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Arbeitsgemeinschaft
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Association suisse pour
la prévention du tabagisme
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la prevenzione del tabagismo

Report

Heated Tobacco Products

A Harmful Alternative

September 2025

Content

Introduction

Heated Tobacco Products (HTPs)

are portrayed by the tobacco industry as being less harmful than cigarettes. However, this claim is not supported by independent scientific studies.

The substances released by HTPs are harmful to health, addictive, and - just like cigarettes - can be deadly.

KEY FACTS

Heated tobacco products are harmful to **Health**.

Studies confirm that exposure to second-hand smoke from heated tobacco products is harmful.

Heated tobacco products must be taxed in the **same way** as conventional cigarettes.

Heated tobacco sticks **damage the environment**

Nearly 1.6 billion sticks sold!
A worrying trend in the sale of HTP sticks in 2024.

Global sales of HTPs are rising rapidly, and Switzerland is no exception. In just a short time, HTPs have developed from a niche product into a mass market. Particularly alarming is that in 2024 almost 1.6 billion HTP sticks were sold in Switzerland, compared with only 13 million in 2015. This represents an increase of more than 125-fold in just nine years. This is a deeply concerning surge.

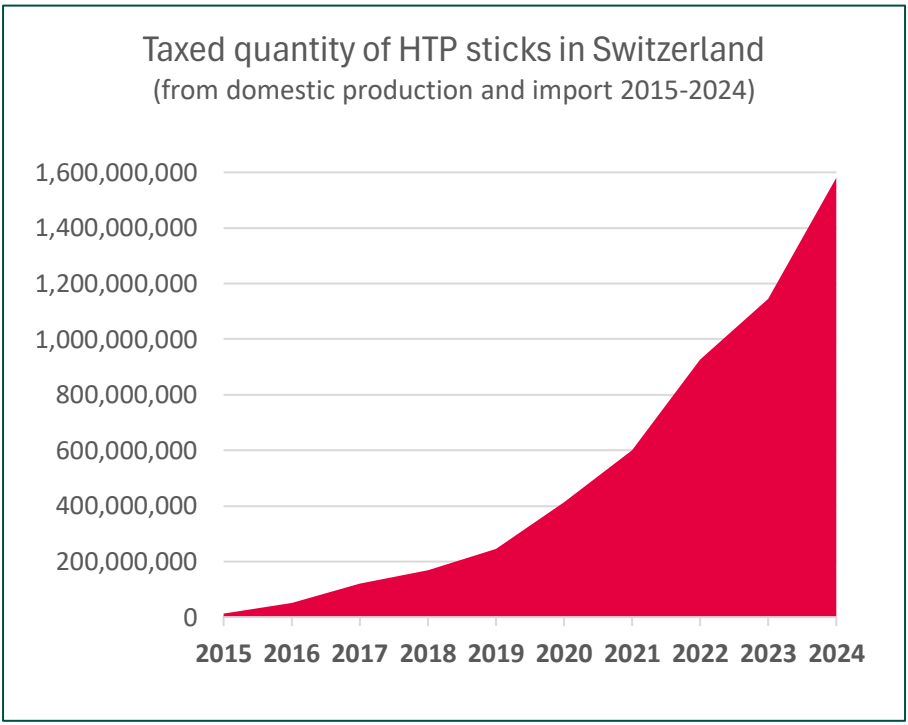


Figure: Data from the Federal Office for Customs and Border Security (BAZG), graphic ©AT Switzerland

What are Heated Tobacco Products (HTPs)?

Heated tobacco products (HTPs), and misleadingly referred to by the tobacco industry as 'Heat-not-Burn' products, are a new product category that has been available on the Swiss market since 2015. In HTPs, tobacco is heated to temperatures of up to 550 °C according to the tobacco companies, lower than the combustion of conventional cigarettes, which can reach up to 900 °C (Upadhyay et al., 2023). In some products, the tobacco is treated with humectants such as propylene glycol to generate an aerosol, which is then inhaled by consumers (Majek et al., 2023).

Independent research challenges the claim of being 'smoke-free'

The tobacco industry often markets these products with the promise that they are less harmful than conventional cigarettes. It claims that heating, rather than burning, the tobacco releases fewer harmful chemicals. However, smoke can also be generated without direct combustion. With IQOS, smoke is produced through pyrolysis (a form of incomplete combustion) and thermogenic degradation (the breakdown of tobacco components through heat). These processes generate smoke containing harmful substances similar to those found in conventional tobacco smoke (Auer et al., 2017). Unfortunately, relatively few data are currently available on the health effects of HTPs, and many of the published studies come from researchers with ties to the tobacco industry. Only a few studies have reported on the short-term pathophysiological impacts of HTP use. Existing data on HTP toxicity mainly relate to the respiratory and cardiovascular systems. Moreover, no data exist on long-term toxicity, meaning that the tobacco industry's claims that HTPs are a harmless alternative to conventional cigarettes have no scientific basis (Leigh et al., 2018; Znyk et al., 2021).

The World Health Organization (WHO) and other health authorities have expressed concern about the safety and health risks of HTPs, as they still contain nicotine and other

chemicals that endanger health (Organisation Mondiale de la Santé, 2021; Grigg, 2021; German Cancer Research Center, 2024).

The risks of HTPs

While these products may appear to produce less visible smoke than conventional cigarettes, the release of harmful substances is not eliminated. Studies show that dangerous toxicants are generated even without an open flame (El-Kaassamani et al., 2022; Auer et al., 2017).

Toxic exposure on par with cigarettes

Auer et al. (2017) demonstrated that concentrations of formaldehyde, acetaldehyde and nicotine in HTP emissions are similar to those in conventional cigarettes. These substances are known to be toxic and carcinogenic. Leigh et al. (2018) also found high levels of the genotoxin glycidol, a substance that can increase cancer risk. Majek et al. (2023) indicated that regular HTP use may raise the risk of chronic respiratory and cardiovascular diseases.

High heat, higher toxins: up to 400% more glycidol

Although HTPs operating temperatures are below the threshold for open combustion, they can still reach up to 550 °C - sufficient to generate toxic substances (El-Kaassamani et al., 2022; Leigh et al., 2018; Li et al., 2019). Glycidol has even been detected in IQOS aerosols at concentrations up to 400% higher than in cigarette smoke. According to the International Agency for Research on Cancer (IARC), glycidol is “possibly carcinogenic” (El-Kaassamani et al., 2022; Génération sans tabac, 2022).

Chemical	Description
Acetaldehyde	An organic compound commonly found in cigarette smoke and other combustion processes. Potentially carcinogenic.
Acenaphthene	An environmental toxicant found in cigarette smoke and fossil fuels.
Carbonyls	A group of organic compounds including aldehydes and ketones. Present in cigarette smoke and contributors to disease.
Formaldehyde	A chemical found in cigarette smoke, industrial emissions and household products. Irritant and potentially carcinogenic.
Formaldehyde cyanohydrin	A derivative of formaldehyde that is toxic and irritating; used in industrial processes.
Glycidol	A chemical found in some e-cigarettes and heated tobacco products. Carcinogenic; can cause genetic mutations.

Ultrafine particles causing cellular damage

High temperatures generate ultrafine particles and carbonyls that damage cells (Davis, Williams & Talbot, 2019; Li et al., 2019). Studies also point to substantial amounts of tobacco-specific nitrosamines and other irritants (Auer et al., 2017; Davis, Williams & Talbot, 2019; El-Kaassamani et al., 2022; Leigh et al., 2018; Mondiale de la Santé, 2021). Nicotine and tar levels are almost identical to cigarettes. In addition, highly toxic substances such as acenaphthene and formaldehyde cyanohydrin have been detected (Davis, Williams & Talbot, 2019).

Hidden harms to health

In-vitro studies show that HTP emissions damage human lung cells, promoting oxidative stress, inflammation and susceptibility to infection (Davis, Williams & Talbot, 2019; Leigh et al., 2018; Sohal et al., 2019). In animal experiments, HTP exposure impaired vascular function to a degree comparable to conventional cigarettes (Znyk et al., 2021). HTP use can also increase uptake of carcinogens and nicotine, potentially reinforcing dependence (Davis, Williams & Talbot, 2019; Li et al., 2019).

Blue Cross sounds the alarm

In Switzerland, the Blue Cross conducted several analyses of the new IQOS ILUMA products and published worrying findings on TEREA tobacco sticks. More than 40 harmful substances were found in the new IQOS ILUMA sticks, including:

- Acetylfuran: acutely toxic if inhaled
- Isopulegol: targets organs; irritates the airways
- n-Butyl ether: known irritant
- Furfural and benzyl alcohol were also detected; both harmful to health (Blaues Kreuz, 2023).

Further tests detected diacetyl, a trigger for respiratory disease. Acetal, acetic acid and 2-furanmethanol were also present in the smoke—substances likewise found in conventional cigarettes (Blaues Kreuz, 2022).

Current products on the market

HTPs are available in various models and brands. One thing unites them: they pose risks to health and the environment, despite industry claims to the contrary. Leading products include:

IQOS/ILUMA from Philip Morris

These devices use cigarette-like tobacco rolls or sticks (“Heets”) that are heated in a battery-powered device to up to 330 °C, still producing toxic emissions - e.g., via pyrolysis and thermal degradation (Auer et al., 2017). The newer ILUMA generation uses an induction system that, according to the manufacturer, reaches up to 360 °C (Philip Morris, 2023).

Whether these temperature claims are accurate has not yet been independently confirmed.

©Kiosk online Shop, Screenshot from https://tabak.kkiosk.ch/

Screenshot of Ploom Aura from ©ploom.ch

Ploom from Japan Tobacco International (JTI)

JTI also markets HTPs. Ploom devices use an electric heat source to warm the tobacco. According to JTI, Ploom heats tobacco electrically to 200–300 °C, generating an inhalable aerosol with nicotine and flavourings. The Ploom X model is a high-heat system in which incomplete combustion and pyrolysis occur, similar to other HTPs (Japan Tobacco International, 2023).

British American Tobacco's (BAT) Glo-Series

BAT offers several Glo models (e.g., Hyper, Hyper Pro). Here too, tobacco sticks are heated electrically. According to BAT, these use induction heating to reach temperatures between 240–280 °C (British American Tobacco, 2023). As with other systems, rapid, high heating of the sticks can lead to incomplete combustion.

Screenshot of glo Hyper Pro from ©discoverglo.com

New technology. Same health risks.

All these systems, whether high- or lower-heat, generate aerosols containing tobacco, nicotine and flavourings. Even though they are marketed as “less harmful”, they contain substances that endanger health and are potentially carcinogenic (Auer et al., 2017; Svendsen et al., 2022). It should also be noted that the manufacturers’ stated heating temperatures are often not independently verifiable and, in actual use, especially towards the end of a stick, can be significantly exceeded, increasing the emission of toxic substances (Zervas et al., 2024). If devices are not cleaned regularly, residue can accumulate and pyrolyse during heating, releasing harmful compounds such as formaldehyde cyanohydrin, a highly toxic substance even at low concentrations (Davis et al., 2019). Despite their positioning as risk-reduced products, heated tobacco devices show widely varying, and in some cases high, levels of fine particulate matter, depending on brand, flavour additives and user behaviour (Zervas et al., 2024).

Image created with Chat GPT

Second-hand exposure from HTP

HTPs harm not only the user but also those nearby. The notion that they pose no second-hand risk is a dangerous misconception.

Indoor pollution: air quality at risk

Studies show that HTPs can significantly deteriorate air quality, particularly in small, poorly ventilated spaces such as cars or indoor rooms. Acrolein, an irritant, has been shown to rise in indoor air during IQOS use (Cancelada et al., 2019; Schober et al., 2019).

Tests in Canada confirmed that IQOS aerosol, both primary and second-hand, can contain up to 33 volatile organic compounds (VOCs) plus aldehydes, nitrogen compounds and other toxicants (Znyk et al., 2021).

The industry counts particles, but ignores what's in them

A review by El-Kaassamani et al. (2022) cited a PMI-funded study claiming IQOS releases four times fewer ultrafine particles than cigarettes. Crucially, however, the chemical composition of these particles was not examined, leaving their actual health impact unknown.Independent studies show that while some toxicants may be lower, others increase. An internal Imperial Tobacco study even detected VOC traces in IQOS second-hand emissions. The risks of these compounds remain under-researched and urgently require investigation (El-Kaassamani et al., 2022; Yu et al., 2022).

Ultrafine particles released by HTPs pose a particular threat. Their tiny size enables them to penetrate deep into the lungs, where they can cause lasting damage. Even though evidence is still limited, the trend is clear: HTPs pollute indoor air, with consequences for lungs and the cardiovascular system. Similar concerns exist for e-cigarettes, also marketed as supposedly safer alternatives. Their aerosols have been shown to contain fine and ultrafine particles, heavy metals, VOCs and nicotine, all substances inhaled passively and harmful to health (Lachireddy & Capon, 2016).

PFAS chemicals in TEREA sticks

In 2024, analyses by Blue Cross detected PFAS (so called "forever chemicals") in TEREA sticks for IQOS ILUMA. PFAS are linked to cancer and organ damage (Blaues Kreuz, 2024).

©AT Switzerland

Environmental burden from HTPs

Large amounts of IQOS TEREA and other HTP stick butts are carelessly discarded in the environment. The sticks are made of cellulose acetate, a plastic that is non-biodegradable (WHO, 2022). During their slow breakdown, they leach harmful substances including nicotine, heavy metals and carcinogens into soils and water bodies (Dobaradaran et al., 2021; Slaughter et al., 2011). Of particular concern: PFAS can also be released, contaminating ecosystems for years (Blaues Kreuz, 2024).

TEREA stick sub-sample	Substances detected	Amount in sub-sample
Filter 1 (mouthpiece)	Perfluorocaproic acid (causes chemical burns), Perfluorodecanoic acid (carcinogenic)	<0.10 ng/g; 0.50 ng/g
Filter 2 (cooling segment, ventilation chamber)	Perfluorodecanoic acid (carcinogenic)	0.19 ng/g
Tobacco	Perfluorobutanoic acid (causes burns), 4:2 fluorotelomer sulfonic acid (harmful if inhaled)	40 ng/g; 0.15 ng/g
Filter 3 (front seal)	Perfluorodecanoic acid (carcinogenic)	0.31 ng/g

Table: PFAS detected in TEREA sticks.

Far from green!

The PFAS detected in TEREA sticks are not just a local issue. The environmental burden of HTPs extends far beyond toxic residues.

The manufacture of HTP devices requires conflict-linked raw materials such as lithium, cobalt and copper. Mining of these metals, often in countries such as the DRC, Indonesia or Chile, causes deforestation, water pollution and human rights abuses. It undermines livelihoods, deepens inequality and drives child labour, all for products marketed as a “clean alternative” (Expose Tobacco, 2024).

Claims of sustainability must therefore be viewed with scepticism. Although devices are rechargeable and reusable, the safe disposal of e-waste and batteries remains a major challenge, with far-reaching ecological impacts including soil and water contamination (Expose Tobacco, 2024; El-Kaassamani et al., 2022).

E-waste, toxic production emissions, long transport chains and packaging all add to the environmental toll. HTPs threaten not only health but also the planet's ecological stability.

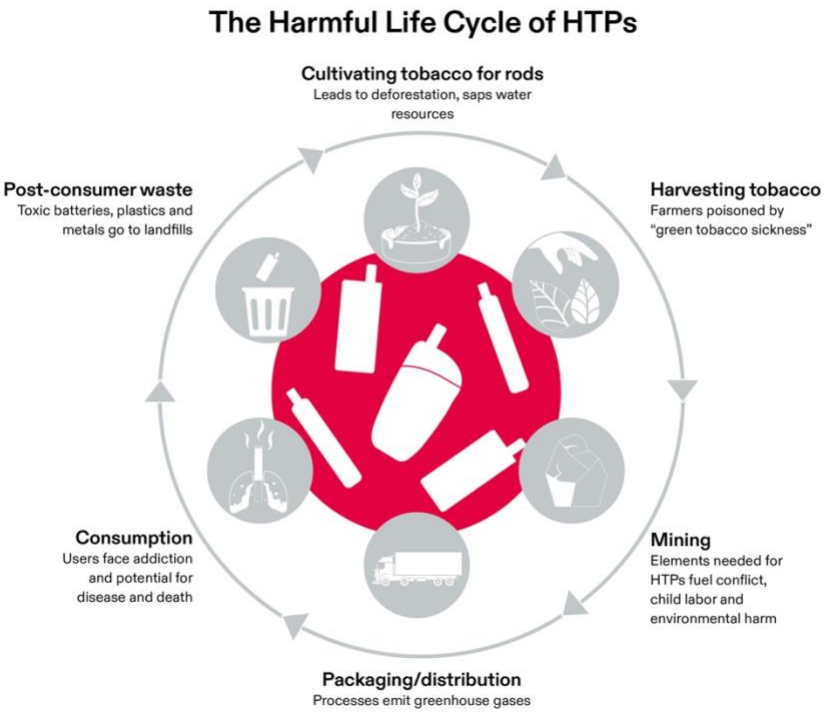


Image adapted from *©exposetobacco.org*

Image of metal blade in TEREA ©Blaues Kreuz

Hidden hazards: blades and disposal issues

Another problem is the metal blades in many devices, especially induction systems such as ILUMA. These are difficult to recycle and require special disposal systems. Their sharpness also poses injury risks, particularly to children. Blue Cross criticised the manufacturer and called for an end to marketing HTPs as a "healthier alternative" (Blaues Kreuz, 2023).

Flavourings in HTPs

HTPs such as IQOS heavily rely on flavourings, not just as additives, but as a deliberate strategy to attract new users. Flavours lower the barrier to initiation, especially for young or inexperienced users. Studies show flavoured products encourage smoking initiation, particularly among adolescents (Cadham et al., 2020; Meernik et al., 2019).

HTPs use tobacco sticks often offered in various flavours, including menthol and fruit flavours (Lim, Choi, & Shin, 2022). Capsule sticks, which contain small crushable capsules in the filter, are especially popular. Users can pop them at will to change taste, making consumption more appealing (Cho & Thrasher, 2019).

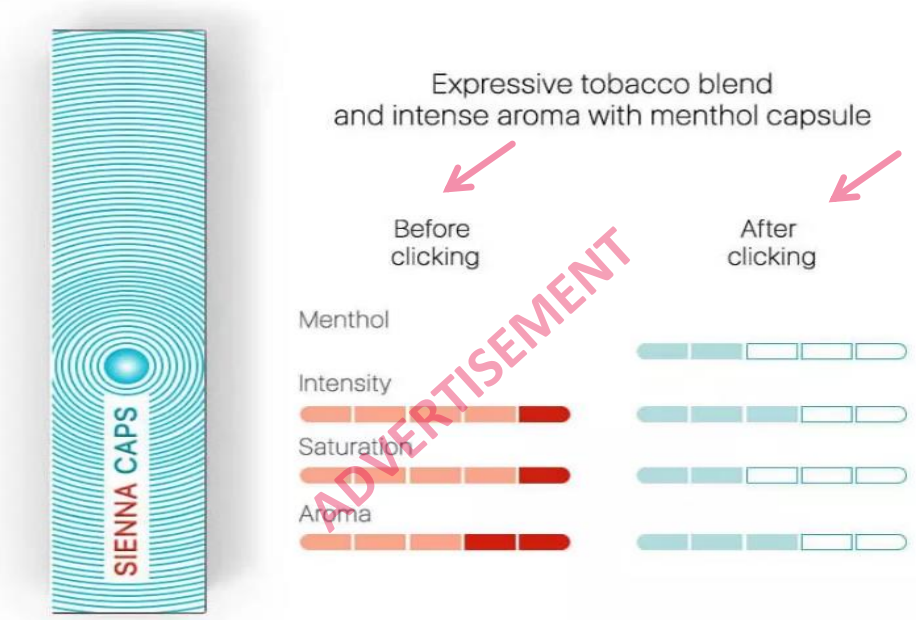


Image: HEETS marketing with flavour capsule in the filter, before and after the «click», Screenshot from online shop https://hnb.one/

A cocktail of 283 chemicals

Lim, Choi & Shin (2022) identified 283 chemical substances in HTP flavours and capsules. Concentrations were often significantly higher than in conventional tobacco products. Alarmingly, some substances numb the bronchi, reducing irritation signals and enabling deeper inhalation. This effect can increase addiction risk, especially among adolescents.

Globally, pressure is mounting to regulate flavours. The WHO and EU have both recommended restrictions or bans. In the US, flavoured tobacco products have been regulated since 2009 under the Family Smoking Prevention and Tobacco Control Act (European Respiratory Society, 2020; Public Health England, 2018; WHO, 2020).

In April 2025, Poland fully banned flavours in HTP sticks. Flavours are more than just taste enhancers, they are a deliberate industry tool to recruit new users. Particularly dangerous is their appeal to young people, lowering entry barriers and increasing risk of long-term dependence. Regulation and research must act decisively.

Image of TEREA and HEETS sticks ©AT Switzerland

So much for quitting.

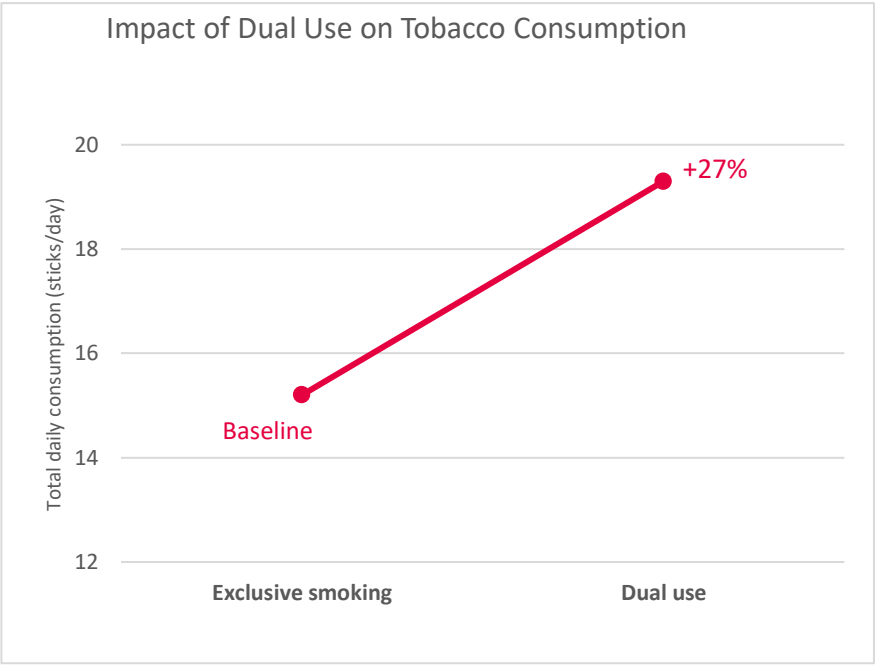


Figure: Data from ITC Japan Study, Fong 2025.

Tobacco companies present HTPs as cigarette substitutes that support quitting. PMI, for example, claims that over 70% of IQOS users in Japan have “quit smoking” (Sutanto et al., 2020; Fong, 2025). In reality, this is based on a permissive definition of quitting and ignores dual use. Independent ITC survey data show that only 10–17% of users quit cigarettes, while more than 80–90% continue dual use (Fong, 2025). Dual users reduce cigarette intake only slightly but add enough HTP use to result in a 27% net increase in overall consumption (Fong, 2025).

Instead of replacing cigarettes, HTPs create an “apex state” of consumption, maximising both health risks and industry profits. The industry knows this, and exploits it in its marketing.

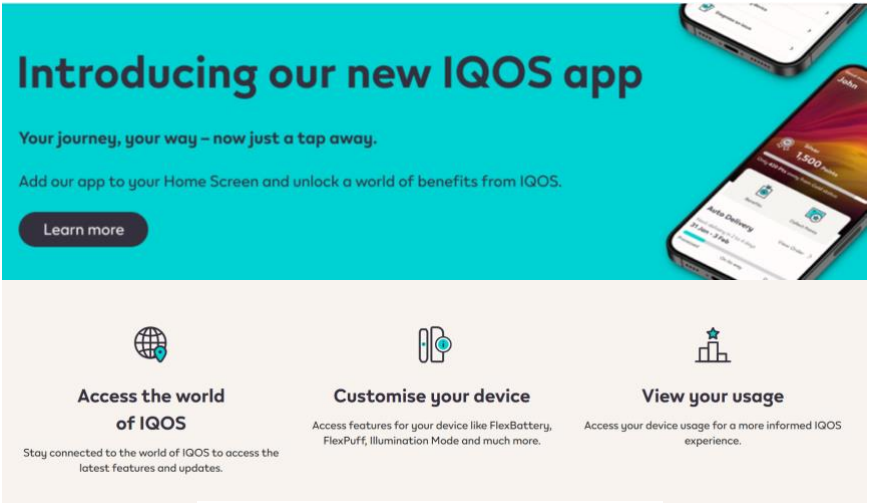
PMIs misinformation and aggressive marketing

PMI systematically downplays its products. It conflates “emissions” with “health” to gain regulatory advantage. Investigations by the Bureau of Investigative Journalism and AT have shown PMI manipulates science and runs campaigns to influence politics (see AT News). As with conventional cigarettes, the tobacco industry employs a range of targeted strategies to sell its HTPs, including the deliberate influencing of scientific research. PMI also financed and co-led a study at ETH Zurich which claimed that, because there is no combustion, HTPs do not produce benzo[a]pyrene. Independent research, however, clearly contradicts this and confirms the presence of this carcinogen (Ruggia, 2025).

PMI therefore promotes its HTPs, namely IQOS and ILUMA, intensively, marketing them as smoke-free and “the next step forward”. Although PMI does not disclose its marketing expenditure, it is known that the company budgets substantial amounts for the promotion of IQOS. In Switzerland alone, PMI invests several million CHF each year in HTP advertising campaigns (Schürch et al., 2024). In addition to online shops, PMI has established dedicated concept stores worldwide, in some cases several per city, to promote its products directly to consumers (Tobacco Tactics, 2023). Sophisticated, multi-stage campaigns have been developed for both traditional and social media (see examples in work by Campaign for Tobacco Free Kids). PMI also promotes its products at music festivals and cultural events in glamorous locations around the world (Werbewoche, 2019).

Image of an IQOS ILUMA display in a concept store ©frantic00 / Shutterstock.com

For PMI, the promotion of IQOS is inseparably linked to its "smoke-free" public relations strategy, as well as to campaigns such as *Hold My Light* and *UnSmoke Your World*. The aim of PMI's marketing activities and strategies is to establish the company and its HTPs in the everyday lives of consumers. This, in turn, increases pressure on policymakers to regulate these products in ways that benefit the industry, especially in lower-income countries.



Screenshot from IQOS app concept ©PMI

Finally, PMI encourages its customers to download and register with the IQOS app in order to receive discounts. The app collects detailed personal data, including the exact time, place, frequency, duration and intensity of each use, as well as the type of sticks consumed. These data enable PMI to further develop its products in ways that deepen dependence on IQOS. In addition, the possibility of sharing or selling this information, particularly location data, raises serious privacy concerns. Particularly problematic is that these digital platforms enable a personalised, continuous presence in users' everyday lives, while existing legislation remains insufficient. Whereas conventional advertising is clearly regulated, communication via the app is largely unregulated and beyond public oversight. This creates new, difficult-to-monitor spaces of influence where tobacco companies can promote their products subtly and continuously (Lasseter, 2018; Przewozniak et al., 2019).

What do HTPs cost?

Philip Morris introduced IQOS to the Swiss market in 2015. At that time, the price for 20 tobacco sticks was around CHF 8, similar to, or slightly above, the price of conventional cigarettes.

Since then, the market has opened up: competitors such as BAT now offer much cheaper alternatives with Glo. A pack of 20 Glo sticks currently costs only CHF 6 (Webshop Glo). How prices will continue to evolve remains to be seen, but the market appears to have stabilised. For PMI and other tobacco companies, it makes sense to diversify their product portfolios, particularly since profit margins for these "new" products are considerably higher than for conventional cigarettes.

An example:

- A pack of Marlboro Red costs CHF 9.20, with **51% going to tobacco tax**.
- A pack of IQOS sticks costs CHF 8.20, with **only 12% going to tobacco tax** (as of October 2024).

Image of a selection of tobacco cigarettes, from left to right:
TEREA stick, HEETS stick, und Marlboro click, slim, and Marlboro red cigarette
©AT Switzerland

This significant difference allows manufacturers to achieve far higher profit margins with HTPs. Beyond these economic advantages, the industry is also tapping into new consumer segments: according to PMI, only two-thirds of IQOS users are former cigarette smokers. This means that one-third of users had never smoked before, another alarming trend showing how these products are also drawing non-smokers into the market.

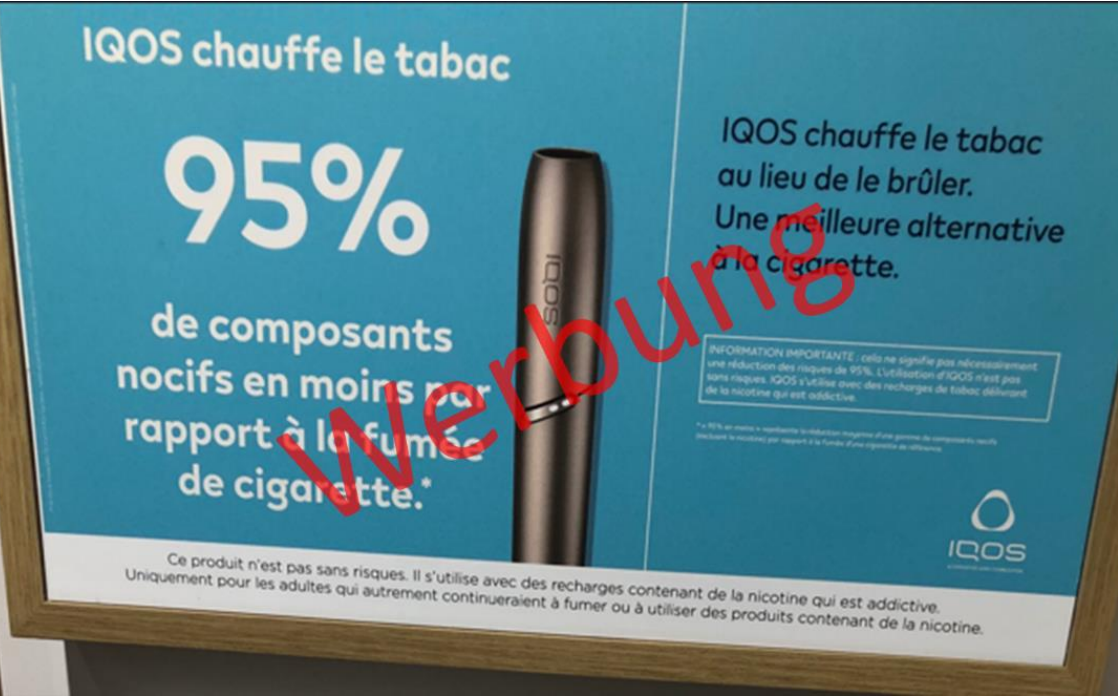


Image: Example of an IQOS advertisement from PMI, November 2022 ©AT Schweiz

And what's the situation in Switzerland?

The current HTP market is characterised above all by the almost complete absence of restrictions on sales or advertising in print and digital media. This regulatory negligence allows PMI and BAT, which has supplemented the market with its Glo brand, to expand their influence and distribute their products across Switzerland without hindrance. PMI has repeatedly advertised IQOS as a "95% safer alternative" to cigarettes, a claim with no scientific basis. This marketing ploy also serves to justify lower taxation for HTPs (AT Schweiz, 2023).

From a public health perspective, the need for action is clear. Stricter rules on advertising, sales and taxation are urgently required. HTPs are, and remain, tobacco products. They must therefore be regulated in the same way as cigarettes, including equal taxation and health warnings. Only in this way can the population be effectively protected from the risks.

Regulation in Switzerland: since 2024

With the new Tobacco Products Act, which entered into force in October 2024, HTPs have for the first time been regulated by law (Schweizer Bundesrat, 2024). They are now subject to:

- Tobacco Products Act (TPG)
- Tobacco Tax Act
- Passive Smoking Protection Act

Key provisions regarding HTPs:

- Sales prohibited to under-18s
- Extension of passive smoking protection to all HTPs
- Obligation to carry text-based health warnings (but not pictorials, as required for cigarettes)

Taxation

Despite these changes, taxes on HTPs remain low. The rate was raised from 12% to 16% on 1 January 2025 – but still falls far below the 51% rate applied to cigarettes. This preferential taxation is not only unfair but also dangerous: it makes HTPs more attractive to consumers even though the health risks are comparable to cigarettes. Further tax increases are under discussion, including to help finance OASI (Old-Age and Survivors' insurance).

Health warnings

Health warnings provide important information about potential health risks. Their effectiveness has been scientifically demonstrated by research institutes and health organisations (Bundesamt für Gesundheit, 2021; Schweizer Bundesrat, 2020). Nevertheless, the current plan is that HTPs will carry only small, text-only warnings, despite the fact that pictorial warnings are mandatory for cigarettes.

Regulation of HTPs in Switzerland is only at the beginning. Future legislative adjustments must be guided by new scientific evidence and international developments. Only through continuous monitoring and consistent adjustment can we ensure that public health protection keeps pace with the dynamics of the tobacco market.

The bottom line

HTPs are not a harmless alternative to cigarettes.

1. Independent research clearly shows that HTPs release toxic and carcinogenic substances at levels comparable to cigarettes, posing serious health risks to users and to those around them.

2. In Switzerland, consumption of HTPs is rising rapidly, driven by misleading advertising, weak regulation and low tax rates. This undermines public health and secures the tobacco industry a significant financial advantage.

3. To protect the population and to maintain regulatory coherence, HTPs must be treated and taxed in the same way as conventional cigarettes. Only then can we close this the current gap in public health protection.

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Additional information:

This report was jointly prepared by AT Switzerland and Addiction Switzerland. It is based on a narrative literature review that compiles and analyses existing research on heated tobacco products (HTPs) with the aim of addressing misleading marketing claims by the tobacco industry. The report is not a systematic review of study outcomes, but rather focuses on presenting recent independent research on HTPs in a clear and accessible manner.

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