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

PhD thesis

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## Statement

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## **Identification record**

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## 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 to 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: Epidemiology of tobacco and tobacco control

## 1.1 Harmful effects of tobacco

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).

Smoking is leading preventable risk factor for numerous non-communicable diseases. One in 10 deaths (11.5% of global deaths in 2015) around the world is caused by tobacco use which means that smoking lead to 7 million of deaths every year. Out of 7 million death cases, 890 000 are due to passive smoking only. (WHO, 2017a) The further rise of total tobacco-attributable deaths is projected to reach 8.3 million in 2030 (Mathers & Loncar, 2006).

Significant differences exists between countries and regions and more than half (52.2%) of these deaths occurred in four countries (China, India, the USA, and Russia; GBD 2015 Tobacco Collaborators, 2017).

In 2016, despite progress in some countries, in 109 countries smoking was among the leading five risk factors for DALYs (GBD 2016 Risk Factors Collaborators, 2017).

### 1.1.1 Health consequences of smoking

Evidence on harmful effect of smoking start to appear from the end of 18<sup>th</sup> century but until the first half of the 20<sup>th</sup> century the hazards of smoking had remained largely unsuspected (Doll, 1999). One of the first and among most important studies showing association between smoking and lung cancer was published in 1950 by Doll and Hill (Doll & Hill, 1950). In another study Doll and colleagues also found that men smokers died on average about 10 years younger than lifelong non-smokers. (Doll, Peto, Boreham, & Sutherland, 2004)

Since the mid-XX century number of studies providing evidence that smoking is risk factor for many non-communicable diseases increased and this led to release of the 9<sup>th</sup> Surgeon General of the United States on health consequences of smoking in 1964 (US Public Health Service, 1964). This report provided robust evidence of harmful effect of tobacco use. After this report was issued, number of researches produced evidence which revealed that smoking affects nearly every organ of the body and that the disease risks of smoking and exposure to tobacco smoke are even greater than presented in previous reports (National Center for Chronic Disease, Health Promotion Office on Health, 2014).

Apart from showing association of smoking with many diseases, Doll and Hill's study on lung cancer in 1950 (Doll & Hill, 1950) also demonstrated a dose-response relationship, which has been documented in numerous studies conducted since then (Ahmed et al., 2015; Di

Giuseppe, Discacciati, Orsini, & Wolk, 2014; Streppel, Boshuizen, Ocke, Kok, & Kromhout, 2007).

On average, smokers lose 15 years of life (WHO, 2008). It is well documented that tobacco contains 7000 substances of which 70 is known cause of cancer. There are various mechanisms of the effects of these substances, and it is impossible to evaluate harmfulness of individual substances as they may be in the interaction. The substance responsible for addiction and mechanism of nicotine addiction is complex. Apart from being responsible for addiction, nicotine increases heart rate and blood pressure, and can have local irritant effects, but is not a carcinogen (Centers for Disease Control and Prevention, 2010).

Even low levels of exposure to tobacco smoke but through active or passive smoking, cause rapid increase in endothelial dysfunction and inflammation, which are implicated in acute cardiovascular events and thrombosis. Smoking increases inflammation and endothelial injury and dysfunction in both coronary and peripheral arteries, thrombosis and produces an atherogenic lipid profile, primarily due to an increase in triglycerides and a decrease in high-density lipoprotein cholesterol (Ambrose & Barua, 2004). Researches show that relationship between smoking and cardiovascular disease is independent of the other coronary risk factors, but also the cardiovascular risk increases with the increase of other risk factors namely blood pressure, serum cholesterol and diabetes mellitus (Leone, 2003).

Lung cancer which is among leading causes of smoking mortality develops as consequence of direct exposure of the lungs to carcinogens in tobacco smoke. Moreover, many cytogenetic changes present in lung cancer are result of DNA damage caused by carcinogen exposure. (US, 2010) Studies show that one out of ten long-term smokers will eventually be diagnosed with lung cancer (Massion & Carbone, 2003).

Another disease strongly associated with smoking is chronic obstructive pulmonary disease (COPD) (Laniado-Laborín, 2009). This illness arises from the irritant and pro-inflammatory effects of smoke (Centers for Disease Control and Prevention, 2010).

In general, among adults 30 years and older, tobacco is responsible for 10% of all deaths from cardiovascular diseases, 22% of all deaths from cancer (71% of lung cancer) and 36% of deaths of respiratory diseases, 12% of lower respiratory infections and 7% of all deaths due to tuberculosis. Tobacco attributable mortality is higher among men than women (WHO, 2012). Smoking has interaction with other risk factors such as high serum levels of lipids, untreated hypertension, and diabetes mellitus, but association with CVD remains even after adjustments in levels of other explored risk factors (Centers for Disease Control and Prevention, 2010).

Considerable burdens to health are caused by exposure to second hand smoke which is combination of smoke from burning cigarette and smoke exhaled by smokers. Exposure to to-



bacco smoke is linked with increased risk of nasal irritation, lung cancer, coronary heart disease, reproductive effects in women and other diseases. Among children, exposure to tobacco smoke is risk factor for middle ear disease, impaired lung function and sudden infant death syndrome (Kalucka, 2007). Children and adolescent exposure to tobacco smoke causes development of chronic diseases like COPD. There are multiple pathways and mechanisms by which tobacco smoke contribute to causation of various diseases and multiple genes may be involved. These mechanisms include DNA damage, inflammation, and oxidative stress. Even so there is correlation between the duration and level of exposure to tobacco smoke and adverse health outcomes caused by smoking, there is no safe level of exposure to tobacco smoke (US Department of Health and Human Services, 2014; Centers for Disease Control and Prevention, 2010; US Department of Health and Human Services, 2006).

Tobacco use is also associated with an increased risk of death from communicable diseases such as tuberculosis and infections of lower respiratory tract (WHO, 2012).

In addition, workers which hand-harvest, cut, or load tobacco plants can develop green tobacco sickness (GTS) which is consequence of most notably acute nicotine poisoning through skin exposure to dissolved nicotine from tobacco leaves. Symptoms of GTS include, but are not limited to nausea, vomiting, dizziness, abdominal cramps, breathing difficulty, diarrhea and changes in blood pressure or heart rate, and increased perspiration and salivation. Researches call for further actions on prevention of this disease (McKnight & Spiller, 2005; Arcury et al., 2003; Ballard et al., 1995 & McBride, Altman, Klein, & White, 1998).

### 1.1.2 Social and economic impact of tobacco use

Apart from health consequences, tobacco has great social and economic impact. Tobacco is more frequently used by poor, and thus contribute to health disparities between different socioeconomic groups. Due to the lack of financial resources, persons with low income, instead of allocating resources to food or education, buy tobacco. Additionally, tobacco related diseases leads to increase of spending for treatment of diseases (WHO, 2017).

Tobacco also endanger poor people in countries where children are involved in tobacco production cycle while the tobacco industry companies benefit from child labour (Otaney & Glantz, 2011).

According to cost of illness approach for estimation of the economic cost of smoking attributable-diseases, economic costs are defined as either 'direct costs' (i.e hospitalization and medications) or 'indirect costs' representing the productivity loss from morbidity and mortality. In 2012, 5.7% of global health expenditure was due to smoking-attributable diseases. Economic burden was found to be especially high in Europe and North America (Goodchild, Nargis,

Tursan, & Espaignet, 2018). One of studies on economic cost found that the most important costs were the cost of outpatient care and premature deaths (Rezaei, Akbari Sari, Arab, Majdzadeh, & Mohammad, Poorasl, 2016).

### 1.1.3 Environmental consequences

Tobacco (*Nicotiana tabacum*) is cultivated in more than 100 countries. Top producers in 2004 were China, Brazil, India, United States and Malawi, accounting for two-thirds of worldwide tobacco production (McKnight & Spiller, 2005).

There are many evidences of negative environmental impacts of tobacco. Among these consequences are deforestation and soil degradation and agrochemical pollution. Some of the consequences are related to heavy use of pesticides for tobacco farming, growth regulators and chemical fertilizers. These can create environmental health problems, particularly in LMICs with limited regulatory standards. Research show negative impact of tobacco to environment in its whole cycle and point out necessity of multisectorial cooperation to address this issue. Some of the possible measure are adoption of green technologies and alternative agriculture production (WHO, 2017a). More attention should be paid to these aspect of tobacco by raising awareness of decision makers and further research (Lecours, Almeida, Abdallah, & Novotny, 2012).

## 1.2 Prevalence of smoking and exposure to tobacco smoke

### 1.2.1 Smoking among general population

Globally, 21% of adults worldwide are current smokers (men 35%; women 6%) with more than 80% living in low and middle-income countries. Majority of current smokers are daily smokers. According to the systematic analysis from the Global Burden of Disease Study 2015, worldwide, the age-standardized prevalence of daily smoking was 25.0% for men and 5.4% for women (GBD 2015 Tobacco Collaborators, 2017).

Global burden of disease study 2015 also revealed decline in prevalence of daily smoking since 1980. However, due to the population growth, the number of smokers increased from 721 million in 1980 to 967 million in 2012. Both prevalence and the number of cigarettes smoked per day vary across countries (GBD 2015 Tobacco Collaborators, 2017) and these differences are influenced by cultural and political climate (Zatonski, Przewozniak, Sulkowska, West, & Wojtyla, 2012).

In the European Union (EU) about one in four adults (26%) smoke while 24% are daily smokers. However, prevalence vary between member states from 7% in Sweden to 37% in Greece.

Other high prevalence countries are Bulgaria (36%), France (36%) and Croatia (35%) and in general there are persistently higher rates of smoking in Southern Europe. This data should be interpreted having in mind that despite low prevalence of smoking cigarettes found in Sweden, in this country, 23% of adults use oral tobacco at least monthly. Boxed cigarettes is the most used form of tobacco with 79% of tobacco users using them. Also, almost one third of EU smokers use hand-rolled cigarettes (29%). Oral, chewing or nasal tobacco use is less common with 5% of smokers using tobacco in such forms. In EU, after the decline of smoking prevalence in period 2006-2014, smoking rates stabilized in most EU countries (European Commission, 2017).

After implementation of tobacco control measures and decrease of prevalence and tobacco industry profit in developed countries, tobacco production shifted to developing countries. In spite of overall decrease of smoking prevalence and exposure to tobacco smoke, as result of population growth and aging, tobacco-attributable deaths and DALYs, have continued to rise (Riquinho & Hennington, 2012). Smoking-attributable mortality is higher among males than females with highest number of such deaths in Americas and the European region due to long history of high prevalence of tobacco use (WHO, 2012).

Except for gender differences, other sociodemographic worrying disparities are expected among smokers whose number is estimated to reach 1.1 billion in 2025 (Bilano et al., 2015). Disparities among smokers are also emphasized in 2014 Surgeon General's report, *The Health Consequences of Smoking—50 Years of Progress*, where it is written “although cigarette smoking has declined significantly since 1964, very large disparities in tobacco use remain across groups defined by race, ethnicity, education level, and socioeconomic status and across regions of the country” (National Center for Chronic Disease, 2014).

### 1.2.2 Smoking in school children

Number of school children 13-15 years old estimated to be 25 million (Drope J, 2018). Overall, in 2012-2015 period, in this age group there is 10.7% smokers, with prevalence in the range from 2% in Sri Lanka to 35% in Timor-Leste. In EUR region of the WHO smoking prevalence varied from 2.4% (Tajikistan) to 27.4% (Bulgaria) (Arrazola et al., 2017). In Europe, based on information provided by more than 90 thousand students from 35 European countries, in 2015, 21% of 16 years old students were current smokers, while 23 % had smoked cigarettes at the age of 13 or younger. The differences between country exists with lower prevalence in Albania, Iceland, Moldova and Norway (5 % and less) and higher than 20% in Bulgaria, Croatia, Italy, Liechtenstein and Romania. Despite variations between countries there are signs of positive developments (ESPAD, 2016). Cigarettes use is declining in US and are at lowest levels in the history according to the findings from the study *Monitoring the Future* from 2015. Results

of this study show that 11% of 12th graders (17-18 years old) have smoked in the last 30 days (Johnston, O'Malley, Miech, Bachman, & Schulenberg, 2016).

In general, according to the FCTC progress report 2016 that included reports from 133 FCTC Parties, 59% of reporting countries showed decrease in smoking prevalence among youth and 58% among adult population.

### 1.2.3 Exposure to tobacco smoke

Despite progress made in many countries, in 2016 one third of females and one-fifth of males were exposed to tobacco smoke and especially high prevalence of exposure is noted in Asia, with Indonesia and Pakistan reaching 80% of population exposure to tobacco smoke (Drope J, 2018). Exposure to tobacco smoke varies by settings, but also by countries. In EU, 20% of visitors of drinking establishment were exposed to tobacco smoke last time they visited such place with range from 2% in Sweden to more than 70% in Czech Republic (73%), Croatia (77%) and Greece (87%). Less people were exposed to tobacco smoke in the restaurants (9%) with similar differences between countries and highest exposure in Greece (78%) followed by Cyprus (51%) and Czech Republic (49%) (European Commission, 2017).

Level of exposure is highly dependent on adoption and implementation of smoke free legislation (Pickett, Schober, Brody, Curtin, & Giovino, 2006) and thus smoke free laws are associated with improved health outcomes (Frazer et al., 2016). However, only 20% of the world's population, are protected by comprehensive national smoke-free laws (WHO, 2018).

Smoke free laws are often challenged by tobacco industry claiming that it will negatively affect business, and by smokers themselves, calling for their rights. It is known that studies providing evidence of a negative impact were supported by the tobacco industry (Scollo, Lal, Hyland, & Glantz, 2003) and numerous independent studies provide evidence that smoke free laws do not affect business (Luk, Ferrence, & Gmel, 2006; Melberg & Lund, 2012). In addition, economic issues should never be above health, and, as stated in Surgeon General Report on Health consequences of involuntary smoking "the choice to smoke should not interfere with the non-smoker's choice for environment free of tobacco smoke" (US Department of Health and Human Services, 2006).

### 1.3 Risk factors for smoking

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).

Evidence of association of social factors with substance use show that different factors have impact at different levels. Factors associated with smoking at intrapersonal level are socio-demographic characteristics which are explored through many studies showing gender (Branstetter, Blosnich, Dino, Nolan, & Horn, 2012; P. H. Smith, Bessette, Weinberger, Sheffer, & McKee, 2016; Waldron, 1991) and socioeconomic differences (Huisman, Kunst, & Mackenbach, 2005; Q. Wang, Shen, Sotero, Li, & Hou, 2018) in smoking behaviour and cessation across different population groups. In addition, at the intrapersonal level individual characteristics that influence behavior are knowledge, attitudes, beliefs and personality traits (Institute of Medicine US, 2001).

Interpersonal level involves interpersonal processes and primary groups, including family, friends, and peers that provide social identity, support, and role definition. Adverse family conditions, low levels of parental supervision and single-parent families are linked with substance use initiation (Galea, Nandi, & Vlahov, 2004). Institutional factors involve rules, regulations, policies, and informal structures that may constrain or promote recommended behaviors. Community factors deal with social networks and norms or standards that exist as formal or informal among individuals, groups, and organizations. Public policy involves policies and laws that regulate or support healthy actions and practices for disease prevention, early detection, control, and management.

In addition, trajectories from experimentation to heavy smoking is associated with psychosocial, biologic, and genetic determinants (Centers for Disease Control and Prevention, 2010).

Factors that are correlated with smoking might be also systematized as those related to product such as additives, and flavourings in cigarettes, host factors (intention to use, level of dependence); tobacco company activities and environmental factors (e.g., peer and parental smoking, smoke-free air laws and policies (Giovino, 2007).

Understanding relationships between many factors is of importance for planning tobacco control measure which have to be comprehensive. Due to its complexity, tobacco is described also in literatures as wicked problem. The term *wicked* which appeared in literature more than four decades ago (Rittel & Webber, 1973) refers to problems that, as stated by Young, “cannot be managed by single organization, jurisdiction or domain” (Young, Borland, & Coghill, 2012).

Complex nature of tobacco and relationships among different components relevant to the tobacco control are well elaborated in the report of the Institute of Medicine and presented in

“Tobacco Control Landscape” model and among those components are smoke free legislation, individual smoking behavior and social norms and tobacco research (Institute of Medicine, 2015).

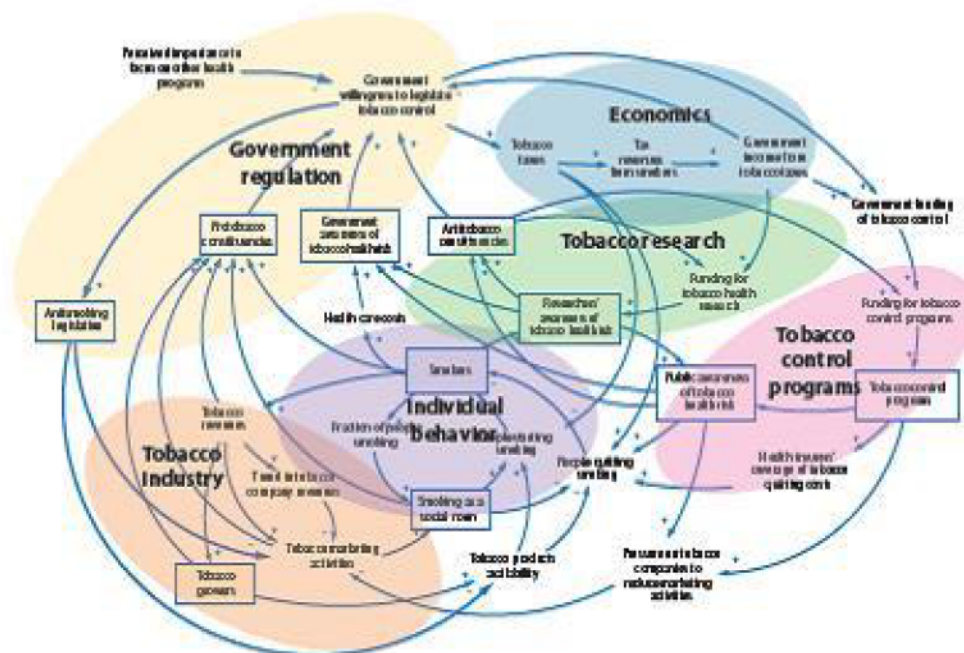


FIGURE 3-2 Complex tobacco landscape.  
 NOTE: This figure is not drawn to scale, nor is any meaning implied by the relative sizes of elements within the figure. See Kirkwood (1998) for more information about causal loop diagram construction.  
 SOURCE: NCI, 2007, adapted by Luke, 2013.

Understanding basic of human behaviour is of importance for planning interventions to prevent tobacco use. Human behaviour is directly and indirectly influenced by individual characteristics and by the conditions under which people live, policies and practices (Cohen, Scribner, & Farley, 2000). An individual’s behaviour is understood to affect and be affected by intrapersonal characteristics such as knowledge, attitudes and beliefs and interpersonal factors like peer influence and community level factors such as social norms and policies. It is also well known that human behaviour plays a central role in the maintenance of health and the prevention of disease (*Institute of Medicine*, 2001). Prevention, reduction or quitting interventions are dependent on behavior change. As a first step in designing such intervention, analysis of the targeted behavior is needed. According to COM-B model, people need capability (C), opportunity (O) and motivation (M) to perform a behavior (B) and these components should be kept in mind when developing behavioral targets as a basis for intervention design. Capability is defined as the individual's psychological and physical capacity to engage in the activity concerned. It includes having the necessary knowledge and skills. Motivation is defined as all those brain processes that energize and direct behavior, not just goals and con-

scious decision-making. It includes habitual processes, emotional responding, as well as analytical decision-making. Opportunity is defined as all the factors that lie outside the individual that make the behavior possible or prompt it (Michie, Van Stralen, & West, 2011).

Recognizing importance of targeting factors at different levels, COM-B system foresees equal status of intra-psychic and external factors in controlling behavior (Susan Michie et al., 2011).

In addition, individuals' behavior often depends on the behaviors of other people and on social environment and therefore it is, *inter alia*, important for policy makers to predict reaction of individuals to policy changes. This is a challenging task due to complex relationships between individuals and the social environment (Institute of Medicine, 2015). Importance of changing social norms for reducing tobacco use was discussed for decades in the literature. Sustain in the mid-nineties of the 20th century noted that much of the preventable risk factors could be reduced by changing social norms and that those norms have influence on behavior. This is also relevant for smoking as changes in beliefs about harm and risk of smoking is followed by changes in social norms (Sunstein, 1997). Understanding how people think about and respond to risk has great implications for health promotion and public health policies (Bjarnason & Jonsson, 2005).

Apart from risk perception, beliefs on prevalence of behaviors also influence individuals' behaviors and there is correlation between smoking behavior and perception of norms for tobacco use. Phenomenon of pluralistic ignorance is relevant to social norms and problem of smoking. This phenomenon describes misperception of attitudes or behavior of community members and usually problem or risk behavior are overestimated while protective or healthy behaviors are underestimated (Berkowitz, 2003). Findings from numerous studies confirm correlation between perception of prevalence of substance use and actual use showing that overestimation of substance use among peers encourages individuals to engage in this behavior (D'Amico & McCarthy, 2006; Ellickson, Bird, & Orlando, 2003; Olds, Thoms, & Tomasek, 2005). Evidence on successful programs based on given assumptions exists (Franca, Dautzenberg, Falisad & Reynauld, 2010). Some authors state that peer influence can have bigger influence than other factors such as family, religious cultural influences (Berkowitz, 2004). For planning interventions, it is worth knowing that studies show that influence on individuals in respect of health behavior is higher coming from those who are similar to them (Centola, 2011).

There are many theories used in addiction science which has implications for 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).

Theories might be also systematized as motivational theories (Social cognitive theory Theory of planned behavior (+ theory of reasoned action, protection motivation theory, health belief model), Action theory (i.e. Social cognitive theory, Transtheoretical model) and organization theories (Diffusion theory, social influence).

Following domains that explain behavior change are identified: (1) knowledge, (2) skills, (3) social/professional role and identity, (4) beliefs about capabilities, (5) beliefs about consequences, (6) motivation and goals, (7) memory, attention and decision processes, (8) environmental context and resources, (9) social influences, (10) emotion regulation, (11) behavioral regulation, and (12) nature of the behavior (Michie et al., 2005).

Some of theories/approaches often used to provide framework to planning interventions to reduce smoking are Theory of Planned Behavior and Socio-ecological approach. At the intrapersonal level, the Theory of Planned Behavior (TPB) tends to predict an individual's intention to engage in a behavior at a specific time and place. Behavioral intentions are influenced by the attitude about the likelihood that the behavior will have the expected outcome and the subjective evaluation of the risks and benefits of that outcome. The TPB states that behavioral achievement depends on both motivation (intention) and ability (behavioral control). However, despite successful use of TPB to predict and explain a wide range of health behaviors and intentions including smoking, it should be kept in mind that this theory does not address roles of impulsivity, habits, self-control, associative learning, and emotional processing (Susan Michie, Fixsen, Grimshaw, & Eccles, 2009).

Socio-ecological approach says that individuals are influenced by their families, social networks, the organizations in which they participate (workplaces, schools, and religious organizations), the communities of which they are a part, and the society in which they live. In other words, the health behavior of individuals is shaped in part by the social context in which they live. Social context means the sociocultural forces that shape people's day-to-day experiences and that directly and indirectly affect health and behavior.

Social norms have great implications for smoking. There are many definitions of social norms and according to one of them social norms specify what to do and what not to do in a given situation (Prentice, 2012). Social norms are what is believed to be normal and/ or typical or appropriate action in the reference group (Mackie, Moneti, & Denny, 2012) and may refer to what is commonly approved or what is commonly done in society (Sieverding, Mattered, & Ciccarello, 2010). Distinction between injunctive and descriptive social norms should be made. While descriptive norms identify the typical attitudes or behaviors of the group, injunctive norms identify the desirable attitudes or behaviors of a group (Paluck & Ball, 2010). In another words "what is typically done in a given setting" refers to descriptive norm while 'doing what others think should do' refers to injunctive norms (Reno, Cialdini, & Kallgren, 1993).

Studies on correlation between descriptive norms and health intentions confirmed significant contribution of descriptive norms in respect of health related behavior (Rivis & Sheeran, 2003).



In previous years social norms theory application to health problems increased (Berkowitz, 2003) and correlation with smoke free policy was scope of number of researches. Smoke free laws can change tobacco related social norms (European Commission, 2009) and smoking ban has influence on social norms and attitudes which has impact on individual smoking behaviour. Smoking ban in public places communicate message that smoking is not socially acceptable and influences both smoking initiation and cessation (WHO, 2007).

Primary socialization theory is one of the theories that has strong implications for improving prevention and treatment of adolescent substance use (Oetting & Donnermeyer, 1998). According to this theory crucial determinants for substance use, including tobacco are friends, exposure in home (parental modelling of health behavior and genetic predisposition to nicotine dependence) and media and advertising exposure (Villanti, Boulay, & Juon, 2011).

### 1.3.1 Association of smoking with substance use and mental health

Mental and substance use disorders are the leading health problems in the world in terms of years lived with disability (Whiteford et al., 2013). In Europe alone, more than 160 million people suffer from mental disorders (Wittchen et al., 2011) and almost a quarter of Europeans have tried illicit drugs (EMCDDA, 2016), while the smoking prevalence in the European Union was 26% in 2016 (European Commission, 2017). Evidence suggests an association between psychoactive substance use and mental health. Studies analyzing the association between smoking and substance use vary in their focus, from those aimed at an association between smoking and specific substances such as cannabis (Hindocha et al., 2015; Montgomery, 2015; Suris, Akre, Berchtold, Jeannin & Michaud, 2007) to studies analyzing the correlation with various substances (Connor, Gullo, White, & Kelly, 2014; Degenhardt, Hall, & Lynskey, 2001; Karila et al., 2013). Evidence from 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.

### 1.3.2 Smoking among stigmatized populations

Prevalence of tobacco smoking among vulnerable and stigmatized groups is continuously found to be high (Drope et al., 201; Hiscock, Bauld, Amos, & Platt, 2012; Odani, Armour, Graf-funder, 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, & Munafa, 2012).

There are several highly stigmatized populations. Stigmatized population groups can have high smoking rates. Available results show much higher smoking rates among prisoners in

comparison to the general population (Indig et al., 2010), while data on prevalence of smoking among female prisoners are sparse (Catherine, Heino, Michael, Jean-François, & Bernice, 2011). Studies on smoking behaviour among sex workers mostly include female sex workers and also reveal high smoking prevalence. (Devóglío, Corrente, Borgato, & de Godoy, 2017; Odukoya, Sekoni, Onajole, & Upadhyay, 2013) Research also points to higher prevalence of smoking among 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 on the streets have higher smoking rates and also substance use disorders (Attia, Tayel, Shata, & Othman, 2017).

Population living in Roma settlements is 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). Apart from lower socioeconomic status, Roma communities in Serbia are exposed to discrimination, segregation, non-education and poverty. This is population group which is among the youngest population of Serbia. In addition Roma communities are territorially dispersed and often closed. Women with lower educational background have the highest number of children and in addition, illiterate or semi-educated parents (Svetlana & Sveltana, 2014). As a result of traditional approach in Roma families that girls do not need school as their primary role is to give birth children and take care of household, there is high rate of drop out of Roma girls from educational system (Bibija Romski ženski centar, Romani cikna, Pravni Skener & Crljeni, 2014). While in general population challenge might be in low participation of parents in family based programs, in Roma population challenges are more complex. Research from other countries show lower support for tobacco control measures in the Roma population (Hajioff & McKee, 2000; Paulik, Nagymajtenyi, Easterling, & Rogers, 2011).

## 1.4 Evidence based tobacco control interventions

Harmful effects of tobacco were known since decades but more organized measures of public health community to reduce negative impact of tobacco use that started the Surgeon general report from 1964 (US Public Health Service Smoking and Health, 1964) This report provided sufficient evidence on harmful effects on smoking and in 1986 was followed by evidence on harmful effects on exposure to tobacco summarized in the Surgeon general report on health consequences of involuntary smoking (Health & General, 1986), updated in 2006 (US Department of Health and Human Services). Today there is wealth of evidence of devastating effects of tobacco.

However, despite the fact that smoking is related to more death than HIV/AIDS, malaria and tuberculosis combined, it is still not sufficiently priority and it is not given enough attention. (WHO, 2017b).

After the period 1970-1990 marked with decrease in cigarette consumption in many high income countries, more advanced tobacco control policies started to be developed and implemented such as smoke free laws in hospitality sector and raise of tobacco taxes and ban on tobacco industry promotions and sponsorship (Pampel, 2010). However, adoption and implementation of tobacco control policies vary worldwide (Davis, Wakefield, Amos, & Gupta, 2007).

Interventions aimed at reducing smoking and exposure to tobacco smoke must be aimed at multiple levels of influence in order to achieve substantial changes in health behavior.

There are five levels of influence which corresponds 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.

Vast evidence exist on effectiveness of different types of intervention, but its very important to link intervention with behaviour targets and to take into account context in which interventions will be implemented (Susan Michie et al., 2011). Different implementation theories have been developed with aim to explain success or failure of implementation of interventions. (Nilsen, 2015) Interventions might change one or more components in the behaviour system. Additionally, its often the case that theories used for interventions do not cover important variables (Michie et al., 2009).

### 1.4.1 FCTC and MPOWER

With the aim to reduce tobacco demand and supply as well as to reduce consequences of tobacco use, World Health Assembly in 2003 adopted the World Health Organization Framework Convention on Tobacco Control (WHO, 2003, updated reprint 2004, 2005) which entered into force in 2005. Currently ratified by 181 Parties, the WHO FCTC currently covers about

90% of the world's population (WHO, 2015). This legally binding treaty includes evidence-based measures to combat tobacco epidemic and the first international treaty negotiated under the auspices of WHO.

The core provisions of the demand-reduction provisions are: Price and tax measures to reduce the demand for tobacco and non-price measures to reduce the demand for tobacco. Nonprice measures are: Protection from exposure to tobacco smoke (Article 8); Regulation of the contents of tobacco products (Article 9). Regulation of tobacco product disclosures (Article 10), Packaging and labeling of tobacco products (Article 11), Education, communication, training and public awareness (Article 12), Tobacco advertising, promotion and sponsorship (Article 13) and tobacco dependence and cessation (Article 14).

Supply measures include support for tobacco growers to find economically viable alternatives; sales by and to minors; and ending the illicit trade in tobacco products. Since FCTC took into effect, numerous achievements has been recorded and recent study confirm that implementation of measures foreseen in FCTC lead to reduction in several smoking-related outcomes including prevalence of smoking (Chung-Hall, Craig, Gravely, Sansone, & Fong, 2018).

Tobacco control is also in line with the 2030 Agenda for Sustainable Development which was adopted by countries at the United Nations in September 2015. This new agenda comprises 17 Sustainable Development Goals (SDGs) complete with 169 targets and in SDG 3 – to “ensure healthy lives and promote well-being for all at all ages” – are specific targets on reducing premature mortality from no communicable diseases (NCDs) by one third by 2030 (target 3.4), and strengthening implementation of the WHO Framework Convention on Tobacco Control in all countries, as appropriate (target 3.a) (UN Assembly, 2015).

Despite the adoption of the FCTC there are still considerable differences in the implementation of the tobacco control measures. Tobacco control scale developed by Joossen and Raw which compares 35 countries based on tobacco control measures (Joossens & Raw, 2017) show that in 2016 the best positioned country was UK followed by Ireland, Serbia was at 23<sup>rd</sup> place, while the country with lowest score was Austria.

Insufficient decrease in prevalence in many countries can be due to absence of tobacco control policies but also low compliance with policies in countries where such policies are implemented. Research show that higher levels of perceived public sector corruption is one of the factors negatively associated with smoking prevalence (Bogdanovica, McNeill, Murray, & Britton, 2011).

To assist countries to fulfill their WHO FCTC obligations, in 2008 WHO promoted six proven measures to reduce tobacco use worldwide. These measures known as the MPOWER package measures are: Monitoring tobacco use and prevention policies (M); Protecting people from tobacco smoke (P); Offering help to quit tobacco use (O); Warning about the dangers of

tobacco(W); Enforcing bans on tobacco advertising, promotion and sponsorship (E) and Raising taxes on tobacco (R) (WHO, 2008).

#### 1.4.2 Prevention

Prevention is a complex of psycho-social, legal and health actions used in order to prevent health damage, emergence of diseases, health problems, and constant effects as results of various forms of risk behaviour/substance use. Prevention activity is one that is designed to avoid substance abuse and reduce its health and social consequences. In broader understanding, include both actions on demand (including health promotion and disease prevention) and supply reduction (by reducing availability of substances) (Medina-Mora, 2005).

Common goals of prevention programs can be reduction of ever use, reduction of experimentation, prevention of dependence by preventing transition to consistent use and smoking cessation. The later one is especially challenging when it comes to adolescent smoking.

The most used and widely accepted differentiation of prevention is classification proposed by Institute of Medicine (Mrazek & Haggerty, 1994) based on Gordon's classification (Gordon, 1987) of prevention on universal, selective, indicated prevention. Within this approach, population is divided according to the risk of developing substance use and interventions are implemented according to that risk.

Universal prevention is aimed at people with observed average risk as observed as overall group (the general population, school classes). It is therefore aimed at target population not identified by individual risk. Selective prevention is targeted at groups with identified higher risk, e.g., minority group members, children of substance abusing parents. Indicated prevention targets high-risk individuals, e.g., already experimenting individuals with already developing problems. Early diagnostics and intervention, targeting individuals already using some substance, but without diagnosed dependence or problem drug use, sometimes falls under the indicated prevention. Apart from above mentioned domains of prevention there is environmental prevention which covers interventions aimed at cultural, social, physical and economic environments.

Some examples of prevention interventions according to the level of prevention are:

- Environmental prevention (i.e. written policy on smoking in schools, regulations on legal drugs in community)
- Universal prevention: school programs/curriculums for all students
- Selective prevention: school program for children with problematic behavior
- Indicated prevention: interventions aimed at reduction of substance use among those who already use it.

Due to complexity of tobacco use and exposure to tobacco smoke comprehensive approach is needed. 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 (Institute of Medicine, 2010). Effective measures at the population level such as smoke free indoor places, legislation that protects youth from advertising and selling of tobacco products and raise of taxes are described in FCTC and MPOWER.

In their report dating back more than two decades ago Institute of Medicine (IOM) grouped tobacco prevention program based on the approach used on programs oriented toward: a) information sharing, b) changes of tobacco related beliefs, attitudes, intentions, and norms including strengthening self-esteem and c) social environment as a crucial in tobacco use (Free, 1994).

As majority of current smokers start to smoke before they are 18 years old (US Department of Health and Human Services, 2012) it is of great importance to reach these population groups with targeted preventive programs. However, these programs should be carefully designed in order to be effective. Some of examples of not effective youth smoking prevention programs are those that imply that smoking is adult behaviour. Such programs were funded by tobacco industry without any evidence of their efficacy and with the aim to fight taxes, clean-indoor-air laws, and marketing restrictions worldwide (Landman, Ling, & Glantz, 2002). In general, preventive programs include interventions aimed at limiting access and availability to tobacco as well as exposure to pro tobacco messages and other which are out of the scope of regulation such as education and mass media campaigns (Lantz et al., 2000).

Education programs which include strengthening skills is common in prevention of smoking. The important elements of successful health education programs are needs assessment, development and implementation of program, and evaluation of program's effectiveness.

Family based intervention might prevent tobacco use and are also often used for smoking prevention. Programs that include components aimed at parents' responsibility strengthening and are designed to include active parental involvement are found to be effective. Of special importance are promotion of children's psychosocial development and active participation of parents in the programs (EMCDDA, 2015).

The school is a priority setting as it offers substantial opportunities to prevent tobacco use and enables effective way to reach a large number of population. Addressing prevention of tobacco use in schools can enhance attention to the use of other substances and other relevant risk factors among students. Systematic review of school-based smoking prevention trials with long-term follow-up found limited number of studies showing that such programs led to decrease of prevalence (Wiehe, Garrison, Christakis, Ebel, & Rivara, 2005). Other research show that school based interventions based on the social influence resistance model are the most effective (Lantz et al., 2000). However, it should be noted that school-based smoking prevention programs are very often not evaluated rigorously, especially as regards their long

term impact. In addition, there are examples of school programs using approaches which lack evidence such as fear arousal approach, Suh approach can even cause defensive reaction rather than positive change of behaviour (Kok, Bartholomew, Parcel, Gottlieb, & Fernandez, 2014).

Peer based programs can be implemented in different settings. Peer based programs, both led by peers and adults were found as effective in terms of reduction of smoking. However, there are several factors that should be taken into account such as selection and training of educators, their motivation and their relationship with target group of intervention (Golechha, 2016).

Community programs with a school program as a basis, with supportive parent, media, and community organization components, have shown the most sustained effects on tobacco use. Programs including key community programs also can have preventive effect. Studies call for more evidence and explanation on why multi-component programs appear to be most effective and whether effect is related to existing tobacco policies (EMCDDA, 2015).

Social marketing and media campaigns are often used strategies for reaching mass public. Term "social marketing" which means application of commercial marketing principles for social goals creating, communicating and delivering value in order to influence a target audience behavioral change and this term was established by Kotler and Zaltman. This behavioral approach that helps to create a long-term sustainable impact upon the choices of people and incorporates the use of behavioral theory (Kotler & Zaltman, 1971; Smith, 2006). Despite many challenges, social marketing approach has been confirmed as successful in many studies (Richter et al., 2001).

Mass media work through direct and indirect pathways to change the behavior of whole populations. Mass media campaigns approach is based on the theories of the social influences or social learning theory and such approach can have positive but also negative changes in health-related behavior. It is shown useful for putting issue of interest higher on the agenda and fostering debate on the problem. Despite evidence on effectiveness of mass media in reduction of smoking, methodological limitation of the studies drawing such conclusion should be borne in mind. Also, all campaigns that lead to positive results had theoretical background, based on formative research and sufficient broadcasting intensity and duration (Brinn, Carson, Esterman, Chang, & Smith, 2010). In addition by acting directly to affect decision-making processes at the individual level aimed to strengthen intentions to alter and increase the likelihood of achieving new behaviours, mass media campaigns also acts indirectly influencing interpersonal discussions within individuals social networks, prompting public discussion which should lead to policy change and changing social norms (Wakefield, Loken, & Hornik, 2010). Interpersonal communication which can both stimulate change through social interaction and diffusion process lead to exposure of those who haven't seen campaign (Van den Putte, Yzer, Southwell, de Bruijn, & Willemsen, 2011).

Same as information giving alone, stand-alone media campaigns which are not run in parallel with other interventions are shown to be ineffective (EMCDDA, 2015). Additional factors that can contribute to ineffectiveness of many mass media campaigns despite their potential to widely disseminate messages to target groups are use of inappropriate formats, focusing behavior that target population is incapable of changing, insufficient exposure and changing media environment (Wakefield et al., 2010). Of importance for success of media campaigns are, among other, appropriate level of exposure to message during sufficient time. Evaluation of campaigns should be well designed to be able to detect subgroup effects (Hornik & Yanovitzky, 2003) and provide evidence of good quality of the effects of this intervention which is always challenging.

There are also campaigns which are aimed to encourage smokers to quit. Systematic review shows that there are some positive results of mass media campaigns in terms of decreases of consumption, abstinence or quit rates. However, obstacles in drawing more specific conclusions exist due to differences in design, settings, duration, content and intensity of intervention, length of follow-up, methods of evaluation and also in definitions and measures (Bala, Strzeszynski, & Topor-Madry, 2017).

Evidence suggests that other interventions can have some preventive effect effective such as educational measures by medical staff, internet and computer based interventions in schools, extracurricular programs to promote personal and social skills and school tobacco policies (Wiessing et al., 2014).

In summary, there are many effective programs implemented in different settings, but also it is not a rare case that not evidence based interventions are implemented. 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 suggests that many interventions are not driven by theory (Bartholomew, Parcel, & Kok, 1998).

#### 1.4.3 Smoking cessation

Tobacco dependence is addiction recognized by the ICD-10 – International Classification of Diseases. Researches show that specific genotypes and receptor subtypes contribute to and play an important role in nicotine addiction. In addition, similarity in pharmacologic and behavioral processes that determine tobacco addiction and those that determine addiction from other substances such as heroin and cocaine was found. Additive nature of the nicotine can be also seen from the results of some researches indicating that, about one-third of those who have ever tried smoking become daily smokers. The development of nicotine dependence differs among smoker which can be grouped as rapid onset, slower onset and individuals resistant to dependence. Of concern is that young persons can develop dependence symptoms within days or weeks (DiFranza et al., 2000).



Nicotine dependence is characterized by tolerance, cravings, feeling a need to use tobacco, withdrawal symptoms during periods of abstinence, and loss of control over the amount or duration of use (Hughes & Hatsukami, 1986). Among factors correlated to development of nicotine dependence are age, sex, genetic predisposition, psychiatric disorders and substance use. (Benowitz, 2010) Widely used test for nicotine dependence also in general population surveys are Heaviness of Smoking Index (Heatherton, Kozlowski, Frecker, Rickert, & Robinson, 1989) and Fagerström Test for Nicotine Dependence (Heatherton, Kozlowski, Frecker, & Fagerstrom, 1991). Time-to-first-cigarette item was found to be a most important single-item measure of nicotine dependence (Baker et al., 2007). While DSM and ICD define criteria for addiction, these tests can be used to determine the degree of dependence.

Nicotine addiction can be cured, although often repeated interventions are needed. Evidence based interventions include behavioral interventions alone or in combination with pharmacological treatment (Laniado-Laborin, 2010). There are several proven pharmacotherapies that improve chances of quitting when used alone or in combinations, namely Nicotine replacement Therapy (NRT), bupropion, varenicline and cytisine with no significant side effects (Cahill, Stevens, Perera, & Lancaster, 2013). Cochrane reviews of randomized controlled trials provide evidence of effectiveness of brief advice from a health-care worker given opportunistically in smoking cessation. This review also provide evidence in favor of telephone helplines, automated text messaging and printed self-help materials.

(West et al., 2015). In recent decades there is growing number of internet based interventions. Although not all studies can confirm effectiveness, still there are evidence from research that such interventions might be useful in assisting smokers to quit especially those with tailored messages and frequent contacts (Civljak, Sheikh, Stead, & Car, 2010). Such interventions are evaluated among adults. It was found that they can be effective with or without additional behavioral support (Taylor et al., 2017).

Cost-effectiveness review on electronic support to smokers actively seeking help provide evidence that such interventions can be effective alone and when implemented with brief advice or more intensive counselling (Chen et al., 2012). Mass media campaigns can be effective in increasing smoking cessation rates among general population, but effects largely depends on allocated expenditures for such campaigns (Kuipers, Beard, West, & Brown, 2018) as well as on other factors such as the intensity and duration of mass media campaigns (Bala et al., 2017).

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 good strategy for reduction of smoking-related mortality and morbidity (Breslau & Peterson, 1996). The age at which a person begins to smoke cigarettes has been found to be related to the total number of years of subsequent smoking.

Findings show that all health-care professionals should consistently deliver smoking cessation interventions to their patients (Raw, McNeill, & West, 1998). However, in developing countries, not only that physicians are less involved in tobacco control and smoking cessation efforts (Abdullah et al., 2010) but there is high prevalence of smoking among them. In addition, smoking at work or in front of patients is commonly practiced by physicians in some countries (Abdullah et al., 2014).

Smoking cessation among youth is complex having in mind episodic nature of adolescent smoking and there is indication that complex approaches might be effective. At the same time there is lack of robust evidence for pharmacological interventions for adolescent smokers (Stanton & Grimshaw, 2013).

In addition to need for development of smoking cessation interventions, research also calls for focusing on motivation of smokers to quit and ways to increase frequency of quit attempts. (Zhu, Lee, Zhuang, Gamst, & Wolfson, 2012).

## **1.5 New challenges in tobacco control**

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). There is discussion on how emerging tobacco products will contribute to this epidemic. Emerging products are often described as “reduced risk products” (RRP) and as alternatives to combustible cigarettes with the potential to reduce the health risks from smoking. The mutual characteristic is that many of these products are not subject to smoke free laws and there is insufficient evidence about long term health consequences which is understandable given the novelty of products on the market.

Some of the tobacco products are new, but some, such as waterpipe, were known for decades. In many countries waterpipes, after being limited for centuries to EMR region of the WHO are gaining popularity in other parts of the world. In EU, 13% of adults and three in ten (28%) respondents aged 15-24 have at least tried using a water pipe. Prevalence of waterpipe use increased not only in the Eastern Mediterranean region but also globally (Rastam, Ward, Eissenberg, & Maziak, 2004; Soule, Lipato, & Eissenberg, 2015).

Factors that contributed to increase in the waterpipe use are introduction of maassel which is flavored and aromatic waterpipe tobacco, media promotion during the nineties lack of knowledge about the risk, social acceptability, easy access, traditions and gaps in regulation and enforcement (Momenabadi, Kaveh, Hashemi, & Borhaninejad, 2016; Rastam et al., 2004; Soule et al., 2015). Not much is known about health effects and treatment due to the water pipe use (Maziak, Ward, Soweid, & Eissenberg, 2004). However, the evidence exists that

waterpipe smoke contains harmful constituents and there is preliminary evidence on association of water pipe smoking to a variety of short term and long term health consequences. Potential risk of waterpipe tobacco smoking is CO poisoning because of the high concentrations of CO found in waterpipe tobacco smoke (Soule et al., 2015). Additional short term effects are a modest increase in heart rate, blood pressure, and maximum end-expiratory carbon monoxide (Shafagoj & Mohammed, 2002). Long term health risk of waterpipe use include lung cancer, low birth weight and respiratory illness (Akl et al., 2010) Evidence also point out to possible association of water pipe tobacco smoking and periodontal disease (Warnakulasuriya, 2011). Research also found association of waterpipe tobacco smoking with cardiovascular disease and therefore it is needed to document waterpipe tobacco smoking as risk factor in a same way as cigarette smoking (Sibai et al., 2014).

In response to the documented harms of cigarette smoking and smoke free laws, new products promoted as „heat not-burn“(HNB) tobacco cigarettes were launched in recent years. This product is promoted as tobacco which is heated up to 350 C°, not burned and there is no exposure to tobacco smoke in the environment (PMI, 2017). The key difference from e-cigarettes is that heated tobacco products heat real tobacco instead of a nicotine-containing liquid. Pilot programs for IQOS, PMI's heated tobacco product began in 2014 in Japan and in 2015 in Switzerland and Italy, and since 2016, a total of 19 countries have allowed the sale of IQOS cigarettes. Growing popularity can also be seen from the data showing that in 2016 IQOS had captured 2.2% of the cigarette market in Japan (Auer, Concha-Lozano, Jacot-Sadowski, Cornuz, & Berthet, 2017). Currently IQOS is present in 30 countries, including 19 European countries, and applications have been submitted to market it as a modified risk tobacco product in the USA (Liu et al., 2018). Evidence from some existing independent toxicological studies confirm presence of harmful and potential harmful substances in HTP substances, even so at reduced level compared to conventional cigarettes (Liu et al., 2018; Ruprecht et al., 2017). One study found 84% of the nicotine of those found in conventional cigarette smoke (Tettauerová, 2007). In addition, studies conducted by tobacco industry on modified risk of heated tobacco products claim that heating, instead of burning, tobacco reduces the amount of toxic compounds reduced toxicity and no new hazards ( Smith et al., 2016). One of the tobacco industry studies claim that heated tobacco product pose lower risk to oral health compared to cigarettes (Zanetti et al., 2018). In the EU, developments related to heated tobacco products are closely monitored by European Commission which favors cautious approach (European Parliament, 2017). There are not many surveys on prevalence and trend in use of heated tobacco products. In Italy, it was found that 1.4% have tried IQOS and 2.3% intended to try it (Liu et al., 2018). In Japan, increase in prevalence was observed from 0.3% in 2015 to 3.6% in 2017 (Tabuchi et al., 2017).

Systematic review published in 2016 with four studies of RRP (cigarettes with reduced levels of tar, carbon and nicotine, and in one case delivered using an electronically-heated cigarette smoking system) concluded that despite some reduction in exposure to certain number of

toxicants, there were not enough evidence to support their use of other harm reduction (Lindson-Hawley et al., 2016). Another concern is increase of use among younger population groups. According to research based on US National Adult Tobacco Survey data 2012-2013 it was found that prevalence of non-cigarette tobacco product use is highest among young adults; and that openness to using non-cigarette tobacco products was greatest for water pipes (28.2%) and e-cigarettes (25.5%) (Mays et al., 2016).

Surveys that were conducted in 2013 and 2014 in Serbia didn't include any question on waterpipe tobacco smoking and heated tobacco products. Therefore, within this thesis special attention will be paid only on electronic cigarettes.

### 1.5.1 Electronic cigarettes

Electronic cigarettes are battery powered devices designed to electrically heat and vaporize e-liquids to produce inhalable vapors. These products are also known as electronic nicotine delivery systems (ENDS), alternative nicotine delivery systems (ANDS) or vaporized nicotine products (VNPs) (Villani, 2001). Common liquid is solution of nicotine (e-liquid) and other additives (including propylene glycol, vegetable glycerin and ad hoc flavoring agents (Kaisar, Prasad, Liles, & Cucullo, 2016).

Tobacco companies have started developing electronic nicotine delivery systems since 1963 and in response to decrease in social acceptability of smoking Phillip Morris started developing a nicotine aerosol device in 1990 (Dutra, Grana, & Glantz, 2017). However, Chinese pharmacist Hon Li is considered as inventor of this product in 2003 (Rahman, Hann, Wilson, & Worrall-Carter, 2014). Not long after product was invented it appeared on the European market (in 2006) and American markets (in 2007) (Noel, Rees, & Connolly, 2011).

In the comprehensive internet searches of English-language websites from May–August 2012 and December 2013–January 2014, 466 brands (each with its own website) and 7764 unique flavors were identified (S.-H. Zhu et al., 2014). Since its appearance, these products gain popularity in many countries. Among EU citizens, in 2016, nearly one in ten (9%) have tried them once or twice but do not use them regularly, while 2% currently use them European Commission, 2017).

Study conducted in 13 Eastern European urban areas show that around 33% of adolescents have used e-cigarette. Almost 20% of Eastern European adolescents have used e-cigarettes 3 times or more (Kristjansson et al.).

Appearance of new tobacco products in 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 et al., 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).

There is also discussion on effectiveness of e-cigarette use as smoking cessation aid. Research show that even so it is very likely that ENDS are less toxic than cigarette smoke, there is currently insufficient evidence to conclude that e-cigarettes are effective in helping current smokers to successfully quit. In study of 5717 US adults from 2014, it was found that many current smokers who have tried ENDS reject them as a satisfying alternative to regular cigarettes. The same study call for continued surveillance in order to evaluate potential impact of ENDS on population quit rates (Pechacek, Nayak, Gregory, Weaver, & Eriksen, 2016).

Report of the seventh session of the Conference of the Parties to the WHO Framework Convention on Tobacco Control states that its very likely that ENDS are less toxic than cigarette smoke, but also that is unlikely that these products are not harmful. Due to e-cigarette potential as smoking cessation aid, there is need for further research in this respect, including best ways to regulate it (WHO, 2016).

On the other hand, there are experts that see great potential of such products from the perspective of harm reduction. Harm reduction is approach which related to tobacco control originates from 1970s when it was pointed out by some researcher that the nicotine is not the leading factor for smoking related diseases but combustion process (Russell, 1976). Harm reduction interventions are aimed to reduce consequences of tobacco use among those who do not want to quit. Of importance for decision making about the implementation of such strategies are effectiveness of products and their safety as well as potential use among never smokers and youth in particular. Relevant England authorities in their policy paper for tobacco control plan "Towards a smoke-free generation: tobacco control plan for England", foreseen actions on maximizing the availability of safer alternatives to smoking as well as evaluation of their effects, and also state that will evaluate role of the novel tobacco products in reducing the risk of harm to smokers (Global and Public Health/Population Health/HB/ cost centre, 2017).

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). One of studies points out that electronic cigarettes (ECs) are useful for smoking cessation, but also state that the long-term safety of ECs is unknown (Hartmann-Boyce et al., 2016). Another systematic review conducted in 2014 indicated that ECs helped smokers unable to stop smoking to reduce their

cigarette consumption but researcher also emphasized limitations of the studies included in the review (McRobbie, Bullen, Hartmann-Boyce, & Hajek, 2014).

Evidence from general population surveys support effectiveness of e-cigarette in smoking cessation, however, some research claim that evidence from RCT do not provide robust evidence to support this claim (Farsalinos, 2018).

ENDS are regulated differently in countries as Tobacco products (includes imitation tobacco products), Medicinal/pharmaceutical products, Consumer products, ENDS/E-Cigarettes Poison. Also different aspects are regulated and these aspects are Sales, Minimum age, Advertising, promotion and sponsorship, Vape-free places, Packaging and labeling, Tax Product regulation, Required reporting/disclosures (Institute for Global Tobacco Control, 2017).

In general, a range of regulatory approaches are being applied to e-cigarettes globally; many countries regulate e-cigarettes using legislation not written for e-cigarettes. The research published in 2017 identified 68 countries that regulate e-cigarettes: 22 countries regulate e-cigarettes using existing regulations; 25 countries enacted new policies to regulate e-cigarettes; 7 countries made amendments to existing legislation; 14 countries use a combination of new/amended and existing regulation (Kennedy, Awopegba, De León, & Cohen, 2017).

In European Union, EU Tobacco Products Directive 2014, in addition to other tobacco products, regulates also the manufacture, presentation and sale of e-cigarettes and novel tobacco products. The aim of this directive is to facilitate the smooth functioning of the internal market for tobacco and related products, in order to protect human health, especially for young people, and to meet the obligations of the Union under the WHO FCTC.

According to this directive, among others, manufacturers and importers must notify government at least *six months* prior to placing new product on the market; maximum nicotine concentration is 20 mg/ml; max volume for cartridges and tanks is 10 ml for refill containers and 2 ml for single-use/disposable.

In addition to regulatory framework, attitudes and behaviour of youth and young adults in respect of e-cigarette is becoming as important as in the case of conventional tobacco products, as data show that newest brands tend to highlight multiple flavors and product versatility, while older brands promoted their advantages over conventional cigarettes (Zhu et al., 2014).

## 1.6 Tobacco epidemic and tobacco control in Serbia

After initial activities on tobacco control in Serbia in 2003, more organized and intensive activities were conducted from 2006 – 2011, mostly due to efforts of tobacco control experts and the strong political support lots of activities and measures were implemented. In 2007, Strategy of Tobacco Control 2007 – 2015 was adopted by the Government of Serbia with Action Plan 2007 – 2011. The most important achievements in this period were ratification of the FCTC in 2005 (took into effect in 2006) and adoption of the smoke free law in 2010.

However, due to low compliance and gaps in smoke free law as well as social acceptability of tobacco use, prevalence of smoking in Serbia is still high and above EU average.

Main tobacco related legislation include:

- Law on the Protection of Citizens from Exposure to Tobacco Smoke (Official Gazette 30/2010)
- Tobacco Law (Official Gazette 101/05, 90/07... 108/13)
- Law on Advertising (Official Gazette 6/2016)
- Excise Tax Law (Official Gazette 22/01,...61/07, 31/2009...47/13.....103/15)
- Customs Law (Official Gazette 18/2010; 111/2012)

Law on Protection of Citizens against Tobacco Smoke (hereinafter smoke free law) regulates smoking in enclosed spaces. According to this Law smoking is forbidden at working places, schools and other public institutions and in public transportation. The main gap of the Law is exemption that was made for the hospitality sector. Exemption was made in such way that if hospitality facility is smaller than 80m<sup>2</sup> owner can choose to allow or ban smoking and if it is bigger than 80m<sup>2</sup> non-smoking area has to be provided.

Related to Article 6 of the FCTC (Price and tax measures to reduce the demand for tobacco), in Serbia mixed excise system exists (specific excise + ad valorem + VAT). Since 2012 the Excise Law regulates the excise policy related to cigarettes and other tobacco products until 2016. The proportion of the retail price of the most popular price category of cigarettes, mostly used tobacco product in 2016 is 77.98%. However, price of cigarette pack in Serbia is still low and affordable.

Smoke free law in Serbia is not aligned with recommendations from Article 8 - Protection from exposure to tobacco smoke, as there is exemption to smoking ban for hospitality sector.

There is also room for improvement as regards of Articles 9 and 10 (Regulation of the contents of tobacco products and of tobacco product disclosure) and Article 11 – Packaging and labeling of tobacco products. According to Law on Tobacco (Official Gazette of the Republic of Serbia, No. 101/05, 90/07, 95/10, 36/11, 93/12 and 108/13) the cigarettes sold on the territory of the Republic of Serbia could not contain more than: 10 mg of tar per cigarette, 1 mg of

nicotine per cigarette and 10 mg of carbon monoxide per cigarette. Regulation of tobacco product disclosures has not been included in the Law at all. Same Law bans the use of text, names, signs and symbolic and other representations, in Serbian or in any other language, suggesting that the tobacco product is less harmful than other tobacco products, and especially the emphasis of the words 'low tar', 'light', 'ultra light', 'mild', and similar, is banned. There is no ban on the display of colours or other industry package design techniques or figures for emission yields on packaging and labelling and health warnings on the tobacco packages cover 30% of the principal display. Pictorial health warnings are not required by the Law and in that respect Serbian legislation is not in line with the Tobacco Product Directive. (Union, 2014) Updated Serbian Law on Advertising which entered into force in 2016 prohibits all forms of advertising of tobacco and tobacco products, with exceptions for publishing information on quality and other features of tobacco products at point of sale, in professional books, journals and other professional publications that are reserved for manufacturers and retailers of these products. Law on Advertising also regulates the advertising ban of specific types of deceptive, misleading and comparative advertising and unfair commercial practices. However, promotion and advertising are not banned at the point of sale, which is now the most important way of promotion of tobacco products.

Law on Advertising, bans promotion and advertising of electronic cigarettes, fluids and parts of electronic cigarettes.

Many different media campaigns have been performed in previous years. Some of them were awarded by the WHO. However, since 2012 due to the lack of sustainable funding of tobacco control a limited number of media campaigns were released in past two years.

There are tobacco cessation services within different levels of health care system. Smoking cessation counselling units have been established in the period 1993-2016, while in some institutions these units don't function anymore. Smoking cessation is provided by various health professionals (epidemiologist, specialist of social medicine, specialist of hygiene, psychiatrists, nurses...). Individual and group counselling are free of charge while pharmacotherapy is not covered by health insurance. Number of smokers receiving smoking cessation support is not higher than 3000 which is extremely low number taking into account number of 2,5 estimated smokers (Kilibarda, Nikolic, & Vasic, 2018) Telephone quit line and internet based cessation programs and applications are not available at national level. Apart from the low coverage with services, one of the barriers for achieving better results was high smoking prevalence among health workers (47.1% of nurses and 29.1% of doctors; Krstev, Marinkovic, & Simic, 2014) which was similar to situation in other developing countries (Abdullah, Stillman, & Yang, 2014).



## 2 Aims and hypothesis of the thesis

Despite smoking being of great public health concern in Serbia and fact that there were several representative surveys including smoking issues, still there is no comprehensive overview to guide tailored preventive interventions and policies. 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 priorities. Gaps in availability of specific data will be identified to serve as guideline for design of further formative research.

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

Hypotheses:

- 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 Material and methods**

To fulfil aims of the thesis and to get as comprehensive picture on smoking among different population groups in Serbia, secondary analysis of data obtained through different surveys implemented in 2013 and 2014 was conducted.

Three national representative surveys among general population (adult and youth) were conducted in Serbia in 2013 and 2014, namely:

#### **National Survey on Lifestyles of the Citizens of Serbia in 2014**

This survey was conducted on nationally representative sample of 5835 adults 18-64 years old. Survey was conducted in line with European Monitoring Centre for Drugs and Drug addiction (EMCDDA) methodology for general population surveys on drugs. Detailed methodology is described elsewhere (Kilibarda, Mravcik, Martens, Sieroslowski, & Gudelj Rakić, 2014). This survey provides data on cigarette smoking prevalence, prevalence of electronic cigarettes use, prevalence of alcohol and illegal substance use, and include module on mental health (Kessler 6 scale)(Kessler et al., 2003) Apart from data on prevalence, survey provides data on tobacco related opinions and attitudes (risk perception of smoking).

#### **The Health Survey of Citizens of Serbia in 2013**

This survey was conducted on random, stratified two-stage cluster nationally representative sample of 13756 persons older than 15 years. For the third National health survey (2013), harmonization of research instruments with those of the European Health Interview Survey wave 2 (EHIS wave 2) was done. Detailed methodology is described elsewhere (Boričić et al., 2014). Variables relevant for this thesis are smoking prevalence, exposure to tobacco smoke, smokers that received advice to stop smoking and attitudes association of smoking and other diseases.

#### **The Global Youth Tobacco Survey among 13-15 years old students in Serbia 2013**

The Global Youth Tobacco Survey (GYTS) is a nationally representative school-based survey of students in VII and VIII grades of primary schools and I grade of high schools. It was conducted in 2013 and 3.994 eligible students completed the questionnaire, of which 3,076 were aged 13 - 15 years. Detailed methodology is explained elsewhere (Krstev, 2014). Variables used for analysis within this thesis are smoking prevalence, exposure to tobacco smoke, smoking cessation attempts, desire to quit, smoking related knowledge and attitudes.

#### **Research among populations most at risk to HIV and among people living with HIV**

For exploring smoking among vulnerable population groups we used data from the Bio-behavioural surveillance surveys among populations most at risk for HIV conducted in Serbia in 2013.

Populations 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).

The research had several components: behavioural (quantitative among all populations), qualitative (among MSM), estimation of the populations' size among PWID, MSM and SWs and sero-prevalent (bio-BSS) component (on HIV and HCV) among PWID, MSM and SWs. All studies are cross-sectional. Detailed methodology of research and its components are described elsewhere (IPHS, 2014). There were separated databases for each population group. In total, 3299 responses were analysed. Different sampling methodologies were applied across the groups, namely: RDS for men who have sex with men; Snowball sampling for sex workers; RDS for Roma youth; random sampling of clusters for children without parental care living in institutions and prisoners and convenient sampling for people living with HIV.

Smoking-related variable used for analysis within vulnerable population groups is smoking status. Smoking status was examined with the question "Do you currently smoke cigarettes" and the given reply options were: "yes", "no" and "I used to, but I do not anymore" and the last one was recorded to no smokers.

For all surveys, approval from Ethical Committee of the Institute of Public Health of Serbia was obtained.

Although not all aspects of tobacco and electronic cigarette use are covered in all mentioned surveys, all surveys provide useful data on prevalence of current cigarette use and at minimum allow comparison of smoking prevalence by sociodemographic characteristic. Therefore, secondary analysis of data obtained through surveys makes solid resource for comprehensive, in depth analysis of current situation in terms of prevalence of tobacco use and electronic cigarettes, patterns of use and correlates and exposure to tobacco smoke. The strength of this analysis is that all surveys are conducted in the period of two years so the smoking rates can be compared, taking into account limitation of non-random sampling methods used for surveys among vulnerable populations.

### **3.1 Data analysis**

For exploring smoking prevalence among different population groups, descriptive statistics was used. To determine statistically significant differences in smoking status by some socio demographic characteristic and substance use, column proportions Z test with Bonferroni correction or chi square test were used. To asses influence of sociodemographic characteristics and other substance use (alcohol and illicit drugs) logistic regression was applied and were reported as adjusted odds ratios (OR) and 95% CI. Reported statistical significance reported at the 5% level ( $P < 0.05$ ).

SPSS was used for data analysis. Cases in which data were missing for the variables of interest were excluded from analyses.

## 4 Results

### 4.1 Smoking and related factors among adults

In Serbia, 34.7% adults 15 years and older smoke, with higher percentage of smokers among males (37.9%) compared to females (31.7%). The highest smoking prevalence is in the age group 35-44 (47.0%) According to marital status, the highest percentage of smokers are among divorced people (54.9%) (Table 1).

*Table 1. Smoking status of Serbian adults 15+ according to sociodemographic characteristics, National Health Survey, Serbia 2013*

Socio demographic characteristics		Non smokers %	Current smokers %
Gender	Female	68.4	31.7
	Male	62.1	37.9
Age groups	15-17	86.6	13.4
	18-24	68.2	31.8
	25-34	55.9	44.1
	35-44	53.0	47.0
	45-54	54.3	45.7
	55-64	65.3	34.8
	65-74	80.1	20.0
	75+	91.7	8.3
Education status	Elementary or less	72.2	27.9
	Middle	60.3	39.8
	High	69.9	30.1
Type of settlement	Urban	63.6	36.4
	Rural	67.8	32.2
Marital status	Never married	67.4	32.6
	Married or informal marriage	63.6	36.4
	Widowed	78.2	21.8
	Divorced	45.2	54.9
Index of wealth	The first (poorest)	67.0	33.0
	The second	63.8	36.2
	The third	65.1	34.9
	The forth	65.1	34.9
	The fifth (richest)	65.6	34.4
Total		65.3	34.7

Gender differences exist regarding age groups and unlike total population, the highest smoking prevalence among females is in the age groups 45-54 (Table 2).

Table 2. Current smokers by age group and sex among Serbian adults 15+Serbia, National Health Survey, Serbia 2013

Age group	Sex		Total 95% CI
	Female %	Male %	
15-17	13.6.	13.2	13.4 (10.4-16.4)
18-24	30.5	33.1	31.8(29.0-34.6)
25 - 34	40.5	47.5	44.1 (41.8 to 46.3)
35 - 44	44.0	49.9	47.0 (44.7 to 49.3)
45 – 54	45.2	46.3	45.7 (43.5 to 47.9)
55 – 64	31.8	38.0	34.8 (32.8 to 36.8)
65 – 74	16.6	24.2	19.9 (17.8 to 22.2)
75 - 84	6.3	13.2	9.1 (7.1 to 10.9)
85+	3.4	5.0	4.0 (0.8 to 7.2)
Total	31.7	37.9	34.7 (32.5 to 37.0)

Compared to population 15-17 years old, 18-24 years old have more than three times odds of being smokers. Results of logistic regression also show higher odds of being smoker among people with high education compared to those with elementary school only, and divorced people compared to those who never been married (Table 3).

Table 3. Results of multivariate logistic regression analyses of sociodemographic characteristic predicting smoking among Serbian adults, 15+, National Health Survey, Serbia 2013

Sociodemographic characteristics	OR (95% CI)	
Gender	Female	ref
	Male	1.34 (1.24- 1.44)*
Age groups	15-17	ref
	18-24	3.12 (2.36-4.13)*
	25-34	5.29 (4.01-6.99)*
	35-44	5.45 (4.09-7.26)*
	45-54	4.98 (3.73-6.65)*
	55-64	2.99 (2.24-4.00)*
	65-74	1.36 (1.00-1.84)
	75+	0.46 (0.32-0.65)*
Education	Elementary or less	ref
	Middle	0.96 (0.87-1.07)
	High	0.64 (0.55-0.73)*
Settlement type	Urban	ref
	Other	0.72 (0.65-0.79)**
Index of wealth (quintiles)	The first (poorest)	ref
	The second	0.92 (0.81-1.03)
	The third	0.78 (0.68-0.89)**
	The forth	0.75 (0.66-0.87)**
	The fifth (richest)	0.69 (0.59-0.80)**
Marital status	Never married	ref
	Formal/informal marriage	1.15 (1.02-1.30)*
	Widowed	1.46 (1.20-1.77)**
	Divorced	2.39 (1.96-2.92)**

\*\*p<0.001

Average number of smoked cigarette among daily smokers is 18.7 and is higher among male compared to females (Table 4)

*Table 4 Average number of smoked cigarette by daily smokers among adult population, National Health Survey, Serbia 2013*

Gender	Mean, 95% CI	Std. Error	5% Trimmed Mean	Median	Std. Deviation
Female	16.7 (16.3-17.0)	0.180	16.29	15	7.433
Male	21.4 (21.0-21.9)	0.211	20.9	20	9.416
Total	19.2(18.9-19.5)	0.146	18.70	20	8.89

Every fifth smoker in Serbia, smoke more than 20 cigarettes per day with highest percentage of such smokers in the age group 45-54 and among poorest smokers (Table 5).

*Table 5. Smokers that smoke 20+ cigarettes daily by sociodemographic characteristics, National Health Survey, Serbia 2013*

Variable		Smokers smoking 20+ cigarettes a day %	p
Type of settlement	Urban	20.4	0,71
	Rural	20.1	
Gender	Female	14.69	0.00
	Male	25.90	
Age groups	15 - 24	8.09	0.00
	25 - 34	19.79	
	35 - 44	24.41	
	45 - 54	27.15	
	55 - 64	20.11	
Education	Elementary or less	19.5	0.00
	Middle	21.98	
	High	15.48	
Index of wealth	The first (poorest)	23.73	0.00
	Second	21.98	
	The third	19.78	
	The forth	19.18	
	The fifth (richest)	17.55	
Total		20.28	

According to general population survey on drugs conducted in 2014 found that highest percentage of smokers is in the age groups 45-54, but only slightly higher compared to groups 35-44. This survey also confirmed higher percentage of smokers among males and people living in urban areas. According to GPS 2014, manual workers has higher smoking prevalence compared to people with different occupation (Table 6).

Table 6. Smoking among Serbian general population 18-64, by sociodemographic characteristics, National Survey on Lifestyles of the Citizens of Serbia, 2014.

Sociodemographic characteristics		N	Current tobacco smoking (n=2164) % yes (95%CI)
Total		5385	40.2 (38.8-41.3)
Sex	Male	2676	44.3(42.1-45.7)
	Female	2709	36.2 (34.4-38.0)
<i>p</i> <0.001			
Age groups	18-24	693	34.7(31.1- 38.2)
	25-34	1126	42.5(39.6-45.4)
	35-44	1111	44.7(41.7-47.6)
	45-54	1158	45.1(42.2-48.0)
	55-64	1297	32.9(30.4- 35.5)
<i>p</i> <0.001			
Education	≤ Elementary	1419	40.4(37.5-43.2)
	Secondary	2942	42.5(40.8-44.2)
	Post-secondary	1024	33.4(30.5-36.3)
<i>p</i> <0.001			
Settlement type	Urban	3281	41.3(39.6-43.0)
	Rural	2105	38.4(36.4-40.5)
<i>p</i> =0.027			
Occupation	Non active	2321	38.7(36.8-40.7)
	Student	449	26.7(22.6-30.8)
	Manual worker	1125	50.2(47.2-53.1)
	Administrative worker	679	39.0(35.3-42.6)
	Businessman	167	40.4(32.9-48.0)
	Intellectual	582	37.9(34.0-42.0)
<i>p</i> <0.001			

On average, daily smokers in Serbia smoke for more than 22 years (Table 7).

Table 7. Mean number of smoking years by daily smokers, National Survey on Lifestyles of the Citizens of Serbia in 2014

Mean number of years smoking	Std. Error	95% CI	5% Trimmed Mean	Median	Variance
22.60	.27	(22.0723.13)	22.45	22	152.47

Smokers in Serbia on average light up the first cigarette at the age of 17.5 and started to smoke daily at the age 19.2 with gender differences (Table 8).



Table 8. Age of onset of first cigarette and daily smoking among Serbian adults 18-64 by gender, National Survey on Lifestyles of the Citizens of Serbia in 2014

Age at onset		Mean	Median	Standard Error of Mean	Standard Deviation	p
Age at first cigarette or other tobacco product like cigars or a pipe	Male	16.7	16	0.0	4	0.0
	Female	18.5	17	0.0	5	0.0
	Total	17.5	17	0.0	5	0.0
Age at starting daily use of tobacco such as cigarettes, cigars or a pipe daily?	Male	18.4	18	0.0	4	0.0
	Female	20.2	19	0.0	6	0.0
	Total	19.2	18	0.0	5	0.0

According to National Survey on Lifestyles of the Citizen, less than two years was period from the first cigarette to daily smoking (Table 9).

Table 9. Number of years since onset of smoking to daily smoking among Serbian population 18-64 by gender, National Survey on Lifestyles of the Citizens of Serbia in 2014

Gender	Mean	Median	Standard Error of Mean	Standard Deviation	p
Male	1.68	1	0.059	2.41	0.211
Female	1.86	1	0.096	3.42	
Total	1.76	1	0.054	2.89	

#### 4.1.1 Electronic cigarettes use

In Serbia, in 2014, almost every tenth adult citizens tried electronic cigarette (9.6%), with higher percentage of citizens from younger age groups. Unlike the conventional cigarettes, electronic cigarette were more popular among more educated people (Table 10).

Table 10. Prevalence of tobacco and e-cigarette use in 2014 by the Serbian adult population as a function of sociodemographic characteristics, National Survey on Lifestyles of the Citizens of Serbia in 2014

Variable		Ever e-cigarette use (n=517) % (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)
	<i>p</i> *	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)
	<i>p</i> *	<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)
	<i>p</i> *	<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)
	<i>p</i> *	<0.001	.0177
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)
	<i>p</i> *	<0.001	0.008

\*All *p* values are from  $\chi^2$  tests

There is significant difference in electronic cigarette use according to smoking status, both for ever and current e cigarette use. The most popular, electronic cigarette is among current daily smokers, with only few cases of ever use among never smokers (Table 11).

Table 11. E-cigarette use according to tobacco smoking status among adult Serbian population in 2014, National Survey on Life Styles of Citizens of Serbia, 2014

Smoking status	N	Ever e-cigarettes use		Current e-cigarette use	
		row %	n	row %	n
Never smoker	1914	0.3	6	0.0	0
Tried smoking but never smoked	338	2.9	10	0.0	0
Previously smoked but not on daily basis but do not smoke anymore	231	5.1	12	1.3	3
Previously smoked on daily basis but do not smoke anymore	762	9.4	71	3.9	30
Currently smoking occasionally	214	12.8	27	3.3	7
Currently smoking daily	1926	20.2	390	3.4	66
Total	5385	9.6	516	2.0	106
Chi-square tests		$\chi^2 = 467.38;$ $p = 0.000$		$\chi^2 = 84.23;$ $p = 0.000$	

Average number of cigarettes smoked per day is lower among current e-cigarette users compared with those who are not. However, difference in number of smoked cigarettes between current and non-current electronic cigarettes users is not statistically significant for females. (Table 12).

Table 12. Mean (SD) number of daily cigarettes among adult Serbian smokers as a function of current e-cigarette use in 2014, National Survey on Life Styles of Citizens of Serbia 2014

	Current e-cigarette users	Current e-cigarette nonusers	Mdiff 95% CI	t	p
Female	15.37 (6.90)	14.98 (8,74)	-0.39 (-2.9,2.2)	-0.30	0.77
Male	16.41 (8.01)	20.37 (9.99)	3.96 (0.4,7.5)	2.20	0.03
Total	15.78 (7.33)	17.96 (9.82)	2.17 (0.2,4.4)	1.94	0.05

#### 4.1.2 Exposure to tobacco smoke

According to Health survey in Serbia 2013, 45.4% of males and 38.6 females are exposed to tobacco smoke one or more hours per day. Population in the age group 35-44 was most exposed to tobacco smoke, followed by population 44-54 years.

Table 13. Exposure to tobacco smoke, National Health Survey Serbia, 2013

Exposure to tobacco smoke	Never or almost never %	Less than 1 hour per day %	One or more hours per day %
Gender	Female	31.01	38.64
	Male	22.69	45.43
Ag group	15-17	25.53	38.00
	18-24	15.45	48.64
	25-34	14.59	48.59
	35-44	18.55	49.27
	45-54	20.45	48.98
	55-64	30.72	40.37
	65-74	45.39	28.37
	75+	62.59	15.96
Education	Elementary or less	34.83	37.21
	Middle	22.70	46.24
	High	27.79	35.86
Settlement	Urban	26.28	42.08
	Other	28.00	41.72

### 4.1.3 Attitudes toward smoking and risk perception

In general, half of population is very or rather worried because of consequences of smoking, expectedly more smokers than non-smokers (Table 14).

Table 14. Percentage of population worried because of consequences of smoking according to smoking status, National Health Survey 2013

Are you worried because of exposure to tobacco smoke or smoking to your health	Smokers %	Non smokers %	Total %
Yes, very	23.3	24.6	24.1
Rather worried	34.8	22.5	26.8
Not too much	25.9	21.7	23.2
Not at all	11.9	16.1	14.6
NA	4.1	15.2	11.3
$\chi^2= 55.462, p=0.000$			

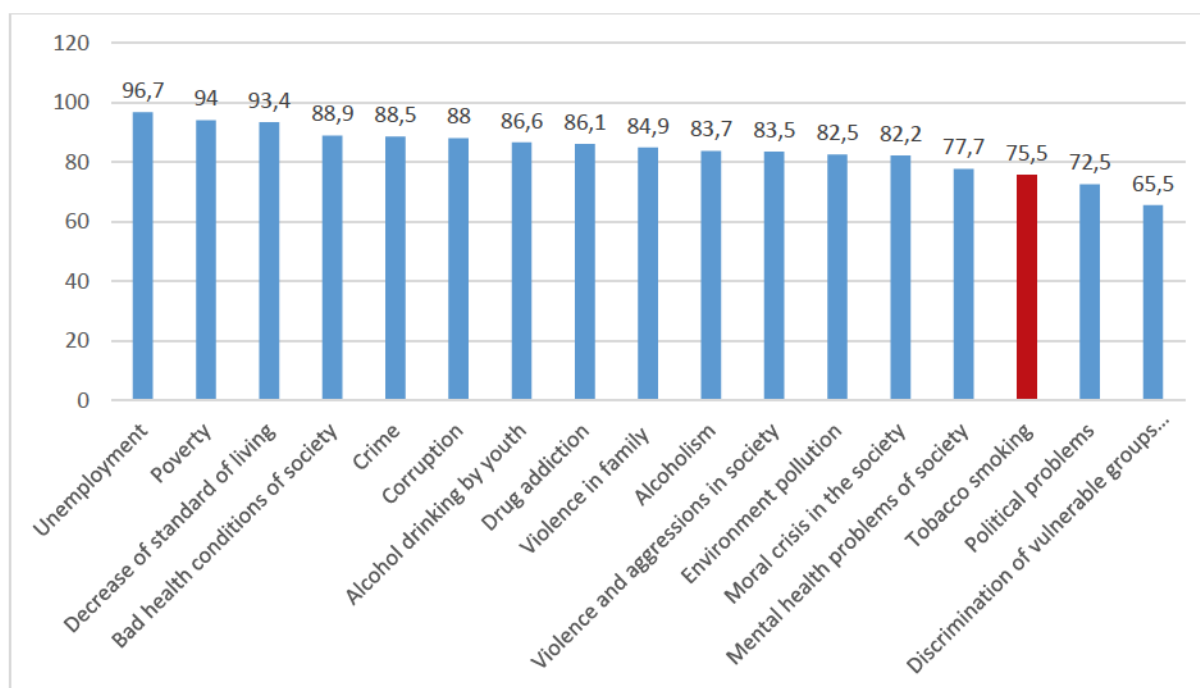
However, it can be seen that rather small percentage of smokers think they risk getting sick of some disease with their health related behaviour, with less than 10% of smokers who think that they risk getting sick of cancer due to their behavior. The highest risk perception is related to cardiovascular diseases (CVD), but still only 22% of smokers think they risk getting ill of CVD (Table 15).

Table 15. Percentage of smokers who think that risk certain disease with his/her behaviour, National Health Survey 2013

Sociodemographic characteristics		Think that risk diabetes		Think that risk CVD		Think that risk lung disease		Think that risk cancer	
		%	p	%	p	%	p	%	p
Age groups	15-17	6.7	0.000	7.8	0.000	10.5	0.000	2.6	0.001
	18-24	5.4		9		12.6		5.1	
	25-34	8.2		13.7		18.7		9.7	
	35-44	14.3		23.8		22.9		12.3	
	45-54	15.2		27.6		23		10.6	
	55-64	16.4		30.6		22.3		10.4	
	65-74	13.4%		26		17.2		9	
	75+	9.3%		18.8		11.6		3.7	
Education	Elementary	14.2	0.162	21.7	0.001	18.8	0.000	8.4	0.001
	Middle	12.1		20.7		19.3		9.5	
	High	11.5		27.8		26.6		13.7	
Sex	Female	13.9	0.006	23.9	0.002	21.7	0.011	11.5	0.001
	Male	11.3		20.2		18.9		8.5	
Place	Urban	13.0	0.105	23.7	0.000	22.5	0.000	10.8	0.003
	Other	11.6		19.1		16.4		8.2	
Index of wealth	First (poorest)	10.5	0.218	18.3	0.000	16.7	0.000	7.3	0.000
	The second	12.8		19		18.5		7.0	
	The third	11.8		23.2		19.2		9.1	
	The fourth	13.2		25.4		24.3		12.7	
	The fifth	14		23.7		22.6		13.6	
Total		12.5		22		20.2		9.9	

According to General Population Survey 2014, Serbian adults do not perceive smoking as important problem in society and only 75.5% find it as important or very important. Only political problems and discrimination of vulnerable groups are ranked as less important than tobacco smoking compared to other problems in society (Graph 1).

*Graph 1. Percentage of adults who think that specific problem is important or very important compared to other problems in society, National Survey on Life Styles of Citizens of Serbia 2014*



There are significant differences in opinions on importance of tobacco smoking according to sociodemographic characteristics. Females, older population and no smokers recognize importance of tobacco smoking as problem in society in higher percentage compared to other population groups (Table 16).

More than two thirds (66.5%) of adults perceived smoking one or more packs of cigarettes per day to be great risk. There is also a significant difference in risk perception according to smoking status. Among adults that perceive smoking one or more packs of cigarettes per day to be great risk, 48.9% are non-smokers, 31.7% are current smokers and 19.4% are ex-smokers (Table 17).

Table 16. Opinions on importance of tobacco as problem for society, adults 18-64, National Survey on Life Styles of Citizens of Serbia 2014

Variables			Rather important + important	Neither important nor unimportant	Rather unimportant + unimportant
			%	%	%
Gender	Male	A	72.9%	17.1% B	10.0% B
	Female	B	78.0% A	14.0%	7.9%
Age	18-24	A	74.5%	16.0%	9.5%
	25-34	B	73.6%	16.5%	9.7%
	35-44	C	73.1%	18.80% E	8.1%
	45-54	D	74.4%	14.6%	10.90% E
	55-64	E	80.50% ABCD	12.5%	6.9%
Education	Elementary or less	A	74.0%	14.5%	11.4%
	Secondary	B	74.9%	16.3%	8.7%
	College or university	C	79.2%	13.9%	6.8%
Settlement type	Rural	A	74.4%	15.9%	9.7%
	Urban	B	76.2%	15.3%	8.4%
Smoker status	No smoker	A	80.3% C	12.3%	7.3%
	Ex-smoker	B	78.0% C	15.9% A	6.2%
	Smoker	C	69.2%	18.8% A	12.0% AB
Total			75.5%	15.5%	8.9%

Table 17. Risk perception of smoking one or more packs of cigarettes per day according sociodemographic characteristics and smoking status, National Survey on Life Styles of Citizens of Serbia 2014

Variable			No risk	Slight risk	Moderate risk	Great risk
Gender	Male	A	2.6% B	11.1% B	24.4% B	61.9%
	Female	B	1.4%	8.1%	19.4%	71.1% A
Age	18-24	A	2.6%	8.3%	24.1% E	65.0%
	25-34	B	2.1%	9.6%	22.9% E	65.4%
	35-44	C	2.2%	10.1%	22.0%	65.7%
	45-54	D	2.0%	10.3%	24.3% E	63.5%
	55-64	E	1.5%	9.3%	17.5%	71.7% ABCD
Education	Elementary or less	A	2.2%	12.6% BC	18.4%	66.9%
	Secondary	B	2.1%	9.5% C	23.8% AC	64.5%
	College or university	C	1.3%	6.7%	19.9%	72.0% AB
Settlement type	Rural	A	2.3%	10.2%	21.5%	66.0%
	Urban	B	1.8%	9.2%	22.1%	66.8%
Smoker status	No smoker	A	0.9%	5.7%	15.6%	77.8% BC
	Ex smoker	B	0.4%	9.0% A	20.6% A	70.0% C
	Smoker	C	3.9% AB	14% AB	29.1% AB	53.0%
Total			2.0%	9.6%	21.9%	66.5%

Higher odds of being smokers have adults who think tobacco is not an important problem compared with people who think it is and those who perceive smoking as not risky compared with those who think it is a great risk (Table 18).

Table 18. Logistic regression - last month smoking status and sociodemographic characteristics, opinions and risk perception, National Survey on Life Styles of Citizens of 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.

#### 4.1.4 Smoking cessation

According to Health Survey 2013, every fifth smoker tried to stop smoking in the last 12 months. The lowest percentage is in the age group 45-54, while younger population groups had more quit attempts (Table 19).

Table 19. Percentage of smokers that tried stop smoking in the last 12 months, National Health Survey 2013

Variable		Have you tried to stop smoking in the last 12 months? (%)
Gender	Female	34.22
	Male	31.95
Age groups	15-17	52.86
	18-24	35.32
	25-34	36.07
	35-44	32.23
	45-54	29.36
	55-64	32.24
	65-74	35.93
	75+	33.72
Education	Elementary	34.10
	Middle	33.11
	High	30.86
Type of settlement	Urban	32.50
	Other	33.91
Total		20.28

Slightly more than one third of smokers received advice from health professionals to stop smoking with differences according to sociodemographic characteristics. Smokers in the age group 56-74, received such advice in highest percentage, despite highest prevalence of smokers being in younger age groups. There are no statistically significant difference according to index of wealth (Table 20).

*Table 20. Percentage of smokers receiving advice from health professionals to stop smoking, National Health Survey 2013*

<b>Variables</b>		<b>Yes %</b>	<b>No%</b>	<b>MISS</b>	<b>P</b>
Total		31.7	58.4	9.9	
Settlement type	Urban	32.5	58.4	9.1	0.04
	Rural	30.4	58.4	11.2	
Gender	Female	33.3	55.5	11.2	0.00
	Male	30.3	61.1	8.7	
Age groups	15 - 24	18.8	66.9	14.3	0.00
	25 - 34	21.1	70.5	8.4	
	35 - 44	26.6	66	7.4	
	45 – 54	37.8	54.3	7.8	
	55 – 64	43.1	46.3	10.6	
	65 – 74	47.1	40.3	12.6	
	75 - 84	36.6	37.4	26	
	85+	24.6	22	53.4	
Education	Elementary or less	33.8	53.9	12.3	0.00
	Middle	31.3	59.4	9.3	
	Higher of high	29.8	61.6	8.6	
Wellbeing index in quintiles	First (the poorest)	31.9	57.5	10.6	0.36
	Second	31.6	57.8	10.6	
	Third	31	59.7	9.3	
	Forth	32	56.9	11	
	The fifth	32	60.2	7.8	

#### 4.1.5 Association of smoking with substance use and mental health

Results from The National Survey on lifestyles of citizens of Serbia, 2014 show difference in substance use according to smoking status with smokers having higher last year prevalence of binge drinking, risky drinking, problem drinking and psychological distress (Table 31).



Table 31. Smoking status by substance use and psychological distress among adult population in Serbia, the National survey on lifestyles of citizens of Serbia, 2014

Variables	N	Current smoker % (95% CI)	Non-smoker % (95% CI)
Total population 18-64	5385	40.2 (38.8-41.3)	59.8 (58.5-61.1)
<b>Alcohol use within last 12 months</b>			
No	1488	31.5% (29.1 -33.8)	68.5% (59.5-70.9)
Yes	3866	43.5% (41.9-45.1)	56.5% (54.9-58.1)
Chi square, p		$\chi^2=64.958, p=0.000$	
<b>Frequent binge drinking (60gr) at least once a week during last 12 months</b>			
No	5188	39.1 (37.8-40.5)	60.9 (59.5-62.2)
Yes	197	67.8 (61.2-74.3)	32.2 (25.7-38.8)
Chi square, p		$\chi^2=64.757, p=0.000$	
<b>Risky drinking (1+ on RAPS scale)</b>			
No	4570	38.2 (36.8-39.6)	61.8 (60.4-63.2)
Yes	715	53.0 (49.4-56.7)	47.0 (43.3-50.6)
Chi square, p		$\chi^2=56.386, p=0.000$	
<b>Problem drinking (2+ on RAPS scale)</b>			
No	5054	39.1 (37.8-40.4)	60.9 (59.6-62.2)
Yes	331	56.8 (37.8-40.4)	43.2 (37.8-48.6)
Chi <sup>2</sup> , p		$\chi^2=40.489, p=0.000$	
<b>Sedative use within last month</b>			
No	4599	40.0 (38.6-41.4)	60.0 (58.2-64.4)
Yes	786	41.5 (38.0-45.0)	58.5 (55.0-62.0)
Chi square, p		$\chi^2=0.637, p=0.425$	
<b>Sedatives more than 15 days in last 30 days</b>			
No	5088	40.0 (38.6-41.3)	60.0 (58.7-61.4)
Yes	297	43.9 (38.2-49.6)	56.1 (50.4-61.8)
Chi square, p		$\chi^2=1.809, p=0.179$	
<b>Cannabis use in last 12 months</b>			
No	5301	39.7 (38.4-41.0)	60.3 (59.0-61.6)
Yes	84	71.8 (62.3-81.8)	28.2 (18.2-37.7)
Chi square, p		$\chi^2=35.830, p=0.000$	
<b>Cannabis use in last 30 days</b>			
No	5340	39.9(38.6-41.2)	60.1(58.8-61.4)
Yes	45	78.3(66.4-90.4)	21.7(9.6-33.6)
Chi square, p		$\chi^2=27.964, p=0.000$	
<b>CAST*</b>			
No risk	60	66.7 (54.3-78.9)	33.3 (21,1-45.7)
Risky cannabis use	25	84.0 (70.5-100.0)	16.0 (-0.06-29.5)
Chi square, p		$\chi^2=2.617, p=0.106$	
<b>Psychological distress (Kessler6 scale)</b>			
No distress	4310	38.3 (36.8-39.8)	61.7 (60.2-63.2)
Mild to moderate distress	766	44.6 (40.8-48.4)	55.4 (51.6-59.2)
High distress	319	55.3 (49.3-61.3)	44.7 (38.7-50.7)
Chi square, p		$\chi^2=41.928, p=0.000$	

\*among last year cannabis users

The results show that the average number of smoked cigarettes is statistically significantly higher among people who reported frequent binge drinking in the last 12 months, those who can be considered risk or problem drinkers according to the RAPS scale, as well as among

people under high psychological distress. No differences in cigarette consumption however, were identified with regard to last year cannabis use and problem cannabis use (Table 32).

*Table 32. Cigarette consumption according to substance use and mental health status among current smokers (number of smoked cigarettes in the last month\*\*\*), The National survey on lifestyles of citizens of Serbia, 2014*

Variable	No	Yes	t	p	Std. error difference	95% CI of the difference	
						lower	upper
Binge drinking (60gr) at least once a week during last 12 months	17.44	24.61	-8.28	0.000	0.86	-8.86	-5.47
Harmful drinking (1+ on RASP scale)	17.33	20.49	-5.37	0.000	0.55	-4.24	-2.08
Problem drinking (2+ on RAPS scale)	17.71	20.84	-4.090	0.000	0.766	-4.633	1.630
Cannabis use in last 12 months	17.96	18.50	-.406	0.684	1,310	-3,102	2,037
Cannabis risk on CAST*	17.07	21,23	-1,251	0.216	3,318	-10.791	2.489
Psychological distress**	17.61	21.01	-3.601	0.000	0.945	-5.27	-1.54

\*Among last 12 months cannabis users \*\* No- no psychological distress or low to moderate; Yes- serious distress

\*\*\*Among those who smoked 1-90 cigarettes in the last month

With respect to sociodemographic characteristics, the smoking status was found to have a statistically significant association with almost all sociodemographic variables. Highly educated people, students, and people who perceive their financial status as average are less likely to be current smokers in comparison with the reference group in the respective categories. Alcohol and cannabis use are also statistically significant predictors of the smoking status, with exemption of recent cannabis users, problematic cannabis users according to the CAST scale as well as people with at least one positive response within the RAPS4 scale. According to the findings, people who are under serious stress are twice as likely to smoke compared to people who are not. The results show that the strongest predictors of the smoking status are frequent drinking, frequent binge drinking and last year prevalence of cannabis use (Table 33).

Table 33. Results of the binary logistic regression for the correlation between smoking status and other substance use and substance use and mental health disorders, The National survey on lifestyles of citizens of Serbia, 2014

Variable		OR (95% CI)	p
Sex	Female	ref	
	Male	1.12(0.98-1.28)	0.089
Age	Cont.	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 mar-	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 (0.66-0.85)	0.000
	Good or very good	0.81 (0.66-1.01)	0.059
Last month prevalence cannabis	no	ref	
	yes	1.27 (0.42-3.80)	0.668
Last year prevalence cannabis	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

Percentage of smokers is higher among those who use alcohol and illicit drugs compared to those who don't. This is finding consistent in every surveyed stigmatized population group. (Table 34).

*Table 34. Percentage of smokers among alcohol and drug users in adult and young vulnerable population groups, Research among populations most at risk to HIV and among people living with HIV, Serbia 2013*

Population group			Prisoners %	PLHIV %	SWs %	MSM %	ROMA Youth %	Institutionalized children %
Total			70.0	51.0	90.5	66.6	55.1	57.8
Alcohol use*	No	A	66.5	45.1	88.4	51.4	46.3	48.8
	Yes	B	85.1A	75.9A	92.1	74.7A	70.3A	72.0
Illicit drugs*	No	A	68.1	50.3	86.5	66.0	52.4	*
	Yes	B	89.7 A	73.9A	95.1 A	79.1	88.7A	*

\*last 12 month

## 4.2 Smoking and related factors among youth

According to Global Youth Tobacco Survey conducted in Serbia in 2013, 13.0% of student 13-15 years old smoke with higher percentage of smokers among girls compared to boys. Additional 17.5% percent of never smokers are susceptible to smoke in future (Table 21)

*Table 21. Tobacco use and susceptibility to smoking among students 13-15 years old, Global Youth Tobacco Survey, Serbia 2013*

Indicators	Overall % (95% CI)	Boys% (95% CI)	Girls% (95% CI)
Current tobacco smokers	15.0 (12.4 - 18.0)	15.3 (12.9 - 18.0)	14.6 (11.1 - 18.9)
$\chi^2 = 1542.373, p=0.000$			
Current cigarette smokers	13.0 (10.5 - 16.1)	12.7 (10.3 - 15.5)	13.3 (9.8 - 17.8)
$\chi^2 = 13.58, p=0.000$			
Frequent cigarette smokers	5.6 (4.1 - 7.6)	5.1 (3.7 - 7.0)	6.0 (4.0 - 9.0)
$\chi^2 = 62.17, p=0.000$			
Ever cigarette smokers	40.4 (36.6 - 44.4)	43.0 (39.2 - 46.8)	37.9 (33.1 - 43.0)
$\chi^2 = 394.891, p=0.000$			
Never tobacco users susceptible to tobacco use	17.5 (14.0 - 21.6)	15.0 (11.0 - 20.1)	19.7 (15.9 - 24.1)
$\chi^2 = 544.785, p=0.000$			
Never smokers who thought they might enjoy smoking a cigarette	6.2 (4.4 - 8.6)	7.6 (4.7 - 11.8)	5.0 (3.6 - 7.0)
$\chi^2 = 524.112, p=0.000$			

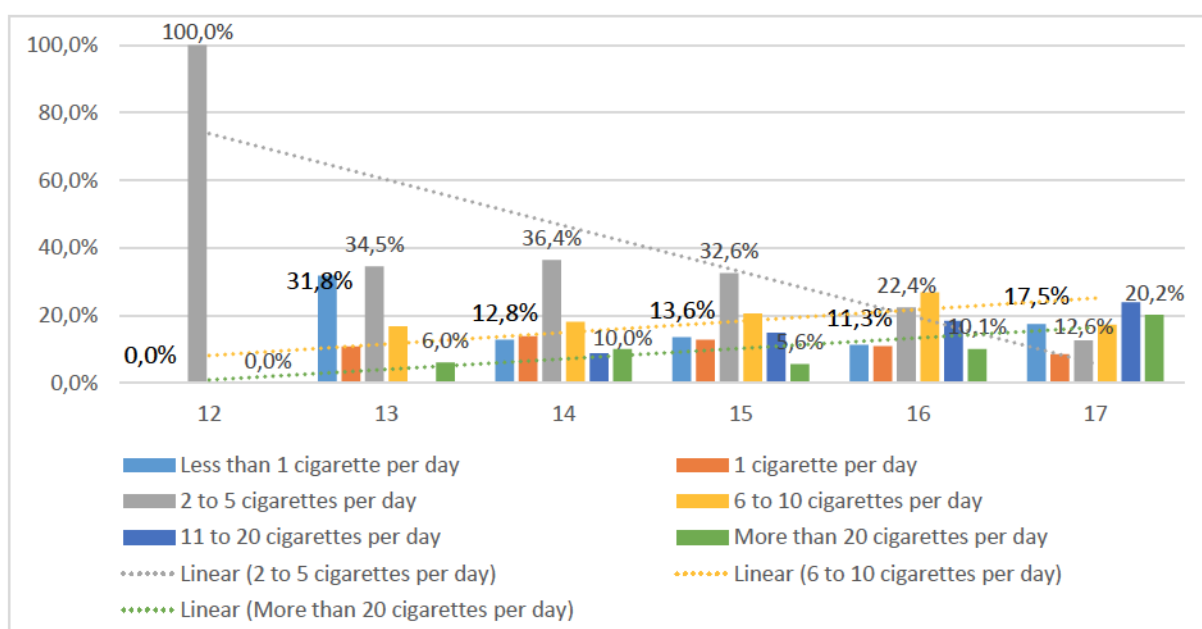
Majority of students aged 13-15 years old of both gender, smoke 2-5 cigarettes per day. However, every tenth boy smokers, smoke more than pack of cigarettes per day (Table 22).

Table 22. Number of smoked cigarettes on the days they smoked according to gender, Global Youth Tobacco Survey, Serbia 2013

Number of cigarettes usually smoked	Total % (95% CI)	Boys % (95% CI)	Girls% (95% CI)
Less than one a day	16.1 (12.0 - 21.3)	17.8 (12.9 - 24.0)	14.7 ( 9.0 - 22.9)
1 per day	13.1 ( 9.6 - 17.7)	11.1 ( 7.0 - 17.3)	15.1 (10.5 - 21.3)
2 - 5 a day	33.1 (27.1 - 39.7)	32.1 (25.4 - 39.6)	34.3 (26.5 - 42.9)
6 - 10 a day	18.9 (15.6 - 22.6)	17.5 (12.5 - 24.1)	20.2 (15.5 - 25.9)
11 - 20 day	12.0 (9.1 - 15.6)	11.1 (6.9 - 17.2)	12.9 (9.6 - 17.1)
More than 20	6.8 (4.2 - 10.8)	10.5 ( 6.4 - 16.6)	2.8 (0.9 - 8.5)

Number of smoked cigarettes on a typical day when smoked increase by age and at the age of 17, every fifth smoker report smoking more than 20 cigarettes per day (Graph 2).

Graph 2. Number of smoked cigarettes by age\*, Global Youth Tobacco Survey, Serbia 2013



11 years old excluded due to very low number of respondents

$\chi^2=1828.317$ ,  $p=0.000$

Majority of students 13-15 years old that smoked cigarette, did that first time at the age 12 or 13 with differences according to gender. Majority of girls smoked first cigarette at the age of 14 and 15, while majority of boys started at the age 12 or 13 (Table 23).

*Table 23. Age at onset of smoking among Serbian students 13-15 years old, Global Youth Tobacco Survey, Serbia 2013*

<b>Indicators</b>	<b>Overall % (95%CI)</b>	<b>Boys% (95%CI)</b>	<b>Girls% (95%CI)</b>
7 years old or younger	17.8 (14.6 - 21.6)	20.8(16.9 -25.3)	14.5 (10.6 - 19.5)
8 or 9 years old	9.5 ( 7.1 - 12.6)	11.1 (7.7 - 15.8)	7.7 ( 5.5 - 10.7)
10 or 11 years old	13.1 (11.2 - 15.3)	16.4 (14.0- 19.1)	9.5 ( 6.8 - 13.2)
12 or 13 years old	30.4 (26.3 - 34.8)	27.6 (22.4- 33.6)	33.5 (27.7 - 40.0)
14 or 15 years old	29.1 (23.5 - 35.5)	24.1 (18.3- 31.0)	34.7 (27.4 - 42.8)

$\chi^2=1901.830$ ,  $p=0.000$

For students 13-15 years old which is target group for Global Youth Tobacco Survey, the most common place for smoking are social events, followed by home. Home as a usual place for smoking is more common for girls compared to boys (Table 24)

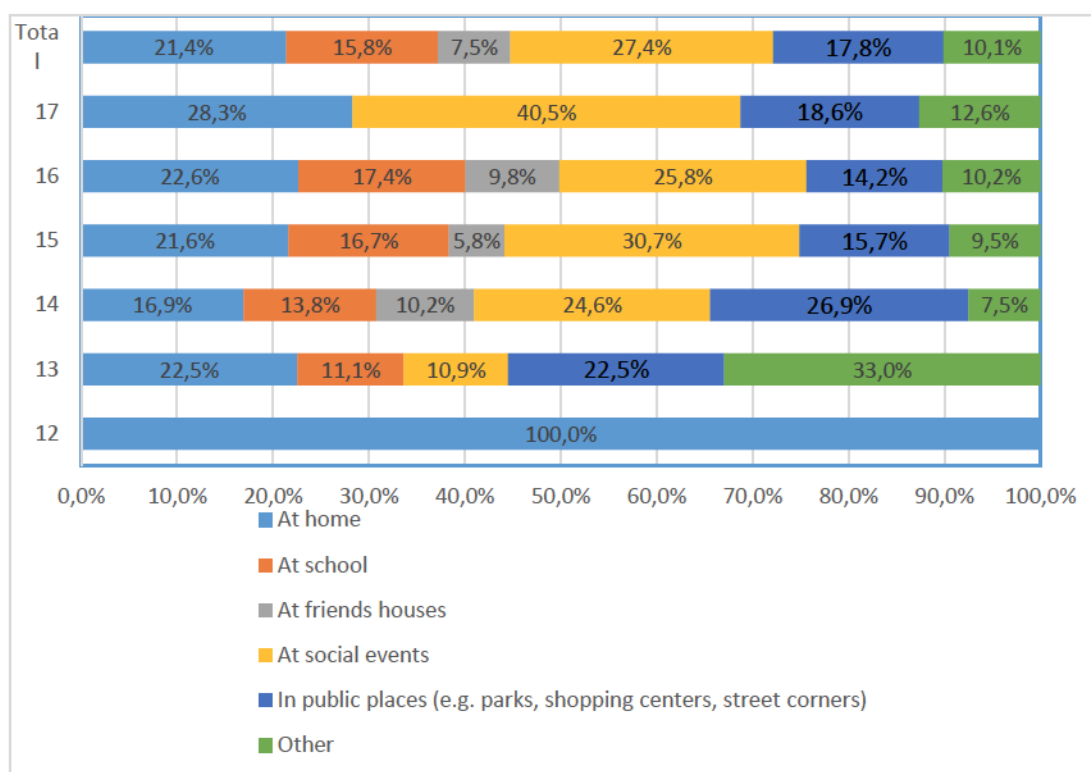
*Table 24. Place of smoking, school children 13-15 by gender, Global Youth Tobacco Survey, Serbia 2013*

<b>Place</b>	<b>Total % (95% CI)</b>	<b>Boys% (95% CI)</b>	<b>Girls% (95% CI)</b>
At home	20.3 (15.3 - 26.4)	18.0 (11.4 - 27.2)	22.5 (16.5 - 30.1)
At school	15.6 ( 10.2 - 23.1)	12.6 ( 6.3 - 23.8)	17.8 (11.5 - 26.7)
Friend's house	6.8 (3.9 - 11.5)	5.7 (3.4 - 9.2)	7.8 (3.1 - 18.6)
Social events	28.0 (22.5 - 34.3)	29.6 (21.6 - 39.2)	26.7 (20.3 - 34.1)
Public places	19.3 (13.0 - 27.6)	21.7 (12.7 - 34.5)	17.1 (10.1 - 27.4)

$\chi^2=479.258$ ,  $p=0.000$

Places where students smoke, change with the age. While all students who smoked at the age of 12 reported doing so at home, from the 13 years of age student start smoking at other places, with social events being the most frequent answer for students 15 years and older (Graph 3).

Graph 3 Places at which students usually smoke by age, Global Youth Tobacco Survey, Serbia 2013



p=0.000,  $\chi^2=1819.17$

More than 60% student 13-15 years old are exposed to tobacco smoke at home, inside enclosed public places as well as at outdoor public places (Table 25).

Table 25 Percentage of 13-15 years old school children exposed to tobacco smoke, Global Youth Tobacco Survey, Serbia 2013

Variable	Total % (95% CI)	Boys % (95% CI)	Girls % (95% CI)
Exposed to tobacco smoke at home*	63.4(60.9 - 65.9)	61.5 (58.7 - 64.3)	65.4(61.8 - 68.7)
Exposed to tobacco smoke inside any enclosed public place	60.9(56.7 - 64.9)	53.6 (49.7 - 57.4)	68.1(63.3 - 72.6)
Exposed to tobacco smoke at any outdoor public place	66.0(62.8 - 69.1)	60.3 (56.9 - 63.6)	71.8(68.0 - 75.4)

\*During past 7 days

Results show that more than 60% of 13-15 years old student are aware that passive smoking is harmful which might be one of reasons why more than 80% of them are in favour of smoking ban in enclosed places. However, worrying result is that smoking helps people to feel more relaxed at parties (Table 26).

Table 26 Smoking related attitudes and risk perception of school children 13-15 years old, Global Youth Tobacco Survey, Serbia 2013

Smoking related attitudes	Total %(95% CI)	Boys %(95% CI)	Girls %(95% CI)
Thought smoking tobacco helps people feel more comfortable at celebrations, parties, and social gatherings	53.3 (50.6 - 56.0)	54.2 (50.5 -57.8)	52.3 (48.7 - 56.0)
p=0.000, $\chi^2= 1025.67$			
Definitely thought other people's tobacco smoking is harmful to them	65.2 (62.2 - 68.1)	65.1 (61.4 - 68.6)	65.4 (61.5 - 69.0)
p=0.000, $\chi^2= 2687.96$			
Favoured banning smoking inside enclosed public places	81.2 (79.0 - 83.2)	79.5 (77.0 - 81.8)	82.8 (80.0 - 85.3)
p=0.000, $\chi^2= 415.17$			
Favoured banning smoking at outdoor public places	61.8 (59.1 - 64.5)	63.0 (60.1 - 65.8)	60.6 (56.7 - 64.4)
p=0.000, $\chi^2= 52.27$			

More than half of student were exposed to tobacco advertisement at point of sale, nine out of ten noticed someone using tobacco on electronic media. Less students were thought about dangers of smoking in school than saw someone smoking inside school or outside school property (Table 27).

Table 27. Exposure to pro and anti-tobacco messages, Global Youth Tobacco Survey, Serbia 2013

Variables	Total %(95% CI)	Boys%(95% CI)	Girls %(95% CI)
Noticed tobacco advertisements or promotions at points of sale	51.8 (48.8 - 54.7)	52.7(49.0 - 56.3)	50.9(47.0 - 54.9)
Noticed anyone using tobacco on television, videos, or movies	89.5(87.9 - 90.9)	90.1 (88.1 - 91.8)	89.0(86.6 - 91.0)
Ever offered a free tobacco product from a tobacco company	5.5 ( 3.9 - 7.8)	7.7 ( 5.5 - 10.6)	3.3( 2.0 - 5.5)
Owned something with a tobacco brand logo on it	11.9 (10.0 - 14.1)	14.5 (12.4 - 16.9)	9.3 (7.2 - 11.9)
Anti-tobacco messages in the media	54.3 (51.0 - 57.6)	54.5 (50.7 - 58.2)	4.1 (49.9 - 58.3)
Anti-tobacco messages at sporting or community events	52.8 (48.1 - 57.5)	54.7 (49.5 - 59.9)	50.9(45.4 - 56.4)
Taught in school about the dangers of tobacco use	61.7 (57.0 - 66.2)	59.7 (54.5 - 64.6)	63.7(58.0 - 69.1)
Saw anyone smoking inside the school building or outside on school property	66.3 (59.7 - 72.3)	65.2 (58.6 - 71.3)	67.5(60.2 - 73.9)

Availability of smoking presents important issue for tobacco control. Results show that despite ban of selling tobacco products to minors 81.2% was not prevent buying them because of age (Table 28).



Table 28. Availability of tobacco products, Global Youth Tobacco Survey, Serbia 2013

Variable	Total %(95% CI)	Boys %(95% CI)	Girls %(95% CI)
Buying cigarette from a store, shop, or kiosk	68.6 (62.8 - 73.8)	68.6 (59.4 - 76.5)	68.6 (59.7 - 76.2)
Not prevented from buying cigarettes because of their age	81.2 (75.7 - 85.7)	75.3 (66.1 - 82.6)	87.3 (81.1 - 91.7)

Results of logistic regression show that all explored factors predicts smoking except for possibility to buy tobacco near school. 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 to buy such products (Table 29).

Table 29. Logistic regression analysis of predictors of smoking among adolescents, Global Youth Tobacco Survey, Serbia 2013

Variables		OR 95% CI	p
Age	cont	1.46(1.41-1.50)	.000
Gender	male (ref)		
	female	1.32(1.25-1.40)	.000
Pocket money	no pocket money (ref)		
	less than 500 RSD	1.54(1.33-1.78)	.000
	500-1500	1.41(1.23-1.61)	.000
	more than 1500	1.92(1.66-2.22)	.000
Think smoking is harmful to their health	definitely yes (ref)		
	probably yes	4.54(4.19-4.92)	.000
	probably not	4.77(4.15-5.47)	.000
	definitely not	1.61(1.42-1.82)	.000
Smoking helps feel comfortable at social events	no difference (ref)		
	less comfortable	1.58(1.45-1.71)	.000
	more comfortable	2.24(2.11-2.38)	.000
Hard to quit once someone starts smoking	Definitely yes (ref)		
	Probably yes	2.13(1.00-2.27)	.000
	Probably not	2.59(2.37-2.83)	.000
	Definitely not	2.62(2.38-2.91)	.000
How often you see father smoking	Never (ref)		
	Sometimes	0.62(0.72-0.85)	.000
	Always	0.74(0.70-0.79)	.000
How often you see mother smoking	Never (ref)		
	Sometimes	1.76(1.62-1.91)	.000
	Always	1.42(1.33-1.51)	.000
How often you see sibling smoking	Never (ref)		
	Sometimes	2.06(1.91-2.23)	.000
	Always	2.20(2.01-2.40)	.000
On the whole, do you find it easy or difficult to buy cigarettes from a shop?	Very difficult (ref)		
	Fairly difficult	2.29(2.09-2.50)	.000
	Fairly easy	2.79(2.53-3.07)	.000
	Very easy	7.18(6.63-7.79)	.000
Possibility to buy tobacco near school	No (ref)		
	Yes	1.06(0.98-1.12)	.142
Being thought in school about harmful effects of smoking	Yes (ref)		
	No	1.12(1.06-1.19)	.000
Exposed to point of sale marketing	No (ref)		
	Yes	1.53(1.44-1.62)	.000
Have tobacco industry item	No (ref)		
	Yes	1.28(1.10-1.36)	.000

Almost 60% of smokers have tried to stop smoking in the past 12 months, and almost every second student wants to stop smoking. However, less than 10% received advice from health professional to do so. Slightly more than every third student think that it is difficult to stop smoking once someone starts (Table 30).

*Table 30 Smoking cessation attempts and received advices/help from professional among students 13-15 by gender, Global Youth Tobacco Survey, Serbia 2013*

<b>Variable</b>	<b>Total %(95% CI)</b>	<b>Boys %(95% CI)</b>	<b>Girls %(95% CI)</b>
Tried to stop smoking in the past 12 months	59.7 (51.5 - 67.4)	61.2 (49.9 - 71.3)	58.4 (47.7 - 68.4)
Want to stop smoking now	45.9 (38.9 - 53.1)	49.0 (39.4 - 58.6)	43.4 (34.7 - 52.4)
Thought they would be able to stop	85.8 (80.7 - 89.8)	82.5 (74.5 - 88.4)	88.8 (80.5 - 93.8)
Received help/advice from a program or professional to stop smoking	7.6 (5.0 - 11.6)	7.4 (4.1 - 12.7)	7.9 (4.2 - 14.2)
Definitely thought it is difficult to quit once someone starts smoking	33.3 (31.3 - 35.3)	31.0 (28.4 - 33.9)	35.6 (32.5 - 38.7)

### **4.3 Smoking and related factors 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 35).

Table 35. 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

Population group		Prisoners %	PLHIV %	SWs %	MSM %
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	92.7A	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
Working	Employed	A 70.2C	49.4	76.5	70.1C
	Unemployed	B 73.3C	62.6C	90.9A	72.5C
	Other (retired, students)	C 44.1	41.5	x	56.7
Marital	Living with partner	A 65.5	49.2	89.8	79.7C
	Divorced/Widowed	B 73.3	56.3	98.5C	90.5C
	Single	C 74.2	50.0	88.1	64.0

Note: For each pair of smoking categories, proportions (for each row) are compared using a z test with significance level at 0.05, both current smoker and non-smoker. If a pair of values is significantly different, the values have different letters assigned to them.

Smoking prevalence are also high among Roma Youth and Institutionalized children which are considered as vulnerable population groups in Serbia. More than girls 12-14 years old in institutions for children without parental care smoke (Table 36).

Table 36. Smoking among young vulnerable groups, Research among populations most at risk to HIV and among people living with HIV, Serbia 2013

Population group		ROMA Youth %	Institutionalized children %
Total		55.1	57.8
Gender	Male	54.8	53.4
	Female	55.7	65.4
Age group	12-14	x	52.6
	15-17	44.2	65.2
	18-24	61.9E	45.2

Results of adjusted logistic regression show that female among sex workers and institutionalized children have more than twice higher odds of being smokers. Prisoners who belong to the category other (i.e students, retired people) has lower odds of being smokers. Prisoners who are divorced/widowed or single have higher odds of being smokers odds compared to

those living with partner before imprisonment, while single MSMs have lower odds of being smoker compared to living with partner.

In all population groups, except for sex workers, alcohol use is statistically significantly associated with smoking status. Odds of being a smoker is more than two times higher for those who use alcohol with odds being exceptionally high among PLHIV who use alcohol. Drug use was associated with smoking status in all groups with Roma youth who use drugs having five times higher odds of being smoker compared to those who do not use drugs (Table 37).

Table 37. Multivariate regression analysis of predictor variables of smoking by vulnerable group, Research among populations most at risk to HIV and among people living with HIV, Serbia 2013

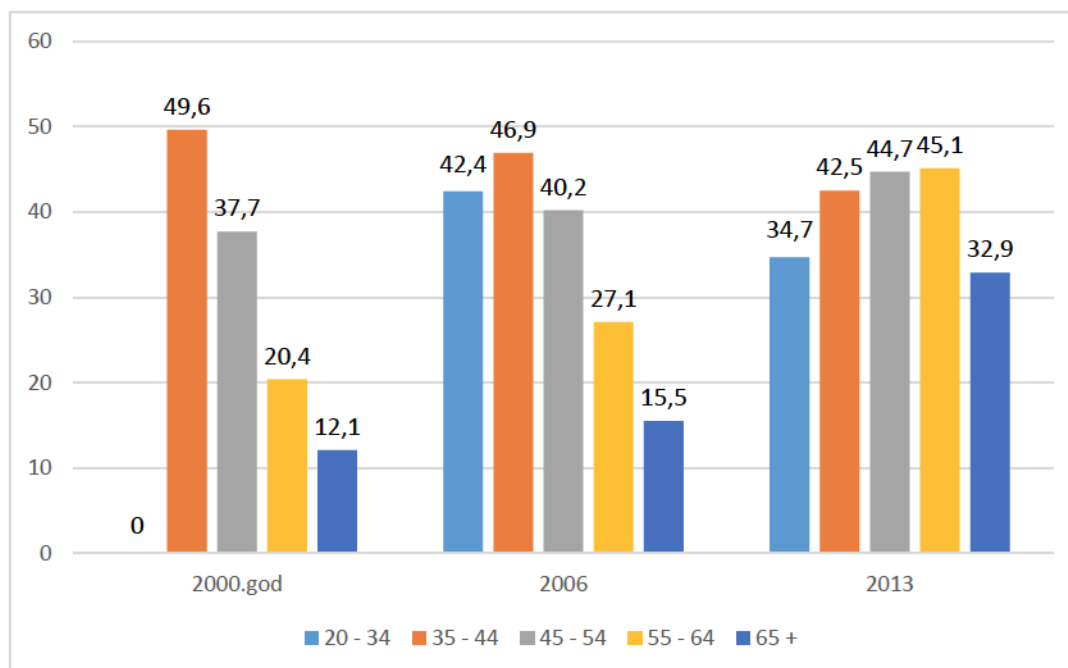
Variables		Prisoners	PLHIV	SWs	MSM	Roma Youth	Institutionalized children
		OR (95%CI)	OR (95%CI)	OR (95%CI)	OR (95%CI)	OR (95%CI)	OR (95%CI)
		(R2=10.6)	(R2=15.0)	(R2=14.8)	(R2=14.0)	(R2=13.6)	(R2=17.2)
Sex	Male	ref	ref	ref	x	ref	ref
	Female	2.38 (1.13-5.01)	1.20 (0.70-2.06)	2.54 (1.18-5.46)*	x	1.26 (0.91-1.76)	2.22 (1.20-4.12)*
Age		1.00 (0.97-1.02)	0.98 (0.96-1.01)	1.01 (0.96-1.07)	1.02 (0.99-1.04)	1.11 (1.04-1.19)*	0.90 (0.76-1.05)
Education	Not any school	ref	ref	ref	ref	ref	x
	Primary	0.55 (0.24-1.29)	0.76 (0.15-3.91)	1.14 (0.48-2.70)	0.80 (0.11-5.79)	1.03 (0.65-1.61)	x
	Secondary	0.70 (0.31-1.59)	0.47 (0.11-1.98)	1.57 (0.59-4.16)	0.66 (0.11-3.90)	1.27 (0.74-2.17)	x
	Higher/high	0.63 (0.23-1.70)	0.39 (0.09-1.66)	1.15 (0.17-7.64)	0.47 (0.08-2.82)	1.12 (0.09-13.72)	x
	Currently enrolled	x	x	x	x	1.04 (0.62-1.73)	x
Working status	Employed	ref	ref	ref	ref	x	x
	Unemployed	1.11 (0.73-1.71)	1.87 (1.09-3.20)*	2.58(0.69-9.62)	1.32 (0.86-2.05)	x	x
	Other (retired, students)	0.30 (0.14-0.65)*	0.92 (0.53-1.59)	x	0.75 (0.51-1.11)	x	x
Marital status	Living with partner	ref	ref	ref	ref	x	x
	Divorced/widowed	1.78 (1.02-3.10)*	1.58 (0.84-2.97)	6.61 (0.84-52.34)	2.62 (0.88-7.85)	x	x
	Single	1.66 (1.03-2.67)*	0.82 (0.47-1.42)	0.89 (0.41-1.93)	0.48 (0.25-0.90)*	x	x
Alcohol	No	ref	ref	ref	ref	ref	ref
	Yes	2.53 (1.19-5.41)*	3.83 (2.07-7.07)**	1.41 (0.69-2.88)	2.75 (2.06-3.68)**	2.41 (1.71-3.41)*	2.89 (1.48-5.62)*
Illicit drug	No	ref	ref	ref	ref	ref	***
	Yes	2.31 (0.62-8.52)	1.45 (0.51-4.10)	3.03 (1.35-8.84)*	1.79 (0.80-4.01)	5.10 (2.09-12.48)**	***

\*p<0.05 \*\*p<=0.001 \*\*\* small number of respondents

#### 4.4 Comparison of smoking behaviour among various population groups

Previous health surveys among general population were conducted in 2000 and 2006. These surveys included questions on smoking for population 20 years and older. Comparing smoking prevalence for 20 years and older population it can be seen that groups with highest prevalence are changing from younger to older population groups. Among older than 65 years smoking prevalence almost doubled from 2006-2013 (Graph 4).

*Graph 4. Changes in smoking prevalence (%) from 2000-2013, by age groups, adults 20 years and older, Health Surveys Serbia, 2000, 2006 and 2013*



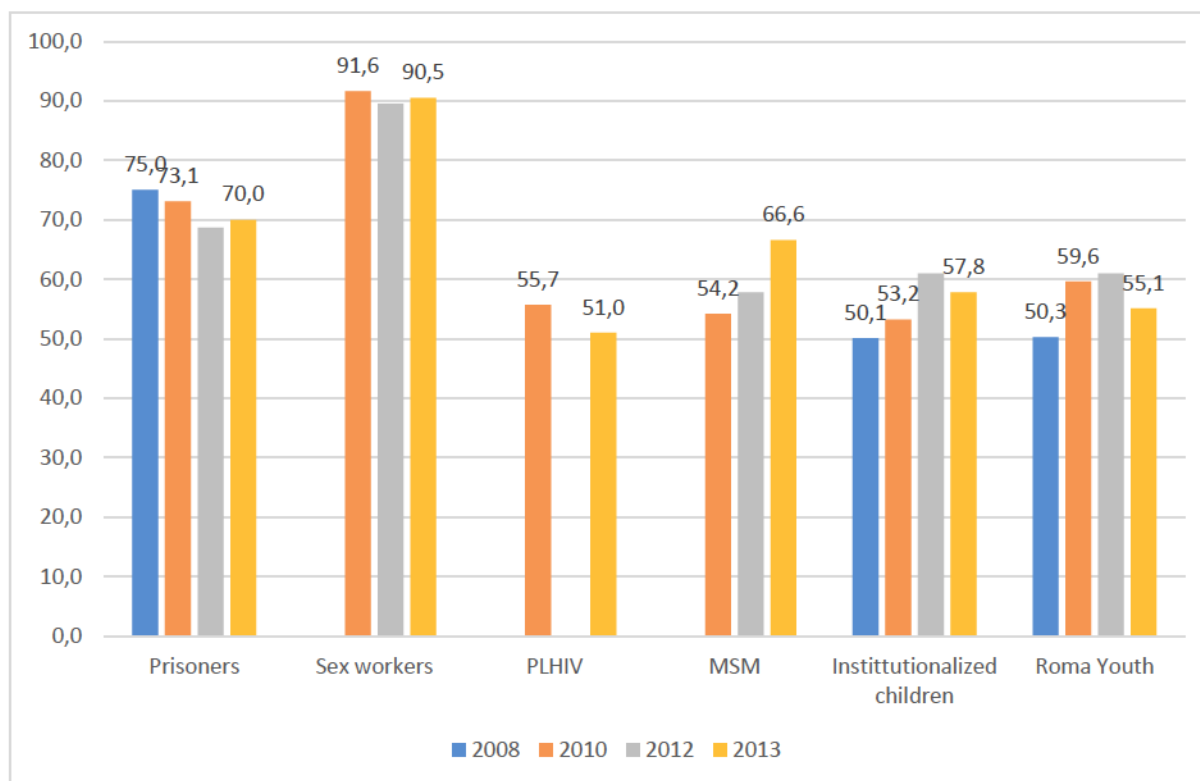
*Percentage of daily smokers among males decreased from 40.6 in 2000 to 32.6 in 2013, while percentage of daily smokers among females stayed unchanged in the same period (Table 38).*

*Table 38. The prevalence of daily smoking by gender among Serbian adults, Health Surveys Serbia, 2000, 2006 and 2013 years*

Gender	2000	2006	2013
Male	40.6 %	30.7 %	32.6 %
Female	26.1 %	22.6 %	26.0%
Total	33.0 %	26.2 %	29.2 %

Smoking prevalence among stigmatized populations are at high level, without significant changes in period 2008-2013 (Graph 5).

Graph 5. Smoking prevalence (%) among vulnerable populations, by year and population group, Research among populations most at risk to HIV and among people living with HIV, Serbia 2008, 2010, 2012, 2013



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 (Graph 6, Tables 39-41).

Graph 6 Smoking among vulnerable/stigmatized and general populations in 2013, by gender (%), Research among populations most at risk to HIV and among people living with HIV, Serbia 2013 and National Health Survey 2013

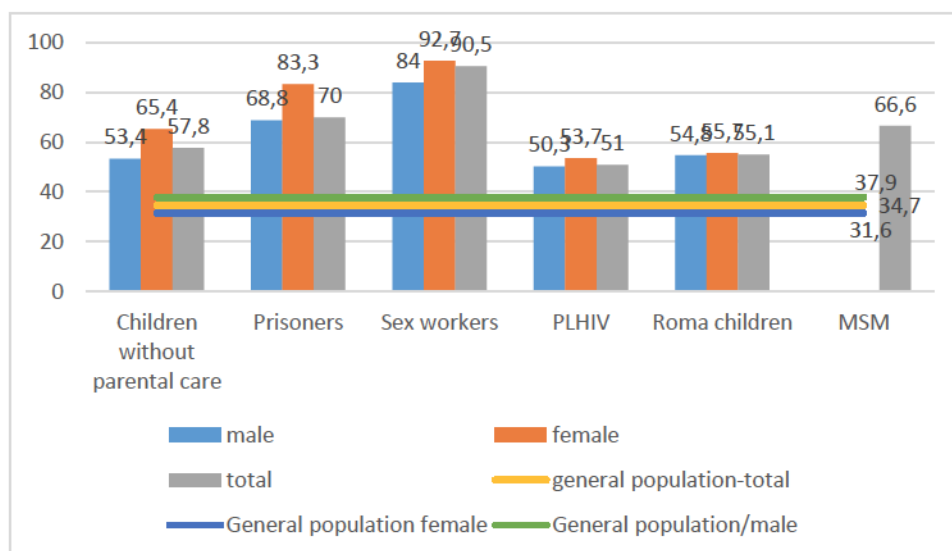


Table 39. Comparison of smoking prevalence (%) among total general population and vulnerable groups in Serbia

Age groups	General population			Stigmatized populations					
	HS	GPS	GYTS	Prisoners	PLHIV	SWs	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

Table 40. Comparison of smoking prevalence (%) among males in general population and vulnerable groups in Serbia

Age groups	General population			Stigmatized populations					
	HS	GPS	GYTS	Prisoners	PLHIV	SWs	MSM	Roma Youth	Institutionalized children
< 15*	-	-	12.7	-	-	-	-	-	48.8
15-17	13.2	-	-	-	-	-	-	47.4	66.7
18-24**	33.1	36.2	-	63.3	38.5	81.5	60.3	59.6	33.3
25-34	47.5	44.0	-	70.9	46.8	88.0	65.7	-	-
35-44	49.9	50.3	-	75.8	63.6	81.0	71.9	-	-
45-54	46.3	50.2	-	72.7	57.5	50.0	83.6	-	-
55-64***	38.0	38.3	-	52.9	35.7	-	88.9	-	-

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

Table 41. Comparison of smoking prevalence (%) among females in general population and vulnerable groups in Serbia

Age groups	General population-female			Stigmatized populations					
	HS	GPS	GYTS	Prisoners	PLHIV	SWs	Roma Youth	Institutionalized children	
< 15*	-	-	13.3	-	-	-	-	64.3	
15-17	13.6	-	-	-	-	-	38.0	63.5	
18-24**	30.5	33.2	-	100.0	-	92.5	65.8	75.0	
25-34	40.5	40.9	-	95.2	66.7	91.5	-	-	
35-44	44.0	38.9	-	81.0	63.2	94.4	-	-	
45-54	45.2	40.2	-	55.6	59.5	100	-	-	
55-64	31.8	28.0	-	100	46.2	66.7	-	-	

\*12-14 for Institutionalized children \*\* For institutionalized children 18-19 year age group

## 5 Discussion

### 5.1 Adults

Smoking prevalence among adults 15 years and older (34.7) in Serbia is higher compared to world (21%) (GBD 2015 Tobacco Collaborators, 2017) and EU average (26%) (European Commission, 2015). Tobacco use among adult population has its own specific characteristic and correlates such as education, occupation and employment status (Gilman, Abrams, & Buka, 2003). According to logistic regression analysis of data obtained through Health Survey 2013, the richest people had lower odds of being smoker. Data from National Survey on lifestyles of citizens in Serbia conducted in 2014, confirm that people with lower education status and lower perceived financial status have higher odds of being smokers. This findings are in line with other studies showing that disadvantage and lower socioeconomic status, especially education are linked with smoking status (Hiscock, Bauld, Amos, Fidler, et al., 2012; Huisman et al., 2005).

Although gender differences exist in Serbia, prevalence is not remarkably higher among males. Comparing with 2006, increase in daily smoking prevalence is higher among females (from 22.6%to 26.0%) compared with males (30.7%to 32.6%). This indicates that gender differences are narrowing and show that female smoking is increasing in typical way for countries in the third phase of tobacco epidemic, the model suggested in 1994 and in 2012 proved to be useful relevant for developing countries. (Lopez, Collishaw, & Piha, 1994b; Thun, Peto, Boreham, & Lopez, 2012).

Type of settlement also plays role as regards smoking status in Serbia, as smoking prevalence in cities is significantly higher in comparison with other settlements (36.4 compared to 32.2). Urban-rural disparities in smoking behaviour with higher smoking rates were found by other authors (Völzke et al., 2006; Duelberg, 1992), but some studies indicate opposite results using data on smoking among adolescents (Plotnikoff, Bercovitz, & Loucaides, 2004). Higher smoking rates in urban areas might be linked to more stressful lifestyle in urban areas, but also to other factors such as more intensive advertising and sponsorship strategies. Some of the factors might be related to working conditions and less social interactions (Völzke et al., 2006). Factor contributing to smoking disparities between urban and rural settlements should be further explored and tobacco programs should be adapted to tackle these differences.

Marital status is also predictor of smoking with divorced persons having higher smoking rates (54.8%) compared to all other categories, while the lowest smoking prevalence was among widowed persons (21.8%) Contrary to other studies (Espinoza & Nájera, 2012), in Serbia, being single was not found to be in positive correlation with smoking.



The highest prevalence is in the age group 35-44 (47%) However, there are gender differences with highest prevalence of smoking among females in the age group 45-54. Comparison of smoking prevalence by age groups from 2000-2013 show that prevalence of smoking is increasing in older age groups with smoking rates doubled from 2000 to 2013 in the age groups 55-64 and among older than 65 years.

In Serbia, population of smokers that smoke more than 20 cigarettes per day is significantly higher in the age group 45-54 (27.15%) compared to total percentage of this group of intensive smokers (20.3%) Even so there are no data on level of nicotine addiction this indicate that this is a group of hard core smokers and might be one of the reasons for stable smoking prevalence in Serbia since years. Such findings reveal gap in smoking cessation services in Serbia.

On average, daily smokers smoke 19.2 cigarettes which is more than in EU average (14 cigarettes per day), although there are variations between countries (European Commission, 2017). Male daily smokers smoke on average more than a pack per day (21.4 cigarettes) which is significantly higher number compared to female (16.7). Apart from gender, in Serbia, differences among more than 20 cigarettes per day smokers are found by education, age groups and index of wealth. Highest prevalence of intensive smokers are among poorest people and people in the age group 45-54 years old.

According to results from National Survey on lifestyles of citizens in Serbia, on average, smokers start to smoke occasionally at the age of 17.5, while average year of starting smoking daily is 19.2. In EU, based on data collected in 2012, average age of onset of regular smoking was 16.6 years, with differences between countries ranging from 15.8 to 18.8 years (Filippidis, Agaku, & Vardavas, 2015). However, it should be taken into account that EU data are based on sample of population 15-39 years old, while data from Serbia is based on sample of population 18-64 years old, which has certain influence on comparability due to recall bias.

Results also show that on average, it takes less than two years (1.76) from the first cigarette to daily smoking. This is important finding which should be taken into account when planning intervention for prevention of smoking and transition from occasional to daily smoking. Due to traditional focus on youth, preventive efforts do not target sufficiently population older than 18, despite added value that interventions targeting young adults would have on reduction of smoking prevalence (Backinger, Fagan, Matthews, & Grana, 2003) (Hammond, 2005) interventions targeted to young adults in Serbia which might also prevent transition from occasional to daily smoking.

## 5.2 Electronic cigarettes

The popularity of electronic cigarettes has been growing since its appearance on the European market in 2006 and American markets in 2007 (Noel et al., 2011). Since then, a significant number of studies have been published examining possible health effects of its use and their value as an aid to smoking cessation (Besaratnia & Tommasi, 2017; Bullen et al., 2013; McRobbie, Bullen, Hartmann-Boyce, & Hajek, 2014). In addition, questions have been raised if e-cigarettes can be a gateway to nicotine addiction and if they contribute to renormalization of smoking (Barrington-Trimis et al., 2016; Zhong, Cao, Gong, Fei, & Wang, 2016).

In Serbia, electronic cigarettes appeared on the market in 2010, with no legislation specifically written to their import, trade and use since then.

Data on electronic cigarette use, which are obtained from National Survey on lifestyles of citizens in Serbia in 2014, are first of this kind in Serbia. It can be seen that in 2014, every tenth adult citizen has tried e-cigarettes at least once, while current use was not very prevalent. Unlike the EU, where there was an observed increase in the prevalence of ever e-cigarette use over a two year period from 12 in 2014 to 15 in 2016 (European Commission, 2017), data from survey which were conducted in 2016 Serbia, showed no changes as ever e-cigarette use was 10.7 while less than 1 of adults were current users of electronic cigarettes with almost all of them being smokers (Kilibarda & Nikolic, 2016).

Data from National Survey on lifestyles of citizens in Serbia 2014 showed a slightly higher prevalence in lifetime and current e-cigarette use among females. Male cigarette smokers Serbia who currently use e-cigarettes consumed significantly fewer cigarettes per day than male cigarette smokers who have not use e-cigarettes. However, no such difference could be found for female cigarette smokers. This finding implies that special attention should be given to the understanding of motives and patterns of use among females.

In Serbia e-cigarette use is more prevalent in younger population groups. The situation in Serbia is similar to the USA where the percentage of lifetime e-cigarette use among young adults was higher than in the older adult population (Choi & Forster, 2013).

Same as in the case with conventional cigarettes, settlement type is significantly correlated with ever e-cigarette use. Citizens from urban areas have a higher prevalence of e-cigarette use but the difference between rural and urban areas is not statistically significant. A study conducted in Poland also found that living in urban areas is associated with ever e-cigarette use. (Goniewicz & Zielinska-Danch, 2012) In contrast, a study on e-cigarette use among Canadian students found that students from rural areas had greater odds of e-cigarette use (Hamilton et al., 2015).

In Serbia, apart from females and young adults, intellectuals were more likely to use e-cigarettes compared from people with other professions.

In 2016, the Law on Advertising banned advertising of electronic cigarettes with exemption for the point of sale (Official Gazette RS, 2016), which might be one of the reasons that compared to more recent surveys, there were no significant increase in e-cigarette prevalence. However, smoke free law still doesn't regulate electronic cigarette use and further monitoring is needed. In addition, in recent years the water pipe use is becoming challenge with 6 adults that reported water pipe tobacco smoking (Kilibarda, Nikolic, Gudelj Rakic, & Vasic, 2018). It might be presumed that some of the users for which curiosity was the main reason for using e cigarette, switched to water pipe use due to growing number of water pipe bars in Serbia. Standardized methodology for monitoring e-cigarette use in population surveys should be developed and prevalence, patterns, motives for and attitudes toward e-cigarette use should be regularly monitored.

### **5.3 Exposure to tobacco smoke**

Data show high level of adult population's exposure to tobacco smoke in Serbia. Given the social acceptability of smoking and low recognition of tobacco as a problem for society, as well as only partial smoking ban in place, such results are expected. Data show that psychoactive substance use in general is not recognized by adult Serbian population as very important problem in society in comparison with other problems. Among substance-related problems drug addiction is seen as more important than alcohol addiction, although it is less prevalent and tobacco smoking is despite high tobacco prevalence among the least important problems in society. In that respect, changing social norms and attitudes toward tobacco is of great importance in Serbia, especially due to their interactive relationship with policy change. Shifts in social norms and attitudes most likely contributed to changes in tobacco control and smoking behaviour during the second half of the 20<sup>th</sup> century. Researches demonstrate that, particularly in public situations, individuals will behave in accordance with norms even when they privately disagree and despite his or her personal attitudes and beliefs (Paluck & Ball, 2010).

In the process of planning of implementation of smoke free interventions as in case of other health related interventions different factors (individual, family, society..) should be taken into account (Institute of Medicine, 2001). High exposure to tobacco smoke both among youth and adults indicates that legislation should be improved in sense that smoking should be banned completely in hospitality sector and compliance with current legislation should be improved. This would contribute to making smoking is less socially acceptable of smoking as evidence of such effects are numerous (Rashid, Manan, Yahya, & Ibrahim, 201). In addition, partial bans are not effective in protection of citizens from tobacco smoke (Takahiro Tabuchi, Hoshino, & Nakayama, 2016) and attract less support in Europe than comprehensive policies (Mons et al., 2012) One of concerns with regards of smoke free laws is perceived resistance

of population. However, evidence suggest that after adoption of comprehensive smoke free law, it might be expected that support will increase which can be explained with changes in smoking-related norms due to reduced visibility and perceived social acceptability of smoking (Alesci, Forster, & Blaine, 2003; Brown, Moodie, & Hastings, 2009; Gilpin & Pierce, 2004; Satterlund, Lee, & Moore, 2012). Smoke-free environment has positive impact on reduction of smoking initiation and makes it easier for smokers to reduce number of cigarettes or quit smoking (Farkas, Gilpin, & White, 2000; WHO, 2007; Bauer, Hyland, & Qiang, 2005; Chapman, Borland, & Brownson, 1999). High percentage of intensive smokers might also benefit from reduction of smoking as consequence of smoke free law. There is evidence that (Brown, Crawford, & Hastings, 2009) normative beliefs are correlated with smoking initiation (Olds et al., 2005) and that perceived antismoking norms promote smoking cessation among adults (Biener, Hamilton, Siegel, & Sullivan, 2010; Zhang, Cowling, & Tang, 2010). Research also indicate that own benefits, but risks to others are best predictors of acceptance of smoking policy. This indicates that in awareness raising campaign aimed at acceptance of policy, focus should be on reminding people that they are putting others at risk rather than themselves (Zlatev, Pahl, & White, 2008).

Smoke free laws also contributes to reduction of smoking prevalence among youth and young adults through reduction of opportunities for smoking while reduced visibility of role models lower social acceptance of the smoking (National Center for Chronic Disease, 2014). Comprehensive tobacco control program should be aimed to establishment of smoke free policies and to changes of population attitudes and strengthening of the non-smoking social norms (CDC, 2014). Smoke free legislation have positive impact on acceptance of non-smoking behaviour (Brown, Crawford, et al., 2009) and de-normalize smoking while non-smoking environment becomes prevailing norm (Kagan & Skolnick; Malone, Grundy, & Bero, 2012).

Despite methodological issues related to different measurements of risk perception, it is well documented that risk perception is associated with the use of psychoactive substances, including tobacco (Carbone, Kverndokk, & Røgeberg, 2005; Aryal & Bhatta, 2015; Borrelli, Hayes, Dunsiger, & Fava, 2010). 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.

National Survey on lifestyles of citizens in Serbia 2014, show that only 66.5 consider smoking one or more packs of cigarettes per day as great risk while 86.5 consider trying cocaine once or twice and 80.9 trying ecstasy once or twice to be great risk.

Data from Health Survey 2013 show that in general, adult citizens of Serbia are aware of dangerous of smoking as majority of population think that smoking has big impact on health (75.2 of smokers and 83 of non-smokers). However, relevance of this data would be bigger if

question was more specific (in terms to make distinction between dangers to own health, and to others' health).

Similarly to other studies as in the studies (Klesges et al., 1988; Dawood, Rashan, Hassali, & Saleem, 2016; Yang, Hammond, Driezen, Fong, & Jiang, 2010; Murphy-Hoefer, Alder, & Higbee, 2004), data from Serbia show there is significant difference in the risk perception among smokers and non-smokers with smokers' risk perception being lower. This difference may arise from smokers' underestimation or non-smokers overestimation (Weinstein, Marcus, & Moser, 2005). Unrealistic optimism or optimistic bias phenomenon reflected in minimization of risk among smokers was found in many studies (Neil D. Weinstein, 1999; Helweg-Larsen, Tobias, & Cerban, 2010; Mantler, 2013; Arnett, 2000). Unrealistic optimism might be one of explanation for very low percentage of smokers thinking they personal risk getting sick due to their behaviour as found in Health Survey 2013. In addition to correlation of smoking and risk perception, low risk perception is of importance for motivation to quit. Research found that underestimation of risks of heart attack, cancer and stroke leads to lower motivation to quit (Strecher, Kreuter, & Kobrin, 1995).

Raising awareness of consequences of smoking is needed for public support of tobacco control measures (Roberts et al., 2013). However, data show that in Serbia, population is aware that smoking is harmful but nevertheless don't see it as problem for society. Focusing future campaigns to social, economic and ecological consequences in addition to health consequences, should be considered. Media campaigns aimed at changing individual behavior or influencing social norms should not be implemented without careful planning and isolated from other interventions as there are evidence pointing out that such interventions when implemented alone has limited or no effect (EMCDDA, 2015). Empowering communities to bring about change in their own social domains is shown to be effective (Golechha, 2016) and could be considered as intervention for the future.

Within prevention interventions, including media campaigns, particular attention should be paid to message framing. Research show that gain framed messages have better effects compared to loss framed messages for smoking cessation (Gallagher & Updegraff, 2012). In addition, for better framing of messages some novel approaches might be applied such as neurological quantitative research techniques as eye tracking, and implicit association testing (Harris, Ciorciari, & Gountas, 2018).

#### **5.4 Smoking cessation**

In line with recommendations for countries in the third stage of tobacco epidemic, apart from better enforcement of current restriction, enabling access to broad range of smoking cessation is recommended (Lopez, Collishaw, & Piha, 1994a). In Serbia the highest prevalence of more intensive smokers is in the age groups 45-54. Data on past quit attempts according to level of

dependence of smokers are missing, but it can be hypothesized that persons that smoke more than 20 cigarettes per day have high level of nicotine dependence which makes smoking cessation harder to them. Therefore it might be assumed that smokers in the age group 45-54 are more resistant to smoking cessation. Prevalence of more intensive smokers is also high in age group 35-44. These findings call for additional intervention targeting smokers 35-54 old aimed at increase of their motivation to quit. Health survey also revealed that percentage of smokers younger than 45 years that received advice to stop smoking is lower compared to older smokers. Strengthening smoking cessation services as such, including education of health professionals for smoking cessation is pre-request for increase in quit rates. Due to the very low coverage of smokers with smoking cessation (Kilibarda, Nikolic, & Vasic, 2018) and traditionally high smoking prevalence among health workers in Serbia (Krstev, Marinkovic, Simic, Jovicevic, & Markovic-Denic, 2014), this is challenging task.

Results presented in the thesis show that only every third smoker in Serbia received advice from health worker to stop smoking. Percentage of smokers being asked about smoking status vary across countries from 17.3 in Mexico to 67.3 in Romania, based on surveys conducted 2008-2011 (Kruger et al., 2013).

In the absence of well-developed network of smoking cessation in Serbia, there is demand for printed self-help materials from the health professionals working at primary health care settings. Effects of distribution of printed self-help materials are small. However, research on effects comes from high income countries and call for further research in countries where there is no better options available (Hartmann-Boyce, Lancaster, & Stead, 2014). Since such practice is well embedded in the Serbia it is not likely demand for printed materials will be reduced. As this might take away time and resources for more effective interventions, further trainings should be organized for health professionals on evidence based measures together with strengthening network and deliver of smoking cessation services in more organized national level.

One of the first steps should be increasing number of health professionals who give simple opportunistic advice to stop smoking to their patients also known as brief interventions. Although not effective as behavioral support or pharmacotherapy, these intervention are proven to increase motivation to quit and quit attempts (Aveyard, Begh, Parsons, & West, 2012; Stead et al., 2013).

Systematic review of literature on factors influencing health professionals' behaviours found that social cognitive theories was usually used for predicting the clinical behaviour of health professionals. The Theory of Planned Behavior is one of the most widely used social cognition models (Godin, Belanger-Gravel, Eccles, & Grimshaw, 2008). According to theory, behaviour is primarily determined by the intention to perform that behaviour. Also intentions are related to beliefs and attitudes about the specific behaviour. Therefore, first interventions should be

aimed at building positive attitudes of health professionals toward smoking cessation and believes that this might help smokers to improve their health. As beliefs about the expectations of important others and the motivation to comply with those expectations is of utmost importance, interventions should include managers and another influential persons at the level of health institution who are not very interested in smoking cessation at this moment in Serbia. Importance of targeting managers of health institutions on Serbia is backed up with findings from other research showing that institutional commitment to tobacco reduction is related to an increased likelihood of clinicians providing smoking cessation interventions (Schultz, Johnson, & Bottorff, 2006). Third component within this model should be perceived control and perception of the ability to implement interventions and to overcome obstacles to implementation. In that respect training of health professionals for the evidence based smoking cessation is recommended as well.

## 5.5 Youth

In Serbia, 13 of school children aged 13-15 smoke with small differences according to gender. In addition, 17.5% of never tobacco users are susceptible to tobacco use in the future, significantly more girls than boys.

Smoking is often seen as individual choice and not in the broader context. However, many factors are associated with smoking. Therefore, it is rare that single factor cause complex behaviour which happens in social context as it is case with substance use. Not only family, peers, school and neighbourhood individually contribute to substance use, but their effects exacerbate mutually each other (EMCDDA, 2015).

For this population group, onset of smoking is of special concern. Findings from GYTS Serbia 2013 show gender differences between age at onset of smoking, but majority of student light their first cigarette at the age 12 or 13. There is also 27.3% stating that they have smoked the first cigarette at 9 years or younger. High percentage of youth that have early contact with cigarettes is alarming due to its association with increased odds of consequences later in life. Apart from correlation between age of onset and likelihood of nicotine dependence in the adulthood, research also show that onset of smoking at the age of 15 or less increase risk of developing lung cancer compared to age of onset at 20 (Peto et al., 2000; Taioli & Wynder, 1991). According to results from GYTS 2013, predictors for early smoking are also availability of tobacco products and exposure to tobacco industry advertising, same s found in other studies. (Lovato, Watts, & Stead, 2011; El-Toukhy & Choi, 2016). At the individual level, predictor of smoking is perceiving smoking as behaviour that helps feel relaxed as well as knowledge in harmful effects of smoking and perceived easiness to quit smoking.

Many preventive activities focus well established risk and protective factors and interventions are implemented in different settings. In order to prevent smoking, delay onset of use and

transition from occasional to regular smoking it is of crucial importance to implement evidence based preventive measure. However, evidence of effectiveness of programs differs. Despite vast evidence available on evidence based measure, in Serbia, often used approach is information sharing. It demands special attention due to evidence showing that such approach, despite being successful in knowledge and attitudes change, can have negative influence on substance use (EMCDDA, 2015). Therefore, training of professionals involved in delivery and or planning of prevention activities is of great importance. With implementing interventions which are not evidence based, the opportunity for prevention or delay of smoking can be lost.

Adolescents' perceptions of substance use related risks is associated with initiation of tobacco use (Roditis, Delucchi, Cash, & Halpern-Felsher, 2016; Virgili, Owen, & Severson, 1991). In Serbia 65.2 perceive other people's tobacco smoking as harmful to them. However, despite studies show that risk perception is protective factor, it should be kept in mind that health consequences happens in future and adolescents are focused on the rewards in present.. In addition emphasizing risk might make smoking looks more attractive to youth. Failing to acknowledge this and focusing only on future risk may lead to losing opportunity to reach adolescents with tailored intervention such as one emphasis perceived consequences of quitting in the present (Antin, Hunt, & Sanders, 2018). Therefore, as recommended by other research, role of perceived social risks should be considered in intervention as well as increase adolescents' awareness of the addictive nature of cigarettes (Halpern-Felsher, Biehl, Kropp, & Rubinstein, 2004).

Equally important to defining behavioral target is defining target age group. Evidence suggest that beginning of adolescence is appropriate period for setting norm and developing resistance skills but also recommend booster interventions as effects of interventions might decrease over time (Botvin, 2000). Surveys indicate that school programs for young people are most effective when they target students aged between 11 and 14 and delivered by peer leaders (Gottfredson & Wilson, 2003). Taking into account that age of onset of smoking among Serbian students for majority of students happens toward the end of primary and begging of secondary school, these recommendations might be translated into Serbian context.

Influencing the behavior of current or potential tobacco users is often used strategy in prevention of youth smoking. Many behavioural smoking prevention programs are found to have some positive effect. According to West, there are different methods that can be used such as education (increasing knowledge), persuasion (shaping attitudes through imagery and other means), inducement (Making the desired behaviour more attractive), coercion (Making the undesired behaviour less attractive), Upskilling (trainings), regulating access and empowerment (West, 2006).

Programs could be grouped according to setting or point of approach to following: school settings, family community settings, leisure, media and health care settings.



School based programs are often used approach. Such programs can improved knowledge level, influence attitudes and reduce smoking initiation of smoking (VanDyke & Riesenberg, 2002). However, school programs are less effective in terms of behavioral changes and social resistance and it is recommended to implement such programs with other interventions such as media campaigns, family programs and extracurricular activities (Baska, Straka, Baskova, & Mad'ar, 2004). Findings from GYTS 2013 in Serbia implies that two third of student aged 13-15 years old were thought in school about harmful effects of tobacco. However, at the same time high percentage of students have seen someone smoking at the school building or outside building which is issue that needs to be addressed in future. Based on unpublished data collected by Office for Smoking Prevention of the Institute of Public Health Serbia, the most often delivered intervention in Serbia on prevention of substance use is information sharing. Evidence of well-designed and evaluated school programs in Serbia is missing (Kilibarda, Simić, Baros, & Brandic, 2014). Since numerous evidence show that information giving alone is not effective as smoking prevention intervention (EMCDDA, 2015), it is necessary to increase knowledge on evidence based practice among all those who are involved in planning and delivering prevention interventions.

Evidence for the effectiveness of community-based and multisectorial interventions are available (Muller-Riemenschneider et al., 2008). In Serbia, one of the resources available for delivery of smoking prevention interventions is existence of network of institutes for public health at regional level and are coordinated at the national level. This resource should be used as it provides opportunity to reach final target groups easily through well-established cooperation between local self-government, schools, and offices for youth in community. However, such networks seldom used for structured community based programs.

Health care system also provides opportunity for delivery of interventions through counselling centres for youth. Limited evidence exist on efficacy of programs in health care settings, especially for long term effects. (Song et al., 2009) Despite lack of evidence on effectiveness, health care professional that deliver certain preventive activities should not be omitted. Rather, pilot programs are needed to find best way to use resources that are in place which could give input for putting in place efficient interventions within available resources and in line with context.

Results of logistic regression show that parents and sibling smoking is associated with higher odds of smoking. It is of concern as it is well know that already during preadolescence, parents contribute to shaping the smoking cognitions of their children (Hiemstra, Otten, van Schayck, & Engels, 2012) and that frequency and quality of communication about smoking were associated with adolescents' smoking (Harakeh, Scholte, de Vries, & Engels, 2005). Parents can have preventive effects on children's smoking through high quality of communication, negative

reactions or punishments (Hiemstra, de Leeuw, Engels, & Otten, 2017) and therefore encouraging parents regardless of their smoking status to discuss smoking-related issues is recommended for further research as promising strategy (Bricker et al., 2006; Harakeh et al., 2005). Factors from broader social context, associated with smoking among Serbian students are perceived easy access to tobacco product, and having tobacco industry item. Of concern is also result that 81.2 of students stated that they were not refused because of age when they tried to buy tobacco. These findings call for multisectorial interventions such as better regulation of promotion of tobacco products and better compliance with ban on selling tobacco products to youth.

## **5.6 Smoking cessation among school children**

Almost 60 of smokers have tried to stop smoking in the past 12 months, and almost every second want to stop smoking. GYTS Serbia 2013 revealed the lack of recognition of young smokers as target group for smoking cessation intervention as only 7.6 of smokers received advice to stop smoking from health professional. It is important to focus on keeping occasional smokers from moving into daily smoking status, where nicotine addiction begins to play a prominent role in maintaining the behavior. These findings call for action and indicates that this might be lost opportunity for prevention of transition from occasional to daily smoking. Low percentage of student that received advice to stop smoking can be partly attributed to traditional focus on prevention the youth is often not recognized as target group for smoking cessation, but only for universal prevention.

Preventive check-ups for students which are in Serbia obligatory for students of this age might be occasion for giving advice. Health workers should be instructed to consider students as target group for smoking cessation instead of only seeing it as groups for traditional universal smoking prevention interventions. Based on the GYTS 2013 findings interventions targeting school children should be framed in such way to increase knowledge of current Serbian student smokers ages 13 to 15 on the benefits of smoke cessation; increase their smoke cessation intention of current Serbian youth smokers ages 13 to 15 that are motivated to quit smoking; provide smoke cessation educational tool to current Serbian students ages 13 to 15 that have experimented with cigarettes and those that show signs of smoking dependence and build capacities of health professional for delivering appropriate smoking cessation interventions for young smokers. Evaluated smoking cessation interventions targeting youth are rare compared with vast amount of evidence of efficiency of these interventions targeting adults. There are evidence that show effectiveness of internet-based programs in youth smoking prevention and cessation in spite of the studies' limitations (Park & Drake, 2015; Zhu, Lee, & Zhuang, 2012).

## 5.7 Students' exposure to tobacco smoke

In 2004 at global level there were 40 of children are exposed to SHS (Obergh, Jaakkola, Woodward, Peruga, & Pruss-Ustun, 2011) while in Serbia more than 60 of students are exposed to tobacco smoke at home, in side any enclosed public place an at outdoor public place. Majority of students are aware that smoking is harmful to their health which is important as risk perception of second hand smoke is associated with initiation of smoking (Roditis et al., 2016; Song et al., 2009; Halpern-Felsher & Rubinstein, 2005). Encouraging youth to communicate they are bothered with second hand smoke including parents smoking is recommended in studies as promising strategy (Song, Glantz, & Halpern-Felsher, 2009). All other interventions aimed at changing social norms and risk perception mentioned for adults are relevant to youth as well.

## 5.8 Substance use and mental health

Among Serbian adults most commonly used psychoactive substances are tobacco and alcohol. Results show that the strongest predictors of smoking status are frequent drinking, frequent binge drinking and last year prevalence of cannabis use. Results also show that people under serious stress are twice as likely to smoke in comparison with people that are not. Other authors also stress strong association of smoking status with sociodemographic variables SES, psychological distress, and concurrent tobacco and alcohol use (Bonevski, Regan, Paul, Baker, & Bisquera, 2014).

Apart for higher smoking prevalence, of concern is finding that average number of smoked cigarettes is statistically significantly higher among frequent binge drinkers, risky and problematic drinkers as well as among people under serious psychological distress.

Association found between smoking status and alcohol use has been confirmed after controlling for sociodemographic variables and other substance use in logistic regression. Those findings are in line with other studies, where cigarette smoking and alcohol use was found to be associated both among youth (Reed, Wang, Shillington, Clapp, & Lange, 2007; Tsiligianni et al., 2012) and adults with alcohol consumers more likely to be smokers than abstainers and vice versa (Höhne, Pabst, Hannemann, & Kraus, 2014). Similar to results from this thesis, research across different countries show that cigarette smoking prevalence is approximately from two to four fold higher in patients with psychiatric disorders and substance use disorders (Lasser et al., 2000).

Despite findings that that 78 of current marijuana users are smokers, which is in line with finding from other large scale surveys (Richter, Ahluwalia, Mosier, Nazir, & Ahluwalia, 2002) results from logistic regression could not confirm that current cannabis use is statistically significant predictor of smoking status, nor was risky cannabis use. However in Serbia, cannabis

use is lower than in majority of EU countries and small number of users didn't allowed more sophisticated statistical analysis despite the fact that odds of smoking are highest among last year cannabis users.

Having in mind high smoking prevalence among people with alcohol, cannabis and mental health disorders in Serbia and well documented comorbidity of substance use disorders with mood and anxiety disorders and other disorders, results call for targeted actions to substance users and people under psychological distress.

Presence of substance use and mental health problems should be taken into account in the smoking cessation treatment even though it is often incorrectly believed that smoking cessation cannot be successfully implemented together with mental and substance disorders treatments (Hitsman, Moss, Montoya, & George, 2009). However, there are researchers that 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 (G. Taylor, Taylor, Munafò, McNeill, & Aveyard, 2015). Literature review from 2009 found that smoking cessation success rates varied between interventions from 4.7 to 23.4 during substance abuse treatment (Baca & Yahne, 2009).

Integrative smoking cessation program for people suffering from alcohol related problems, use illicit substances and are under psychological distress has to be developed and implemented. Evidence from studies indicate need and positive results of integrating smoking cessation among those in treatment or early in recovery due to alcohol and other substance-related problems. Tobacco cessation interventions in treatment and recovery for substance addictions increases tobacco abstinence and do not affect abstinence from alcohol and other drugs and thus provide evidence to support tobacco cessation interventions incorporating pharmacotherapy (Apollonio, Philipps, & Bero, 2016; Sussman, 2002; Sees & Clark, 1993; Prochaska et al., 2004). Integrated care can improve adherence as it provide a consistent message targeting all addictive substances. However, researches point out that tobacco doesn't receive much attention of treatment providers in comparison with other substance use and mental health disorders and substance abuse treatment programs too often do not pay attention to tobacco use and even discourage smoking cessation (Baca & Yahne, 2009). Despite evidence showing that patients in drug or alcohol treatment programs are interested in smoking cessation (Sullivan & Covey, 2002) this is often overlooked in addiction treatment programs (Ziedonis, Guydish, Williams, Steinberg, & Foulds, 2006).

As research show positive association between brief motivational intervention and engagement in smoking cessation treatment among patients with mental health illness (Christiansen, Carbin, TerBeek, & Fiore, 2018) this should be recommended for piloting in Serbian health care settings. Other intervention that could be recommended based on research from other countries (Baker, Callister, Kelly, & Kypri, 2012) are support to those who do not want to quit

through assistance in reducing smoking and addressing multiple health-risk behaviors. Having five times higher odds of being smoker compared to those who do not use drugs. In addition, due to correlation of nicotine dependence and mental health status and other substance use disorders, comorbidity of these conditions should be considered within evaluation of smoking cessation programs.

## **5.9 Vulnerable populations**

Despite progress in reducing smoking prevalence in many countries, marginalized and socially deprived populations with low socioeconomic status still have higher smoking rates compared to general population (Hiscock, Bauld, Amos, & Platt, 2012; Odani et al., 2017; Lawlor et al., 2003). Smoking prevalence in all stigmatized groups in Serbia included in this thesis is stable since 2008 and higher than 50. Highest prevalence was found among sex workers (90.5%) while PLHIV have the lowest prevalence (51.0%) among population groups described in this thesis.

Smoking prevalence among Roma youth and institutionalized children without parental care in Serbia is exceptionally high (55.1% in Roma Youth and 57.8% among institutionalized children) and almost fourfold higher comparing to 13 smokers among school children 13-15 years old. Unlike general population, smoking rates in all vulnerable population groups are higher among females comparing to males. Although differences are not statistically significantly different for all population group, this finding points out need for targeted interventions for vulnerable groups that will also include gender sensitive issues.

Association between smoking and substance use are found in each population group with the strongest relationship in Roma youth, where those who use drugs have five times higher odds of being smoker compared to those who do not use drugs. Correlation of tobacco use with alcohol and illicit drugs problems was found also in other studies (Richmond et al., 2012; Cook, Wayne, Valentine, Lessios, & Yeh, 2013).

High smoking prevalence is correlated with poor socioeconomic status and living conditions. Conclusions on presence of additional risk factors cannot be made in presented datasets due to lack of available data, except for substance use. However 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 (Baig, Pepper, Morgan, & Brewer, 2017). Research shows that there are interventions that can be effective for smokers from disadvantaged population groups such as prisoners, people with mental illnesses and at risk youth, but also point out the need for further research (Wilson, Guillaumier, George, Denham, & Bonevski, 2017). Due to the barriers to interventions that are specific for these groups researchers recommend individual level, community-level as well as social network interventions (Laura Twyman, Billie Bonevski, Christine Paul, & Jamie Bryant, 2014; Twyman, Bonevski, Paul, & J. Bryant, 2014).

Within presented surveys among vulnerable groups data on intention to quit were not collected, but analogically to the results from general population it can be expected that certain proportion of the vulnerable population would be motivated to stop smoking. For some of those who might be in contemplation phase, availability of smoking cessation services could be a major barrier. Additional challenge is delivery of interventions as these groups are hard to reach.

Peer and community leaders can be used to reach vulnerable population groups. One of approaches which were applied for improvement of access to health care of Roma population are Roma mediators. Since engagements of Roma health mediators has been shown as a good model for improvement in health care of this population groups. (BIBIJA Romski ženski centar et al., 2014) it could be one of the options for tackling smoking prevention and cessation also in Serbia.

Targeted cessation programs can be effective among vulnerable groups. Such interventions include a brief, targeted motivational intervention which showed to increase intention to quit and other behavioral interventions such as extended telephone-delivered counseling which showed some positive short term effects among low income people and those suffering from mental illness (Wilson et al., 2017). However, all measures should be delivered in conjunction with wider interventions aimed at reducing inequalities in health (Hiscock, Bauld, Amos, Fidler, et al., 2012).

It should be kept in mind that despite promising results of some smoking cessation intervention among socially disadvantaged groups, overall findings are inconsistent (Bryant, Bonevski, Paul, McElduff, & Attia, 2011). For all vulnerable groups options for harm reduction interventions should be explored. Tobacco harm reduction approach at global level is not a new approach. One of the rationales for this approach is that nicotine itself is not very harmful which led to development of nicotine replacement therapy products as an aid to quit, reduce to quit or temporarily abstain from smoking. In addition, development of licensed nicotine products pharmacologically and behaviourally substituting conventional cigarettes is supported and incorporated in some way in strategic policy papers in some countries such as UK (Fagerstrom & Bridgman, 2014).

Electronic cigarettes, are advocated as one of the products that can be used for harm reduction as safe alternatives to conventional tobacco cigarettes and/or as aides to smoking cessation (Malas et al., 2016; Hartmann-Boyce et al., 2016). In Serbia, electronic cigarettes are present at market for almost decade but gain popularity mostly among younger population groups and females. In addition, survey conducted in 2016 at representative sample of Serbian adults show that for majority of users, electronic cigarette didn't have impact of smoking status in terms reduction of smoking or quitting (Kilibarda & Nikolic, 2016). This might be taken into account but does not have to be major factor in decision making about recommending electronic cigarette as harm reduction intervention in Serbia. However, of concern are the price and regulatory framework of electronic cigarette. Tobacco Product Directive which in EU govern the electronic cigarette market and sets out safety, quality and notification requirements for electronic cigarettes is not transposed to Serbian legislation yet, nor any other legislation on safety and quality if electronic cigarette exists.

One of harm reduction approaches that should 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. There are studies that show positive effects of reduction to quit approach among smokers recruited in community setting (Wang et al., 2017), but context is different compared to stigmatized population.

Socioeconomic factors highly associated with living condition and smoking prevalence is hard to be changed with tobacco control measures that are efficient for general population and needs measures at national level that require political support and system approach. In countries such as Serbia with high unemployment rate and low income of general population, it remains a challenging task.

## 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 years. Comparison of health survey data from 2000-2013 shows 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 restrictions, education on quitting and providing access to broad range of smoking cessation (Lopez et al., 1994). 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. This might be result of traditional focus on prevention measures targeting students and can be considered as missed opportunity to prevent transition from occasional to daily smoking. Building capability, motivation and opportunities for smoking cessation among health care professionals could bring increase in quit rates both among adults and youth.

Data also show high exposure to tobacco smoke both among youth and adults. However, despite high smoking prevalence and exposure tobacco is not recognized as important problem in society. Interventions should be designed to change attitudes on importance of implementation of tobacco control measures as studies pointing put importance of attitudes for building support and acceptance of tobacco control policies. In general, there is low risk perception especially among smokers' risk to their own health which might be consequence of optimistic bias phenomenon. Based on the results from other studies, messages delivered through various channels should emphasize risk to others and economic and social cost of smoking for society. 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. Some of these neurological and physiological techniques include eye tracking and implicit association testing (Harris et al., 2018).

Factors that predict smoking among all general population and vulnerable groups included in this thesis are substance use and lower socioeconomic status. The high rates of comorbidity



between smoking and other substance related and mental disorders should be given particular attention when evaluating the success of smoking cessation interventions since smoking cessation can contribute to decreasing other burden. 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 demand more attention and go 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. Approach that might be piloted and would be feasible in Serbian context might be reduction of smoking with or without NRT. 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.

Good quality data on various aspects of smoking are of importance for tobacco control (WHO, 2017). 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. While surveys provide insight in several aspects relevant to tobacco control there are need for further improvement. Adding questions to asses nicotine dependence and identify hard core smokers is recommended in general population surveys among adults. Global Youth among school children provided information that are excellent resource for planning preventive interventions among school students and main finding should be used for further advocacy aimed at improvement of legislation and better implementation of existing one to protect children from consequences of smoking. More information are needed related to new challenges such as electronic cigarette, water pipe use and heated tobacco products. Attention should be also paid to peer influence and influence of social networks to smoking initiation. Estimation of peers' smoking should be analysed due to correlation of misperceptions of others' smoking with behaviour. Youth should also be involved in development of targeted campaigns for youth smoking prevention.

Available surveys in Serbia provide significant quantitative data related to smoking. However, 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 factors and norms. Health Survey provided data on prevalence and exposure to tobacco smoke, however, it cannot be seen where this exposure happens mostly. Survey among vulnerable populations gives information on smoking among populations at increased risk for HIV as well as

among disadvantage groups. However, specific research should be aimed at getting insight into motivations to quit among vulnerable populations and barriers for smoking cessation.

In surveys aimed at collection of data on social norms, knowledge and attitudes, specific and standardized sets of questions should be used and when it is possible, in such manner that allows comparison with other countries. Surveys should be conducted regularly so trend could be analysed. 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.

## 7 References

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## 8 Annexes

### 8.1 Sample characteristics

*Sample characteristics National Survey on Lifestyles of the Citizens of Serbia in 2014*

Variables		N	%
Total		5385	100,0
Age groups	18-24	692	12,9
	25-34	1126	20,9
	35-44	1111	20,6
	45-54	1158	21,5
	55-64	1297	24,1
Gender	Female	2709	50,3
	Male	2676	49,7
Type of settlement	Urban	3281	60,9
	Rural	2104	39,1
Personal status	Married or informal marriage	3146	58,4
	Not married	1628	30,2
	Divorced or widowed	610	11,3
Education	Elementary or less	1120	20,8
	Secondary	3218	59,8
	College or university	1022	19,0
	Missing	25	0,5
Age groups	18-24	692	12,9
	25-34	1126	20,9
	35-44	1111	20,6
	45-54	1158	21,5
	55-64	1297	24,1

*Sample characteristics The Health Survey of Citizens of Serbia in 2013*

Variables		N	%
	Total	13756	100,0
Gender	Male	6635	48,2
	Female	7121	51,8
Age groups	15-17	582	4,2
	18-24	1297	9,4
	25-34	2181	15,9
	35-44	2152	15,6
	45-54	2242	16,3
	55-64	2511	18,3
	65-74	1549	11,3
	75+	1242	9,0
Education	Elementary or less	4009	29,1
	Middle	7469	54,3
	High	2278	16,6
Type of settlement	Urban	8155	59,3
	Other	5601	40,7
Personal status	Never married or lived in informal marriage	3189	23,2
	Married or informal marriage	8320	60,5
	Widowed	1605	11,7
	Divorced	642	4,7

Sample characteristics Global Youth Tobacco Survey Serbia, 2013

Total	Gender		School grade			Age				
	Male	Female	VII	VIII	I	≤12	13	14	15	16+
3987	2083	1899	991	1032	1949	20	602	998	1476	891
%	52.2	47.6	24.9	25.9	48.9	0.5	15.1	25.0	37.0	22.3

Sample characteristics, sampling method and criteria for inclusion, Research among populations most at risk to HIV and among people living with HIV, 2013

Population		Prisoners	PLHIV	SWs	MSM	Roma Youth	Institutionalized children
Sample size and method		N=543 Cluster	N=445 Convenience	N=400 Snowball	N=1000 RDS	N=700 RDS	N=211 Cluster
Inclusion criteria (age and other criteria)		18≥, spent the last month in prison	18≥, out- and inpatients regardless the place of residence, treated at the hospitals for infectious diseases in the last six months, and have had confirmed and aware of HIV positive status	18≥, exchanged sexual service for money, drugs or other material goods in the last 12 months, residents or working at the research location for at least three months.	18 – 59, residing at the territory of three cities in Serbia for at least three months, have had anal sexual intercourse in the last six months.	15 -24, live or work in the research location at least last three months	12-19, institutionalized least one-month prior the survey and had normal cognitive functions (ability to understand the questions).
Gender	Male	89.0%	78.7%	25.0%	100%	63.9	63.0%
	Female	11.0%	21.3%	75.0%	x	36.1%	27.0%
Age groups	12-14	x	x	x	x	x	29.9
	15-17	x	x	x	x	38.1	56.9
	18-24	18.6%	2.9%	35.1%	32.6%	61.9	14.2
	25-34	45.3%	25.2%	44.1%	44.8%	x	x
	35-44	20.8%	29.4%	19.8%	21.6%	x	x
	45+	15.3%	42.5%	1.1	1.0%	x	x
Education	No school	8.5%	2.5%	30.8	0.8	19.0%	x
	Elementary	26.5%	6.7%	36.3	3.1	37.0%	x
	Secondary	52.8%	53.0%	30.3	62.3	18.0%	x
	College or university	40.6%	37.8%	2.8	33.8	0.4%	x
	Currently enrolled	x	x	x	x	25.6%	x
Working status	Employed	42.0%	36.9%	3.5	55.8%	x	x
	Unemployed	44.8%	31.2%	93.8	15.3%	x	x
	Other	6.2%	31.9%	2.7	28.9%	x	x
Marital status	Living with partner	48.4	27.5%	39.3	8.0%	x	x
	Divorced/widowed	18.7	19.5%	16.4	6.4%	x	x
	Single	32.9	53.0%	44.3	85.6%	x	x

## 8.2 Questionnaires (selected questions) used for analysis

8.2.1 Questions from questionnaire for population aged 15 years and above - interview, National Health Survey in Serbia, 2013 (questions used within thesis)

Basic characteristics

BC.1 What is your country of birth? (You were born in territory of which current state?)

- Serbia  1
- EU member state  2
- Non EU member state?  3

BC.2 What is your Citizenship?

- Serbian  1
- EU member state  2
- Non-EU member state?  3

BC.3 What is your legal marital status?

**INTERVIEWER INSTRUCTION:** *Mark first adequate response*

- Single, that is never married/cohabiting  1
- Married/Cohabiting  2
- Widowed (or cohabitation ended with a death of a partner) and not remarried or re-enter cohabitation)  3
- Divorced and not remarried (including separated and dissolved partnership and never re-enter cohabitation again)?  4

**INTERVIEWER INSTRUCTION:** *If household has only one member skip the question BC 4 and go to the question BC 5*

OK.4 May I just check, are you living with someone in this household as a couple?

- Yes, with a partner  1
- No  2

OK.5 What is the highest education leaving certificate, diploma or education degree you have obtained? Please include any vocational training.

- No formal education  1
- Incomplete primary education (1-7 year)  2
- Primary education  3
- Lower secondary education (2 years)  4
- Secondary education (3 or 4 years)  5
- Specialization after secondary school  6
- High school (2-3 years)  7
- University (under graduated-BSc)  8
- University (post graduated, MSc/ master)  9
- University (PhD)  10

OK.6 How would you define your current employment status?

- working for payment or profit (including unpaid work for a family business or holding, including an apprenticeship or paid traineeship, including currently not at work due to unemployment)  1
- pupil, student, further training, unpaid work experience  2
- in retirement or early retirement or has given up business<sup>1</sup>  3
- permanently disabled <sup>2</sup>  4
- fulfilling domestic tasks (Housewife)  5
- Other, please explain: \_\_\_\_\_  6

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<sup>1</sup> Excluding disability or health conditions

<sup>2</sup> Including chronic diseases or health issues

## RISK FACTORS

The following questions are related to your attitude, knowledge and behaviour about health risk factors.

FR.1 Do you consider that your behaviour put you at risk of some of following diseases?

*INTERVIEWER INSTRUCTION: Show card 17-FR1. Interviewee references only those categories related to him/her. Fill in code for every disease.*

- Yes..... 1
- No..... 2
- Already diseased..... 3
- Don't Know ..... 8
- Refuse to answer.... 9

Disease	FR.1
a. Obesity	<input type="checkbox"/>
b. Hypertension	<input type="checkbox"/>
c. Diabetes melitus	<input type="checkbox"/>
d. Cardiovascular diseases (AMI, stroke, angina pec-	<input type="checkbox"/>
e. Pulmonary diseases (chronic bronchitis)	<input type="checkbox"/>
f. Cancer	<input type="checkbox"/>
g. Cirrhosis of the liver	<input type="checkbox"/>
h. Sexually transmitted diseases, AIDS	<input type="checkbox"/>
i. Disease due to injuries	<input type="checkbox"/>

FR.2 According to your opinion, what is the influence on health of the following factors:

*INTERVIEWER INSTRUCTION: Show card 18-FR.2 Fill in code for every determinant.*

- High..... 1
- Moderate..... 2
- Low ..... 3
- Don't Know..... 8
- Refuse..... 9

Determinant	FR.2
a. Nutrition	<input type="checkbox"/>
b. Physical activity	<input type="checkbox"/>
c. Smoking	<input type="checkbox"/>
d. Alcohol consumption	<input type="checkbox"/>
e. Social activities (time with friends, going out, picnic...)	<input type="checkbox"/>

Questions from questionnaire for population aged 15 years and above – self administrated, **National Health Survey in Serbia, 2013 (questions used within thesis)**

### Smoking

PU.1 Have you ever smoked?

- Yes  1  
 No  2 → Go to PU.8

PU.2 Have you ever smoked daily?

- Yes  1  
 No  2

PU.3 Do you smoke now?

- Yes, every day  1  
 Yes, occasionally  2  
 3 → Go to PU.8  
 No

PU.4 What type of tobacco products do you mainly use?

ONLY ONE ANSWER IS POSSIBLE.

Cigarettes (Manufactured or hand-rolled cigarettes)  1 → Go to PU.5

- Cigars  2  
 Pipe  3  
 Other  4
- } Go to PU.6



PU.5 On average, how many cigarettes do you smoke each day?

Number of cigarettes:

I do not smoke every day  0

PU.6 During the last 12 months have you tried to stop smoking?

Yes  1

No  2

PU.7 During the last year (12 months) have you been advised to stop smoking by doctor or other health professional?

Yes  1

No  2

PU.8 How often are you exposed to tobacco smoke indoors?  
(At home, at work, in restaurants, other public places such theaters, clubs...)?

Never or almost never  1

Less than 1 hour per day  2

Every day, 1 hour or more a day  3

PU.9 Are you concerned about the harmful consequences that smoking/environmental smoke exposure can have on your health?

Yes, very concerned  1

Yes, a bit  2

Not very much  3

No, not at all  4

8.2.2 National survey on life styles of citizens in Serbia 2014(questions used within thesis)

a2	There are many problems within a society people are concerned with. Which of them in comparison with other problems in society seems to you very important, and which of them seems to you less important in the place where you live? Please assess each of the problems listed below, using the grades from 1 to 5, 1 meaning unimportant to 5 meaning important.					b3	
		unimportant	Rather unimportant	Neither important nor unimportant	Rather important		important
	1. Violence in familv	1	2	3	4		5
	2. Environment pollution	1	2	3	4		5
	3. Alcoholism	1	2	3	4		5
	4. Corruption	1	2	3	4		5
	5. Bad health conditions of society	1	2	3	4		5
	6. Alcohol drinking by youth	1	2	3	4		5
	7. Tobacco smoking	1	2	3	4		5
	8. Unemplovment	1	2	3	4		5
	9. Crime	1	2	3	4		5
	10. Political problems	1	2	3	4		5
	11. Drug addiction	1	2	3	4		5
	12. Poverty	1	2	3	4		5
	13. Discrimination of vulnerable groups (homeless people, Roma, LGBT...)	1	2	3	4		5
	14. Moral crisis in the society	1	2	3	4		5
	15. Mental health problems of society	1	2	3	4		5
	16. Violence and aggressions in society	1	2	3	4		5
	17. Decrease of standard of living	1	2	3	4		5
	18. Other problem - (which one?) .....	1	2	3	4		5
19. Other problem - (which one?) .....	1	2	3	4	5		
20. Other problem - (which one?) .....	1	2	3	4	5		

TOBACCO			
b3	Have you ever smoked tobacco, such as cigarettes, cigars or a pipe?	1. No, I never smoked 2. yes, I just tried smoking but never smoked occasionally or on a daily base 3. yes, I previously smoked only on a not daily basis, but now I don't smoke 4. yes, I previously smoked on a daily basis, but now I don't smoke 5. yes, I currently smoke but not a daily basis 6. yes, I currently smoke on a daily basis	b7       b4
b4	At what age did you smoke first cigarettes or other tobacco product like cigars or a pipe?	_____ years	b5
b5	At what age did you start smoking tobacco, such as cigarettes, cigars or a pipe daily?	1. _____ years Ø Never	b6a

b6a	We ask you to focus now only on the last 30 days (4 weeks). How often in the last 30 days have you smoked tobacco, such as cigarettes, cigars or a pipe?	1. I have not smoked at all the last 30 days 2. I smoked daily 3. I smoked around _____ days out of the last 30 days	b6b
b6b	On such a day in the last 30 days when you have smoked, how many cigarettes or other tobacco products such as cigars or pipe did you smoke on a daily average?	I smoked round about _____ cigarettes or other tobacco products such as cigars or pipe on such a day	b7
b7	Have you ever used electronic cigarettes?	1. no, I never used electronic cigarettes 2. yes, I just tried electronic cigarettes but never used it occasionally or regularly 3. yes, I previously used electronic cigarettes only on a not daily basis, but now I don't use it 4. yes, I previously used electronic cigarettes on a daily basis, but now I don't use 5. yes, I currently use electronic cigarettes but not on a daily basis 6. yes, I currently use electronic cigarettes on a daily basis	c8
<b>ALCOHOL</b>			
c8	How often did you in the past 12 months drink beer, wine, spirits (e.g. vodka, gin, whisky, cognac, brandy) or any other alcoholic beverage, even in small amounts, for example a glass of beer, wine or spirits? Show card 1 [INT] Show card 1	1 Every day 2 5 – 6 times a week 3 3 – 4 times a week 4 1 – 2 times a week 5 2 – 3 times a month 6 Once a month 7 6 – 11 times a year 8 2 – 5 times a year 9 Once a year	c9
		10 I did not drink last 12 months, but I drank earlier 11 I never drank in my life	c21
c16	During what time period (in how many hours) at one occasion did you drink the equivalent of 60 gram of alcohol or more, which is 1.5l of beer (e.g. 3 glasses/bottles/cans of 0.5 liters or 5 glasses, bottles/cans of 0.3l of beer) or 0.6l of wine (3 glasses of 0.2l of wine) or 0,18l of spirits (e.g. 6 shots of 0,03l) or any combination of those?  [INT] Please tick to the nearest hour	1. Less than 1 hour 2. 1-2 hours 3. 3-4 hours 4. 5-6 hours 5. 7-8 hours 6. 9 or more hours	c17
c17	Of the above occasions how often in the past 12 months, have you had the equivalent of 120 gram of alcohol or more, which is 3.0l of beer (e.g. 6 glasses/bottles/cans of 0.5 liters or 10 glasses, bottles/cans of 0.3l of beer) or 1.2l of wine (6 glasses of 0.2l of wine) or 0.36l of spirits (e.g. 12 shots of 0,03l) or any combination of those?  [INT] show card 4 – alcohol	1. Every day 2. 5 – 6 times a week 3. 3 – 4 times a week 4. 1 – 2 times a week 5. 2 – 3 times a month 6. Once a month 7. 6 – 11 times a year 8. 2 – 5 times a year 9. Once a year	c18
		10. Never in the past 12 months	c19

c20	During the past 12 months:			c21
		Yes	No	
	1. Have you had a feeling of guilt or remorse after drinking?	1	2	
	2. Have you had a friend or family member tell you about things you said or did while you were drinking that you couldn't remember?	1	2	
	3. Have you failed to do what was normally expected from you because of drinking?	1	2	
	4. Do you sometimes take a drink in the morning when you got up?	1	2	

#### PHARMACEUTICALS

d23	Now we will talk about so called "medicines for calming down" (sedative, tranquillizer or hypnotics) [ANK] Show card 5 During the last 12 months, have you taken any of such medicines like sedative, tranquillizer or hypnotics?	1. Yes 2. No	d24  d29
d29	Now we will talk about strong medicines containing opiate/opioids which is mainly used for reducing pain. [ANK] Show card 6 During the last 12 months, have you taken any strong medicine with opiates/opioids (they are used mainly for reducing pain)?	1. Yes 2. No	d30  e35

#### VOLATILE SOLVENTS (E.G. GLUE, THINNER, GASOLINE, PAINT....)

e38	During the last 12 months, have you used solvents because of psychoactive effects?	1. Yes 2. No	e39 f41
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#### MARIJUANA AND HASHISH (CANNABIS)

f46	During the last 12 months, have you taken hashish or marihuana?	1. Yes 2. No	f47 g56
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#### ECSTASY

g61	During the last 12 months, have you taken ecstasy?	1. Yes 2. No	g62 h64
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#### AMPHETAMINES

h69	During the last 12 months, have you taken amphetamines?	1. Yes 2. No	h70 h72
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#### COCAINE

i78	During the last 12 months, have you taken cocaine?	1. Yes 2. No	i79 j81
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#### HEROIN AND OPIATES

j87	During the last 12 months, have you taken heroin?	1. Yes 2. No	j88 j90
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LSD, MAGIC MUSHROOMS			
I108	During the last 12 months, have you taken LSD?	1. Yes	I109
		2. No	I111

OPINIONS								
o132	Individual opinions regarding certain things that people do are different. I will mention a few things, which some people might do. Can you tell me if you do not condemn, condemn or strongly condemn when people do any of these things?					o133		
		I do not condemn	I rather condemn	I condemn				
	1. Trying ecstasy once or twice	1	2	3				
	2. Trying heroin once or twice	1	2	3				
	3. Smoking 10 or more cigarettes a day	1	2	3				
	4. Having one or two drinks several times a week	1	2	3				
	5. Smoking marijuana or hashish occasionally	1	2	3				
o133	Now I would like to know how much do you think that people are harming themselves, physically or in other ways, if they do certain things. I will again mention a few things, which some people might do. Please tell me if you consider it to be no risk, a slight risk, a moderate risk or a great risk, if people do such things.					o134		
		no risk	slight risk	moderate risk	great risk			
		Smoke one or more packs of cigarettes per day	1	2	3		4	
		Have five or more drinks each weekend	1	2	3		4	
		Smoke marijuana or hashish regularly	1	2	3		4	
		Try ecstasy once or twice	1	2	3		4	
	Try cocaine or crack once or twice	1	2	3	4			
o134	How often during the last 30 days did you feel:					o135		
		Never	Seldom	Sometimes	Often		Always	
		1. nervous?	1	2	3		4	5
		2. hopeless?	1	2	3		4	5
		3. restless or fidgety?	1	2	3		4	5
		4. so depressed that nothing could cheer you up?	1	2	3		4	5
		5. that everything you	1	2	3		4	5
	6. do requires an effort?	1	2	3	4	5		
o135	How many members of your close family (parents, children, grandparents, grandchildren's, brothers, sisters, closer relatives) who live in Serbia are you close with and keep in touch? [INT] if zero go to Q140.				1. _____ —	o136		

SOCIO-DEMOGRAPHIC INFORMATION ABOUT RESPONDENT			
dem146	Gender	1. Male 2. Female	dem 147
dem147	Year of birth	_____ year	dem 148
dem148	Personal status	1. Married 2. not married 3. divorced 4. widow / widower 5. informal marriage	dem 149
dem149	Educational status	1. not completed primary school 2. completed primary school 3. not completed high school 4. completed high school 5. not completed university of applied sciences or university (higher education or faculty) 6. completed university of applied sciences 7. completed university 8. other	dem 150
dem150	What is your current occupation?	I Self-employed 1. Manual worker (e.g. craftsman) 2. Farmer 3. Professional (e.g. lawyer, medical practitioner, architect, ) 4. Businessman (e.g. business proprietor, owner or co-owner of a company, owner of a shop, restaurant) 5. Other self-employed (e.g. owner of a small shop, small restaurant)	dem 154
		II Employed 6. Highly qualified intellectual (lawyer, doctor, teacher...) 7. Executives (directors), senior officials and legislators 8. administrative officers 9. employed professionals with middle or higher school (e.g. teachers, nurses) 10. Service and sales workers 11. Semiskilled and skilled manual worker 12. Unskilled manual worker	
dem151	Did you do any paid work in the past?	1. Yes	Dem 152
		2. No	Dem 153
dem152	What was your last occupation?	SELF-EMPLOYED 1. Manual worker (e.g. craftsman) 2. Farmer 3. Professional (e.g. lawyer, medical practitioner, architect) 4. Businessman (e.g. business proprietor, owner or co-owner of a company, owner of a shop, restaurant) 5. Other self-employed (e.g. owner of a small shop, small restaurant)	Dem 154

		<p><b>EMPLOYED</b></p> <p>6. Highly qualified intellectual (lawyer, doctor, teacher...)</p> <p>7. Executives (directors), senior officials and legislators</p> <p>8. administrative officers</p> <p>9. employed professionals with middle or higher school (e.g. teachers, nurses)</p> <p>10. Service and sales workers</p> <p>11. Semiskilled and skilled manual worker</p> <p>12. Unskilled manual worker</p>	
dem153	If you have never been employed please indicate recent employment status of a person who mainly supports you?	<p><b>SELF-EMPLOYED</b></p> <p>6. Manual worker (e.g. craftsman)</p> <p>7. Farmer</p> <p>8. Professional (e.g. lawyer, medical practitioner, architect)</p> <p>9. Businessman (e.g. business proprietor, owner or co-owner of a company, owner of a shop, restaurant)</p> <p>10. Other self-employed (e.g. owner of a small shop, small restaurant)</p> <p><b>EMPLOYED</b></p> <p>13. Highly qualified intellectual (lawyer, doctor, teacher...)</p> <p>14. Executives (directors), senior officials and legislators</p> <p>15. administrative officers</p> <p>16. employed professionals with middle or higher school (e.g. teachers, nurses)</p> <p>17. Service and sales workers</p> <p>18. Semiskilled and skilled manual worker</p> <p>19. Unskilled manual worker</p>	Dem 154

8.2.3 Surveys among populations most at risk for HIV (People living with HIV, Men having sex with men, Sex Workers, Roma Youth, Institutionalized children, Prisoners) (questions used within thesis)

Socio-demographic characteristics			
1.	How old are you?		
3.	Highest level of education finished?	a) Haven't gone to school b) Incomplete elementary c) Elementary school d) Middle school (3 or 4 years) e) Higher school f) Faculty g) Currently enrolled	
4.	What is your marital status?	a) Married b) Informal marriage c) Divorced d) Widowed e) Never married (single)	
5.	Employment status?	a) Employed b) Self employed c) Retired d) Student e) Unemployed	
6.	Where do you live?	a) In rural area b) In urban area	
16.	Do you use any of listed substances?		
		No	Yes
			I used previously, but do not use anymore
	1. Cigarettes	1	2
	2. Alcohol	1	2
	3. Drugs	1	2



### 8.3 Biljana Kilibarda: List of Publications

#### Journals with IF

Kilibarda, B., Mravcik, V., & Martens, M. S. (2016). E-cigarette use among Serbian adults: prevalence and user characteristics. *Int J Public Health*. doi: 10.1007/s00038-016-0787-y

Kilibarda, B., Mravcik, V., Oechsler, H., & Martens, M. S. (2017). Association of smoking status with substance use and psychological distress in Serbia. *Public Health*, 152, 95-98. doi: 10.1016/j.puhe.2017.07.026

Kilibarda, B., Mladenovic, I., & Rakic, J. G. (2013). Attitudes on alcohol and drinking patterns among youth in Serbia. *Srp Arh Celok Lek*, 141(1-2), 66-71.

Seke, K., Petrovic, N., Jeremic, V., Vukmirovic, J., Kilibarda, B., & Martic, M. (2013). Sustainable development and public health: rating European countries. *BMC Public Health*, 13, 77. doi: 10.1186/1471-2458-13-77

#### Reports

Farrington J. et al (2018). Better no communicable disease outcomes: challenges and opportunities for health systems. Country assessment Serbia, WHO regional Office for Europe

Kilibarda, B., & Nikolic, N. (2016). Rezultati istrazivanja o efektima i stavovima u vezi sa Zakonom o zastiti stanovnistva od izlozenosti duvanskom dimu. In B. Kilibarda & N. Nikolic (Eds.). Beograd: Institut za javno zdravlje Srbije "Dr Milan Jovanovic Batut".

Boričić, K. et al (2014). Results of the national health survey of Serbia, 2013. In I. Dragan (Ed.). Belgrade: Institute of public health of Serbia.

Kilibarda B., Mravcik V, Sieroslowski J, Martnes, S.M., Gudelj Rakić J (2014) National survey of health lifestyles of citizens of Serbia/ psychoactive substance use and gambling. Institute of Public health of Serbia available at <http://www.batut.org.rs/download/publikacije/lzvestaj%20engleski%20web.pdf>

Kilibarda B, Nikolić N (2015) rezultati istraživanja o efektima i stavovima u vezi sa zakonom o zaštiti stanovništva od izloženosti duvanskom dimu, Institut za javno zdravlje Srbije ISBN-86-7358-066-1

Kilibarda B., Simic, D., Baros, S., Brandic, I. (2014) National Drug report Serbia EMCDDA 2014 available at <http://www.emcdda.europa.eu/html.cfm/index233204EN.html>

Ministry of the health of Serbia, Institute of public health of Serbia (2009). The European School Survey Project on Use of Alcohol and Other Drugs 2008. Institute of Public health of Serbia, Belgrade

Institute of public health of Serbia (2009). Analytical study of the health of the population in Serbia 1997-2007. Institute of Public health of Serbia

### Conference proceedings

Kilibarda, B., Nikolic, N., Gudelj Rakic, J., Vasic, M. (2018). Waterpipe use and attitudes related to it among Serbian adult population. *Tobacco Prevention & Cessation*, 4(Supplement), A47. <https://doi.org/10.18332/tpc/90446>

Kilibarda, B., Nikolic, N., Vasic, M. (2018). Smoking cessation services in Serbia. *Tobacco Prevention & Cessation*, 4(Supplement), A3. <https://doi.org/10.18332/tpc/90138>

Girvalaki, C., Vardavas, C. I., Papadakis, S., Ayesta, F. J., Arapoglou, Y., Bakhturidze, G. ... Behrakis, P. K. (2017). EPACTT 2 - Development of a EuroPeaan Accredited Curriculum on Tobacco Treatment. *Tobacco Prevention & Cessation*, 3(May Supplement), 23. <https://doi.org/10.18332/tpc/70397>

Vasić M., Kilibarda B., Gudelj Rakić J., Nikolić N, Stošić M. (2017), Pušenje u ugostiteljskim objektima - izloženost duvanskom dimu i stavovi stanovništva Srbije, Niški preventivni dani, Niš 27-29. 9. 2017.

Kilibarda, B., Milovanovic, M., Martinson, N., Foley, K. (2018). Association of smoking opinions and risk perception with smoking status in Serbian adults. *Tob. Induc. Dis.* 2018;16(Suppl 1):A855 DOI: <https://doi.org/10.18332/tid/84280>

Kilibarda, B., Baros, S., Foley, K., Kosic Bibic, N., Mravcik, V. (2017). Smoking among vulnerable populations in Serbia. *Tobacco Prevention & Cessation*, 3(May Supplement), 38. <https://doi.org/10.18332/tpc/70303>

Kilibarda, B., Krstev, S., Nikolic, N., Sovic, N., Kosic Bibic, N. (2017). Attitudes of Serbian adults towards e-cigarette use. *Tobacco Prevention & Cessation*, 3(May Supplement), 39. <https://doi.org/10.18332/tpc/70304>