



## Smoking prevalence and smoking attributable mortality in Italy, 2010

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### ABSTRACT

**Objective.** To provide updated information on smoking prevalence and attributable mortality in Italy.

**Method.** A representative survey on smoking was conducted in 2010 on a sample of 3020 Italian adults (1453 men and 1567 women). We used SAMMEC software to update smoking attributable mortality in Italy.

**Results.** In 2010, 21.7% of Italians (23.9% of men and 19.7% of women) described themselves as current smokers. Smoking prevalence was higher in men than in women in all age groups, except for the middle-aged population (45–64 years; 25.6% in men and 25.9% in women). Age-standardized smoking prevalence was higher in men than in women among less educated subjects and in southern Italy. No substantial difference was observed either in educated subjects or in northern and central Italy. Overall, 71,445 deaths in Italy (52,707 men and 18,738 women, 12.5% of total mortality) are attributable to smoking.

**Conclusion.** The overall smoking prevalence of 21.7% in 2010 is the lowest registered over the last 50 years. Since 1998, smoking related deaths declined by almost 15%. Given that Italy has now reached the final stage of the tobacco epidemic, anti-smoking strategies should focus on support for smoking cessation.

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### Introduction

Smoking is the first preventable cause of premature mortality and morbidity, responsible for around 5.4 million deaths worldwide (WHO, 2008). In Italy, using the Smoking Attributable Mortality, Morbidity and Economic Cost (SAMMEC) software (CDC, 2009), in 1998 smoking attributable mortality accounted for 83,650 deaths (67,600 men and 16,000 women; 15.1% of total mortality) (Gorini et al., 2003). The corresponding estimates based on the Peto–Lopez approach, using mortality rates from lung cancer as an indirect measure of cigarette smoking, were 82,502 deaths (71,051 men and 11,451 women; 14.8% of total mortality) in 1995, and 79,536 deaths (66,269 men and 13,267 women; 14.2% of total mortality) in 2000 (Peto et al., 2006). To our knowledge, no updated estimates are available on smoking attributable mortality.

Over the past few decades, smoking prevalence declined in Italian adult men and since the 1990s also in women (Ferketich et al., 2008; Tramacere et al., 2009). This notwithstanding, smoking prevalence remains higher than that of several high income countries, including

the USA (CDC, 2010b), Australia (19.0%) (Scollo and Winstanley, 2008) and some northern European countries, including Sweden (16.0%) and Finland (21.0%) (Eurobarometer, 2010). Notably, between 2008 and 2009, an increase in smoking prevalence in men and women was observed (Gallus et al., 2010). This increase is in contrast with the declining trend observed over the last decades. It is important therefore to update data on smoking prevalence in 2010. Thus, we conducted a representative survey on adults.

### Methods

The Istituto Superiore di Sanità (Italian National Health Service), in collaboration with the Italian League Against Cancer and the Istituto di Ricerche Farmacologiche Mario Negri (Mario Negri Institute for Pharmacological Research), conducted a survey on smoking in Italy in 2010, using methods similar to those described for previous investigations (Ferketich et al., 2008; Gallus et al., 2007; Tramacere et al., 2009). Data were collected during March–April 2010 by the market research institute DOXA, the Italian branch of the Gallup International Association. The sample included 3020 individuals (1453 men and 1567 women), representative of the general Italian population aged 15 years or over in terms of age, sex, geographic area, and socio-economic characteristics (Table 1).

The participants were selected through a representative multistage sampling of 152 municipalities (the smallest Italian administrative division)

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**Table 1**

Distribution of 3020 individuals representative of the Italian population aged 15 years or over according to sex, age, education and geographic area. Italy, 2010.

Characteristics	n	%
Sex		
Men	1453	48.1
Women	1567	51.9
Age (years)		
15–24	359	11.9
25–44	1049	34.7
45–64	908	30.1
≥65	704	23.3
Education		
Low	1190	39.4
Intermediate	1421	47.1
High	409	13.5
Geographic area		
North	1385	45.9
Center	597	19.8
South	1308	34.4

in all of the 20 Italian regions (the largest Italian administrative division). In the municipalities considered, individuals were randomly sampled from electoral rolls, within strata defined by sex and age group, in order to be representative of the demographic structure of the population. Whenever the selected participants were unavailable, they were replaced by selecting among neighbors (living in the same floor/building/street) within the same sex and age group. Adolescents aged 15–17 years, whose names are not included in the electoral lists, were chosen by means of a “quota” method (by sex and exact age), using the same approach. Statistical weights were used to assure representativeness of the Italian population aged 15 years or over.

Interviews were conducted by ad hoc trained interviewers, using a structured questionnaire in the context of a computer-assisted personal in-house interview (CAPI). Besides general information on socio-demographic characteristics, data were collected on several smoking behaviors, including smoking status (never/ex-/current smoker) and number of cigarettes smoked per day.

Smokers were participants who had smoked 100 or more cigarettes in their lifetime, ex-smokers were participants who had quit smoking since at least 1 year. Education was categorized into low (no qualification up to middle school diploma), intermediate (high school) and high (university). Geographic area was categorized as North (8 regions), Center (4 regions), and South of Italy (8 regions, including Islands).

The percent distributions of smoking habits, and the corresponding 95% confidence intervals (CI), were computed overall and in strata of various demographic and socio-economic characteristics. Age-standardized prevalence was computed by the direct method on the total sample of men and women separately.

To evaluate smoking attributable mortality we employed the SAMMEC software (CDC, 2009), a method using the age- and sex-specific prevalence of current and former smokers and the age-, sex- and cause-specific number of deaths in a population, and cause-specific relative risks (RR) on 19 causes of deaths, obtained from the Cancer Prevention Study (CPS) II of the American Cancer Society (ACS). Data on age- and sex-specific smoking prevalence of the

Italian population aged ≥ 35 years were obtained from the DOXA survey of 2010. Cause-specific mortality data by quinquennia of age and sex for 2007 were obtained from the World Health Organization (WHO, 2007).

## Results

The percent distribution of smoking habits of the Italian population aged 15 years or over in 2010 is given in Table 2. Overall, 21.7% (95% CI: 20.2–23.2) of Italian adults described themselves as current cigarette smokers (23.9% of men and 19.7% of women). The prevalence of smokers consuming 15 or more cigarettes per day was 59.8% among male and 39.1% among female smokers. The average daily number of cigarettes per smoker was 14.6 (15.1 in men, 12.0 in women). Ex-smokers were 12.7% (95% CI: 11.5–13.9) of the Italian adult population (15.7% men and 9.8% women).

Fig. 1 gives smoking prevalence between 1957 and 2010. Smoking prevalence steadily declined until 2008 overall (from 35.4% to 21.7%) and in men (from 65.0% to 23.9%) while in women it increased from 6.2% in 1957 to 25.9% in 1990, and declined thereafter to 17.9% in 2008. In 2009 we observed an increased smoking prevalence overall, and in both sexes, but in 2010 smoking prevalence declined again overall (21.7% in 2010 vs 25.4% in 2009,  $p = 0.001$ ), and in both men and women.

Fig. 2 shows the prevalence of current smokers by age group and sex. Males were more frequently current smokers than females before age 45 ( $p = 0.024$ ) and over 64 years ( $p = 0.073$ ). In the age group 45–64 years, smoking prevalence of women (25.9%) exceeded that of men (25.6%;  $p = 0.918$ ). A large but not significant gender difference was observed in the youngest age group (25.1% of men vs 18.4% of women;  $p = 0.124$ ).

Fig. 3 shows the age-standardized smoking prevalence by level of education and sex. An inverse relation between age-standardized smoking prevalence and level of education was evident in men (from 28.6% for low, to 24.7% for intermediate, to 19.3% for high level of education). Among women, no specific pattern according to education was observed, although higher educated women had the lowest age-standardized prevalence (17.0%).

Fig. 4 shows the age-standardized percent prevalence of current smokers by sex, according to geographic area. Overall, no substantial difference in smoking prevalence according to geographic area was observed. No gender difference in age-standardized smoking prevalence was observed in northern (21.7% of men vs 20.2% of women;  $p = 0.493$ ) and central Italy (22.8% of men vs 21.2% of women;  $p = 0.637$ ). In southern Italy, age-standardized smoking prevalence in men (25.2%) was higher than that of women (18.1%;  $p = 0.005$ ).

Table 3 shows the smoking attributable mortality in Italy in 2010. Overall, we estimated that 71,445 deaths (52,707 men and 18,738 women, 12.5% of total mortality) were caused by smoking in 2010. These smoking attributable deaths are due to lung cancer (25,987 deaths), other malignant neoplasms (10,121 deaths), cardiovascular diseases (19,615 deaths) and non-neoplastic respiratory diseases (19,612 deaths).

**Table 2**

Percent distribution and corresponding 95% confidence intervals (CI) of smoking habits in the Italian population aged 15 years or over. Italy, 2010.

Smoking status	Total % (95% CI)	Males <sup>b</sup> % (95% CI)	Females <sup>b</sup> % (95% CI)
Never smokers	65.6 (63.9–67.3)	60.4 (57.9–62.9)	70.4 (68.1–72.7)
Ex-smokers	12.7 (11.5–13.9)	15.7 (13.8–17.6)	9.8 (8.3–11.3)
Current smokers	21.7 (20.2–23.2)	23.9 (21.7–26.1)	19.7 (17.7–21.7)
Cigarettes per day <sup>a</sup>			
<15	10.6 (9.5–11.7)	9.3 (7.8–10.8)	11.9 (10.3–13.5)
15–24	9.6 (8.5–10.7)	12.2 (10.5–13.9)	7.3 (6.0–8.6)
≥25	1.0 (0.6–1.4)	1.7 (1.0–2.4)	0.4 (0.1–0.7)
Total number of participants	3020	1453	1567

<sup>a</sup> The sum does not add up to the total of current smokers because of missing values.

<sup>b</sup> Sex differences for smoking status and number of cigarettes were statistically significant.

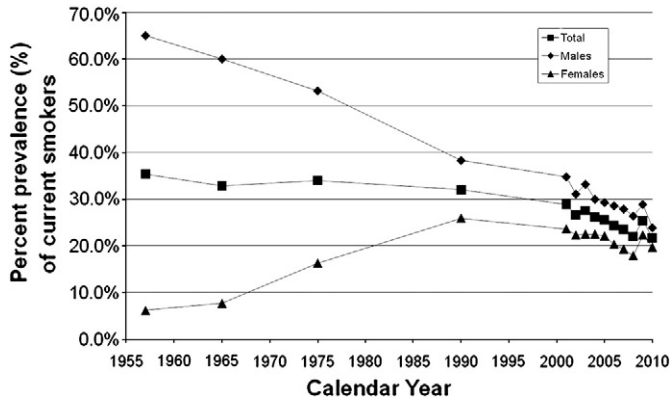


Fig. 1. Smoking prevalence in the adult population according to 14 DOXA surveys overall and by sex, Italy, 1957–2010.

Discussion

The overall estimated smoking prevalence of 21.7% in 2010 is the lowest registered in Italy over the last 50 years. After a steady decline, an increase in smoking prevalence was observed in 2009 (Gallus et al., 2010), but was discontinued in 2010. However, as compared to 2008, total smoking prevalence did not substantially change in 2010, thus, suggesting that the downward trend observed in the overall Italian population during the past 5 decades has flattened.

For the first time, smoking prevalence in women exceeded that of men in middle-aged population (45–64 years; i.e. those born between 1945 and 1965). No gender difference in smoking prevalence was observed in highly educated individuals and in northern and central Italy. In the South, smoking prevalence in men remained higher than in women, although the gap between sexes has substantially reduced throughout the last few years (Tramacere et al., 2009). Thus, for middle-aged individuals, those from higher socio-economic groups, and for northern and central Italy, the most affluent geographic areas, the final phase of the IV stage of the tobacco epidemic model proposed by Lopez et al. (i.e. a continuing slow decline of smoking prevalence for both men and women with converging rates between genders) (Lopez et al., 1994) has approached.

The Tobacco Control Scale (TCS) measures the implementation of tobacco control strategies at a country level, based on the following 6 policies suggested by the World Bank (Joossens and Raw, 2006): i) pricing policies, ii) smoke-free policies, iii) public information cam-

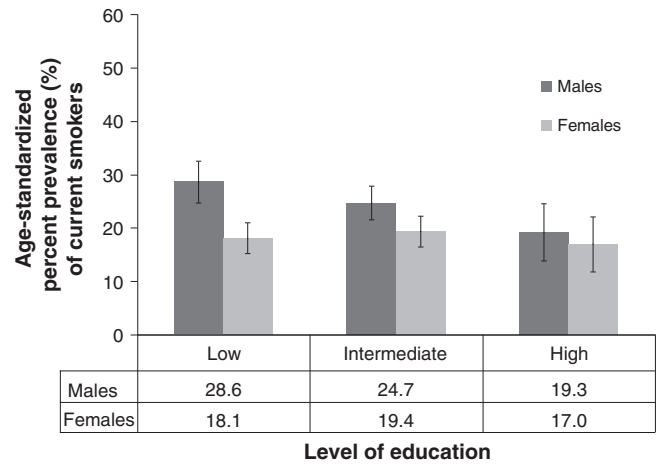


Fig. 3. Age-standardized percent prevalence and corresponding 95% confidence intervals of current smokers by sex, according to level of education. Italy, 2010.

paigns, iv) restrictions on advertising of tobacco products, v) warning labels, and vi) support for smoking cessation. The TCS showed that in 2007 Italy acquired relatively high scores on advertising bans and on large direct health warning labels on cigarettes and other tobacco products (Joossens and Raw, 2007). Moreover, a particularly high score was obtained on smoke-free regulations, after a comprehensive legislation banning smoking in public places and all workplaces came into force in 2005 (Gallus et al., 2006). However, Italy has rather poor implementation of tobacco control policies in the areas of price and tax increase (Gallus et al., 2003), consumer information and provision of psychological and pharmacological support for smoking cessation (Ferketich et al., 2009; Gallus et al., 2009). In particular, given the inadequately implemented smoking cessation policies in Italy (Joossens and Raw, 2007), only a negligible proportion of ex-smokers or current smokers attempting to quit received pharmacological support (Ferketich et al., 2009; Gallus et al., 2009). Thus, measures to enhance the use of pharmacological treatment for smoking cessation should be improved. In particular, pharmacotherapy for smoking cessation, including nicotine replacement therapy, bupropion and varenicline, should be adopted among the drugs covered by the Italian National Health Service (NHS) (Ferketich et al., 2009; Gallus et al., 2009).

Overall, we found a decreased attributable fraction of mortality due to smoking, from 15.1% in 1998 (Gorini et al., 2003) to 12.5% in 2010, equivalent to avoiding 12,215 deaths in Italy. This is at least in part the result of the tobacco control strategies introduced over the

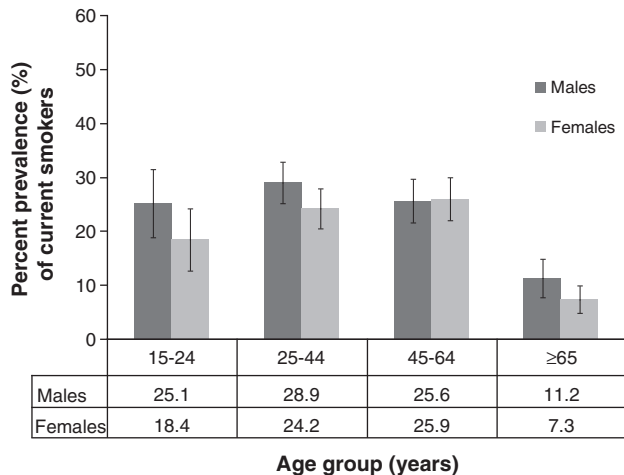


Fig. 2. Percent prevalence and corresponding 95% confidence intervals of current smokers by sex, according to age group. Italy, 2010.

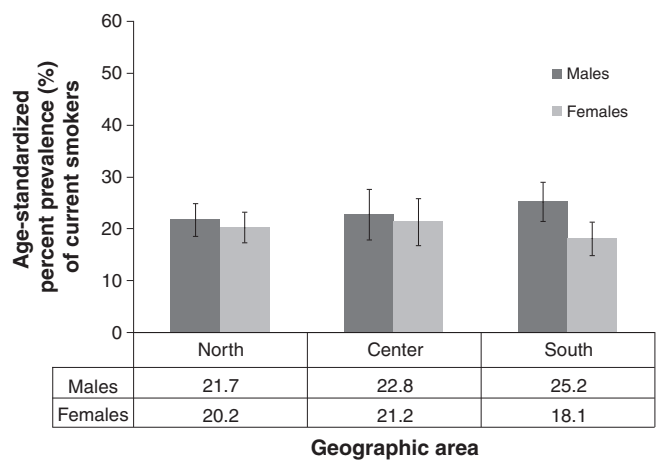


Fig. 4. Age-standardized percent prevalence and corresponding 95% confidence intervals of current smokers by sex, according to geographic area. Italy, 2010.

**Table 3**  
Smoking attributable deaths (SAD) by sex, according to cause of death. Italy, 2010.<sup>a</sup>

Disease category	Men			Women			Total		
	SAD	No. of deaths	%SAD	SAD	No. of deaths	%SAD	SAD	No. of deaths	%SAD
<b>Malignant neoplasms</b>									
Lip, oral cavity, pharynx	1399	2021	69.2	286	764	37.4	1685	2785	60.5
Esophagus	862	1329	64.9	198	428	46.3	1060	1757	60.3
Stomach	1293	6068	21.3	302	4417	6.8	1595	10485	15.2
Pancreas	909	4733	19.2	804	5078	15.8	1713	9811	17.5
Larynx	1186	1525	77.8	91	147	61.9	1277	1672	76.4
Trachea, lung, bronchus	21374	25401	84.1	4613	7487	61.6	25987	32888	79.0
Cervix uteri	0	0	0.0	39	408	9.6	39	408	9.6
Kidney and renal pelvis	631	2012	31.4	36	1066	3.4	667	3078	21.7
Urinary bladder	1661	4362	38.1	195	1117	17.5	1856	5479	33.9
Acute myeloid leukemia	183	1017	18.0	46	853	5.4	229	1870	12.2
<b>Cardiovascular diseases</b>									
Ischemic heart disease	5487	37656	14.6	2755	37394	7.4	8242	75050	11.0
Other heart disease	3006	21027	14.3	1601	30267	5.3	4607	51294	9.0
Cerebrovascular disease	2360	24065	9.8	1852	37382	5.0	4212	61447	6.9
Atherosclerosis	213	994	21.4	109	1839	5.9	322	2833	11.4
Aortic aneurysm	1513	2673	56.6	423	1100	38.5	1936	3773	51.3
Other arterial disease	161	1361	11.8	132	1365	9.7	293	2726	10.7
<b>Respiratory diseases</b>									
Pneumonia, influenza	579	3439	16.8	376	3990	9.4	955	7429	12.9
Bronchitis, emphysema	1953	2256	86.6	1084	1585	68.4	3037	3841	79.1
Chronic airway obstruction	7937	10645	74.6	3796	6142	61.8	11733	16787	69.9
Other causes of death	0	125918	0.0	0	148068	0.0	0	273986	0.0
<b>Total</b>	<b>52707</b>	<b>278502</b>	<b>18.9</b>	<b>18738</b>	<b>290897</b>	<b>6.4</b>	<b>71445</b>	<b>569399</b>	<b>12.5</b>

<sup>a</sup> Total resident Italian population in 2010 was 60,340,328 (29,287,403 males and 31,052,925 females).

past decade. Still, more than 70,000 Italians prematurely die each year due to smoking.

To estimate smoking attributable mortality we used the SAMMEC software. This method uses present smoking exposure without considering the changing trend of smoking and latency of mortality causes. In fact, for most tobacco related diseases, smoking attributable deaths reflect smoking exposure in previous decades, since latency of lung cancer, other cancers and non-neoplastic respiratory diseases is of several decades (Perez-Rios and Montes, 2008). Thus, the smoking attributable mortality estimates do not represent the past or cumulative smoking of the population of interest, but only reflect the current smoking profile (Samet, 2010). Consequently, since in Italy over the last few decades smoking prevalence was sensibly higher in men and slightly lower in women, the method used underestimates the number of deaths attributable to smoking in men and over-estimates those in women (CDC, 2010a). However, given the gender specific trends of smoking prevalence in Italy over the last few decades, the over-estimates for women cannot compensate the under-estimates for men.

Another limitation of the SAMMEC methodology is that it assumes RR estimates from CPS II. Although this represents one of the largest and best conducted studies to provide RRs of mortality according to smoking status, the validity of applying the RRs of a US population to the Italian one is open to discussion. Smoking histories, including in particular intensity and duration, and tobacco product usage of the CPS II participants might in fact differ from the Italian one, thus influencing the RRs of various tobacco-related diseases (Samet, 2010). However, RR estimates from CPS II are in agreement with those from Italian epidemiological studies on cancers of lung (Simonato et al., 2001), head and neck (Polesel et al., 2008; Zambon et al., 2000), pancreas (Talamini et al., 2010), kidney (La Vecchia et al., 1990) and urinary tract (D'Avanzo et al., 1990), as well as coronary heart diseases (Negri et al., 1994).

The potential limitations notwithstanding, the SAMMEC method is one of the most widely used methodologies to estimate smoking attributable mortality (Perez-Rios and Montes, 2008; Samet, 2010). This allowed us to compare our estimates with a previous Italian estimation.

In conclusion, over the last decade smoking related deaths in Italy declined by almost 15%. Italy has now reached the final stage of the

tobacco epidemic (Lopez et al., 1994). Different tobacco control policies apply to various stages, and, for the final stage, smoking cessation should be considered as a priority (Lopez et al., 1994). Thus, Italy should maintain effective tobacco control measures and introduce new policies including coverage of pharmacological support for smoking cessation and rise in tobacco prices.

#### Conflict of interest statement

The authors declare that there are no conflicts of interest.

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