

## Changes in the prevalence of cigarette smoking and quitting smoking determinants in adult inhabitants of rural areas in Poland between 2003 and 2013.

### Introduction:

Almost 700,000 deaths among European citizens per year ~~are~~ the consequence of cigarette smoking (1). According to the European Commission, ~~report~~ smoking costs the EU countries at least €100 billion ~~[per year?]~~, and causes more health problems than alcohol, drugs, high blood pressure, excess weight or high cholesterol ~~combined~~ (1). Despite ~~the~~ considerable successes in reducing tobacco exposure ~~made~~ in recent years, the number of smokers in the EU is still ~~relatively~~ high, ~~comprising~~ 28% of the ~~overall~~ population (1). Poland is one of the countries with the highest death rates due to cigarette smoking, with approximately 69,000 deaths per year, of which approximately 43,000 are premature deaths ~~in people of individuals~~ aged 35–69 years (2). It is estimated that there are nine million tobacco-smokers in Poland, representing 30.3% of the country's adult population (2). These numbers were even higher in the past (3).

Together with political, economical and sociological changes initiated in Poland in early 1990s, social acceptance of smoking noticeably ~~decreased~~ ~~lessened~~. This change in attitude towards smoking was possible due to greater public awareness of health risks, numerous public campaigns against smoking and economic decisions including raising taxes on cigarettes which made them less accessible financially. All these factors have contributed to the fact that, from the 90s, ~~the~~ number of smokers in Poland has markedly decreased (2). ~~However, But~~ in recent years there has been a slowdown in the declining trend, and in some populations ~~the~~ number of smokers ~~has~~ even increased. ~~In th~~ ~~The results of~~ the Global Adult Tobacco Survey (GATS) conducted in 2009–2010 in 16 countries, ~~all over the world~~ ~~indicated that~~ current smoking prevalence among women was the highest in Poland (24.4%)(4). Distinct differences between Polish big cities and village inhabitants' smoking habits were also reported recently (5).

In this paper, we investigate trends in the prevalence of cigarette smoking among adults at all ages in two time points 9 years apart in two neighbouring places of residence ~~in~~ ~~:- seven villages and a small, nearby town in a~~ rural area of south-west Poland. Additionally, we examine social and respiratory health determinants of quitting smoking among individuals living in these two ~~close~~ locations between 2003 and 2012.

### Methods:

Two cross-sectional surveys were conducted in the same rural area of lower Silesia in Poland in 2003 and 2012. All inhabitants ~~at~~ ~~aged~~ 5 years or more over 5 were eligible. For the purpose of this paper,

we ~~restricted the analyses to included~~ adults ~~at aged~~ over-18 years or more ~~in the analyses~~. They were inhabitants of seven small villages, and two randomly selected areas of a nearby small, market town of about 4,000 people.

We used exactly the same instruments in both surveys. All family members completed, with the aid of a nurse interviewer, a questionnaire on respiratory and allergic symptoms and smoking behavior currently and in the past. We also gathered information ~~on about~~ potential confounders or effect modifiers including ~~like~~ sex, place of living, parental and maternal smoking and education (categorized ~~into three levels~~ according to the Polish three-level school system).

Participants were considered ever smokers if they reported smoking at least one cigarette per day for at least one year. Ever smokers were divided into current smokers (do you currently smoke cigarettes?) and ex-smokers (if they had stopped smoking before the survey). We also recorded ~~the gathered information about~~ the duration of smoking in years and age of smoking initiation.

Asthma and hay fever were defined as a positive answer to the question about the doctor's diagnosis of these conditions. Atopy was defined as a positive result (wheal of mean diameter 3mm or more than the response to saline) of skin prick tests (house dust mite, cat fur, mixed grass and tree pollens, ALK-Abello, Hungerford, Berkshire, UK). We asked about chronic cough (Do you usually cough during the day - or at night - in the winter?), exercise induced symptoms (Does exercise give you wheezing or whistling in the chest?), inhaler use (In the past 12 months, have you taken inhalers for breathing or for respiratory problems prescribed by doctor ?) and bronchitis diagnosis ever (Has a doctor ever told you that you have bronchitis?).

Ethical approval was obtained from the Ethics Committee at the Wroclaw Medical University; each participant provided signed consent.

Statistical methods: \_\_\_\_\_

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~~Significance of the differences between two locations was investigated by the chi-squared test.~~ We estimated crude and adjusted prevalence odds ratios for being ever or ex-smoker using logistic regression, adjusting for age, sex, location and school education years (identified *a priori* as potential confounders). All analyses were performed with IBM SPSS Statistics 20 package.

Results:

1328 (91% of adult eligible individuals) in 2003 and 1449 (92% of eligible) in 2012 adult inhabitants completed a questionnaire. The response rate was similar in villages and town (in 2003 89% in

villages vs 93% in town and in 2012 89.6% vs 94.9% respectively); 908 people (560 villagers and 348 town inhabitants) participated in both surveys.

The characteristics of the village and town participants are shown in table 1. Townspeople were slightly older than those from the villages, and older in 2012 than in 2003. Participants were more often female in both locations and in both surveys. The proportion of higher educated inhabitants was ~~greater~~ higher in ~~the~~ town than in the villages both in 2003 and 2012. In 2003 the prevalence of ever smokers was similar in town (53.9%) and villages (53.7%): Nine years later it slightly dropped in town to 48.4% and remained stable in villages (53.9%).

Current smoking was higher in ~~the~~ villages than ~~the~~ town (in 2003 35.8% vs 30.2% and in 2012 33.7% vs 23.0% respectively), higher among men than women in both locations and in both years; ~~it was also higher~~ and among those with ~~a~~ middle level of education than those with basic level and academic degree (table 2). The differences between ~~the~~ villages and town communities with respect to current smoking were ~~evident at present~~ over all ages, and in both surveys, but particularly ~~evident~~ in 2012 for subjects in all age groups -under 60.

The prevalence of current smokers decreased over time in both locations, although ~~this decline~~ it was much more pronounced in ~~the~~ town than in ~~the~~ villages ~~people~~ (table 2). In the youngest age group (18-30) in town, 31% of participants in 2003 ~~reported being declared themselves as~~ current smokers; this dropped to 20% 9 years later. In contrast, there was only ~~a~~ slight reduction in smoking prevalence among young villagers (36.5% in 2003 vs 31.9% in 2012). ~~Among villagers the most pronounced decline in~~ current smoking prevalence was ~~in present among~~ those aged ~~between~~ 41-50 ~~years~~. There was a slightly increase in smoking prevalence among inhabitants in older age ~~groups~~ in both locations. The decline in smoking among townspeople was the most pronounced among those with the highest education level. Men were more ~~likely~~ willing to stop smoking than women both in villages and in town. The prevalence of current smokers among village women even increased between ~~the~~ two surveys from 27.6% to 29.3%. This was ~~the~~ most pronounced among young women aged 18-30 ~~years~~ (22.0% in 2003 vs 32% in 2012) and those ~~aged between~~ 51-60 ~~years~~ (32.0% vs 50.5% respectively)(not shown in the table).

The odd ratios of being ~~a~~ current smoker were much higher if ~~an~~ other household member was also a smoker both in town (2.33; 1.59-3.40 in 2003 and 2.36;1.63-3.43 in 2012) and in the villages (2.82;1.98-4.00 in 2003 and 2.55;1.81-3.60 in 2012). ~~There~~ it was also ~~a~~ non-significant positive association with family smoking history. In the subgroup of 231 participants with the history of parental smoking, the odds ratios of being smoker were 2.54 (0.77-6.63) for those whose father

smoked, 1.55 (0.38-6.27) for those whose mother smoke and 2.01 (0.71-5.67) for both smoking parents in respect to the children of nonsmoking parents (OR=1.0; reference category).

Among respiratory symptoms chronic cough in winter was the strongest positively related to current smoking in both surveys (table 3). The highest prevalence of chest wheeze after exercise was found among ex-smokers. The prevalence of doctor-diagnosed asthma and hay fever increased slightly from 2003 to 2012 among non-smokers and ex-smokers and did not change among current smokers. ~~The atopy prevalence increased significantly, as described in a previous publication [ref] significantly despite of smoking habits.~~ The prevalence of asthma diagnosed by the doctor was slightly higher among never and ex-smokers than current smokers in both surveys.

In ~~the multiple regression multivariable~~ analysis, the ~~probability-odds ratios~~ of being ~~an~~ ever smoker were significantly ~~lower reduced~~ in women ~~than in with respect to~~ men in both surveys and both locations (table 4). Age-stratified analyses ~~indicated that the probability of yielded that ORs of~~ being ~~an~~ ever smoker ~~were the~~ highest in people aged 41-60 ~~years~~, both in villages and town. Those with ~~a~~ middle education level had significantly higher odds ~~ratios~~ for ever smoking. This was stronger for villagers, but was also seen in town inhabitants in 2012.

The odds of being an ex-smoker increased with age in both surveys in town and in villages (table 5). Sex affected the ~~likelihood decision of~~ quitting smoking in both locations, ~~although albeit~~ it was more pronounced in the villages. Among village women, the odds ratios of smoking cessation were lower comparing to men as a reference category: 0.43 (0.29-0.63) in 2003 and 0.50 (0.35-0.72) in 2012. Education level and respiratory and allergic symptom did not modify significantly the odds of being ex-smoker.

A further analysis ~~of smoking cessation~~ confined to those 908 participants who had taken part in both surveys, showed that 66 (26.8%) ~~out of~~ 246 smokers in 2003 quitted smoking by 2012. Place of residence was the strongest factor influencing change in smoking habits. Town inhabitants ~~had an elevated exhibited higher~~ odds ~~ratio~~ for being ~~an~~ ex-smoker 2.37 (1.32-4.25) compared to those living in the villages as a reference group (table 6). Sex, education level and age were nonsignificantly associated with smoking cessation. For those who reported chronic, winter cough, the OR of being ex-smoker was significantly lower 0.36 (0.15-0.85); other respiratory symptoms did not significantly influence smoking cessation.

#### Discussion:

We found that the prevalence of current smoking was higher in villages than in the nearby small town. The ~~decreasing trend~~ in the prevalence of current smoking among inhabitants of rural areas

in Poland has been confirmed. This was much more pronounced in town inhabitants than in villagers, in men than in women and among people in younger age-groups. ~~These declines were~~ also confirmed in analyses confined to those individuals who participated in both surveys. ~~In fact, the~~ prevalence of current smoking slightly increased among village women. ~~The respiratory diseases, such as like~~ asthma and bronchitis, did not influence ~~quitting the smoking~~ quitting. From all respiratory symptoms, chronic cough was the most typical for current smokers.

Some of the limitations of this data should be considered. Reports of smoking status were based on questionnaire responses and were not verified with biochemical methods. Self reporting of smoking status may led to some underestimation of smoking prevalence. On the other hand, in both surveys we used exactly the same methodology, ~~which may make the comparisons between them more reliable. Moreover, we did not conducted, except for atopy, objective measurements of respiratory diseases. The questionnaire was identical for participants at all ages, but we cannot exclude the possibility of differences in interpretation of symptoms at different ages and we cannot rule out recall bias.~~ Another weakness of the study is the lack of ~~some~~ sociological information ~~on factors~~ which are known to possibly influence ~~the~~ smoking habits, ~~such as like~~ family income or occupation, although, to some extent, ~~these~~ may be reflected in education level. On the other hand, a strength of this study is its relatively high response rates and the considerable participation of exactly the same individuals in both surveys.

**Commented [n1]:** I would focus on the smoking results; I have suggested dropping the discussion of respiratory results

The results of the previous studies comparing rural and urban differences in terms of smoking yielded conflicting results. In Germany, for example, in the study using nationwide census including 181 324 subjects over 10 years old, the inhabitants of urban areas were more likely to be current smokers than those living in rural areas (6). In the surveys from Canada and US, smoking prevalence tend to increase in rural settings (7, 8). In our study the prevalence of smoking differed, more evident in 2012, between two populations living in a close proximity. Tobacco use was higher among villagers than the inhabitants of a nearby small, market town. These findings are different from the results of Polish part of Global Adult Tobacco Survey (GATS), where the residents of urban areas smoked more frequently than inhabitants of rural areas. That study was conducted in the cities of varying size and showed that the larger the city the higher percentage of smokers, this was particularly expressed among woman (9).

In our survey a clear difference in the trend of smoking cessation within nine years between ~~the~~ villages and ~~the~~ town was found. ~~A decline~~ in smoking prevalence was clearly seen in ~~the town~~ (Sobotka). Current smoking declined the most among well educated and younger people. This was in line with ~~the trends~~ observed in many European countries (10, 11), which supports the view that

antitobacco consumption initiatives may have been more effective among high educated and younger people. In the GATS study in Poland, the most frequent reason for the decision of giving up smoking, given-confirmed by former smokers, was ~~the fact~~ that they realized that smoking is harmful (12). In the same time in our study, the prevalence of current smoking decreased only slightly in villages and among village women even increased. This was in stark contrast with the trend in the neighbouring small town. The way of life and source of income of rural residents in this area has changed distinctly in recent years. After joining the European Union in 2004 it became uneconomic for many small farmers living in our villages to continue~~carry out~~ farming and they had to look for other sources of income. Many became unemployed, and it is likely that, ~~We can speculate that~~ life became more stressful for them. It was shown previously that stressful events may increase the proportions of current smokers (13). The prevalence of smoking among village people has increased among those with the lowest level of education and among individuals over 50 years of age. We can speculate that those people could have more difficulties in finding themselves in these new circumstances and/or they may be less sensitive to governmental and social antitobacco strategies and programs. On the other hand, economical reasons may also have an influence on the decision about continuing or quitting smoking. Cigarettes became less affordable as the result of tax and price increase. In GATS study higher price of cigarettes was the main motivation to stop smoking for 13% of Polish ex-smokers (12).

In our study, the decline in smoking prevalence was more pronounced among men than women. The similar trend has been reported elsewhere (14). Sex disparities in smoking prevalence, although still exist, seemed to align, especially in high-income countries, but this process has started also in middle-income countries like Poland. Poland is among the countries with particularly high rate of smoking women (4). In major cities the smoking prevalence among women has become equivalent to that among men (12). According to WHO report on smoking in Poland the percentage of women who smoke daily in rural areas has increased 2.5-fold over the past 30 years (2). Our findings of increased prevalence of smoking women in the villages also confirm this trend. Higher social acceptance of smoking among rural women and their emancipation contribute to this growth.

In the family context, not surprisingly and in line with observations from elsewhere (15,16), the risk of being a smoker in our study was higher among those living in the household with other smokers and whose parents were smokers. This shows that higher acceptance of such behaviour in the family may influence the decision to start smoking in younger people.

The prevalence of asthma, atopy and hay fever did not differ significantly between current, ex and never smokers in our study. Among respiratory symptoms chronic winter cough was the most

frequent among current smokers comparing to ex and never smokers and the prevalence of this symptom decreased between 2003 and 2012. The similar trend was seen in Swedish study on respiratory symptoms and their relations to smoking (17). Among all respiratory symptoms chronic cough was the only factor which increased the risk of continuing, not quitting smoking in the group of those inhabitants who participated in our both surveys.

In conclusion, despite the considerable progress in tobacco control in Poland has been made in the recent years, there are still many challenges to be addressed. Our findings confirmed the decreasing trend in smoking prevalence, but the degree of this decline varied considerably within rural neighbouring populations. It was mainly seen in the town and among younger people. The reduction in smoking prevalence among village inhabitants between two surveys was very weak and not present among village women. Men, and those better educated, were more willing to quit smoking, but the presence of respiratory symptoms did not influence significantly smoking cessation. The discrepancies in smoking behaviour between two close rural populations indicates the need for individual approach in designing programs of tobacco control.

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Notes on the tables

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Table 1: this is descriptive and I would remove the p-values.

Table 2: give the %s, and then n in parentheses, e.g. 30.2%(175) rather than 175(30.2%)

Otherwise fine

17.