



National Institute for Public Health
and the Environment
Ministry of Health, Welfare and Sport

Towards a smoke-free generation

Options to make cigarettes **less appealing and addictive**



Cigarettes are designed to maximise the appeal of starting to smoke (1). Smoking is addictive, making it hard for people to quit once they have started. Smoking is by far the most harmful and deadly lifestyle factor (2). More than one-fifth of adults in the Netherlands smoke (3) and hundreds of young people become addicted to smoking every week. The National Prevention Agreement lays down targets for a healthier Netherlands by 2040 (4). A key target is achieving a smoke-free generation: 0% of children and pregnant women and less than 5% of Dutch people aged 18 and over smoke. Measures designed to contribute to this include higher sales taxes on tobacco and smoking products, fewer points of sale and making it easier to quit smoking. Modifications to cigarettes may also make smoking less appealing to young people. This fact sheet describes how imposing tighter restrictions on the appearance and composition of cigarettes can serve to make them less appealing and addictive.

Filters

Cigarette filters became popular in the 1950s, amid growing awareness of the harmful effects of smoking. Filters block some of the nicotine and other harmful substances from being inhaled while smoking. However, even after 60 years of research, there is still no convincing evidence that they reduce the harmful effects of smoking (5).

Filters contain small ventilation holes through which additional air is drawn in during inhalation. This dilutes the smoke and thus the nicotine concentration per puff. Because of this, smokers perceive cigarettes with more ventilation holes as lighter and milder in taste. Cigarettes of this type are also perceived as less harmful (6–8). In the past, these cigarettes were labelled ‘light’ or ‘mild’. Such labelling was banned in 2002, as these terms incorrectly imply that these cigarettes are less harmful.

In fact, dilution of the smoke acts as a catalyst for compensatory behaviour, so smokers end up inhaling the same amount of nicotine (6, 7). Examples of compensatory behaviour include inhaling more deeply and taking more and/or longer puffs. In addition, ventilation holes are partly covered by a smoker’s fingers and mouth while smoking. This means that the intake of harmful substances (such as tar and carbon monoxide) remains high. Moreover, the additional air drawn in

through these holes affects how a cigarette burns and, consequently, the composition of the smoke. As a result, certain harmful substances are released in larger quantities. Various studies show that smoking cigarettes with more filter ventilation yields no health benefits (8–10). In fact, there is strong evidence that cigarette filter ventilation contributes to an increased risk of one type of lung cancer (adenocarcinoma) among smokers (10).

Banning filter ventilation would make it more difficult for the tobacco industry to market cigarette varieties that could be perceived as less harmful than others, when in reality they are at least as harmful.

Filter ventilation also impacts the results of machine-measured cigarette smoke. In measurements carried out using the ISO machine-smoking method, the ventilation holes remain open. The WHO has developed a method based on more frequent and larger puffs with the holes blocked. This more closely replicates human smoking behaviour. The levels of tar, nicotine and carbon monoxide measured using this method are two to 26 times higher than with the ISO method (11). The Dutch government advocates incorporating the WHO method into European tobacco legislation.



Cigarette filters are also harmful to the environment. In the Netherlands, billions of cigarette butts end up in the environment each year. Filters consist of poorly biodegradable plastics that stay in the environment as microplastics for many years. The nicotine, tar and other toxins that accumulate in the filter during smoking also end up leaching into soil and water (12). As there is no convincing evidence that filters make smoking less harmful, regulators could consider banning them as an environmental protection measure.

Appearance

Plain cigarette packaging became mandatory in 2020 and cigarette appearance has been standardised since 1 July 2022 (13). Among other things, cigarettes have to be made to standard dimensions, using unprinted white paper and a white or imitation cork tip. Brand names and variants may still be printed on cigarettes, using a standard font in a prescribed location.

This can make smoking less attractive, as the design of cigarettes influences their appeal (6). Women in particular perceive long, 'slim' cigarettes as stylish (14). This has also been confirmed by consumer surveys carried out by the tobacco industry (15). Female smokers associate slim cigarettes with femininity, elegance and high quality. An independent study showed that young people perceive slim cigarettes as more attractive and less harmful (16).

The colour and patterning of cigarette paper influence the appeal and perceived risk of smoking as well. To reduce the attractiveness of cigarettes, making them a darker colour would be a better choice than the white colour currently prescribed by law (17). Pink cigarettes, for example, are rated as more attractive and better tasting by young women, while the colour gives the impression that these cigarettes are less harmful. White cigarettes are likewise perceived as a safer product. By contrast, darker colours are associated with intense flavour and higher risk (14).

Another addition that could be made to legislation on standardised appearance is a mandatory warning on cigarettes themselves, pointing out the dangers to the smoker while in the act of smoking. Both smokers and non-smokers are less likely to try cigarettes with such warnings and rate them as less appealing (17).



Composition

Tobacco is made from the dried and fermented leaves of the tobacco plant. The drying method affects the tobacco's flavour, sugar content, nicotine content and colour (18). A variety of flavour additives are added to the tobacco to mask its bitterness and to give individual products their trademark taste. Many additives, such as vanilla, liquorice and cocoa, enhance the appeal of smoking, for example by making cigarettes taste and smell better. Other tobacco additives can numb the throat and airways and thereby reduce the harsh effects of the smoke (19). This makes it easier for smokers to start, continue and even increase their smoking. Some additives make smokers more addicted to smoking, for example because they help the body absorb nicotine better (20).

Nicotine

Nicotine is the most addictive substance in cigarettes. It is naturally present in tobacco leaves and thus in tobacco. Nicotine makes smokers crave another cigarette. Research has been conducted into the possibility of making cigarettes less addictive by reducing nicotine levels. Cigarettes used in this study had a very low nicotine content (VLN), e.g. 0.4 mg per gram of tobacco. By comparison, ordinary cigarettes have a nicotine content of around 16 mg per gram of tobacco. Various studies show that smokers who switch to VLN cigarettes end up smoking fewer cigarettes per day, become less dependent on nicotine and are more likely to attempt to quit (21–23). As to whether people may actually start smoking more to compensate for the lower nicotine content, an effect was demonstrated for cigarettes with more filter ventilation, but not for VLN cigarettes (22, 24). This is because the nicotine content of VLN cigarettes is so low that it is impossible to modify smoking behaviour in such a way that the nicotine intake becomes comparable

to that of cigarettes with a regular nicotine content (25). Based on this finding, the US Food and Drug Administration (FDA) announced legislation to lower the maximum nicotine content of cigarettes to non-addictive levels (26). Apart from nicotine, cigarette smoke also contains other substances that can be addictive or enhance nicotine's addictive properties by various mechanisms (20). These include tobacco alkaloids, which have a chemical structure similar to nicotine, as well as menthol and acetaldehyde, which is released when sugars are burned.

Inhalation-facilitating substances

Menthol has a cooling effect in tobacco products, even in very small quantities. It makes tobacco smoke easier to inhale, even when the taste is not perceptible (27). By consequence, menthol makes smoking more appealing to young and new smokers who are not yet accustomed to inhaling harsh tobacco smoke (28). Other additives that facilitate cigarette smoke inhalation include cooling menthol-like and pH-reducing substances. Substances that lower cigarette smoke pH make the smoke taste milder, making it easier to inhale smoke all the way into the lungs. Examples include nicotine salts, acids and sugars. Banning these types of substances would make smoking less attractive, particularly to new smokers. Among the substances prohibited under European tobacco legislation are those facilitating inhalation (29). These categories of substances are described in Articles 7.6, 7.9 and 20.3 of the Tobacco Products Directive (TPD) (30). However, this ban is difficult to enforce, as no specific substances are listed. To clarify the TPD, the Ministry of Health, Welfare and Sport has asked RIVM to prepare a list of additives that fall into these categories (31).



Sugars

Sugars are naturally present in tobacco, but are also added for flavour, as a binding agent and to keep tobacco moist (32). Proportionately, sugars account for the largest share of all cigarette additives. When sugars are burnt, caramel-like substances are formed that impart an attractive sweet flavour to the smoke and mask its bitter taste. The burning of sugar also releases acids that reduce the pH and make the smoke less harsh and easier to inhale. This process also produces acetaldehyde, which intensifies nicotine's addictive properties (33). Regulating all sugars, i.e. both those naturally present and added sugars, is expected to make smoking less attractive and possibly also less addictive (34).

Flavourings

Almost all tobacco products contain flavour enhancers (35). These are substances that impart a pleasant taste to the tobacco smoke and mask its harshness and irritating effect. By making the smoke easier to inhale, they also make it easier to start smoking. Young people are attracted to tobacco products with sugary, sweet flavours in particular. The production of cigarettes and roll-your-own

tobacco with a characterising flavour other than tobacco, such as vanilla, has been prohibited since May 2016 (29). Cigarettes with a characterising menthol flavour were temporarily exempted from this ban, but became illegal in May 2020. Flavourings can still be added, but not in quantities that result in a characterising flavour. Since this ban took effect, a variety of other products have been introduced to add flavour to cigarettes and rolling tobacco (36). These flavour accessories range from flavour cards and capsules to sprays and liquids that can be added to tobacco. As these products do not contain tobacco themselves, they are not covered by the Dutch Tobacco Act.

Under current EU law, a trained panel of experts has to assess product odour to establish whether tobacco products have a characterising flavour (37). Compared to this method, a ban on the addition of flavourings in any quantity is a more time-efficient approach. This could be verified using chemical analysis. Another argument in favour of this approach is that flavourings can make cigarettes more appealing, even in quantities too small to produce a characterising flavour (20). For these reasons, a complete ban on the addition of flavourings, following the example of Brazil and Canada, merits consideration (38).

Conclusions and recommendations

Tobacco products are designed to be appealing and addictive, so young people will start and continue smoking (1). To ensure that fewer young people and adults smoke by 2040, policymakers can impose stricter appearance and composition requirements to reduce the attractiveness and addictiveness of cigarettes. Such restrictions could include the following:

- Prohibiting the use of filter ventilation to prevent manufacturers from creating the impression that some types of cigarettes are less harmful than others. Regulators could also consider banning filters entirely to protect the environment as well.
 - Expanding legislation on the standardised appearance of cigarettes to reduce their appeal further, for example by requiring manufacturers to make cigarettes a darker colour or print a health warning on individual cigarettes.
 - Reducing the nicotine content of cigarettes to a very low level in order to reduce addictiveness.
- Public communication should emphasise that these cigarettes are no less harmful than cigarettes with a 'regular' level of nicotine, only less addictive.
- Prohibiting ingredients such as sugars and flavourings that make cigarettes more appealing to new smokers or that make it more difficult for established smokers to quit smoking. Substances that facilitate inhalation are already banned for the same reason. Regulators would have to clarify which substances fall under the ban and verify that they are no longer added to cigarettes, for example by compiling a list of substances that are subject to enforcement.
 - A possible consequence of tighter product restrictions on cigarettes is that smokers switch to less regulated products, such as cigarillos. To prevent this, regulators could decide to apply the recommendations in this fact sheet to other types of nicotine and tobacco products as well.

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