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Time trends in avoidable cancer mortality in Switzerland and neighbouring European countries 1996–2010

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Summary

QUESTION UNDER STUDY: What are the trends in avoidable cancer mortality in Switzerland and neighbouring countries?

METHODS: Mortality data and population estimates 1996–2010 were obtained from the Swiss Federal Statistical Office for Switzerland and the World Health Organization Mortality Database (http://www.who.int/healthinfo/mortality_data/en/) for Austria, Germany, France and Italy. Age standardised mortality rates (ASMRs, European standard) per 100 000 person-years were calculated for the population <75 years old by sex for the following groups of cancer deaths: (1) avoidable through primary prevention; (2) avoidable through early detection and treatment; (3) avoidable through improved treatment and medical care; and (4) remaining cancer deaths. To assess time trends in ASMRs, estimated annual percentage changes (EAPCs) with 95% confidence intervals (95% CIs) were calculated.

RESULTS: In Switzerland and neighbouring countries cancer mortality in persons <75 years old continuously decreased 1996–2010. Avoidable cancer mortality decreased in all groups of avoidable cancer deaths in both sexes, with one exception. ASMRs for causes avoidable through primary prevention increased in females in all countries (in Switzerland from 16.2 to 20.3 per 100 000 person years, EAPC 2.0 [95% CI 1.4 to 2.6]). Compared with its neighbouring countries, Switzerland showed the lowest rates for all groups of avoidable cancer mortality in males 2008–2010.

CONCLUSION: Overall avoidable cancer mortality decreased, indicating achievements in cancer care and related health policies. However, increasing trends in avoidable cancer mortality through primary prevention for females suggest there is a need in Switzerland and its European neighbouring countries to improve primary prevention.

Key words: *avoidable cancer mortality; cancer mortality; Switzerland; Europe*

Introduction

Mortality data and indicators (e.g. cause-specific mortality, years of potential life lost) are widely used to assess the health of populations and the quality of medical care within a society. They are also one of the oldest forms of public health information available to health authorities. Rutstein and colleagues initially developed the concept of avoidable mortality in 1976 [1]. They published a list of conditions from which "disease, disability or death" should not occur if appropriate care is provided. The concept of avoidable mortality is based on the selection of causes of death considered to be amenable to medical care and/or health policies. It is used as an indicator of the effectiveness of the available healthcare services within a society. For inclusion, not every single death caused by a condition is considered "avoidable". Rather, it is essential that health services and/or health policies can contribute substantially to minimise mortality caused by the selected conditions. The first population-based study using this concept was carried out by Charlton et al. in 1983 to study regional variations in avoidable mortality in England and Wales [2]. Subsequently, the concept was widely used by various researchers to investigate time trends and/or geographical disparities within or between regions, countries or social groups [3, 4].

Cancer remains one of the leading causes of mortality in the developed world. In Switzerland, approximately 26% of all deaths are caused by cancer [5]. Age is a primary risk factor for cancer mortality, 67% of cancer deaths in Switzerland occur in persons 65 years and older [6]. With increasing longevity (i.e. average life expectancy 79.8 years in Swiss men and 84.4 years in Swiss women) cancer prevalence is expected to increase [7]. A Swiss study based on data from four Swiss cancer registries covering 7 out of 26 Swiss cantons estimated an increase in cancer prevalence from 289 797 cases in 2010 to 372 000 in 2020 [8]. Demand on the healthcare systems providing cancer care and cancer-related healthcare costs are projected to rise accordingly.

Measuring time trends in cancer morbidity and mortality is an important tool for cancer control focused on addressing the public health needs within a country. Societies need to monitor changes in populations at risk and evaluate outcomes as well as the effectiveness of their healthcare systems serving those populations. Given the public health importance of cancer in developed countries this study aimed to examine avoidable cancer mortality in Switzerland and neighbouring European countries. International comparisons of avoidable cancer mortality highlight country-specific achievements as well as opportunities for improvement in cancer care and/or health policies for cancer.

Methods

Data sources

Mortality data and mid-year population estimates for Switzerland were provided by the Swiss Federal Statistical Office (SFSO) covering the time period 1996 to 2010. Corresponding data for Austria, France, Germany and Italy were obtained from the World Health organization (WHO) Mortality Database (http://www.who.int/healthinfo/mortality_data/en/) providing mortality and population data compiled by the national health authorities [9]. Depending on country and year, the underlying cause of death information was coded according to the 9th (ICD-9) or 10th (ICD-10) version of the International Classification of Diseases (table 1). For Italy, no mortality data were available for 2004 and 2005. For France, population data were missing for 2010.

Definition of avoidable cancer mortality

The selection of causes of death considered as avoidable was based on the compilation of Simonato et al. [10]. For this study, the original Simonato et al. list was restricted to deaths caused by cancer. The list of Simonato et al. is based on the original list of Rutstein et al. [1]. Simonato et al. undertook a further differentiation of avoidable causes of death and classified cancer deaths as: (1) avoidable through primary prevention through exposure reduction (e.g. smoking and alcohol consumption); (2) avoidable through early detection and treatment (secondary prevention); (3) avoidable through improved treatment and medical care (tertiary prevention); and (4) remaining cancer deaths. The adaptions of Simonato et al. enabled the distinct investigation of avoidable mortality by intervention level followed by various researchers [11–13]. Because of the rising evidence of mortality benefits of screening for colorectal cancer, we included deaths caused by colorectal cancer as avoidable through secondary prevention [14–18]. Specificity of cause of death and the extent of "avoidability" decreases with age. Thus we restricted cancer deaths to those occurring in persons less than 75 years old as suggested by Nolte and McKee [4]. We classified all cancer deaths according to the categories presented in table 2.

Analytic methods

Annual and 3-year age-standardised mortality rates (ASMRs, European standard) per 100 000 person-years (PY) and corresponding 95% confidence intervals (95% CIs) were calculated for the population aged less than 75 years by country, sex and group of avoidable cancer death [19]. To analyse time trends in ASMRs, estimated annual percentage changes (EAPC) were calculated using the natural log of ASMRs as target variable and the year of death as predictor.

Results

ASMRs for avoidable cancer mortality and the remaining cancer deaths by sex and country are presented in figure 1. The corresponding EAPCs are listed in table 3. Cause-specific ASMRs and corresponding EAPCs for avoidable cancer mortality in Switzerland are listed in table 4.

Levels of avoidable cancer mortality in Switzerland and neighbouring countries

Overall, cancer mortality in persons younger than 75 years decreased continuously between 1996 and 2010 in all countries under investigation. Comparing the time-periods 1996–1998 and 2008–2010, avoidable cancer mortality decreased by all groups of avoidable cancer mortality and sex, with one exception. ASMRs for causes avoidable

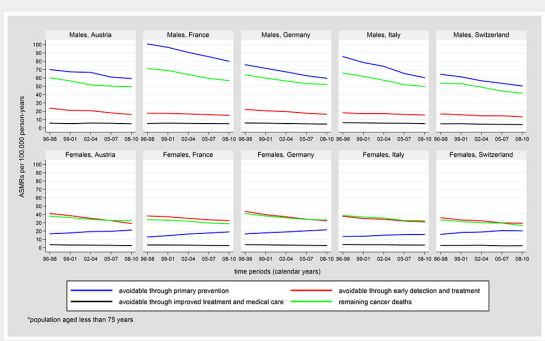

Figure 1

Time trends in avoidable cancer mortality and remaining cancer deaths (age-standardised mortality rate [ASMR], European standard) by country and sex, time period 1996–2010.
Note: For Italy, data are lacking for 2004 and 2005. For France, data are lacking for 2010.

Table 1: Cause of death coding (ICD-version) by country and time period.

Country	ICD-9	ICD-10
Austria	1996–2001	2002–2010
France*	1996–1999	2000–2009
Germany	1996–1997	1998–2010
Italy†	1996–2002	2003, 2006–2009
Switzerland	–	1996–2010

ICD = International Classification of Diseases 9th or 10th version
* For France, data are lacking for 2010.
† For Italy, data are lacking for 2004 and 2005.

through primary prevention increased in females in all countries reported. The highest increase was observed in females in France with an EAPC of 3.3 (95% CI 3.0 to 3.7). Switzerland had the lowest rates of avoidable cancer mortality for causes avoidable through primary prevention in males (64.3 per 100 000 PY in 1996–1998, 50.4 per 100 000 PY in 2008–2010). Corresponding figures for females, (16.2 per 100 000 PY in 1996–1998 and 20.3 per 100 000 PY in 2008–2010), were midrange compared with neighbouring countries. For causes avoidable through early detection and treatment, Switzerland had comparably low ASMRs (males 13.0 per 100 000 PY, females 29.2 per 100 000 PY, 2008–2010) with an EAPC of –1.7 (95% CI –2.4 to –1.1) in males and –1.7 (95% CI –2.1 to –1.4) in females. Compared with neighbouring European countries, mortality for causes avoidable through improved treatment and care were lowest in Switzerland. In 2008–2010, 4.1 deaths per 100 000 PY (EAPC –1.9, 95% CI –3.0 to –0.7) for causes avoidable through improved treatment and care were observed in males and 2.4 per 100 000 PY (EAPC –1.9, 95% CI –3.6 to −0.3) in females.

Cause-specific avoidable cancer mortality in Switzerland

Shifts in cancer mortality avoidable through primary prevention have been mainly driven by increasing numbers of deaths caused by cancer of the lung, bronchus and trachea. In males, mortality from cancer of the lung, bronchus and trachea decreased from 40.7 per 100 000 PY in 1996–1998 to 29.7 in 2008–2010 (EAPC –2.6, 95% CI –3.0 to –2.1). For the same time periods, an increase from 10.8 to 14.8 per 100 000 PY was observed in females with an EAPC of 2.7 (95% CI 2.1 to 3.3). Cancer-specific mortality rates with cancers avoidable through early detection and treatment decreased in both sexes. In females, EAPCs varied between –0.6 (95 % CI –1.9 to 0.7) for skin cancer and –3.6 (95% CI –5.0 to –0.5) for cervical cancer. In males, EAPCs ranged from –1.0 (95% CI –2.6 to 0.6) for skin cancer to –1.9 (95% CI –2.6 to –1.2) for colorectal cancer. In the group of cancer mortality avoidable through improved treatment and medical care, significant changes in mortality rates were observed only for leukaemia (EAPC –1.7, 95% CI –2.9 to –0.5 males; –2.1, 95% CI –3.7 to –0.4 females). The highest, albeit not significant, decrease was found for testicular cancer (EAPC –4.7, 95% CI –1.0 to 0.6). The most common cause of avoidable cancer mortality in females during 2008–2010 was breast cancer, with an ASMR of 18.1 per 100 000 PY, followed by cancer of the lung, bronchus and trachea (14.8 per 100 000 PY) and colorectal cancer (6.5 per 100 000 PY). In men, cancer of the lung, bronchus and trachea (29.7 per 100 000 PY), cancer of the upper airways and digestive tract (10.7 per 100 000 PY) and colorectal cancer (10.6 per 100 000 PY) were the leading causes of avoidable cancer mortality.

Discussion

In this paper, mortality and population data from the SFSO and the WHO mortality database were used to describe levels and trends in avoidable cancer mortality 1996–2010 for Switzerland and its neighbouring European countries. We split avoidable cancer mortality into three literature-based groups of intervention levels as proxy measures for the effectiveness of healthcare and health policies in the countries under investigation [10, 12].

Cancer mortality avoidable through primary prevention

In Switzerland, the group of cancer deaths avoidable through primary prevention represented almost half of all cancer deaths in males and nearly one-quarter in females. Despite an overall decreasing trend in avoidable cancer mortality in both sexes, cancer mortality avoidable through primary prevention increased substantially in the female population consistently across all countries.

The majority of cancer deaths avoidable through primary prevention in Switzerland were from cancers (lung, bronchus, trachea, upper airways, digestive tract) highly related to tobacco exposure. In 2004, the WHO estimated that approximately one-quarter of Western European cancer deaths, (Austria 23%, France 27%, Germany 25%, Italy 27%, Switzerland 23%) were attributable to tobacco exposure [20]. Crude cancer death rates in the male population aged ≥30 years were highest in France (213 per 100 000 PY) and lowest in Switzerland (122 per 100 000 PY). In fe-

Table 2: Categorisation of avoidable cancer mortality (adapted from Simonato et al. [10]).

Causes of death	ICD-9	ICD-10
1. Causes avoidable through primary prevention		
Cancer of upper airways and digestive tract	140–150, 161	C00–C15, C32
Liver cancer	1 550	C22
Cancer of lung, bronchus and trachea	162	C33, C34
Bladder cancer	188	C67
2. Causes avoidable through early detection and treatment		
Skin cancer (melanoma and non-melanoma)	172, 173	C43, C44
Female breast cancer	174	C50
Cervical cancer	180	C53
Uterine cancer	179, 182	C54, C55
Colorectal cancer	153–154	C18–C21
3. Causes avoidable through improved treatment and medical care		
Testicular cancer	186	C62
Hodgkin's disease	201	C81
Leukaemia	204–208	C91–C95
ICD = International Classification of Diseases, 9th or 10th version		

males, the highest rates were in Germany (39 per 100 000 PY) [20].

In Western Europe, tobacco consumption peaked through the 1960s and 1970s with high proportions of male smokers (50% and more). The 1980s and 1990s showed a downturn in total tobacco consumption, driven by decreasing proportions of male smokers [21, 22]. While smoking prevalence in males levelled off and/or dropped the proportions of

Table 3: Age-standardised mortality rates per 100 000 person-years (European standard) for time periods 1996–1998 and 2008–2010 and estimated annual percentage changes 1996–2010 by country, sex and group of avoidable cancer deaths.

Groups of avoidable cancer deaths and remaining cancer deaths by country	Males*				Females*			
	ASMR		EAPC	95% confidence limits	ASMR		EAPC	95% confidence limits
	1996–1998	2008–2010			1996–1998	2008–2010		
Austria								
Primary prevention	70.0	59.3	−1.4	(−1.7, −1.2)	16.7	21.3	1.9	(1.6, 2.3)
Early detection/treatment	23.7	16.2	−3.1	(−3.7, −2.6)	41.1	29.2	−2.8	(−3.2, −2.5)
Improved treatment/care	5.7	4.8	−0.8	(−1.9, 0.2)	3.6	2.6	−2.5	(−3.9, −1.1)
Remaining cancer deaths	60.1	49.3	−1.7	(−2.1, −1.3)	37.8	32.7	−1.3	(−1.7, −0.8)
France†								
Primary prevention	100.8	80.0	−2.0	(−2.2, −1.8)	12.9	19.0	3.3	(3.0, 3.7)
Early detection/treatment	17.6	15.2	−1.4	(−1.6, −1.0)	38.2	32.6	−1.5	(−1.7, −1.2)
Improved treatment/care	5.4	5.0	−0.8	(−1.4, −0.2)	3.4	2.7	−2.1	(−2.4, −1.7)
Remaining cancer deaths	71.3	56.7	−2.1	(−2.4, −1.8)	33.7	28.8	−1.4	(−1.7, −1.2)
Germany								
Primary prevention	75.8	59.6	−2.0	(−2.1, −1.9)	16.6	21.6	2.2	(2.0, 2.3)
Early detection/treatment	22.2	16.3	−2.6	(−2.8, −2.3)	43.6	32.4	−2.5	(−2.7, −2.3)
Improved treatment/care	5.9	4.6	−2.3	(−2.7, −1.8)	3.7	2.7	−2.6	(−2.9, −2.4)
Remaining cancer deaths	63.7	52.1	−1.7	(−2.0, −1.5)	41.1	33.4	−1.8	(−2.0, −1.6)
Italy‡								
Primary prevention	85.6	60.3	−2.9	(−3.1, −2.7)	13.6	16.0	1.5	(1.1, 1.9)
Early detection/treatment	18.1	15.4	−1.3	(−1.4, −1.1)	37.9	31.1	−1.6	(−1.8, −1.4)
Improved treatment/care	6.3	5.2	−1.4	(−1.8, −1.0)	3.8	3.1	−1.6	(−2.0, −1.3)
Remaining cancer deaths	65.8	49.7	−2.4	(−2.6, −2.1)	38.8	32.5	−1.5	(−1.8, −1.3)
Switzerland								
Primary prevention	64.3	50.4	−2.0	(−2.4, −1.7)	16.2	20.3	2.0	(1.4, 2.6)
Early detection/treatment	16.3	13.0	−1.7	(−2.4, −1.1)	35.9	29.2	−1.7	(−2.1, −1.4)
Improved treatment/care	4.9	4.1	−1.9	(−3.0, −0.7)	2.8	2.4	−1.9	(−3.6, −0.3)
Remaining cancer deaths	54.2	42.2	−2.2	(−2.6, −1.8)	33.8	27.1	−1.7	(−2.1, −1.2)

ASMR = age-standardised mortality rate; EAPC = estimated annual percentage change

* Population aged less than 75 years.

† No data available for 2010.

‡ No data available for 2004 and 2005.

Table 4: Swiss cancer-specific age-standardised mortality rates per 100 000 person-years (European standard) for time periods 1996–1998 and 2008–2010 with estimated annual percentage changes 1996–2010 by sex and group of avoidable cancer deaths.

Groups of avoidable cancer deaths by cancer site	Males*				Females*			
	ASMR		EAPC	95% confidence limits	ASMR		EAPC	95% confidence limits
	1996–1998	2008–2010			1996–1998	2008–2010		
1. Primary prevention								
Cancer of upper airways and digestive tract	13.5	10.7	−2.0	(−2.6, −1.4)	2.5	2.6	0.3	(−1.2, −1.8)
Liver cancer	6.4	7.0	0.7	(0.1, 1.5)	1.7	1.8	1.2	(−0.5, 2.8)
Cancer of lung, bronchus and trachea	40.7	29.7	−2.6	(−3.0, −2.1)	10.8	14.8	2.7	(2.1, 3.3)
Bladder cancer	3.7	3.0	−2.2	(−3.6, −0.8)	1.2	1.0	−0.7	(−2.7, 1.3)
2. Early detection/treatment								
Skin cancer	3.0	2.4	−1.0	(−2.6, 0.6)	1.7	1.6	−0.6	(−1.9, 0.7)
Female breast cancer	–	–	–	–	22.5	18.1	−1.8	(−2.4, −1.3)
Cervical cancer	–	–	–	–	1.8	1.1	−3.6	(−5.0, −2.1)
Uterine cancer	–	–	–	–	2.2	2.0	−1.3	(−2.3, −0.4)
Colorectal cancer	13.3	10.6	−1.9	(−2.6, −1, 2)	7.7	6.5	−1.5	(−2.3, −0.6)
3. Improved treatment/care								
Testicular cancer	0.3	0.2	−4.7	(−1.0, 0.6)	–	–	–	–
Hodgkin's disease	0.3	0.3	−0.7	(−5.0, 3.5)	0.2	0.3	−0.2	(−5.5, 5.0)
Leukaemia	4.2	3.5	−1.7	(−2.9, −0.5)	2.6	2.1	−2.1	(−3.7, −0.4)

ASMR = age-standardised mortality rate; EAPC = estimated annual percentage change

* Population aged less than 75 years.

female smokers increased [23]. Despite this fact, the overall smoking prevalence in Switzerland and its neighbouring European countries was consistently higher in males than females [21]. The Swiss health survey found that smoking prevalence in males was higher in 1992 than 2012 but stable in females [24]. In 2012, nearly one-third of Swiss males and one-quarter of Swiss females were self-reported current smokers [24]. The prevalence of female smokers decreased slightly in Germany (since 2000) and Italy (since 1990) after increasing for decades [25, 26]. For Austrian and French females, there is evidence of a continuous rise in smoking prevalence until at least 2007 [22, 27]. Increasing trends in female smoking prevalence, reported in the second half of the last century, are reflected in our results, which show a substantial rise in tobacco-related cancer deaths. Looking at more recent data, the Organisation for Economic Co-operation and Development (OECD) reported substantial declines in female smoking proportions between 2000 and 2011 for most of its member states (with the exception of Czech Republic, France and Italy where no or modest declines were observed) [28]. However, given the long latency period for tobacco-related cancers, future increases in female cancer mortality avoidable through primary prevention are foreseen.

Cause-specific analyses of avoidable cancer deaths in Switzerland revealed an increase in liver cancer mortality in both sexes. Results were not significant in females, absolute changes in rates were comparably low, and the observed rise contributed little to the overall trend of cancer deaths avoidable through primary prevention. Nonetheless, the finding should stimulate public health awareness and emphasises the need for further investigation.

Cancer mortality avoidable through early detection and treatment

In all countries under investigation, cancer mortality avoidable through early detection and treatment decreased in both sexes. Women showed substantially lower ASMRs for overall cancer mortality than men, but higher rates for cancer mortality avoidable through early detection and treatment. This result can be explained by taking a closer look at the distinct conditions classified as avoidable through early detection and treatment and the individual rates of these conditions. Three out of five conditions classified as avoidable through early detection and treatment are specific for females, such as female breast cancer, the leading cause of cancer mortality in women. In 2008–2010, Switzerland and its neighbouring European countries had comparable levels of female cancer mortality classified as avoidable through early detection and treatment. In the same period, there was slightly more variation in cancer mortality rate avoidable through early detection and treatment in males, with the lowest levels in Switzerland.

In 2003, the council of the European Union (EU) published EU screening guidelines and called upon the member states to implement effective screening programmes for breast, colorectal and cervical cancers. In 2007, the EU Commission reported on the status of screening implementation [29]. Of the European countries neighbouring Switzerland, only Italy had started or planned the introduction of nationwide, population-based screening programmes for all three recommended cancer sites. In Switzerland, healthcare is organised at the cantonal level, leading to substantial regional differences in the provision of primary preventive services [30]. Up to the end of the study period, organised cancer screening programmes had been implemented only for breast cancer and mainly in the Western part of the country [31–33]. Organised screening programmes are more likely to reduce mortality and achieve high coverage in the target population compared with opportunistic screening [34]. Nonetheless, organised programmes with inadequate resources or insufficient infrastructure may perform more poorly than opportunistic screening options, emphasising the need for programme evaluation [34]. Our findings of decreased cancer mortality avoidable by early detection and treatment suggest improvements in the quality of screening activities and/or population coverage in the countries studied herein.

Cancer mortality avoidable through improved treatment and medical care

Cancer mortality avoidable through improved treatment and medical care declined in both sexes and all countries under investigation. Compared with its neighbouring countries, Switzerland had slightly lower ASMRs for causes avoidable through improved treatment and medical care. However, cancer mortality avoidable through improved treatment and medical care represented only 3–4% of all cancer deaths in both sexes. Therefore, these decreases contributed minimally to the overall decrease of avoidable cancer mortality, despite EAPCs comparable with cancer mortality avoidable through early detection and treatment.

For most cancer sites, there is little basis suggesting striking mortality benefits at the population level due to advances in cancer treatments [35, 36]. There are, however, a few cancer types for which substantial improvements in treatments have been achieved over the last decades. For these cancers (e.g. testicular, Hodgkin's) a reduction in mortality has been observed independent of changes in incidence [35]. Testicular cancer has become a curable disease primarily owing to the development of more effective chemotherapy regimens [35, 37]. Although advanced treatment for testicular cancer has been available since 1970, declines in mortality have been greater in the USA than the EU and substantial mortality differences have been observed between European countries [38–40]. For Hodgkin's disease, effective treatment has been available for several decades [41]. Improvements in Hodgkin's treatments have been driven by enhancements in diagnostic methods, technical advancements in radiotherapy and the introduction of new chemotherapy regimens [41, 42]. Furthermore, there is evidence that high cure rates for Hodgkin's disease can be achieved even for advanced stage disease if treated appropriately [42]. Consequently, mortality from Hodgkin's disease has dropped substantially in Western European countries since the early 1970s. However, differences between regions and countries suggest there is room for further improvements in the implementation of available therapies [35, 43–45]. For leukaemia, favourable mortality trends have been observed in several European countries since 1970, initiated by introduction of multidrug chemotherapy and/or improved radio-

therapy [46]. However, leukaemia includes a heterogeneous group of diseases with varying treatment options and prognoses [35]. Substantial treatment-related mortality reductions were found mainly in children, and young and middle-aged adults [35, 46]. We observed moderate decreases in EAPCs for cancer deaths avoidable through improved treatment and medical care in all countries under investigation. Our study period (1996–2010) was relatively late compared with the availability of the advanced treatment options mentioned above. The effect of the introduction of these types of treatment improvements were not seen in our results most likely because they had already become the accepted clinical standard prior to the study period.

Strengths and limitations

The study is the first population-based investigation in Switzerland and neighbouring European countries to examine the effectiveness of medical care by intervention level (primary, secondary and tertiary prevention) using avoidable cancer mortality as quality indicator. The concept of avoidable mortality has been widely used internationally to estimate the effectiveness of healthcare using official mortality data readily available for almost all developed countries.

There are some limitations to this research study worth mentioning. Particularly, cross-national differences and/or changes over time in death certification and coding practices may have influenced the results. For example, France changed in 2000 from ICD-9 to ICD-10 for cause-of-death coding and replaced manual coding of deaths with a new automated system. Meslé and Vallin investigated the impact of these changes and detected discontinuities even at the crude levels (i.e., ICD primary categories) [47]. However, we did not detect any suspicious breaks in time trends for the cancer groups under investigation. Despite this fact, effects from coding-related differences between countries and across time periods cannot be completely ruled out.

We investigated a relatively short time period of 15 years using 1996 as starting point. In Switzerland, the definition of the underlying cause of death deviated from international standards up to 1995. In brief, cancer was given priority as underlying cause of death if the word “tumour” was mentioned anywhere on a death certificate. This resulted in higher cancer mortality rates prior to 1995 [48, 49]. As a result, the investigation of long-term trends (i.e. covering several decades) was not feasible within this study.

Further, every list of causes of death considered as avoidable is – at least to some extent – dependent on the view of the respective researcher(s) who developed it. Since the introduction of the concept in 1976, competing approaches have led to varying lists of single conditions and groups of conditions defined as avoidable. In this study, we used an adapted version of the list of Simonato et al., because it was intended to measure the effectiveness of cancer treatment as well as the impact of primary, secondary and tertiary prevention policies related to cancer [10]. However, there are certain overlaps between the mortality categories assigned to each condition. For example, Tobias and Jackson [13] assumed that in New Zealand (1981–1997) 15% of avoidable female breast cancer deaths are avoidable through primary prevention, 35% through secondary prevention and 50% through tertiary prevention.

Another point of criticism regarding the concept of avoidable mortality is the one-dimensional focus on mortality as a measure of the quality of healthcare [4]. It is widely accepted that to accurately measure the quality of medical care it should be assessed in three dimensions: (1) structures, (2) processes and (3) outcomes [50–52]. Although a very important one, mortality is just one potential outcome of interest. Hence, interpretation of these results is limited since individual indicators, like mortality, cannot alone capture the effectiveness of healthcare services.

Conclusion

Overall, these results suggest comparable trends in avoidable cancer mortality for Switzerland and its neighbouring European countries. Avoidable cancer mortality has decreased in both sexes and all countries reported. However, cancer mortality avoidable through primary prevention increased substantially in females in all countries under investigation, indicating that there is a need to increase gender-specific primary prevention (e.g. anti-smoking campaigns targeting females). Despite this trend, cancer deaths avoidable through primary prevention were much less common in females than in males, indicating to support primary prevention for both sexes in the near future.

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Figures (large format)

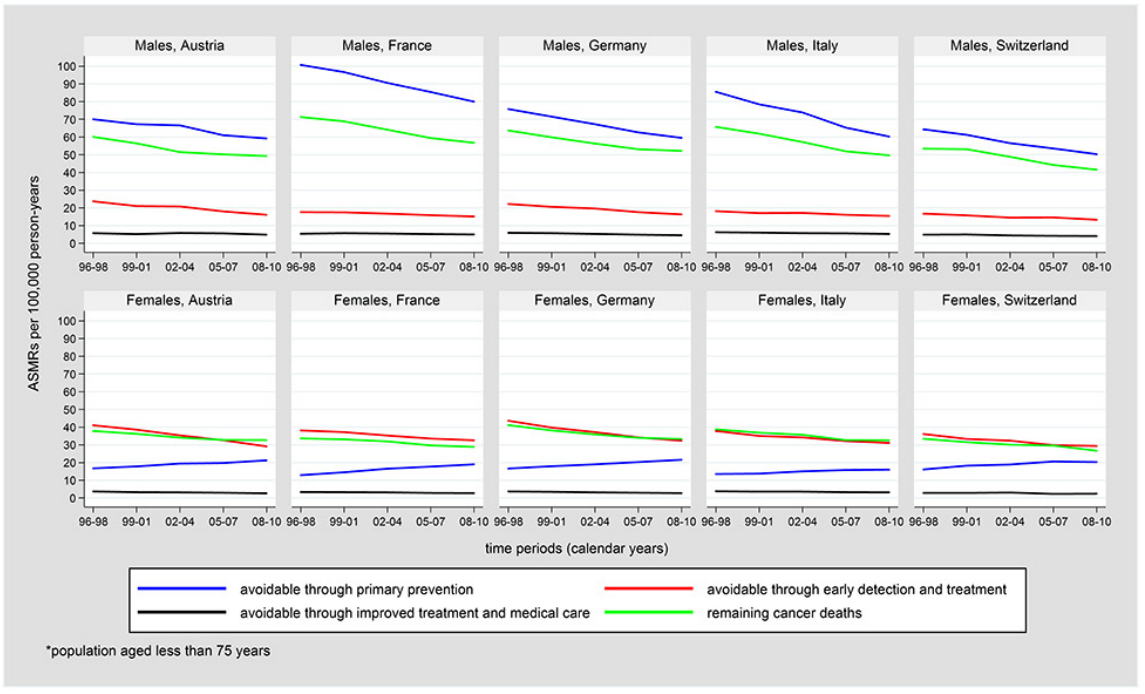

Figure 1

Time trends in avoidable cancer mortality and remaining cancer deaths (age-standardised mortality rate [ASMR], European standard) by country and sex, time period 1996–2010.

Note: For Italy, data are lacking for 2004 and 2005. For France, data are lacking for 2010.