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**Comparison of smoking patterns of different population groups
– implications for interventions**

Biljana Kilibarda

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President of the subject area board: Prof. PhDr. Michal Milovsky, Ph.D

Training Institution: Department of Addictology, First Faculty of Medicine of the Charles University and General University Hospital in Prague

Author: Biljana Kilibarda

Supervisor: Assoc. Prof. MUDr. Viktor Mravčík, Ph.D.

Supervisor-consultant (if applicable): No

Opponents: Assoc. Prof. MUDr. Petr Kachlík, Ph.D.
                Dr. Peter Degkwitz, M.A.

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Contents

Abstract

Background: Smoking prevalence in Serbia is high, both among general and vulnerable populations. Interventions should be evidence based and in line with needs of each population group. The highest prevalence of smoking is among vulnerable groups, where interventions beyond those aimed at general population are required. **Aims:** To analyze and compare smoking prevalence and its patterns, exposure to tobacco smoke and their correlates among general population and vulnerable groups and identify gaps and needs for monitoring and policy. **Material and methods:** Secondary analysis of data obtained through different surveys implemented in 2013 and 2014 was conducted. Databases from three general population surveys and six surveys among selected vulnerable groups (prisoners, men having sex with men, sex workers, people living with HIV, Roma youth, institutionalized children) were used. **Results:** Data show high smoking prevalence among adults (34.7%) with gender differences. Lower socioeconomic status is the strongest factor associated with smoking among adults. Smoking prevalence is the highest in the age group 35-45 years (47.0%). Among Serbian youth, perceived availability and being taught in school about tobacco are important correlates of smoking. More than half of adults and youth are exposed to tobacco smoke at various places. Smoking is socially highly acceptable in Serbian society and risk perception is at low level. Smoking status is correlated with frequent drinking, frequent binge drinking and recent cannabis use. Smoking prevalence is significantly higher among stigmatized populations compared to general population, both among adults and youth, with highest prevalence among sex workers (90.5%). **Conclusions:** There is an urgent need for strengthening smoking cessation services and for targeted actions to substance users and people under psychological distress. Better regulation of promotion of tobacco products and stronger compliance with selling ban to youth are needed. Among vulnerable populations, harm reduction approaches including those reducing smoking could be initiated; they should take into account stigmatization, cultural sensitive issues and hidden nature of these population groups.

Key words: tobacco use – general population – vulnerable groups – substance use – interventions –monitoring

1   Introduction: Tobacco epidemiology and tobacco control

Tobacco impacts health, poverty, global hunger, education, economic growth, gender equality, the environment, finance and governance and thus represents a major barrier to sustainable development (Novotny et al., 2015; WHO, 2017). Tobacco is more frequently used by poor, and thus contributes to health disparities between different socioeconomic groups (WHOa, 2017). The further rise of total tobacco-attributable deaths is projected to reach 8.3 million in 2030 (Mathers & Loncar, 2006). Globally, 21% of adults worldwide are current smokers (men 35%; women 6%) with more than 80% living in low and middle-income countries. The age-standardized prevalence of daily smoking worldwide is 25·0% for men and 5·4% for women (GBD 2015 Tobacco Collaborators, 2017). Overall, in 2012-2015 period, in the age group 13-15 years old students, there is 10.7% smokers, with   smoking prevalence in EUR region of the WHO in the range from 2.4% (Tajikistan) to 27.4% (Bulgaria) (Arrazola et al., 2017). In 2016, one third of females and one fifth of males were exposed to tobacco smoke (Drope J, 2018).   Level of exposure is highly dependent on adoption and implementation of smoke free legislation and yet only 20% of the world's population, are protected by comprehensive national smoke-free laws (WHO, 2018).

Evidence suggest an association between psychoactive substance use and mental health (Hindocha et al., 2015; Montgomery, 2015; Suris, Akre, Berchtold, Jeannin, & Michaud, 2007; Connor, Gullo, White, & Kelly, 2014; Degenhardt, Hall, & Lynskey, 2001; Karila et al., 2013). These studies show correlation between mental disorders, psychoactive substance use and smoking status, but also a variation in the strength of this association, depending on the type of substance, the pattern of use and the sociodemographic characteristics. Prevalence of tobacco smoking among vulnerable and stigmatized groups is continuously found to be high, (Drope et al., 2018; Hiscock, Bauld, Amos, & Platt, 2012; Odani, Armour, Graffunder, Garrett, & Agaku, 2017; Lawlor, Frankel, Shaw, Ebrahim, & Smith, 2003), but at the same time evidence

of effective interventions among these groups are limited (Hiscock, Bauld, Amos, Fidler, & Munafo, 2012).

Available results show much higher smoking rates among prisoners in comparison to the general population (Indig et al., 2010), among sex workers (Devóglio, Corrente, Borgato, & de Godoy, 2017; Odukoya, Sekoni, Onajole, & Upadhyay, 2013), people living with HIV/AIDS (Weinberger, Smith, Funk, Rabin, & Shuter, 2017) and among gays, lesbians and bisexuals (Gerend, Newcomb, & Mustanski, 2017; Lee, Griffin, & Melvin, 2009; Tami-Maury et al., 2015).

In addition, compared to school children, institutionalized children and those living in the streets have higher smoking rates and also substance use disorders (Attia, Tayel, Shata, & Othman, 2017).

Population living in Roma settlements is also considered a highly stigmatized and vulnerable group in respect of higher prevalence of many communicable and non-communicable diseases with smoking as main risk factor (Babinska et al., 2014; Hujova et al., 2011; Gerevich, Bacskai, Czobor, & Szabo, 2010; Kanapeckiene, Valinteliene, Berzanskyte, Kevalas, & Supranowicz, 2009; Zeljko et al., 2013).

A number of factors are known to influence the initiation and continued use of cigarette smoking and tobacco use. These factors include inter and intra personal resources (personality, social support and socio-economic status, self-esteem) environmental factors (extent of tobacco advertising, anti-smoking media messages) social factors (peers, siblings, parents), economic factors (especially the price of tobacco).

Interventions aimed at reducing smoking and exposure to tobacco smoke must target multiple levels of influence to achieve substantial changes in health behavior. There are five levels of influence which correspond to risk factors for smoking: 1) intrapersonal or individual factors, 2) interpersonal factors, 3) institutional or organizational factors, 4) community factors, and 5) public policy factors.

Some of risk factors like adverse family conditions, low levels of parental supervision and single-parent families, that are especially linked with licit substance use initiation (Galea, Nandi, & Vlahov, 2004). In addition, trajectories from experimentation to heavy smoking are associated with psychosocial, biologic, and genetic determinants (US Centers for Disease Control and Prevention, 2010).

Due to proven link between early onset of smoking and dependence and difficulties in later life to quit, public policy to discourage early smoking is one of good strategies for reduction of smoking-related mortality and morbidity (Breslau & Peterson, 1996). Efficient and highly cost-effective treatments have been explored for years and findings show that   all health-care professionals should consistently deliver smoking cessation interventions to their patients (Raw, McNeill, & West, 1998).

For planning interventions, it is worth knowing that influence on individuals in respect of health behavior is higher coming from those who are similar to them (Centola, 2011) .

Due to its complexity, comprehensive approach to the tobacco problem is needed and the prerequisite for planning and implementation of evidence based measures is to understand relationships between different factors of importance for tobacco use. This means that measures aimed at entire population, from the individual to the societal level is needed, and that different factors (social, cultural, economic, and environmental) should be taken into account   (US Centers for Centers for Disease Control and Prevention, 2010). Complex nature of tobacco and relationships among different components relevant to the tobacco control are well elaborated and among those components are smoke free legislation, individual smoking behavior, social norms and tobacco research (Institute of Medicine, 2015).

There are many theories used in addiction science which have implications for tobacco prevention policies and programs. In broad sense these theories can be divided at individual level theories and population-group level theories. Some of the individual level theories can be further grouped as automatic processing theories, reflective choice theories, goal focused theories, integrative theories, process of change theories and biological theories. Population group theories include   social   networks   theories,   economic   models, community/marketing theories and organizational system models (West, 2013). Understanding a problem using a theory and evidence to define determinants of behavior and environmental conditions and to propose a change process is of great importance. However, evidence suggest

that many interventions are not driven by theory (Bartholomew, Parcel, & Kok, 1998).

Despite reduction in smoking prevalence in many countries, epidemiological projections concerning tobacco prevalence suggest that the epidemic will continue to grow (Mackay, Bettcher, Minhas, & Schotte, 2012). Appearance of new tobacco products in the last decade, including electronic cigarettes have triggered debate on influence of these products on tobacco epidemic. Group of experts with cautious approach are worried as studies show association of e-cigarette use with smoking initiation (Weaver et al., 2018; Soneji et al., 2017; Carroll Chapman & Wu, 2014) and insufficient evidence on effectiveness, especially about long term health consequences (Rahman, Hann, Wilson, & Worrall-Carter, 2014). Among explanations for increase of e-cigarette use among youth is availability of appealing flavoring agents including candy or fruit-flavors stressing need for better regulation to prevent e-cigarette use among youth (Aleyan, Cole, Qian, & Leatherdale, 2018). On the other hand, there are experts that see great potential of such products for the perspective of harm reductions. Experts in favor of this approach consider ENDS not only as safe alternatives to conventional cigarettes, but as aid to smoking cessation as well (Malas et al., 2016).

In Serbia, there are many gaps in tobacco control that contribute to high prevalence of smoking. At the same time, there are insufficient resources allocated to tobacco control, which highlight need for targeted interventions. In that respect it is of importance to identify needs and priorities and define priority evidence - based measures.

Despite smoking being of great public health concern in Serbia, there is no comprehensive overview to guide tailored preventive intervention. In depth analysis is the first step in developing effective and tailor made interventions. Within this thesis data obtained from several important surveys will be analyzed in order to fully understand needs and define target groups and priorities. Lack of specific data will be indicated to serve as guideline for design of further formative research

2 Aims and hypothesis of the thesis

Aims:

- Determine the prevalence and patterns of tobacco use and exposure to tobacco smoke among general population (youth and adults) and specific factors (sociodemographic and psychosocial) related to smoking
- Describe electronic cigarette use and correlates in Serbia
- Determine prevalence of smoking among vulnerable population groups and among people who use alcohol and illicit drugs
- Determine priority needs and interventions for different population groups
- Identify gaps in available data

Hypothesis:

- There are statistically significant differences in smoking prevalence and patterns and exposure to tobacco smoke based on sociodemographic and psychosocial factors among general population
- Electronic cigarette is popular among young adults and should be regulated in Serbia
- Smoking among vulnerable population groups and other substance users is higher compared to general population
- There are differences in smoking prevalence and patterns among different population groups and interventions should be aligned with them.
- There are gaps in available data needed for tailored tobacco control interventions

3 Method

To fulfil aims of the thesis and to get comprehensive picture on smoking among different population groups in Serbia, secondary analysis of data obtained through different surveys was conducted. Data obtained from different surveys conducted in 2013 and 2014 was used. In 2013 and 2014, three surveys among general population (adult and youth) were conducted, all on nationally representative samples according to different international standardized methodologies (National Survey on Lifestyles of the Citizens of Serbia in 2014 (GPS) (n=5385), Health Survey of Citizens of Serbia (HS) in 2013 (n=13576) and The Global Youth Tobacco Survey (GYTS) among 13-15 years old students in Serbia 2013(n=3994).

For exploring smoking among vulnerable population groups data from the Bio-behavioral surveillance surveys among populations most at risk for HIV conducted in Serbia in 2013 was used. Population surveyed were: men who have sex with men (MSM)(n=1000), sex workers (SWs) (n=400), prisoners(n=543), Roma youth(n=700), institutionalized children without parental care (n=211), and people living with HIV (PLHIV) (n=445).

4 Results

4.1 Smoking prevalence among adults

In Serbia, 40.2% of adult population 18-64 years old smoke, with highest prevalence among population 45-54 years old and among manual workers (Table 1).

Table 1. Smoking among Serbian general population 18-64, by sociodemographic characteristics, GPS, Serbia, 2014

Variables		Current tobacco smoking (n=2164) % yes (95%CI)	p
Total		40.2 (38.8-41.3)	
Sex	Male	44.3(42.1-45.7)	<0.001
	Female	36.2 (34.4-38.0)	
Age groups	18-24	34.7(31.1- 38.2)	<0.001
	25-34	42.5(39.6-45.4)	
	35-44	44.7(41.7-47.6)	
	45-54	45.1(42.2-48.0)	
	55-64	32.9(30.4- 35.5)	
Education	≤ Elementary	40.4(37.5-43.2)	<0.001
	Secondary	42.5(40.8-44.2)	
	Post-secondary	33.4(30.5-36.3)	
Settlement type	Urban	41.3(39.6-43.0)	0.027
	Rural	38.4(36.4-40.5)	
Occupation	Not active	38.7(36.8-40.7)	<0.001
	Student	26.7(22.6-30.8)	
	Manual worker	50.2(47.2-53.1)	
	Administrative worker	39.0(35.3-42.6)	
	Businessman	40.4(32.9-48.0)	
	Intellectual	37.9(34.0-42.0)	

Every tenth adult citizen of Serbia, 18-64 years old reported having tried electronic cigarette with no significant difference by gender. However, there is higher prevalence of current e-cigarette use among females compared to males and in age group 25-44 (Table 2).

Table 2. Prevalence of tobacco and e-cigarette use in 2014 by the Serbian adult population 18-64 old by sociodemographic characteristics, GPS, Serbia 2014

Variables		Ever e-cigarette use (n=517) % yes(95%CI)	Current e-cigarette use (n=106) % (95%CI)
Total		9.6 (8.8 -10.4)	2.0 (1.6-2.3)
Sex	Male	9.5(8.4-10.6)	1.6(1.1-2.1)
	Female	9.7(8.6-10.8)	2.3(1.8-2.9)
	p*	0.805	0.03
Age groups	18-24	12.3(9.9-14.8)	1.6(0.7-2.5)
	25-34	13.7(11.7 -15.7)	3.0(2.0-4.0)
	35-44	12.3(10.4-14.2)	3.0(2.0-4.0)
	45-54	6.9 (5.8-8.4)	1.2(0.5-1.8)
	55-64	4.6(3.5-5.6)	1.1(0.6-1.7)
	p*	<0.001	<0.001
Education	≤ Elementary	6.0 (4.8-7.3)	1.2(0.6-1.8)
	Secondary	10.9(9.8-12.0)	2.2(1.7-2.7)
	Post-secondary	10.8 (8.9-12.7)	2.4 (1.4-3.3)
	p*	<0.001	0.018
Settlement type	Urban	11.4(10.3-12.5)	2.2(1.7-2.7)
	Rural	6.8 (5.7-7.9)	1.6(1.0-2.1)
	p*	<0.001	.0.177
Occupation	Non active	7.8(6.7-8.9)	1.7(1.2-2.2)
	Student	10.1(7.3-12.9)	0.9(0.4-1.8)
	Manual worker	9.2 (7.5-10.9)	1.7(0.9-2.4)
	Administrative worker	13.2 (10.6-15.7)	2.7(1.5-3.9)
	Businessman	13.1(7.9-18.3)	2.7(0.2-5.2)
	Intellectual	11.9(9.3-14.5)	3.4(1.9-3.9)
	p*	<0.001	0.008

*All p values are from χ² tests

Higher odds of being smokers have adults who think tobacco is not an important problem   compared to people who think it is and those who perceive smoking as not risky compared to those who think it is a great risk (Table 3).

Table 3. Logistic regression - last month smoking status and sociodemographic characteristics, opinions and risk perception, GPS, Serbia, 2014

Variables		Adjusted OR (95% CI)
Sex	Female (ref)	
	Male	1.28 (1.14-1.43) **
Age group	18-24 (ref)	
	25-34	1.55 (1.26-1.91)**
	35-44	1.70 (1.39-2.10)**
	45-54	1.67 (1.36-2.05) **
	55-64	1.06 (0.87-1.30)
Education	≤ Elementary (ref)	
	Secondary	0.95 (0.82-1.10)
	College or university	0.63 (0.51-0.76)**
Settlement type	Rural (ref)	
	Urban	1.28 (1.14-1.45)**
Tobacco smoking problem opinion	Rather important + Important(ref)	
	Neither important nor unimportant	1.36 (1.16-1.59)*
	Unimportant + Rather unimportant	1.59 (1.30-1.94)**
Smoke one or more packs of cigarettes per day	Great risk(ref)	
	Moderate risk	2.29 (2.00-2.62)*
	Slight risk	2.66 (2.20-3.23)**
	No risk	7.02 (4.32-11.40)**

*p < 0.05; **p< 0.001.

4.2 Smoking prevalence among youth

According to 2013 data, overall 15% of school children aged 13-15 years currently used tobacco, while 13% smoked cigarettes. In addition, there were 15.7% of never tobacco users susceptible to tobacco use in future. Mother's and sibling' smoking increase odds of being smoker. Students that think that smoking is probably not harmful to their health have almost five times higher odds of being smoker. Students that find it

very easy to buy cigarettes from a shop have more than 7 times higher odd of being smoker compared who find it very difficult. (Table 4)

Table 4. Logistic regression analysis of predictors of smoking among adolescents, GYTS, Serbia 2013

Variables		OR 95% CI
Age	cont	1.46 (1.41-1.50)**
Gender	male (ref)	
	female	1.32(1.25-1.40)**
Pocket money	no pocket money (ref)	
	less than 500 RSD	1.54 (1.33-1.78)**
	500-1500	1.41 (1.23-1.61)**
	more than 1500	1.92(1.66-2.22)**
Think smoking is harmful to their health	definitely yes (ref)	
	probably yes	4.54 (4.19-4.92)**
	probably not	4.77 (4.15-5.47)**
	definitely not	1.61 (1.42-1.82)**
Smoking helps feel comfortable at social events	no difference (ref)	
	less comfortable	1.58 (1.45-1.71)**
	more comfortable	2.24 (2.11-2.38)**
Hard to quit once someone starts smoking	Definitely yes (ref)	
	Probably yes	2.13 (1.00-2.27)**
	Probably not	2.59 (2.37-2.83)**
	definitely not	2.62 (2.38-2.91) **
Variables (contin.)		OR 95% CI
How often you see father smoking	Never (ref)	
	Sometimes	0.62 (0.72-0.85) **
	Always	0.74(0.70-0.79) **
How often you see mother smoking	Never (ref)	
	Sometimes	1.76 (1.62-1.91) **
	Always	1.42 (1.33-1.51) **
How often you see sibling smoking	Never (ref)	
	Sometimes	2.06 (1.91-2.23) **
	Always	2.20 (2.01-2.40) **
On the whole, do you find it easy or difficult to buy cigarettes from a	Very difficult (ref)	
	Fairly difficult	2.29(2.09-2.50) **
	Fairly easy	2.79 (2.53-3.07) **

Variables		OR 95% CI
shop?	Very easy	7.18 (6.63-7.79) **
Possibility to buy tobacco near school	No (ref)	
	Yes	1.06 (0.98-1.12)
Being thought in school about harmful effects of smoking	Yes (ref)	
	No	1.12 (1.06-1.19) **
Exposed to point of sale marketing	No (ref)	
	Yes	1.53 (1.44-1.62) **
Have tobacco industry item	No (ref)	
	Yes	1.28 (1.10-1.36) **

4.3   Smoking, substance use and mental health

The results from The National Survey on lifestyles of citizens of Serbia, 2014 show that the strongest predictors of the smoking status are frequent drinking, frequent binge drinking and last year prevalence of cannabis use (Table 5).

Table 5. Results of the binary logistic regression for the correlation between smoking status and other substance use and mental health disorders, GPS, Serbia, 2014

Variables		OR (95% CI)	p
Sex	Female	ref	
	Male	1.12 (0.98-1.28)	0.089
Age		0.98 (0.98-0.99)	0.000
Education	≤ Elementary	ref	0.000
	Secondary	1.02 (0.87-1.19)	0.833
	Post-secondary	0.65 (0.52-0.82)	0.000
Settlement type	Rural	ref	
	Urban	1.31 (1.15-1.48)	0.000
Occupation	Non-active	ref	
	Student	0.40 (0.31-0.53)	0.000
	Manual work	1.39 (1.19-1.63)	0.000
	Administrative worker	0.95 (0.79-1.12)	0.633
	Businessman	0.99 (0.71-1.40)	0.978
	Intellectual	1.21 (0.96-1.52)	0.102
Personal status	Married or informal marriage	ref	0.000
	Not married	0.81 (0.69-0.95)	0.009
	Divorced/widowed	1.53 (1.27-1.85)	0.000
Perceived financial status	Very bad or bad	ref	0.000
	Average	0.75 (0.66-0.58)	0.000
	Good or very good	0.81 (0.66-1.01)	0.059
LM prevalence cannabis	no	ref	
	yes	1.27 (0.42-3.80)	0.668
LY prevalence cannabis use	no	ref	
	yes	2.55 (1.26-5.17)	0.000
CAST –risk	no	ref	
	yes	1.20 (0.29-4.92)	0.804
Frequency of alcohol use	Lifetime abstainer	ref	
	Last year abstainer	1.42 (1.11-1.80)	0.005
	Up to three times a month or less	1.94 (1.56-2.40)	0.000
	1-2 times a week	2.25 (1.72-2.95)	0.000
	3-7 days a week	2.35 (1.75-3.16)	0.000
Binge drinking (60 grams)	No	ref	0.000
	yes	2.23 (1.59-3.14)	0.000
RAPS scores	0	ref	0.082
	1	1.15 (0.91-1.45)	0.230
	2	1.26 (0.88-1.80)	0.205
	3	1.82 (1.14-1.80)	0.012
	4	0.98 (0.61-1.59	0.952
Psychological distress	low	ref	0.000
	mild to moderate	1.25 (1.06-1.48)	0.009
	high	2.02 (1.56-2.61)	0.000

LM-last month, LY-last year

4.4 Smoking among vulnerable populations

Smoking prevalence among stigmatized population groups is higher compared to general population and the highest smoking prevalence is among sex workers, reaching 90.5 %. However, also in other groups, more than half of the population were current smokers. There are statistically significant gender difference in smoking prevalence among prisoners and sex workers with higher prevalence among females. Statistically significant differences by age groups are noticed only among MSM with higher prevalence in older age groups, while working status played role among all adult population groups. In addition, in all population groups, smoking prevalence are higher among those who use alcohol or illicit drugs (Table 6).

Table 6. Smoking prevalence by sociodemographic characteristics and substance use among different vulnerable groups, Research among populations most at risk to HIV and among people living with HIV, Serbia 2013

Variables			Prisoners N=543	PLHIV N=445	SWs N=400	MSM N=1000
Total			70.0%	51.0%	90.5%	66.6%
Gender	Male	A	68.3%	50.3%	84.0%	66.3%
	Female	B	83.3% A	53.7%	92.7% A	x
Age	12-14[c]	E	x	x	x	x
	15-17[bc]	F	x	x	x	x
	18-24	A	62.4%	38.5%	90.2%	60.3%
	25-34	B	72.4%	46.4%	90.4%	65.7%
	35-44	C	76.1%	61.1%	90.7%	71.9% A
	45+	D	63.9%	47.6%	92.0%	84.3% AB
Education	No elementary	A	78.3%	63.6%	90.2%	75.0%
	Elementary	B	70.1%	63.3%	90.3%	77.4%
	Secondary	C	69.3%	53.8%	91.7%	68.0%
	College or university	D	67.2%	44.0%	81.8%	63.5%
	Currently enrolled	E	x	x	x	x
Working status	Employed	A	70.2% C	49.4%	76.5%	70.1% C
	Unemployed	B	73.3% C	62.6%C	90.9% A	72.5% C
	Other	C	44.1%	41.5%	x	56.7%
Marital status	Living with partner	A	65.5%	49.2%	89.8%	79.7%C
	Divorced/Widowed	B	73.3%	56.3%	98.5%C	90.5%C
	Single	C	74.2%	50.0%	88.1%	64.0%
Alcohol use *	No	A	66.5%	45.1%	88.4%	51.4%
	Yes	B	85.1% A	75.9% A	92.1%	74.7%A
Illicit drug Use*	No	A	68.1%	50.3%	86.5%	66.0%
	Yes	B	89.7% A	73.9% A	95.1% A	79.1%

*in last 12 months

4.5   Comparison of population between different population groups

Smoking is significantly higher among stigmatized populations compared to general population, both among adults and youth. Among adults, smoking is highest in age groups 35-45 for both gender and for each population group (Table 5).

Table 5. Comparison of smoking among total general population and vulnerable groups in Serbia

Age groups	General population			Stigmatized populations					
	HS	GPS	GYTS	Prisoners	PLHIV	Sex workers	MSM	ROMA Youth	Institutionalized children
< 15*	-	-	13.0	-					52.6
15-17	13.4	-		-				44.2	65.2
18-24**	31.8	34.7	-	63.6	38.5	90.2	60.3	61.9	45.2
25-34	44.1	42.5	-	73.0	49.1	90.4	65.7		
35-44	47.0	44.7	-	76.8	63.5	90.7	71.9		
45-54	45.7	45.1	-	69.8	58.3	95.5	83.6		
55-64 ***	34.8	32.9	-	66.7	38.3	66.7	88.9		

*12-14 for Institutionalized children, 13-15 for GYTS, ** 18-19 for institutionalized children *** 55-59 for MSM

5   Discussion

Data from Health Survey 2013 and National Survey on Lifestyles of citizens 2014 confirm association of lower socioeconomic status with higher smoking prevalence among adults which was found in other studies across the world (Hiscock, Bauld, Amos, Fidler, et al., 2012).

Analysis of smoking rates according to age group and comparing results with previous surveys indicates that of special interest for interventions are smokers aged 35-54 which might be considered as hard core smokers.   These findings, together with low percentage of smokers that received advice to stop smoking, call for   intervention targeting smokers 35-54 old aimed to increase their motivation to quit. However, such interventions should be followed by strengthening

smoking cessation services as such, including education of health professionals for smoking cessation. Due to the very low coverage of smokers with smoking cessation services (Kilibarda, Nikolic, & Vasic, 2018) and traditionally high smoking prevalence among health workers in Serbia (Krstev, Marinkovic, Simic, Jovicevic, & Markovic-Denic, 2014), this is quite challenging task.

Results also indicate that gender differences are narrowing which point out that female smoking is increasing in typical way for countries in the third phase of tobacco epidemic, proved to be relevant for developing countries in 2012 (Lopez, Collishaw, & Piha, 1994b; Thun, Peto, Boreham, & Lopez, 2012).

Data on onset of smoking and average time needed from occasional to daily smoking indicate need for interventions focused on young adult smoker, also stressed by other research (Backinger, Fagan, Matthews, & Grana, 2003).

In Serbia, females, young adults and intellectuals are more likely to use e-cigarettes. Findings also implies that special attention should be given to the understanding of motives and patterns of use among females.

Results presented in the thesis show that despite of high prevalence of smoking, small proportion of smokers received advice from health worker to stop smoking. One of the explanations could be the low motivation of health workers to work on the smoking cessation. There is urgent need for smoking cessation interventions for disadvantage groups. In addition, data point out lack of recognition of young smokers as target group for smoking cessation intervention.

Perceived risks of different substances use reflect not only personal attitudes, but also substance-use cultures, levels of use and levels of availability in specific environment. Based on available results, risk perception is not at satisfactory level in Serbia both among youth and adults. As in the studies of other authors there is significant difference in the risk perception among smokers and nonsmokers with smokers' risk perception being lower (Dawood, Rashan, Hassali, & Saleem, 2016; Yang, Hammond, Driezen, Fong, & Jiang, 2010; Murphy-Hoefer, Alder, & Higbee, 2004). Low risk perception among smokers might be explained with optimistic bias phenomenon, confirmed to be present among smokers by other authors (Mantler, 2013; Arnett, 2000). Special

attention should be given to raising risk perception of smokers due to their evidenced underestimation of the risk (Weinstein, Marcus, & Moser, 2005). In line with the evidence from research (Zlatev, Pahl, & White, 2008) the message should be framed in such way to remind people they are putting others at risk rather than themselves since effects could be better. Changing norms towards smoke-free environment is likely to contribute to smoke-free policy adoption together with success of existing smoke-free policy implementation (Hyland, Barnoya, & Corral, 2012).

Of concern is also co-occurrence of smoking and other substance use. High smoking prevalence among people with alcohol, cannabis and mental health disorders call for targeted actions to protect and improve the health of these especially vulnerable groups from the negative effects of tobacco use. Researchers show no negative impact of smoking cessation on (other) addiction treatment goals (Prochaska, Delucchi, & Hall, 2004;Hurt et al., 1994) and that smoking reduction is not associated with negative change in mental health (Taylor, Taylor, Munafò, McNeill, & Aveyard, 2015). Integrative smoking cessation program for people suffering from alcohol related problems, use illicit substances and who are under psychological distress has to be developed and implemented as it is shown that such programs do not affect abstinence from alcohol and other drugs (Apollonio, Philipps, & Bero, 2016; Sussman, 2002; Sees & Clark, 1993; Prochaska et al., 2004). Despite evidence, smoking cessation programs are not represented much in addiction treatment (Sullivan & Covey, 2002).

In Serbia, in 2013, 13% of school children aged 13-15 smoked with small differences according to gender. For this population group, onset of smoking is of special concern and majority of smokers among schoolchildren started to smoke in the age of 12 or 13 (30.4%). Similarly to other findings (Lorant et al., 2017), in Serbia odds of being smoker are higher among 13-15 years old who have mother that smokes as well as those who have brother or sister that smokes. Other factors that predict smoking among school children in Serbia are lower risk perception, perceived availability of cigarettes and those who are not thought in school on harmful effects of smoking.

Smoking prevalence among sex workers, men having sex with men, prisoners, people living with HIV, Roma youth and institutionalized children is two to three fold higher than in the general population. All vulnerable groups showed higher smoking rates among females with the highest prevalence rate of more than 90% among sex workers. Culturally and gender specific, evidence-based cessation programs are needed in these populations.

High smoking prevalence is correlated with poor socioeconomic status and living conditions. Results from other studies show that social and cultural factors such as stigmatization, victimization and internalized homophobia leads to mental health problems and contribute to high smoking rates (Pizacani et al., 2009; Pitoňák, 2017; Hatzenbuehler et al., 2014; Hatzenbuehler & Link, 2014).

While prevalence of tobacco smoking among vulnerable groups are remaining high (Drope et al., 2018), evidence of effective interventions among these groups are limited (Hiscock, Bauld, Amos, Fidler, et al., 2012).

Better understanding of the barriers to smoking cessation of stigmatized groups is important for antismoking campaigns and other targeted interventions. Peer and community leaders can be used to reach vulnerable population groups. Targeted cessation programs can be effective among vulnerable groups. However, all measures should be delivered in conjunction with wider interventions aimed at reducing inequalities in health (Hiscock, Bauld, Amos, Fidler, et al., 2012). In addition, options for harm reduction interventions should be explored. One of harm reduction approaches that could be piloted in Serbia is reduction of smoking with nicotine replacement therapy as well as short interventions such as giving advices for reduction to quit.

Tobacco control experts would benefit also from additional data which are not available within current monitoring system such as data on level of addiction, motivation to quit among adults and vulnerable population and data that would give more precise information on social norms.

6   Conclusion

Smoking prevalence in Serbia is high compared to global and EU average. Highest smoking rates in all adult population groups are in the age group 35-54. Comparison of health survey data from 2000-2013 show that age groups with highest prevalence are moving from younger to older population groups.   Among older than 65 years smoking prevalence almost doubled from 2006-2013. In line with recommendations for countries in the third stage of tobacco epidemic such as Serbia, there is a need for better enforcement of current restriction, education on quitting and providing access to broad range of smoking cessation (Lopez, Collishaw, & Piha, 1994a). Data show need for strengthening smoking cessation services and coverage of population with evidence based smoking cessation interventions with special focus on adults in the age group 35-54, where there is highest smoking prevalence of intensive smokers. Among students, population group of special interest are children aged 12-13 since majority of smokers report the first experience with cigarette at this age.   High percentage of youth not being prevented to buy cigarettes because of age call for better compliance with existing law that ban selling tobacco to minors.

Half of 13-15 years old students that smoke would like to quit smoking. However, this age group is not usually recognized by health professionals as group that could benefit from support to quit, despite data indicating such need.

Data also show high exposure to tobacco smoke both among youth and adults. There is low risk perception especially among smokers' risk to their own health which might be consequence of optimistic bias phenomenon. Due to many finding showing inefficiency of media campaigns, apart from appropriate planning, implementation and evaluation other emerging neurological quantitative research techniques might be considered for framing appropriate messages such as neurological and physiological techniques (Harris, Ciorciari, & Gountas, 2018).

The high rates of comorbidity of other substance use and mental disorders should be given particular attention when evaluating the success of smoking cessation interventions. Furthermore, high rates of comorbidity call for integration of tobacco and other substances in the prevention, treatment and policy strategies.

There are specific subgroups of population having substantially higher smoking rates which demands more attention and goes beyond evidence based tobacco control measures aimed at general population. In Serbia, there is a significantly higher smoking rate among all studied vulnerable populations of both gender – moreover, the highest smoking prevalence was found among female sex workers. Some interventions including harm reduction which shown promising results in other countries might be piloted. However, while planning interventions for vulnerable and socially excluded population, stigmatization and hidden nature of such population groups such as MSM or cultural issues as in case of Roma population should be taken into account.

Despite wealth of data obtained through surveys and presented in this thesis, it is evident that there are gaps that should be narrowed with specific qualitative and quantitative research. More information are needed related to new challenges such as electronic cigarette, water pipe use and heated tobacco products. Some novel approaches might also be tested such as measuring tobacco use through wastewater analysis as supplementary indicator of tobacco consumption in local communities. Apart for quantitative analysis, qualitative analysis should be made. Qualitative studies could be especially important for understanding the sociocultural factors and contexts in vulnerable groups.

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