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Impact of regulatory tightening of the Hungarian tobacco retail market on availability, access and cigarette smoking prevalence of adolescents

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ABSTRACT

Introduction Policies that reduce tobacco retail density to decrease tobacco use among the youth are critical for the tobacco endgame. This paper reviews a Hungarian tobacco regulatory measure, which, since 2013, has confined the sale of tobacco products exclusively to so-called National Tobacco Shops, summarises the changes in the national tobacco retail marketplace and reports on analyses of the impact of this intervention on illegal sales to minors and adolescent smoking behaviour.

Methods We reviewed the available national statistical data on the structure and dynamics of the tobacco retail market. Changes in lifetime and current (past 30 days) use of cigarettes among Hungarian adolescents aged 13–17 years were assessed using data from international youth surveys on health behaviours collected in 2010–2020.

Results Since the start of policy implementation, the density of tobacco shops in Hungary decreased by 85%, from 4.1 to 0.6 per 1000 persons. The prevalence of lifetime and current cigarette smoking among adolescents declined by 13–24 percentage points (pp) and by 4.8–15 pp, respectively. The rate of illegal sales of tobacco products to minors decreased by 27.6 pp, although the prevalence of compensatory access strategies, especially asking others to buy cigarettes for minors, increased.

Conclusions After a significant decrease in the nationwide availability of licensed tobacco retailers, Hungary experienced short-term reductions in youth smoking prevalence. However, the sporadic implementation of complementary, evidence-based tobacco control strategies might limit further declines in youth smoking initiation and tobacco product use.

INTRODUCTION

In the recent decade, there is a growing interest in tobacco endgame which refers to moving beyond tobacco control to change or eliminate permanently and rapidly the tobacco epidemic by a set of policies.^{1,2} One of critical policies for the tobacco endgame is to reduce tobacco retailer availability.^{3–5} The density of tobacco retailers is associated with tobacco-related attitudes and behaviour among youth and cigarette consumption, quit attempts and cessation success among adults.^{6–9} Several density and proximity reduction policy approaches have been implemented in the USA and Europe, including capping the number of retailers in a geographical area or proportional to population size in an area; requiring a minimum distance

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Policies that reduce tobacco retail density to decrease tobacco availability raise barriers to easy access and are critical for the tobacco endgame.

WHAT THIS STUDY ADDS

⇒ Hungary provides an example of how strict tobacco retail licensing is a feasible tool to affect youth access to and use of tobacco products.
⇒ Tobacco retailer density reduction approaches might have significant short-term impact on tobacco use outcomes, but effects may not be sustainable without ongoing monitoring and implementation of complementary, comprehensive tobacco control strategies.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ This study offers evidence of the real-world impact of a nationwide tobacco retailer density reduction policy.

between existing retailers or between retailers and schools or other youth-focused locations; or prohibiting tobacco product sales at certain retailers (eg, pharmacies).^{10–12}

To date, several countries have implemented short-term, temporary tobacco sales bans (eg, Bhutan, South Africa, Botswana, India), and others have enacted but not yet fully implemented national tobacco retailer reduction policies (eg, the Netherlands, New Zealand).^{13–17} In contrast, Hungary has had a nationwide tobacco retailer density reduction policy in effect since 2013.¹⁸ Prior to this policy, the tobacco retail market had long been neglected in Hungary. In 2010, there were about 40 000 licensed tobacco retailers, 4.1 per 1000 persons, while the corresponding number was 1.5 per 1000 in the USA.¹⁹ According to the Hungarian National Tax and Customs Administration, consumers could purchase tobacco at convenience stores (71%), supermarkets (26%), specialised tobacco shops (21%), gas stations (10%), pubs, bars, restaurants (7%), news stands (6%), vending machines (1%) and other locations (2%) in Hungary. The Hungarian government, elected in 2010, committed itself to a wide-scale effort to reduce tobacco consumption and to protect non-smokers. First, a comprehensive clean air policy was introduced on 1 January



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2012 for the protection of non-smokers, banning smoking in all enclosed public places including, for example, workplaces, restaurants, education institutions, public transportation and some outdoor public places (eg, playgrounds, public transportation waiting areas, underpasses).^{20 21} Parallel the rapid introduction of the clean air policy, significant excise tax increases were implemented three times in 2012. Then, the sale of tobacco products with compulsory, combined, text and pictorial health warning labels, covering 65% of the package front and back, and 50% of the package sides, was introduced in the Hungarian legal market on 1 January 2013.^{20 22 23} In late 2012, an additional tobacco control effort targeted the retail market with tightened regulation by the Act CXXXIV of 2012 on Reducing Smoking Prevalence Among Young People and Retail of Tobacco Products (aka Tobacco Shop Act), which came into effect on 1 July 2013.^{18 24} The main goal of the Tobacco Shop Act was to reduce tobacco sales to minors through preventing access to and reducing visibility of tobacco products in retail shops. This legislation was also intended to reduce unauthorised retail sale of tobacco products and to raise tax revenues.²⁴

Regulatory changes in the tobacco retail system

The Tobacco Shop Act gave the State exclusive ownership of tobacco retailing rights, which are allocated through a public tendering procedure as individual concessions. The Tobacco Shop Act brought about major changes in tobacco retail in Hungary in three ways: proscribes that only persons meeting the statutory requirements may exercise the retail concession granted by the State to sell tobacco products; establishes a maximum number of concessions in any given municipality; and requires that tobacco products be sold only in so-called National Tobacco Shops (NTS) starting 1 July 2013. NTS may also sell alcohol products, candy and lotteries, most of which are subject to excise and public health product taxes.²⁵ Minors are banned from the premises. Violation of these rules can lead to revocation of concession rights.

To organise the retail system, the Ministry of National Development established a fully state-owned, private, non-profit shareholding company (ND National Tobacco Trade Nonprofit Private Joint-stock Company, ND Company), which prepares the tender for the assignment of tobacco retailing rights, evaluates bids, and executes and controls concession contracts. There were four invitations to tender from December 2012 to December 2013.²⁰

Only natural persons were eligible for bidding, even if they established a business company to run the shop after the successful bid. If tobacco retailing is managed through business associations, the winning bidders were obliged to bear unlimited liability and the offices must be registered in the territory of European Union member states or in countries that have signed the Treaty on the European Economic Area. Licences are valid for 20 years. Under the concession contract, tobacco retailing activities may only be performed by persons who also have been authorised by the customs authority. Since implementation of the Tobacco Shop Act, consumers can purchase tobacco products exclusively at supervised NTS, with each retailer displaying a standardised brand image and having darkened windows to eliminate tobacco product cues that are typically visible from outside the store.

Objectives

This paper provides a brief introduction to the Hungarian tobacco regulatory measures based on the Tobacco Shop Act,

summarises changes in the retail market and analyses the impact of these interventions on illegal sales to minors and adolescent smoking prevalence.

METHODS

Participants and procedure

To assess the impact of these regulations, we reviewed the available national statistical data on the structure and dynamics of the tobacco retail market compiled by ND Company. Besides, national surveys conducted in the period 2010–2020 among adolescents were included to assess short-term and medium-term impacts of the Tobacco Shop Act. We calculated changes in lifetime and current cigarette use among Hungarian adolescents aged 13–16 years who participated in the national Global Youth Tobacco Surveys (GYTS) administered in 2012, 2013, 2016, 2020²⁶; the European School Survey Project on Alcohol and Other Drugs (ESPAD) in 2011, 2015, 2019^{27–30}; and the Health Behaviour in School-aged Children (HBSC) surveys in 2010, 2014, 2018.^{31–36} All three surveys had a standard methodology, had a cross-sectional design, employed cluster sampling to obtain nationally representative samples of students, conducted classroom based and anonymously and administered by paper-and-pencil questionnaires. As for the age/grade of surveyed students, the GYTS collects self-reported data of students in 7th–9th grades enrolling typically 13–15 year-olds, while the ESPAD surveys are performed among students at 16 years of age only. The HBSC data collection targets 11.5, 13.5 and 15.5 mean years of age students, but in the present study, we included data only in the last age group who were represented by 9th graders. The ESPAD and the HBSC surveys are conducted at 4-year intervals, while the GYTS does not indicate a strict time interval for regular monitoring of adolescent tobacco.^{37–39}

Measures

Lifetime cigarette use and current (last/past 30 days) cigarette use were assessed in all three surveys as core questions in each survey year. For the present study, prevalence data of lifetime and current cigarette use were obtained from the ESPAD and HBSC survey reports.^{27–29 31–35} As for the GYTS, publicly available national datasets for GYTS 2012 and 2013,²⁶ as well as national datasets for the GYTS 2016 and 2020 requested from third parties were used to calculate lifetime and current cigarette use prevalence. Access to tobacco products was measured only in the GYTS. In the present study, variables on purchasing tobacco products in NTS, or asking someone else to buy, or purchasing tobacco products without excise stamps were assessed.²⁶

Statistical analysis

Frequentist inferential statistics were used to estimate population-level proportions of the examined tobacco use-related behaviours in different time points. Average was applied as a point estimation function, Z-tests were applied for interval estimation and 95% CI was computed. Frequentist two-sample Z-tests were used to estimate the change between two proportions in percentage points (aka pp) in different time points, and the Cohen's h test was applied to assess the effect size of the change.

In analysing ESPAD and HBSC data, sample sizes and prevalences were extracted from survey reports. For GYTS, original datasets were available, including weighting for years 2012 and 2013. To address unknown and unreported design effects, a sample size correction was implemented. When weights were available, they were rescaled to achieve a maximum value of 1 (all

Table 1 Changes in lifetime cigarette smoking prevalence and current cigarette smoking (past 30 days) among Hungarian adolescents aged 13–16 years, 2010–2020

Survey	Year (n; n _c)	Lifetime cigarette smoking prevalence % (95% CI)	Percentage point difference from survey series start to end year	Current cigarette smoking prevalence % (95% CI)	Percentage point difference from survey series start to end year
GYTS	2012 (3844; 3051)	57.0% (55.2% to 58.8%)	24.0 pp	27.0% (25.4% to 28.6%)	15.0 pp
	2013 (4018; 2905)	46.0% (44.2% to 47.8%)	(95% CI 21.5 to 26.5, Z=18.1, p<0.0001, h=0.5)	24.0% (22.5% to 25.5%)	(95% CI 13.0 to 17.0, Z=14.1, p<0.0001, h=0.4)
	2016 (3798; 2659)	39.0% (37.1% to 40.9%)		16.0% (14.3% to 17.7%)	
	2020 (3766; 2636)	33.0% (31.2% to 34.8%)		12.0% (10.3% to 13.7%)	
ESPAD	2011 (3062, 2143)	66.0% (64.0% to 68.0%)		13.0 pp	
ESPAD	2015 (2735; 1914)	55.0% (52.8% to 57.2%)	(95% CI 9.9 to 16.2, Z=8.1, p<0.0001, h=0.3)	29.0% (27.0% to 31.0%)	(95% CI 6.5 to 11.5, Z=5.8, p<0.0001, h=0.2)
	2019 (2355; 1648)	53.0% (51.0% to 55.0%)		28.0% (25.9% to 30.1%)	
HBSC	2010 (2250; 1575)	63.0% (60.6% to 65.4%)	21.5 pp	27.8% (25.6% to 30.0%)	4.8 pp
	2014 (1510; 1057)	46.5% (43.5% to 49.5%)	(95% CI 17.8 to 25.2, Z=11.1, p<0.0001, h=0.4)	29.2% (26.5% to 31.9%)	(95% CI 1.5 to 8.1, Z=2.8, p<0.001, h=0.1)
	2018 (1627; 1139)	41.5% (38.4% to 44.4%)		23.0% (20.5% to 25.4%)	

Current cigarette smoking denotes smoked cigarettes in the past 30 days.

ESPAD, European School Survey Project on Alcohol and Other Drugs; GYTS, Global Youth Tobacco Survey; HBSC, Health Behaviour in School-aged Children; n, sample size; n_c, corrected sample size; pp, percentage point.

weights were divided by the maximum weight). These corrected weights were then summarised to calculate the corrected sample size. In instances where weighting information was absent, based on the clustering sampling designs, a minimum design effect of 1.43 was assumed, and accordingly 70% of the sample size was used as corrected sample size.^{40 41} Both the original and the corrected sample sizes were reported in table 1. The corrected sample sizes were used in the statistical tests. Statistical analyses were carried out using the R statistical programming language (R V.4.3.2, Vienna, Austria).

RESULTS

Reduction in tobacco retail density

After the first three tenders, a total of 19 963 bids were received, of which 6132 were won, but 144 contracts were never signed. There were about 40 000 active licensed retailers ('units') in 2013 selling tobacco products in Hungary, which decreased to 6046 active supervised retail units following the transformation process. In 2020, the number of supervised retail units further decreased to 5977 NTS. Thus, the nationwide density of tobacco retailers decreased from 4.1 to 0.6 units per 1000 persons.

Changes in cigarette use and access to tobacco among adolescents

The prevalence of lifetime cigarette smoking decreased by 24.0 pp ($z=18.1, p<0.001, 95\% \text{ CI } 21.5 \text{ to } 26.5, h=0.5$) according to GYTS data collected in 2012–2020 (figure 1, table 1). A smaller reduction in the lifetime cigarette smoking was detected by the ESPAD in 2011–2019 (13.0 pp; $z=8.1, p<0.001, 95\% \text{ CI } 9.9 \text{ to } 16.1, h=0.3$) and by the HBSC in 2010–2018 (21.5 pp; $z=11.1, p<0.001, 95\% \text{ CI } 17.8 \text{ to } 25.2, h=0.3$). The prevalence of current cigarette smoking among 7th–9th grade GYTS respondents decreased from 27.0% (95% CI 25.4% to 28.6%) in 2012 to 12.0% (95% CI 10.3% to 13.7%) in 2020, a 15.0 pp decrease (95% CI 13.0 to 17.0, $z=14.1, p<0.0001, h=0.4$). Similarly, the ESPAD and HBSC surveys also detected decreasing current cigarette smoking trends among 16-year-old and 9th grade students between 2010 and 2015, respectively, but to a lesser extent (figure 1, table 1).

Although sales to minors were (and are) illegal, 44.6% (95% CI 41.2% to 48.0%) of adolescent tobacco users reported buying cigarettes in retail shops in 2012 (table 2). After implementation

of the Tobacco Shop Act, 19.3% (95% CI 16.4% to 22.2%) of adolescents aged 13–15 years reported purchasing tobacco products in NTS in 2013, 20.2% (95% CI 16.4% to 24.0%) in 2016 and 17.0% (95% CI 12.9% to 21.1%) in 2020. We observed a declining, postpolicy trend in the proportion of adolescents reporting they had purchased illicit tobacco products (without excise stamps): 28.5% (95% CI 25.1% to 31.9%) in 2013, 16.7% (95% CI 13.0% to 20.2%) in 2016 and 13.4% (95% CI 9.7% to 17.2%) in 2020. Prior to the Tobacco Shop Act, only 12.9% (95% CI 10.6% to 15.2%) of 13–15 year-olds reported that had asked someone else to buy them tobacco products, while after the establishment of NTS, a greater proportion of adolescents reported accessing tobacco products through this social source: 28.7% (95% CI 25.3% to 32.1%) in 2013, 37.2% (95% CI 32.6% to 41.8%) in 2016 and 31.6% (95% CI 26.5% to 36.7%) in 2020.

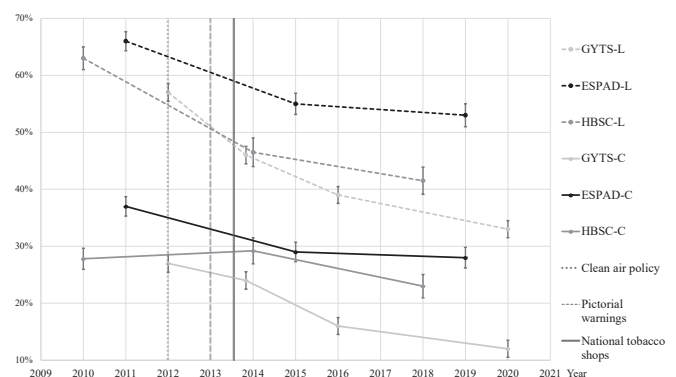


Figure 1 Changes in lifetime and current (past 30 days) cigarette smoking prevalence (with 95% CI) among adolescents aged 13–16 years under tobacco control policies implemented in 2012–2013 in Hungary. ESPAD-C, European School Survey Project on Alcohol and Other Drugs (current cigarette smoking); ESPAD-L, European School Survey Project on Alcohol and Other Drugs (lifetime cigarette smoking); GYTS-C, Global Youth Tobacco Survey (current cigarette smoking); GYTS-L, Global Youth Tobacco Survey (lifetime cigarette smoking); HBSC-C, Health Behaviour in School-aged Children (current cigarette smoking); HBSC-L, Health Behaviour in School-aged Children (lifetime cigarette smoking).

Table 2 Changes in access to tobacco among Hungarian adolescents aged 13–16 years who use tobacco, 2012–2020

Survey	GYTS			
	2012 (824)	2013 (697)	2016 (425)	2020 (316)
Bought cigarettes in retail shops/NTS				
Prevalence, % (95% CI)	44.6% (41.2% to 48.0%)	19.3% (16.4% to 22.2%)	20.2% (16.4% to 24.0%)	17.0% (12.9% to 21.1%)
Percentage point difference from survey series start to end year	27.6 pp (95% CI 32.9 to 22.2, Z=8.6, p<0.0001, h=0.6)			
Asked someone else to buy their tobacco products				
Prevalence, % (95% CI)	12.9% (10.6% to 15.2%)	28.7% (25.3% to 32.1%)	37.2% (32.6% to 41.8%)	31.6% (26.5% to 36.7%)
Percentage point difference from survey series start to end year	-18.7 pp (95% CI -13.9 to -24.3, Z=-7.3, p<0.0001, h=-0.5)			
Bought tobacco products without excise stamps				
Prevalence, % (95% CI)	13.3% (11.0% to 15.6%)	28.5% (25.1% to 31.9%)	16.7% (13.0% to 20.2%)	13.4% (9.7% to 17.2%)
Percentage point difference from survey series start to end year	Not significant (p=0.97, h<0.01)			

GYTS, Global Youth Tobacco Survey; n_c, corrected sample size; NTS, National Tobacco Shop; pp, percentage point.

DISCUSSION

The tobacco endgame strategy of reducing tobacco retailer density is currently being explored in many nations and subnational areas.^{2,5} Some studies have used simulation modelling to estimate the impact of hypothetical or proposed density and proximity reduction strategies,^{42–44} while others have measured public perceptions of policy impacts of proposed policies.⁴⁵ The current study appears to be the first to measure real-world outcomes associated with implementation of a national tobacco retailer reduction policy.

The Tobacco Shop Act has fundamentally transformed the tobacco retail market in Hungary. Hungary's strong political commitment to prevent youth smoking initiation by implementing one of the strictest tobacco retail licensing schemes in the world¹² decreased the nationwide number of tobacco retail outlets by 85%. In addition, the diversity of tobacco retailer types was also drastically reduced from many to only supervised NTS having uniform designs that eliminate on-site marketing. These measures achieved its regulatory intent by curbing the availability of and access to tobacco products among minors, with a documented 61.9% decrease in the illegal sales rate from 2012 to 2020. These beneficial, intended effects were, however, accompanied by an increasing prevalence of compensatory access strategies, mainly youth asking others to buy cigarettes on their behalf. Nevertheless, and notwithstanding the limitations of self-reported data, the prevalence of lifetime and current smoking among adolescents in Hungary showed a significant decline after the implementation of these tobacco control measures. Although it would be challenging to disentangle the specific impact on youth smoking of each tobacco control measure implemented closely before the Tobacco Shop Act, our findings suggest that the regulatory interventions by the Tobacco Shop Act appear to have contributed to significant reductions in cigarette use among Hungarian youth, at least in the short term. Further impacts on cigarette smoking among adolescents were minimal 2–3 years after the regulatory changes, implying that continued efforts to counter policy avoidance actions are necessary to achieve ultimate policy goals.

Our real-world findings support that radically reducing tobacco retailer density could be an essential and promising policy to reach tobacco endgame goals. However, it should be noted that supply-focused policies, like restrictions on tobacco retailer density, are just one policy element of tobacco endgame strategies. In itself or combined with a few other tobacco control policies sporadically, it has no long-term effect even on priority

population like youth. Therefore, our findings highlight that continuous and comprehensive policy efforts are necessary implementing product, user, supply and institutional structure-focused policies.^{1,2}

Limitations and strengths

We believe that this is the first empirical study to assess the actual (non-simulated) impact on tobacco use behaviour of a national policy that reduced tobacco retailer availability. Besides, we assessed changes in cigarette use based on internationally and regularly conducted representative youth surveys. However, this study is not without limitations. First, the three international youth surveys identified different population estimates for lifetime and current cigarette use. One of the reasons for different population estimates could be the age and grade of students. GYTS participants were 7th–9th graders which refer to students aged 13–15 years, HBSC survey assessed cigarette use behaviour among 9th graders (students aged 15–16 years), while ESPAD survey was conducted among 16-year-old students. Lifetime as well as current cigarette use is increasing during adolescence. Thus, cigarette use estimates in older adolescents (in the HBSC and the ESPAD surveys) would be expected to exceed estimates for younger adolescents (in the GYTS), reflected by our findings. However, the downward trends in outcomes are similar across these data sources, raising the confidence of a population-wide effect across age groups. Second, due to data availability from the three international youth surveys, only cigarette use data were secondarily analysed in our study. Due to methodological limitations of the ESPAD, GYTS and HBSC surveys, e-cigarette use data were not fully available. The ESPAD started measuring e-cigarette use in 2019, while the HBSC surveys, considered in our study, did not collect data on e-cigarette use. Although the national GYTS collected data about current e-cigarette use of 7th–9th graders since 2012, lifetime e-cigarette use data were collected only from 2016. Therefore, continuity of repeated lifetime and current e-cigarette use data is limited which could inadequately reflect changes in related tobacco control policies. Finally, due to a single-group (Hungary), pre-post outcome study design, we have low confidence in attributing causality to associations seen between policy implementation and the behavioural outcomes studied.

CONCLUSIONS

Our analysis demonstrates a short-term reduction in youth cigarette smoking rates after implementation of a strict, nationwide

tobacco retail licensing system, supported by other comprehensive tobacco control policy efforts in Hungary. The reduction in rates of underage purchases in retail stores indicates that a strict tobacco retailer licensing system, embedded in simultaneous comprehensive tobacco control policies, can successfully prevent youth access to retail sources of tobacco products. However, its effects may not be sustainable on the longer term. Therefore, continuous monitoring of the effect of tobacco control policies and changes in youth tobacco and/or nicotine product use is necessary, along with implementation of additional comprehensive policies and programmatic interventions directed at curbing the tobacco and nicotine epidemic.

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Contributors TJ, KF, MS, JB and TR conceptualised the paper. MP, TJ and TR reviewed the literature. TJ and MP were responsible for gathering data for the secondary data analyses. MP and ZB conducted data analyses under the mentorship of TR. TJ, KF and MP wrote the original manuscript text. TR, PG, JB and MS supervised the work. PG and MP contributed equally to this paper as joint last authors. All authors revised the manuscript critically for important intellectual content. All authors reviewed the manuscript and have approved the final version. MP is the guarantor.

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Data availability statement Data are available in a public, open access repository. Data may be obtained from a third party and are not publicly available. Data of the Global Youth Tobacco Survey administered in 2012 and 2013 are publicly available on the website of the Hungarian Focal Point for Tobacco Control. Data of the Global Youth Tobacco Survey administered in 2016 and 2020 are available upon reasonable request from a third party.

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