International Journal of Public Health (2019) 64:423–430
https://doi.org/10.1007/s00038-019-01204-5

ORIGINAL ARTICLE

Roll-your-own cigarette use in Italy: sales and consumer profile—data from PASSI surveillance, 2015–2016

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Received: 4 September 2018 / Revised: 23 November 2018 / Accepted: 11 January 2019 / Published online: 25 January 2019

Abstract

Objectives The use of roll-your-own (RYO) cigarette has substantially increased in most high-income countries recently. This work aims to update Italian trends on loose tobacco sales and to describe the consumer profile of predominant RYO users.

Methods Data from the Italian Agency of Customs and State Monopolies and from PASSI (Italian behavioral risk factor surveillance system) were used. Information on 16,858 interviews to current smokers aged 18–69 was analyzed.

Results Sales of loose tobacco increased more than sevenfold between 2004 and 2017. In 2015–2016, 11.6% of smokers reported smoking predominantly RYO cigarettes, with higher percentages among the youngest where a significant association between use of RYO and education was observed, unlike what happened in older adults. The association between economic difficulties and use of RYO was observed only in older adults.

Conclusions A growing trend in RYO cigarette sales was registered between 2004 and 2017. In young smokers, the greater use of RYO was observed among the most educated regardless of financial strain, while in older ones among those with economic difficulties.

Keywords Hand-rolled/RYO tobacco · Taxation · Surveillance and monitoring · Public policy · Price

Introduction

According to the World Bank (World Bank 1999) and the Framework Convention on Tobacco Control of the World Health Organization (WHO 2018), fiscal policies represent the most important strategy to control tobacco use. How products are taxed, however, affects their cost, and if some forms of tobacco are taxed at lower levels, less wealthy smokers may switch over to the cheaper product. The presence in the market of relatively affordable tobacco products may therefore undermine the efficacy of tax increases as a tobacco control strategy (IARC 2011; Curti et al. 2015; WHO 2016).

In recent years, the sale and consumption of loose tobacco for roll-your-own (RYO) cigarette have substantially increased in most high-income countries, particularly in Europe (Gallus et al. 2013; D'Argenio et al. 2014; IARC 2014; Brown et al. 2015; Lidon-Moyano et al. 2017; Lugo et al. 2017; Sureda et al. 2017; Tarrazo et al. 2017; Partos et al. 2018). The increasing trend toward RYO cigarettes has been largely explained in terms of their economic

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advantage, since the unit price of RYO cigarettes is substantially lower—almost half in most European countries—than that of manufactured ones (Gallus et al. 2014; Brown et al. 2015; Lugo et al. 2015, 2017; Partos et al. 2018). The economic advantage may also explain why the consumption of RYO cigarettes is particularly frequent among poorer smokers (Brown et al. 2015; Gilmore et al. 2015) and the young (Gallus et al. 2014; Healey et al. 2016; Lidon-Moyano et al. 2017; Lugo et al. 2017; Sureda et al. 2017), who are more responsive to tobacco price increases (IARC 2011) and who may have switched, particularly during the economic crisis, from manufactured to more affordable cigarettes (Gallus et al. 2014; Brown et al. 2015; Lugo et al. 2015, 2017).

Nevertheless in some countries, the prevalence of predominant RYO cigarette use was similar among smokers with a higher socioeconomic status (e.g., more educated or wealthier) and those with a lower socioeconomic status (Brown et al. 2015; Sureda et al. 2017; Tarrazo et al. 2017), a result that could also be explained by confounding factors, including in particular the age distribution. If this pattern can be confirmed in samples with sufficient statistical power to correctly take age and other potential confounding factors into account, it would suggest that reasons other than economic ones may further contribute to the spread of RYO tobacco use. Such findings may have important implications for the development of future smoking cessation strategies.

In Italy, the market share of RYO tobacco, as estimated by Italian official sales data, was extremely low (i.e., 1%) in 2010 and rapidly rose to 5–6% in 2013 (Gallus et al. 2013; D'Argenio et al. 2014). In response to this rising trend, PASSI (Progressi delle Aziende Sanitarie per la Salute in Italia), an ongoing national behavioral surveillance system (Baldissera et al. 2011), began collecting data in 2015 on RYO use among smokers. In this paper, we use official tobacco sales data as well as PASSI surveillance data (1) to update information on the trends of loose tobacco sales, (2) to investigate the prevalence of predominant RYO cigarette smokers and (3) to evaluate the socioeconomic characteristics of predominant RYO tobacco users.

Methods

Quarterly sales data on manufactured cigarette and on loose tobacco for RYO cigarettes were obtained from the Italian Agency of Customs and State Monopolies. For the present analyses, we considered quarterly sales data for the period 2004–2017.

Data on RYO consumption among current smokers for 2015–2016 were obtained from PASSI, the Italian behavioral risk factor surveillance system that monitors the prevalence of the major behavioral risk factors for non-communicable chronic diseases and the adherence to selected preventive measures in the adult population (18–69 years) resident in Italy (Baldissera et al. 2011).

The study design of PASSI is cross-sectional with continuous data collection. Interviews are conducted on a daily basis and are aggregated in an annual dataset at the end of the calendar year. More details on the data system have been described elsewhere (Baldissera et al. 2011). The unit of data collection for PASSI is the local health unit (LHU), each of which has populations ranging from 40,000 to over a million. The survey-eligible population consists of residents 18–69 years of age, enrolled on the LHU lists, who have an available telephone number (landline or cell phone). In each LHU, a random stratified sample is drawn on a monthly basis from the enrollment list of residents. People who are no longer living in the area are not considered eligible; other exclusion criteria include inability to understand Italian, inability to participate in the interview, hospitalization or institutionalization. The sample is stratified by gender and age (18–34, 35–49 and 50–69 years), with the number in each category proportional to the size of the respective strata in the general population.

Ad hoc trained personnel from the public health departments of each LHU administered telephone interviews using a standardized questionnaire, which collects information on a wide variety of topics, including behavior-related risk factors and socio-demographic characteristics.

For this analysis, datasets from 2015 and 2016 have been assembled together to guarantee a sufficient number of interviews to explore specific phenomena even in subclasses of population. Over the period 2015–2016, 69,058 people aged 18–69 years have been interviewed in 124 out of the 139 Italian LHUs. The response rate, calculated according to the guidelines of the American Association for Public Opinion Research (AAPOR 2001) and adjusted for ineligible cases, was above 81%. For purposes of the analysis, current smokers were defined as participants who declared having smoked at least 100 cigarettes during their lifetime and being current smokers. A total of 16,858 study participants were current smokers and this represents the denominator of our analysis.

Information on number of cigarettes smoked per day was collected. Moreover, a specific question on type of cigarette used allowed us to distinguish between predominant factory-made cigarette smokers (i.e., smokers reporting to consume the majority of the cigarettes smoked in a day as manufactured cigarettes) and predominant RYO smokers (i.e., those reporting to consume the majority of the cigarettes smoked in a day as RYO cigarettes).

Information was also collected on sex, age, educational level (none or primary school, middle school, high school, university), financial difficulties in reaching the end of the month with the available household income (many, some or no difficulties), geographic area of residence (North, Center, or South and major islands), nationality (Italian, foreigner) and employment status (permanently/temporarily employed, unemployed). Sex, age and residence were objectively confirmed through the LHUs' lists.

Data analysis

We estimated the prevalence of predominant RYO smokers and the relative 95% confidence intervals (CI), overall and by socio-demographic characteristics. Poisson regression models with robust variance and hypothesis testing (Barros and Hirakata 2003) were used to calculate multivariate prevalence ratios (PR), after adjustment for sex, age, educational level, financial difficulties, geographic area of residence, nationality (Italian, foreigner) and employment status.

Complex survey design analyses, using the Taylor series method for variance estimation, have been carried out. To guarantee representativeness of the national population, prevalence estimates were weighted, assigning each record a probability weight equal to the inverse of the sampling fraction in each LHU stratum. All the analyses were conducted in Stata 13 software (StataCorp LP).

Results

In Italy, approximately 4,700,000 tons of loose tobacco was sold in 2017, 95% of which was loose tobacco for RYO cigarettes. Sales of loose tobacco increased 7.2 times between 2004 and 2017, from 658,600 to 4,716,000 tons, respectively, with the sharpest increase between 2008 (1,229,400 tons) and 2012 (4,095,900 tons) (Fig. 1). In contrast, total tobacco for manufactured cigarette sales decreased by 30%, from 99,000,000 tons in 2004 to 69,000,000 tons in 2017.

Among 16,858 current smokers enrolled in 2015–2016 in the PASSI surveillance system, 11.6% reported smoking predominantly RYO cigarettes. Among these, 89% were exclusive RYO smokers. Predominant RYO smokers smoked a mean of 10.5 cigarettes per day (SD 0.3) and predominant manufactured smokers a mean of 12.5 (SD 0.2) cigarettes per day.

Table 1 shows that, during the period examined, the predominant use of RYO was more frequent among men (multivariate PR for men vs women was 1.53; 95% CI 1.36–1.72). Predominant RYO smokers were more frequent (20.1%) among those aged 18–24 years and decreased with increasing age (p for trend < 0.001). RYO use increased by level of perceived financial difficulties (p for trend < 0.001). No statistically significant difference was observed by employment status (PR for unemployed vs. employed participants: 1.08; 95% CI 0.95–1.22), while the predominant use of RYO increased with increasing of level of education (p for trend < 0.001). Predominant RYO smokers were less frequent among foreigners compared to Italian citizens (PR was 0.67; 95% CI 0.53–0.84) and more frequent in central (PR: 1.87; 95% CI 1.62–2.15) and northern regions (PR: 1.64; 95% CI 1.43–1.89) as compared to southern regions and islands.

Table 2 shows the PR estimates of predominant RYO according to selected socio-demographic characteristics stratified by age groups (18–24, 25–34, 35–49 and 50–69 years, respectively). RYO was more widely used by men than women, in all age groups except 25–34 years old, with the strength of the association increasing with age. The PRs of men vs women were 1.53 (95% CI 1.22–1.93) among smokers aged 18–24 years, 1.19 (95% CI 0.97–1.47) among those aged 25–34 years, 1.75 (95% CI 1.42–2.14) among those aged 35–49 years and 1.84 (95% CI 1.34–2.54) among smokers aged 50–69 years. Economic difficulties were not associated with RYO use among the young (PR for many vs none economic difficulties was 0.93, 95% CI 0.66–1.32 among smokers 18–24 years and 1.27, 95% CI 0.96–1.68 among those 25–34 years), whereas they were directly related to RYO use in the older age groups (PR = 1.38, 95% CI 1.03–1.83 among smokers aged 35–49 years and PR = 2.11, 95% CI 1.51–2.97 among smokers aged 50–69 years). Having a higher education was associated with RYO use among the young (PR for university degree vs intermediate school degree or lower was 1.62, 95% CI 1.07–2.46 among smokers 18–24 years and 1.46, 95% CI 1.09–1.96 among those 25–34 years), whereas no significant relation was observed in older age groups (PR = 1.26, 95% CI 0.94–1.70 among smokers aged 35–49 years, and PR = 1.03, 95% CI 0.66–1.60 among smokers aged 50–69 years).

Discussion

Official sales data in Italy demonstrate that RYO tobacco has undergone a dramatic increase over time, with loose tobacco for RYO representing about 6.5% of the market share of tobacco in 2017. The greatest increase occurred between 2008 and 2012, a period in which a serious economic crisis affected large sectors of the population (Di Quirico 2010; Ghoshray et al. 2016). Over the same period, the sales of manufactured cigarettes substantially decreased.

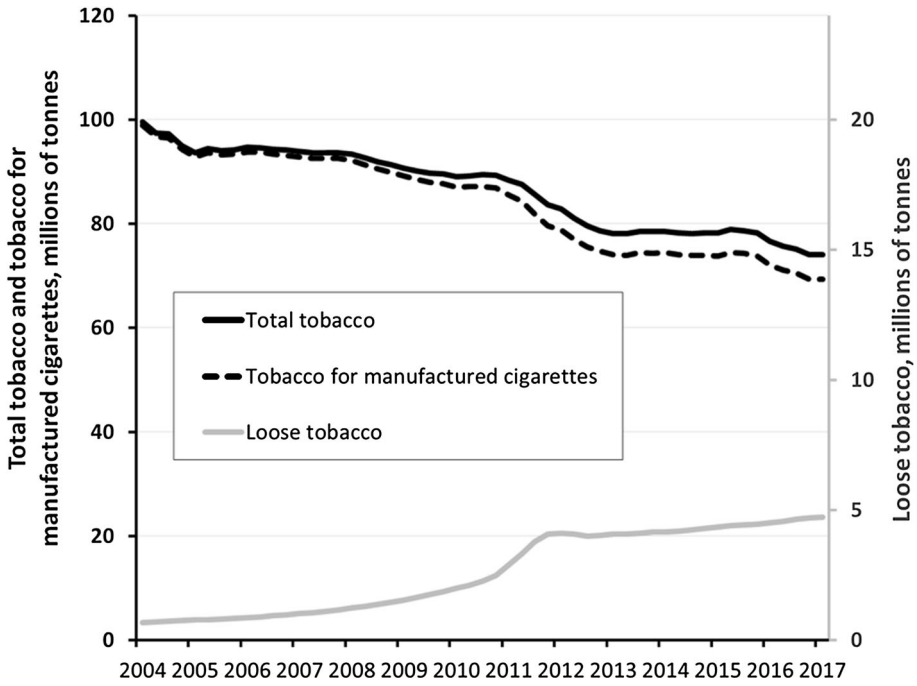

Fig. 1 Sales data of tobacco: total, tobacco for manufactured cigarettes and loose tobacco. Italian Agency of Customs and State Monopolies. Italy, 2004–2017

Our large sample size allowed us to perform analyses stratified by age, which revealed several important findings on the role of socioeconomic characteristics on RYO cigarette use. In older adults (i.e., aged $\geq$ 35 years), we confirm that the most economically disadvantaged subpopulations were more likely to use RYO (Brown et al. 2015), suggesting that for older adults, economic reasons act as primary motivations for RYO tobacco use.

In Italy, the final unit price of RYO is almost 50% of that of manufactured cigarette (Lugo et al. 2015). This discrepancy in costs between the two tobacco products is likely the main reason why a considerable number of smokers, instead of quitting smoking completely, decide to substitute manufactured with RYO cigarettes.

The total cost of tobacco products is made by different components: (1) VAT; (2) excise; (3) retailers' profit; (4) tobacco companies profit. The excise is the only component modifiable by the Government. In order to prevent the switch from a more expensive tobacco product toward a cheaper one, the taxation should be tackled differently, increasing the fiscal burden of RYO cigarettes to equate the final costs and to reduce attractiveness toward them.

Despite having a similar perception of economic difficulties compared to older adults, younger adults did not show any relationship between economic difficulties and use of RYO, and more educated smokers were actually more likely to be predominant RYO users. This suggests that the choice of RYO tobacco among younger generations may not be motivated only by costs. Our findings are consistent with those from nationally representative surveys conducted in Australia between 2001 and 2016 (Bayly et al. 2018). In fact, the similar increases in RYO use across different socioeconomic levels brought to the same conclusion that RYO use is not motivated purely by cost, particularly among young people, who showed increasing appeal of exclusive RYO use (Bayly et al. 2018). Besides economic motivations, other reasons to prefer RYO cigarettes might include the misperception that RYO cigarettes are less harmful than manufactured ones, because they have fewer additives, are more natural and contain a lower amount of tobacco (Brown et al. 2015; Hoek et al. 2016; O'Connor et al. 2007; Young et al. 2010). This misperception has been shown particularly frequent among young adults (Brown et al. 2015). Moreover, RYO smokers generally create and enact rolling rituals, which may facilitate socialization and interactions with others (Hoek et al. 2016). This may be particularly true among the young who tend to be influenced by their peers (Bayly et al. 2018). Additionally, some RYO smokers believe that RYO products have a better taste than manufactured cigarettes (Young et al. 2006; Hoek et al. 2016). Finally, some smokers believe that switching from manufactured to RYO cigarette results in decreased smoking intensity (Hoek et al. 2016). Indeed, our data confirm the findings of others that RYO smokers generally consume a lower number of cigarettes per day (Laugesen et al. 2009; Young et al. 2012).

According to the available evidence from the scientific literature, the health damage caused by RYO cigarettes is similar to that caused by manufactured ones (Edwards 2014; Gallus et al. 2014; Koszowski et al. 2014). As already mentioned, a lower amount of tobacco (75% the

Table 1 Distribution of predominant roll-your-own (RYO) smokers according to selected demographic and socioeconomic characteristics

Demographic and socioeconomic characteristics	Total number of smokers	Percent (%) of prevalent RYO smokers (95% CI)	PR* (95% CI)
Total	16,858	11.6 (11.0–12.2)	
Sex			
Women	7146	9.0 (8.2–9.7)	1^
Men	9728	13.5 (12.7–14.3)	1.53 (1.36–1.72)
Age group (years)			
18–24	1979	20.1 (18.1–22.2)	1^
25–34	3245	16.4 (14.9–18.0)	0.83 (0.71–0.96)
35–49	6012	10.9 (9.9–11.9)	0.54 (0.47–0.63)
50–69	5638	6.5 (5.8–7.3)	0.33 (0.28–0.39)
p for trend			< 0.001
Perception of financial difficulties			
None	6958	12.0 (11.1–12.9)	1^
Some	6975	10.9 (10.0–11.9)	1.09 (0.97–1.22)
Many	2868	12.4 (11.0–13.8)	1.39 (1.20–1.62)
p for trend			< 0.001
Employment status			
Employed	11,533	11.6 (10.9–12.4)	1^
Unemployed	5340	11.5 (10.6–12.5)	1.08 (0.95–1.22)
Schooling			
Primary or intermediate school	6833	9.5 (8.7–10.5)	1^
High-school diploma	7962	12.7 (11.8–13.7)	1.14 (1.00–1.29)
University	2070	14.1 (12.5–16.0)	1.40 (1.19–1.65)
p for trend			< 0.001
Citizenship			
Italian	15,910	11.7 (11.1–12.3)	1^
Foreigner	864	9.8 (7.8–12.2)	0.67 (0.53–0.84)
Geographic area			
Southern Italy	4692	8.8 (7.7–9.7)	1^
Central Italy	4554	14.7 (13.6–15.9)	1.87 (1.62–2.15)
Northern Italy	7612	12.9 (12.0–13.8)	1.64 (1.43–1.89)

Prevalence ratio (PR) and corresponding 95% confidence interval (CI). PASSI, 2015–2016, Italy

*Estimated by Poisson regression models after adjustment for sex, age, level of education, perception of financial difficulties, geographic area, nationality (Italian, foreigner) and employment status

^Reference category

weight of one manufactured cigarette) is contained in RYO cigarettes, at least in Europe (Gallus et al. 2014). However, because they are thinner, smokers inhale more deeply and thus breathe the same amount of nicotine (O'Connor et al. 2007; Laugesen et al. 2009; Young et al. 2012). More importantly, many RYO cigarette smokers still do not use filters. Consequently, smokers of RYO cigarettes inhale more nicotine, tar and carbon monoxide than manufactured ones (Darrall and Figgins 1998; Young et al. 2006; Shahab et al. 2009).

It is extremely important to inform RYO users, particularly young users, on the true health harms of RYO tobacco products.

As for the health interview surveys, self-reported information may introduce bias in the study, such as recall and social desirability bias. Furthermore, mode of data collection (i.e., telephone interview) could represent a limitation because coverage may not be complete, particularly among the young. However, the study protocol requires a big effort to contact subjects of all age groups and the analysis tools allow to proportionally adjust the estimates on any underrepresented strata in the sample. In addition, every year it is ensured that the gender and age distribution of the sample PASSI is comparable with that of the residents in Italy released by the Italian National Institute of Statistics. Moreover, we considered

Table 2 Prevalence ratio (PR) and corresponding 95% confidence interval (CI) of predominant roll-your-own (RYO) smokers by age group, according to selected demographic and socioeconomic characteristics

Demographic and socioeconomic characteristics	Age group (years); PR (95% CI)			
	18–24	25–34	35–49	50–69
Sex				
Women	1^	1^	1^	1^
Men	1.53 (1.22–1.93)	1.19 (0.97–1.47)	1.75 (1.42–2.14)	1.84 (1.34–2.54)
Perception of economic difficulties				
None	1^	1^	1^	1^
Some	0.93 (0.74–1.17)	1.03 (0.83–1.28)	1.26 (1.03–1.54)	1.02 (0.77–1.37)
Many	0.93 (0.66–1.32)	1.27 (0.96–1.68)	1.38 (1.03–1.83)	2.11 (1.51–2.97)
p for trend	0.129	0.281	0.017	< 0.001
Schooling				
Primary or intermediate school	1^	1^	1^	1^
High-school diploma	1.39 (1.08–1.78)	1.04 (0.8–1.34)	1.14 (0.92–1.41)	1.07 (0.78–1.46)
University	1.62 (1.07–2.46)	1.46 (1.09–1.96)	1.26 (0.94–1.70)	1.03 (0.66–1.60)
p for trend	< 0.001	< 0.001	0.106	0.661

PASSI, 2015–2016, Italy

*Estimated by Poisson regression models after adjustment for sex, level of education, perception of financial difficulties, geographic area, nationality (Italian, foreigner) and employment status

^Reference category

"predominant RYO users" those subjects consuming the majority (i.e., from 51% to 100%) of the cigarettes smoked in a day as RYO cigarettes. Therefore, there may be a difference in patterns of RYO use between younger and older age groups (e.g., the younger may be more "mixed users," smoking relatively less RYO than the older, or vice versa). However, our data show that the percentage of mixed users corresponds to only 10% of the predominant RYO users; thus, the effect of any difference in patterns of RYO use between younger and older age groups can be considered modest.

The strengths of the study are a particularly high response rate and a representative sample of the Italian population. Finally, the large sample of non-smokers allowed us to obtain stable PR estimates using a large number of covariates, not only in the whole sample, but also in strata of specific age groups.

In conclusion, 12% of smokers and 20% of young smokers in Italy use predominantly RYO cigarettes, most likely as a result of economic factors as well as, for younger smokers possibly due to other factors, including mistaken beliefs about product safety. If these smokers had quit rather than switched to RYO, the prevalence of smoking would be 2–3 percentage points lower overall and more than 6 percentage points lower among young individuals. Italy needs to adopt fiscal policies on tobacco specifically aimed toward public health benefits rather than financial benefits alone.

Taxation system should levy excise taxes of RYO and manufactured cigarettes in order to equalize their final price. That would prevent product substitution and lead to a reduced tobacco consumption. Furthermore, RYO smokers, particularly younger smokers, could be reached via information campaigns or through health warnings on RYO tobacco pouches tailored to provide accurate information of the true health harms of RYO cigarettes.

Acknowledgements The authors thank the many PASSI regional referents and the regional and local coordinators who contributed to the data collection. A special thank goes to the health care workers in the public health departments in the LHUs, who conducted the interviews, and to Nancy Binkin for her precious support and editorial assistance.

Authors' contribution PD had the original idea of the work. VM performed the statistical analyses. SG, GF and MM wrote the manuscript. All authors contributed to critical review, editing and revision of manuscript draft and approval of the final version.

Funding This work was supported by the Italian Ministry of Health/National Centre for Disease Prevention and Control (CCM 2016 PROGRAMME—EXECUTIVE PROJECT TITLE: Support to the regions for maintenance and implementation of PASSI surveillance on behavioral risk factors related to the health of the Italian adult population). The work of Silvano Gallus was partially supported by the Italian League Against Cancer (Milan).

Compliance with ethical standards

Conflict of interest No conflict of interest to be declared.

Human participants and/or animals For this type of study, formal consent is not required.

Informed consent Informed consent was obtained from all individual participants included in the study.

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