

# Five-Year Cumulative Incidence of Smoking in Adult Croatian Population: the CroHort Study

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## ABSTRACT

*The aim of this paper is to investigate the incidence of smoking and changes in smoking habits in Croatia during a 5-year period. Data from the Croatian Adult Health Study of 2003 and 2008 was used for the study (N=3229). The results of this study suggest that the incidence of smoking is the highest in youngest men and decreases with age. In ages 35 to 64 and older than 65 the incidence was higher in women than men. The cumulative smoking incidence is low in Croatia, but particularly alarming is a higher incidence in women than in men.*

**Key words:** smoking incidence, risk factor, CroHort Study

## Introduction

Tobacco smoke contains around 4,800 compounds, of which about 100 are carcinogenic, mutagenic or have tumor promoter properties<sup>1</sup>. Smoking is the main risk factor in developing malignant diseases<sup>2–9</sup>. Smoking doubles the risk of death caused by cardiovascular diseases, and 30–40% of all deaths caused by coronary diseases are attributed to smoking<sup>10</sup>. Smoking is a socially accepted behavior in Croatia and every third citizen is a smoker<sup>11</sup>. The CAHS study 2003 suggested regional difference in smoking prevalence and prevalence were higher in men<sup>12</sup>. By ratifying the Framework Convention for Tobacco Control (FCTC), Croatia will integrate European tobacco bans: restricted areas for smokers, limitation of tar and nicotine levels, and forbidden advertising throughout the country. The participants of the CAHS study were followed in a 5-year period. Data was used to show a cumulative 5-year smoking incidence by age group and gender. Given the preventive activities and the campaign against smoking, we expected a low incidence of smoking.

## Material and Methods

Data from the Croatian Adult Health Survey (CAHS) was used in this study. CAHS is a cross-sectional survey which provided the basis for the calculation of represen-

tative estimates for a number of health related risk factors<sup>13,14</sup>. A multistage stratified sample design was used to draw a representative sample of general adult population. The survey targeted people aged  $\geq 18$  years living in private households in the Republic of Croatia. The 2001 Croatian Census was used to select a representative sample of households to be included in this survey<sup>15</sup>. In total, 10766 households were selected to participate in the 2003 CAHS. Response was obtained from 9070 individuals, which gave the overall response rate of 84.3%. Public health nurses trained in face-to-face interviews<sup>13</sup> administered the questionnaire. Survey results were representative of the regional, sex, and age structure of the Croatian adult population. Out of the 9070 individuals included in CASH 2003, 3230 participated in CroHort Study.

## Statistical Analysis

Respondents were divided into three groups (smokers, former smokers and non-smokers), to help analyze changes in smoking status. We calculated incidence as the number of respondents who were nonsmokers in 2003, and began smoking by 2008. The recidivists were respondents who were former smokers in 2003, and began

**TABLE 1**  
DISTRIBUTION OF MEN ACCORDING TO SMOKING STATUS IN 2003

	Non smokers		Former smokers		Smokers		All	
	N	%	N	%	N	%	N	%
<35	75	31.4	48	20.1	116	48.5	239	100.0
35–64	515	30.1	520	30.4	674	39.4	1,709	100.0
65+	308	33.0	432	46.4	192	20.6	932	100.0
All age	898	31.2	1,000	34.7	982	34.1	2,880	100.0

**TABLE 2**  
DISTRIBUTION OF WOMEN ACCORDING TO SMOKING STATUS IN 2003

	Non smokers		Former smokers		Smokers		All	
	N	%	N	%	N	%	N	%
<35	261	41.6	126	20.1	241	38.4	628	100.0
35–64	1,875	53.2	654	18.6	994	28.2	3,523	100.0
65+	1,643	81.9	214	10.7	148	7.4	2,005	100.0
All age	3,779	61.4	994	16.1	1,383	22.5	6,156	100.0

**TABLE 3**  
DISTRIBUTION OF MEN ACCORDING TO SMOKING STATUS IN 2008

	Non smokers		Former smokers		Smokers		All	
	N	%	N	%	N	%	N	%
<35	17	32.1	19	35.8	17	32.1	53	100.0
35–64	173	31.3	207	37.5	172	31.2	552	100.0
65+	119	36.1	163	49.4	48	14.5	330	100.0
All age	309	33.0	389	41.6	237	25.3	935	100.0

smoking by 2008. Contingency tables were used in the analysis. All confidence intervals (CI) were calculated with 95% probability levels. The software SAS for Windows (version 8.2, SAS Institute Inc, Cary, NC) was used for the analysis<sup>16</sup>.

## Results

Smoking prevalence in men decreased from 2003 (34.1%) to 2008 (25.3%). The highest smoking prevalence was among men younger than 35 and decreases with age. In 2003 48.5% of men younger than 35, and 32.1% in 2008 were smokers (Table 1 & 3). In the same period the share of former smokers and non-smokers was increased (former smokers from 34.7% in 2003 to 41.6% in 2008; non-smokers from 31.2% in 2003 to 33.0% in 2008) (Table 1 & 3).

Prevalence of smoking among women has not changed significantly (22.5% in 2003 and 22.4% in 2008) (Table 2 & 4). Prevalence of smoking among women decreases in age groups under 35, and increases in groups aged 35–64, and older than 65. In this period the proportion of former smokers increased from 16.1% in 2003 to 22.5% in 2008 and reduced the proportion of nonsmokers from

61.4% in 2003 to 55.0% in 2008 (Table 2 & 4). The least women smokers are younger than 35 and that proportion increases with age. Such a distribution is the same in 2003 and 2008 (Table 2 & 4).

Smoking incidence was highest in the women age group 35–64 (3.1%, 95%CI=2.31–3.87) (Table 5). In men the highest incidence is in younger than 35, and decreases with age. In the age group 35 to 64 and older than 65 the incidence was higher in women than in men (3.1% in women vs. 1.2% in men and 1.4% in women vs. 0.6% in men) (Table 5). The cumulative smoking incidence was higher in women (2.3%, 95%CI=1.8–2.76) than in man (1.1%, 95%CI=0.42–1.8) (Table 5).

In men there were a greater number of those who have stopped smoking in the 5-year period (9.8%, 95%CI=7.92–11.64 in men and 9.1%, 95% CI=7.59–10.63 in women) (Table 6). In the age group younger than 35 the percent of respondents who had stopped smoking is the same in both genders. Men stopped smoking more often than women in the age group 35–64, and less than women in the age group older than 65 (Table 6).

Most former smokers who started smoking again are younger than 35 (6.3%, 95%CI=0.6–13.1 in men and 7.9%, 95%CI=3.22–12.66 in women) (Table 7). Women in

**TABLE 4**  
DISTRIBUTION OF WOMEN ACCORDING TO SMOKING STATUS IN 2008

	Non smokers		Former smokers		Smokers		All	
	N	%	N	%	N	%	N	%
<35	56	38.6	43	29.7	46	31.7	145	100.0
35–64	568	47.5	286	23.9	341	28.5	1,195	100.0
65+	456	73.3	113	18.2	53	8.5	622	100.0
All age	1,080	55.0	442	22.5	440	22.4	1,962	100.0

**TABLE 5**  
5-YEARS CUMULATIVE SMOKING INCIDENCE

	M			F		
	N	%	95% CI	N	%	95% CI
<35	2	2.7	3.65 (–0.98–6.32)	5	1.9	1.66 (0.26–3.58)
35–64	6	1.2	0.93 (0.24–2.1)	58	3.1	0.78 (2.31–3.87)
65+	2	0.6	0.9 (–0.25–1.55)	23	1.4	0.57 (0.83–1.97)
All age	10	1.1	0.69 (0.42–1.8)	86	2.3	0.48 (1.8–2.76)

**TABLE 6**  
RESPONDENTS WHO HAD STOPPED SMOKING IN THE 5-YEAR PERIOD

	M			F		
	N	%	95% CI	N	%	95% CI
<35	11	9.5	5.33 (4.15–14.81)	23	9.5	3.71 (5.83–13.25)
35–64	65	9.6	2.23 (7.41–11.87)	81	8.1	1.7 (6.45–9.85)
65+	20	10.4	4.32 (6.1–14.74)	22	14.9	5.73 (9.13–20.59)
All age	96	9.8	1.86 (7.92–11.64)	126	9.1	1.52 (7.59–10.63)

**TABLE 7**  
FORMER SMOKERS 2003 – STARTED SMOKING AGAIN UNTIL 2008

	M			F		
	N	%	95% CI	N	%	95% CI
<35	3	6.3	6.85 (–0.6–13.1)	10	7.9	4.72 (3.22–12.66)
35–64	19	3.7	1.61 (2.04–5.26)	40	6.1	1.84 (4.28–7.96)
65+	10	2.3	1.42 (0.89–3.73)	4	1.9	1.81 (0.06–3.68)
All age	32	3.2	1.09 (2.11–4.29)	54	5.4	1.41 (4.02–6.84)

the youngest age group started smoking again more often than men. Women aged 35 to 64 started smoking more often than men (6.1% in women vs. 3.7% in men) (Table 7).

If we analyze the distribution of smoking habits by gender, we can say that only 21.8% of men and 48.2% of women had never smoked, while others are smokers or former smokers (Table 8 & 9). The proportion of people who never smoked was highest in the oldest age group and decreases towards the younger age in both genders.

The largest proportion of recidivists was in the youngest age group and decreases with age in both genders.

Men were more often recidivists than women in the age group older than 65 (Table 8 & 9).

The proportion of former smokers was lowest in the age group younger than 35 (29.4%) and increases with age in men (36.5% in age 35–64 and 54.8% older than 65). The opposite pattern was present in women where the proportion was highest among younger than 35 (26.9%) and decreases with age (24.6% in age 35–64 and 18.8% older than 65) (Table 8 & 9).

From 2003 to 2008 10.3% of men and 6.4% of women had stopped smoking. Smoking cessation was the most common in the age group younger than 35 in both genders (Table 8 & 9).

**TABLE 8**  
SMOKING INCIDENCE AND DISTRIBUTION OF MEN ACCORDING TO SMOKING STATUS, CHANGE IN STATUS

	Incidence		Smokers '03 & '08		Smokers '03 & nonsmokers '08		Nonsmokers '03 & '08		Former smokers '03 – recidivists		Former smokers '03 & '08		Sum	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
<35	2	3.9	12	23.5	11	21.6	8	15.7	3	5.9	15	29.4	51	100.0
35–64	6	1.1	146	26.5	65	11.8	114	20.7	19	3.4	201	36.5	551	100.0
65+	2	0.6	36	10.9	20	6.1	81	24.5	10	3.0	181	54.8	330	100.0
All age	10	1.1	194	20.8	96	10.3	203	21.8	32	3.4	397	42.6	932	100.0

**TABLE 9**  
SMOKING INCIDENCE AND DISTRIBUTION OF WOMEN ACCORDING TO SMOKING STATUS, CHANGE IN STATUS

	Incidence		Smokers '03 & '08		Smokers '03 & nonsmokers '08		Nonsmokers '03 & '08		Former smokers '03 – recidivists		Former smokers '03 & '08		Sum	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
<35	5	3.4	31	21.4	23	15.9	37	25.5	10	6.9	39	26.9	145	100.0
35–64	58	4.9	241	20.2	81	6.8	478	40.1	40	3.4	293	24.6	1,191	100.0
65+	23	3.7	26	4.2	22	3.5	429	69.1	4	0.6	117	18.8	621	100.0
All age	86	4.4	298	15.2	126	6.4	944	48.2	54	2.8	449	22.9	1,957	100.0

## Discussion

In Croatia 2003 there were more than one million smokers in a country of only four million residents<sup>17</sup>. In comparison to 1997 there has been a reduction in the frequency of smokers among both genders<sup>13,17</sup>. The intensive antismoking campaigns, legislation and restricting smoking had an impact on citizens' attitudes toward smoking<sup>18</sup>. This trend is probably influenced a significant proportion of smokers who quit in five years. According to the data we can say that every tenth smoker has tried to quit smoking. Smoking prevalence is higher in men<sup>19</sup>, and men are more likely to stop smoking<sup>20</sup>. The reduction in smoking prevalence among men in the period of 2003 to 2008 is probably the result of the implementation of non-specific and comprehensive public health measures, which had no effect in middle aged and elderly women. The question is why are the implemented measures better suited for men? By ratifying the Framework Convention for Tobacco Control (FCTC), Croatia will integrate European tobacco bans: restricted areas for smokers, limitation of tar and nicotine levels, and advertising forbidden throughout the country. According to the Ministry of Health of Croatia only 50 mandatory penalties for violation of the Act restricting the use of tobacco products were handed down by an inspection in the last year. Better law enforcement would certainly contribute to further reducing the prevalence of smoking.

Although there are a significant number of recidivists, we hope that at least some respondents who quit smoking will not return to this habit. When the number of recidivists is subtracted from the number of smokers who quit smoking, we get a significant share of those who do not return to this habit, approximately 3.6% of women and 6.9% of men. Although there are many benefits of quitting for health<sup>21–23</sup>, smokers lack the motivation to

quit smoking. Smoking cessation and recidivism of smoking is most common in young people, who do not have firmly established smoking habits. This is precisely the age group we should provide support for smoking cessation to, as well as intensify the anti-smoking campaign in this age group. In the age group older than 65 there is a higher proportion of smokers who stop smoking, probably caused by health problems, as previous research has shown<sup>24</sup>.

The cumulative smoking incidence was higher in women than in men, and in women in the age group 35–64. In men the highest incidence is in the age group younger than 35, and decreases with age. Researchers have published data that confirms a higher incidence of smoking, but mainly in the age group younger than 18 years<sup>25,26</sup>. Smoking incidence was also higher in young men<sup>27</sup>. By searching existing data bases we did not find published data on the incidence in older age groups.

## Conclusion

The cumulative smoke incidence is low in Croatia. But particularly alarming is a higher incidence in women than men. The changes in smoking status tell us about a significant proportion of smokers who have a desire to quit smoking. All segments of society should continue the fight against smoking. It is needed to better organize support for smokers who want to quit smoking, and expand and improve the network of »Schools of no smoking«.

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## PETOGODIŠNJA INCIDENCIJA PUŠENJA ODRASLE POPULACIJE HRVATSKE – CROHORT STUDIJA

### SAŽETAK

Cilj rada je bio istražiti incidenciju pušenja i promjene u navici pušenja u Hrvatskoj tijekom petogodišnjeg razdoblja. Koristili smo podatke dobivene Hrvatskom zdravstvenom anketom 2003 i 2008 godine (N=3229). Rezultati su pokazali da je incidencija pušenja najveća u mlađih muškarca i smanjuje se s dobi. U dobnim skupinama od 35–64 i starijim od 65 godina incidencija je veća kod žena. U Hrvatskoj je kumulativna petogodišnja incidencija pušenja mala i značajno veća kod žena. To ukazuje na potrebu preventivnih aktivnosti i javnozdravstvenih intervencija kako bi se smanjila incidencija i prevalencija pušenja, te poboljšalo zdravlje populacije.