Tumori, 99: 296-307, 2013

Estimates of cancer burden in Trentino-Alto Adige

Silvano Piffer[1], Maria Gentilini[1], Roberto Rizzello[1], Guido Mazzoleni[2], Francesco Bellù[2], and Silvia Rossi[3]

[1]Servizio Epidemiologia Clinica e Valutativa, Registro Tumori, Azienda Provinciale per i Servizi Sanitari, Trento; [2]UO Anatomia Patologica, Registro Tumori, Ospedale S Maurizio, Bolzano; [3]Centro Nazionale di Epidemiologia, Istituto Superiore di Sanità, Rome, Italy

ABSTRACT

Aims and background. The Trentino-Alto Adige region is composed of two autonomous provinces (Trento and Bolzano), each with its own cancer registry. The registries' total coverage is 100% of the regional population. The main difference between the two provinces in terms of cancer epidemiology is related to the prostate cancer incidence and survival, with higher values in Bolzano. This paper provides an update until 2015 of the basic epidemiological indicators for seven major cancers for the entire region.

Methods. The indicators were estimated by means of the MIAMOD method, a statistical back-calculation approach to derive incidence and prevalence figures starting from mortality and relative survival data. Mortality data were provided by ISTAT for the period 1970-2002 while survival was modeled on the basis of published data from the Italian cancer registries.

Results. The estimates for 2012 show that breast cancer was the most common cancer in women and prostate cancer was most common in men. Incidence and mortality were decreasing for cervix cancer and stomach cancer in both genders during the whole study period. The lung cancer incidence and mortality were decreasing in men but increasing in women. The colorectal cancer incidence rose in both genders while the mortality was decreasing in women. The incidence of skin melanoma increased in both sexes, while the mortality remained very low. The breast cancer incidence was increasing up to 2015 while the mortality was declining since 1986. The prostate cancer incidence increased up to 2006, thereafter the rates stabilized while mortality started to decrease in the early 2000s. The highest mortality rates were estimated for lung cancer in men and breast cancer in women.

Conclusions. Lifestyle plays an important role in cancer trends, as does organized screening for early detection of cervix, breast and colorectal cancer. The provincial data on risk factor distribution and adherence to and coverage of organized screening are satisfactory and their optimization may allow additional benefits in terms of public health.

Key words: cancer, incidence, prevalence, mortality, Trento, Bolzano, cancer registries.

Funding: The work presented in this paper has been partially funded by the "Programma Straordinario di Ricerca Oncologica 2006, Alleanza Contro il Cancro – Istituto Superiore di Sanità", project 2.4: "The Italian Cancer Registries Network", and by the project "Produzione e aggiornamento sistematico di stime a livello nazionale e regionale di alcuni tumori nella popolazione generale" funded by CCM, Italian Ministry of Health.

Conflict of interest statement: The authors declare no conflicts of interest. The funding sources had no role in study design, data collection, data analysis, data interpretation, writing this paper, or the decision to submit it for publication.

Correspondence to: Silvano Piffer, Direttore del Servizio di Epidemiologia Clinica e Valutativa, Registro Tumori della Provincia di Trento, Azienda Provinciale per i Servizi Sanitari, Centro per i Servizi Sanitari, Viale Verona, 38123 Trento, Italy.
Tel +39-0461-904638/9;
fax +39-0461-904645;
email Silvano.piffer@apss.tn.it

Received January 7, 2013;
accepted March 8, 2013.

Introduction

The Trentino-Alto Adige region is composed of 2 separate provinces: the Autonomous Province of Trento (Trentino) and the Autonomous Province of Bolzano (Alto Adige). The special autonomy status allows greater opportunity and responsibility of intervention by local government in the health sector.

In Alto Adige most of the population belong to the German linguistic group, a smaller proportion speaks Italian, and a small minority speaks Ladin. In Trentino, the vast majority of the population belongs to the Italian linguistic group and only a small proportion is Ladin speaking.

Belonging to one of the different linguistic groups produces cultural and lifestyle differences among the 2 populations. The incidence, mortality and prevalence of can-

cer, like other health conditions, are affected by the cultural differences[1,2]. According to a recent publication, the incidence of breast, stomach and lung cancer in both genders and colorectal cancer in males did not differ substantially between the 2 provinces. A significant discrepancy emerged for prostate cancer, with high values in the Bolzano province, probably due in part to a more intensive use of the PSA test among the population with a consequent higher rate of prostate biopsies[3].

The health activities in the 2 provinces are managed by 2 distinct provincial health authorities (ASL). Prevention, treatment and rehabilitation activities are provided in both provinces through 4 health districts.

The Trentino population is served by 7 public hospitals and 7 private hospitals[4]. The population of Alto Adige is served by 7 public hospitals and 2 private hospitals. In both provinces there are medical and radiation oncology units. In the province of Trento the activities of medical oncology are provided through a departmental structure.

In both provinces a proportion of patients with cancer (especially rare forms and/or childhood cancers) are referred for treatment to facilities outside the region. For Alto Adige, an important center of reference is in the city of Innsbruck (Austria).

Organized screening programs are active in Trentino for cervix, breast and colorectal cancer which were started in 1993, 2001 and 2007, respectively. In Alto Adige only 2 screening programs are ongoing: for cervix cancer from 2010 and for breast cancer from 2003.

Since 1995 a population-based cancer registry has been active, providing incidence and follow-up data in each of the provinces. The registries of the 2 provinces cover the entire regional population.

Cancer was the major cause of death both in the Trentino and Alto Adige provinces, with 1,483 and 1,170 total cancer deaths in 2010, respectively. The specific proportional mortality rate was 37.1% in men and 27.7% in women in Trentino and 35.2% in men and 29.6% in women in Alto Adige[5,6]. For both provinces the age-standardized cancer mortality was higher than the national average, therefore cancer in this region requires major efforts in primary care, for diagnosis and treatment, and to face social needs.

This paper will provide the basic epidemiological indicators: incidence, prevalence and mortality in the Trentino Alto Adige region for the major cancers (lung, breast, prostate, colorectal, stomach and uterine cervix cancer and skin melanoma). These indicators were estimated up to the year 2015. Due to the cultural and lifestyle differences and to the separate organization of health care provision in the 2 autonomous provinces, the incidence trends of the analyzed cancer sites and provided by the 2 regional population-based registries are also presented and discussed at the provincial level.

Material and methods

Mortality data for all considered cancers, general mortality and population data by age, calendar year and geographical region for the period 1970-2002 were obtained from the Italian National Institute of Statistics (ISTAT)[7]. Specific mortality data for the subsequent years, i.e. 2003, 2006 and 2007 (data for 2004-2005 were not yet published by ISTAT), were only used to validate the mortality projections. Relative survival data for the considered cancers for the period of diagnosis 1985-2002 were obtained from the EUROCARE-4 study[8]. The data refer to the populations covered by 21 cancer registries in Italy jointly covering about 25% of the national population.

Table 1 reports the cancer registries active in the Trentino-Alto Adige region with the respective area and size of the population covered, the corresponding coverage of the regional population, the percentage of people older than 65 years, and the data collection period. Age-standardized incidence rates from 1995 to 2007 collected by the Bolzano (Alto Adige) and Trento (Trentino) cancer registries were taken from the ITACAN database of the Italian Association of Cancer Registries' website[9].

The MIAMOD method[10-13] was used for the estimation of incidence and prevalence. This statistical method is based on a back-calculation approach to estimate and project the morbidity of chronic irreversible diseases from mortality and patient survival. The method relies on the mathematical relationships between mortality, prevalence, incidence and survival. The model's estimation is based on mortality data from ISTAT for the period 1970-2002, with cause of death coded according to the ninth revision of the International Classification of Diseases (ICD-9)[14]. The relative survival of cancer patients was estimated from observed cancer registry data by means of parametric cure models of the Weibull type at the level of macro area. The geographical area and the age of patients were considered as categorical covariates in the survival model. The covariate year of diagnosis was modeled for each site and sex as continuous or categorical, and as unique for all areas or variable by area, according to the pattern of observed survival data[12]. The survival estimates for the northeast of Italy were assigned to Trentino-Alto Adige.

The survival time trend after 2002 was assumed to have the same tendency as that estimated over the observation period 1985-2002 for all cancers except prostate cancer, where survival was assumed to be constant from 2005 onwards.

All incidence, mortality and prevalence estimates were carried out up to age 99 for the period 1970-2015. For cervical cancer, prostate cancer and skin melanoma, additional specific procedures were applied to take into account particular problems related to these sites. The estimates for cervix cancer were performed after having estimated the regional cervical cancer mortality with a specif-

ic methodology[15,16] allowing to correct observed mortality data which are largely incomplete due to misclassification with uterus not otherwise specified (NOS). The methodology could be applied from 1980 onwards because before that year the ICD-8 classification, which did not distinguish uterus NOS, was adopted in the ISTAT statistics. The corrected mortality data were used as input data for incidence and prevalence estimates by the MIAMOD method. Estimates for this site were carried out up to 94 years because the distinction of uterus NOS cancer deaths into cervix and corpus uteri cancer deaths in women over 94 years old is not very reliable. Furthermore, for cervical cancer only limited-duration prevalence at 15 years was reported. Indeed, complete prevalence is highly sensitive to the past trends. For cervical cancer, incidence estimates before 1980 are unreliable due to the subsequent spread of non-organized early diagnosis and to the fact that neither mortality nor cancer registry data exist to support reliable modeling assumptions. Simple backward linear extrapolation of the decreasing trend estimated during the 1980s and 1990s may inflate the past incidence level and consequently (due to the high survival) the estimated prevalence of women with a diagnosis of cervical cancer.

For prostate cancer, because of the rapid changes in the recent time trends, more up-to-date mortality data were used in order to capture recent variations which could not be modeled with data up to 2002. Since mortality data for 2004-2005 were missing, mortality data estimates with projections up to 2010 were preliminarily performed by means of the PIAMOD method[17]. The modeled mortality was then used as input for the MIAMOD method.

The projections of age-specific incidence and mortality rates for skin melanoma were obtained by linearly projecting the annual percent change of the age-specific incidence and mortality rates estimated in the period 2001-2002. The total rates were obtained by age-specific rates. The age-standardized rates are based on the standard European population.

Results

The number of cases, crude and age-standardized incidence and mortality rates, and prevalence proportions estimated in Trentino-Alto Adige for 2012 are presented in Tables 2A and 2B for men and women, respectively.

In 2012, prostate cancer was the most frequent cancer in the male population, with 1,035 estimated new diagnoses. The incidence of the other cancers was substantially lower, ranging between 500 (colon-rectum) and 102 (skin melanoma) estimated new cases. During the same year, almost 900 new cases of breast cancer were expected to be diagnosed in the female population. For the other cancers, the numbers of estimated new cases were considerably lower and ranged between 392 (colon-rectum) and 24 (cervix uteri).

The prevalence figures were more than 10 times the incidence rates for breast cancer and skin melanoma. At the opposite end, prevalence was only 2.5 times the incidence for lung cancer in both sexes. The highest crude mortality rates were for lung cancer in men (53 per 100,000) and breast cancer in women (38 per 100,000) and the lowest for skin melanoma (2.2 in males and 2.9 in females) and cervical cancer (2.2 per 100,000/year). For colorectal, lung and stomach cancer all the indicators were higher in men than women; only the skin melanoma rates were higher in women than in men. The highest male/female ratio was reported for gastric cancer (2.5 for both standardized mortality and incidence) and the lowest for skin melanoma (<1).

The time trends of the 3 indicators over the period 1970-2015 are shown in Figures 1 to 6. They present the age-standardized incidence rates, mortality rates and crude prevalence proportions separately for men and women. The age-standardized incidence rates observed in the Bolzano and Trento provinces separately for the period 1995-2006 are shown by sex and site in Figure 7. The results will be described below, grouped by cancer site.

Stomach

The incidence and mortality trends for stomach cancer were estimated to be clearly decreasing during the whole represented period. In men, incidence and mortality decreased from 67 and 57, respectively, per 100,000 in 1970 to 19 and 11 in 2015. The trends in women were similar, but always at a lower level than in men. The stomach cancer incidence was about 20% higher and less steeply decreasing in the Bolzano province than in the Trento province (Figures 7A and 7B).

Colon and rectum

For colorectal cancer, the male incidence rates were estimated to rise progressively up to the mid 1990s and then to stabilize (from 38 per 100,000 in 1970 to 70 per 100,000 in 1994-1995) to a projected value of 75 per 100,000 in 2015. The female incidence trend was similar until the late 1990s, though the rates were lower and showed a less marked increase (from 31 to 44 per 100,000/year during the period 1970-1998). A slight decrease was observed from 1999 onwards, down to 40 in 2015. The mortality rates in men rose slightly until the late 1980s and, after having reached a plateau, started to decline from 1995 onwards to 22 per 100,000 in 2015. The mortality trend in women showed a constant decrease and the rates almost halved between 1970 (21 per 100,000) and 2015 (12 per 100,000). No difference between the 2 provinces in colorectal cancer risk is evidenced in Figures 7C and 7D for women and men, respectively.

Lung

The lung cancer incidence rates in men reached their peak during the late 1980s (with a maximum rate equal to 92 per 100,000/year in 1985-87) and then were estimated to gradually decrease to 38 per 100,000 in 2015. In women

the rates increased throughout the study period and are expected to reach the highest rate of 26 per 100,000 in 2015. The male/female incidence ratio declined from 1970 (8.1) to 2015 (1.5). Due to the very poor prognosis of this cancer, the mortality trends closely mimicked those estimated for incidence. In women, lung cancer was estimated to be the second most common cause of cancer death after breast from 2008 onwards. Also for lung cancer no significant difference was observed between the incidence trends in the 2 provinces (Figures 7E and 7F).

Skin melanoma

The skin melanoma incidence rates were estimated to increase uniformly for both genders until the mid 1980s, then the female rates started to rise more rapidly than the male rates. In men we estimated an 8-fold increase from 2.3 to 18.2 per 100,000/year during the period 1970-2015, while in women the increase was more than 10-fold. In the same period, the female/male ratio was 1.5. The mortality rates were low, thanks to the good survival of skin melanoma patients. Mortality reached a peak in the mid 1990s and tended to slightly decrease thereafter. The incidence of skin melanoma was similar in the 2 provinces during the first part of the considered period. After 2003, the age-standardized incidence rates showed a sudden 2- to 3-fold increase in Bolzano, while they remained unchanged in the province of Trento (Figures 7G and 7H).

Breast

The incidence of breast cancer in women was estimated to increase rapidly until 1993-1994 (from 51 per 100,000 in 1970 to 108 per 100,000 in 1994) and then to a lesser extent. Projections for breast cancer incidence are to be taken with caution, as this indicator reflects more the impact of screening activities than the effect of risk factors. Our projections based on observations up to 2002 foresaw a stabilization at around 120 per 100,000 from 2009 onwards. The mortality rates reached a peak in 1987-1988 (31.2 per 100,000) and then dropped steadily to a foreseen level of 18 in 2015. The breast cancer incidence trends overlapped in the 2 provinces (Figure 7I).

Cervix uteri

During the study period the cervix cancer incidence and mortality showed a marked decline, reaching the lowest rates among the malignancies considered: 3 and 1 per 100,000, respectively, in 2015. The incidence of cervical cancer differed within the region (Figure 7K): the age-standardized rates were more than 50% higher and less sharply decreasing in the province of Bolzano compared with Trento.

Prostate

The prostate cancer incidence was estimated to increase during the period 1970-2006 from 30 to 149 per 100,000/year. Thereafter the rates seemed to stabilize or decrease slightly, reaching a level of 141 per 100,000 in 2015. The mortality rates rose slightly from 1970 (18 per 100,000) to the beginning of 2000 (26 per 100,000) and then started to decrease, with an estimated reduction in 2015 of about 22% with respect to the peak level. The incidence/mortality ratio dramatically increased from 1.8 to 7 during the study period. Prostate cancer presented the most striking difference between the 2 provinces, with similarly increasing slopes but a level in Bolzano about double that in Trento (Figure 7J).

Prevalence

Prevalence increased for all the considered cancers except uterine cervix and stomach cancer in women. In men, the stomach cancer prevalence declined from the early 1990s, and the trend was markedly influenced by the impressive reduction of the incidence rates. For cervical cancer the 15-year limited-duration prevalence was estimated to decrease during the whole study period (from 176 per 100,000 in 1980 to 50 in 2015). The lung cancer prevalence rose exponentially in women during the period 1970-2015, whereas in men the linear growth started to slow down in 2010. The prevalence of breast and prostate cancer increased dramatically. It was interesting to note the opposite behavior of prevalence and mortality, which declined for all considered cancers with the only exception of lung cancer in women.

Discussion

This paper provides an updated description of the burden of the major cancers in the Trentino-Alto Adige region in terms of time trends through 2015 and point estimates in 2012.

In order to validate the model-based estimates, the age-standardized incidence obtained with the MIAMOD model (Figures 1 and 2) was compared with the corresponding values observed by the 2 regional cancer registries for the available period 1995-2005 (Figure 7). This comparison is not straightforward, considering that only for some sites there is substantial overlap between the incidence trends in the 2 provinces. The regional estimated and observed trends were fully consistent for stomach and uterine cervix cancer. For melanoma of the skin the trends were also consistent on average, even if the smooth model-based estimates did not capture the sudden incidence rise reported in 2004 and 2005 by the Bolzano registry, which was attributable to the start of an early-diagnosis campaign in that province. The model-based estimates were slightly higher (about +9%) than the observed values for breast cancer, female colorectal cancer (+8%) and male colorectal cancer (+11%).

For colorectal cancer the observed age-standardized incidence trends appear not to diverge from the corresponding mortality trends, as would be expected be-

cause of the generally improving survival rates. In the MIAMOD estimation, survival rates derived from data of all northeastern registries were used because the Trentino and Alto Adige data were too sparse to allow for a reliable region-specific survival trend.

Differences ranging from 12% to 13% were found for lung cancer. For this cancer, both registries recorded mortality/incidence ratios in both sexes of about 1, which is higher than the corresponding values (ranging between 0.8-0.9) reported by the other registries of the northeastern macro area. Finally, the estimated prostate cancer trends completely overlapped with the corresponding trend observed in Bolzano, where an intensive early-diagnosis program was initiated. The prostate cancer incidence was of course much lower in the Trentino province, where no such activity was ongoing.

The incidence rates are estimated to be still rising for breast cancer, skin melanoma, colorectal cancer and female lung cancer. By contrast, the rates have been declining for cervix and stomach cancer. The rates increased reaching a peak and then decreased for lung cancer in men and prostate cancer. The major risk factor affecting the observed trend is smoke. Smoke is related to lung, stomach and cervix cancer[18].

The prevalence of smoking in Italy has been decreasing among men since the 1970s. By contrast, the smoking habit in women is rising, approaching the proportion of male smokers in 1990s[19]. The periodic "Multipurpose" surveys by ISTAT allow to obtain data on the time trends of smoking prevalence at the regional and autonomous province level. Historical data show that the prevalence of smokers in the 2 provinces for the recent decades was lower than the national average and the northeast Italian averages. In particular in the 2009 survey, the prevalence of smokers was estimated to be 18% in Alto Adige and 20% in Trentino[20,21]. According to the 2005 MIAMOD estimates[22], the incidence rate of male lung cancer in Trentino-Alto Adige was the lowest in Italy (47 *versus* 69 per 100,000). Also the incidence rates observed by the Trentino and Alto Adige cancer registries were lower than those observed by the pool of Italian registries and the lowest among the northeastern registries[23]. The attributable risk of tobacco is highest for lung cancer and lower for stomach and cervical cancer[18]. For stomach, colorectal, breast and prostate cancer, diet is a more important risk factor[24]. We can assume that recent changes in the diet, with increased consumption of energy-dense foods and sugary drinks, has raised the risk of these cancers, while the decreased consumption of salted or smoked preserved foods, an important risk factor for stomach cancer, has resulted in a decline in its incidence[24]. We do not have specific information about food consumption in the Trentino-Alto Adige population. However, according to the latest ISTAT survey, the proportion of people who consumed at least 5 servings of vegetables or fruit a day in both provinces was higher than in Italy (7.5% *versus* 4.8%) and the proportion of the population that was overweight or obese (BMI >25%) was 38% in Alto Adige and 41% in Trentino, less than the national average (46%)[20]. Physical activity protects against cancers of the colon and breast[24]. According to the PASSI survey[25,26], in 2008 6% and 13% of the adult populations of Alto Adige and Trentino, respectively, admitted to having a sedentary lifestyle[25,26]. These proportions were much lower than the Italian average (29%). Nevertheless, according to the 2005 MIAMOD estimates[27,28] the colorectal and breast cancer incidence rates for Trentino-Alto Adige were higher than the Italian rates.

Screening programs had a strong impact on the incidence trend of breast, cervical and colorectal cancer. In Trentino, according to the PASSI annual report[25] the access to Pap tests for 25- to 64-year-old women was high (83%) in the late 2000s (at least 1 test in the last 3 years) and the percentage of invited women who yearly accepted to be tested, during the same period and for the same age groups, was around 48%[29].The access to mammograms for 50- to 69-year-old women was higher (84%) in the same period (at least 1 test in the last 2 years)[25,30]. In Alto Adige, according to the same source[26] the access to Pap tests for 25- to 64-year-old women was 83% in the late 2000s (at least 1 test in the last 3 years) and the percentage of invited women who yearly accepted to be tested, during the same period and for the same age groups, was around 36%. The lower compliance of Alto Adige women could be due to difficulties for cervical screening to reach the fraction of the provincial population living in highly mountainous areas, and might partially explain the higher incidence of cervical cancer with respect to the Trento province. The access to mammograms for 50- to 69-year-old women was 65% in the same period (at least 1 test in the last 2 years)[26].

Regarding colorectal cancer screening, the Ministry of Health in 2006 included colorectal cancer in the recommendation for screening[31]. In the Trentino province, as in Italy, the access to the effective screening tests for this cancer is still low: only 19% of healthy people aged 50-69 years declared to have undergone a fecal occult blood test in the last 2 years[25]. The organized screening program for colorectal cancer started only at the end of 2007 in the province of Trento[32]. For this cancer the slight reduction of incident cases cannot be attributed to the start of screening examinations; the change is more likely due to stabilization of the pattern of risk factors for colorectal cancer and to a more widespread knowledge of the risk factors themselves among the population.

As is the case in several Western countries, also in Italy the incidence of skin melanoma is increasing[23,33]. Several factors may contribute to this increase in incidence, including increased ultraviolet exposure, increased public awareness of the warning signs of skin melanoma, and increased screening by clinicians[34]. It should be noted that from 1970 to 1990 the Trentino province was involved in an extensive information campaign to increase awareness of melanoma in the population that has proven to be effective[35]. The reasons for the jump in in-

cidence observed for both sexes in the Bolzano province after 2003 are not perfectly clear. The increase mainly involved early stage tumors in young adults. Even though it can be related to the influence of aggressive early diagnostic activity in the near region of North Tyrol (Austria), which is a major attractor of the Alto Adige population for health care provision, the causes of such a steep increase should be investigated more in depth.

The huge increase in the prostate cancer incidence may be partly due to the spread of PSA testing and to opportunistic screening. We cannot say how much of the prostate cancer incidence rise is due to risk factors or to early diagnosed lesions including overdiagnosis. This rise was not accompanied by a corresponding increase in mortality, which was quite stable up to 2000 and then slightly declined, supporting the hypothesis of a major contribution of overdiagnosis for this cancer. In Trentino-Alto Adige the prostate cancer incidence began to decline several years later than in many Western countries, including the US and the Nordic countries, where the decline started around 2000[33]. Model estimates assume equal coverage of PSA testing in the whole regional population. However, intense early diagnostic activity is ongoing in Alto Adige but not in the Trento province. This is reflected by the different incidence trends and levels reported by the Bolzano and Trento registries (Figure 7J).

Since the early 1990s the mortality rates for all the considered cancers, except lung cancer in women, have been declining. Mortality is obviously proportional to incidence and, given the very few therapeutic options for lung cancer[36], its mortality rates were very close to the incidence rates. Mortality is also related to survival, and thus to early diagnosis for those cancers that benefit from effective therapy given to patients with localized disease. The reduction of postoperative mortality, especially for colorectal, stomach and prostate cancer[37-39], and the more widespread availability of adjuvant hormonal therapy for breast cancer and adjuvant chemotherapy and neoadjuvant radiotherapy for colon and rectum cancer, respectively, further contributed to the reduction of mortality[40-42].

Prevalence is a measure of different aspects of the cancer burden: treatment, clinical follow-up, palliation and social disabilities. This indicator is therefore important for the planning and organization of health services. Tables 2A and 2B show that the demand for continuing support after the main treatment phase mainly comes from patients with breast and prostate cancer. It was estimated that in 2012 about 11,000 women with a diagnosis (new or old) of breast cancer were living in Trentino-Alto Adige. In the same year 8,100 prevalent cases of prostate cancer were estimated.

Except for lung cancer, where the cessation of smoking is the central goal for reducing mortality, substantial diagnostic and therapeutic resources contributed to the reduction of the cancer mortality rates in Trentino-Alto Adige. Due to the benefit of early diagnosis and screening programs, and partly to the improvement of therapeutic effectiveness, cancer survival will increase in the next years. This phenomenon, added to population aging, will inflate the cancer prevalence. The increasing demand for oncology services is one of the major challenges of the Trentino Alto Adige region.

In conclusion, prevention is the only way to contrast the increasing incidence and prevalence trends, thereby saving further lives and simultaneously preserving health care resources. The adoption of healthier habits could play a decisive role in reducing the number of cases diagnosed every year. To be effective, prevention must be organized and cross-sectoral. In this sense a good opportunity may be provided by the Provincial Plan for Prevention[43], which refers to the directions of the National Prevention Plan for 2009-2011[44].

Table 1 - Population of Trentino-Alto Adige, proportion of the elderly population and cancer registries with their coverage and beginning of registration activity

Area	Population by 31 December 2010	Population ≥65 years of age %	Cancer registry coverage %	First year of published incidence
Trentino province	529,457	19.4	100	1995
Alto Adige province	507,657	17.9	100	1995
Trentino-Alto Adige region	1,037,114	18.7	100	1995

Table 2A - Estimated incidence, mortality and prevalence by cancer site for the year 2012 in Trentino-Alto Adige. Number of cases and deaths, crude and European age-standardized (age-std) rates per 100,000 person-years and crude prevalence proportion per 100,000 persons. Age 0-99 years, men

	Incidence			Mortality			Prevalence	
Cancer site	Number of cases	Crude rate	Age-std rate	Number of deaths	Crude rate	Age-std rate	Number of cases	Crude proportion
Prostate	1,035	202.8	144.3	165	32.3	20.8	8,152	1,597.9
Stomach	142	30.2	21.0	90	19.1	12.9	773	164.1
Colon-rectum	500	106.1	75.0	165	35.0	23.8	3,446	731.3
Lung	304	64.5	43.9	252	53.4	35.6	843	178.7
Melanoma	102	21.6	16.8	10	2.2	1.6	990	210.1

Table 2B - Estimated incidence, mortality and prevalence by cancer site for the year 2012 in Trentino-Alto Adige. Number of cases and deaths, crude and European age-standardized (age-std) rates per 100,000 person-years and crude prevalence proportion per 100,000 persons. Age 0-99 years, women

Cancer site	Incidence			Mortality			Prevalence	
	Number of cases	Crude rate	Age-std rate	Number of deaths	Crude rate	Age-std rate	Number of cases	Crude proportion
Breast	874	179.3	121.0	186	38.3	19.7	10,811	2,217.6
Stomach	87	17.9	8.5	56	11.6	5.2	559	114.6
Colon-rectum	392	80.4	40.7	132	27.1	12.6	2,902	595.4
Lung	199	41.0	23.7	140	28.8	15.8	491	100.9
Melanoma	164	33.6	25.6	14	2.9	1.7	1,772	363.6
Cervix	24	4.9	3.5	11	2.2	1.3	270*	55.5*

*Limited-duration prevalence at 15 years.

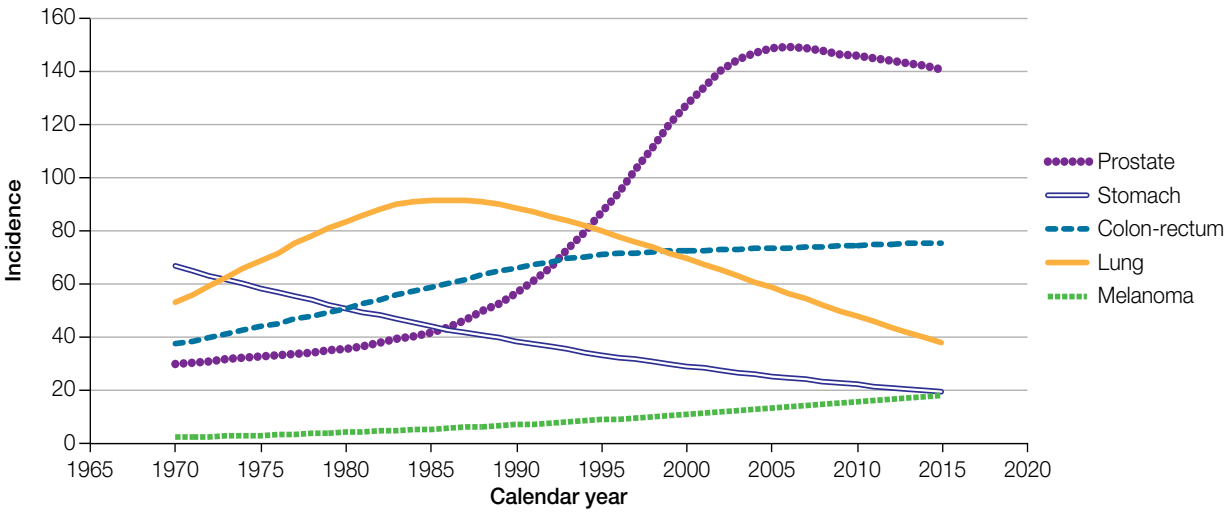


Figure 1 - Incidence estimates by cancer site in Trentino-Alto Adige in the period 1970-2015. Age-standardized rates (European population) per 100,000 person-years. Age 0-99 years, men.

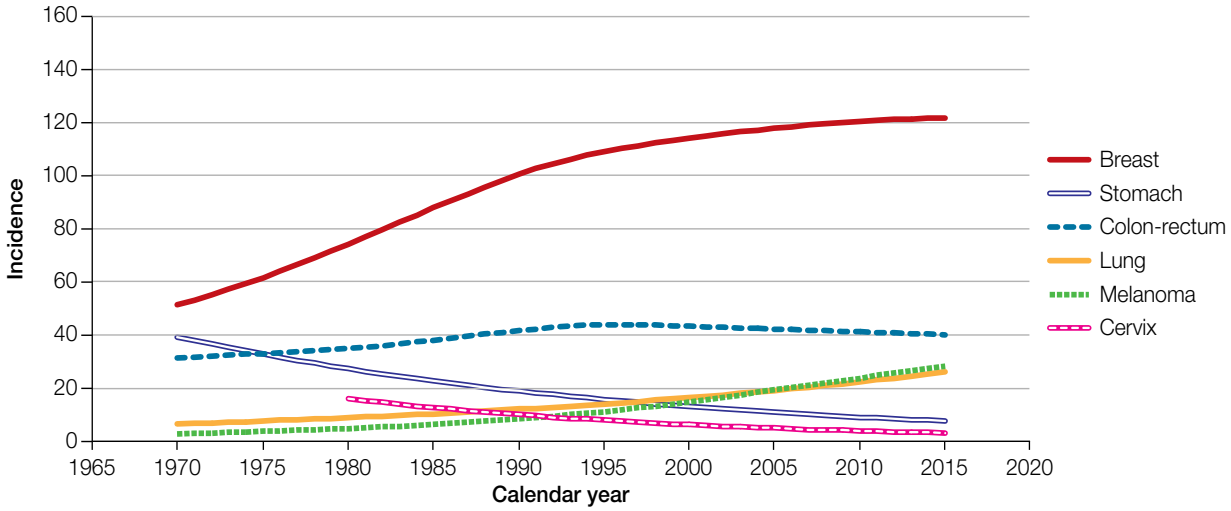


Figure 2 - Incidence estimates by cancer site in Trentino-Alto Adige in the period 1970-2015. Age-standardized rates (European population) per 100,000 person-years. Age 0-99 years, women.

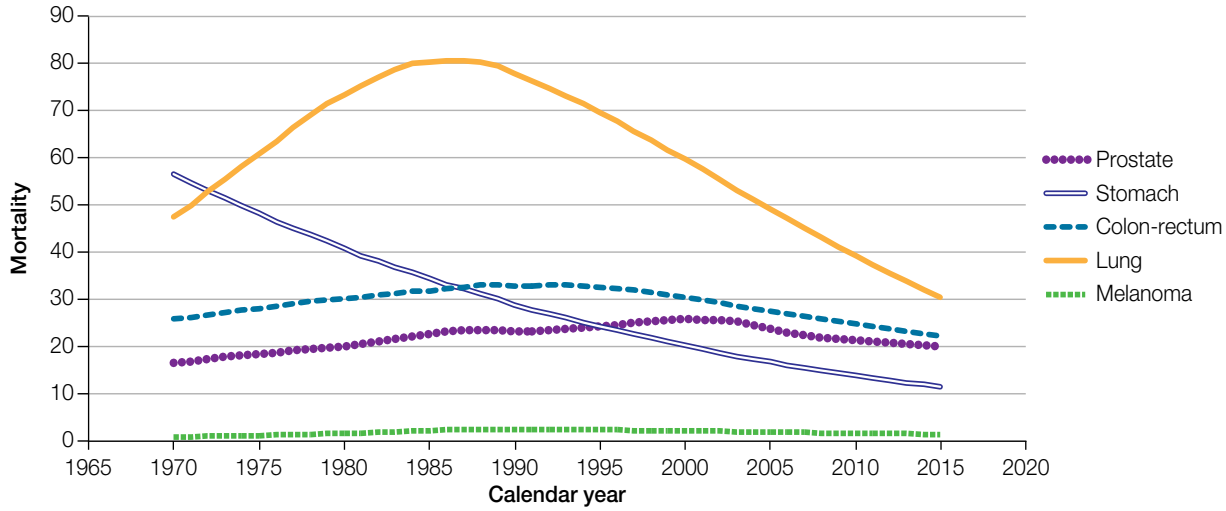


Figure 3 - Mortality estimates by cancer site in Trentino-Alto Adige in the period 1970-2015. Age-standardized rates (European population) per 100,000 person-years. Age 0-99 years, men.

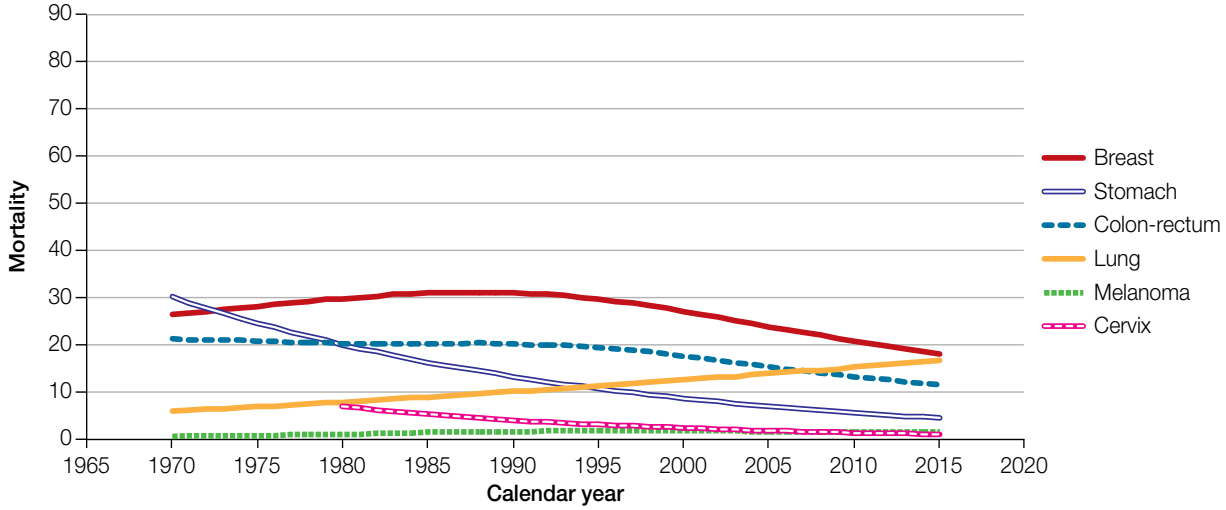


Figure 4 - Mortality estimates by cancer site in Trentino-Alto Adige in the period 1970-2015. Age-standardized rates (European population) per 100,000 person-years. Age 0-99 years, women.

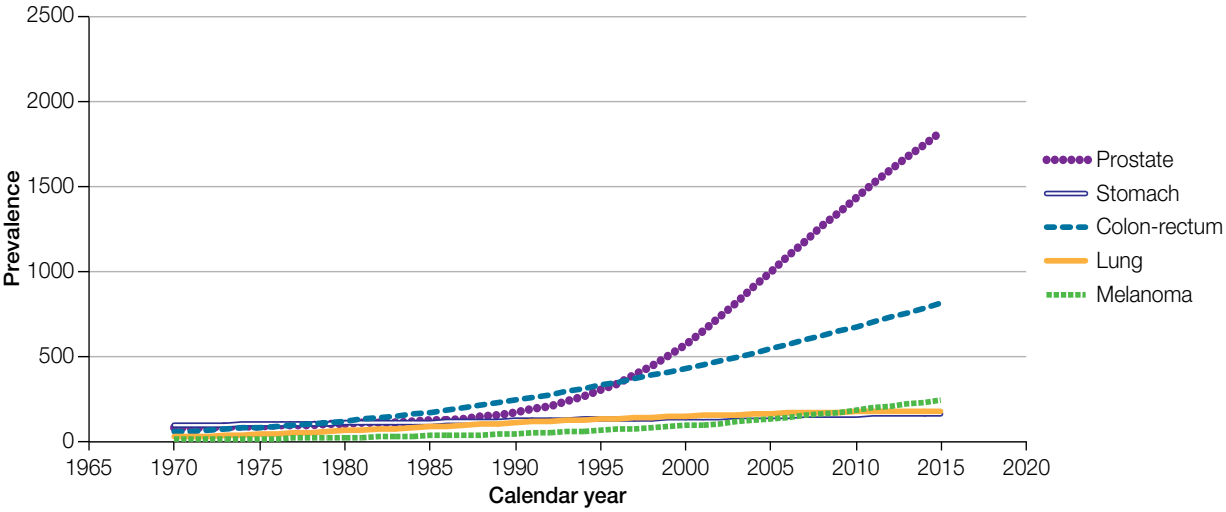
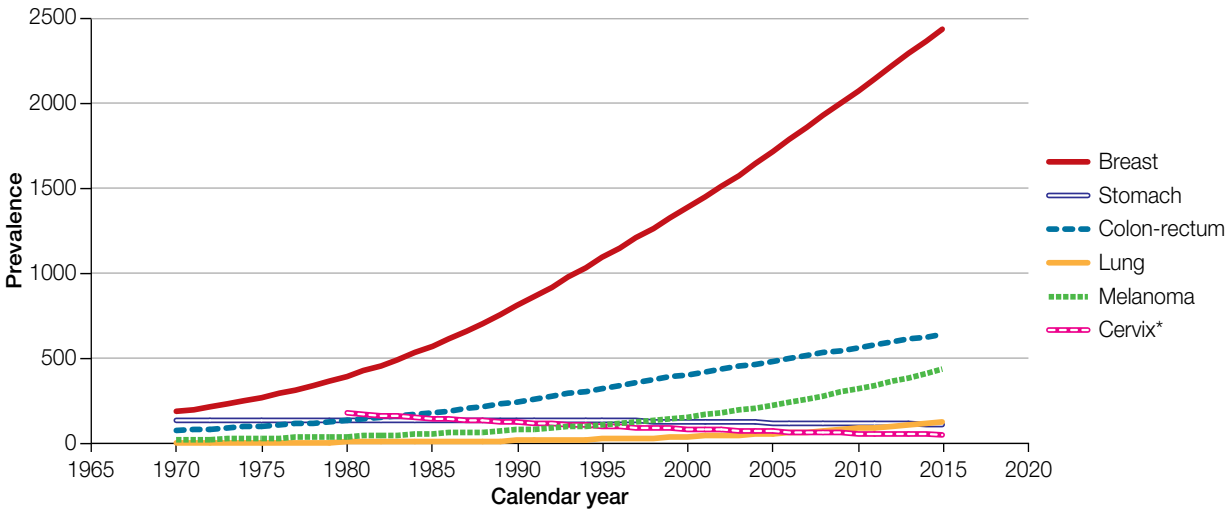


Figure 5 - Prevalence estimates by cancer site in Trentino-Alto Adige in the period 1970-2015. Crude proportion per 100,000 persons. Age 0-99 years, men.



*Limited-duration prevalence at 15 years

Figure 6 - Prevalence estimates by cancer site in Trentino-Alto Adige in the period 1970-2015. Crude proportion per 100,000 persons. Age 0-99 years, women.

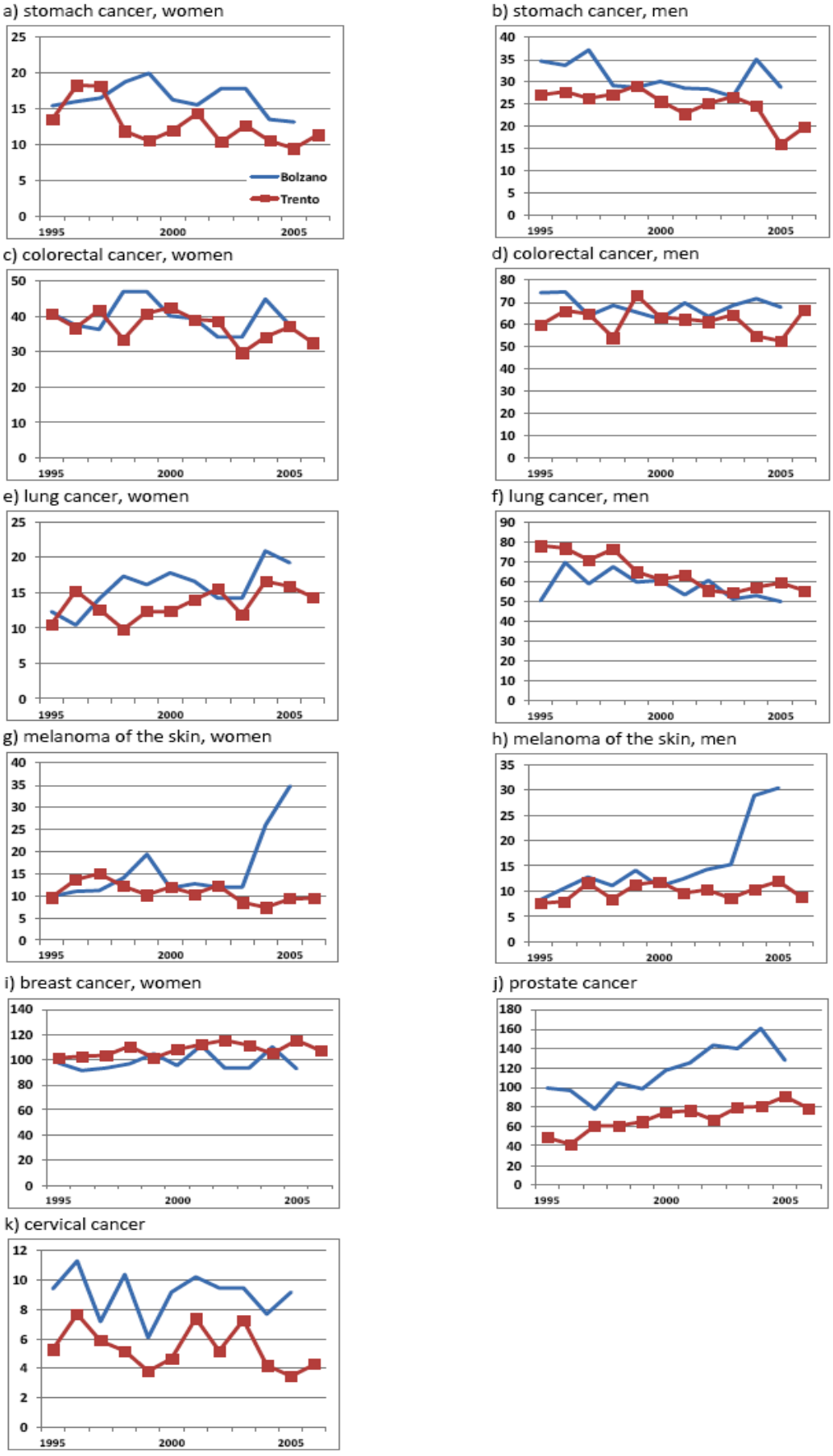


Figure 7 - Incidence of selected cancers by province. Observed cancer registry data: age-standardized rates per 100,000 person-years.

References

1. Bhopal R: Ethnicity, race, and health in multicultural societies: foundations for better epidemiology, public health, and health care. Oxford University Press, Oxford, 2007.
2. Marlow LA, Robb KA, Simon AE, Waller J, Wardle J: Awareness of cancer risk factors among ethnic minority groups in England. Public Health, 126: 702-709, 2012.
3. AIRT Working Group: I tumori in Italia. Rapporto 2006. Epidemiol Prev, 30 (Suppl 2), 2006.
4. Provincia Autonoma di Trento. Azienda Provinciale per I Servizi Sanitari. http://www.apss.tn.it (accessed 8 March 2013).
5. Servizio Epidemiologia Clinica e Valutativa: Rapporto epidemiologico anno 2010. http://www.apss.tn.it (accessed 8 March 2013).
6. Osservatorio Epidemiologico della provincia di Bolzano. Relazione Sanitaria 2010. http://www.provincia.bz.it/oep (accessed 8 March 2013).
7. ISTAT: Statistiche sulle cause di morte anno 2008. http://www.istat.it/dati/dataset/20110412_00/ (accessed 30 May 2011).
8. Capocaccia R, Gavin A, Hakulinen T, Lutz JM, Sant M: Survival of cancer patients in Europe, 1995-2002: the EUROCARE-4 study. Eur J Cancer, 45: 901-908, 2009.
9. Associazione Italiana Registri Tumori (AIRTUM). http://www.registri-tumori.it (accessed 8 March 2013).
10. Grande E, Inghelmann R, Francisci S, Verdecchia A, Micheli A, Baili P, Capocaccia R, De Angelis R: Regional estimates of all cancer malignancies in Italy. Tumori, 93: 345-351, 2007.
11. Verdecchia A, Capocaccia R, Egidi V, Golini A: A method for the estimation of chronic disease morbidity and trends from mortality data. Stat Med, 8: 201-206, 1989.
12. De Angelis G, De Angelis R, Frova L, Verdecchia A: MIAMOD: a computer package to estimate chronic disease morbidity using mortality and survival data. Comput Methods Programs Biomed, 44: 99-107, 1994.
13. Verdecchia A, De Angelis R, Francisci S, Grande E: Methodology estimation of cancer incidence, survival and prevalence in Italian regions. Tumori, 93: 337-344, 2007.
14. World Health Organization: International classification of diseases, 9th ed, WHO, Geneva, 1997.
15. Capocaccia R, Martina L, Inghelmann R, Crocetti E, De Lisi V, Falcini F, Guzzinati S, Rosso S, Tagliabue G, Tumino R, Vercelli M, Zanetti R, De Angelis R: A method to estimate mortality trends when death certificates are imprecisely coded: an application to cervical cancer in Italy. Int J Cancer, 124: 1200-1205, 2009.
16. De Angelis R, Rossi S, Martina L, Meduri C, Galati F, Capocaccia R: Stime di incidenza e mortalità per cervico-carcinoma in Italia. In: La prevenzione dell'infezione da papilloma virus umano in Italia. Atti del Workshop "La prevenzione dell'infezione da papilloma virus umano in Italia". Istituto Superiore di Sanità, Rome, 28 September 2009. Rapporti ISTISAN, 10/25: 4-11, 2009.
17. Verdecchia A, De Angelis G, Capocaccia R: Estimation and projections of cancer prevalence from cancer registry data. Stat Med, 21: 3511-3526, 2002.
18. Gandini S, Botteri E, Iodice S, Boniol M, Lowenfels AB, Maisonneuve P, Boyle P: Tobacco smoking and cancer: a meta-analysis. Int J Cancer: 122, 155-164, 2008.
19. European Health For All Database (HFA-DB). World Health Organization, Regional Office for Europe, 2005.
20. ISTAT: Indagine Multiscopo ISTAT – Aspetti di vita quotidiana 2009. ISTAT, Rome, 2011.
21. Rapporto nazionale Passi 2009: Guadagnare salute. Abitudine al fumo. http://www.epicentro.iss.it/passi/rapporto2009/Fumo09.asp (accessed 8 March 2013).
22. Inghelmann R, Grande E, Francisci S, Verdecchia A, Micheli A, Baili P, Capocaccia R, De Angelis R: Regional estimates of lung cancer burden in Italy. Tumori, 93: 360-366, 2007.
23. AIRTUM working group: I tumori in Italia. Rapporto 2009. Epidemiol Prev, 33 (Suppl 1), 2009.
24. World Cancer Research Fund (WCRF) and the American Institute for Cancer Research (AICR): Food, nutrition, physical activity, and the prevention of cancer: a global perspective. AICR, Washington DC, 2007.
25. Rapporto Passi 2008, Provincia Autonoma di Trento, Assessorato alla Salute e politiche sociali. http://www.apss.tn.it (accessed 8 March 2013).
26. Rapporto Passi 2008, Provincia di Bolzano http://www.epicentro.iss.it/passi/pdf/AltoAdige_it07-08.pdf (accessed 8 March 2013).
27. Grande E, Inghelmann R, Francisci S, Verdecchia A, Micheli A, Baili P, Capocaccia R, De Angelis R: Regional estimates of colorectal cancer burden in Italy. Tumori, 93: 352-359, 2007.
28. Grande E, Inghelmann R, Francisci S, Verdecchia A, Micheli A, Baili P, Capocaccia R, De Angelis R: Regional estimates of breast cancer burden in Italy. Tumori, 93: 649, 2007.
29. Servizio Epidemiologia Clinica e Valutativa: Rapporto annuale sullo screening Pap test in provincia di Trento – Anno 2009. Trento, 2011. http://www.apss.tn.it (accessed 8 March 2013).
30. Servizio Epidemiologia Clinica e Valutativa: Rapporto annuale sullo screening mammografico in provincial di Trento – Anno 2010. Trento, 2012. http://www.apss.tn.it (accessed 8 March 2013).
31. Ministero della Salute, Direzione Generale della Prevenzione: Screening oncologici. Raccomandazioni per la pianificazione e l'esecuzione degli screening di popolazione per la prevenzione del cancro della mammella, del cancro della cervice uterina e del cancro del colon retto. Roma, 2006. http://www.ccm-network.it/documenti_Ccm/pubblicazioni/Screening_oncologici.pdf (accessed 8 March 2013).
32. Servizio Epidemiologia Clinica e Valutativa: Rapporto Annuale sullo screening colo-rettale in provincia di Trento – Anno 2010. Trento, 2011. http://www.apss.tn.it (accessed 8 March 2013).
33. Curado MP, Edwards B, Shin HR, Storm H, Ferlay J, Heanue M, Boyle P (Eds): Cancer incidence in five continents, Vol IX, IARC Scientific Publications No. 160, IARC, Lyon, 2007.
34. Crocetti E, Capocaccia R, Casella C, Ferretti S, Guzzinati S, Rosso S, Sacchettini C, Spitale A, Stracci F, Tumino R: Cancer trends in Italy: figures from the cancer registries (1986-1997). Epidemiol Prev, 28 (Suppl 2): 1-6, 2004.
35. Cristofolini M, Bianchi R, Boi S, DeCarli A, Micciolo R, Cristofolini P, Zumiani G: Effectiveness of the health campaign for the early diagnosis of cutaneous melanoma in Trentino, Italy. J Dermatol Surg Oncol, 19: 117-120, 1993.
36. Schrump DS, Giaccone G, Kelsey CR, Marks LB: Non-small cell lung cancer. In: Cancer: Principles and practice of oncology, 9th ed, DeVita VT, Lawrence TS, Rosenberg SA (Eds), pp 799-847, Lippincott Williams & Wilkins, Philadelphia, 2008.
37. Ferjani AM, Griffin D, Stallard N, Wong LS: Newly devised scoring system for prediction of mortality in patients with colorectal cancer: a prospective study. Lancet Oncol, 8: 317-322, 2007.
38. Degiuli M, Sasako M, Ponti A; Italian Gastric Cancer Study Group: Morbidity and mortality in the Italian Gastric Cancer Study Group randomized clinical trial of D1 versus D2 resection for gastric cancer. Br J Surg, 97 : 643-649, 2010.
39. Lowrance WT, Elkin EB, Jacks LM, Yee DS, Jang TL, Laudone VP, Guillonneau BD, Scardino PT, Eastham JA: Comparative effectiveness of surgical treatments for prostate cancer: a population-based analysis of postoperative outcomes. J Urol, 183: 1366-1372, 2010.

40. Berry DA, Cronin KA, Plevritis SK, Fryback DG, Clarke L, Zelen M, Mandelblatt JS, Yakovlev AY, Habbema JDF, Feuer EJ: Effect of screening and adjuvant therapy on mortality from breast cancer. N Engl J Med, 353: 1784-1792, 2005.
41. Mano MS, Duhoux F: Colon cancer: update on adjuvant therapy. Clin Colorectal Cancer, 7: 178-183, 2008.
42. Dobie SA, Warren JL, Matthews B, Schwartz D, Baldwin LM, Billingsley K: Survival benefits and trends in use of adjuvant therapy among elderly stage II and III rectal cancer patients in the general population. Cancer, 112: 789-799, 2008.
43. Provincia di Trento: Piano Provinciale di Prevenzione 2011-2012. Trento, 2011.
44. Ministero della Salute: Piano Nazionale della Prevenzione 2009-2011. http://www.salute.gov.it (accessed 8 March 2013).