frontier economics

Working towards a smoke-free Netherlands

Economic assessment of the Dutch government's target to reduce smoking prevalence to below 5% by 2040

A report prepared for Philip Morris Benelux

May 2019

Contents

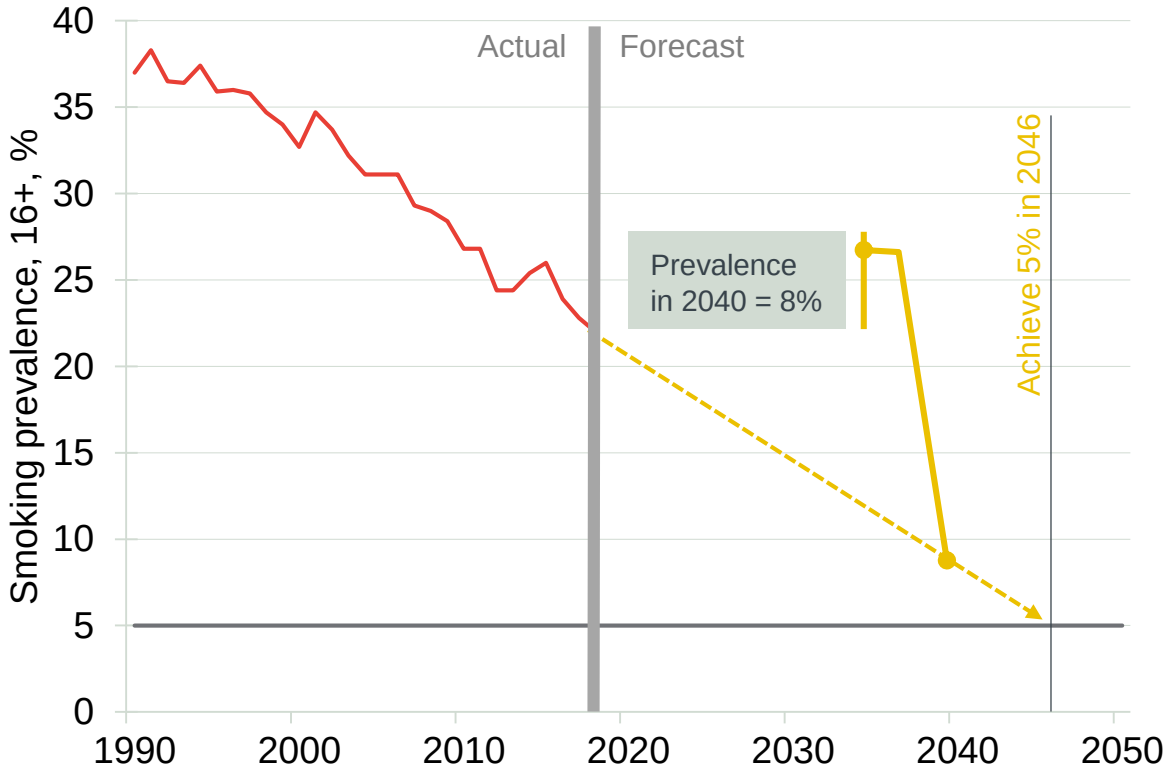
Executive summary: Our central forecast is that the Dutch government will not meet its target for 5% smoking prevalence by 2040

1. Our central forecast is for adult smoking prevalence in the Netherlands to reach **8.0%** in 2040, 3.0 percentage points above the government's target as set out in the National Prevention Agreement (NPA). This forecast combines the historic rate of prevalence reduction with the modelled impact of the policies proposed in the NPA, including above-inflation excise duty increases, and future regulatory interventions.

2. The government's 5% target implies a maximum of 740,000 adult smokers in 2040. Our central forecast implies that there will be an additional **460,000** adult smokers above the government's 5% target in 2040.

3. If prevalence continued to decline in line with our central forecast, we estimate that adult smoking prevalence would fall below the **5%** target in **2046**.

Smoking prevalence forecast for the Netherlands up to 2050



Source: Statistics Netherlands (CBS), Frontier calculations.

Executive summary: Achieving the 5% target by 2040 or faster would require an acceleration in prevalence reduction, as occurred in England at the same time e-cigarettes became popular

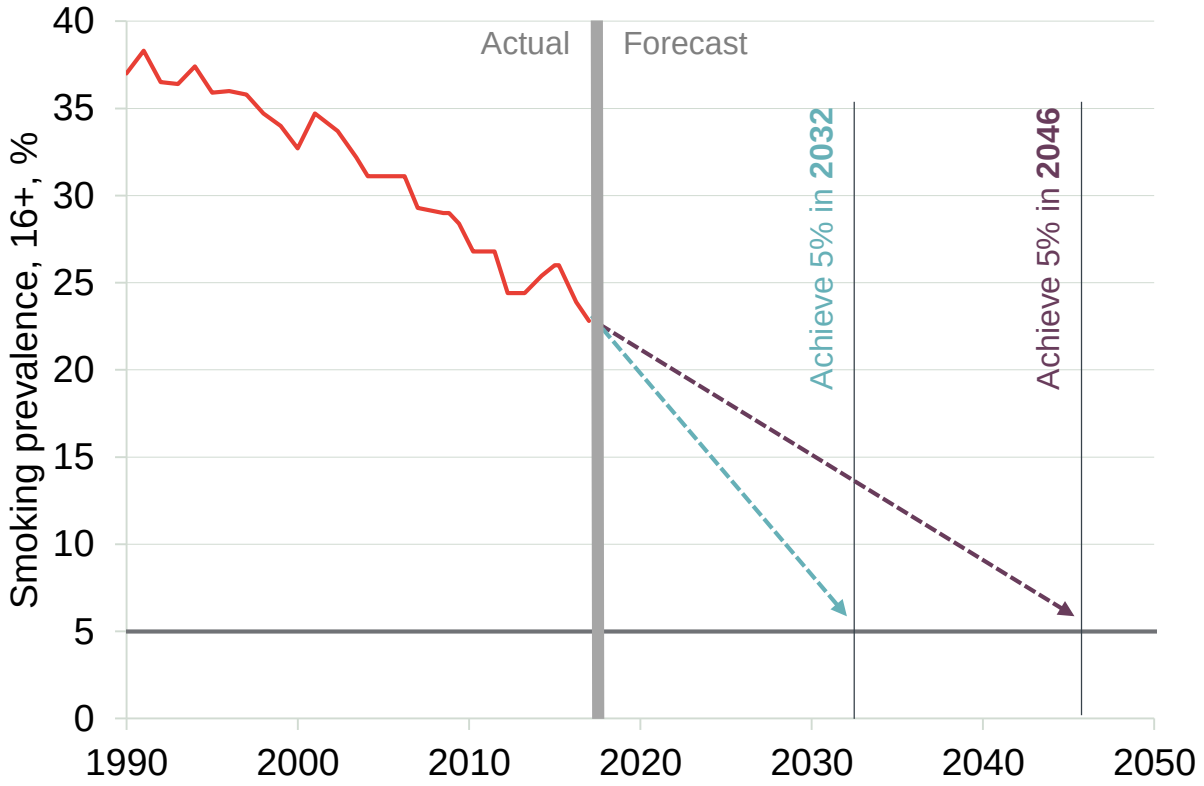
4 Meeting the **5% target** by 2040 would require a large acceleration in the rate of decline in smoking prevalence as compared to the historical trend.

5 **This would require significant changes**, such as:

- A rapid increase in the number of smokers switching to smoke-free alternatives, including e-cigarettes; and/or
- Finding other new and effective ways to persuade smokers to quit.

6 If the Netherlands experienced the same **acceleration in prevalence reduction** as seen in England between 2012 and 2017, over which time a significant number of smokers switched to e-cigarettes, the 5% target could be met **as early as 2032**, 8 years earlier than the government's target and with **1.1 million fewer smokers** in 2032 as compared to our central forecast.

Case study: rate of decrease of prevalence doubles



Source: Statistics Netherlands (CBS), Frontier calculations.

Frontier has assessed when the Netherlands might achieve the government's target for 5% adult smoking prevalence

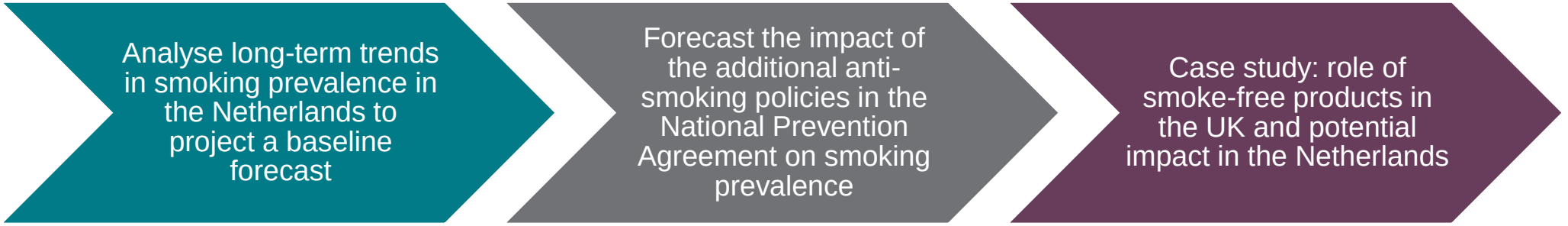
The National Prevention Agreement

- In November 2018 the Dutch government signed the National Prevention Agreement (NPA)[1], a set of new policies to improve Dutch public health by tackling obesity, problematic alcohol use and smoking.
- The target for smoking is to reduce prevalence among adults to <20% by 2020, and <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[2] concluded the proposed package of measures was appropriate for the stated target, but provided little detail of the assumptions behind the analysis.

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.[3]
- Frontier Economics was asked by PM Benelux to investigate the likely path of adult smoking prevalence in the Netherlands from now to 2040, including the impact of the proposed NPA policies. We were also asked to consider the extent to which innovative products can help achieve a smoke-free society, drawing on our analysis of smoking prevalence in England.[4]
- This report summarises our analysis and our findings.

Our approach:



[1] https://www.rijksoverheid.nl/documenten/convenanten/2018/11/23/nationaal-preventieakkoord

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

[3] 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 1.

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

Smoking prevalence in the Netherlands is in decline, but an acceleration in this rate of decline will be needed to meet the 5% target by 2040

3.1 million

Number of adult smokers in the Netherlands, 2018

2.4 million

The number of adult smokers that would need to quit today to meet the 5% target now

Source: Statistics Netherlands (CBS), Frontier calculations.

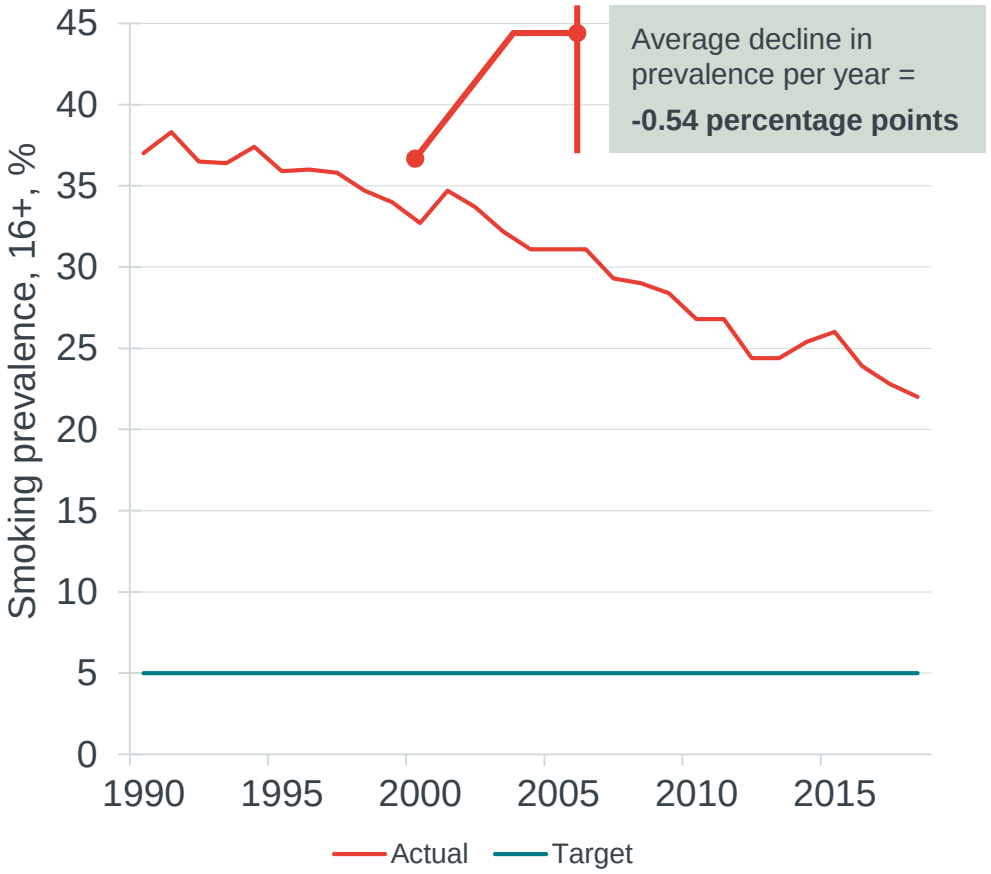
Smoking prevalence (age 16+)[1] in the Netherlands has fallen from **37.0%** of the adult population in 1990 to **22.0%** in 2018.

In 1990 smoking prevalence was high compared to the OECD average,[2] but prevalence has since fallen faster than other European countries including Germany, France, Italy and Spain.[3]

However prevalence remains significantly above the 5% target, equivalent to **2.4 million additional smokers** in 2018 (the last year of data).

To reach the 5% target by 2040, prevalence would need to decline by **-0.77 percentage points per year**, an increase of 44% on the average historical rate of decline.

Smoking prevalence in the Netherlands 1990-2018



Source: Statistics Netherlands (CBS), Frontier calculations.

Notes: See Annex 2 for methodology detail.

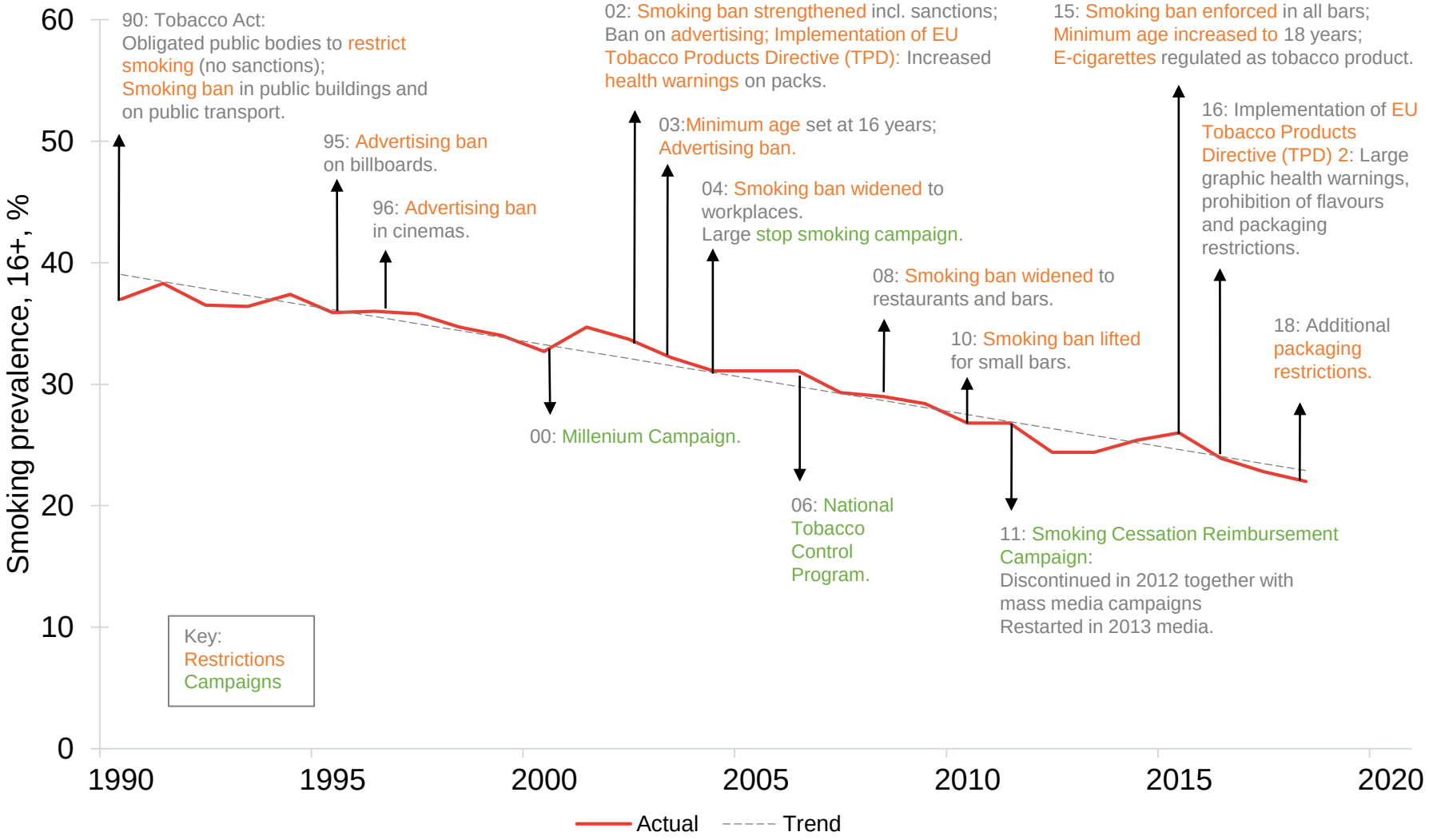
[1] All prevalence figures presented in this report represent the number of smokers aged 16+ as a fraction of the 16+ population: this is the series with sufficient historical data available from Statistics Netherlands. The NPA 5% target is stated in terms of the adult (18+) population. Smoking rates 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 (2014-2018). Therefore our **prevalence** forecasts, based on the 16+ population, are close proxies (slightly optimistic in terms of smoking reduction) for the 18+ prevalence. on which the NPA target is based. For forecasts of **number** of smokers, we apply the average uplift of 18+ prevalence over 16+ prevalence from the years of comparable date (2014-2018) to estimate the number of smokers in the adult population.

[2] OECD (2019), Daily smokers (indicator). doi: 10.1787/1ff488c2-en

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

Over the past 30 years, new tobacco control policies have been introduced, and adult smoking prevalence has declined

Trend in smoking prevalence and tobacco control policy in the Netherlands 1990-2018



Sources: https://www.rug.nl/rechten/congressen/archief/2009/oprichtingscongres-nilg/selfreg_c5_smoking_bans_in_the_netherlands.pdf and https://alliantienederlandrookvrij.nl/wp-content/uploads/2018/05/2018-Geschiedenis_Tabaksontmoediging-webversie.pdf

The National Prevention Agreement proposes further policy reforms that aim to reduce future adult smoking prevalence

	Excise	Packaging restrictions	Smoking bans	Display and advertising restrictions
Current policy	Real[1] excise duty has increased at an average annual growth rate of 2.8% since 1996 and currently comprises almost 60% of the weighted average price of a pack of cigarettes.[2]	Based on EU Tobacco Products Directive (TPD) requirements: pictorial health warnings covering the top 65% of the front and back of cigarette packaging.[3] Prohibition of 'glitz and glamour element on the pack	Smoking is banned indoors in all public places, including the hospitality industry, with the exception of designated smoking rooms.	Display at point of sale is allowed in all retail outlets. Advertising is only allowed inside and on the façade of tobacconists.[4]
Proposed policy changes	Increasing excise duty so that the price per pack of 20 cigarettes increases by €1 in April 2020. After a review of the impact of this increase, plans to implement further tax increases so that a pack of 20 cigarettes costs €10 by 2023.	Cigarettes and fine cut tobacco to have dark green / brown plain packaging from 2020.	Smoking banned (inc. outdoors) on the premises of schools, daycare centres, and petting zoos from 2020. Smoking rooms in hotels, restaurants and cafes banned from 2022. Smoking banned (inc. outdoors) at the premises of playgrounds, sports clubs and healthcare institutions from 2025.	Cigarettes out of sight at supermarkets from 2020. Cigarettes out of sight at other sales points from 2021, except for particular specialist tobacconists.[5] Advertising ban on the façade of all sales outlets from 2021. Advertising ban inside all sales outlets from 2021, except for particular specialist tobacconists as above.

[1] Adjusted for inflation.

[2] EU duty tables 1990-2000, as of 2001, PMI documentation; Eurostat inflation data (Harmonised Index of Consumer Prices); Frontier calculations.

[3] http://www.tobaccolabels.ca/countries/european-union/

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

[5] 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.

Our baseline forecast is that, without the NPA policy interventions, prevalence will fall to 10.2% by 2040 – more than double the target rate

Our baseline forecast for adult smoking prevalence is a **projection of past rates of decline**. In effect it assumes:

- Tobacco control policies will continue to be introduced at the same pace as in the past, and will have the same impact on prevalence;
- Demographic trends affecting adult prevalence will also continue as before.

The baseline does **not** include any specific estimate of the additional anti-smoking policies proposed in the NPA: we consider the effects of these policies to be **additional to this existing trend**.

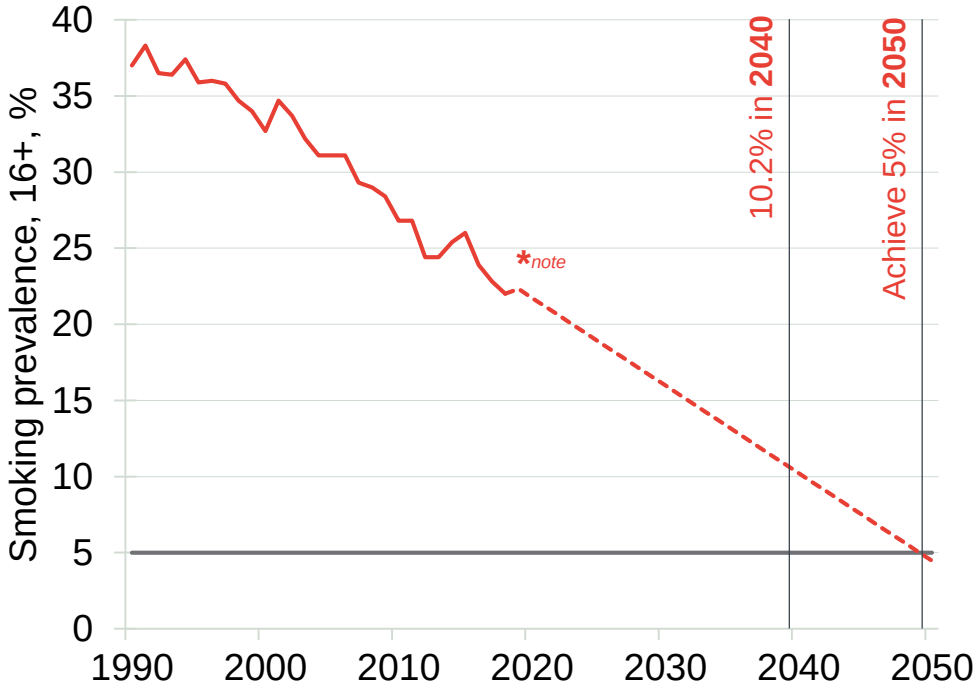
Smoking prevalence in our baseline forecast is:

- 2018: **22.0%**
- 2020: **21.7%**
- 2040: **10.2%**
- 2050: **4.5%**

This is more optimistic about future prevalence decline than the baseline of RIVM's analysis.[1] RIVM use the forecast produced in 2018 as part of the Public Health Future Outlook (VTV). The VTV forecast predicts smoking prevalence to fall to 13.6% in 2040. See Annex 3 for further details. This may be because the VTV forecast makes different assumptions about future demographic and policy trends.

The government's target for 5% adult smoking prevalence implies a maximum of 740,000 adult smokers in the Netherlands in 2040. Under our baseline forecast, the number of smokers in 2040 will be 1.5 million, meaning an additional 790,000 smokers above the target.

Baseline forecast, 1990-2050



Source: Statistics Netherlands (CBS), Frontier calculations.

790,000

Number of additional smokers above 5% target in 2040, under our baseline forecast

2050

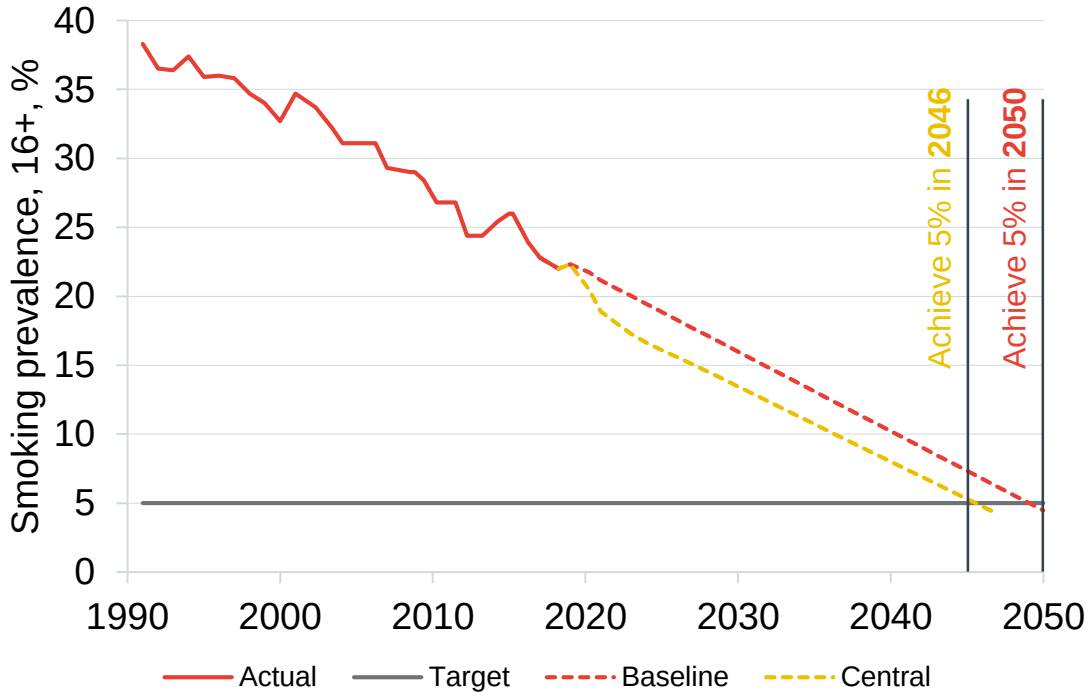
Year in which the 5% target is achieved, under our baseline forecast

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

* Note that the baseline forecast takes the trend in prevalence over the whole period 1990-2018. 2018, the last year of data, saw a larger-than-average decrease in prevalence over the previous year, taking prevalence below this long term trend. Hence our baseline forecast has a small uptick in prevalence in 2018, returning to trend.

Adding the modelled impact of reforms included in the NPA, our central forecast is that adult smoking prevalence will fall to 8.0% by 2040

Central forecast, 1990-2050



Source: Statistics Netherlands (CBS), Frontier calculations.

460,000

Number of additional smokers above 5% target in 2040, under our central forecast

2046

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

We adjusted our baseline forecast to account for modelled estimates of how adult smoking prevalence could be impacted by future policy interventions, based on the proposals in the NPA.

Policies included in our modelling were:

- Increased excise duties;
- Packaging restrictions;
- Smoking bans;
- Advertising and display restrictions.

We undertook a review of the literature and policy impact assessments to generate estimates of how these policies would affect future prevalence relative to the baseline. Details of our approach can be found in Annex 4.

Under our central forecast, smoking prevalence reaches **8.0%** in 2040. The 5% adult smoking prevalence target is reached in **2046**, 6 years later than the target, but 4 years sooner than the baseline.

Large reductions in prevalence are seen from 2019-2023 because of large increases in excise duty, and the one-off impacts of packaging restrictions, smoking bans and advertising and display bans which are assumed to reduce prevalence over a few years.

How policy reforms will affect prevalence is uncertain. In our low and high prevalence scenarios, adult smoking prevalence reaches 6.5% to 10.0% in 2040

As well as our central forecast we model low and high prevalence scenarios, accounting for uncertainty around both the future path of policy, and the impact of proposed policies on adult smoking prevalence.

The '**high prevalence**' scenario assumes:

- faster increases in excise duty are abandoned after 2020;
- cross-border effects limit the impact of prices on prevalence;
- regulatory restrictions on smoking prove ineffective.

Taken together, in this scenario 2040 prevalence is only 0.2 percentage points below the baseline forecast, and the 5% target is reached 9 years late, in 2049.

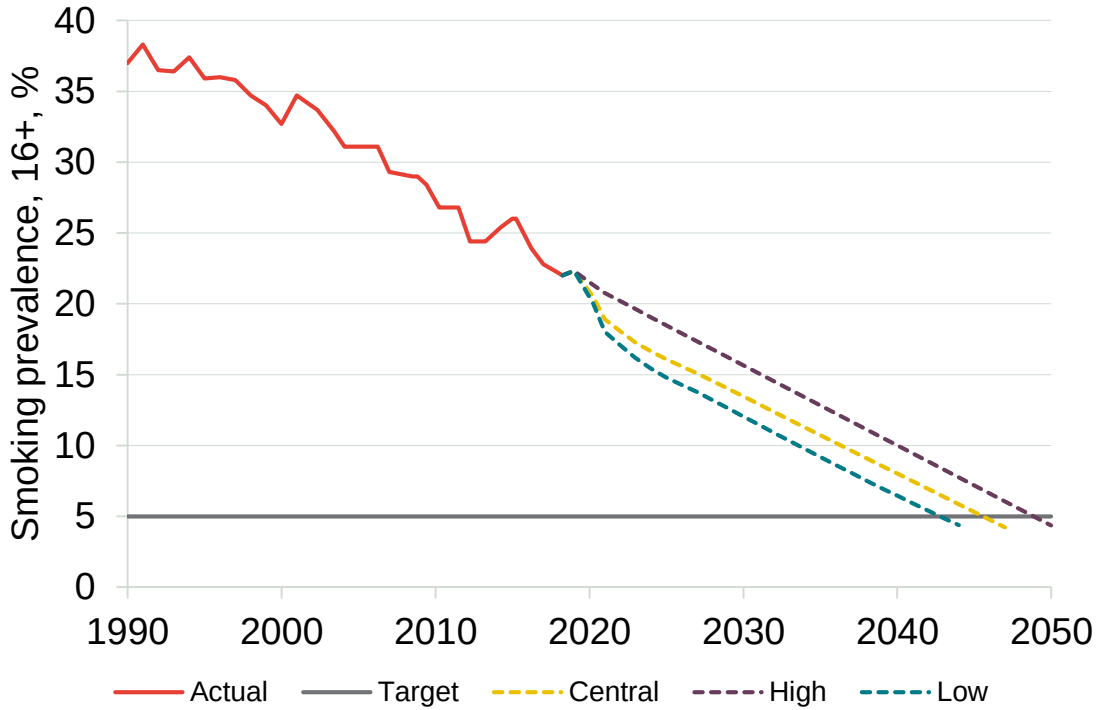
The '**low prevalence**' scenario assumes:

- excise duty continues to increase at above-historical rates;
- higher prices have a large impact on prevalence;
- regulatory restrictions reduce prevalence at the upper end of evidence from international experience.

In this scenario we come closer to the government target, achieving 6.5% prevalence in 2040 and 5% prevalence in 2043.

Details of all scenarios can be found in Annex 4.

High, central and low scenarios, 1990-2050



Source: Statistics Netherlands (CBS), Frontier calculations.

	Baseline	High	Central	Low
Adult smoking prevalence in 2040, %	10.2	10.0	8.0	6.5
Year in which 5% target is achieved	2050	2049	2046	2043

E-cigarettes are an effective quitting aid and are primarily used in the Netherlands to help quit smoking or reduce tobacco consumption

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.
  - 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%.[1]
- Responses from the Lifestyle Monitor Survey also show **that daily smokers are more likely to use e-cigarettes** than non-daily smokers.[2]

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

- Evidence from randomised controlled trials (RCTs) – the gold standard to evaluate effectiveness – shows that e-cigarettes increase the chances of quitting:
  - Hartmann-Boyce et al. (2016), combining the evidence of two RCTs, find that e-cigarettes more than double the chances of long-term abstinence as compared to placebo e-cigarettes. The authors acknowledge that there is a need for further research in this area.
  - 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 to 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).
- 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).

[1] Special Eurobarometer 458: Attitudes of Europeans towards tobacco and electronic cigarettes, March 2017.
[2] Netherlands Expertise Centre for Tobacco Control (Trimbos Institute), October 2018.

Case study: in England, the rate of prevalence reduction accelerated in 2012, coinciding with increased popularity of e-cigarettes

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

Between 2012 and 2017 (the last year of available data) the average annual decline in smoking prevalence in England was **twice as fast** as in the earlier period from 1993 to 2011.

Average annual decline in smoking prevalence:

- 1993 - 2011: **0.41** percentage points;
- 2012 - 2017: **0.82** percentage points;

The recent faster decline in smoking prevalence is likely due in material part to greater use of e-cigarettes as a quitting aid.[1]

ASH (2018)[2] found that 1.7 million ex-smokers in Great Britain had quit smoking and fully converted to e-cigarettes[3] and that the use of e-cigarettes increased significantly between 2012 and 2017.

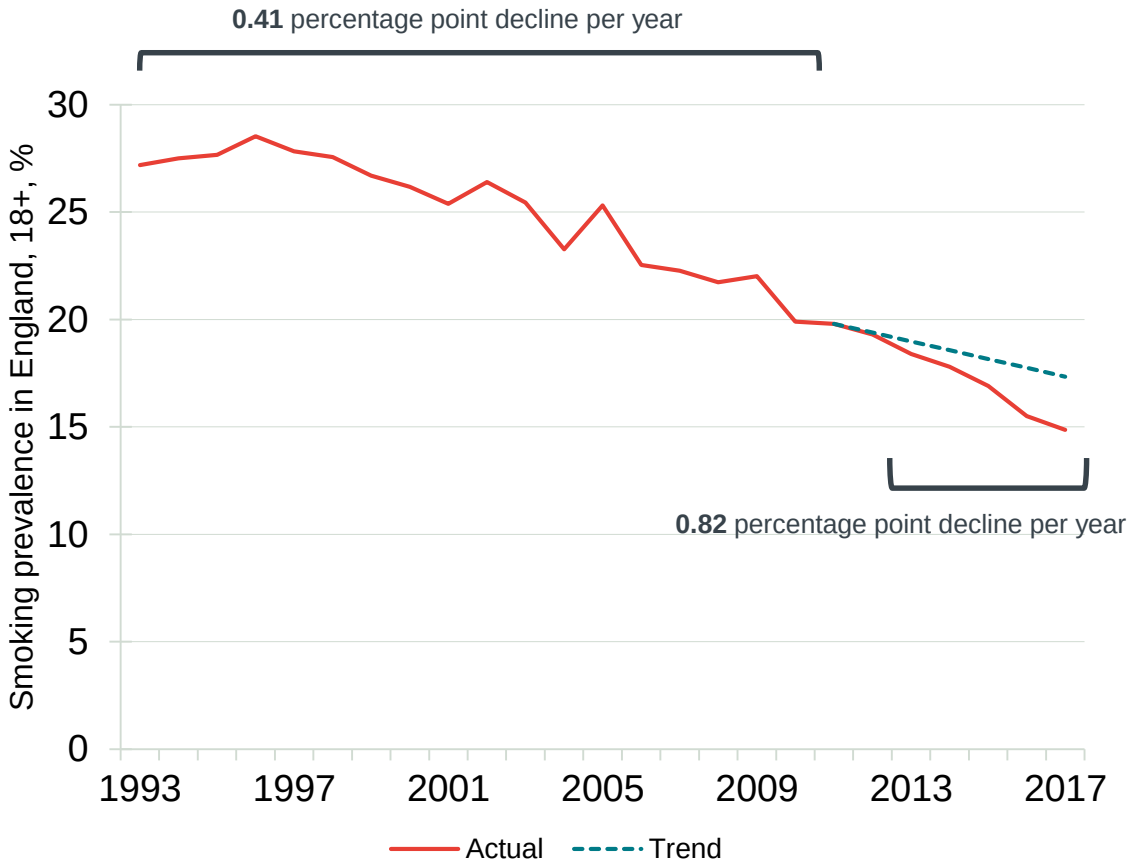
The majority of e-cigarette users ('vapers') are ex-smokers (**52%**) or current smokers (**44%**).

1.7 million

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

Source: ASH (2018).

Smoking prevalence in England: 1993–2011 and 2012–2017



Source: Health Survey for England (1993-2009), Annual Population Survey (2010-2017), Frontier calculations.

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

[2] http://ash.org.uk/information-and-resources/fact-sheets/use-of-e-cigarettes-among-adults-in-great-britain-2018/

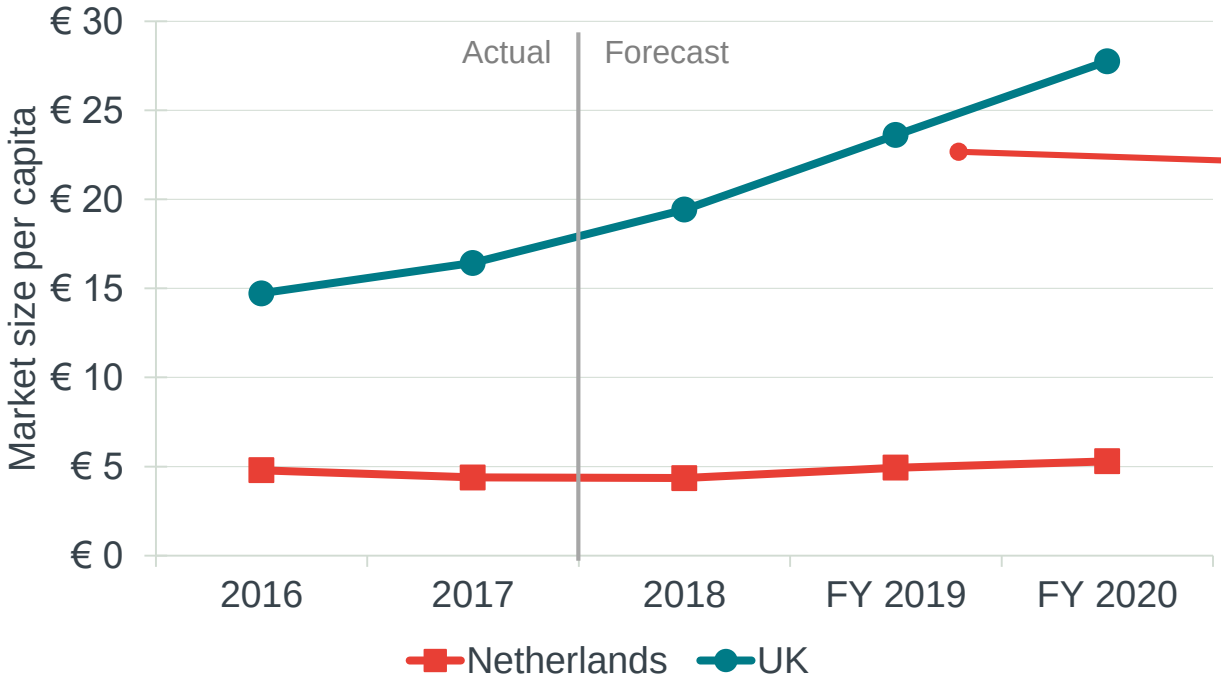
[3] Some of the 1.7 million ex-smokers who have fully converted to e-cigarettes would have quit using other means had e-cigarettes not existed. Quantifying the precise contribution of e-cigarettes to the observed decline in prevalence was beyond the scope of this report.

Case study: the e-cigarette market in the UK is significantly larger than that in the Netherlands

Comparing the e-cigarette markets in the UK and Netherlands

	Netherlands	UK
Adult vaping population (% of 18+)	2.0%	6.1%
Total market size (2017, m)	€ 60	€ 856
Market size per capita (2017)	€ 4.39	€ 16.43
Percent of users who use daily	35%	72%

A higher proportion of the UK population uses e-cigarettes, and more of those are daily users, leading to a higher spend per head of the population.



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.

The regulatory policy towards e-cigarettes, and public opinion surrounding their use, is likely to affect the rate of smokers switching to e-cigarettes.

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

Case study: in contrast to the UK, public bodies in the Netherlands have not adopted e-cigarettes as part of their smoking cessation strategy

Attitudes towards e-cigarettes of major stakeholders in tobacco control in the 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). [1]	*"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). [4]
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 know on the harmfulness of the e-cigarette on the long term."* - Standpoint of **Alliantie Nederland Rookvrij.** [2]	*"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). [5] "*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."* - **Action on Smoking and Health (ASH)** Chief Executive Deborah Arnott (2018). [6]
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). [3]	*"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). [7] *"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). [8] 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.

[1] https://www.rivm.nl/nieuws/damp-van-e-sigaret-schadelijk-voor-gezondheid (translated from Dutch)
[2] https://alliantienederlandrookvrij.nl/standpunt-alliantie-nederland-rookvrij-e-sigaretten/ (translated from Dutch)
[3] https://www.rijksoverheid.nl/documenten/convenanten/2018/11/23/nationaal-preventieakkoord (translated from Dutch
[4] https://www.gov.uk/government/publications/e-cigarettes-an-evidence-update
[5] https://www.rcplondon.ac.uk/guidelines-policy/e-cigarettes-inquiry
[6] http://ash.org.uk/media-and-news/press-releases-media-and-news/ash-welcomes-new-public-health-england-report-e-cigarettes/
[7] https://www.gov.uk/government/publications/towards-a-smoke-free-generation-tobacco-control-plan-for-england
[8] https://publications.parliament.uk/pa/cm201719/cmselect/cmsctech/505/505.pdf

Case study: if prevalence decline accelerated in the NL, as happened in England when e-cigarettes gained popularity, the 5% target could be achieved as early as 2032

From 2012-2017, smoking prevalence in England declined at twice the historical rate, which was likely due in material part to the popularisation of e-cigarettes.

'What-if' scenario: what would happen if the Netherlands experienced a similar acceleration in the trend rate of decline in smoking prevalence?

The average rate of decline in prevalence over the period 1990-2018 was **-0.535 percentage points per year.**

In our case study scenario:

- The trend rate of reduction in prevalence doubles from **0.535** to **1.07** percentage points per year;
- The National Prevention Agreement tobacco control policies have the same impact on reducing prevalence as in our central scenario.

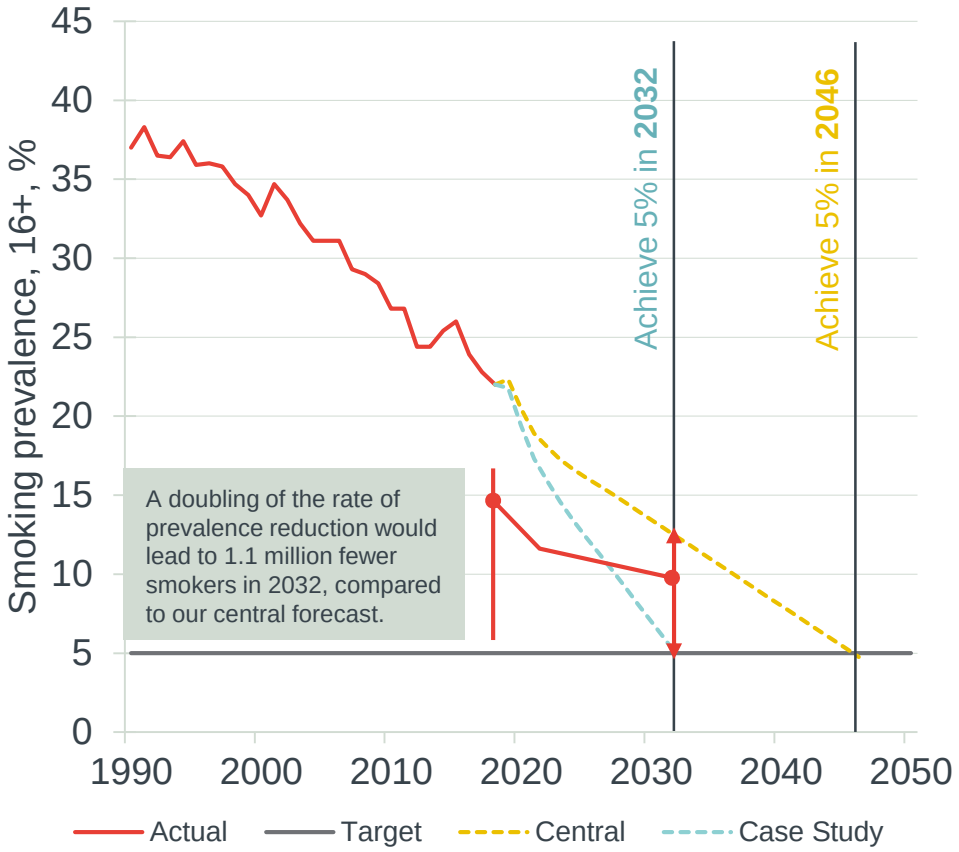
Result: smoking prevalence falls to **4.9% in 2032**, achieving the 5% target **8 years early**.

This implies **1.1 million** fewer smokers in 2032, as compared to the central forecast.

England achieved its acceleration in prevalence reduction at the same time as a rise in the popularity of smoke-free alternative products. The NPA proposes to increase regulations on smoke-free alternatives, for example considering plain packaging from 2022.

Such regulations would be an upside risk to our prevalence forecast to the extent that smoke-free alternatives have shown to be effective quitting aids.

Case study: rate of decrease of prevalence doubles



Source: Statistics Netherlands (CBS), Frontier calculations.

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. Over time the design of e-cigarettes has evolved considerably:[1]
  - *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

- The EU Tobacco Products Directive categorises these under 'novel tobacco products'.
- Heat-not-burn products 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, heat-not-burn products do not involve combustion processes, as opposed to conventional 'combustible' tobacco products.[2]

'Snus' oral tobacco

- Snus is a Scandinavian non-combustible tobacco product which is consumed by being placed between the user's lips and gums.
- Snus is currently banned in EU countries under the EU Tobacco Products Directive, except in Sweden, as part of a general prohibition on oral tobacco products.[3]
- '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.

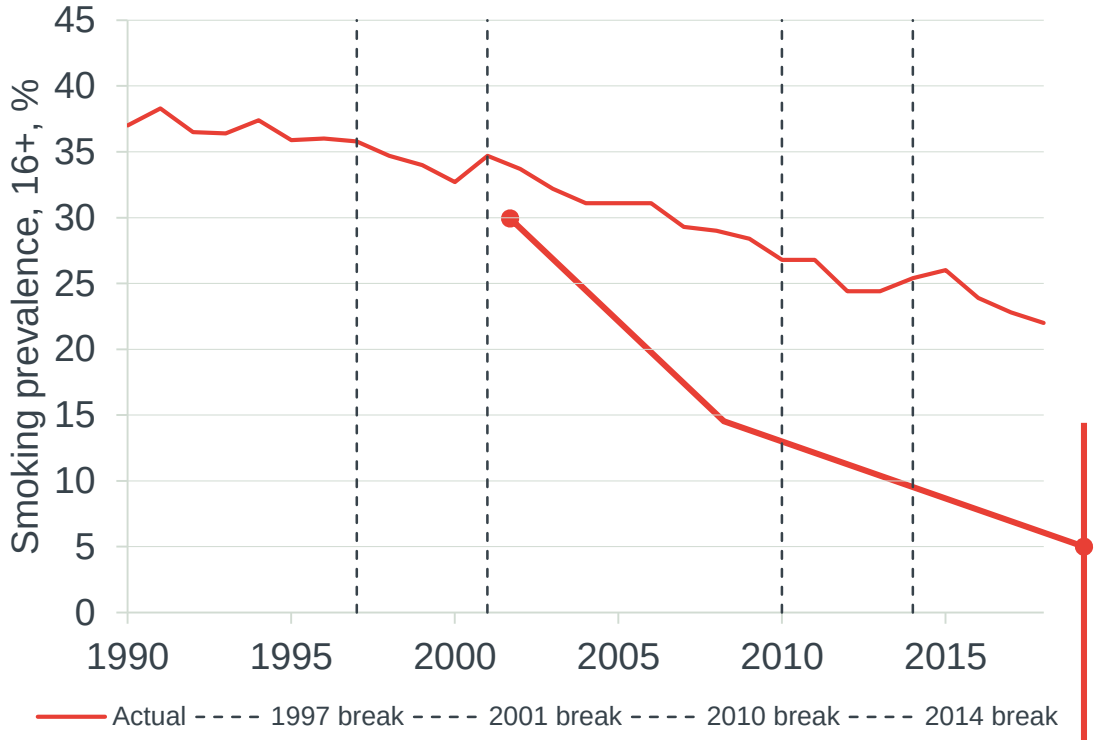
[1] https://www.rcpe.ac.uk/sites/default/files/jrcpe_48_4_mathur.pdf

[2] https://ec.europa.eu/taxation_customs/sites/taxation/files/study_on_directive-2011_64_main_text_en.pdf

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

We use Statistics Netherlands as our source for smoking prevalence data to look at trends and underpin our forecasts

Smoking prevalence in the Netherlands 1990-2018



Source: Statistics Netherlands (CBS)

- 1990-1996: Gezondheidsenquete (Health Survey)
- 1997-2009: Permanent onderzoek naar de leefsituatie (POLS)
- 2010-2013: Gezondheidsenquete (Health Survey)
- 2014-2018: Gezondheidsenquete/Leefstijlmonitor (Health Survey/Lifestyle Monitor)

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.

We use prevalence data from Statistics Netherlands (CBS) for our calculations.

Data are gathered from a survey and re-weighted to account for differences in the survey samples and target population.

Changes in methodology between survey sources (see source box) have led to potential breaks in the series, indicated left. However the only potentially significant methodological break cited by CBS is in 2001. We investigated this potential break in the series but do not believe it to be necessary to adjust the data (see box below).

Before 2001 the basic question was “Do you smoke?”, and, if answered “no”, “Do you never smoke?”.

In 2001 the 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 VTV and Volksgezondheidenzorg (Public Healthcare): neither organisation make an adjustment for the break in their use of the historical data.

The prevalence data available from Statistics Netherlands is comparable to prevalence evidence available from other sources

Dutch Continuous Survey of Smoking Habits (DCSSH) [1]

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.

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

Smoking prevalence:

- 2013: 25%
- 2014: 23%

Daily smokers:

- 2013: 19%
- 2014: 17%

DCSSH evidence on e-cigarettes [1]

E-cigarette usage:

- 2013: 2.5%
- 2014: 4.1%

Share of e-cigarette users using the product daily:

- 2013: 29%
- 2014: 44%

Use of quitting aids with quit attempts:

- 2013: 34%
- 2014: 40%

Special Eurobarometer 458 [2]

Measured from around 1,000 face-to-face interviews.

Smoking prevalence:

- 2017: 19%

European Health Interview Survey (EHIS) [4]

The second wave of the EHIS was designed to measure the health status of European member states on a harmonised basis.

Smoking prevalence:

- 2014: 17.7%

Netherlands Measurement Survey [3]

Survey of 4,500 people in 2009-2010. Measured ages 30-70 only but figure standardised to Dutch population:

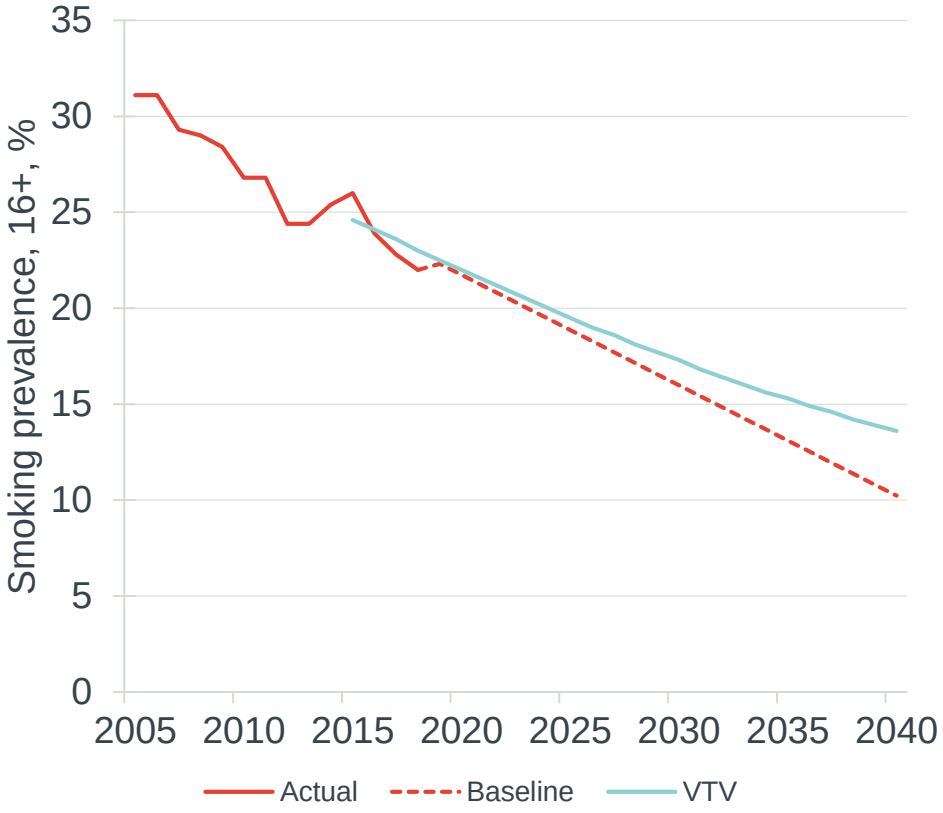
Smoking prevalence:

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

[1] https://www.trimbos.nl/aanbod/webwinkel/product/af1278-factsheet-continu-onderzoek-rookgewoonten
[2] European Commission (2017). Special Eurobarometer 458: Attitudes of Europeans towards tobacco and electronic cigarettes
[3] https://www.rivm.nl/nederland-maat-genomen
[4] https://ec.europa.eu/eurostat/web/microdata/european-health-interview-survey

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

Baseline prevalence: comparison to VTV forecast



Source: Statistics Netherlands (CBS); Volksgezondheid Toekomst Verkenning (VTV) (RIVM, 2018); Frontier calculations.

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 (1990-2018) 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:

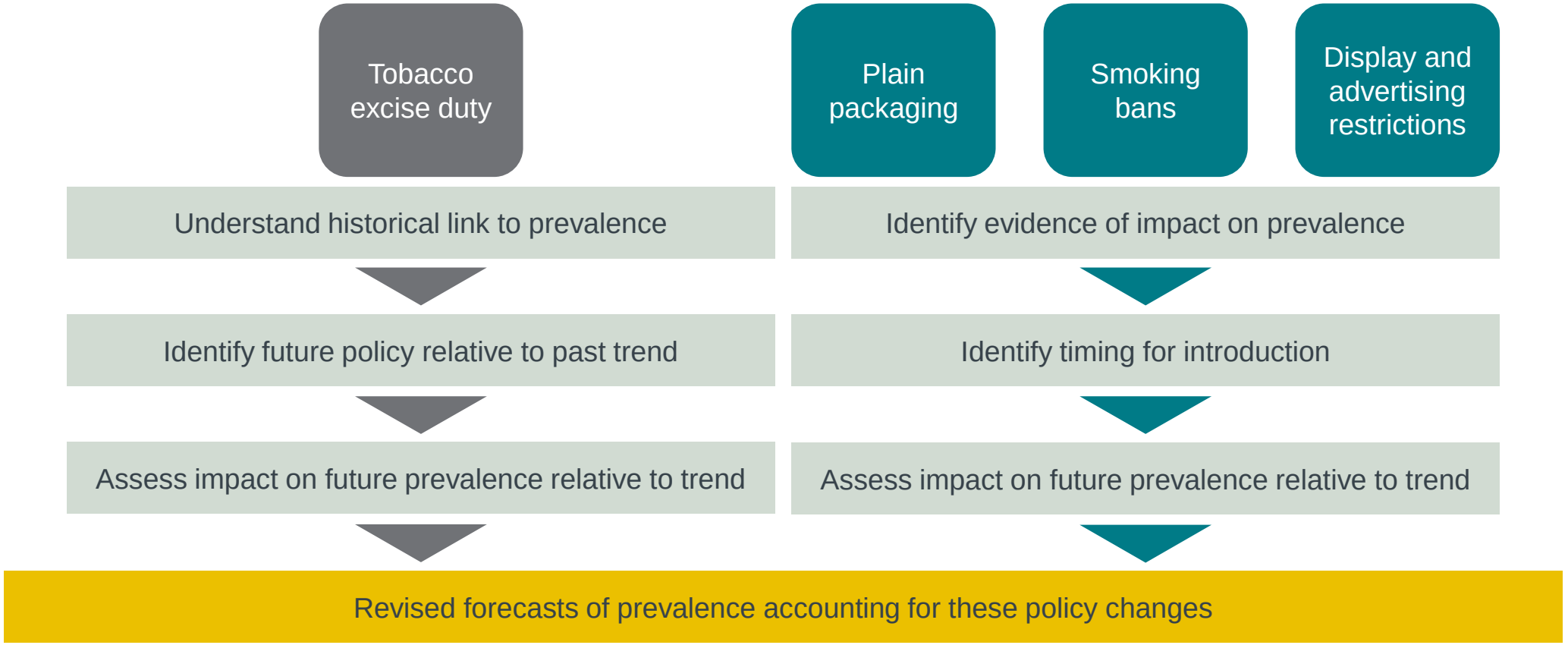
- VTV prevalence in 2040: **13.6%**
- Frontier baseline prevalence in 2040: **10.2%**

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.[1]

We also test the sensitivity of our forecast to the use of an exponential rather than a linear trend projection: the choice of functional form is not found to have a large impact on prevalence in 2040. Inspection of the historical data implies that prevalence has historically declined linearly rather than exponentially, so we opt for the simple linear trend projection.

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

We account for the impact of four policy interventions on the long-run trend in smoking prevalence



Note: 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 3), and do not include it as an additional policy driver.

Excise: we model the increases in excise duty proposed in the National Prevention Agreement, which are higher than the historical trend

Our baseline assumes that total real excise duty grows in future at its historical average rate from 1996-2018.

For each of our low, central and high prevalence scenarios we make alternative assumptions about the path of excise duty and the impact of price on prevalence, summarised on the next slide:

- All scenarios have an increase in excise in April 2020 which raises the price of a pack of 20 cigarettes by €1, as proposed in the NPA;
- In the high prevalence scenario, faster increases are abandoned after the review in April 2020: from that point excise increases at 2.8% p.a.: this is the compound average growth rate (CAGR) of historical excise from 1996-2018;
- In the central and high scenarios, excise duty continues to rise faster so that a pack of 20 cigarettes costs €10 (nominal) in January 2023.

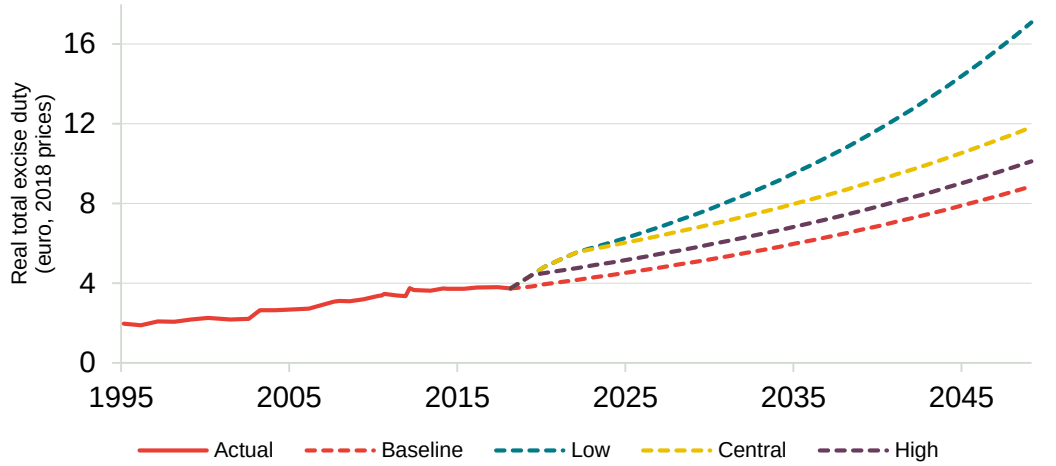
After 2023 we have different rates of growth of excise in the central and low prevalence scenarios:

- Central: Real excise grows at 2.8% p.a., equal to the historical CAGR;
- High: Real excise grows at 4.2% p.a.: this is 50% greater than the historical CAGR.

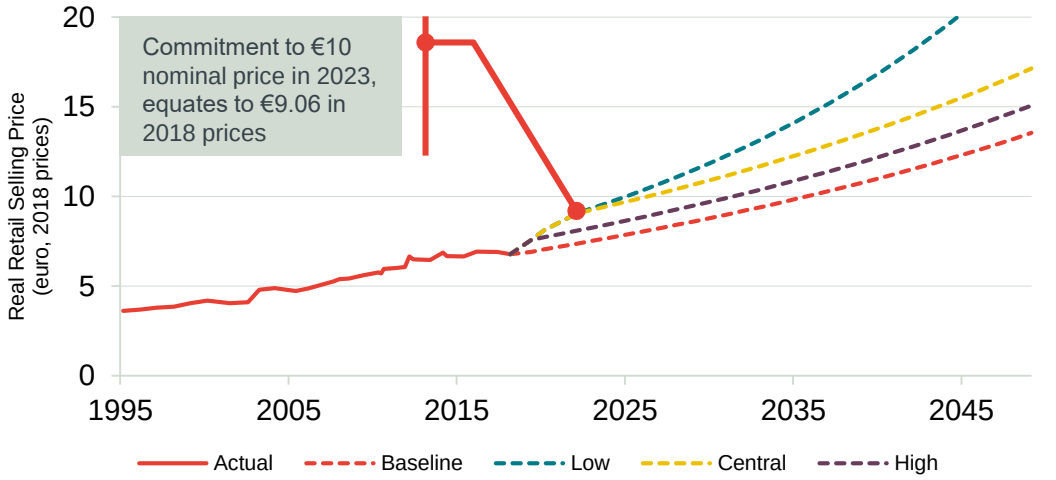
Each excise scenario is translated into a forecast for the path of the real Retail Selling Price (RSP) of a pack of 20 cigarettes (see right).

	Prevalence scenario			
	Baseline	High	Central	Low
Real RSP in 2040 (euro)	10.78	11.94	13.50	16.33

High, central and low prevalence scenarios: excise 1996-2040



High, central and low prevalence scenarios: RSP 1996-2040



Excise: our assumptions for the path of excise duty lead to forecasts for the real retail selling price (RSP) of a pack of 20 cigarettes

Table: summary of excise assumptions

	High prevalence	Central prevalence	Low prevalence
Price elasticity of demand	**-0.40**	**-0.50**	**-0.60**
Price elasticity of prevalence	**-0.20**	**-0.25**	**-0.30**
Path of excise 2018 - 2020	Tax increases such that nominal price increases by **€1 in April 2020**		
Path of excise 2020 - 2023	Total real excise grows by **2.8% p.a.**	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.**

Additional assumptions:

- Unit price (pre-tax) grows at historical trend 1996-2018
- Data source for inflation is the Harmonised Index of Consumer Prices (HICP) (Eurostat)
- HICP index grows at historical trend 1996-2018
- VAT = 21%

…from an excise scenario to a price scenario…

Retail selling price (real) = (Unit price + Total excise) x 1 + VAT rate x 100 / Inflation index

Excise: from our forecasts for the real retail selling price compared to the baseline we calculate the impact on prevalence

…from a price scenario to a prevalence scenario…

Annual reduction in prevalence = % Difference in price between baseline and price scenario X Price elasticity of prevalence

Evidence base for price elasticity of demand (PED) assumption

- The Trimbos Institute reports that Gallet and List (2003) in a meta-analysis of 86 studies find an average price elasticity of **-0.48;**
- The International Agency for Research on Tobacco Control in a review of time series analyses from the US find the largest cluster of estimates between **-0.2 and -0.4,** and that other developed countries have comparable elasticities;
- De Kinderen et al. (2016) in their study of Dutch smoking prevalence use a PED of **-0.4**, referencing Chaloupka and Warner (2000) for this estimate;
- The PED used by HMRC in the UK is higher, at **-1.05** (Czubek & Johal, 2010);

Many of the Dutch studies suggest relatively low PED, but this is based on older estimates from the literature. More recent UK evidence has suggested higher elasticities. However, it is plausible that the PED in the Netherlands is significantly lower than in the UK due to the greater ease of cross-border substitution[1], and the higher prevalence of roll-your-own tobacco leading to a higher rate of substitution to other products. The UK estimate is an estimate for duty-paid tobacco, whereas to estimate prevalence the correct estimate is for all tobacco.

We adopt the following price elasticity estimates for our analysis:

- Low prevalence scenario: **-0.60**
- Central scenario: **-0.50**
- High prevalence scenario: **-0.40**

$$Price\ elasticity\ of\ demand = \frac{\%\ change\ in\ demand}{\%\ change\ in\ price}$$

$$Price\ elasticity\ of\ prevalence = 0.5\ x\ Price\ elasticity\ of\ demand$$

Evidence base for prevalence elasticity assumption

The impact of a price change on prevalence is assumed to be **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) and in other studies of Netherlands smoking prevalence.

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**
- High prevalence: **-0.20**

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

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. The National Prevention Agreement includes the commitment for cigarettes and fine-cut tobacco products to have dark green / brown plain packaging from 2020.

Evidence on impact of plain packaging:

- Standardised packaging has been introduced in Australia, New Zealand, France, Hungary, Ireland, Norway, and the UK.
- Evidence on the impact of standardised packaging is limited. Our central scenario takes the average figure from the impact studies of Australia and the UK, while acknowledging that other outcomes are possible, including zero impact.
- The UK Impact Assessment (DH IA) assessed the combined impact of standardised packaging and the EU TPD, suggesting the impact of plain packaging alone to be a reduction in tobacco consumption of **3.8% over two years**.[1]
- Australia implemented plain packaging in December 2012 and the Australian Department for Health published a Post-Implementation Review in 2016 which found a **0.55 percentage point reduction in prevalence**.[2] This corresponds to **2.5%** of the Netherlands 2018 smoking prevalence.

Modelling scenarios:

- High prevalence: **0%** (no impact of plain packaging);
- Central: **3.1%** (average of the UK and Australian evidence);
- Low prevalence: **3.8%** (equivalent to the UK evidence).

All scenarios are modelled as one-off impacts as a percentage of 2018 prevalence, spread over 2 years, 2020 and 2021.

Additional note on calculations: The DH IA is based upon the following proportionate (rather than percentage point) impacts upon 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).

In line with the DH IA, we take the impact of plain packaging alone on top of the requirements of EU TPD to be 3.80%.

[1] https://www.gov.uk/government/publications/impact-assessment-opinion-standardised-packaging-of-tobacco-products-final
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/403493/Impact_assessment.pdf

[2] 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

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;
- School areas, childcare centres and playgrounds;
- Sports clubs and healthcare institutions.

The bans on smoking rooms in the catering industry and at school areas are to be 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).

Evidence on smoking bans in 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 effects above are for a ban of more extensive coverage than is proposed in the NPA.
- Given this consideration, we use 2% as an optimistic upper bound for the effect of banning smoking rooms in our low prevalence scenario.
- For our high prevalence and central scenarios we use intermediate estimates of 0% and 1% respectively.
- No evidence exists on the effects of bans with limited coverage such as the residual bans. The SimSmoke estimate for a ban in health facilities, universities, government facilities, relative to no ban (greater coverage than that in the NPA) is 2%, so we take half of this effect as an optimistic upper bound, and assume effects of 0% and 0.5% for our high and central scenarios.

Modelling assumptions for the combined impact:

- High: **0%**
- Central: **1.5%**
- Low: **3%**

The effects on prevalence are modelled as a one-off impact as a percentage of 2018 smoking prevalence, phased over five years from 2020-2025.

Display and advertising restrictions: we model a one-off reduction in prevalence, accounting for uncertainty around the potential impact

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

- Cigarettes out of sight at supermarkets from 2020;
- Cigarettes out of sight at other sales points from 2021, with the exception of some specialist tobacconists (see slide 10);
- Advertising ban on the façade of sales outlets from 2021;
- Advertising ban inside sales outlets from 2021, with the exception of some specialist tobacconists (see slide 10).

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.

Evidence on the impact on prevalence of retail restrictions:

- Li et al (2013) find that display bans reduce exposure to tobacco displays and reduce impulse buying.[1]
- 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.[2]
- He et al. (2018), using aggregated longitudinal data from 77 countries, find that a point-of-sale display ban reduces smoking prevalence by 7%.[3]
- Europe Economics finds no statistically significant effects of bans on tobacco displays on prevalence or tobacco consumption in Canada and Australia.[4]
- 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.

Given the lack of consensus on the impact on prevalence of retail restrictions, 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:

- High: **0%**
- Central: **3%**
- Low: **5%**

The effects on prevalence are modelled as a one-off impact as a percentage of 2018 smoking prevalence, phased over 2020 and 2021.

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

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

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

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

Summary of assumptions underlying the policy impact estimates in each of the low, central and high prevalence scenarios

	High prevalence	Central prevalence	Low prevalence
Excise	Low price elasticity of prevalence. Faster excise increases are abandoned after 2020, after which excise increases at the historical rate.	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	**Zero** impact	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[1]	**Zero** impact	One-off **1.5%** reduction in prevalence.	One-off **3%** reduction in prevalence.
Display and advertising restrictions[1]	**Zero** impact	One-off **3%** reduction in prevalence.	One-off **5%** reduction in prevalence.

[1] Impact estimates for smoking bans and display and advertising restrictions are taken from previous studies using the Netherlands SimSmoke model, and from a wider evidence review (see previous slides) .

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