netherlands by tackling obesity, problematic alcohol use and smoking.

The target for smoking is to reduce prevalence among adults (22% in 2018) to less than 20% by 2020, and to less than 5% by 2040.

The Dutch Ministry of Health, Welfare and Sport (VWS) asked the National Institute for Public Health and the Environment (RIVM) to produce a 'Quickscan' analysis of the possible impact of the planned interventions relative to the targets. RIVM's analysis concluded that the proposed package of measures was appropriate for the stated targets,[6] but provided little detail of the assumptions behind the analysis.

1.2 The scope of this report

Philip Morris International (PMI) supports the objectives of the NPA and is committed to a smoke-free future. It has announced its ambition to help phase out cigarettes by providing smoke-free alternatives for adults who would otherwise still smoke conventional tobacco products.[7]

Frontier Economics was asked by PM Benelux to investigate the likely path of adult smoking prevalence in the Netherlands from now to 2040 and beyond, including the impact of the proposed NPA policies.

We were also asked to consider the extent to which innovative smoke-free products can help achieve a smoke-free society, drawing on our analysis of smoking prevalence in England,[8] and the recent evidence from Japan of the potential for heated tobacco products to replace cigarettes.

This report summarises our analysis and our findings.

1.3 Our approach

Our approach to the analysis is summarised in Figure 4 below.[9]

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[6] https://www.rivm.nl/en/news/ambitions-National-Prevention-Agreement-feasable-for-smoking-more-measures-necessary-to-%20reduce-overweight-and-alcohol-%20use

[7] PMI has stated that it believes that quitting is best but that switching to smoke-free alternatives is a better alternative than continuing to smoke. "Smoke-free alternatives" refers to products that do not involve the combustion of tobacco, such as heated tobacco products and electronic cigarettes. See Annex A.

[8] https://www.frontier-economics.com/media/3455/working-towards-a-smoke-free-england.pdf

[9] Full detail of the approach and all modelling assumptions is given in Annex C.

Figure 4   Summary stages of our approach

1. Analyse the long-term trends in smoking prevalence in the Netherlands, using official prevalence data from Statistics Netherlands (CBS). The long-term trend, assumed to be driven by demographic factors and the past introduction of anti-smoking policy, is used to project a baseline forecast for how we expect prevalence to evolve in the absence of the proposed policy changes.

2. Forecast the impact of the additional anti-smoking policies proposed in the NPA, over and above our baseline scenario. If the NPA policies proved successful we expect the outcome to be a fall in prevalence relative to our 'no-action' baseline. Estimates of policy impacts are based on a literature review and evidence from the introduction of similar policies in other countries.

3. Consider the role of smoke-free products in reducing smoking prevalence in England, and of reducing sales of cigarettes in Japan. We use the findings of these case studies and a contrast of the policy and regulatory environments to evaluate the potential impact of smoke-free products to reduce prevalence in the Netherlands.

1.4 Report structure

Section 2 sets out the context of past smoking prevalence and anti-smoking policy in the Netherlands, and the measures in the National Prevention Agreement to tackle smoking by increasing anti-smoking legislation.

In Section 3.1 we analyse past prevalence trends to project a baseline forecast for the evolution of prevalence in the absence of the NPA measures.

In Section 3.2 we forecast the impact of the additional anti-smoking policies in the NPA on future prevalence, accounting for uncertainty around our central estimates.

In Section 4 we investigate the role of smoke-free products in England and in Japan, and evaluate the potential of alternative products to help achieve the smoke-free target more quickly.

2 CONTEXT

In this section we set out the context for our analysis: the fall in the proportion of adults who are smokers over the past 30 years; the concurrent evolution of increasing anti-smoking legislation; and the measures set out in the National Prevention Agreement.

2.1 Historical rates of smoking prevalence in the Netherlands

The NPA target is based on adult smoking prevalence in the Netherlands (the share of all adults who smoke), which is in long term decline. However, an acceleration in this rate of decline will be required to meet the government's 5% target by 2040.

2.8 million

Number of adult smokers in the Netherlands, 2020

In 1990 the prevalence of smoking among adults aged 16+ was 37%.[10] This has fallen to 19.9% in 2020 (Figure 5).[11]

2.1 million

Number that would need to quit today to achieve the 5% target

The average fall in prevalence has been 0.57 percentage points per year, though there has been variation in the year-to-year rate of decline. In some years prevalence falls more quickly and in other periods prevalence has fallen more slowly or the decline has stalled.

In 1990 smoking prevalence was high compared with the OECD average.[12] Since then, smoking prevalence has been falling faster than it has in other European countries, including Germany, France, Italy and Spain.[13]

However, prevalence remains much higher than the target set out by the Dutch government of 5%, the rate at which the Netherlands would be considered to be 'smoke-free'. The 2020 prevalence rate implies an additional 2.1 million smokers above target.

To reach the 5% target by 2040, prevalence would need to decline by 0.75 percentage points per year. This would mean the proportion of smokers in the

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[10] All prevalence figures presented in this report represent the number of smokers aged 16+ as a fraction of the 16+ population: this is the series with sufficient historical data available from Statistics Netherlands. The NPA 5% target is stated in terms of the adult (18+) population. Smoking rates are lower among 16- and 17-year-olds than in the adult population:16+ prevalence has on average been around 0.3 percentage points lower than 18+ prevalence based on the years of comparable data (2014 to 2018). Therefore our **prevalence** forecasts, based on the 16+ population, are close proxies for 18+ prevalence but are probably slightly optimistic in terms of smoking reduction. For forecasts of **number** of smokers, we apply the average uplift of 18+ prevalence over 16+ prevalence from the last 5 years of comparable data (2015 to 2019) to estimate the number of smokers in the adult population.

[11] Note that the prevalence rate for the 16+ population in 2020 had not yet been published when this report was compiled: we instead take the published 2020 figure for 18+ prevalence (20.2%) and adjust as described above for the 16+ population.

[12] OECD (2019), Daily smokers (indicator). doi: https://doi.org/10.1787/1c4df204-en

[13] OECD iLibrary, Health at a Glance 2015, Tobacco consumption among adults.

population would need to fall 31% faster year-on-year than it has historically to hit the 2040 smoke-free target.

Figure 5   Adult smoking prevalence in the Netherlands, 1990 to 2020
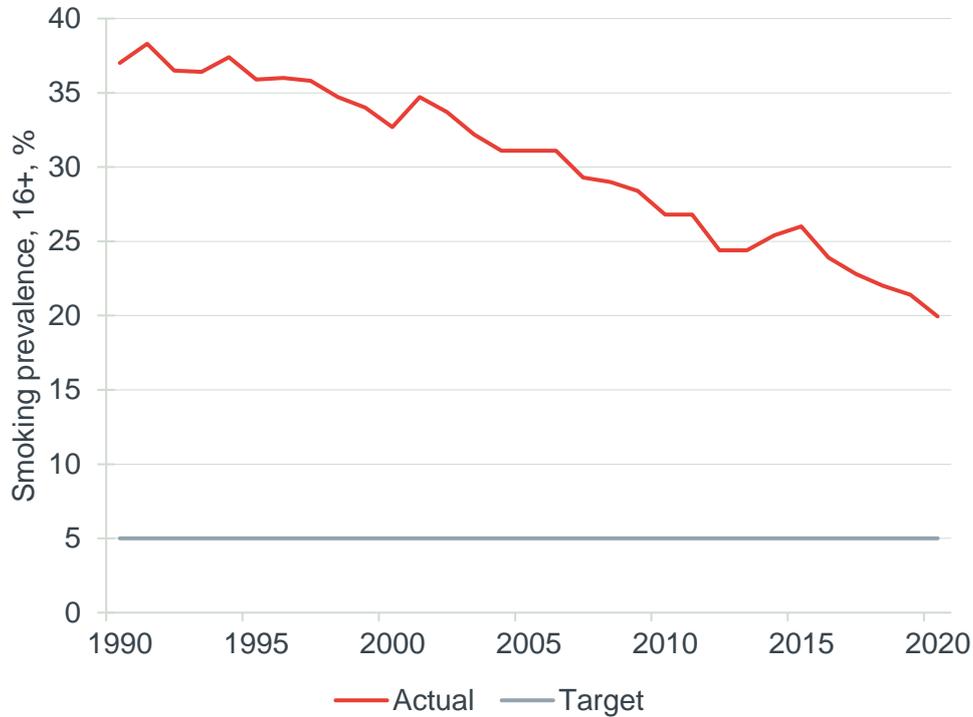
2.2 Tobacco control policies in the Netherlands up to 2020

Figure 6 shows tobacco control policies introduced in the Netherlands since 1990. Policies aimed at reducing smoking have included restrictions, such as bans on smoking in particular places and the ways in which tobacco products can be advertised, and campaigns to encourage smokers to quit or support stop-smoking services. In recent years, restrictions required by EU-level tobacco legislation have been implemented including graphic health warnings and bans on special flavours.

Over the same time period, smoking prevalence has declined significantly. The reduction in the proportion of the population that are smokers is likely to be driven both by the regulatory environment, that makes smoking more expensive and restricts the ways in which tobacco products can be used and sold, and by demographic factors. The availability of alternative smoke-free products such as e-cigarettes is also likely to influence prevalence, to the extent that smokers completely substitute smoking conventional tobacco products by the use of these smoke-free alternatives.

This makes it difficult to attribute any decline in prevalence over a previous year to any one anti-smoking intervention. Future declines in smoking prevalence will also be driven by a combination of these underlying drivers.

Figure 6   Trend in smoking prevalence and tobacco control policy in the Netherlands 1990 to 2020

90: Tobacco Act:
Obligated public bodies to restrict smoking (no sanctions)
Smoking ban in public buildings and on public transport

95: Advertising ban on billboards

96: Advertising ban in cinemas

91: Campaign "quit smoking together"

02: Smoking ban strengthened incl. sanctions
Ban on advertising
Increased health warnings on packs

03: Age limit 16 years
Advertising ban

04: Smoking ban widened to workplaces and transport

08: Smoking ban widened to restaurants and bars

10: Smoking ban lifted for small bars

00: Millenium Campaign

06: National Tobacco Control Program

11: Smoking Cessation Reimbursement Campaign + mass media campaign.
Discontinued in 2012
Restarted in 2013 but without mass media

15: Ban enforced in all bars
Age limit 18 years
E-cigarettes regulated as tobacco

16: Implementation of EU Tobacco Products Directive: Large graphic health warnings, prohibition of flavours, packaging restrictions

18: Additional packaging restrictions

Key:
Restrictions
Campaigns

Smoking prevalence, 16+, %

—— Actual   ----- Trend

Source: *Statistics Netherlands (CBS), Frontier calculations*
https://www.rug.nl/rechten/congressen/archief/2009/oprichtingscongres-nilg/selfreg_c5_smoking_bans_in_the_netherlands.pdf
https://alliantienederlandrookvrij.nl/wp-content/uploads/2018/05/2018-Geschiedenis_Tabaksontmoediging-webversie.pdf

2.3 Proposed policy reforms of the National Prevention Agreement

The package of policies set out in the National Prevention Agreement imply a step up in the rate of introduction of anti-smoking policies compared with historical trends. If successful, we would expect to see a faster rate of decline in smoking prevalence over the medium term horizon that the legislation covers (up to 2023) than we would have seen in the absence of the new tobacco control policies.

The new policies fall under four main categories:

- Increases in excise duty;
- Packaging restrictions;
- Smoking bans; and
- Display and advertising restrictions.

The details of the new policies, in comparison to the legislation previously in place, are set out below.

Increases in excise duty

From 1996 to 2019, real (inflation-adjusted) excise duty increased at an average rate of 2.9% per year, and the price in euros of a pack of 20 cigarettes increased threefold over this period. Policies to increase excise duty, or accelerate the rate of increase, have a material impact on the price of a pack of cigarettes, and we would expect this to decrease demand.

In April 2021, a large increase in excise duty of €1 per pack of 20 cigarettes was implemented as part of the NPA policy package. As can be seen in Figure 7, this is a much larger increase than has occurred in the past, and excise now accounts for almost 65% of the pack price

In the medium term, after a review of the impact of the April 2020 tax increase, the government plans to increase excise duty such that a pack of 20 cigarettes will cost €10 by 2023. For comparison, as of January 2021 the price of a pack of 20 Marlboro cigarettes is €8.20.[14]

Packaging restrictions

Restrictions on packaging requirements are based on the EU Tobacco Products Directive (TPD), which includes a requirement for pictorial health warnings covering the top 65% of the front and back of cigarette packaging.[15]

The NPA included proposals to require cigarettes and fine cut tobacco to have dark green or brown plain packaging,[16] which was implemented in October 2020. This is a policy already implemented in countries including the United Kingdom and Australia (see Annex C.2).

Smoking bans

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[14] PMI documentation. Note that our forecasts for the retail selling price of a pack of 20 cigarettes are based on historical data on the price of a Marlboro brand pack.

[15] https://tobaccolabels.ca/countries/european-union/

[16] https://zoek.officielebekendmakingen.nl/stb-2020-109.html

In 2020, smoking rooms in hotels, restaurants and cafes were banned.

As of July 1st 2021 smoking rooms will be banned in (semi-) public and government buildings and as of January 1st 2022 in businesses. On top of that, the NPA contains the intention to extend the smoking ban to cover outdoor areas on the premises of schools and daycare centres from 2025.

Figure 7   Historical increases in excise duty, 1996 to 2021
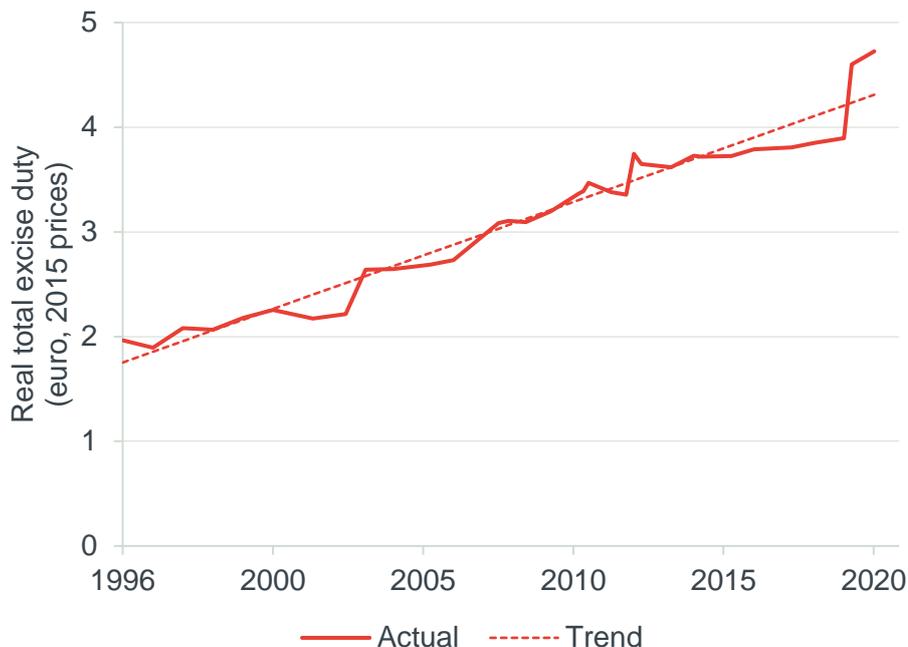
Display and advertising restrictions

Pre-NPA, the display of tobacco products was allowed at the point of sale, and advertising allowed inside and on the façade of tobacconists.[17]

The NPA has introduced additional restrictions on display and advertising including:[18] [19]

- Cigarettes out of sight at supermarkets from July 2020;
- Cigarettes out of sight at other sales points from January 2021, except for particular specialist tobacconists;[20] and
- Advertising ban on the façade of all sales outlets from January 2021;

An advertising ban inside all sales outlets, except for the specialist tobacconists that are exempted from the display ban, is expected to be implemented later in 2021.

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[17] https://www.who.int/tobacco/surveillance/policy/country_profile/nld.pdf

[18] https://zoek.officielebekendmakingen.nl/stcrt-2019-57274.html

[19] https://www.internetconsultatie.nl/x

[20] The exception applies to specialist tobacconist retailers that only sell tobacco, magazines and lottery tickets, and existing small specialist tobacconist retailers that generate > 75% of their turnover from tobacco and a total turnover of up to EUR 700,000.

3 FORECASTS OF FUTURE PREVALENCE

In this section we set out our forecasts for adult smoking prevalence up to 2040, first excluding and then including the impact of the NPA policies outlined in Section 2.3. We assess how our forecasts compare with the government's 5% target for prevalence in 2040.

3.1 Modelling the future path of smoking prevalence without the NPA reforms

Baseline prevalence scenario

Our baseline forecast is that, without the NPA policy interventions, smoking prevalence will stand at 9.6% of the adult population in 2040 – almost double the target rate (Figure 8).

A 9.6% smoking rate equates to 1.4 million smokers. The number of smokers would need to fall by a further 690,000 to meet the 5% target.

690,000

Number of additional smokers above 5% target in 2040, excluding the impact of the NPA

To form a baseline forecast, we project forward the past rates of decline year-on-year that have been observed since 1990. In effect, we project what would happen to future prevalence if:

2048

Year in which the 5% target is achieved, under our baseline forecast

- Tobacco control policies continue to be introduced at the same pace as in the past, and have the same impact on prevalence; and

- Demographic trends affecting adult prevalence also continue as before.

The baseline does not include any specific estimate of the additional anti-smoking policies proposed in the NPA, as we consider the effects of these policies to be additional to the existing trend and largely to occur in 2021 and beyond.[21]

The baseline path that we have forecasted is more optimistic about future prevalence decline than the baseline of RIVM's Quickscan analysis.[22] RIVM use as their baseline scenario the forecast produced in 2018 as part of the Public Health Future Outlook (VTV). The VTV forecast predicts adult smoking prevalence to fall to 13.6% in 2040 (see Annex C.1 for further details), higher than under our baseline forecast. As RIVM have not published the assumptions underlying the analysis, we cannot identify the precise reasons for the differences in the forecasts,

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[21] The baseline trajectory does include the observed 2020 prevalence data, which could in part reflect reforms introduced under the NPA, in particular the large increase in excise duty in April 2020. However the majority of NPA reforms had either not been implemented by 2020 or might be expected to feed through into prevalence from 2021 onwards. The impact of including 2020 in our baseline projection is small, increasing the annual average decline in smoking prevalence by 0.03 percentage points compared with excluding it.

[22] https://www.rivm.nl/en/dutch-public-health-foresight-study

but they may differ due to different assumptions about future demographics, or the future trend of anti-tobacco policies.

Figure 8   Baseline forecast of smoking prevalence, 1990 to 2050
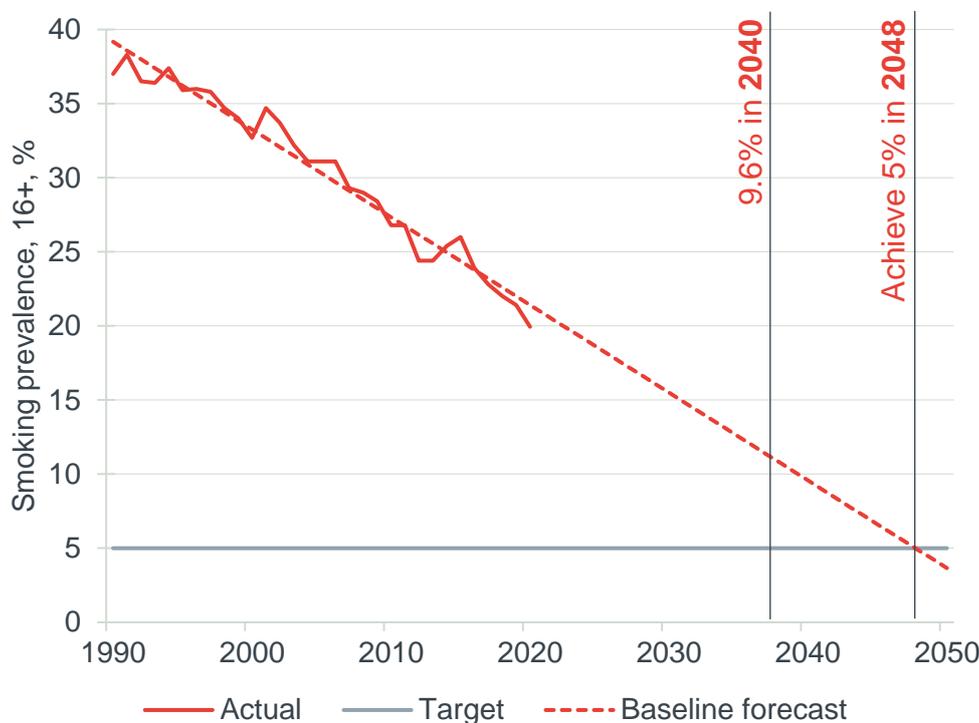
Source: Statistics Netherlands (CBS), Frontier calculations.

Note: Note that the baseline forecast takes the trend in prevalence over the whole period 1990-2020. 2020, the last year of data, saw a larger-than-average decrease in prevalence over the previous year, taking prevalence below this long term trend. There is no reason to assume that prevalence will remain below this long-term trend in future; our baseline projection is that in the long-term prevalence would decline at the same rate as the historical average.

3.2 Modelling the future path of smoking prevalence including the impact of the NPA reforms

Central prevalence scenario

Our central prevalence scenario is based on an estimate of the additional impact of the new policies in the NPA.

The impact of any new policies is inherently uncertain, so the assumptions of prevalence impacts are based on a literature review and the previous experiences from other countries of introducing similar policies. Modelling assumptions and the evidence underpinning them are detailed in Annex C.

We also model a 'low' prevalence sensitivity to account for the uncertainty bounds around our impact estimates.

The impacts of these policies, over and above the long-term trend, are combined with the baseline forecast to project future prevalence including the impacts of increased anti-smoking restrictions.

Under the central case, adult smoking prevalence falls to 7.8% by 2040 (Figure 9), lower than in the baseline due to the additional impact of the NPA policies. The government's 5% target is reached only in 2045, 5 years behind the target date, but 3 years sooner than in our baseline forecast.

Relative to the baseline projection, our central scenario sees large reductions in prevalence between 2021 and 2023 because of further large increases in excise duty, and the one-off impacts of the packaging restrictions, smoking bans and advertising and display bans introduced over 2020, which are spread over a few years.
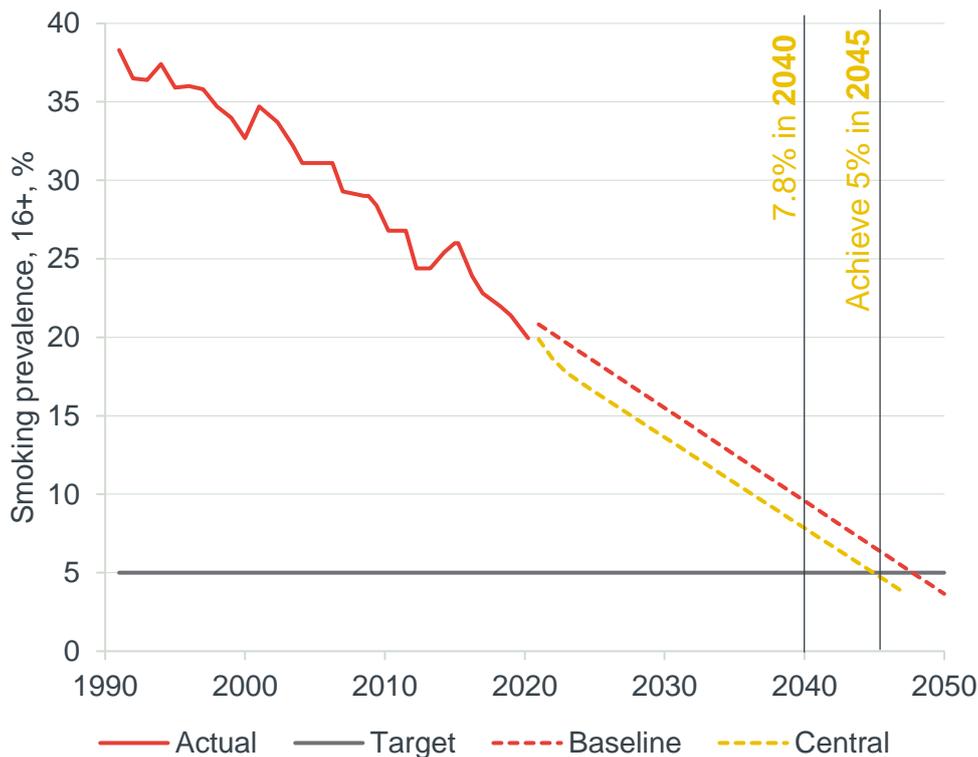
430,000
Number of additional smokers above 5% target in 2040 under our central forecast, including the impact of the NPA

2045
Year in which the 5% target is achieved, under our central forecast

Figure 9   **Central scenario of smoking prevalence after NPA reforms, 1990 to 2050**

Source: Statistics Netherlands (CBS), Frontier calculations.

Low prevalence sensitivity

The impact of future policy reforms on prevalence is uncertain. Our central scenario represents our best estimates of future prevalence, based on the likely path of future policy, the literature assessing the size of policy impacts, and the prior experiences in other countries of introducing similar legislation. However for each

assumption there is a range of possible assumptions implying higher or lower future prevalence.

To account for this uncertainty around both the future path of policy, and the impact of proposed policies on adult smoking prevalence, we model a 'low' prevalence scenario in addition to the central forecast. Details are in Annex C.2.

Even in the low scenario, prevalence falls to only 6.5% by 2040, i.e. remains above the 5% target for that year. Summaries of our scenario forecasts for 2040 are in Figure 11.

The 'low prevalence' scenario assumes:

- Excise duty continues to increase at above-historical rates;
- Tax increases prove more successful in reducing demand for cigarettes, and cross-border effects do not materialise to the same extent, which increases the effect of higher prices on reducing prevalence;
- Regulatory restrictions reduce prevalence by a magnitude at the upper end of the evidence from international experience.

Figure 10   Central, low and high scenarios of smoking prevalence after NPA reforms 1990-2050
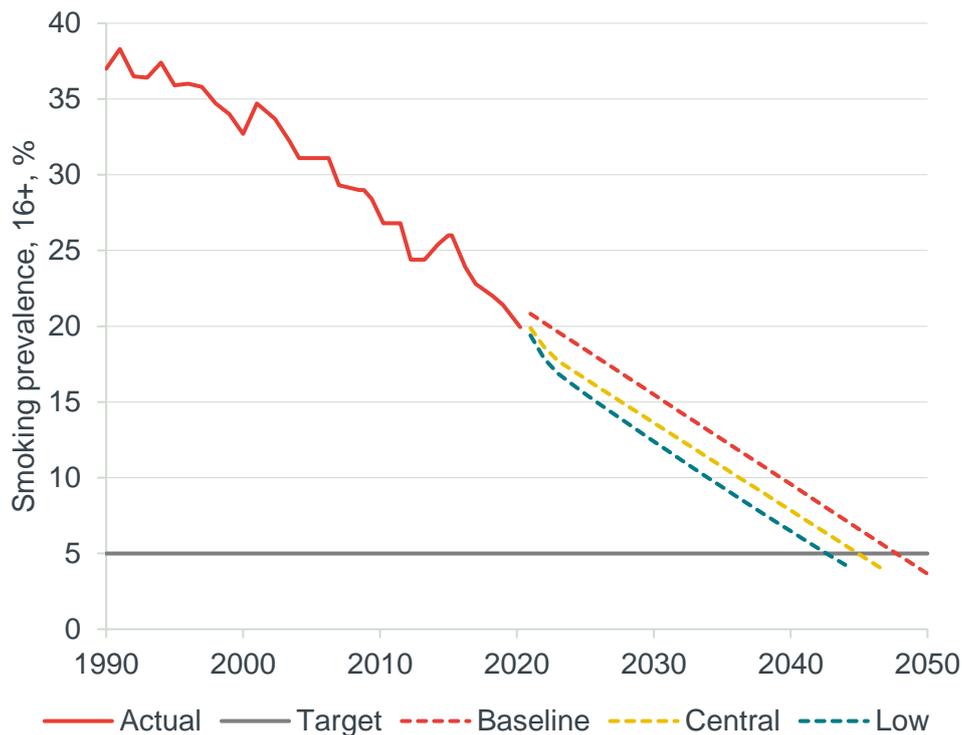
Source: Statistics Netherlands (CBS), Frontier calculations

Figure 11   Smoking prevalence across all scenarios in 2040

	Baseline	Central	Low
Smoking prevalence in 2040, %	9.6	7.8	6.5
Year in which 5% target is achieved	2048	2045	2043

Source: Statistics Netherlands (CBS), Frontier calculations

4 CASE STUDIES: THE ROLE OF ALTERNATIVE PRODUCTS IN ACHIEVING A SMOKE-FREE SOCIETY MORE QUICKLY

4.1 The uptake of e-cigarettes in England

England's experience with tobacco harm reduction policies and e-cigarettes makes an informative case study for considering smoking prevalence in the Netherlands.

Prevalence of smoking and e-cigarette use

In England, the annual rate of reduction of smoking prevalence accelerated in 2012, coinciding with increased popularity of e-cigarettes (Figure 12).

Between 1993 and 2011 the average annual decline in smoking prevalence in England was 0.41 percentage points per year.

1.9 million
Smokers in Great Britain who have stopped smoking entirely by switching to e-cigarettes

Between 2012 and 2019 (the last year of available data), this rate accelerated to 0.71 percentage points per year, declining 74% faster compared with the earlier period.

The accelerated decline in smoking prevalence is likely due in material part to greater use of e-cigarettes as a quitting aid.[23]

In 2020, Action on Smoking and Health (ASH) found that just under 2 million ex-smokers in Great Britain had quit smoking and fully converted to e-cigarettes.[24] The majority of e-cigarette users ('vapers') are ex-smokers (59%) or current smokers (38%). The main reason given by ex-smokers for using e-cigarettes is firstly to help them quit (41%), and secondly to prevent relapse (20%).

Data on the e-cigarette market shows that a higher proportion of the UK population uses e-cigarettes than in the Netherlands, and more of those are daily users. Spend per head is much higher in the UK. The UK market is forecast to grow significantly over the next few years, whereas the size of the market in the Netherlands per head of the population is predicted to stall.

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[23] https://www.frontier-economics.com/media/2264/pmi-revised-frontier-report-final-300818.pdf

[24] https://ash.org.uk/wp-content/uploads/2020/10/Use-of-e-cigarettes-vapes-among-adults-in-Great-Britain-2020.pdf.
Calculated as proportion of vapers who are ex-smokers (59%) multiplied by total number of vapers (3.2 million).
Note that the prevalence data reported in this Section covers England only, while ASH report data for Great Britain and the size of the e-cigarette market data shown in Figure 13 and Figure 14 is for the United Kingdom. As England makes up the majority of the population of the UK and Great Britain, we would expect findings on e-cigarette use for the Great Britain or UK as a whole to be comparable to the situation in England only, so these figures are still informative for analysing the decline in England's smoking prevalence.

Figure 12   Smoking prevalence in England, 1993 to 2019
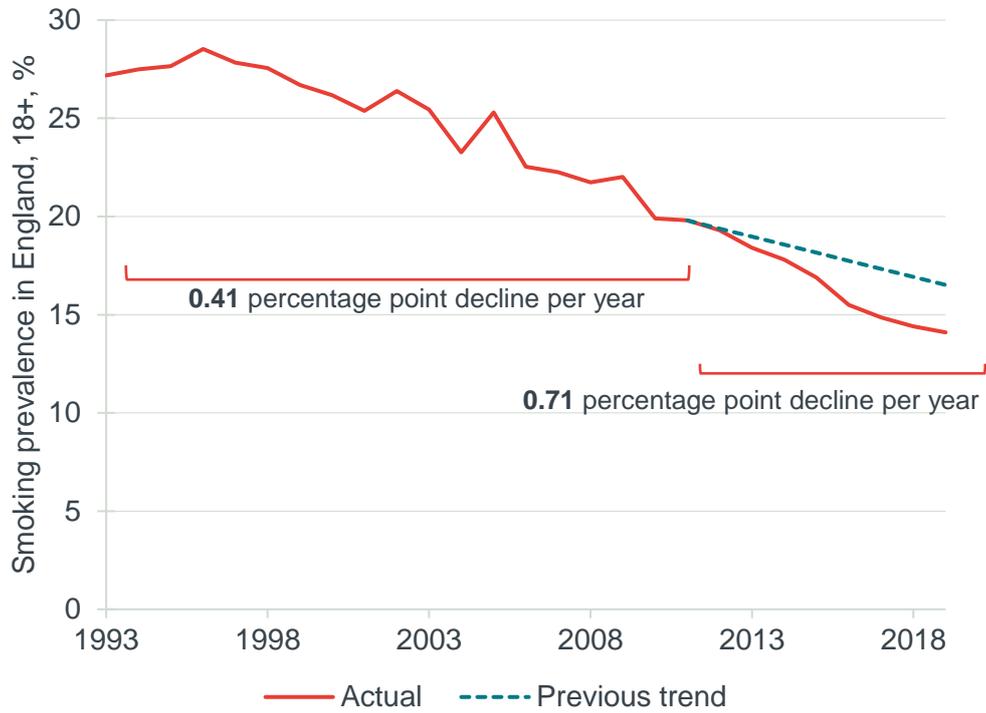
Source: Health Survey for England (1993-2009), Annual Population Survey (2010-2019), Frontier calculations.

Figure 13   Comparison of the e-cigarette markets in the UK and in the Netherlands

	Netherlands	UK
Adult vaping population (% of 18+)	1.8%	7.1%
Market size (2019, m)	€ 59	€ 1,139
Market size per capita (2019)	€ 3.45	€ 17.25
Percent of users who use daily	50%	65%

Source: ECigIntelligence market reports (2020), Office for National Statistics (UK population forecast), Statistics Netherlands (NL population forecast), Eurostat (£/€ exchange rate), Frontier calculations.

Figure 14   Trend and forecasts of the e-cigarette market in the UK and the Netherlands
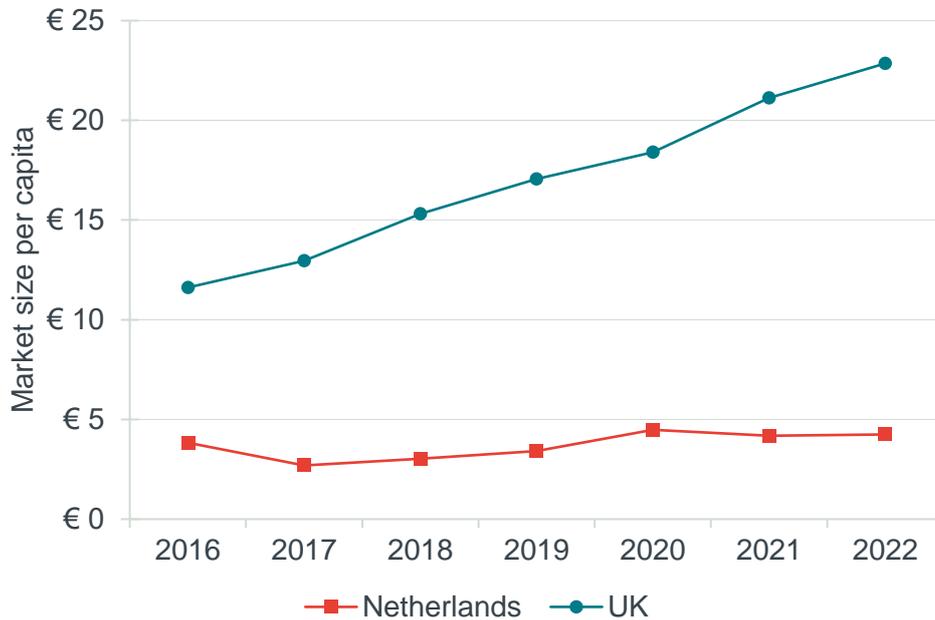
Source: ECigIntelligence market reports (2020), Office for National Statistics (UK population forecast), Statistics Netherlands (NL population forecast), Eurostat (£/€ exchange rate), Frontier calculations.

Note: Figures for 2021 and 2022 are forecasts, the UK 2020 figure is also a forecast..

Public health attitudes to e-cigarettes in England and the Netherlands

The regulatory policy towards e-cigarettes, and public opinion surrounding their use, is likely to affect the rate of smokers switching to e-cigarettes. Figure 15 contrasts the context in England/the UK towards that of the Netherlands.

A more restrictive attitude towards e-cigarettes, expressed by policy makers or other stakeholders, could present a barrier for smokers considering switching from cigarettes to reduced-harm alternatives, holding back the rate of prevalence decline. While in general the attitude in the Netherlands is more restrictive towards e-cigarettes than in the UK, more recently there have been some indications of stakeholders highlighting the reduced-harm potential of e-cigarettes as an alternative to smoking.

However, the NPA proposes to increase regulations on smoke-free alternatives, for example considering plain packaging from 2022 on which draft regulation has already been published. England achieved its acceleration in prevalence reduction at the same time as a rise in the popularity of smoke-free alternative products. Therefore the proposed regulations would be an upside risk to our prevalence forecasts, to the extent that smoke-free alternative products have been shown to be effective quitting aids (see Annex A).

Figure 15   Attitudes towards e-cigarettes of public health authorities in UK and the Netherlands

	Netherlands	UK
Public Health Institutes	*"The Dutch Food and Consumer Product Safety Authority is of the opinion that electronic cigarettes - both with and without nicotine - are so unsafe, that consumers should not use them regularly for a long time."* - **The Netherlands National Institute for Public Health and the Environment (RIVM)** (2015).[25] However more recently, RIVM has published research underlying the harm reduction potential of e-cigarettes and recommending improved health communication about smoking and vaping: *"Although total cessation of nicotine and tobacco products would be most beneficial to improve public health, exclusive e-cigarette use has potential health benefits for smokers compared to cigarette smoking."*[26] *"It is clear that e-cigarettes are less safe than previously thought. Based on the precautionary principle, Dutch public health benefits most from discouraging the use of e-cigarettes and limiting their use to the group of smokers who really do not succeed in quitting smoking with the proven effective tools."* -**Trimbos Institute** (2020).[27]	*"Best estimates show e-cigarettes are 95% less harmful to your health than normal cigarettes, and when supported by a smoking cessation service, help most smokers to quit tobacco altogether."* - **Public Health England (PHE)** (2015).[28] *"Studies show that tens of thousands of smokers stopped as a result of vaping in 2017, similar to estimates in previous years... there is stronger evidence in this year's report that nicotine vaping products are effective for smoking cessation and reduction."* - **Public Health England (PHE)** (2021).[29]
Non-governmental organisations	*"Our starting point is that not smoking and not vaping is the norm [...] We suppose that the e-cigarette can help smokers to quit, or play a role as harm reduction tool for nicotine addicts, but too little is known about its effectivity to remain abstinent. On the other hand we do not exclude that via the e-cigarette some non-smokers (especially minors) will take up smoking. The e-cigarette is not harmless, but it is less harmful than a traditional cigarette. Too little is known on the harmfulness of the e-cigarette on the long term."* - Standpoint of **Alliantie Nederland Rookvrij** (2014).[30]	*"E-cigarettes are not a gateway to smoking… E-cigarette use is likely to lead to quit attempts that would not otherwise have happened… E-cigarettes offer a useful tool to reduce the harm associated with tobacco."* - **The Royal College of Physicians (RCP)** (2017).[32] *"ASH supports PHE's recommendation that smokers who have struggled to quit should try vaping as an alternative to smoking, and that e-cigarettes should be made available on prescription."*

[25] https://www.rivm.nl/nieuws/damp-van-e-sigaret-schadelijk-voor-gezondheid (translated from Dutch)

[26] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6862614/

[27] https://www.trimbos.nl/docs/160d6402-233a-426e-9343-b10d1c5f5b39.pdf

[28] https://www.gov.uk/government/publications/e-cigarettes-an-evidence-update

[29] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/962221/Vaping_in_England_evidence_update_February_2021.pdf

[30] https://www.alliantienederlandrookvrij.nl/wp-content/uploads/2012/10/140527-standpunten-e-sigaret-ANR.pdf (translated from Dutch)

[32] https://www.rcplondon.ac.uk/guidelines-policy/e-cigarettes-inquiry

	More recently, Gera Nagelhout, **The Chief Science Officer of the Institute for Research on Lifestyle and Addiction (IVO),** expressed support for e-cigarettes as harm reduction tool: "*Now both American and Dutch politicians and doctors are calling for a ban on e-cigarettes. That response is not a smart one, because smokers can benefit from using e-cigarettes to stop smoking.*"[31]	- **Action on Smoking and Health (ASH)** Chief Executive Deborah Arnott (2018).[33]
Government policy positions	In 2018, a new regulation was adopted to extend the same restrictions to nicotine-free e-cigarettes as to those containing nicotine. The National Prevention Agreement proposes to consider introducing many of the same regulations on e-cigarettes as traditional tobacco products, including extending plain packaging to e-cigarettes from 2022, and banning vaping in public places from 2020. This is on the basis that smoke-free products could act as a gateway and hence different regulation is not appropriate: "A smoke- and tobacco-free environment also means that children do not come into contact with novel tobacco products (such as heated tobacco) and e-cigarettes with and without nicotine. […] it is it is not excluded that young people may start smoking tobacco due to the use of these products." - **National Prevention Agreement** (2018).[34]	"*The best thing a smoker can do for their health is to quit smoking. However, the evidence is increasingly clear that e-cigarettes are significantly less harmful to health than smoking tobacco. The government will seek to support consumers in stopping smoking and adopting the use of less harmful nicotine products.*" - **Department for Health and Social Care**, Tobacco Control Plan for England (2017).[35] "*E-cigarettes present an opportunity to significantly accelerate already declining smoking rates… Existing smokers should always be encouraged to give up all types of smoking, but if that is not possible they should switch to e-cigarettes as a considerably less harmful alternative.*" - **House of Commons Science and Technology Committee** (2017).[36] The Committee recommended reviewing "anomalies" of the UK regulatory system that could be holding back the use of e-cigarettes as a stop-smoking measure, and relating the level of taxation to the level of harm.

[31] https://www.volkskrant.nl/columns-opinie/pak-liever-de-e-sigaret-dan-de-tabakspeuk~bf6389fe/ (translated from Dutch)

[33] http://ash.org.uk/media-and-news/press-releases-media-and-news/ash-welcomes-new-public-health-england-report-e-cigarettes/

[34] https://www.rijksoverheid.nl/documenten/convenanten/2018/11/23/nationaal-preventieakkoord (translated from Dutch)

[35] https://www.gov.uk/government/publications/towards-a-smoke-free-generation-tobacco-control-plan-for-england

[36] https://publications.parliament.uk/pa/cm201719/cmselect/cmsctech/505/505.pdf

Scenario: if the Netherlands experienced the same acceleration of reduction in prevalence as England

If prevalence decline accelerated in the Netherlands at the same rate as happened in England when e-cigarettes gained popularity, the 5% target could be achieved as early as 2035, 10 years earlier than in the central scenario (Figure 16).

Figure 16   Case study: prevalence in the Netherlands if the rate of decline accelerates as it did in England
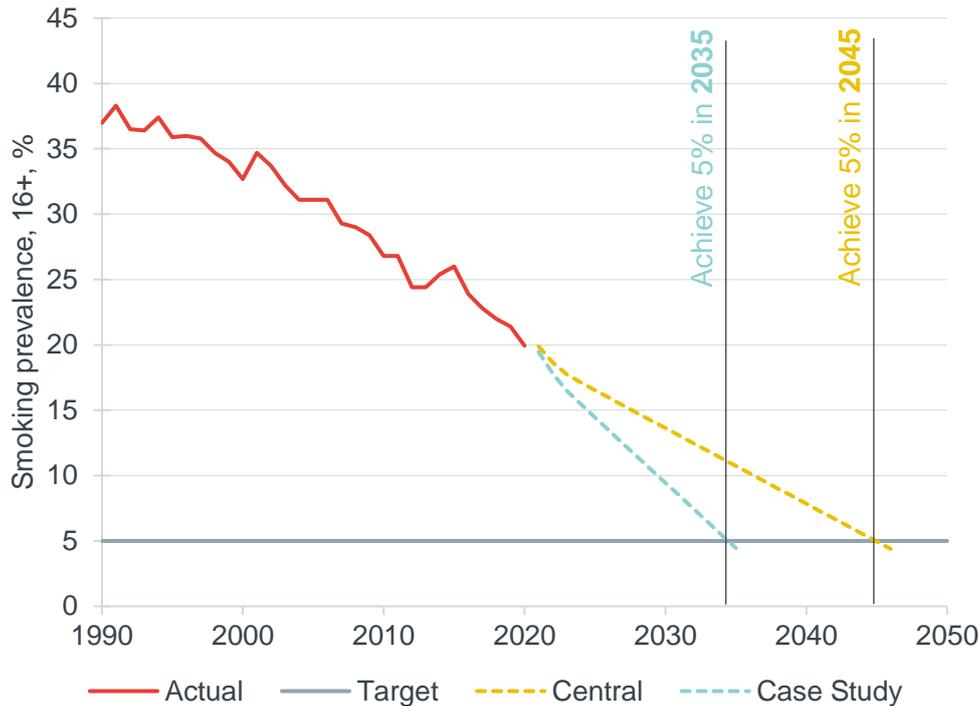
Source: Statistics Netherlands (CBS), Frontier calculations

The average rate of decline in prevalence in the Netherlands over the period 1990 to 2020 was 0.57 percentage points per year.

If this underlying rate of decline increased by 74%, in line with the English experience, to 0.99 percentage points per year, and the National Prevention Agreement tobacco control policies had the same impact on reducing prevalence as in our central scenario, smoking prevalence could fall to 4.5% by 2035, achieving the 5% target 5 years earlier than 2040.

This implies over 900,000 fewer smokers in 2035, compared with our central forecast.

This is an illustrative scenario rather than a prediction of future prevalence. However it illustrates how a sustained increase in the rate of decline in prevalence (which may in part be due to increased popularity of smoke-free products) can have a big impact on when the 5% smoke-free target could be achieved.

4.2 The uptake of heated tobacco products in Japan

Japan's experience as the largest global market for heated tobacco products (HTPs), and as a country which has seen a substantial acceleration in the rate of decline of cigarette sales over the past 4 years, makes an informative case study for assessing potential avenues for reducing smoking prevalence in the Netherlands. Evidence from Japan suggests that HTPs could be effective in reducing consumption of cigarettes.

Heated tobacco products in Japan

HTPs have a heating device and a tobacco element. When the element is heated, it produces a vapour which is inhaled. As with e-cigarettes, HTPs do not involve combustion processes and the tobacco is only heated and not burned. Examples of HTPs currently on the market in Japan include Philip Morris' IQOS, British American Tobacco's Glo and Japan Tobacco's Ploom.

Japan is the largest market globally for HTPs, accounting for around 85% of global sales in 2018. HTPs make up more than 20% of the total Japanese tobacco market.[37] E-cigarettes containing nicotine, which in other countries have gained popularity as an alternative to smoking conventional cigarettes, are not available in Japan.[38]

Compared with other developed countries, Japan has relatively lower levels of anti-smoking legislation, with some voluntary but fewer compulsory restrictions. A ban on smoking indoors in government agency, school and hospital premises only came into effect in July 2019, whereas such a ban was enacted in 1990 in the Netherlands. Similarly, fewer legal restrictions exist on display and advertising, although some restrictions are followed in practice because of industry self-regulation or accepted practices.[39]

Current restrictions on HTPs in Japan are relatively lighter than for cigarettes. Heated tobacco sticks (the refills for the heating devices) are regulated in the newly-created product category "Heated Tobacco", carrying a lower tax rate than regular tobacco. The devices heating the tobacco are regulated only under consumer product law, not tobacco legislation.[40] More places choose to allow use of HTPs than allow smoking. By comparison, in the Netherlands HTPs are currently regulated as a smokeless tobacco product, although the government has proposed to bring electronic heating devices under the tobacco law from 2022, which would mean heating devices would be covered by the same advertisement and sale restrictions as cigarettes.

The different regulatory regimes in Japan and the Netherlands, and other cultural and contextual differences between the two countries, mean that what happened to cigarette sales in Japan after HTPs were introduced and widely adopted there

[37] https://www.reuters.com/article/us-pmi-japan/philip-morris-aims-to-revive-japan-sales-with-cheaper-heat-not-burn-tobacco-idUSKCN1MX06E

[38] https://www.globaltobaccocontrol.org/e-cigarette/japan

[39] https://www.tobaccocontrollaws.org/legislation/country/japan/summary

[40] https://ecigintelligence.com/japanese-rules-favour-heated-tobacco-products-over-e-cigarettes/

may not happen in the same way in the Netherlands. However the evidence from Japan still offers important insights from a mature, advanced country market.

Cigarette sales in Japan

Recent peer-reviewed academic research (Stoklosa et al. in *Tobacco Control* 2019)[41] examines the rollout of IQOS in Japan in 2015 and 2016. The authors find a likely causal link to a reduction in per capita cigarette sales.

Before the nationwide launch in April 2016, PMI introduced IQOS in 12 of Japan's 47 prefectures in September 2015. This staggered rollout provides a natural experiment where sales of cigarettes in the regions with 'early' rollout can be compared with those in the 'late' rollout regions to assess the likely impact of IQOS availability on sales of cigarettes, controlling for nationwide factors affecting sales.

The authors' analysis of monthly retailer panel data collected from participating supermarkets and convenience stores in each region shows that:

- Per capita cigarette sales started to decline earlier in regions with early IQOS introduction compared with regions with late IQOS introduction;
- There is a statistically significant change in the trend rate of decline of per capita cigarette sales at the time of IQOS entering the market; and
- Before the introduction of IQOS, per capita cigarette sales were slightly increasing at a rate of 0.10 to 0.14 cigarettes per person per month. After the introduction of IQOS, per capita cigarette sales started to decline at a rate of 0.63 to 0.66 cigarettes per person per month.

The authors conclude that it is likely that the introduction of IQOS reduced per capita cigarette sales in Japan.

The findings of Stoklosa et al. (2019) are reflected in a simple analysis of the trend in nationwide market volumes of cigarettes. Figure 17 shows sales of cigarettes in Japan from 2010 to 2019, in terms of number of cigarettes per head of the population per year.
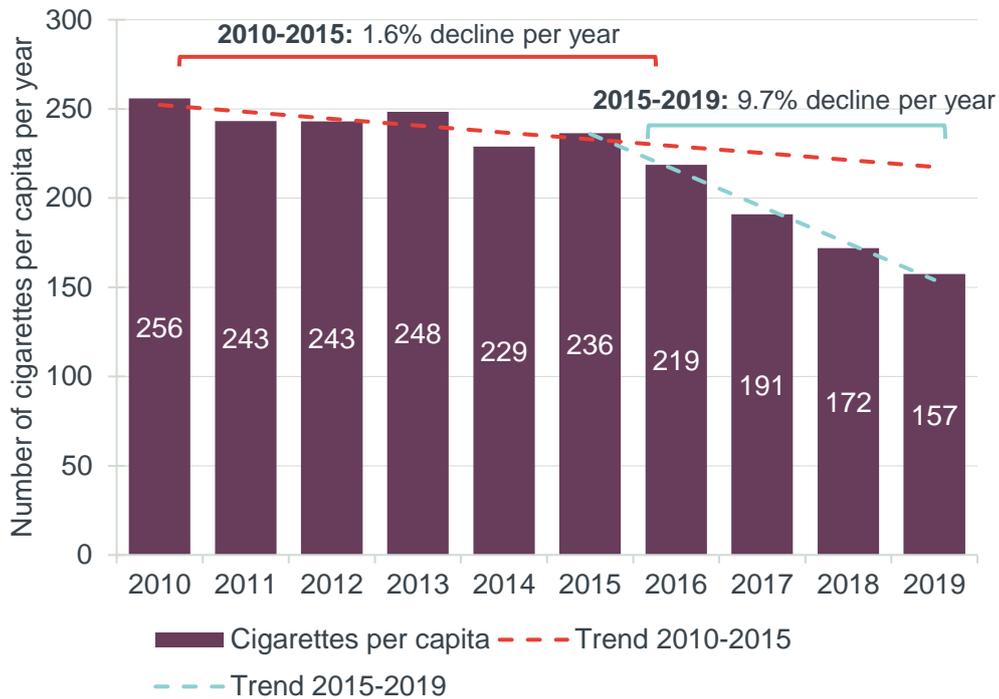
From 2010 to 2015, sales of cigarettes declined by an average 1.6% per year.[42] From 2015 onwards, after HTPs were introduced to the Japanese market, the yearly decline in sales has accelerated to an average rate of 9.7% per year. This means that the sales of cigarettes per head has fallen by more than 33% in 4 years, at the same time as consumption of heated tobacco products has increased.

Recent data also suggests that the share of adults smoking cigarettes habitually (cigarette prevalence) may have started to decline more quickly in recent years, consistent with the finding of an accelerated decline in cigarette sales since 2015.

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[41] https://tobaccocontrol.bmj.com/content/early/2019/06/11/tobaccocontrol-2019-054998.info

[42] Compound average growth rate (CAGR)

Figure 17   Cigarette sales per capita in Japan, 2010 to 2018

*Source: Tobacco Institute of Japan (TIOJ)[43]
The World Bank population estimates[44] [45]
Frontier calculations.*

Note: Per capita figures are calculated per head of the population aged 15-64.

In 2019 the Japanese National Health and Nutrition Survey, the source for national prevalence data, collected data on the types of tobacco products used by the population reporting to habitually use tobacco products (Figure 18). Respondents using tobacco products are categorised into those who only smoke cigarettes, those who use only heated tobacco products, those who use a combination of cigarettes and heated tobacco products, and those who use any combination of 'other' products (a very small share of respondents).

In 2019 the prevalence rate of tobacco use in Japan was 16.7%. Of this, 20.3% used only heated tobacco products (did not smoke cigarettes). This implies a lower 'cigarette' prevalence of 13.1% of the population. This suggests a significant fall in cigarette prevalence since 2015 (before HTPs became available nationwide), when the prevalence rate of tobacco products was 18.2%.

A deeper dive into the use of HTPs suggests that they are particularly used by the 30-39 age group: 39% of habitual tobacco users in this group only used HTPs. This suggests further potential for HTPs to displace cigarette smoking in other adult age groups.

[43] https://www.tioj.or.jp/data/index.html

[44] https://data.worldbank.org/indicator/SP.POP.1564.TO.ZS?locations=JP

[45] https://data.worldbank.org/indicator/SP.POP.TOTL?locations=JP

Figure 18 Tobacco product use, 2019

Tobacco product use	Percentage using product, out of habitual tobacco users	Percentage using product, out of general population
Cigarette only	72.0%	12.0%
Cigarettes and HTP	6.4%	1.1%
Heated tobacco only	20.3%	3.4%
Other	1.3%	0.2%
Any tobacco product	*100.0%*	*16.7%*

Source: 2019 National Health and Nutrition Survey, Frontier calculations; figures may not sum due to rounding

As only two years of data are available separating cigarette use from HTP use, the evidence from Japan cannot readily be adapted to forecasts of future adult smoking prevalence in the Netherlands. However, the combined findings from cigarette sales data and recent prevalence data appear to indicate that HTPs could be providing an alternative to cigarette smoking, and that the increasing use of HTPs since 2015 could be contributing to faster reductions in the share of adults smoking cigarettes. This suggests that alternative products have the potential to contribute towards 'smoke-free' goals.

ANNEX A   NOVEL SMOKE-FREE PRODUCTS

A.1 Types of smoke-free products

There are several types of smoke-free products currently available:

- E-cigarettes: E-cigarettes provide nicotine for inhalation in a vapour generated by heating a solution containing water, nicotine, propylene glycol, vegetable glycerine and some flavouring. There are some disparities in the tax and regulatory treatment of e-cigarettes across European member states.[46] Over time the design of e-cigarettes has evolved considerably:[47]

  - *First generation e-cigarettes:* designed to be similar in appearance to a combustible cigarette and often disposable: also known as 'cigalikes';

  - *Second generation e-cigarettes*: rechargeable with a more powerful battery and a refillable tank;

  - *Third generation e-cigarettes*: larger and more complex devices allowing the user to modify settings such as temperature and puff volume;

  - *Fourth generation e-cigarettes*: newer devices which are smaller and flatter than third-generation devices, and use the technology of nicotine salts packaged into disposable cartridges.

- Heated tobacco products: Heated tobacco products (HTPs) are novel products which have a heating device and a tobacco element. When the element is heated, it produces a vapour which is inhaled. In common with e-cigarettes, heated tobacco products do not involve combustion processes, as opposed to cigarettes. Heated tobacco products are available in most EU countries and elsewhere in the world including the United States.

- 'Snus' oral tobacco: Snus is a Scandinavian non-combustible tobacco product which is consumed by being placed between the user's lips and gums. The sale of snus is currently prohibited in EU countries under the EU Tobacco Products Directive, except in Sweden, as part of a general prohibition on oral tobacco products.[48] All White Snus (which contains less tobacco) and tobacco-free nicotine pouches are gaining popularity.

This list is not exhaustive and new product categories are being developed and commercialised over time.

A.2 Smoke-free products as a quitting aid

There is evidence that e-cigarettes are used as an aid to reduce cigarette consumption or give up smoking entirely.

- Hummel et al. (2015) investigate the reasons for use of e-cigarettes among smokers in the Netherlands aged 15 years and over. Data comes from the International Tobacco Control (ITC) Netherlands Survey.

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[46] https://ec.europa.eu/taxation_customs/sites/taxation/files/study_on_directive-2011_64_main_text_en.pdf
[47] https://www.rcpe.ac.uk/sites/default/files/jrcpe_48_4_mathur.pdf
[48] https://publications.parliament.uk/pa/cm201719/cmselect/cmsctech/505/505.pdf

- In 2014 15.9% of smokers were currently using e-cigarettes, up from 4.0% in 2008: a significantly higher proportion than in the general population;

- 79% of e-cigarette users reported that they use e-cigarettes to reduce the number of regular cigarettes smoked per day.

■ A Eurobarometer report on the attitudes of Europeans to e-cigarettes found that 9% of Dutch smokers who had attempted to quit, or successfully quit, had used e-cigarettes or a similar device to aid their quitting attempt: this is comparable to the EU-wide figure of 10%.[49]

■ Responses from the Lifestyle Monitor Survey also show that daily smokers are more likely to use e-cigarettes than non-daily smokers.[50]

There is evidence that e-cigarettes are an effective aid to quitting combustible tobacco products.

■ Evidence from randomised controlled trials (RCTs) shows that e-cigarettes increase the chances of quitting:

- The most recent systematic review, published by Hartmann-Boyce et al. (2020), draws on 50 studies including 26 RCTs. It concludes that there is evidence that nicotine-containing e-cigarettes increase quit rates compared with nicotine replacement therapy, nicotine-free e-cigarettes, behavioural support and no support treatments. The quality of the evidence varies according the number and quality of studies;

- ;

- Hajek et al. (2019) find the 1-year abstinence rate to be 83% higher among smokers given an e-cigarette starter pack as part of their quitting support, as compared with smokers given alternative nicotine-replacement products. Both interventions were combined with behavioural support.

■ Analysis based on survey evidence is more mixed:

- Beard et al. (2016) show that increases in the aggregate prevalence of e-cigarette use by smokers has been associated with an increase of the success rate of quit attempts;

- However, Pasquereau et al. (2017) do not find clear evidence that tobacco users who also use e-cigarettes are more likely to successfully quit smoking relative to tobacco users who do not use e-cigarettes.

There is evidence that use of e-cigarettes can be associated with increased attempts to quit smoking, though not all studies show this:

■ Regular e-cigarette use has been shown to lead to additional quit attempts, which would not have been made if e-cigarettes did not exist (Brose et al., 2015);

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[49] Special Eurobarometer 458: Attitudes of Europeans towards tobacco and electronic cigarettes, March 2017. Note that the more recent update, Special Eurobarometer 506: Attitudes of Europeans towards tobacco and electronic cigarettes, found similar results, with 8% of respondents in the Netherlands who were former smokers or currently trying to quit saying they used e-cigarettes or similar devices to do so, compared with an EU-wide average of 11%. However this survey found only 12% of respondents in the Netherlands reporting to be current smokers, much lower than other credible estimates of smoking rates in 2020.

[50] Netherlands Expertise Centre for Tobacco Control (Trimbos Institute), October 2018.

- Evidence from some longitudinal studies show that those who smoke and use e-cigarettes regularly are more likely to make a subsequent quit attempt than those who smoke but do not use e-cigarettes (Pasquereau et al., 2017);

- Another study examining aggregate e-cigarette use and total quits attempts found no significant relationship between e-cigarette usage and quit attempts (Beard et al., 2016).

ANNEX B   EVIDENCE ON PAST SMOKING PREVALENCE

B.1 Prevalence data from Statistics Netherlands

We use Statistics Netherlands (CBS) as our source for smoking prevalence data to look at historical trends and underpin our forecasts. Data are gathered from a survey and re-weighted to account for differences in the survey samples and target population.

There have been multiple changes in methodology and survey sources over the years that the data series covers. This could be a potential concern if this had led to a break in the series, i.e. the measured prevalence becoming higher or lower due to a change in the data collection method rather than a 'true' change in prevalence, as this would affect our calculations of the historical trend. Examining the prevalence time series, there do not appear to be any breaks or large changes in the series between years where the method changes, except in 2001 when there was a moderate uptick in prevalence after a change in the basic question used in the survey (see Figure 19): this point is also cited by CBS as a potentially significant methodological break.

However we have investigated this method change and do not believe it to be necessary to adjust the data as a result (see Box B1.1).

BOX B1.1: PREVALENCE DATA METHODOLOGY

Before 2001 the basic question in the survey used to assess smoking prevalence was "Do you smoke?", and, if answered "No", "Do you never smoke?".

In 2001 this question was changed to "Do you smoke sometimes?" and, if answered "Yes", "Do you smoke every day?"

It is plausible that the method change could be responsible for part of the uptick in prevalence data in 2001.

However, we do not believe it is appropriate to adjust for this method change in the historical data, for the following reasons:

- The upward tick in prevalence rates in 2001 is not large enough to conclude definitely that it is a result of the method change (similar increases are observed in earlier years);
- CBS prevalence data is used by the RIVM both in its VTV forecast, and at the Volksgezondheidenzorg (Public Healthcare) site[51], where trends in smoking prevalence and behaviour are presented and analysed. Neither of these sources make an adjustment for the 2001 break in their use of the historical data.

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[51] volksgezondheidenzorg.info/

Figure 19   Smoking prevalence in the Netherlands, 1990 to 2020
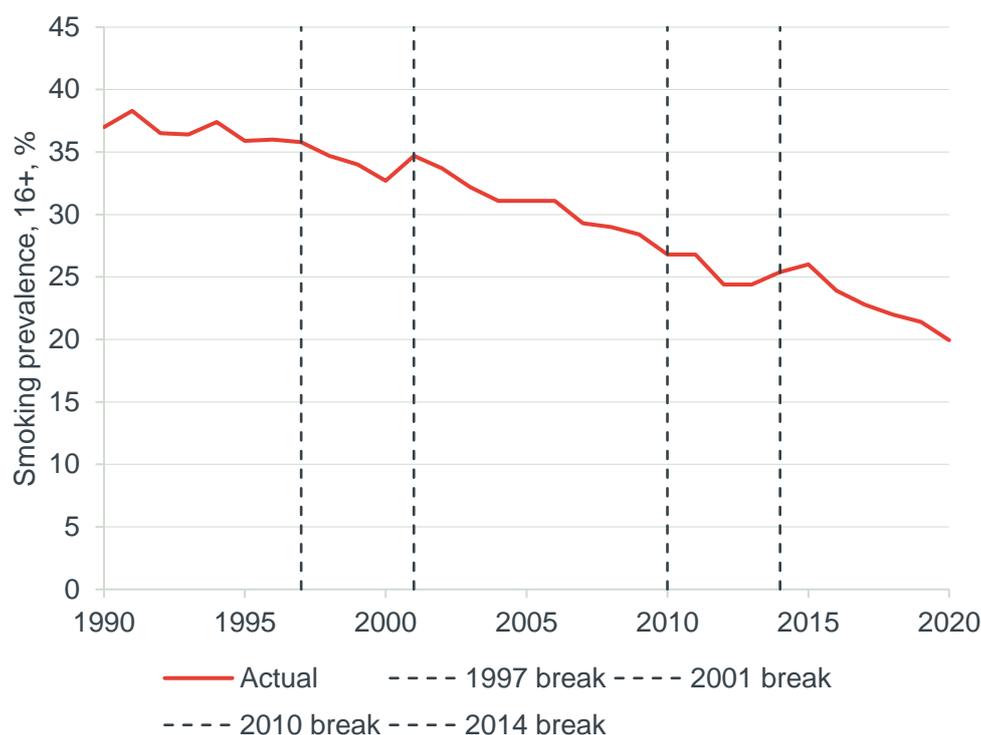
Source: *Statistics Netherlands (CBS)*
            1990-1996: Gezondheidsenquete (Health Survey)
            1997-2009: Permanent onderzoek naar de leefsituatie (POLS)
            2010-2013: Gezondheidsenquete (Health Survey)
            2014-2020: Gezondheidsenquete/Leefstijlmonitor (Health Survey/Lifestyle Monitor)

Note: *Sampling method changes from household interviews to personal interviews in 1997.*
          Sampling method changes from Computer Assisted Personal Interviewing (CAPI) with an additional
          written questionnaire to Computer Assisted Web Interviewing (CAWI) in 2010.
          Sample size: 10,000-16,000 respondents.

B.2 Alternative data sources

The prevalence data available from Statistics Netherlands (CBS) is our preferred source, underpinning our forecasts and used to calculate the historical rate of prevalence decline.

We have investigated alternative sources of prevalence data (summarised below), which were collected using a variety of statistical methods, and find that they produce comparable figures to those of CBS, confirming its estimates as reliable.

Dutch Continuous Survey of Smoking Habits (DCSSH)

The DCSSH was conducted by TNS-NIPO, commissioned by the Trimbos Institute, and discontinued in 2014 when the Lifestyle Monitor survey was integrated into the Health Survey of Statistics Netherlands.[52]

The data come from a survey of around 18,000 respondents. Prevalence figures are for ages 15+, so are not directly comparable to the CBS figures which are for ages 16+.

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[52] https://www.trimbos.nl/aanbod/webwinkel/product/af1278-factsheet-continu-onderzoek-rookgewoonten

Figure 20   Dutch Continuous Survey of Smoking Habits (DCSSH) evidence on smoking behaviour in the Netherlands

	2013	2014
Smoking prevalence	25%	23%
Daily smokers	19%	17%
E-cigarette usage	2.5%	4.1%
Share of e-cigarette users using the product daily	29%	44%
Use of quitting aids with quit attempts	34%	40%

Source: Dutch Continuous Survey of Smoking Habits (DCSSH)

Special Eurobarometer 458

Measured from around 1,000 face-to-face interviews.[53]

Smoking prevalence:

- 2017: 19%

Netherlands Measurement Survey

Survey of 4,500 people in 2009 and 2010.[54] Measured ages 30 to 70 only, but figures are standardised to the Dutch population:

Smoking prevalence:

- 2010: 22.9% (men), 18.5% (women)

European Health Interview Survey (EHIS)

The second wave of the EHIS was designed to measure the health status of Member States on a harmonised basis.[55]

Smoking prevalence:

- 2014: 17.7%

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[53] European Commission (2017). Special Eurobarometer 458: Attitudes of Europeans towards tobacco and electronic cigarettes. Note that as per footnote 51, the 2020 version of this Special Eurobarometer report suggested the smoking rate in the Netherlands in 2020 was 12%, much lower than other credible estimates.

[54] https://www.rivm.nl/nederland-maat-genomen

[55] https://ec.europa.eu/eurostat/web/microdata/european-health-interview-survey

ANNEX C DETAIL ON MODELLING ASSUMPTIONS

C.1 Baseline forecast

Our baseline forecast for smoking prevalence is optimistic about future prevalence reduction relative to the baseline used in RIVM's analysis, and to other prevalence forecasts.

RIVM's Quickscan analysis uses as a baseline the forecast produced in 2018 as part of the Public Health Future Outlook (VTV). Future reductions in prevalence are underpinned by demographic change and "trend-based anti-smoking policy".

Without knowing in detail the method of the VTV forecast, we adopt a simple linear projection of the historical (1990 to 2020) rate of decrease of prevalence, to which we later add the expected impact of new policies.

This linear projection is a more optimistic forecast for smoking prevalence than the VTV forecast (Figure 21). VTV forecast prevalence in 2040 is 13.6% compared with Frontier's baseline forecast in 2040 of 9.6%.

**Figure 21 Baseline prevalence: comparison to VTV forecast**
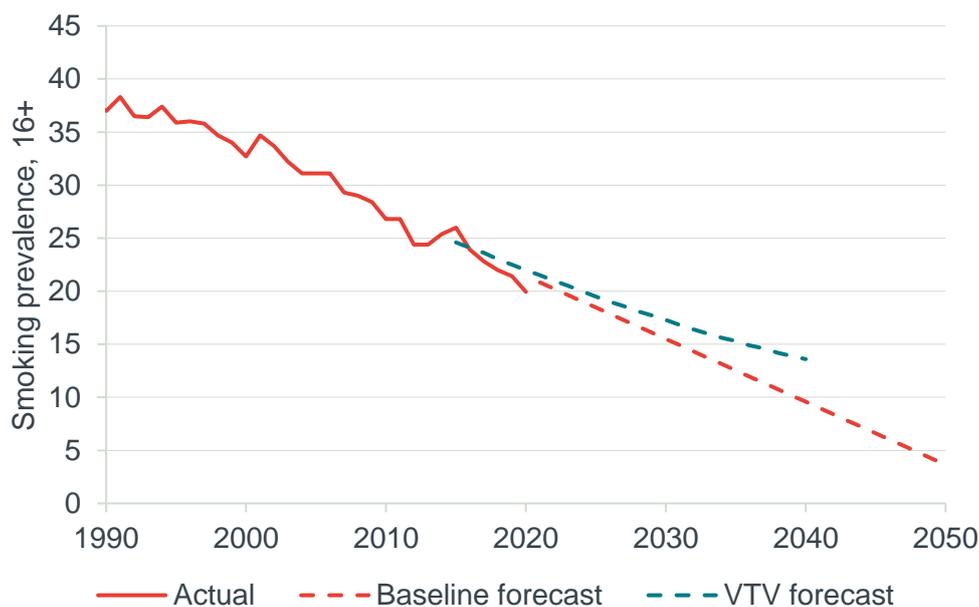
Source: Statistics Netherlands (CBS); Volksgezondheid Toekomst Verkenning (VTV) (RIVM, 2018); Frontier calculations.

De Kinderen et al. (2016) also produce a less optimistic forecast of prevalence in the Netherlands, reaching 17.6% in 2040 without additional policy interventions.[56]

We also test the sensitivity of our forecast to the use of an exponential rather than a linear trend projection (Figure 22). Using a negative exponential function to project future prevalence implies more smokers in 2040 than when a linear function is used. Inspection of the historical data suggests that prevalence has historically declined linearly rather than exponentially, so we opt for the simple linear trend projection, which is also more optimistic for the underlying annual rate of prevalence decline. However we note that as prevalence declines further, the rate of decline is likely to slow at some point.

Figure 22   Baseline prevalence: sensitivity to functional form
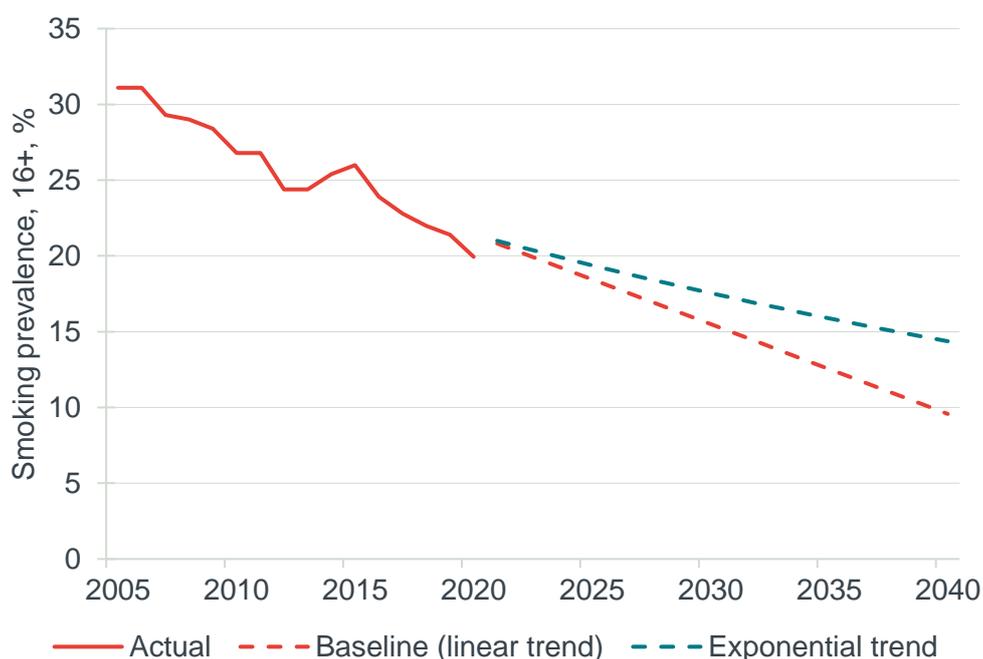
Source: Statistics Netherlands (CBS); Frontier calculations.

C.2 Modelling policy impacts in different prevalence scenarios

Approach to modelling policy impacts

We account for the impact of four categories of policy interventions introduced as part of the NPA on the long-run trend in smoking prevalence:
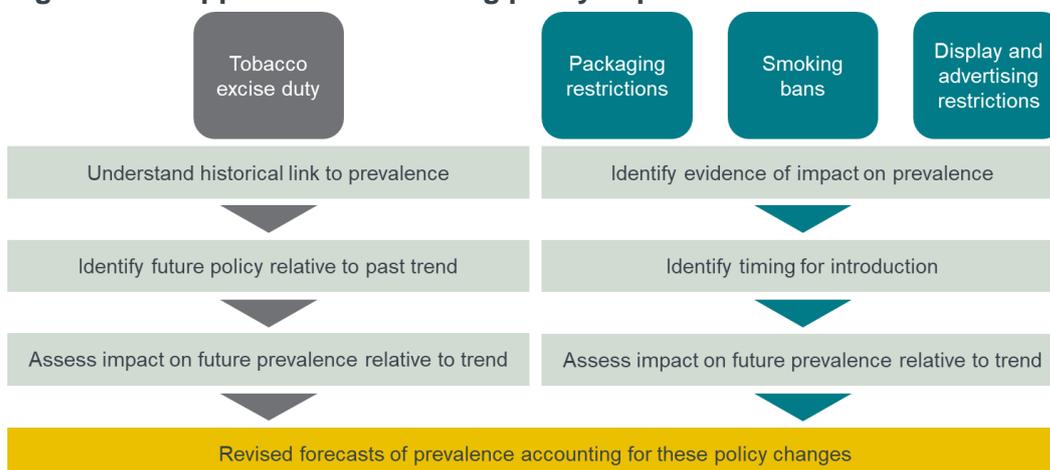
- Increased excise duties;
- Packaging restrictions;
- Smoking bans; and

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[56] Social cost-benefit analysis of tobacco control policies in the Netherlands, Maastricht University with RIVM and Trimbos Institute, 2016.

- Advertising and display restrictions.[57]

Our approach to evaluating the size of the impact of each of these interventions on prevalence is summarised in Figure 23. Further details of the assumptions underlying the modelling for each policy type is given in the subsequent Sections.

Figure 23   Approach to modelling policy impacts

Excise duty

Excise duty assumptions

The increases in excise duty introduced following the National Prevention Agreement, and planned up to 2023, are higher than the historical trend. Our baseline forecast assumes that total real (inflation-adjusted) excise duty continues to grow in the future at its historical average rate from 1996 to the beginning of 2020 (before the higher NPA increases).

For both our low and central prevalence scenarios we make alternative assumptions about the future path of excise duty, summarised below and visualised in Figure 24.

From 2020 to 2023:

- The central and low scenarios include the data on the increases in excise duty which have already been introduced:
  - January 2020: +€0.14 per pack of 20 cigarettes
  - April 2020: +€1.00
  - January 2021: +€0.12
- In both the central and low prevalence scenarios, excise duty continues to rise at a faster rate so that a pack of 20 cigarettes costs €10 (nominal) by January 2023.

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[57] Also included in the National Prevention Agreement is an intention to reduce the number of selling points at which smoking products can be purchased. However, no firm commitments have been outlined in the NPA, therefore we do not explicitly model this intervention in the analysis. The RIVM Quickscan analysis also does not model this measure. An additional policy commitment is for a ban on display vending machines coming into force in 2022, which had already been announced prior to the additional policies presented in the National Prevention Agreement. Therefore we assume this policy to form part of the baseline trend of historical tobacco control policies (see Annex C.1), and do not include it as an additional policy driver.

From 2023 onwards:

- In the central scenario, real excise grows at 2.9% p.a., equal to the historical CAGR.
- In the low scenario, real excise grows at 4.3% p.a., 50% greater than the historical CAGR.

Figure 24   Real total excise duty in the central and low prevalence scenarios: 1996-2045
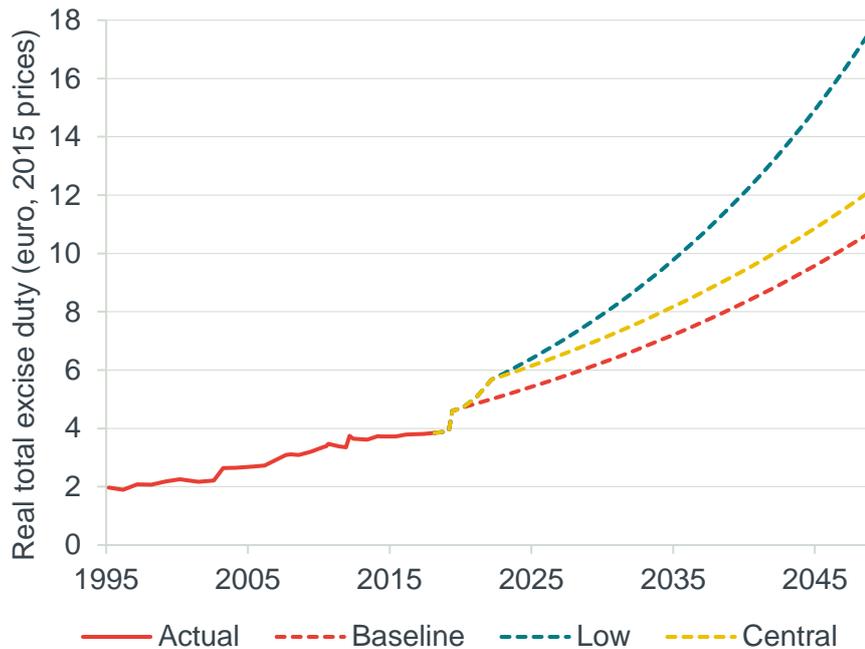
Source: EU duty tables 1990-2020; PMI documentation; Harmonised Index of Consumer Prices (HICP) (Eurostat); Frontier calculations.

Real retail selling price assumptions

Using the assumptions about the path of excise duty, we calculate scenarios for the path of the real retail selling price (RSP) according to the equation:

$$RSP = (Unit\ Price + Total\ Excise)\ x\ (1 + VAT\ Rate)\ x\ (\frac{100}{Inflation\ Index})$$

Total excise duty includes both the specific and ad valorem components.

Additional assumptions we make are that:

- The unit price (pre-tax) grows at the historical trend from 1996 to 2020;
- The data source for inflation up to January 2021 is the monthly Harmonised Index of Consumer Prices (HICP) (Eurostat);
- From 2022 onwards the price index is a linear forecast based on the historical trend up to January 2021; and
- The assumed rate of VAT is 21%.

The implied path of the retail selling price across scenarios is summarised in Figure 25 and Figure 26. By 2040, a pack of cigarettes costs more than €22 in our low scenario compared with just under €17 in the baseline.

Figure 25   Real retail selling price in the central and low prevalence scenarios: 1996-2045
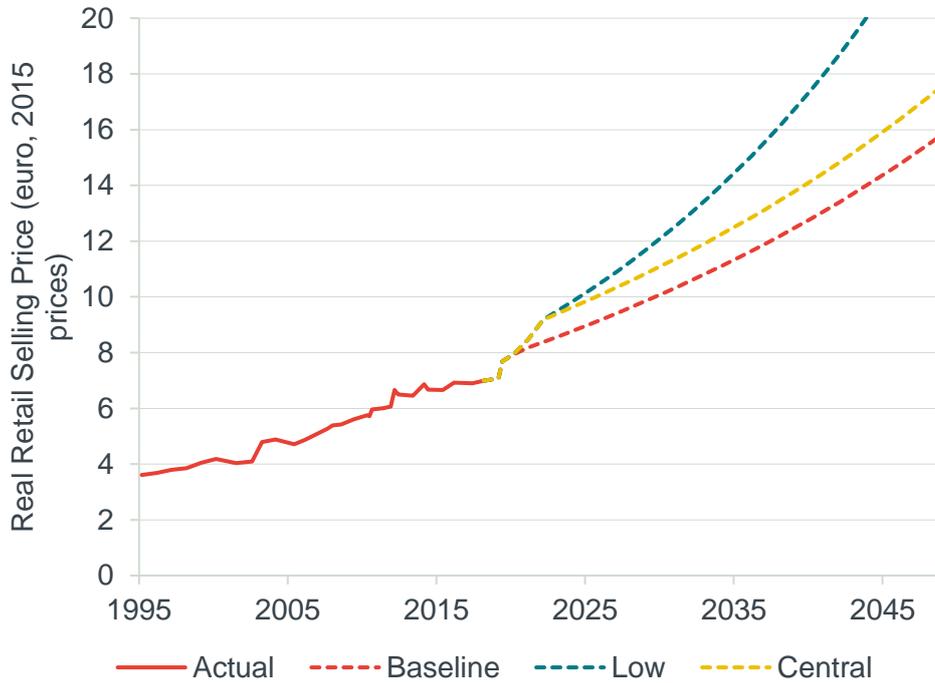
Source: EU duty tables 1990-2019; PMI documentation; Harmonised Index of Consumer Prices (HICP)
          (Eurostat); European Central Bank (ECB) Macroeconomic Projection December 2019; Frontier
          calculations.

Figure 26   Summary of RSP across prevalence scenarios

	Baseline	Central	Low
Real RSP in 2040 (2015 prices)	€12.50	€13.81	€16.79
Nominal RSP in 2040	€16.88	€18.65	€22.67

Source: Frontier calculations.

Calculating changes in prevalence

From our scenarios of the path of the real RSP, we translate this to a reduction in prevalence in each scenario compared with the baseline forecast using the equations:

$$Annual\ reduction\ in\ prevalence\ (percent)$$
$$= (\%\ difference\ in\ price\ between\ scenario\ and\ baseline\ forecast)$$
$$x\ (price\ elasticity\ of\ prevalence)$$

$$Price\ elasticity\ of\ demand = estimate\ based\ on\ literature\ (see\ below)$$

$$Price\ elasticity\ of\ prevalence = \mathbf{0.5}\ x\ Price\ elasticity\ of\ demand$$

Price elasticity of demand assumptions

The price elasticity of demand (PED) is equal to the percentage change in demand for cigarettes, divided by the percentage change in price. After a price increase, demand for cigarettes is expected to fall, making price elasticity estimates

negative. A higher absolute estimate for the PED implies that consumption is more sensitive to price changes, implying that policies such as increased excise duties which increase cigarette prices will cause a larger reduction in cigarette sales.

The price elasticity is impacted by the extent to which buyers can avoid paying higher prices for cigarettes, for example by switching to other tobacco products such as roll-your-own tobacco, purchasing from other jurisdictions with lower taxes, or purchasing illicitly. The NPA proposals include a commitment to raise excise taxes on all tobacco products in line with taxes on cigarettes, limiting the extent to which cross-product substitution will decrease the price elasticity. However, the Netherlands is a small country, which potentially allows a high level of cross-border substitution, implying a lower price elasticity. Indeed the Dutch government plans to review the efficacy of increases in excise duty in 2021, as the policy may be undermined if border effects prove to be significant.[58]

The possibility of sizeable border effects is captured in the range of PED estimates we use across the high, low and central prevalence scenarios, discussed in detail in Box C.2.1 which summarises the estimates for price elasticity of demand found in the literature.

We combine these estimates and knowledge of the specific conditions in the Netherlands market and apply the following PED assumptions:

- Low prevalence scenario: **-0.60**
- Central scenario: **-0.50**

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[58] https://www.government.nl/documents/reports/2019/06/30/the-national-prevention-agreement

BOX C.2.1: EVIDENCE BASE FOR PED ASSUMPTIONS

A number of academic papers have investigated the price elasticity of demand for cigarettes. These papers have used a number of research methods and designs, including survey data, analysis of sales, and panel-based estimates, and the estimates are based on data from a number of different countries. Below we summarise the main findings of the seminal papers and recent additions to the literature:

Dutch studies:

- The Netherlands Trimbos Institute reports that Gallet and List (2003) in a meta-analysis of 86 studies find an average price elasticity of **-0.48**;
- De Kinderen et al. (2016) in their study of Dutch smoking prevalence use a PED of **-0.40**, referencing Chaloupka and Warner (2000) for this estimate.

Other countries:

- The International Agency for Research on Tobacco Control in a review of time series analyses from the US finds the largest cluster of estimates **between -0.20 and -0.40**, and that other developed countries have comparable elasticities;
- Chelwa and C. van Walbeek. (2019) find a PED of around **-0.30** using panel data in Uganda;
- Bonfrer et al., (2019), assessing the impact of plain packaging in Australia, find a PED of **-0.39;**
- Cheng et al., (2018) in an evidence review find a central estimate of **-0.47;**
- Nargis et al., (2014) find a PED of **-0.49** in Bangladesh;
- Gjika et al., (2020) find a PED of **-0.57** using household-level data from Albania;
- Yeh et al., (2017) find an average PED of **-0.59** using data across EU countries**;**
- Cheng et al., (2018), assessing the association between advertising bans and smoking find a PED of **-0.66,** however they find a much lower association than other papers in the literature between demand for tobacco and prevalence;
- The PED used by HMRC in the UK is higher, at **-1.05** but it is for duty-paid tobacco only (i.e. legal sales) not total tobacco consumption (Czubek & Johal, 2010);
- Zheng et al., (2016) also find a higher PED of **-1.12** investigating US demand for tobacco products.

In summary, many of the Dutch studies suggest relatively low PED, but this is based on older estimates from the literature. More recent UK and US evidence has suggested higher elasticities.

It is plausible that the PED in the Netherlands is significantly lower than in the UK and the US, due to the greater ease of cross-border substitution.[59] The UK estimate is an estimate for duty-paid tobacco, whereas for our forecast of prevalence we estimate the price elasticity of all cigarettes. Therefore for our central scenario assumption our preference is to follow the assumption used by the Netherlands Trimbos Institute, rounding this up to a PED of **-0.5**. We use a sensitivity for this assumption in our low prevalence scenario.

Price elasticity of prevalence assumptions

As our forecasts are based on the future path of smoking prevalence, our estimates for the impact of price on reduced demand for cigarettes must then be translated into an estimate for the number of people who quit smoking entirely in response to the price increase.

We assume the impact of a price change on prevalence is **half** of the impact on the quantity of tobacco consumed.

This is a consistent assumption in the literature (Ross et al., 2011; Goodchild et al., 2016, Nargis et al., 2014) and in other studies of smoking prevalence in the Netherlands.

Combining this with the estimates of PED, our price elasticity of prevalence assumptions in each modelling scenario are:

- Low prevalence: **-0.30**
- Central prevalence: **-0.25**

Summary of excise duty assumptions across scenarios

Figure 27   Summary of assumptions about excise duty and retail selling price (RSP) across prevalence scenarios

	Central prevalence	Low prevalence
Price elasticity of demand	-0.5	-0.6
Price elasticity of prevalence	-0.25	-0.3
Path of excise 2021 to 2023	Tax increases such that nominal price = **€10** in Jan 2023	
Path of excise post-2023	Total real excise grows by **2.8% p.a.**	Total real excise grows by **4.2% p.a.**

Packaging restrictions

For the impact of packaging restrictions, we model a one-off reduction in prevalence, accounting for uncertainty around the potential impact.

The Netherlands implemented the requirements of the EU Tobacco Products Directive (TPD), including graphic health warnings, in 2016. We assume that the EU TPD forms part of the baseline reduction in smoking prevalence: the introduction of plain packaging is an additional impact over and above this. Since October 2020, dark green / brown plain packaging has been required for cigarettes and fine-cut tobacco products.

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[59] Ecorys for Alliantie Nederland Rookvrij! (2018). Short and medium term impacts of tobacco control policy

Following the review of the evidence summarised in Box C.2.2, we make the following assumptions for the impact of plain packaging on prevalence in each of our scenarios:

- Central: **3.1%** (average of the UK and Australian evidence); and
- Low prevalence: **3.8%** (upper bound from UK and Australia evidence).

All scenarios are modelled as one-off impacts as a percentage of 2020 prevalence, spread over 2 years, 2021 and 2022.

BOX C.2.2: EVIDENCE BASE ON IMPACT OF PLAIN PACKAGING

Standardised packaging has been introduced in Australia, New Zealand, France, Hungary, Ireland, Norway, the UK and recently Belgium.

- The UK Impact Assessment (DH IA) assessed the combined impact of standardised packaging and the EU TPD, finding the following proportionate (rather than percentage point) impacts on prevalence:
  - □ 1.90% impact of EU TPD over 5 years;
  - □ 4.80% impact of PP over 2 years; and
  - □ an overlap of 1.00% between these two figures (see paragraphs 219 and 372 of the DH IA).

  The above suggests the impact of plain packaging alone on top of the requirements of EU TPD to be **3.80%.**

- Australian Department for Health published a Post-Implementation Review in 2016 of the 2012 implementation of plain packaging and found a **0.55 percentage point reduction in prevalence**.[60] This corresponds to **2.5%** of the Netherlands 2018 smoking prevalence.

- Bonfrer et al., (2019) find a 7.5% reduction in sales due to the Australian plain packaging mandate, using New Zealand as a counterfactual country. Applying our prevalence elasticity assumption of 0.5, this would translate to a **3.80%** reduction in prevalence.

Evidence on the impact of standardised packaging is limited and based on only two countries' experiences, leading us to use relatively wide uncertainty bounds for our impact estimates across scenarios, including the possibility of no impact.

Smoking bans

For the impact of smoking bans, we model a one-off reduction in prevalence, accounting for uncertainty around the potential impact.

The NPA proposes a range of smoking bans to be introduced in stages from 2020 to 2025. The coverage of the bans includes:

- Smoking rooms in restaurants and cafes;
- Outdoor areas at schools, childcare centres and playgrounds; and
- Outdoor areas at sports clubs and healthcare institutions.

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[60] https://ris.pmc.gov.au/sites/default/files/posts/2016/02/Tobacco-Plain-Packaging-PIR.pdf
Note that this estimate does not separate the impact of plain packaging from the impact of enlarged graphic health warnings which were implemented in Australia at the same time, so this estimate can be considered an upper bound for the impact of plain packaging only

The bans on smoking rooms in the catering industry and at school areas are mandatory. The remaining bans are to be achieved through the cooperation of relevant organisations (for example NUSO, the branch organisation for playground associations and foundations).

Given this consideration, and our review of the evidence summarised in Box C.2.3, we use the following impact assumptions for the extension of the smoking ban in the catering industry:

- Central: **1%** (half of the SimSmoke estimate for a full ban on smoking in restaurants, relative to no ban)

- Low prevalence: **2%** (an optimistic upper bound based on the SimSmoke estimate).

And we use the following impact assumptions for the residual smoking bans:

- Central: **0.5%**;

- Low prevalence: **1%** (an optimistic upper bound based on half of the SimSmoke estimate SimSmoke estimate for a ban in health facilities, universities, government facilities, relative to no ban - greater coverage than that in the NPA).

Adding these together gives us the modelling assumptions for the combined impact:

- Central: **1.5%**, and 0.5% as half of the SimSmoke estimate for a more comprehensive residual bans

- Low: **3%**

The effects on prevalence are modelled as a one-off impact as a percentage of 2020 smoking prevalence, phased over five years from 2020 to 2025.

BOX C.2.3: EVIDENCE BASE ON IMPACT OF SMOKING BANS

As an estimate from the Netherlands, de Kinderen et al. (2016) report estimates of policy impacts on prevalence from the SimSmoke model (Nagelhout el al., 2012):

- Ban in health facilities, universities, government facilities: **2%**

- Ban in all indoor restaurants in all areas: **2%**

- Ban in all indoor pubs and bars in all areas: **1%**

It should be noted that the estimates from the SimSmoke model are relative to a policy environment where smoking was allowed in small bars: this ban was re-introduced in 2015 and smoking is now only allowed in designated separate smoking rooms. Therefore the impact estimates above are for a ban of more extensive coverage than is proposed in the NPA. We are not aware of any evidence which specifically estimates the impact of policies such as the more limited extensions to existing bans being proposed in the NPA policy package.

Display and advertising restrictions

For the impact of display and advertising restrictions, we model a one-off reduction in prevalence, accounting for uncertainty around the potential impact.

The NPA has introduced several display and advertising restrictions on tobacco retail points:

- Cigarettes out of sight at supermarkets from July 2020;
- Cigarettes out of sight at other sales points from 2021, with the exception of some specialist tobacconists;
- Advertising ban on the façade of sales outlets from 2021; and
- Advertising ban inside sales outlets from 2021 (timing still pending), with the exception of some specialist tobacconists.

It has already been regulated that cigarette vending machines are to be prohibited from 2022. We assume this policy forms part of our baseline reduction in prevalence so is not modelled as a separate policy impact of the NPA.

Given the lack of consensus on the impact on prevalence of retail restrictions (see Box C.2.4), our scenarios have large uncertainty bounds. In our most optimistic scenario we use 5% instead of the full 7% impact figure found by He et al. (2018) because the proposed display ban in the Netherlands is not comprehensive.

Modelling assumptions:

- Central: **3%**
- Low: **5%**

The effects on prevalence are modelled as a one-off impact as a percentage of 2020 smoking prevalence, phased over 2021 and 2022.

BOX C.2.4: EVIDENCE BASE ON THE IMPACT OF DISPLAY AND ADVERTISING RESTRICTIONS

Quantitative evidence on display and advertising bans is limited. The estimates cannot be directly re-applied to the Netherlands context because of differences in the existing policy and the relative extent of the new restrictions being introduced. However the following papers give guidelines for assessing how effective the proposed bans might be on reducing prevalence:

Quinn et al. (2011), using time series data, find **no impact** on tobacco sales from the restriction on tobacco displays implemented in Ireland in July 2009.[61]

Europe Economics finds **no statistically significant** effects of bans on tobacco displays on prevalence or tobacco consumption in Canada and Australia.[62]

Cheng et al., (2018) find a reduction in prevalence by 0.7 percentage points, however the result is **not statistically significant.**

Li et al (2013) find that display bans **reduce** exposure to tobacco displays and reduce impulse buying.[63]

Estimates from the SimSmoke model (Nagelhout el al., 2012) suggest that the impact of banning in-store displays, sponsorships and free samples would be **2%** of prevalence.

He et al. (2018), using aggregated longitudinal data from 77 countries, find that a point-of-sale display ban reduces smoking prevalence by **7%.**[64]

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[61] https://tobaccocontrol.bmj.com/content/20/2/151.short

[62] http://www.europe-economics.com/publications/the_impact_of_retail_display_bans_around_the_world_on_tobacco_consumption_and_prevalence.pdf

[63] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3772332/

[64] https://tobaccocontrol.bmj.com/content/27/e2/e98

Summary

Figure 28   Summary of assumptions about policy impacts in each of the low, central and high prevalence scenarios

	Central prevalence	Low prevalence
Excise	Medium price elasticity of prevalence. Faster excise increases are pursued until 2023, after which excise increases at the historical rate.	High price elasticity of prevalence. Faster excise increases are pursued until 2023, after which excise increases at 1.5x the historical rate.
Packaging restrictions	One-off **3.1%** reduction in prevalence (equal to average of estimates from the impact evaluations of UK and Australia).	One-off **3.8%** reduction in prevalence (equal to estimate from UK impact evaluation).
Smoking bans	One-off **1.5%** reduction in prevalence.	One-off **3%** reduction in prevalence.
Display and advertising restrictions	One-off **3%** reduction in prevalence.	One-off **5%** reduction in prevalence.

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