

Recent trends in incidence and mortality of oral and pharyngeal cancer in Schleswig-Holstein in Northern Germany

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Objective: Oral and pharyngeal cancer is still a serious public health problem with more than 10,000 new cases every year in Germany, more than 4,000 patients die of this tumour each year. Aim of the project was a detailed analysis on incidence and mortality rates by age, gender and tumour sites in Northern Germany. **Methods:** The data on incidence and mortality rates from the population-based Cancer Registry of Schleswig-Holstein in Northern Germany were evaluated by age, gender and tumour sites from 2000 to 2006. **Results:** Some 3,127 new cases of oral and pharyngeal cancer (72% men, 28% women) were registered. About half of all cases were aged 60-79 years. The incidence trends for 40-59 years described a slight decrease. Trends for pharyngeal cancer showed the highest incidence rates for both genders in those aged 60-79. This detailed analysis with subgroups showed interesting differences and revealed considerable variations, especially compared to the increasing trends in several European countries. **Conclusions:** These population-based data of Schleswig-Holstein showed interesting differences in the trends for incidence and mortality rates for age groups and tumour sites within the state and compared to the national German data and revealed noticeable different trends compared to several European countries. This population-based information informs effective cancer control.

Key words: oral cancer; pharyngeal cancer; salivary glands; cancer registry; epidemiology; incidence; mortality

Introduction

Oral and pharyngeal cancer is still a serious public health problem. In 2004, 67,000 new cases were registered in the European Union (EU). Compared to all malignant tumours, oral and pharyngeal cancer occupied the 7th position (Boyle and Ferlay, 2005). In Germany, more than 10,000 individuals are diagnosed annually with oral and pharyngeal cancer and more than 4,000 die of this tumour each year. This malignant tumour is listed in 7th place in men (3.5%) and 16th place in women (1.5%). The 5-year survival rate for all oral and pharyngeal cancers at 47% for men and 55% for women is still as low as the survival rate for the tumours of stomach and colon (Robert Koch Institut, 2010). The best outcome was reported for the cancer of the lips and the worst for the hypopharynx.

Population-based publications about trends in incidence and mortality of oral and pharyngeal cancer mostly focused on a group evaluation. Therefore, little is known about the temporary development of the different tumour sites with regard to gender and age (Robertson *et al.*, 2010). Studies in the USA and Europe have observed an increased trend in oral cancer incidence over the years (Conway *et al.*, 2006; Ferlay *et al.*, 2004; Johnson and Warnakulasuriya, 1993; Ramqvist and Dalianis, 2010). Warnakulasuriya (2009) reported intermediate rates for Germany compared to other countries in Europe, such as Spain, Portugal and Switzerland. Lower rates were observed in Greece, Finland and Sweden (Warnakulas-

uriya, 2009). Mackenzie *et al.* (2000) described increasing trends of incidence and mortality rates for specific groups, e.g. for young adults (Mackenzie *et al.*, 2000). Conway *et al.* (2006) showed these trends for both younger and older adults (Conway *et al.*, 2006). With regard to gender, Warnakulasuriya (2009) described rising trends for men in France and Curado and Hashibe (2009) observed this trend for women in all Nordic countries (Curado and Hashibe, 2009; Warnakulasuriya, 2009). For different European countries a wide variability was described, including differences among areas within the same state (La Vecchia *et al.*, 1997; Warnakulasuriya, 2010). Conway *et al.* (2006) and Junor *et al.* (2010) showed obvious variations and trends within a country using the example for UK (Conway *et al.*, 2006; Junor *et al.*, 2010).

In Germany, these data are evaluated by the cancer registries organised usually at Federal State level. The Cancer Registry in Schleswig-Holstein in Northern Germany is able to provide excellent data quality and has been used for national and also international comparison. Therefore, these specific data of a federal state or a country, based on the population-based estimates of the cancer registries, are essential and should be used as a reasonable complement for the evaluation of the disease burden (de Camargo Cancela *et al.*, 2010).

It was the aim of this study to evaluate the changes in the descriptive epidemiology of oral and pharyngeal cancer regarding incidence and mortality rates, with an

emphasis on differences by gender, age groups and the categorization of different tumour sites over the period from 2000 to 2006 of Schleswig-Holstein in Northern Germany. It also aimed to compare these data with German national and European data.

Material and methods

Since 1998 all newly diagnosed tumour cases in the population of Schleswig-Holstein in Northern Germany (approx. 2.8 million inhabitants, Reference: Federal Statistical Office, Germany) have been registered state-wide in accordance with the mandatory notification required by federal state law. Death certificates issued by the health centres were added to the data records of the cancer registry.

The tumour diagnoses are encoded by the International Statistical Classification of Diseases and Related Health Problems: C00-C06 oral cancer, salivary glands C07-C08, pharyngeal cancer C09-C13 (ICD-Code, 10th revision), the classification, histology and tumour sites by the International Classification of Diseases for Oncology (ICD-O, 3rd edition).

The data of the population of Schleswig-Holstein in Northern Germany and the mortality rates were evaluated by the Statistical Office of the federal states of Schleswig-Holstein and Hamburg. The incidence and mortality rates were age-adjusted using the Europe Standard Population rate (Europe-standardised ASR[E]) per 100,000 persons (Robert Koch Institut, 2010). The age-specific incidence and mortality rates (0-39, 40-59, 60-79 and over 79 years) were calculated for each year of the period 2000 to 2006. The results of Schleswig-Holstein were compared to the results of the state of Saarland. This Cancer Registry is the only German one with more than 40 years continuous documentation of the required quality so is used as the German reference

(Robert Koch Institut, 2010). In 2004, two additional and in 2006 two more registries reached the required data quality and completeness so that since then these data have been used together with the Saarland's data as the German reference for international comparison. However, as our results described a period from 2000 to 2006, the Cancer Registry recommended using the Saarland reference for the described period; to ensure a single reference data set covers the whole period.

The study was approved by the Ethics Committee of the University of Kiel, Germany (AZ: A 113/06)

Results

From 2000-2006 3,127 new cases of oral and pharyngeal cancer (72 % in men vs. 28% in women) were registered within the state of Schleswig-Holstein. Table 1 gives an overview of the epidemiological results for all tumour sites. The mean-age by diagnosis for 2006 was 63 years for men and 61 for women. About half the cases for both men and women were aged 60-79. More than 80% of tumours were diagnosed as squamous cell carcinoma.

Figure 1 shows the age-standardised rates over time (ASR [E]) for incidence and mortality for all oral and pharyngeal cancer (C00-C14) in men and women of Schleswig-Holstein and the internationally accepted reference data for Germany, Saarland (Robert Koch Institut, 2010). Neither incidence nor mortality plots display a clear improvement or decline for Schleswig-Holstein from 2000 to 2006. However, analysis of subgroups for the different tumour sites, genders and age groups reveals differences in the trends and distributions.

Trends for oral cancer (C00-C06): The incidence trends for the 40-59 year olds showed a slight decrease for both men and women and a slight increase in the mortality rate for men. The incidence and mortality rates for oral cancer fluctuated greatly for those aged 60 or over

Table 1. Descriptive results for oral-pharyngeal cancer 2000-2006 in Schleswig-Holstein, Germany

	Incidence		Mortality	
	Men	Women	Men	Woman
Number of cases	2,246	881	807	277
Crude percentage rate	23.3	8.8	8.4	2.8
Age-standardised rates (Europe ASR[E]) ^a	19.5	6.5	7.0	1.8
Mean Age for 2007	63	60	65	67
<i>Location (ICD-0)^b</i>				
Oral cancer (C00-C06)	1,119	492	376	139
Salivary glands (C07/08)	134	101	44	42
Pharyngeal cancer (C09-C13)	940	271	339	78
Others (C14)	53	17	36	18
<i>Histology^b (%)</i>				
Squamous cell carcinoma	91.4	82.7	-	-
Adenocarcinoma	4.0	11.4	-	-
Sarcoma and other tumours of the soft tissue	0.2	0.6	-	-
Other tumours	4.4	5.3	-	-

^a Age-standardised rates (Europe ASR[E])

^b International Classification of Diseases in Oncology, 3rd edition

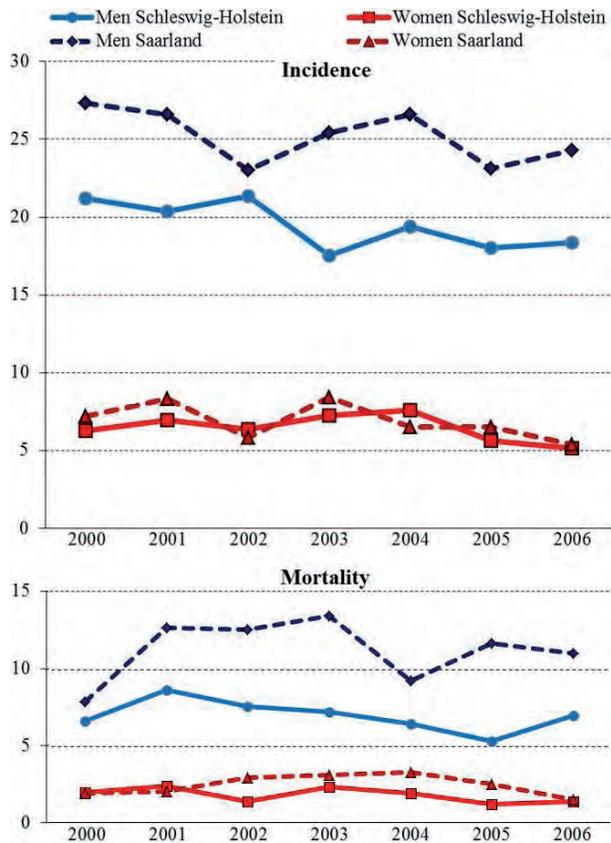


Figure 1. Incidence and mortality rates per 100,000 (ASR [E]) for oral and pharyngeal cancer (C00-C14) in men and women from 2000 to 2006 in Schleswig-Holstein and the Saarland

of either gender, with a particularly remarkable peak for the mortality rate in men - up to 55 per 100,000 in 2001.

The highest mortality rates were for men and women aged over 79 and this also applied for the incidence rates for women, followed by the 60-79 year olds. Only the incidence rates for men showed the highest number of cases in the age groups 60 and over (Figure 2).

Trends for tumours of the salivary glands (C07-C08): The rate for men aged over 79 showed a high peak in 2001 and subsequent decrease up to 2005 for both incidence and mortality rates. The trends for women in this age group also showed a slight decrease. Over the same period, there was a small increase in the incidence in men aged 60-79. The highest incidence and mortality rates for both genders were found in those aged over 79 (Figure 3), with a remarkable 2001 peak on both incidence and mortality plots for men.

Trends for pharyngeal cancer (C09-C13): This tumour showed a strong fluctuation in the incidence and mortality rates in men aged 60 or older. There was a minor decrease in the incidence trend in men aged 40-59, but a slight increase in the mortality rate. The highest male incidence and mortality rates were found in the 60-79 year olds, followed by the incidence rates for the 40-59 year olds. The incidence rates for this tumour were also highest in women aged 60-79, again with a slightly increasing trend. However, the highest mortality rates for women were for the over 79s (Figure 4).

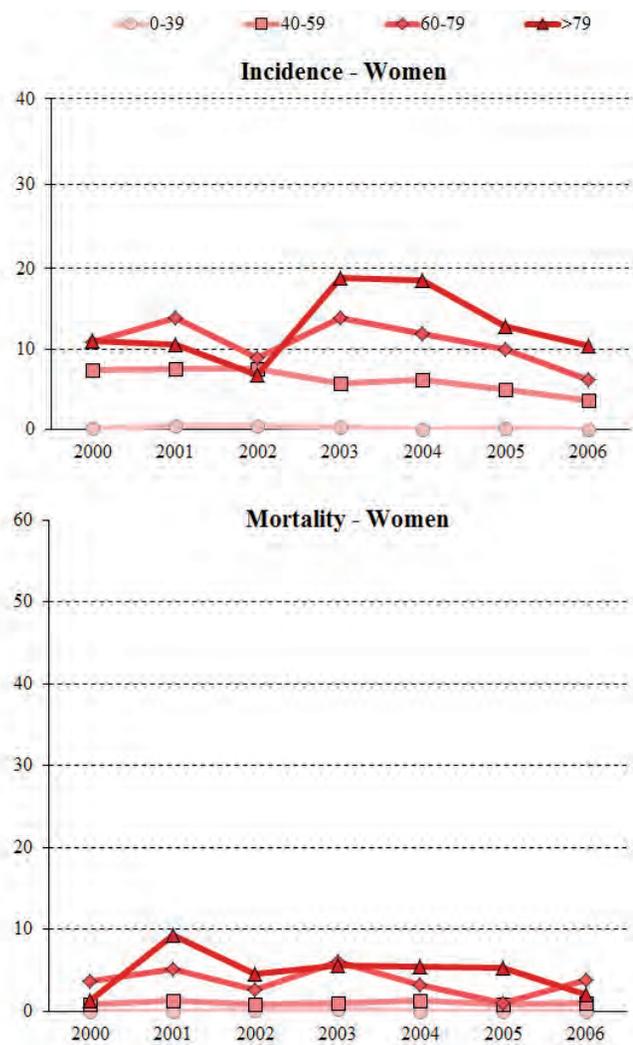
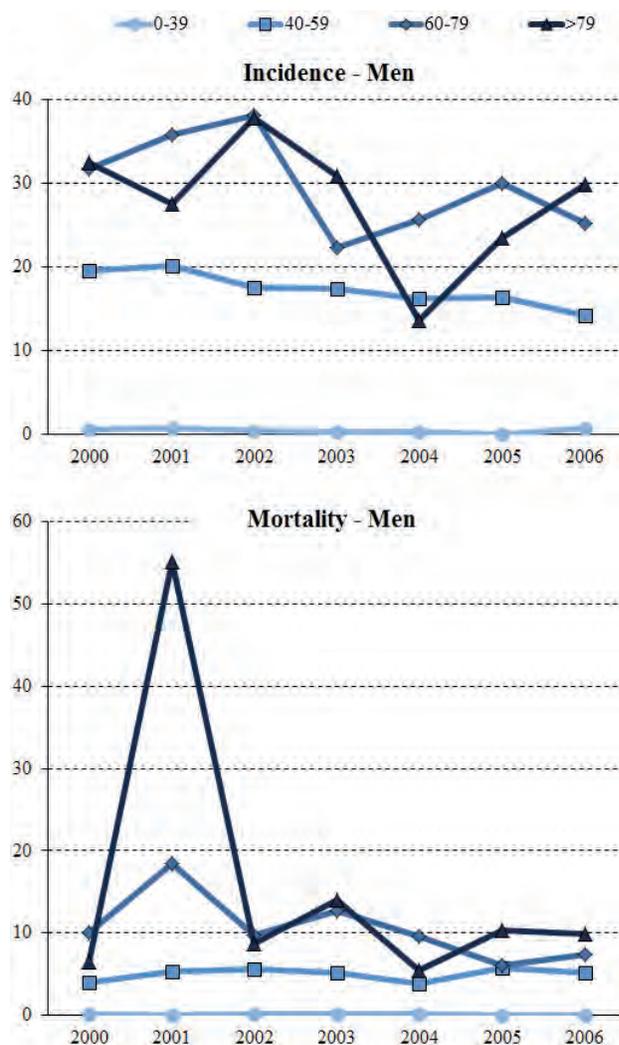


Figure 2. Incidence and mortality rates per 100,000 (ASR [E]) with regard to age for oral cancer (C00-C06) in men and women from 2000-2006 in Schleswig-Holstein

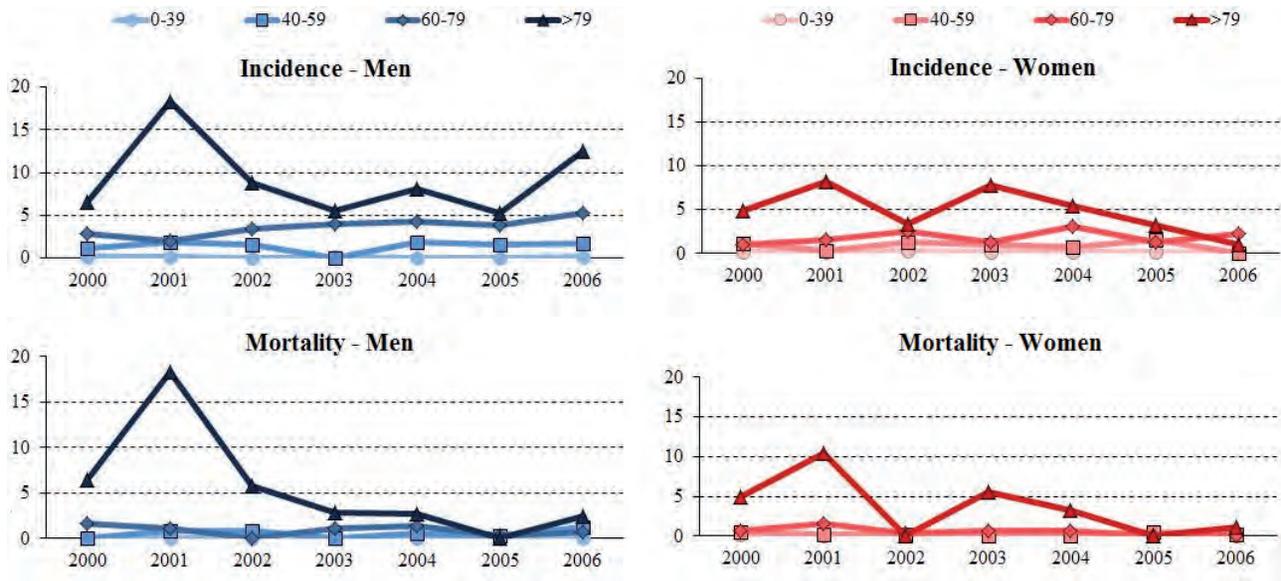


Figure 3. Incidence and mortality rates per 100,000 (ASR [E]) with regard to age for salivary glands (C07-C08) in men and women from 2000-2006 in Schleswig-Holstein

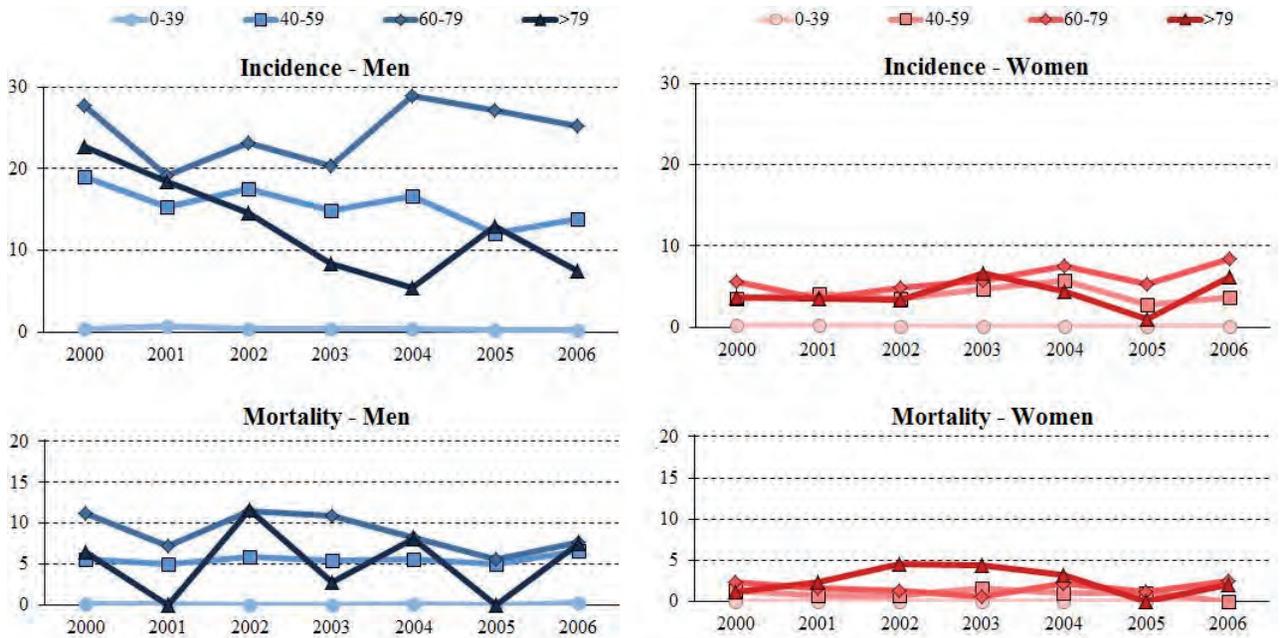


Figure 4. Incidence and mortality rates per 100,000 (ASR [E]) with regard to age for pharyngeal cancer (C09-C13) in men and women from 2000-2006 in Schleswig-Holstein

Discussion

Our project presents detailed incidence and mortality analyses for oral and pharyngeal cancer, with special regard given to the different tumour sites, by age groups and gender within a German federal state. So far, analyses of the different tumour sites for oral and pharyngeal cancers focussed more on European or worldwide comparisons (Curado and Hashibe, 2009; Ferlay *et al.*, 2007; Petersen, 2009; Warnakulasuriya, 2009) with detailed country-specific analyses still a rarity. However, this approach appears to be reasonable and our detailed analysis revealed interesting differences within the results and also through a European comparison.

One limitation inherent to descriptive epidemiological analyses such as this study is the absence of qualitative data explaining observed trends. However, this study complements a representative public survey identifying socio-economic factors and risk groups to develop a state-wide awareness campaign for the early detection of oral cancer (Hertrampf *et al.*, 2012).

Trends for oral and pharyngeal cancer (C00-C14): The Robert Koch Institut (2010) and the Cancer Registry Schleswig-Holstein (Pritzkeleit *et al.*, 2010) describe the incidence estimates for these cancers as slightly increasing. After comparing our Schleswig-Holstein results with those for the German reference state of Saarland (Robert Koch Institut, 2010), it could be observed that

the incidence and mortality rates for Schleswig-Holstein males were obviously lower than the national reference data. However, this difference was not shown for women.

Both Schleswig-Holstein and German reference data were lower than the European levels (EU 25) for incidence rates (women 15.7, men 54.5 (ARS [E]) and mortality rates (women 5.8, men 19.5 (ARS [E]) (Ferlay *et al.*, 2007; Warnakulasuriya, 2009). Warnakulasuriya also gave high incidence rates for men in France (32.2) especially in the north with 42.3 (ARS [E]) and described German incidence rates as intermediate rates similar to those of Spain, Portugal and Switzerland unlike the lowest rates in Greece, Finland and Sweden. Petersen (2009) described a sharp increase in the incidence rates for oral and pharyngeal cancer in countries like Denmark, France, Germany, Scotland and Central and Eastern Europe. This increase in men and women in Denmark was also described by Curado and Hashibe (2009) together with a slight increase in women in all Nordic countries. With regard to the detailed results for Schleswig-Holstein and for Germany, there was no observable trend.

In our study, we observed no increasing incidence in oral and pharyngeal cancer among men and women within the age group younger than 40 years. This result appeared to contrast with the observation of Warnakulasuriya (2009) who described rising trends within young people in several countries in Europe (Warnakulasuriya, 2009).

The observed mortality rates from 2000 – 2006 for Germany and Schleswig-Holstein were comparable for women but the national data for men were apparently higher than the data of the state of Schleswig-Holstein. The actual age-standardised mortality rates in Germany and Schleswig-Holstein for men and women (9.9 vs 5.9) described lower rates than Ferlay *et al.* (2007) for men (19.5) and comparable rates for women (5.8).

Trends for oral cancer (C00-C06): Oral cancer in Schleswig-Holstein showed a slight decrease in incidence over the years similar to the trends observed by Curado and Hashibe (2009) for men in Italy and France and for women (especially for C01/C02) in Spain. However, those authors also observed an increasing trend for men and women for North and Eastern Europe, an increase for men in Spain; and an increase in trends for women in France, UK and Germany. The last differed from the trends for women in Schleswig-Holstein which was clearest in the age group, 40-59 years old.

The current data of Globoscan 2008 described an incidence rate for C00-C08 of 7.1 for men and 2.5 for women (EU 27, ASR [W]) for 2008 (IARC/WHO, 2008) though these data are presented as World age-standardised incidence, which are usually lower than the European age-standardised rate.

In 2001, a noticeable peak was observed for the mortality rate in men which may be an artefact due to changes in coding. Due to a 2001 merger of the federal states of Schleswig-Holstein and Hamburg into one statistical office, an exact analysis is not possible. Another reason, an obvious increase in the number of the death certificate only cases in this year, can be excluded (Pritzkeleit *et al.*, 2011). Therefore, the best explanation for this peak may lie in the small number of cases.

Trends for tumours of the salivary glands (C07-C08): These tumour sites showed a fairly even distribution

between men and women probably because cancer of the salivary gland is not strongly related to alcohol and tobacco use. Most of the cases described a tumour in elderly people (>79 years). Because of the grouping of these tumour sites (C07-C08) by the Cancer Registry, there direct comparisons could not be with the available literature.

In 2001 among men, noticeable peaks were observed for the mortality and incidence rates, as was mentioned for oral cancer. The best explanation for these peaks may lie in the small number of cases.

Trends for pharyngeal cancer (C09-C13): The slightly decreasing incidence trend for these tumour sites observed in men did not correspond with the available literature. Curado and Hashibe (2009) showed for men, either an increase (Northern and Eastern Europe, UK) or no fluctuation, in France. The slight increase in trends for women in Schleswig-Holstein was also observed in Northern and Eastern Europe and France while rates in the UK were stable (Curado and Hashibe, 2009). The current data of Globoscan 2008 described an incidence rate (for C09-C10 and C12-C14, except C11 and World age-standardised) of 5.3 for men and 1.0 for women (EU 27, ASR [W]) (IARC/WHO, 2008).

These population-based incidence and mortality rates for oral and pharyngeal cancer from the state of Schleswig-Holstein, with subgroups according to age and tumour sites, showed interesting differences, differed from the Germany reference data and differed substantially from European trends. Therefore, using data from one state may not represent the national picture. These results also underlined the published variations between countries (O'Sullivan, 2008).

The reason for these variations between and within countries for age, gender and with regard to the impact of different lifestyle risk factors is still under discussion (Conway *et al.*, 2006). Although in several international studies the public identified tobacco as a risk factor but had a relatively low level of knowledge about alcohol, HPV, exposure to sun or dietary factors (Hertrampf *et al.*, 2012; Patton *et al.*, 2004; Tomar and Logan, 2005; West *et al.*, 2006). The extent to which the different aspects of behaviour with regard to these lifestyle risk factors can be seen as the explanation for the changing trends in incidence and mortality rates between and within countries has not been comprehensively explained. Conway *et al.* (2006) described possible historical trends for tobacco consumption or geographical inequalities in diet and, as surrogate for socio-economic inequalities, a 'north-south divide' in the UK (Conway *et al.*, 2006). This type of analysis has not yet been published for Germany.

In Germany, cancer registration is organised regionally, usually at Federal State level. Since the establishment of state-wide registration in Schleswig-Holstein, a well-organised collaboration between the institutes involved and the cancer registry has been developed contributing to prompt capture of almost all cases. More than 95% of Schleswig-Holstein's diagnosed cases are registered with almost 100% case-ascertainment because only cases with an assured histopathology have been registered (Pritzkeleit *et al.*, 2009). Clearly, the cancer registry is a very important institution for collecting and coordinating these high quality data which can be combined with

targeted evaluations of public understanding to make recommendations for further health programmes such as public awareness campaigns.

Conclusion

These population-based data from Schleswig-Holstein showed interesting differences and variations in the trends for incidence and mortality rates for age groups and tumour sites and revealed noticeable different trends compared to several European countries.

Hence, this population-based information about incidence and mortality trends in cancer patients analysed by age, gender and tumour sites informs effective cancer control. The cancer registries undertake the essential task of collecting this information for a more detailed and meaningful assessment. These data are valuable 'pieces of the puzzle' and prerequisites for planning further health programmes, preventive strategies and for targeting public awareness campaigns.

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