# CANCER MAPPING IN ALPINE REGIONS

## Trentino, South Tyrol, Carinthia, Tyrol, Vorarlberg

## 1996-2000

# *Atlante del Cancro nelle Regioni Alpine*

## *Trentino, Alto Adige, Carinzia, Tirolo, Vorarlberg*

## *1996-2000*

# *Krebsatlas Alpenraum*

## *Trentino, Südtirol, Kärnten, Tirol, Vorarlberg*

## *1996-2000*

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ISBN-Nummer: 3-86611-206-8

pro literatur Verlag, Mammendorf


The authors alone are responsible for the views expressed in this publication.

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## *Trentino*

L'impegno dell'Assessorato alle politiche per la salute nella prevenzione e lotta contro le patologie tumorali è doveroso, tenuto conto che tale patologia, costituisce la seconda causa di morte nei Paesi industrializzati e vede il Trentino con una mortalità più elevata rispetto alla media nazionale. Nonostante l'avvento di nuove procedure diagnostico-terapeutiche e una nuova consapevolezza in merito al miglioramento degli stili di vita ritengo che non si possa prescindere, ancora oggi, da alcune condizioni essenziali per massimizzare l'efficacia e la qualità delle cure. Esse riguardano sostanzialmente due aspetti, applicabili routinariamente in tutti gli ambiti ma che assumono, in campo oncologico, un peso particolarmente rilevante. Il primo si richiama alla necessità di garantire la "centralità del cittadino", approccio che di per sé può favorire una risposta positiva alle cure. Il secondo si riferisce alla necessità di adottare un approccio integrato e personalizzato, che consenta di offrire a ciascun paziente il trattamento adeguato alle sue peculiarità.

Il controllo della patologia oncologica può essere correttamente programmato e valutato però solo in base alle conoscenze del peso e delle sue caratteristiche nella popolazione. La valutazione epidemiologica costituisce pertanto, lo strumento irrinunciabile per orientare gli interventi preventivi, curativi ed assistenziali.

Il presente documento, frutto della collaborazione del Registro Tumori della Provincia di Trento (gestito dall'Osservatorio epidemiologico dell'Azienda provinciale per i servizi sanitari) con i Registri tumori di altre realtà regionali europee dell'arco alpino di Nord Est, consente di studiare e di comprendere la malattia oncologica nei suoi diversi aspetti, prendendo in considerazione aree e popolazioni omogenee, nel senso che condividono caratteristiche di storia e di vita. Inoltre, anche a livello metodologico, la collaborazione che si è realizzata ha permesso di operare secondo procedure standardizzate e confrontabili, avvallando e qualificando così la validità scientifica dell'opera stessa.

Ringraziando quanti hanno collaborato al lavoro, posso garantire che le informazioni fornite - da rinnovare e sviluppare ulteriormente - costituiranno la base di riflessione e di proposta per la comprensione della patologia tumorale e per permettere di programmare in modo mirato ed efficace l'insieme degli interventi, con l'obiettivo di giungere ad una graduale diminuzione della patologia oncologica in provincia di Trento.

L'assessore alle politiche per la salute

**dott. Remo Andreolli**

## *Südtirol / Alto Adige*

Ich begrüße die Herausgabe der vorliegenden Publikation, die ein wichtiges Instrument zur Information und Planung der Gesundheitsversorgung im Bereich der Tumorerkrankungen darstellt.
Für eine zielführende Einsetzung der Ressourcen braucht es fundierte epidemiologische Daten. Im Detail angeführt sind in dieser Studie die bösartigen Tumorerkrankungen und die damit zusammenhängenden Todesfälle im Zeitraum von 1996 bis 2000 in den Alpenländern wie Südtirol, Nordtirol, Trentino, Kärnten und Vorarlberg. Diese Informationen sind für Studien über mögliche Risikofaktoren von Bedeutung, die mit der Umwelt, der Arbeitswelt oder den Lebensstilen in den verschiedenen Gebieten zusammenhängen können.
Der Vergleich der Daten über bösartige Tumore zwischen angrenzenden Regionen, aus dem Tumorregister erlaubt es, mögliche Unterschiede zwischen angrenzenden Gebieten zu erforschen und dadurch genauere Strategien für die Gesundheitserziehung und –vorsorge zu erarbeiten. Darüber hinaus können all jene Ressourcen im Gesundheitsbereich genauer definiert werden, die für die Krebsbekämpfung von Bedeutung sind.
Diese Publikation gibt vor allem auch in Südtirol den Anstoß zu einer engeren Zusammenarbeit zwischen den Verantwortlichen des Südtiroler Tumorregisters und dem Sanitätspersonal, insbesondere den Ärzten, die Krebspatienten behandeln.
Ich möchte die Gelegenheit nutzen, um den Mitgliedern der Arbeitsgruppe für den großen Einsatz und die Professionalität in der Ausarbeitung dieser Studie zu danken.

Sono lieto di presentare questa pubblicazione, che considero un fondamentale strumento di informazione per la programmazione sanitaria. L'attività di allocazione delle risorse va infatti guidata anche dall'approfondita conoscenza di dati epidemiologici.
I dati contenuti nell'Atlante di incidenza e mortalità dei tumori maligni per gli anni 1996 – 2000 nelle regioni dell'area alpina come Alto Adige, Nord Tirolo, Trentino, Carinzia e Vorarlberg sono di sostanziale supporto per avviare studi di individuazione e misurazione sui possibili fattori di rischio di natura ambientale, professionale o legati a stili di vita nelle diverse realtà territoriali.
Il confronto fra i dati sui tumori maligni fra aree confinanti, basato sui dati dei registri tumori, permette la verifica e la riflessione sulle eventuali differenze fra realtà circostanti. I dati rappresentano per ogni realtà territoriale un supporto fondamentale per determinare le risorse sanitarie da destinare alla lotta contro il cancro e supportano anche la definizione più precisa delle strategie di educazione sanitaria e di prevenzione secondaria. In particolare per l'Alto Adige questo Atlante rappresenta anche un'importante occasione per accrescere la collaborazione tra il Registro tumori e tutti gli operatori sanitari, soprattutto medici, coinvolti professionalmente con il fenomeno cancro.
Colgo l'occasione per ringraziare tutti i membri del gruppo di lavoro che hanno speso il proprio impegno, passione e professionalità nella realizzazione di questo progetto.

Landesrat für Gesundheits- und Sozialwesen - L'Assessore alla Sanità e alle Politiche sociali

**Dr. Richard Theiner**

## *Kärnten*

Es gibt fast immer eine Chance.

Derzeit erkranken in Kärnten jährlich rund 2400 Personen an Krebs. Darunter viele Kinder und Jugendliche. Aus diesem Grund gilt ein Hauptaugenmerk der medizinischen Arbeit und Forschung der Diagnostik und Therapie gegen Krebs. Es gibt Hunderte Arten von Krebserkrankungen, die alle heilbar sind, wenn sie rechtzeitig erkannt werden. Ich bitte Sie daher, sollten Sie an Krebs erkranken, geben Sie nicht auf. Es gibt fast immer eine Chance.

Durch die steigende Lebenserwartung und den Wegfall anderer Todesursachen ist der Krebs - rein statistisch gesehen - zwar häufiger geworden. Dem gegenüber stehen aber inzwischen, und dies mit steigender Tendenz, die Chancen mit und nach einer Tumorerkrankung ein hohes Alter zu erreichen. Verantwortlich hiefür ist zum einen die verbesserte Frühdiagnostik und zum anderen die Therapieerfolge vor allem bei Hautkrebs oder Leukämie.

Das alles sind "nackte" Zahlen. Diesen gegenüber stehen aber Menschen, Kinder, Einzelschicksale und Angehörige. Als gesunder Mensch kann man nur erahnen, wie viel Mut erforderlich ist, der Krankheit Krebs den Kampf anzusagen. Denn schon allein die Diagnose ist ein harter Schlag und zugleich eine der schwersten Prüfungen.

Umso wichtiger ist es, zu informieren, Angst zu nehmen, Mut zu schenken und Hoffnung zu geben. Und dieses Buch ist ein wichtiger Beitrag dazu.

Gesundheitsreferent des Landes Kärnten

**Dr. Wolfgang Schantl**

## *Tirol*

In Tirol wurde mit finanzieller Unterstützung der Landesregierung 1986 das erste Tumorregister in Österreich gegründet, welches seit 1988 in regelmäßigen Abständen die gesammelten Daten über Inzidenz und Prävalenz von Morbidität und Mortalität an Tumorerkrankungen der Tiroler Bevölkerung erfasst und beschreibt.

Das Tiroler Tumorregister wird nicht nur intensiv von Experten aus dem Gesundheitsbereich in Tirol genützt, sondern genießt auch weit über die Landesgrenzen hohe fachliche Anerkennung und Akzeptanz, und ist Mitglied in zahlreichen internationalen Register zur Erfassung von Tumoren.

Ich freue mich außerordentlich, dass sich Experten aus Tirol, Südtirol, Trient, sowie Vorarlberg und Kärnten zum Ziel gesetzt haben, ein Alpenländisches Tumorregister zu gründen, in welchem in Zukunft Daten zum Tumorgeschehen gemeinsam erarbeitet und dokumentiert werden.

Wir erhoffen uns durch diese Konzentration von Information und Expertise für die Zukunft einen besser möglichen Vergleich der Daten unter den beteiligten Ländern, um gemeinsame Aktionen sowohl zur Prävention, als auch zur Therapie und Rehabilitation von Tumorerkrankungen zu intensivieren.

Nicht zuletzt sehe ich den Krebsatlas auch als Instrument die Position Tirols im Bereich von Neuerkrankungen und Todesfällen an Tumoren, im Vergleich mit den geographisch, politisch und sozial ähnlich gestalteten Nachbarländern, zu beleuchten und als Grundlage für Lösungsansätze heranzuziehen.

Landeshauptmann-Stellvertreterin

**Dr. Elisabeth Zanon**

## *Vorarlberg*

Bösartige Neubildungen stehen in allen entwickelten Gesellschaften an vorderster Stelle bei Kranksein und Sterben vor der Zeit. Sie bedeuten für den Einzelnen nicht nur Krankheitslast sowie für nicht wenige auch Leid und Verzweiflung, sondern fordern das Gesundheitswesen insgesamt durch den beträchtlichen medizinischen, personellen und betreuungsbezogenen Aufwand in hohem Maße. Die genaue Beobachtung des Geschehens, der bisherigen Entwicklung und das Erkennen von Trends anhand objektiver, solider erhobener Zahlen ist wichtig für die Orientierung der Verantwortungsträger in Politik und Verwaltung und damit auch für die Gestaltung und die Ausrichtung der Gesundheitspolitik. „Krebsregister“ über bösartige Neubildung sind ein bedeutender Indikator der Volksgesundheit.

Unsere bald 30 Jahre währende Befassung mit dieser Thematik und die diesbezüglichen Aktivitäten des Arbeitskreises für Vorsorge und Sozialmedizin bringt Vorarlberg gerne in diesen Überblick über die Kernregionen der Arbeitsgemeinschaft der Alpenländer ein. Unser Land hat sich vorgenommen, die Daten des Tumor-Registers so aufzubereiten, dass sie auch international vergleichbar und bewertbar sind. Dies hat uns auch die Teilnahme am Netzwerk „cancer incidence in five continents“ ermöglicht.

Mit diesem Bericht ist ein interessanter und wichtiger Überblick möglich geworden, wie sich sozialmedizinisch hoch bedeutsame Erkrankungen – speziell in den einzelnen Regionen der Alpenländer – entwickeln, welche möglichen Parallelen es zwischen den einzelnen Ländern gibt und wie die Lebensbedingungen in den Ländern des Alpenraumes zu beurteilen sind.

Das Zustandekommen des Krebsregisters reflektiert den Willen maßgeblicher Länder im Alpenraum, wichtige Grundlagen ihrer Gesellschaft gemeinsam zu analysieren und grenzüberschreitend zusammen zu arbeiten. Ich empfehle diesen Bericht der Aufmerksamkeit aller, welche aus der Fachwelt, in den verschiedenen Institutionen und in der täglichen Praxis mit dieser Thematik befasst sind.

Landesstatthalter
**Dr. Hans-Peter Bischof**

# Acknowledgements

Successful cancer registration is the result of fruitful collaboration of many institutions. The editors acknowledge with gratitude the following institutions and groups of professionals:

All medical doctors in the hospitals of the study region who spend a lot of time for documenting cancer patients which is the essential basis of incidence data.

All collaborators in all pathology institutes who contribute to the good completeness of incidence data.

Statistics Austria that collects mortality data in Austria.

All funding institutions and all politicians who are responsible for the budget of the cancer registries.

All coworkers in the cancer registries for their effort in collecting the incidence data.

# 1 Introduction

Cancer mapping has a long tradition in cancer epidemiology. Maps have been produced for decades and some of them have been regarded as milestones, see for example the Cancer Mapping of Scotland[1]. Both layout and methods have changed since then. Layout has mostly changed due to progress in IT-technology and methods due to widely available programmes for sophisticated smoothing methods[2,3].

Our main goal is to show a stable estimate of the regional distribution in our study area. The study area covers three states in the western part of Austria and two provinces in northern Italy, with a total population of approximately 2.5 million people. The entire study area is within alpine regions, where we are confronted with sparse populations. Regional units are small with an average population size of 20,000 inhabitants, the smallest units not having less than 10,000. There are only few bigger cities with more than 100,000 people. We present incidence and mortality data from the years 1996 to 2000. Incidence data are collected by cancer registries that are part of Cancer incidence in Five Continents or have applied for inclusion in this publication. Mortality data are official data collected in a uniform way in Austria, and on a local level in Italy.

We present information for main cancer sites and omit rarer cancer sites in order to get more stable estimates. Also for main cancer sites, we are confronted with small numbers per units, so there was a need to apply smoothing methods. We show only smoothed maps, which should give a more stable estimate of the underlying pattern. In addition to maps, we also present additional material for the reader who is interested in details.

Cancer registries require finances and some people ask whether it is still necessary to run cancer registries. Regional distribution of cancer incidence and mortality is one of the important public health questions where cancer registries can play a major role. Maps are very easy to read and so the importance of cancer registries can be shown to a broad audience.

We hope that our material will be widely discussed and will lead to in depth investigations of those sites where we see some discrepancies in regional distribution. The material is presented in such a way that not only specialists should be able to read the maps. Of course this has some danger in it because interpretation of cancer maps requires a lot of knowledge. Regions with higher rates can be due to a) risk factors, b) screening activities (which can directly influence rates namely low incidence, for example cervical cancer, and at least temporarily high incidence, for example prostate cancer, c) differences in outcome if we see problems in mortality and not in incidence, d) documentation or registration bias, and finally e) random variation.
As we mentioned above, it was not our aim to detect cancer clusters. We highly recommend to our readers not to use the material presented here to search for cancer clusters. For this task, we would use other methods based on statistical testing. We also would like to stress that for some readers, only maps with regional effects will be interesting. However, to analyse cancer sites with

no high risks in certain geographical units is valuable because this information is important for the public. In addition, one must also have in mind that for some cancer sites like stomach cancer, incidence and mortality in the study region is high when compared to the European countries.

One of the side effects of this project was the deepening of the collaboration between all participating cancer registries. We hope that this collaboration will lead to further interesting investigations besides cancer mapping.

Willi Oberaigner, Innsbruck Francesco Bellù, Bolzano

## References

1 Kemp I, Boyle P, Smans M, Muir C. Atlas of Cancer in Scotland 1975-1980. 1985.
2 Richardson S, Thomson A, Best N, Elliott P. Interpreting posterior relative risk estimates in disease-mapping studies. Environ.Health Perspect. 2004;1016-25.
3 WinBugs with DoodleBugs Version 1.4.1. Medical Research Council (MRC) Imperial College and MRC,UK, 2004.

# 2 Material and methods (Fabio Vittadello, Laura Battisti, Willi Oberaigner)

## *2.1 Incidence data*

The cancer incidence data presented in this study were collected by the cancer registries of Trento, South Tyrol, Carinthia, Tyrol and Vorarlberg. All of these are population-based cancer registries and, except for Carinthia, are accredited by IARC. Incidence and mortality data collected by these cancer registries were published in the volume "Cancer Incidence in Five Continents – Vol. VIII" in 2003 by IARC (Tyrol and Vorarlberg: 1993-1997; South Tyrol and Trentino: 1995-1997). All data were verified using IARC tools and multiple registrations were accepted in accordance with IARC rules. Urinary cancers included only malignant invasive tumours (not in-situ or of uncertain malignity), while cases judged as "borderline" concerning cancer of the ovary were considered differently (included or not included in malignant cases) among the five registries.

Utilized data quality indicators are the ones normally used at the international level:

- Percentage of histologically or cytologically verified cases (% microscopically verified cases - MV)
- Percentages of cases registered only on the basis of death certificates (Death Certificate Only – DCO). In Carinthia, DCO cases registered during the years 1996-2000 were not traced back due to data privacy laws, while in Vorarlberg trace back could be done only in a few of the years.
- The ratio between the number of deaths and the number of incident cases (Mortality/Incidence Ratio) observed for each cancer site.

## *2.2 Mortality data*

Cancer mortality data were provided by national (Tyrol, Vorarlberg, Carinthia and Trentino) or local registries of mortality (South Tyrol), in accordance with the data source normally used by each cancer registry. With reference to the analyzed period, in all areas, causes of death were codified using the International Classification of Diseases (ICD) - 9$^{th}$ version.

## *2.3 Geographical units*

In accordance with the study's objectives, as municipalities inside the Alpine area are characterized by small numbers of inhabitants (except for a few cases), we decided to subdivide each area into wider geographic units, defined by agreed upon criteria: the population should be at least 10,000 inhabitants; moreover, each geographic unit should be morphologically homogeneous, that is cities or "natural" units should not be split up. For Italian provinces (Trentino and South Tyrol) administrative units (called "health districts") were considered, as

they already satisfied these criteria. With reference to Austrian provinces, the boundaries of respective geographical units were defined by experts at the local level.

## 2.4 Which sites and why these sites

Due to the small populations in the chosen geographical units (ranged from 360,000 to 700,000) and consequently the limited number of incident cases registered in the areas during the period (1996-2000), some cancer sites (like kidney, melanoma, pancreas, thyroid, liver) were not investigated in our study. In two cases, in order to reach the numerical consistency necessary for the analysis, the only solution we found was in proceeding to an aggregation of different sites: Head & Neck & Esophagus & Larynx (ICD-9: 140-150 plus 161) and the haematopoietic system (including laeukemias and lymphomas, ICD-9: 200-208). Since the incidence of non-melanoma skin cancer (ICD-9: 173) is difficult to assess and completeness of registration is rather different among cancer registries, this site was not included in the analysis concerning the comparison of all cancer cases (All – NMSC). Moreover, as a prostate screening program has been active in Tyrol since 1993, resulting in a relevant and extremely high number of incident cases for this cancer here, we decided to reproduce the previous analysis excluding this tumour too (All – NMSC - Prostate).

The complete list of cancer sites analyzed in the study is illustrated below:

| ICD-9 Code | Description | Sex |
|---|---|---|
| 140 to 150, 161 | Head & Neck & Esophagus & Larynx | M, F |
| 151 | Stomach | M, F |
| 153-154 | Colon/Rectum | M, F |
| 162 | Bronchus, Lung | M, F |
| 174 | Breast | F |
| 180 | Cervix uteri | F |
| 182 | Corpus uteri | F |
| 183 | Ovary | F |
| 185 | Prostate | M |
| 188 | Bladder | M, F |
| 200-208 | Haematopoietic / Lymphatic System | M, F |
| 140 to 208 except 173 | All sites except non-melanoma skin cancer (All – NMSC) | M, F |
| 140 to 208 except 173, 185 | All sites except non-melanoma skin cancer and prostate (All – NMSC- Prostate) | M, F |

## 2.5 Scaling, colour scheme

In mapping procedure, we chose to apply absolute scaling, especially because this approach allows the reader to directly compare cancer maps across sites and sexes throughout the whole report, in a common colour scale: regions with the same colour have the same meaning or interpretation for every site. On smoothed maps, in order to best illustrate the distribution of

geographical units by risk, 11 breakpoints were defined around 1: 5 intervals (differently coloured from yellow to green) were related to values <1 and 5 intervals (differently coloured from orange to brown) represented values >1.

| Colour | Minimum value | Maximum value | Legend label |
|---|---|---|---|
| Green | 0.000 | 0.533 | <= 0.533 |
| Mid green | 0.534 | 0.612 | <= 0.612 |
| Light green | 0.613 | 0.704 | <= 0.704 |
| Yellow | 0.705 | 0.810 | <= 0.810 |
| Light yellow | 0.811 | 0.932 | <= 0.932 |
| Very light yellow | 0.933 | 1.071 | <= 1.071 |
| Light orange | 1.072 | 1.232 | <= 1.232 |
| Mid orange | 1.233 | 1.417 | <= 1.417 |
| Orange | 1.418 | 1.630 | <= 1.630 |
| Red | 1.631 | 1.876 | <= 1.876 |
| Brown | 1.877 | 1.877 and over | > 1.876 |

## *2.6 Populations*

Availability of population data was very different among the five regions and we had to use an estimation method in order to calculate the population at risk for each geographical unit. In fact, while South Tyrol and Trentino have population registers, at the municipality level, updated every year, in Tyrol, Vorarlberg and Carinthia the single geographical unit population is only gathered at 10-year intervals through the census procedure. Then, in Austrian regions, population numbers split at the geographical unit level by sex and age were not available in the study period, as presented in the following scheme:

| Period | | Tyrol | Vorarlberg | Carinthia |
|---|---|---|---|---|
| Census years 1991, 2001 | | Population by sex, 5 year – class, geographical unit | Population by sex 5 year – class, geographical unit | Population by sex, 5 year – class, geographical unit |
| Intercensal years (1992-2000) | Population | Distribution by geographical unit | Distribution by sex and geographical unit | Distribution by sex and geographical unit |
| | Births | Distribution by geographical unit | Distribution by sex and geographical unit | Distribution by sex and geographical unit |
| | Deaths | Distribution by sex, age at death and geographical unit | Distribution by sex | Distribution by sex, and geographical unit |

One choice could be to use the 2001 census population to estimate the population at risk, but this could lead to a sensible bias in producing incidence and mortality rates. Rather, an intercensal population estimate model based on a Lexis diagram was adopted.

The population in 1996 (called 1996*) was obtained starting with the population at census 1991. The cohort aged x, (x+5) is followed through time for five years. Since the distribution of deaths by age at death and sex is available for each intercensal year, death counts are subtracted from the cohort: deaths aged (x+1), (x+6) are subtracted after the first year,

(x+2),(x+7) after the second year, and so on for the whole period. Births were added to the cohort every year. Through this procedure, it was possible to obtain population estimates at the end of five succeeding years. For example, intercensal estimated population five years after census 1991 aged x, (x+5) is:

$$P^{1996}_{[x\ ,\ (x+5)]} = P^{1991}_{[(x-5)\ ,\ x]} - \sum_{i=0,..4} D^{1992\text{-}96}_{[(x-5+i)\ ,\ (x+i)]}$$

where:

$P^{1996}_{[x\ ,\ (x+5)]}$ = population at 1996 aged x, (x+5)

$P^{1991}_{[(x-5)\ ,\ x]}$ = population at 1991 aged (x-5), x

$D^{1992\text{-}96}_{[(x-5+i),(x+i)]}$ = deaths in the period 1992-1996 belonging to cohort aged (x-5+i) , (x+i) i=1,...,5

The final step of this procedure yields an estimate of the cohort size at time t+5 that differs from the real amount of the cohort: this difference is due to migration effect. Unfortunately, data on migration were not available for the intercensal period, not even at the regional level. Then, the size of migration effect was estimated at regional level by calculating the difference between the observed ($P^{1996}$) and estimated population ($P^{1996*}$).

The correction for migratory balance was applied to those geographical units where the difference between natural balance and total balance from 1991 to 2001 was greater than 2%. The distribution of migratory difference was made proportional to average weight 1991-2001 of each unit with respect to the provincial population and according to the age-class weight on total migratory balance. At the end of the estimating procedure, the intercensal population $P^{1996**}$ was obtained for each five-year class and geographical unit.

In a similar way, a population estimate was obtained at the mid point of the period covered by the study ($P^{1998*}$). The hypothesis of uniform distribution was followed in estimating the number of subjects inside the age class x-(x+5). Different weights were applied to age classes 55-59, 60-64, 75-79 and 80-84, due to different demographic dynamics that were observed for the population of these provinces during the years of world wars.

In order to evaluate the goodness of the model, an estimated population was obtained at the geographical unit level until the year 2001 ($P^{2001**}$): these data were then compared to the 2001 census population ($P^{2001}$).

| | | **Population at census 2001** | **Population estimates 2001**** | **Difference 2001-2001*** | **% difference in 2001** |
|---|---|---|---|---|---|
| **Tyrol** | F | 345.494 | 342.006 | 3.488 | 1,0% |
| | M | 328.010 | 329.148 | -1.138 | -0,3% |
| **Vorarlberg** | F | 177.758 | 177.037 | 721 | 0,4% |
| | M | 173.337 | 175.337 | -2.000 | -1,2% |
| **Carinthia** | F | 289.204 | 290.222 | -1.018 | -0,4% |
| | M | 270.200 | 274.059 | -3.859 | -1,4% |

At the geographical unit level, the population estimates for the time periods covered by the cancer incidence and mortality were obtained as:

$$P^{1996-2000} = P^{1996^{**}} + \frac{P^{1996^{**}} + P^{1998^{**}}}{2} + 2 \times P^{1998^{**}} + \frac{P^{1998^{**}} + P^{2001}}{2}$$

Population estimates were then used as denominators to calculate incidence and mortality rates.

## 2.7 Epidemiological rates

Annual crude incidence and mortality rates were computed. In order to compare cancer levels among the areas considered in the study, age-standardized rates were calculated by the direct method. As the standard, the theoretical World Standard Population was used, which was modified by Doll et al. (1966) from that proposed by Segi (1960)[1]. The standard errors of direct age-adjusted rates were computed in accordance with the binomial approximation[2].
For each cancer site, the expected number of cases (and deaths) were calculated via the indirect age-standardization method, by applying the age-specific rates obtained for the whole area to each geographical unit population. Standardized incidence ratios (SIR) and standardized mortality ratios (SMR) were obtained by the indirect method[2]. Their 95% confidence intervals were estimated by computing standard error[2].

## 2.8 Smoothing procedure

Disease mapping based on small geographical units is known to be less susceptible to ecological bias because within-area heterogeneity is smaller. However, data are usually much sparser which can lead to unstable estimates and over-dispersion with respect to the Poisson model. Hence it is common practice to apply modelling to overcome some of these problems. The main goal is to achieve a more stable estimate of the underlying pattern and to approach the true underlying risk pattern[3].

So we decided to apply a Bayesian hierarchical model. Our decision was to choose the well known BYM-model proposed by Besag, Yorke and Mollié[4]. The model takes adjacency of regions into account and is defined by the following set of equations:

$$y_i \approx \text{Poisson}(e_i\theta_i)$$
$$\log(\theta_i) = \alpha + u_i + v_i$$

$\alpha$ ... overall level of relative risk
$u_i$ ... correlated heterogeneity
$v_i$ ... uncorrelated heterogeneity

where $y_i$ denotes number of cases,
$\approx \text{Poisson}(e_i\theta_i)$

Uncorrelated heterogeneity is modelled by

$$v_i \approx N(0,\tau_v^2)$$

Correlated heterogeneity resp. adjacency is modelled by

$$\left[u_i \middle| u_j, i \neq j, t_u^2\right] \approx N(\bar{u}_i, t_i^2)$$

$$\bar{u}_i = \frac{1}{\sum_j w_{ij}} \sum_j u_j w_{ij}$$

$$t_i^2 = \frac{t_u^2}{\sum_j w_{ij}}$$

$w_{ij} = 1$ if i and j are adjacent and 0 otherwise

It is known that this model is improper, so it is necessary to define a constraint to ensure that the model is identifiable. This is done by assigning a uniform prior distribution to $\alpha$.
For every site and sex combination, we fitted a separate model for incidence and mortality. Firstly, two chains were defined starting from different initial values chosen a priori, using the same initial values for every model. Afterwards, 10,000 samples were run as burn in step. Secondly, convergence was checked visually. According to the literature, there are no formal procedures for checking convergence, but at least it is clearly known when there is no convergence. We looked at the Gelman Rubin statistics, inspected history and density plots and finally checked the condition MCError/SD <= 5%[5]. After assuring convergence, we finally ran another 10000 samples in order to get the final estimates. For every combination site and sex and incidence/mortality, we could achieve reasonable convergence. Analysis was performed using WinBUGS Version 1.4[5].

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# 3 Country specific description

## *3.1 Trentino* (Laura Battisti, Maria A. Gentilini, Silvano Piffer)

### 3.1.1 Incidence data

In 1997 the Trentino Local Government gave the Provincial Agency for Health Services (APSS) the goal of "Planning and experimentally starting a population cancer registry". The provincial registry started 1998 and is located within the Epidemiology Department. The main sources of data are: hospital discharge records for public and private hospitals of both in-patients and out-patients, pathology laboratories, autopsies, and death certificates. All these data are in electronic form. The auxiliary sources are clinical records, radiotherapy records, and oncological medical records. The APSS Information Systems provide hospital data, the Pathology Departments of Trento and Rovereto provide pathological data, and the Provincial Office of National Statistics Institute (ISTAT) provides death certificates. All data are first checked with the birth, marriage and death registries and then joined in a single data base. The data are submitted to SITE software which accepts the cases in an automatic way, according to a specified algorithm. For these cases, site and histology are automatically coded according to ICD-O version 1. Records not accepted by SITE are checked and coded manually by Registry staff. Municipalities are coded following ISTAT classification. Multiple primaries are accepted according to the IARC rules. The Trento Cancer Registry uses individual death certificates and follows IARC trace back procedures before registering the case as DCO.

The Registry is staffed by a part-time epidemiologist, a part-time statistician, and by a full-time health visitor.

Registry data from 1995-97 were published in Cancer Incidence in five Continents by IARC, as part of North-East Italy Cancer Registry (Bolzano, Trento Provinces and Friuly Venetia Giulia Region). Registry data are routinely used at a local level to monitor cancer incidence, for implementing and evaluating cancer screening, and for health planning.

### 3.1.2 Mortality data

While a Cancer Registry uses local mortality data, in this study national data were used. Differences between national and local mortality data are irrelevant because there exists a special agreement between the national ISTAT and the ISTAT office at local level. According to this agreement, the local office of ISTAT collects and controls death certificates directly under terms of data quality, and subsequently hands them over to the department of epidemiology of the local health unit to code the causes of death. The complete mortality registry is delivered to the central office once a year where integrations with death certificates that could have bypassed the provincial level (about 1% of all certificates/year) take place.

### 3.1.3 Population

The Trento Cancer Registry covers the population of 10/11 districts of the Trentino county in northern Italy. For organizational reasons, the Primiero district (9,000 inhabitants), which borders the Veneto Region, was not included in the 1996-2000 period. The Trentino population in Census 2001 was 477,017 (48.7% males; density 76.9 inhabitants per km²). The proportion of people aged 0-14 was 15.1% and the percentage of people aged 65+ was 18.2%. About 3.5% of the people are from foreign countries, mainly from East Europe (49.6%; Albania, Yugoslavia) and Magreb (24.7%; Marocco, Tunisia). The birth rate is 10.4 per 1,000, the total fertility rate is 1.5, the mortality rate is 9.0 per 1,000 and the cancer mortality rate is 3.4 per 1,000 for males and 2.4 per 1,000 for females. In 2000 the life expectancy was 76.9 years for males and 83.7 years for females. The emigration rate is 5.3 per 1,000, whereas the immigration rate is 8.2 per 1,000. The Trentino county GDP per capita is equal to 23,282 Euros and the standing health expense is 677,436,000 Euros, which is equal to 0.9% of national standing health expenses; total health expenses are 1,424 Euros per capita (national average 1,301 Euros). The employment rate is equivalent to 65.5% for residents aged 15-64. The composition of workers in the working sector is: agriculture 4.0%, industry 19.1%, construction 9.2%, and other activities 67.7%. At present, industrial sites are rare in Trentino. Two important factories which used aluminium and asbestos (amosite) were closed twenty years ago. Important silica caves are in operation today in Valle di Cembra, and a steelworks is located in Borgo Valsugana.

#### Municipalities

Trentino has a surface area of 6,206 Km² and is a mountainous province. 70% of the land is located over 1,000 m above sea level. 20% of inhabitants live over 750 m above sea level. The province is divided into 223 municipalities: 13.3% of the population lives in the 52.0% of municipalities with less than 1,000 inhabitants, 37.9% of the population lives in municipalities with between 1,000 and 4,999 inhabitants, which represents 42.6% of the municipalities, 19.7% of the population lives in municipalities with between 5,000 and 19,999 inhabitants, which represents 4.4% of the municipalities. Finally, 29.9% of the population lives in 2 towns (Trento and Rovereto) which have more than 20,000 inhabitants. There is a public hospital in every health district except for Valle di Fassa, Valle di Fiemme, Primiero and Alta Valsugana.

### 3.1.4 Description of the Health System

#### Providers

Health care in the province is provided by the Provincial Health Service, as part of the National Health Service. More specifically, it is provided through a single health agency -APSS- and 11 health districts. Hospital services are provided by 10 public hospitals and 4 private clinics. The most important hospital is S. Chiara (SCH) in Trento, which, for cancer patients, provides radiotherapy, cancer surgery and medical oncology services. Radiotherapy has a lot of history in the province, considering that the activity started in 1950 and today it can offer, beyond external treatment, brachytherapy and IORT (intraoperative RT) too. Medical oncology activity started in

the late ‘70s, later joined with the Radiotherapy Department, and has been an autonomous Service since the mid '90s.
Patients suspected to have cancer are mostly referred to SCH for surgery and radiotherapy sessions, while for chemotherapy they can also be treated at other hospitals, especially the general hospital of Rovereto (20 km south of Trento). Oncology care is managed, as a whole, by the Provincial Oncology Department in which surgery, chemotherapy and radiotherapy are represented. A network of general practitioners and family paediatricians assure primary health care services. Home care for terminally ill cancer patients is provided by a palliative care service covering, at the present, the municipalities of Trento and Rovereto. Systematic cancer registration started in 1992 when a specialized skin cancer registry was established. This registry is still being used.

### Access to the medical system

Availability of diagnostic and treatment services is good for all cancer sites and throughout the province. Today there is still no department for neurosurgery. The average waiting time for a pap-test (preventive/clinical) is 18.4 days, for colposcopy (preventive/clinical) is 20 days, for mammography is 200 days (preventive/clinical), for colonscopy is 49 days, for magnetic resonance (MR) cerebral is 85 days, for MR rachis is 46 days, for computerized tomography (ct-scan) cranium is 20 days, for ct-scan chest is 48 days, for ct-scan abdomen is 45 days, for clinical breast exam is 3.4 days, for clinical urological exam is 18 days, for chemotherapy is 12.6 days and for first starting radiotherapy is 5.6 days.

### Treatment outside of the study region

The proportion of cancer admissions outside of Trentino county in 1999-2000 was equal to 12.8% (all causes 13.1%). For neurosurgery, patients are referred to Verona (90 km south of Trento).

### Screening programs

An organized screening programme for cervical carcinoma for women between the ages of 20-65 has been running in the province since 1993. For the reference period, the average population coverage for pap smear screening is 65%. Since October 2000, there has been a screening programme for breast cancer for women between the ages of 50-69. A pilot phase for colo-rectal cancer screening has been planned for the year 2006. PSA screening is only recommended for individual subjects when based on the opinion of a general practitioner.

## *3.2 South Tyrol* (Eduard Egarter-Vigl, Fabio Vittadello, Francesco Bellù)

### 3.2.1 Incidence data

The South Tyrol Cancer Registry was instituted in 1992 by the provincial government as an operative unit under the Histopathology Service of Bolzano and began its activity in 1995. The Registry covers the entire population of the Province of Bolzano and is staffed by the chief of the Pathology Department of Bolzano (director), a medical oncologist (co-ordinator), a statistician, and three secretaries (1 full-time and 2 part-time).

The data collection method is based on a passive system of notification. All care units in the Province are requested to report every newly detected cancer case using a standard form (new diagnostic case form). Every notified case is subjected to a quality check. Data obtained through this method are controlled and integrated through an active procedure based on the linkage of several computerized database: pathological data and autopsies, provided by the Pathology Department of Bolzano, hospital discharge records (public and private hospitals, both in-patients and out-patients) and death certificates (Provincial Mortality Registry). Due to the sensible migration of patients towards the University Hospital of Innsbruck (Austria), one important additional source of cancer information is the procedure for reimbursement of care received at that hospital. All new cases of cancer are checked with the birth, marriage and death registries and then registered in the data-base according to ICD-O Version 2 classification.

The registry follows the IARC/IACR rules to code multiple primaries, and the data-base of incident cases is periodically submitted to the verification tools proposed by IARC. The Registry has access to death certificates for patients dying in the registration area, and trace-back procedures indicated by IARC are considered before registering a case as DCO. Registry incidence data from the years 1995-1997 were accepted by IARC for their publication in Cancer Incidence in Five Continents- Vol. VIII. Data from South Tyrol were published in an aggregate form together with the Province of Trento and the Friuli Venezia Giulia region, as the North-East Italy Cancer Registry

### 3.2.2 Mortality data

Mortality data used in this study are provided by the Provincial Mortality Registry, which was instituted in 2000 in order to provide detailed information about patient causes of death. During the years 2000-2001, the Provincial Mortality Registry recovered death certificates from the period 1995-2000, registering in a dedicated database all information reported in the death certificate, a National Statistics Institute form that is to be compiled for each death. The physician from the cancer registry codified the principal cause of death according to ICD-9 edition classification. The comparison of local mortality data to national mortality data (ISTAT) for the same period has shown very small differences in the distribution of deaths due to cancer.

### 3.2.3 Population

On 31/12/2001 the population was 466,182, (49.3% male), with a density of 63.0 inhabitants per $km^2$. The average age was 38.5 years, and the model age class was 35-39 years (8.9%); inhabitants aged 25-39 years added up to 25.1% of total, while people aged over 65 years represented 15.7% of the population. For every 100 people under the age of 15 years there were 92 people over the age of 65.

In 2001, the birth rate was 11.7 per 1,000 inhabitants, the total fertility rate was 1.5, and the mortality rate was 7.7 per 1,000 (cancer mortality rate: 2.7 per 1,000). Life expectancy in 2001 was 76.9 years for males and 83.9 years for females.

About 3% of the residents in the area were foreigners, of whom 45% were from European Community countries, 30% from other European countries and 15% from Africa. In 2001, the level of unemployment was only 2.7%; the percentages in employment categories were: 8.1% agriculture, 23.7% industry, and 68.2% trade and services. In 2001, the gross domestic product (GDP) for South Tyrol was 11,638 million euro (24,000 euro per capita) and the provincial health system expenditure (816 million euro) absorbed around 7% of the GDP, corresponding with an expenditure of 1,900 euro per inhabitant. Like other industrialized countries, in South Tyrol there are less and less people engaged in agriculture while the service sector is increasing in importance, even with agriculture still representing an important role in the local economy. Metal processing, building, wood processing and furniture production are the main sectors in the manufacturing industry. On the side of services industries, trade, commerce, catering industries and personal services are the most representative.

#### Municipalities

The territory (7,400.4 $km^2$) is completely mountainous and it is divided into 116 municipalities, with a surface area ranging from 302.5 $km^2$ (Sarentino) to 1.7 $km^2$ (Caines). The average altitude of municipalities is 850 m above sea level: Stelvio (1,314 inhabitants at 31/12/2001) is the most elevated municipality (1,840 m). In Census 2001, about 53% of the population lived in municipalities with more than 5,000 inhabitants (25.5% under 20,000 inhabitants, 27.8% from 20,001 to 100,000 inhabitants). Less than 100,00 people lived in the biggest municipality, Bolzano.

### 3.2.4 Description of the Health System

#### Providers

The Province is subdivided into 20 health districts and 4 local health units (ASL). Within the area covered by the registry there are seven public general hospitals (2,237 beds), and seven private clinics. The most important hospital is San Maurizio general hospital, located in Bolzano. Every general hospital provides cancer surgery and medical oncology services; during the study period (1996-2000) the nearest radiotherapy units were outside of the Province (Trento and Innsbruck).

Primary health care services are assured by a network of general practitioners and family paediatricians.

**Treatment outside of the study region**

Approximately, 20% of registered cancer cases left the registry area for treatment, many of which went to the University Hospital of Innsbruck. About 10 % of cancer cases treated in the Province of Bozen are non-residents who come into the area for treatment.

**Screening programs**

With reference to the period of the study (1996-2000), 3 out of 4 local health units had an organized screening program for breast carcinoma for women aged 50-69. A considerable quota of the female population, over 70%, is used to having a specialist gynecological control with Pap-test at least once every three years. Even if no organized screening program against prostate cancer has been carried out by public health management, the number of PSA tests is increasing year after year.

## *3.3 Carinthia* (Wolfgang Raunik, Zorica Jukic)

### 3.3.1 Incidence data

The Carinthian cancer registry was established in 1987. At the moment, the data are gathered via written forms. The questionnaires (first visit, treatment and follow up forms) are examined by experienced medical doctors, released for documentation and the data are checked for plausibility.
Through an automated "reminder system", contact is taken up by mail with the doctors responsible for follow up care. Improvements in follow up care (post-treatment treatment) documentation are necessary and achievable through the intended reorganisation of the IT structure and connection to the digital network. This will lead to comprehensive documentation of treatment quality with side-effect profiles and tumour response characteristics.
The pathology departments in Villach and Klagenfurt report all of the newly diagnosed malignant cancer cases to the tumour registry – 1 hospital with surgical expertise sent material to a pathology institute in another province during the investigation period. In the western part of the country a notable number of patients were treated in the hospital of Lienz / Eastern Tirol. Both reasons may have contributed to the high DCO – rates in Carinthia.
Due to data privacy law, no trace back of DCO cases could be done, so in fact what is reported are DCN cases.
Precancerous and in-situ lesions (CIS) are also registered if they are reported to the registry (private cytological laboratories are not yet included in the registration process).
According to Austrian law, all cancer cases are reported to "Statistik Austria". Site was coded according to SNOMED, histology according to ICD-O Version 1, and stage according to UICC TNM Classification. Recommendations of IACR are used for the analysis of multiple tumors. The patients' life status is updated in the population registry (based on ZIP code and official municipality codes) and the national mortality registry (Coding and data collection are done centrally in Austria).
The tumour registry is a part of the radiotherapy department and is managed by a medical oncologist. The institutionalisation of the registry was laid down by law in 1987 and is under general leadership of the Landessanitätsdirektion. This way all of the results are directly available for public health decision makers.

### 3.3.2 Mortality data

The official data collected by Statistics Austria were used to analyse cancer mortality.

### 3.3.3 Population

Carinthia covers about 9536 $km^2$ of alpine landscape (11.2% of Austria ), 24.3% (2,317 km2) is inhabitable. The average altitude of the Carinthian municipality is between 500 and 550 m.

According to the 2001 Censusus, 559,404 peope (51% female) live in Caritnthia; seven cities have more than 10,000 inhabitants, including the capital of Klagenfurt (90,765). 16.8 % of the population is under the age of 15, and 21.9% is over 60. 5.7% of the people are from foreign countries, mainly from the former Yugoslavia.
In 1998 the average life expectancy of females was 81.5 years and of males was 75 years. The mortality rate was 9.1 per 1,000, cancer mortality was 2.3 and cardiovascular mortality 4.8 per 1,000.
In the same year the birth rate was 9.5 per 1,000.
The expenditures for health services reached 26.4 % of the Carinthian budget (516,042 versus 1,953,569 Euros). The gross domestic product in the year 2001 was 22,400 EUR per capita.

### 3.3.4 Description of the Health System

**Providers**

The specialised oncological centre at the Klagenfurt General Hospital consists of a medical oncological department including a special unit for autologous cell transplantation and a fully-equipped radiotherapy department. These provide for approximately 650,000 people in Carinthia, the region of Murau in Styria and Eastern Tyrol.
The vast geographical radius means long distances for patients and relatives. Megalomaniac cancer centres have proved to be uneconomical, impersonal and laborious, so 25 years ago a decentralised oncological solution seemed to be the obvious consequence.
The indisputable oncological principle of the interdisciplinary approach today, following all the specified guidelines and recommendations, was first thought of in Carinthia in 1982, and after continuous experiences and improvements was institutionalised in a step by step fashion in 1986.
The goal of interdisciplinary oncological care is to provide care for all cancer patients in Carinthia at a high scientific level, in co-operation with local hospitals, specialists and general practitioners (GPs). As much as possible, the patients should be oncologically treated locally. A permanent on call system has been set up to deal with severe problems and acute emergencies. With more complex problems and extensive high-risk therapies, the patients, after diagnosis and pre-therapy, can be sent to the oncological specialist department at the Klagenfurt General Hospital, and subsequently back to their local GP.
These tumour boards are periodically visited by medical and radio-oncological consultants, (6 hospitals, except Klagenfurt). This way it is ensured that almost all cancer patients are seen by a tumour board. Furthermore for specialists working outside of hospitals, the specialised outpatient departments of the oncological centre are available for requests, treatment recommendations or presentation of patients.
As well as the oncological centre in Klagenfurt, there are also experienced medical-oncological teams in Villach, St. Veit and Wolfsberg. As well as in Villach and Klagenfurt, there are also general surgery and gynaecological departments with emphasis on oncological treatments in Friesach, Spittal a.d. Drau, St. Veit and Wolfsberg (in alphabetical order). Essential specialty departments for cancer patients such as urology, pneumology, heart and chest surgery, head and neck, mouth-jaw-face surgery, plastic and reconstruction surgery, neuro-surgery and nuclear medicine, (incl.

treatment ward for open radionuclids and a PET/CT scanner for diagnostics and radiotherapy treatment planning) have been set up at the Klagenfurt General Hospital.

Following recent concepts of integrated care, rehabilitation centres were established, whereas in Klagenfurt this department is in close structural relation to the oncology department in the framework of the ISO-certified centres for interdisciplinary pain therapy, oncology and palliative medicine (ZISOP).
Access to therapy for all patients is free of charge (financed by the various general health insurances). Various employers and private insurance companies offer favourable possibilities for additional private insurance to employees, which leads to a higher percentage of people with additional health insurance in Carinthia when compared with other provinces.

**Screening programs**

During the study period, no country-wide screening programs, except for regional activities of hospitals in terms of colorectal cancer (information and cancer prevention by endoscopical screening - results have not been published yet) and melanoma, were performed.

## *3.4 Tyrol* (Willi Oberaigner, Helmut Mühlböck)

### 3.4.1 Incidence data

The Cancer Registry of Tyrol commenced operations at the end of 1986, and has been population-based since 1988. Since 1968 there has been a law in Austria, obliging hospitals to report every cancer case to the Austrian Federal Bureau of Statistics. In addition to this national system, some provinces have local registries that are responsible for cancer registration.
The Cancer Registry of Tyrol is a **department within the TILAK**, an organisation managing the university hospital of Innsbruck and some smaller hospitals in Tyrol. The registry is staffed by a part-time epidemiologist, one full time registrar, one part-time registrar, and data entry clerks.
All hospitals are obliged to report cancer cases. Most departments fill in a form consisting of personal data, incidence date, the most valid basis of diagnosis, topography, histology, behaviour, staging and summary of first treatment.
In addition, a **second data base** is kept containing information about cancer patients found in various sources. The main source is taken from pathology reports, but information is also gathered and used from radiotherapy units, other specialised cancer care units, department systems and the diagnosis upon discharge from hospitals.
All entries in this second data base are worked on until either a cancer diagnosis is established or can be ruled out. Finally, the registry has access to official mortality files for the population of Tyrol. The registry sets up a DCN database, and finally a DCO database. DCN cases are investigated via direct calls to general practitioners until a medical record concerning the cancer diagnosis is found; in other cases this is a DCO case.
**Coding of site and histology** is done by one trained person. Up to 1999, cases were coded according to ICD-O Version 1, and since 2000 according to ICD-O Version 3. **Multiple cancers** are recorded separately at the request of the physicians, but the IARC rules are used for reporting.
**Follow up information** is based on probabilistic record linkage between the incidence data and all-cause mortality data for the province of Tyrol. In Austria, there is no unique person identifier used in the medical system, so data combined from different sources need a valid method of record linkage. For this purpose, we developed a probabilistic method of record linkage that suits our special needs[1].
We receive a full address and hence assign a **unique municipality code** to a cancer case based on the address at time of diagnosis.

Programs for **checking personal data** (for example rare ages, combination of sex and first name, ordering of date-values) were developed within the registry. Generated lists are checked manually and, if there are queries, the local communities are contacted. The cancer data are checked using the IARC Check program.
**Use of the data:** Detailed annual reports have been produced since 1988. The data are widely used by physicians (especially from the university hospital in Innsbruck).

### 3.4.2 Mortality Data

Mortality data are not collected by the cancer registry, but instead, official mortality data uniformly collected across Austria are used for this study. Death certificates are written by specially trained medical doctors. Coding is done centrally for the whole of Austria by specialists following international guidelines. Deaths are attributed to location according to their last residence.

### 3.4.3 Population

Tyrol is one of nine provinces in Austria, and is situated in the alpine region in the western part of Austria. The area covers 12,648 km², 12.5% of which is habitable. The average altitude of the habitable regions is about 740 m.

In the year 2000, the population was 669,710 (51.2% female). 18.3% of the population was 15 years or younger and 13.5% were 65 years or older. 9% of the people are from foreign countries, mainly from the former Yugoslavia and Turkey. About 90% are Roman Catholics.

Average life expectancy clearly increased in the last decades and in the year 2000 reached 82.2 for woman and 76.6 for men. In 2000, the birth rate was 10.7 per 1,000, and the fertility rate was 1.36. The general mortality rate was 7.2 per 1000 and the cancer mortality rate 1.8 per 1000 people.

In 2000, the gross domestic product for Tyrol per capita was 25,200 Euro. Expenditure for the health system was 7.7% of total GDP[2] resulting in 1,940 Euro per capita. The main occupational groups are personal services (32%), commerce and traffic (22.2%), industry and trade (21.6%) and tourism (10.4%), with some 7% unemployed.

#### Municipalities

Concerning the **structure of municipalities**, Tyrol consists of 278 municipalities ranging from 60 to 113392 inhabitants. Roughly 30% of people live in municipalities with less than 2000 inhabitants (nearly 70% of municipalities), 30% with 2000 to 5000 inhabitants (25% of municipalities), 25% with 5000 to 20000 inhabitants (20 municipalities) and 15% in the city of Innsbruck with a population of over 100,000 people.

### 3.4.4 Description of the Health System

#### Providers

Medical facilities are provided by the University Hospital in Innsbruck (offering both basic facilities for Innsbruck and special facilities for the whole province), nine local hospitals in the rural districts and two semi-private hospitals in Innsbruck. Distance to hospitals is maximum 40km to local hospitals and 110km to central university hospitals. The district of Lienz (Osttirol) is an exception as it is separated geographically from Tyrol. The distance to Innsbruck is about 200 km.

Most pathology diagnoses are done by one main and two private pathology institutes in Innsbruck. There are two pathology laboratories in Innsbruck that diagnose melanoma and female cancers.

For most cancer sites, approximately one half of the patients are treated by departments of the university hospital where treatment is of very high standard. In some of the district hospitals, interdisciplinary oncological groups have been established bringing together oncologists from the district hospital and from the university hospital.
For some cancer sites almost all patients are treated at the university hospital. This includes leukaemias and lymphomas, head and neck cancers, ovarian cancers, and advanced melanomas. Furthermore a high percentage of lung cancer cases are treated at a centre related to the university hospital, and all radiotherapy is carried out at the university hospital.

**Treatment in hospitals outside of Tyrol** is rather seldom in most parts of Tyrol. There are two reasons for this fact. Firstly, the university hospital in Innsbruck was the only one in western Austria during this study. Secondly, Tyrol is separated in the west and south by mountains with only few passes. The only exception is the eastern part of Tyrol where a percentage of patients are mostly treated in the city of Salzburg. However, we don't have access to information about these patients.

### Screening, early detection

Intensive PSA testing is being carried out in Tyrol. Mammographic screening for breast cancer is available throughout Austria, although screening programmes are not organized according to international guidelines. Cervical smear screening for cervical cancer is offered by gynaecologists, but again there is no organized programme. Most screening activities are free of charge and are paid for by insurance institutions, although there have been slight changes in this respect over the last decade.
With regard to palliative care, hospices have been set up in recent years, but are not able to cover a large portion of terminal cases. Most terminal patients are supported by the very well established home-based care system.

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## *3.5 Vorarlberg* (Hans Concin, Günter Diem, Karin Parschalk)

### 3.5.1 Incidence data

The Vorarlberg Cancer Registry was founded in 1978 by the head of the Pathology Department at Feldkirch Hospital. Since 1981 it has been managed by the Arbeitskreis für Vorsorge und Sozialmedizin (**aks)**; from that time on electronic data processing has been used.

**Organisational Integration**

The **aks** is an agency for preventive and social medicine. This organisation also collects data from various sources such as the Vaccination Registry, Pap smear and Mammography Screening Programme and Health Examination Programme. All data are linked and used for publications and scientific reports known as the Vorarlberg Health Monitoring and Promotion Programme (VHM&PP). The **staff** of the Cancer Registry consist of the Scientific Manager (work contract), a part time (12.5%) Registry Manager (a medical doctor), the Administration Officer (50%) and the staff of the IT department of the aks as required. The **Vorarlberg Cancer Registry Project Group** makes key decisions for the Cancer Registry and, in addition to the staff, consists of Medical Experts.

**Registration procedure**

The first incentive for recording malignant tumour cases is the diagnostic finding – histological, cytological and autoptic - at the Institute for Pathology at the Feldkirch Regional Hospital, the only Pathology Institute in Vorarlberg. This institute supports the registry in two ways: By attaching a survey form, already filled out with the known data of the case, to each diagnosis of a malignant tumour, which is then completed by doctors in hospitals and sent to the Cancer Registry. The administrative officer and Registry manager process the data further (coding, comparison with existing data, entry). The second way the Institute of Pathology aids the Registry is by electronically giving data to the Registry. Some part of pathology diagnosis is done by institutes outside of Vorarlberg.

The extent of the basic documentation is based on the Austrian Cancer Reporting Act. Every incident tumour case must be reported. The Vorarlberg Registry does not organize follow ups as other registries do. Patient life status is assessed by record linkage with mortality data.

**Coding** of site and histology is done by the Registry Manager (medical doctor) according to ICD-O Version 1.

**Multiple cancers** are registered according to the IARC rules.

In addition to invasive malignant tumours, the registry also records: **in situ** carcinomas, moderate and serious **dysplasias** (cervix uteri, ENT area, gastrointestinal tract, breast, dysplastic naevi), skin basaliomas and diseases entailing **a risk of cancer** such as colonic adenomas, colitis ulcerosa, and Crohn's disease. Data is recorded for the Colon **Cancer Risk Programme** with the support of the Vorarlberg Krebshilfe.

Cases without histological diagnosis (diagnosis based on haematological or purely clinical findings or by means of clinical investigations) are reported directly to the Vorarlberg Cancer Registry by the clinics. Additional information on melanoma cases is provided by the Pathology Laboratory of the Dermatology Clinic in Innsbruck. The **Radio-Oncology Department** at Feldkirch LKH plays a key role in ensuring that the Registry's data is complete by providing its own documentation.
Diagnoses from the **hospital information systems** (coded in ICD-9 or ICD-10) are used at greater intervals for comparison with the existing registry data and for research regarding not yet registered cases.
From 1998 onwards, data on the incidence of cancer were supplemented through **DCN** (death certificate notified) cases, as Statistics Austria gave the order for these cases to be examined to reduce the **DCO** (death certificate only) rate in the Austrian Cancer Registry. Till 1997, DCN cases could not be traced back and so were accepted as DCO cases.

**Data Quality**
The first quality inspection is performed by the medical manager before the data is entered. In addition, IARC check programs and plausibility checks established by the Cancer Registry are applied on a periodic basis.

**Use of data:** Updated incidence figures are reported to the Vorarlberg Director of Health on a quarterly basis. Further evaluations are performed on request, e.g. requesting presentations and scientific research from doctors (in such cases, the data passed on will always be anonymous, apart from own patients). Finally, joint evaluations are also conducted in conjunction with preventive medicine with the primary aim of providing quality control for early detection programmes.
Incidence data for the Vorarlberg Cancer Registry between diagnosis years 1993-1997 has appeared in a publication entitled "Cancer Incidence in Five Continents" issued by the International Association for Research on Cancer (IARC).

### 3.5.2 Mortality Data

The official data collected by Statistics Austria were used for analysing cancer mortality.

### 3.5.3 Population

Vorarlberg is the most western province of Austria and borders on Switzerland, Germany, Liechtenstein and Tyrol (19% of its border). The area covers 2,601 square kilometers, of which only 21% are habitable. 90% is mountainous area.
According to the 2001 census, the population is 351,095: 177,758 females, 173,337 males (census 1991: 332,104). More than half of the people (51%) live in communities with more than 10,000 inhabitants, 43% in communities with 1,000 – 10,000 inhabitants, and the others in smaller communities. There are two main areas - the Rheintal (Rhine river valley) and the Walgau which

together host 81% of the Vorarlberg population. The population density in the Rheintal is rather high (1,125 per square kilometer), when compared with the entire province (620 per $km^2$).
Life expectancy at birth is 75.8 for males and 82.6 for females (2001).
The death rate in 2001 was 1.7 for malignant diseases (7.0 for all deaths).
14.3% of the people are from foreign countries (census 1991): 6.3% Turkey, 5.1% the former Yugoslavia, 1.3% Germany. The unemployment rate in 2001 was 4.3%.

### 3.5.4 Description of the health system

#### Providers

5 public and 2 private hospitals cover most of the medical needs. In special cases patients are sent to hospitals in other areas, mostly the University hospital in Innsbruck, Tyrol.
Cancer treatment is provided by every hospital. There is only one Radio-Oncology department in the province, which is in Feldkirch. Hohenems hospital has recently opened a palliative care department.

#### Screening programs

Well organised and well used **preventive care and/or early detection programmes** organised by **aks** have been available in Vorarlberg for many years. Thus, in a three year period (1998-2000), 37% of women and 32% of men took part in health checks (including hemocult tests) and 45% in a gynecological preventive health examination (including PAP smear). A mammography screening program has been running since 1989.

# 4 Results

## *4.1 All except NMSC* (Hans Concin)

ICD-9 Code: 140-208 except 173

### 4.1.1 Introduction

**Females.** Although malignant illnesses are very heterogeneous, the summarization of all tumors results in a good overview of the occurance of cancers.
Non Melanoma Skin Cancers (NMSC) typically aren't included in cancer statistics (refer to methods).

**Males.** Besides the exclusion of NMSC, a summary for men, in which prostate cancer is excluded, is analyzed graphically, as well as in table form.
Due to forced PSA screening, the large number of prostate carcinomas (e.g. 1/3 of all incidences of carcinomas in Tyrol) skews the overall picture (refer to Prostate Cancer).

### 4.1.2 Epidemiology

**Females.** For women, standardized incidence varies from a particularily low value of 209 in Vorarlberg, to 254 in Carinthia. Tyrol and South Tyrol are at 235, and Trentino is at 247.
On the contrary, the mortality rate is the lowest in South Tyrol with 84.6, followed by Vorarlberg, Carinthia and Trentino, with the highest rate being 93.1 in Tyrol.
These differences in mortality are minute and not statistically significant.
When compared internationally, the mortality rate lies in the range of other central European countries.

**Males.** For men, incidence varies between 298 in Vorarlberg and 349 in South Tyrol. The difference between Vorarlberg and South Tyrol is significant for incidence, but not for mortality, which is lowest in Tyrol with 142 and highest in Trentino with 180. The standardized mortality rate is significantly higher in Trentino than in Vorarlberg, Tyrol and Carinthia.

### 4.1.3 Data Quality

**Females.** The DCO-Rates of 1.0 in South Tyrol, 1.7 in Trentino and 3.9% in Tyrol is low, while they are high in Vorarlberg and Carinthia with rates of 6.8 and 9.6, respectively.
Vorarlberg is in the lead for portion of microscopically verified malignant cases with 96.7%. This however also means that not enough carcinomas that are diagnosed clinically, through imaging, or other methods are included in the statistics. At 94.9%, Trentino has the lowest portion of microscopically verified malignomas for women.

The mortality/incidence rate varies between 0.45 and 0.49, with an average of 0.47 across all regions.

**Males.** For men, the DCO rates of 0.9 in South Tyrol, 1.2 in Trentino and 2.2 in Tyrol are very low, while Vorarlberg lies at 5.1 which is slightly above a strived for acceptable level of quality. Carinthia lies at 8.9, which is clearly above this level.

On average, microscopically verified diagnoses are at 90.2%. Here Vorarlberg also has a very high portion at 97.0 (see women above). With 83.3% of diagnoses being microscopically verified, Trentino obviously has a large portion of malignant diagnoses that aren't microscopically verified.

If prostate cancers are excluded, the incidence ranking of the 5 regions changes. Vorarlberg remains lowest, while Trentino, with 300, now clearly lies ahead of Tyrol, Carinthia and South Tyrol.

With prostate cancer excluded, the lowest mortality rate is in Tyrol with 128, and the highest rate is in Trentino with 166. The high mortality rate in Trentino, as opposed to Tyrol, Carinthia and Vorarlberg, is statistically significant.

### 4.1.4 Risk Factors, early detection, screening

Lifestyle and environmental factors influence cancer incidence and mortality more than can be attained through screening and therapy.

The most significant risk factors are:

- Smoking and alcohol consumption
- Obesity
- Low consumption of fruits and vegetables
- Minimal exercise
- Unsafe sex
- Indoor and outdoor pollution

In the industrial provinces, 80% of the mouth and laryngeal carcinomas can be attributed to alcohol consumption and smoking. 85% of carcinomas of the oesophagus can be attributed to alcohol consumption, smoking, and low consumption of fruits and vegetables. In total, it is assumed that 37% of all carcinomas in industrial provinces can be attributed to lifestyle and environmental factors.

The European Commission recommended mammograms to screen for breast cancer in women between the ages of 50 and 69, stool examination for occult blood for colorectal cancer in men and women between the ages of 50 and 74, and pap smears to detect uterine cancer. Signs of cervical cancer start between the ages of 20 and 30 (in Brussels, May 8$^{th}$, 2003).

International randomized studies are currently underway for prostate cancer.

### 4.1.5 Geographical Variation

**Females.** A higher incidence rate is seen in Lower Carinthia, while the incidence is just below the average in the central and far part of Bregenzerwald.

**Males.** For incidence, the distribution pattern with as well as without prostate cancer is very heterogeneous. With or without prostate cancer, lower incidence is seen in Bregenzerwald, individual regions of Tyrol, eastern Tyrol and western Carinthia, while small parts of south-eastern South Tyrol, and south-eastern Trentino show higher incidence with or without exclusion of prostate cancer.
With or without prostate cancer, the picture becomes significantly more homogeneous when speaking of mortality.
There exists a north-south gradient with higher mortality in Trentino.

**Tab. 1**: All except NMSC – Incidence

| Region | FEMALES | | | | MALES | | | |
|---|---|---|---|---|---|---|---|---|
| | New cases | Rates x 100,000 | | SIR | New cases | Rates x 100,000 | | SIR |
| | | Crude | Std | | | Crude | Std | |
| **Trentino** | 5,844 | 494.9 | 246.9 (239.4,254.3) | 1.02 (0.99,1.05) | 6,611 | 588.6 | 339.4 (330.8,348.1) | 1.00 (0.98,1.03) |
| **South Tyrol** | 5,013 | 432.3 | 235.1 (227.8,242.5) | 1.01 (0.98,1.04) | 6,030 | 534.8 | 348.8 (339.7,358.0) | 1.04 (1.01,1.06) |
| **Carinthia** | 6,782 | 467.1 | 254.3 (247.4,261.2) | 1.06 (1.03,1.08) | 7,421 | 543.8 | 341.4 (333.3,349.5) | 1.02 (0.99,1.04) |
| **Tyrol** | 6,629 | 390.1 | 235.8 (229.5,242.1) | 0.99 (0.96,1.01) | 7,598 | 467.8 | 345.4 (337.4,353.3) | 1.01 (0.99,1.03) |
| **Vorarlberg** | 2,872 | 328.7 | 208.9 (200.6,217.2) | 0.87 (0.84,0.90) | 3,277 | 380.7 | 297.6 (287.3,307.9) | 0.88 (0.85,0.91) |
| **TOTAL** | **27,140** | **426.4** | **238.6(235.4,241.7)** | | **30,937** | **507.1** | **338.1(334.2,342.0)** | |

**Tab. 2**: All except NMSC – Mortality

| Region | FEMALES | | | | MALES | | | |
|---|---|---|---|---|---|---|---|---|
| | Deaths | Rates x 100,000 | | SMR | Deaths | Rates x 100,000 | | SMR |
| | | Crude | Std | | | Crude | Std | |
| **Trentino** | 2,794 | 236.6 | 89.6 (85.6,93.6) | 1.00 (0.96,1.04) | 3,757 | 334.5 | 179.5 (173.5,185.5) | 1.14 (1.11,1.18) |
| **South Tyrol** | 2,264 | 195.2 | 84.6 (80.6,88.6) | 0.97 (0.93,1.01) | 2,911 | 258.2 | 158.8 (152.8,164.7) | 1.03 (0.99,1.06) |
| **Carinthia** | 3,024 | 208.3 | 87.9 (84.2,91.6) | 1.00 (0.96,1.03) | 3,435 | 251.7 | 146.7 (141.6,151.9) | 0.95 (0.92,0.99) |
| **Tyrol** | 3,233 | 190.3 | 93.1 (89.4,96.8) | 1.04 (1.01,1.08) | 3,347 | 206.1 | 141.7 (136.8,146.7) | 0.91 (0.88,0.94) |
| **Vorarlberg** | 1,449 | 165.8 | 87.1 (82.1,92.1) | 0.97 (0.92,1.02) | 1,698 | 197.2 | 150.7 (143.5,157.9) | 0.97 (0.92,1.02) |
| **TOTAL** | **12,764** | **200.5** | **88.8(87.0,90.6)** | | **15,148** | **248.3** | **155.3(152.8,157.9)** | |

**Tab. 3**: All except NMSC – Data Quality

| Region | FEMALES | | | MALES | | |
|---|---|---|---|---|---|---|
| | % DCO | % MV | M/I | % DCO | % MV | M/I |
| **Trentino** | 1.7 | 84.9 | 0.48 | 1.2 | 83.3 | 0.57 |
| **South Tyrol** | 1.0 | 88.3 | 0.45 | 0.9 | 89.2 | 0.48 |
| **Carinthia** | 9.6 | 90.6 | 0.45 | 8.9 | 88.9 | 0.46 |
| **Tyrol** | 3.9 | 94.5 | 0.49 | 2.2 | 95.3 | 0.44 |
| **Vorarlberg** | 6.8 | 96.7 | 0.49 | 5.1 | 97.0 | 0.51 |
| **TOTAL** | **4.3** | **90.5** | **0.47** | **3.4** | **90.2** | **0.49** |

## All – NMSC(173) – Females /
## Tutte le sedi eccetto Pelle, non melanomi (173) – Femmine /
## Alle Lokalisationen außer NMSC (173) – Weiblich

***Fig. 1:*** **Incidence/Incidenza/Inzidenz**

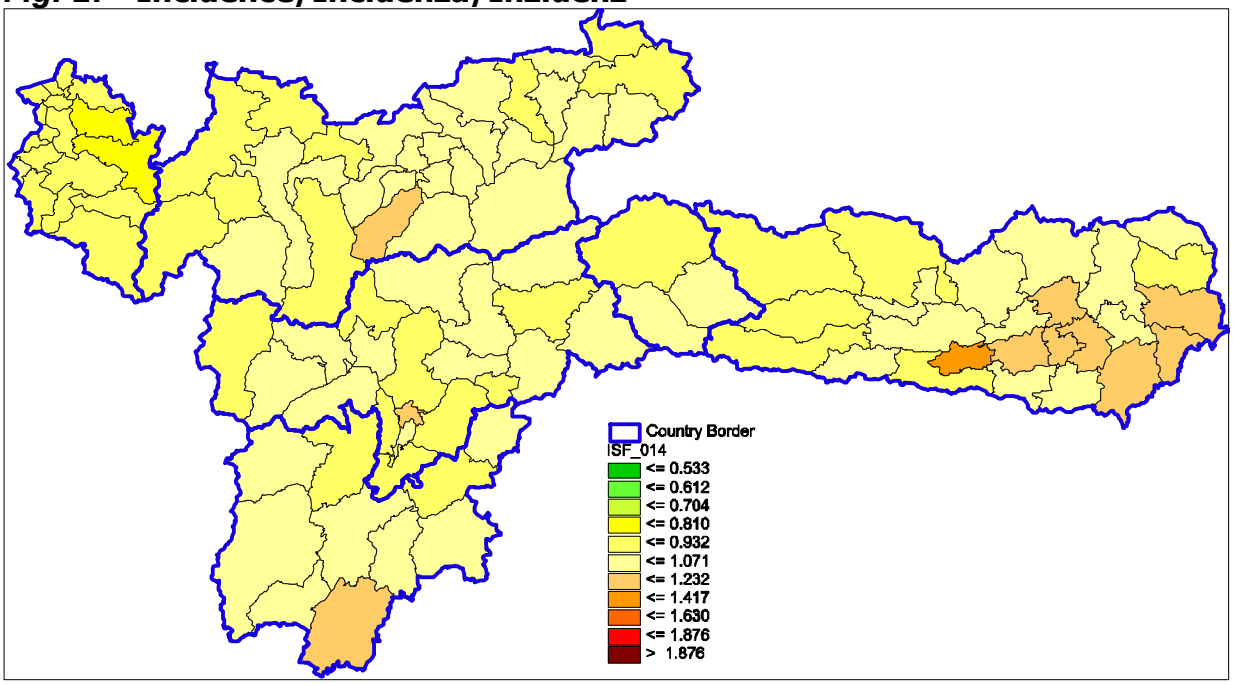
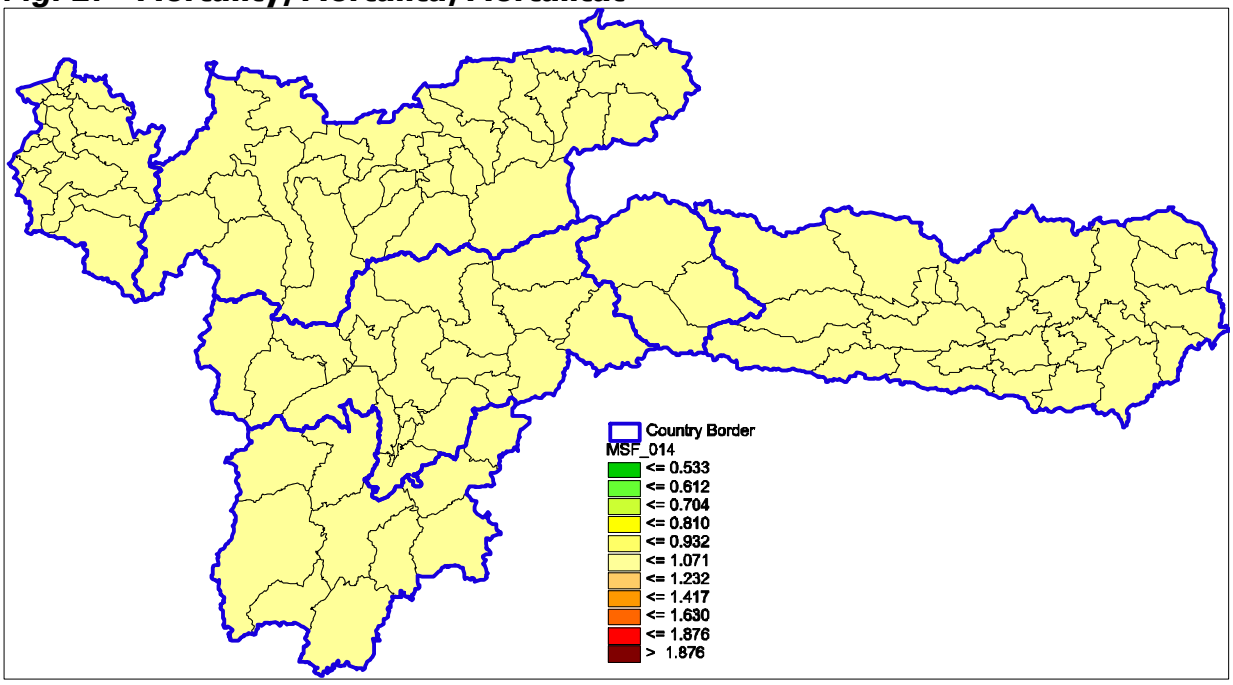



***Fig. 2:*** **Mortality/Mortalità/Mortalität**



## All – NMSC(173) – Males /
## Tutte le sedi eccetto Pelle, non melanomi (173) – Maschi /
## Alle Lokalisationen außer NMSC (173) – Männlich

***Fig. 3:*** **Incidence/Incidenza/Inzidenz**

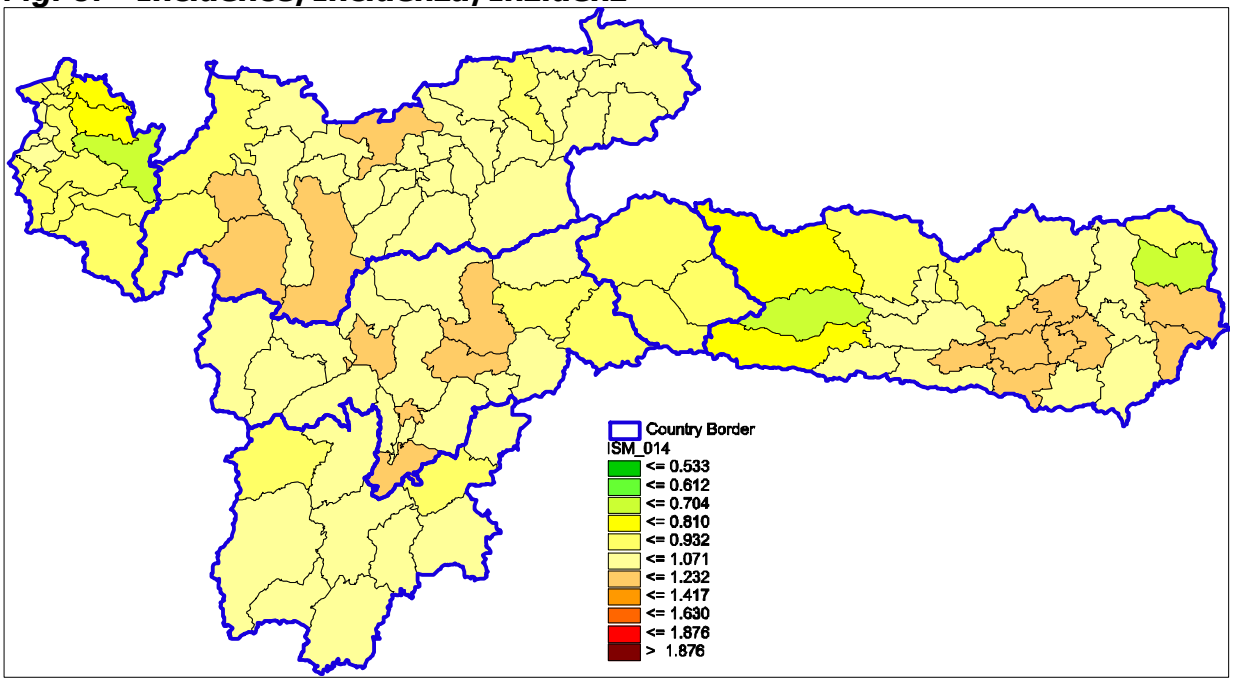
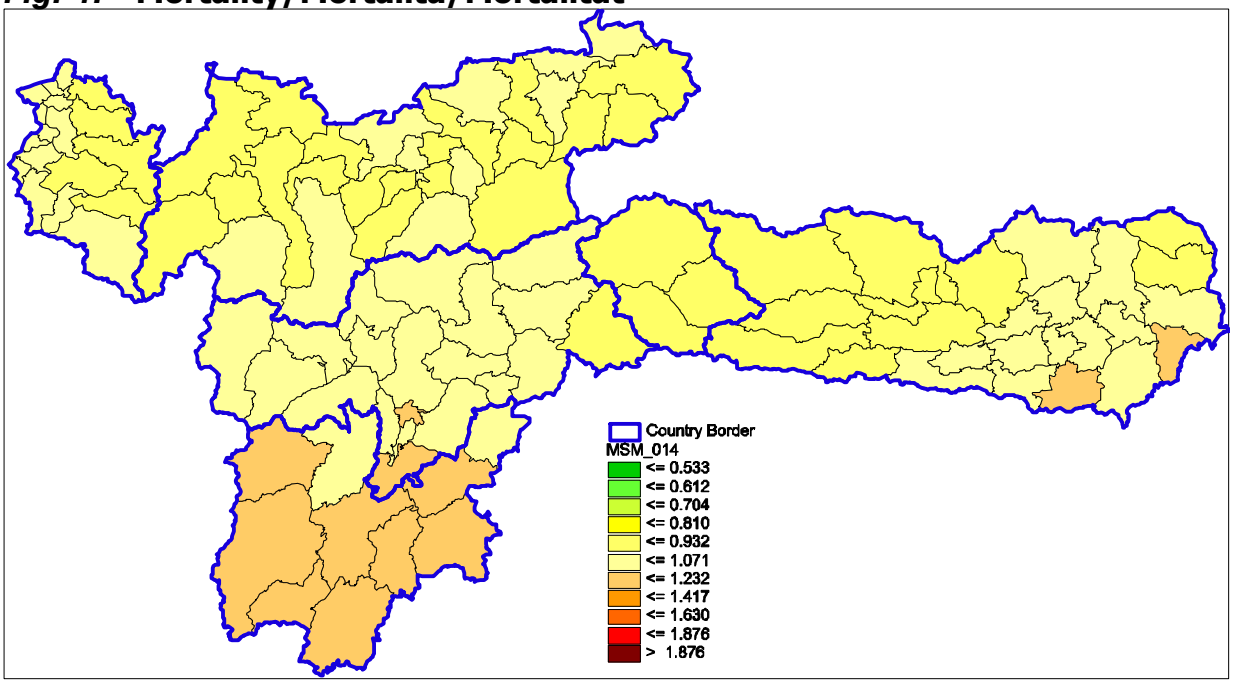



***Fig. 4:*** **Mortality/Mortalità/Mortalität**



**Tab. 4**: All except NMSC and prostate - Incidence

| Region | MALES | | | |
|---|---|---|---|---|
| | New cases | Rates x 100,000 | | SIR |
| | | Crude | Std | |
| **Trentino** | 5,754 | 512.3 | 300.3 (292.1,308.6) | 1,14 (1,11,1,17) |
| **South Tyrol** | 4,829 | 428.3 | 283.7 (275.4,292.0) | 1,08 (1,05,1,12) |
| **Carinthia** | 5,626 | 412.2 | 265.4 (258.2,272.7) | 1,01 (0,98,1,04) |
| **Tyrol** | 5,137 | 316.3 | 234.6 (228.0,241.2) | 0,89 (0,86,0,91) |
| **Vorarlberg** | 2,400 | 278.8 | 219.6 (210.7,228.5) | 0,83 (0,80,0,87) |
| **TOTAL** | **23,746** | **389.2** | **263.2(259.7,266.7)** | |

**Tab. 5**: All except NMSC and prostate - Mortality

| Region | MALES | | | |
|---|---|---|---|---|
| | Deaths | Rates x 100,000 | | SMR |
| | | Crude | Std | |
| **Trentino** | 3,425 | 304.9 | 166.3 (160.4,172.1) | 1,18 (1,14,1,22) |
| **South Tyrol** | 2,620 | 232.4 | 144.8 (139.1,150.5) | 1,04 (1.00,1,08) |
| **Carinthia** | 2,988 | 218.9 | 130.4 (125.5,135.3) | 0,93 (0,90,0,97) |
| **Tyrol** | 2,950 | 181.6 | 127.5 (122.8,132.2) | 0,91 (0,87,0,94) |
| **Vorarlberg** | 1,483 | 172.3 | 132.8 (126.0,139.6) | 0,94 (0,89,0,99) |
| **TOTAL** | **13,466** | **220.7** | **140.5(138.0,142.9)** | |

**Tab. 6**: All except NMSC and prostate - Data Quality

| Region | MALES | | |
|---|---|---|---|
| | % DCO | % MV | M/I |
| **Trentino** | 1.2 | 83.1 | 0.60 |
| **South Tyrol** | 1.0 | 88.2 | 0.54 |
| **Carinthia** | 9.8 | 86.5 | 0.53 |
| **Tyrol** | 2.5 | 93.5 | 0.57 |
| **Vorarlberg** | 6.0 | 95.9 | 0.60 |
| **TOTAL** | **3.7** | **88.5** | **0.57** |

## All – NMSC (173) – Prostate (185) – Males /
## Tutte le sedi eccetto Pelle, non melanomi (173) e Prostata (185) – Maschi /
## Alle Lokalisationen außer NMSC (173) und Prostata (185) – Männlich

***Fig. 5:*** **Incidence/Incidenza/Inzidenz**

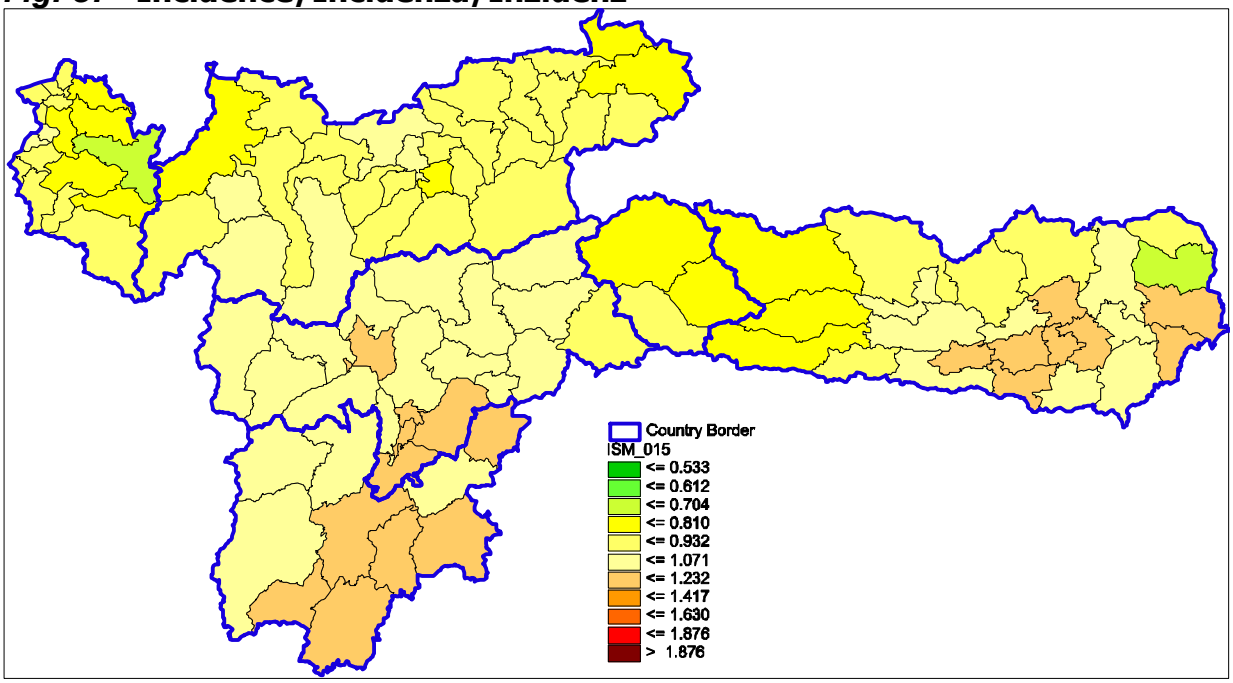
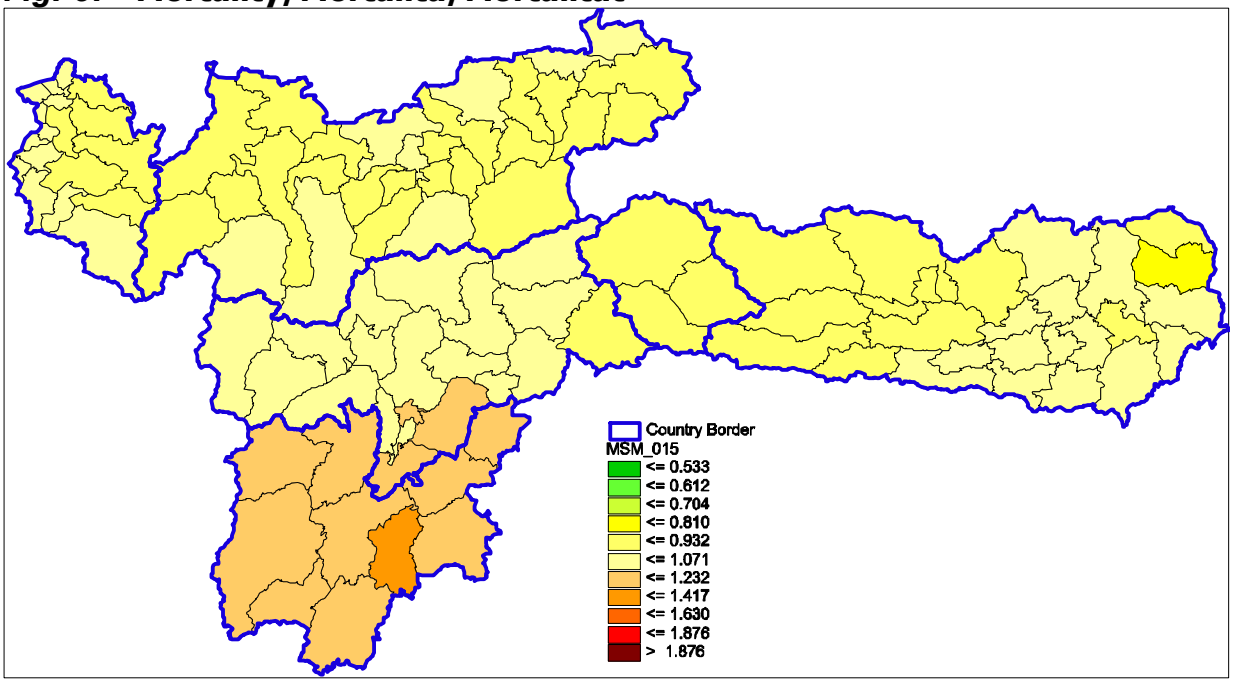



***Fig. 6:*** **Mortality/Mortalità/Mortalität**



### 4.1.6 Call for action

**A clear reduction in incidence and mortality due to cancer can be attained through prevention, i.e. by influencing lifestyle and environmental factors. A healthy lifestyle (exercise, nutrition, a happy life, non smoking, and moderate alcohol consumption) and the reduction of high risk environmental factors can significantly reduce incidence and mortality.**
**Within the scope of secondary prevention, improved screening comes into play for a few illnesses. Increased intensity of screening for preliminary phases of cervical and colorectal carcinomas can distinctively contribute to a reduction in incidence and mortality.**

#### *Proposte operative*

*In primo luogo, una riduzione dell'incidenza e della mortalità per tumore può essere ottenuta attraverso la prevenzione primaria, cioè intervenendo sullo stile di vita e sui fattori ambientali. Uno stile di vita sano (fare esercizio fisico, seguire un corretta alimentazione, condurre una vita felice, non fumare e moderare il consumo di alcool) e la riduzione dei fattori ambientali ad elevato rischio possono ridurre significativamente l'incidenza e la mortalità.*
*Nell'ambito della prevenzione secondaria, il potenziamento dei programmi di screening gioca un ruolo importante per alcune sedi di malattia. Il consolidamento dell'attività di diagnosi precoce per i carcinomi della cervice uterina e del colon-retto può certamente contribuire ad una riduzione dei casi invasivi e della mortalità.*

#### Empfehlungen

Eine deutliche Reduktion der Krebsinzidenz und Mortalität kann in erster Linie durch primäre Prävention, d.h. durch Beeinflussung von Lebensstil und Umweltfaktoren erzielt werden. Ein gesunder Lebensstil (Bewegung, Ernährung, Lebensfreude, Rauchfreiheit und mäßiger Alkoholkonsum) und die Reduktion von Umweltfaktoren mit erhöhtem Risiko können Krebsinzidenz und Mortalität deutlich reduzieren.
Im Rahmen der sekundären Prävention kommt für einige wenige Erkrankungen eine Verbesserung des Screenings in Frage. Vor allem eine Intensivierung des Screenings auf Vorstufen des Zervixkarzinoms und des kolorektalen Karzinoms kann eine deutliche weitere Senkung der Inzidenz und Mortalität erzielen.

#### References


- Goodarz Danaej at al.: Causes of cancer in the world: comparative risk assessment of nine behavioural and environmental risk factors - Lancet 2005; 19; 366: 1784-93
- European commission: Press releases, Brussels 8 may 2003

## *4.2 Head and Neck & Oesophagus & Larynx* (Francesco Bellù)

ICD-9 Code: 140-150, 161

### 4.2.1 Introduction

In this paragraph we analyse a group composed of smaller cancer sites, referred to by ICD IX codes 140-150, 161 (ICD X: C00 - C15, C32). This group is homogeneous: the squamous cell carcinoma is clearly the prevalent histomorphology, moreover the etiology of these malignant neoplasm is common. A great difference in incidence is evident between male and female populations: in the whole area, during the considered period, we observed 2,549 new cases amongst males compared to only 610 new cases amongst females, with a 4:1 ratio of males to females. On the whole, these tumors represent 2.2% of all tumors (except NMSC) in the female population and 8.2% of all tumors (except NMSC) in the male population. With reference to females, the frequency of incident cases is low and substantially homogeneous in the Alpine area: the weight of this group on the total number of new cases ranges from 1.9% (Carinthia) to 2.8% (Trentino). On the contrary, males display a wider range in percentage weights distribution of these groups for all tumors: Austrian regions are all grouped around 6-7%, while Italian areas range from 9.7 to 11.5%.

### 4.2.2 Epidemiology

Since this group is represented by several tumor sites, (mouth, pharynx, esophagus and larynx), epidemiological data are obtained by aggregating available incidence and mortality rates for each single site. In more developed countries, the standardized incidence rates are approximately 27.0 x 100,000 (males) and 5.4 x 100,000 (females), which are fairly close to the values observed in our area (respectively 29.6 x 100,000 and 5.5 x 100,000). European countries show a sensible variability in male incidence, ranging from higher values observed in Hungary (60.4) and France (53.1), to lower values in Nordic countries - Norway (14.8), Finland (12.7), Sweden (12.5) - where these tumors are considerably less diffused. The incidence in Northern America (24.1) is aligned with average European values. Mortality rates in male populations are lower; generally between 10 and 20 x 100.000. The eastern European population - Hungary (39.3) and Slovakia (31.2) – is characterized by higher values, while Northern American countries (9.6) present a more favorable situation [1].

### 4.2.3 Data quality

Data quality seems sufficient in the whole area: Austrian regions show moderate excess in DCO values, higher than Italian regions (Carinthia: 8.6% for females and 5.8% for males, Tyrol: 3.6% for females, Vorarlberg: 4.3% for males). However, the percentage of incident cases with microscopical verification is always elevated, which is usual for these types of cancers: 96.5% in males and 94.7% in females. Moreover, M/I ratio is aligned with our knowledge of these malignant tumors, presenting a value around 0.50 (0.53 in males and 0.46 in females), without noticeable differences among the regions. There is consistency between incidence and mortality data.

### 4.2.4 Risk factor, early detection, screening

As known, the etiology of these tumors is related to cigarette smoke, active or passive; but more recently alcohol abuse (particularly wine, in the risk areas indicated above) has been indicated as a major risk factor. The association of smoke and alcohol could therefore be the most plausible reading-key of the risk excesses shown by these maps [2,3,4,5]. Prevention of these kinds of tumors must therefore consider measures to fight against smoke, active and passive, and programs for dietary education, geared towards the consistent reduction of alcohol abuse, especially in Italian regions [3,6,7]. Up to today, screening programs for these tumors are not provided, however prevention can occur through an otorhinolaryngological examination, which is recommended at least every two years.

### 4.2.5 Survival

As a group of different neoplasms, head and neck cancers display a wide range of 5-year relative survival rates: excellent prognosis (lip: over 90%), good prognosis (larynx, salivary glands, round 60%), fair prognosis (tongue, oral cavity, oropharynx, nasopharynx: 30-45%) and poor prognosis (hypo pharynx and oesophagus: under 25%).
Generally, males have survival rates lower than females. Relative survival rates are lower in eastern Europe than they are in western Europe. Low survival rates are also related to delay in diagnosis, as early signs of head and neck cancers are frequently ignored. Hence, diagnosis is often made in an advanced stage where the cancer does not respond to treatment [8].

### 4.2.6 Geographical variation

**Females**: the smoothed map reveals substantial homogeneity or the relative risk in the whole Alpine area, except for the district around the city of Bolzano and some areas of the Trentino region, particularly Bassa Valsugana and Tesino, Alto Garda and Ledro. Other geographical units, like Valle dell'Adige, Giudicarie and Rendena, Vallagarina, show a light risk. With reference to mortality, data are rather homogeneous to incidence data. In the **female** populations we observe that the smoothed map shows the absence of areas with risk excess.
**Males**: as opposed to females, the smoothing procedure shows a noticeable **increase in risk** from North to South. The Trentino region appears to be the area with the greatest incidence, but South Tyrol is also characterized by a higher risk, especially for the area around the district of Bressanone. On the contrary, western South Tyrol (Merano, Naturno and Alta Val Venosta) shows lower risk levels. Head and neck tumors are less diffuse in all Austrian regions: in these populations, the risk is lower than in Italian regions. With reference to males, mortality rates are noticeably higher (from 15.0 to 39.9 x 100,000) and the SMR distribution shows a clear pattern (risk increase) from North to South. This pattern is illustrated by the smoothed map, where the Trentino region comes out as the higher mortality area. Some districts in central and eastern South Tyrol present high mortality too, while all Austrian regions are characterized by low mortality.

**Tab. 7**: Head and Neck & Oesophagus & Larynx - Incidence

| Region | FEMALES | | | | MALES | | | |
|---|---|---|---|---|---|---|---|---|
| | New cases | Rates x 100,000 | | SIR | New cases | Rates x 100,000 | | SIR |
| | | Crude | Std | | | Crude | Std | |
| **Trentino** | 163 | 13.8 | 6.5 (5.3,7.7) | 1.27 (1.08,1.48) | 757 | 67.4 | 40.9 (37.9,43.9) | 1.42 (1.32,1.53) |
| **South Tyrol** | 120 | 10.3 | 6.1 (4.9,7.3) | 1.08 (0.89,1.29) | 592 | 52.5 | 36.2 (33.3,39.2) | 1.24 (1.15,1.35) |
| **Carinthia** | 128 | 8.8 | 4.8 (3.9,5.8) | 0.89 (0.75,1.06) | 497 | 36.4 | 26.0 (23.6,28.3) | 0.85 (0.77,0.92) |
| **Tyrol** | 137 | 8.1 | 5.4 (4.4,6.4) | 0.91 (0.76,1.08) | 472 | 29.1 | 22.6 (20.6,24.7) | 0.76 (0.69,0.83) |
| **Vorarlberg** | 60 | 6.9 | 4.6 (3.4,5.8) | 0.81 (0.62,1.04) | 225 | 26.1 | 20.8 (18.1,23.6) | 0.70 (0.61,0.80) |
| **TOTAL** | **608** | **9.6** | **5.5 (5.0,6.0)** | | **2,543** | **41.7** | **29.6 (28.4,30.8)** | |

**Tab. 8**: Head and Neck & Oesophagus & Larynx - Mortality

| Region | FEMALES | | | | MALES | | | |
|---|---|---|---|---|---|---|---|---|
| | Deaths | Rates x 100,000 | | SMR | Deaths | Rates x 100,000 | | SMR |
| | | Crude | Std | | | Crude | Std | |
| **Trentino** | 77 | 6.5 | 2.4 (1.8,3.1) | 1.27 (1.00,1.59) | 448 | 39.9 | 23.1 (20.9,25.4) | 1.57 (1.42,1.72) |
| **South Tyrol** | 56 | 4.8 | 2.5 (1.8,3.3) | 1.09 (0.82,1.42) | 300 | 26.6 | 17.8 (15.8,19.9) | 1.18 (1.05,1.33) |
| **Carinthia** | 53 | 3.7 | 1.8 (1.2,2.3) | 0.81 (0.60,1.05) | 228 | 16.7 | 11.1 (9.6,12.6) | 0.72 (0.63,0.82) |
| **Tyrol** | 63 | 3.7 | 2.3 (1.7,2.9) | 0.93 (0.71,1.18) | 246 | 15.1 | 11.4 (10.0,12.9) | 0.74 (0.65,0.84) |
| **Vorarlberg** | 30 | 3.4 | 2.1 (1.3,2.9) | 0.90 (0.61,1.28) | 129 | 15.0 | 11.7 (9.7,13.7) | 0.77 (0.65,0.92) |
| **TOTAL** | **279** | **4.4** | **2.2 (1.9,2.5)** | | **1,351** | **22.1** | **15.1 (14.3,15.9)** | |

**Tab. 9**: Head and Neck & Oesophagus & Larynx - Data Quality

| Region | FEMALES | | | MALES | | |
|---|---|---|---|---|---|---|
| | % DCO | % MV | M/I | % DCO | % MV | M/I |
| **Trentino** | 1.2 | 88.2 | 0.47 | 0.8 | 93.6 | 0.59 |
| **South Tyrol** | 0.8 | 97.5 | 0.47 | 0.5 | 97.5 | 0.51 |
| **Carinthia** | 8.6 | 94.0 | 0.41 | 5.8 | 96.8 | 0.46 |
| **Tyrol** | 3.6 | 98.5 | 0.46 | 1.1 | 98.3 | 0.52 |
| **Vorarlberg** | 0.0 | 100.0 | 0.50 | 4.3 | 99.5 | 0.56 |
| **TOTAL** | **3.1** | **94.7** | **0.46** | **1.9** | **96.5** | **0.53** |

## Head and Neck & Oesophagus & Larynx – Females / Testa e Collo & Esofago & Laringe – Femmine / Kopf und Hals & Speiseröhre & Kehlkopf – Weiblich

***Fig. 7:*** **Incidence/Incidenza/Inzidenz**

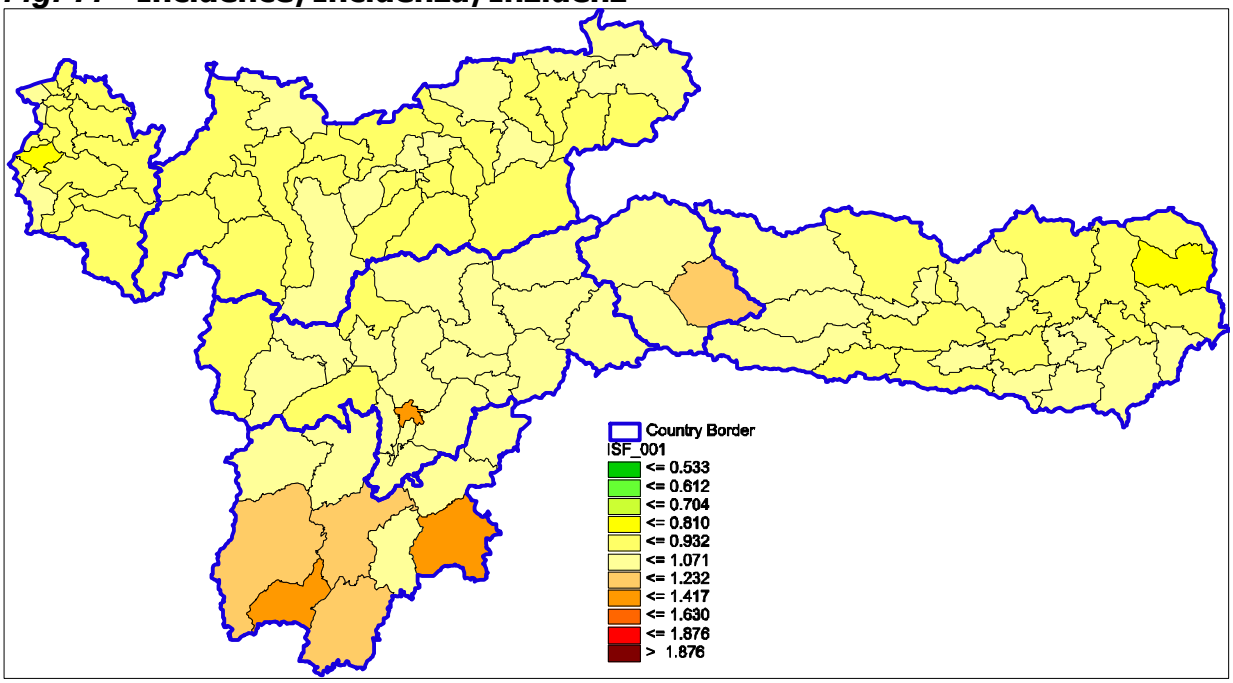
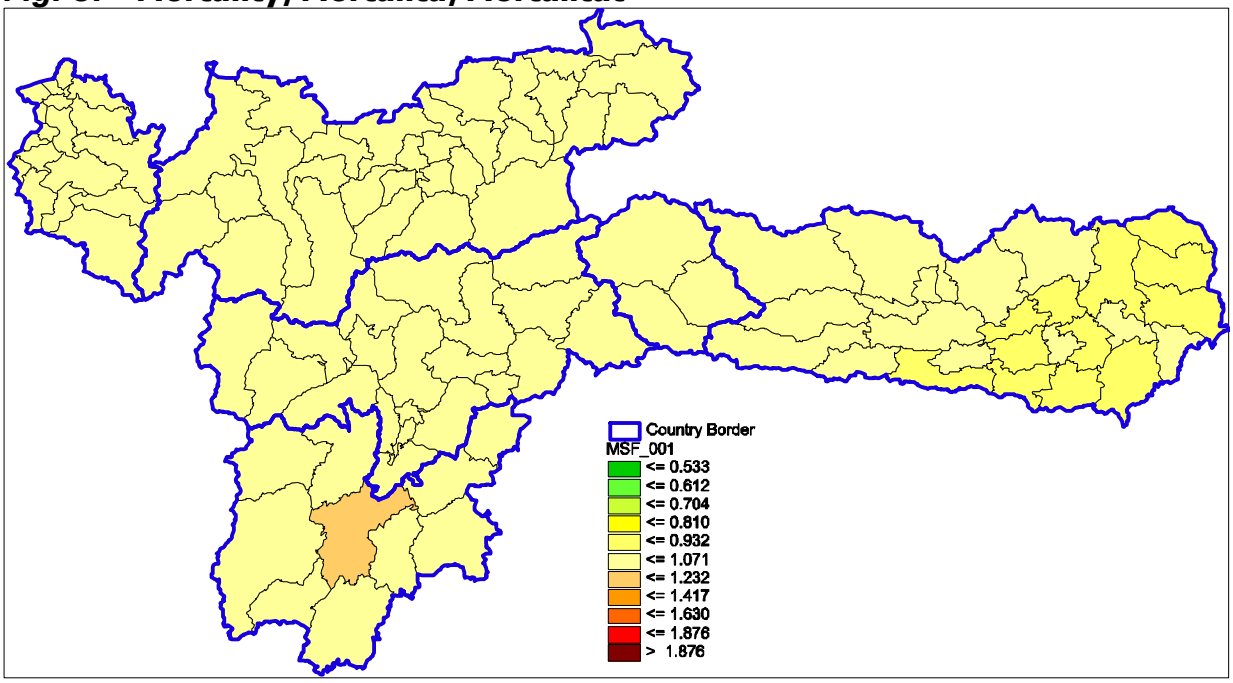



***Fig. 8:*** **Mortality/Mortalità/Mortalität**



## Head and Neck & Oesophagus & Larynx – Males / Testa e Collo & Esofago & Laringe – Maschi / Kopf und Hals & Speiseröhre & Kehlkopf – Männlich

***Fig. 9:*** **Incidence/Incidenza/Inzidenz**

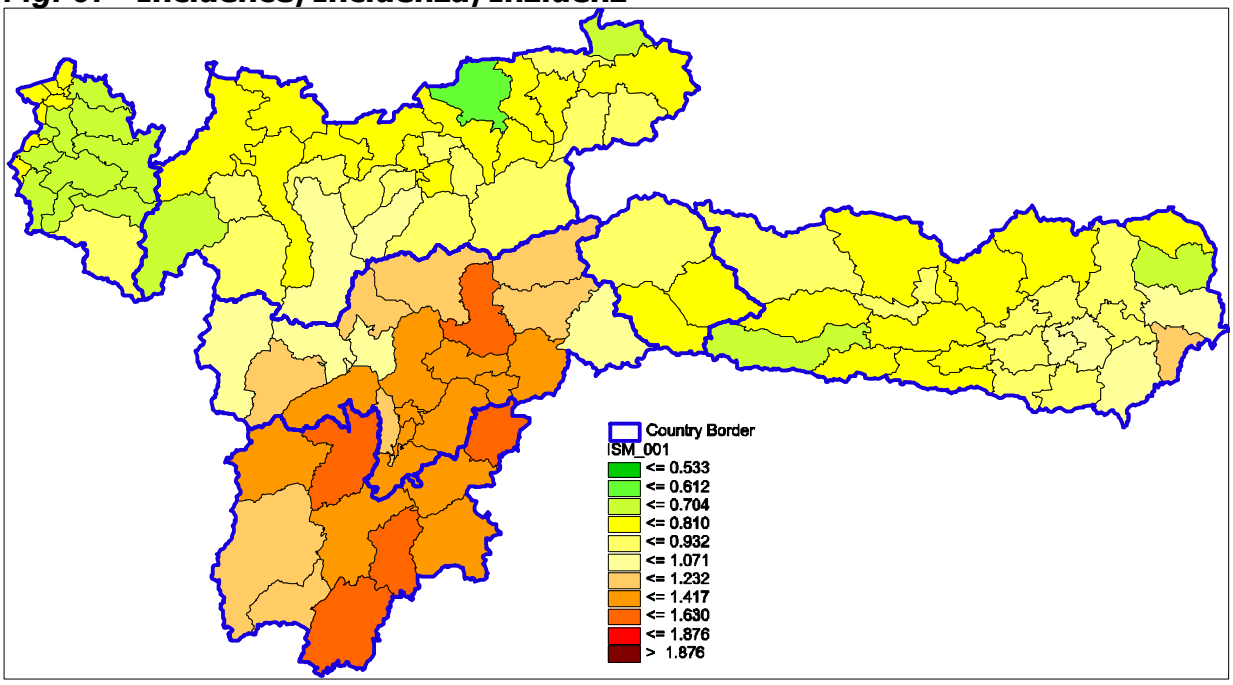
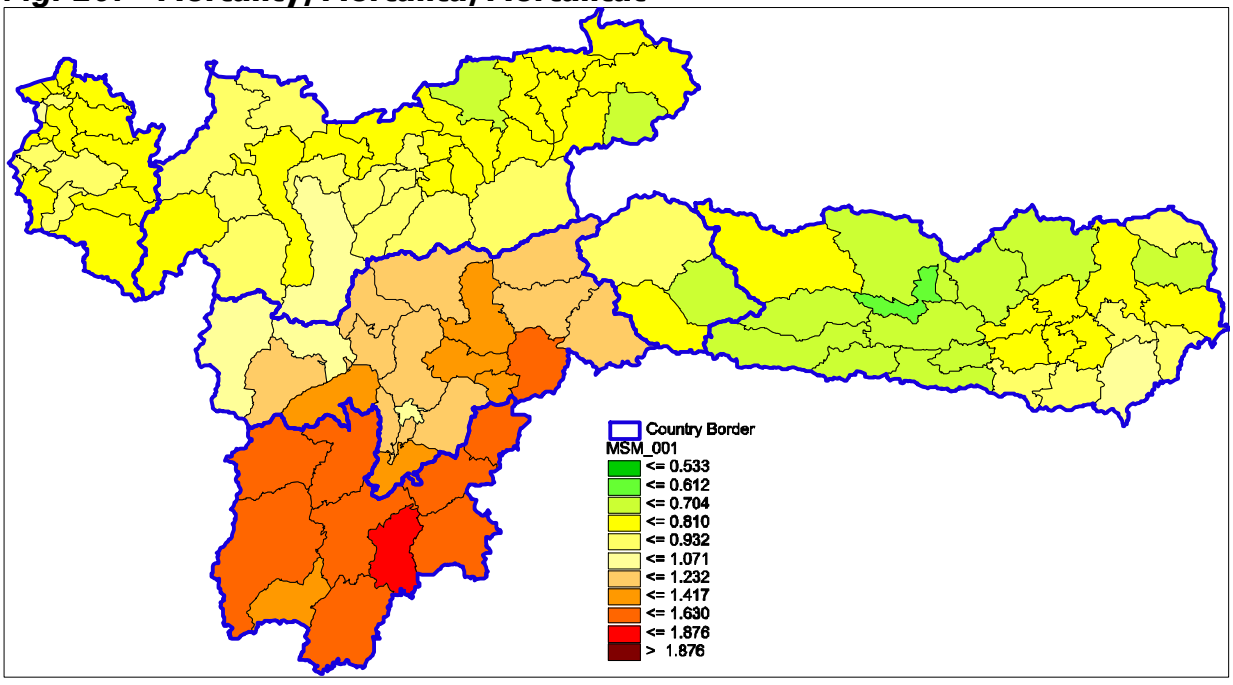



***Fig. 10:*** **Mortality/Mortalità/Mortalität**



### 4.2.7 Summary and Call for action

**For males, the maps of Alpine Regions display a noticeable increase of risk in incidence and mortality, showing a North-South gradient: Trentino appears to be the higher risk area.**
**Under a theoretic point of view, recommending a yearly otorhinolaryngological examination for subjects with higher risk (smokers and hard drinkers) should be reliable and most likely also helpful. Really, all attempts to plan screening programs based on this approach have nearly always failed due to poor compliance by subjects themselves. On the contrary, a specialist visit is clearly recommended when a critical symptomatology (like dysphagia or dysphonia) has manifested and continued over two weeks.**

#### *Sintesi e proposte operative*

*Per i maschi, la mappa delle regioni alpine mostra un chiaro aumento del rischio nell'incidenza e nella mortalità, con un gradiente nord-sud: il Trentino si distingue come area a maggiore rischio.*
*Da un punto di vista teorico, sarebbe raccomandabile e verosimilmente utile per i soggetti a rischio (fumatori e forti bevitori), una visita otorinolaringoiatria annuale. In realtà, tutti i tentativi di pianificare uno screening, su questa base, sono quasi sempre falliti, a causa della scarsa partecipazione degli stessi soggetti a rischio. E' invece esplicitamente raccomandata la visita specialistica in tutti quei casi ove si presenti la sintomatologia critica (come la disfagia oppure la disfonia), e tale sintomatologia si prolunghi oltre due settimane.*

#### Zusammenfassung und Empfehlungen

Die Landkarten zeigen bei den Männern ein deutlich erhöhtes Risiko in den südlichen Teilen des Studiengebietes, das höchste Risiko wird in Trentino beobachtet.
Unter einem theoretischen Gesichtspunkt sollte für Risikogruppen (Raucher und Trinker) eine jährliche HNO-Untersuchung empfohlen werden. In der Praxis scheitern solche Empfehlungen aber an der Akzeptanz. Nichtdestotrotz ist bei Patienten mit Symptomen wie Schluckbeschwerden oder Stimmstörungen, die länger als zwei Wochen andauern, eine Untersuchung durch einen Spezialisten angeraten.

## References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## *4.3 Stomach* (Johann Klocker)

ICD-9 Code: 151

### 4.3.1 Epidemiology

The stomach cancer incidence rate is at about 10 cases per 100,000 females and 18 per 100.000 males (standardised) in the study area. We observed the smallest incidence rate in Vorarlberg with 6.9 per 100.000 females and 12.3 per 100,000 males. The mortality rate is the smallest in Vorarlberg with 6.3 per 100,000 (females) and 12.2 per 100,000 (males). Age standardised SIR (incidence) ranges between 1.11 (female, South Tyrol) and 1.15 (male, South Tyrol) and SMR (mortality) ranges between 1.12 (female, Tyrol) and 1.16 (male, South Tyrol). About 10% of all cancers in men and about 6% of cancers in women are stomach cancer, although in the western industrial states a steady decrease of incidence is evident. Worldwide, about 900,000 newly diagnosed stomach cancer cases are observed. The crude incidence rate is approximately 30-35 per 100,000. The mean age at diagnosis is over 60.
Despite the fact that a steady decrease is also observed in the study region, both incidence and mortality rates are still high when compared to other European countries.

### 4.3.2 Data quality

DCO rates range from 1.3 (females) / 0.8 (males) in South Tyrol up to 10.1 / 2.8 in Vorarlberg and 13.0 / 11.6 in Carinthia. Mortality to incidence ratios (M/I) were fairly similar in all of the investigated regions (about 0.7). Of course DCO rates up to 10% and higher could have influenced incidence rates. With relative survival rates of approximately 30% in mind, the consistency between incidence and mortality figures should be kept in mind when interpreting the maps.

### 4.3.3 Risk factors

Various environmental factors both increase and reduce the risk of stomach cancer. A higher risk occurs with the consumption of food with high salt content, grilled or smoked meat or fish and starch products. A diet rich in vegetables and fruit has shown to reduce the risk of stomach cancer. Vitamin C probably works as an antioxidant protective mechanism. Carotin and whole wheat products are possibly responsible for risk reduction. No association with stomach cancer has been found in alcohol, coffee, black tea, sugar, Vitamin E or retinol. The importance of *Helicobacter pylori* is still a scientific topic, but up to now no causal relationship has been demonstrated. There also seems to be an association with close relatives suffering from stomach cancer. People with blood group A also carry a higher risk of stomach cancer [1].
Due to the fact that there is no effective tool for early detection, no screening programs are performed in the study area nor in other countries.

### 4.3.4 Survival

Stomach cancer has no favourable survival rates. Average five year relative survival rates in Europe are 21% (females) and 27% (males), although in Austria, represented by Tyrol, the

respective rates are higher with 28% (females) and 37% (males). Part of this poor survival is due to unfavourable stage distribution; survival for advanced stages is below 10%.

### 4.3.5 Geographical variation

For females, we see a lot of regions with slightly higher risk, although no simple pattern can be observed. Most of the regions with higher risk of incidence have consistent higher risk of mortality. There is low risk in Vorarlberg which is consistent between incidence and mortality. The picture is less clear for males because there is little consistency between incidence and mortality. Also for males, low risk in seen in Vorarlberg. One reason for the low stomach cancer rates in Vorarlberg might be due to a campaign aimed at more healthy nutrition.

**Tab. 10**: Stomach - Incidence

| Region | FEMALES | | | | MALES | | | |
|---|---|---|---|---|---|---|---|---|
| | New cases | Rates x 100,000 | | SIR | New cases | Rates x 100,000 | | SIR |
| | | Crude | Std | | | Crude | Std | |
| **Trentino** | 303 | 25.7 | 9.2 (8.0,10.5) | 0.93 (0.83,1.04) | 370 | 32.9 | 18.3 (16.4,20.2) | 0.98 (0.88,1.08) |
| **South Tyrol** | 302 | 26.0 | 11.2 (9.7,12.6) | 1.11 (0.99,1.24) | 378 | 33.5 | 21.1 (18.9,23.3) | 1.15 (1.04,1.27) |
| **Carinthia** | 378 | 26.0 | 10.8 (9.6,12.1) | 1.06 (0.95,1.17) | 457 | 33.5 | 19.7 (17.8,21.5) | 1.09 (1.00,1.20) |
| **Tyrol** | 386 | 22.7 | 10.5 (9.3,11.6) | 1.06 (0.96,1.18) | 411 | 25.3 | 17.6 (15.9,19.4) | 0.97 (0.88,1.07) |
| **Vorarlberg** | 124 | 14.2 | 6.9 (5.6,8.3) | 0.71 (0.59,0.85) | 140 | 16.3 | 12.3 (10.3,14.4) | 0.68 (0.57,0.80) |
| **TOTAL** | **1,493** | **23.5** | **10.0 (9.4,10.6)** | | **1,756** | **28.8** | **18.2 (17.4,19.1)** | |

**Tab. 11** Stomach - Mortality

| Region | FEMALES | | | | MALES | | | |
|---|---|---|---|---|---|---|---|---|
| | Deaths | Rates x 100,000 | | SMR | Deaths | Rates x 100,000 | | SMR |
| | | Crude | Std | | | Crude | Std | |
| **Trentino** | 214 | 18.1 | 5.6 (4.7,6.5) | 0.91 (0.79,1.04) | 268 | 23.9 | 12.3 (10.8,13.8) | 1.00 (0.89,1.13) |
| **South Tyrol** | 194 | 16.7 | 6.3 (5.3,7.3) | 1.01 (0.87,1.16) | 266 | 23.6 | 14.5 (12.7,16.3) | 1.16 (1.03,1.31) |
| **Carinthia** | 267 | 18.4 | 7.0 (6.0,8.0) | 1.06 (0.94,1.19) | 296 | 21.7 | 12.0 (10.6,13.5) | 1.01 (0.90,1.13) |
| **Tyrol** | 286 | 16.8 | 6.8 (5.9,7.8) | 1.12 (0.99,1.25) | 285 | 17.5 | 11.6 (10.2,13.0) | 0.97 (0.86,1.08) |
| **Vorarlberg** | 99 | 11.3 | 5.3 (4.1,6.5) | 0.81 (0.65,0.98) | 108 | 12.5 | 9.5 (7.7,11.3) | 0.78 (0.64,0.94) |
| **TOTAL** | **1,060** | **16.7** | **6.3 (5.9,6.8)** | | **1,223** | **20.0** | **12.2 (11.5,12.9)** | |

**Tab. 12**: Stomach - Data Quality

| Region | FEMALES | | | MALES | | |
|---|---|---|---|---|---|---|
| | % DCO | % MV | M/I | % DCO | % MV | M/I |
| **Trentino** | 2.3 | 88.2 | 0.71 | 1.6 | 90.9 | 0.72 |
| **South Tyrol** | 1.3 | 94.6 | 0.64 | 0.8 | 96.0 | 0.70 |
| **Carinthia** | 13.0 | 94.5 | 0.71 | 11.6 | 96.0 | 0.65 |
| **Tyrol** | 4.9 | 95.1 | 0.74 | 2.4 | 97.5 | 0.69 |
| **Vorarlberg** | 10.1 | 94.0 | 0.77 | 2.8 | 99.3 | 0.76 |
| **TOTAL** | **5.8** | **93.3** | **0.71** | **4.2** | **95.5** | **0.70** |

## Stomach – Females /
## Stomaco – Femmine /
## Magen – Weiblich

***Fig. 11:*** **Incidence/Incidenza/Inzidenz**

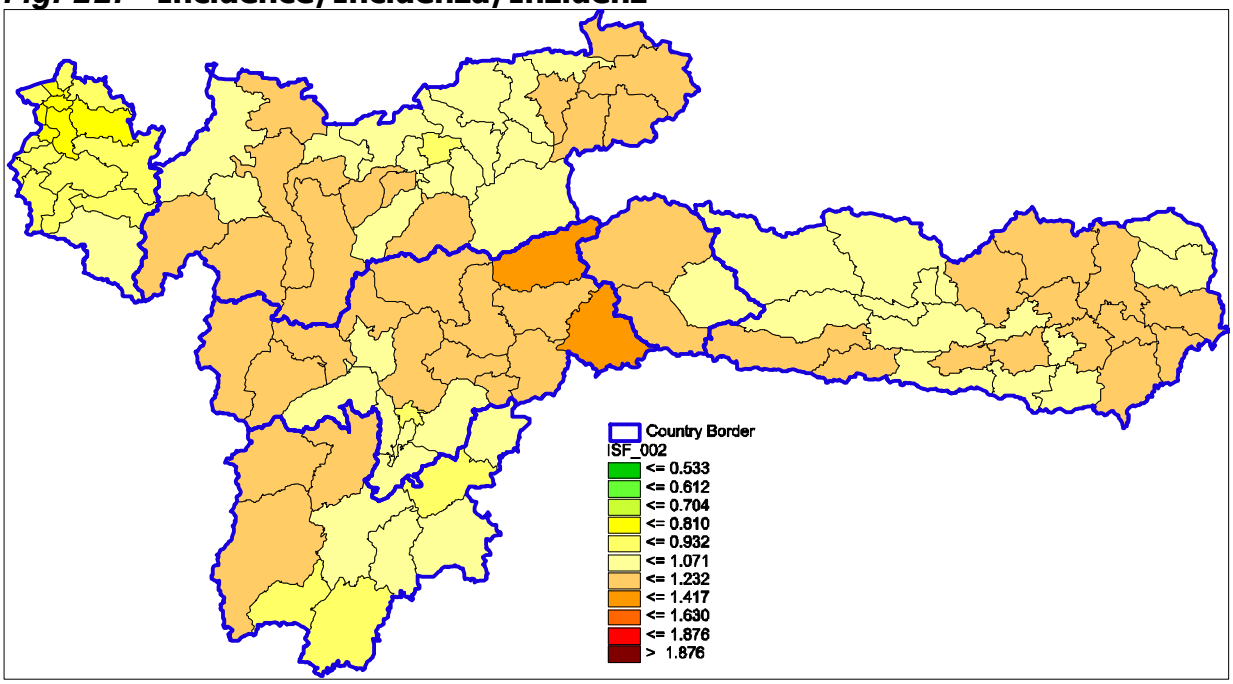
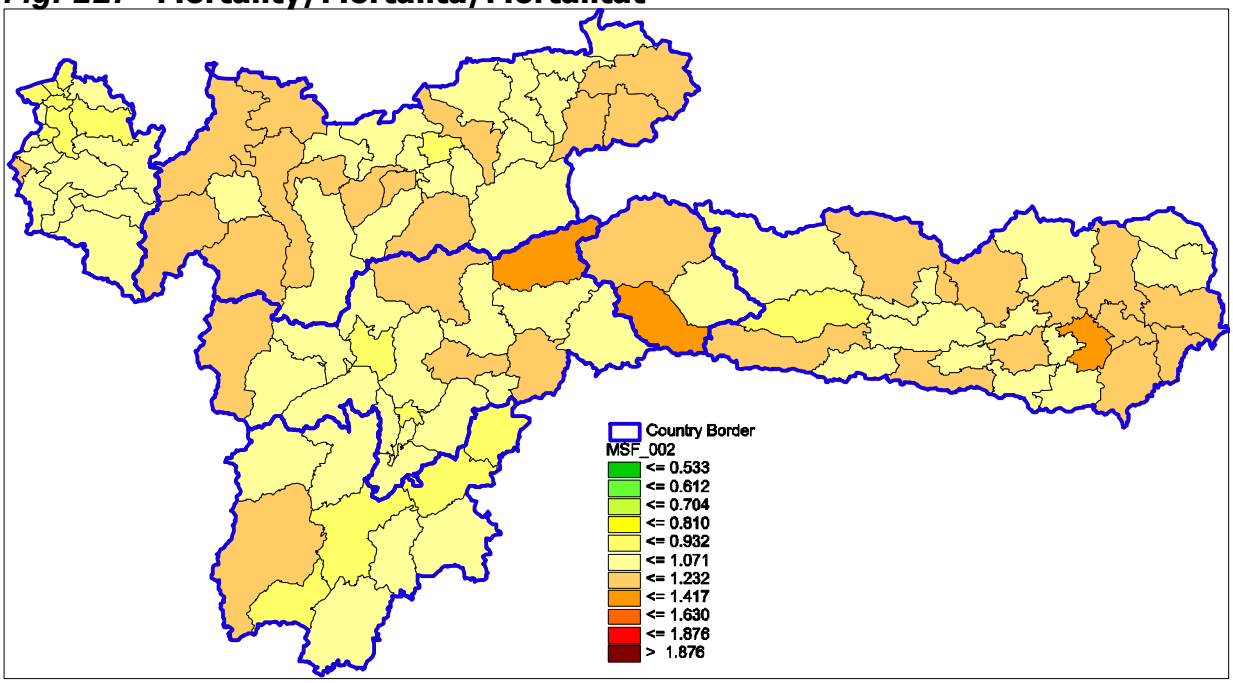



***Fig. 12:*** **Mortality/Mortalità/Mortalität**



## Stomach – Males /
## Stomaco – Maschi /
## Magen – Männlich

***Fig. 13:*** **Incidence/Incidenza/Inzidenz**

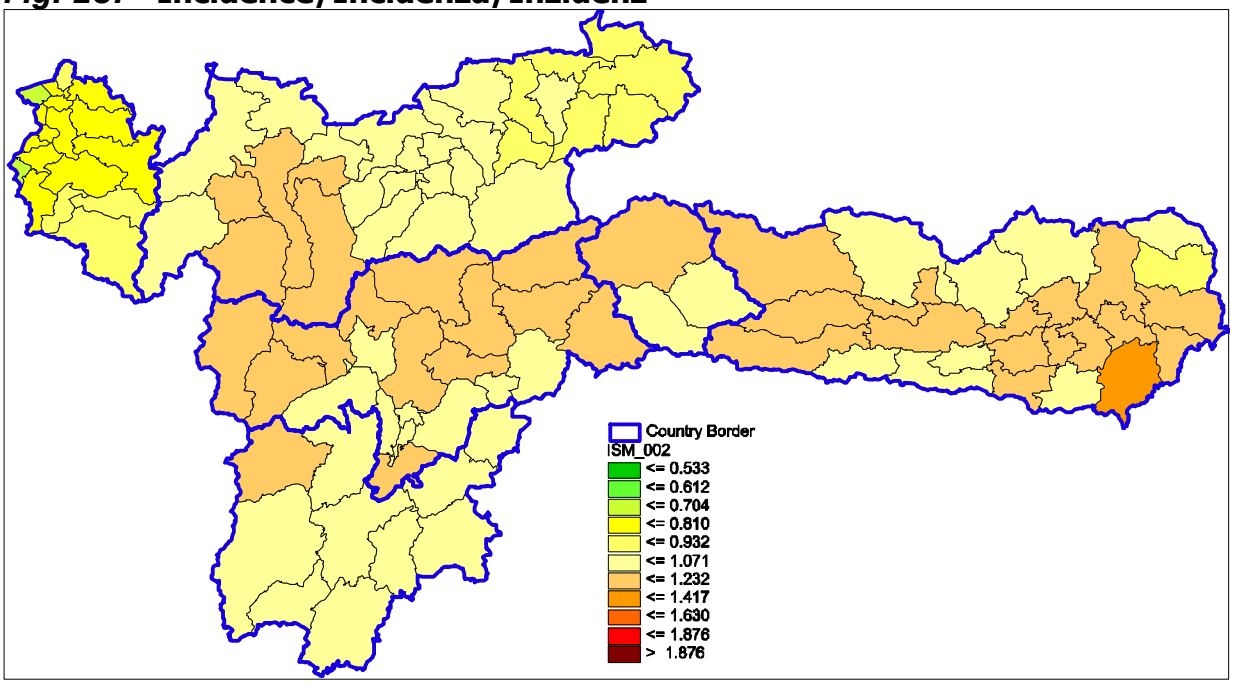
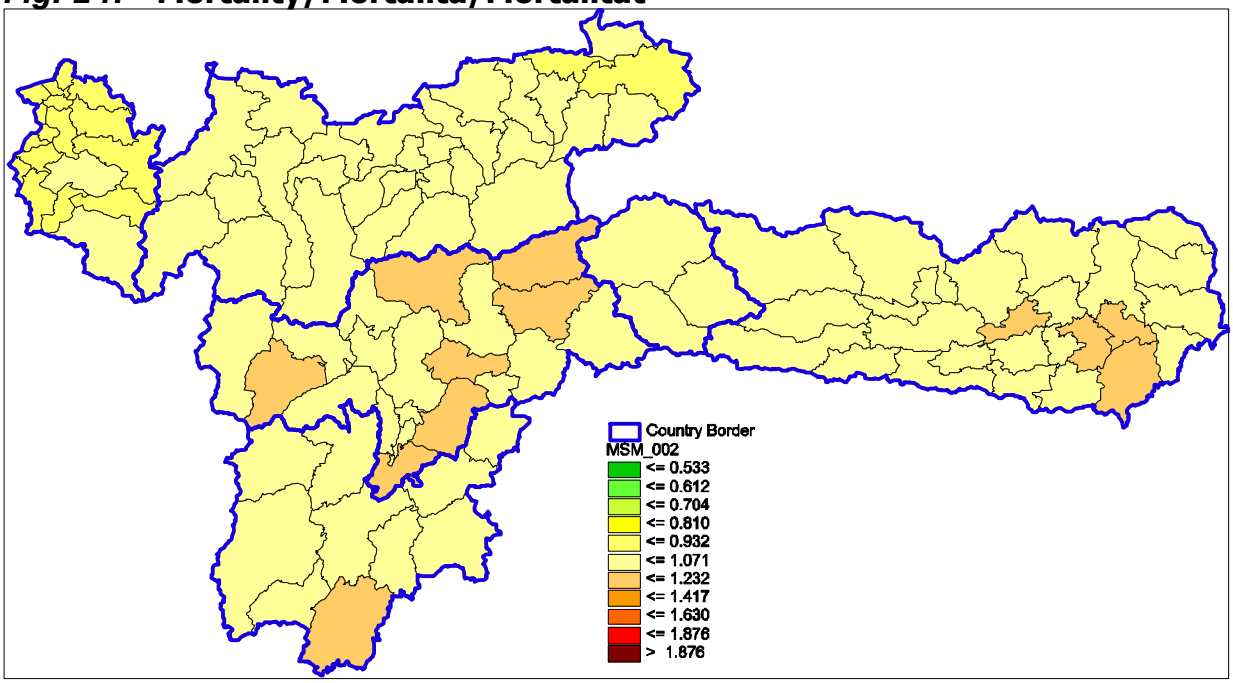



***Fig. 14:*** **Mortality/Mortalità/Mortalität**



### 4.3.6 Summary and Call for Action

**Although stomach cancer incidence and mortality has decreased, it is still high in the study area when compared to other European countries. There are many regions with slightly higher risk but there is no clear geographical pattern for regions with higher risk. We observe consistently lower risk in Vorarlberg.**
**Due to the fact that stomach cancer therapy strategies have hardly improved and effective methods of early detection are not yet available, the participating countries should start information campaigns like "five a day" to propagate healthy diets.**

### *Sintesi e proposte operative*

*Sebbene l'incidenza e la mortalità per tumore dello stomaco siano diminuite, l'area di studio presenta tassi ancora elevati se confrontati con altri paesi europei. Ci sono molte zone che presentano un rischio leggermente maggiore, ma non è individuabile un chiaro pattern geografico. Si osserva in Vorarlberg un rischio costantemente minore.*
*Dato che le strategie terapeutiche per il tumore dello stomaco sono recentemente migliorate e che metodi efficaci di diagnosi precoce non sono ancora disponibili, le regioni coinvolte nello studio dovrebbero promuovere campagne di informazione come "five a day" per sensibilizzare le persone sui benefici delle diete salutari.*

### Zusammenfassung und Empfehlungen

Obwohl Inzidenz- und Mortalitätsrate für Magenkarzinom im Studiengebiet eindeutig abnehmen, sind die Raten im internationalen Vergleich immer noch sehr hoch. Es gibt viele Regionen mit leicht erhöhtem Risiko, aber die geographische Verteilung zeigt keine Ansammlung von Gebieten mit erhöhtem Risiko. Das Risiko ist in Vorarlberg konsistent niedrig.
Angesichts der Tatsache, dass die Strategien für die Behandlung des Magenkarzinoms keine großen Fortschritte gezeigt haben und dass es keine effizienten Methoden der Früherkennung gibt, empfehlen wir Kampagnen zur Förderung von gesunder Ernährung, wie z.B. Obst mal 5.

### References

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## *4.4 Colon and Rectum* (Johann Klocker)

ICD-9 Code: 153-154

### 4.4.1 Epidemiology

The standardised colorectal cancer incidence rate is about 26 cases per 100,000 females and 41 per 100,000 males in the study area. We didn't observe notable differences in the incidence rates within all countries combined, ranging from 23.9 / 35.2 (female/male) per 100,000 in Tyrol to 28.2 / 45.4 in South Tyrol. The average mortality rate is 9.3 per 100,000 for women and 26.8 per 100,000 for men. Comparatively, no increase in colorectal cancer mortality rate was found in any of the investigated regions.

Colorectal cancer is the fourth most common tumour worldwide and there are approximately 950,000 new cases per year. Colorectal cancer accounts for 9% of cancer cases in Europe and about 13% in America. The incidence rate in Europe is approx. 60 per 100,000, (colon cancer ~ 40/100,000, rectum cancer ~ 20/100,000). The incidence rate is very different worldwide; the highest incidence rates can be observed in Japan, Hawaii, Los Angeles, and in the white population of California. The lowest incidence is seen in Israel, Columbia and India with 1.3 per 100,000. Fortunately, colorectal mortality rate has significantly decreased in the last 40 years, which can be explained by early diagnosis and treatment of early stages. This is the reason why mortality rates of colorectal cancer are decreasing, despite increased incidence in most age-groups.

### 4.4.2 Data quality

The DCO–rate ranges from 0.9 (female) / 0.4 (male) in South Tyrol up to 8.8 / 6.4 in Carinthia. Mortality to incidence ratios (M/I) were fairly similar in all of the investigated regions (about 0.45). Data quality therefore seemed to be sufficient.

### 4.4.3 Risk factors, early detection and screening

Environmental factors contribute to higher risk, although eating habits are mainly responsible. Colorectal cancer risk increases with a diet that is rich in animal fat and red meat. Fibre enriched foods, vegetables and calcium reduce the risk. At high risk are people who have little physical activity and high alcohol consumption. The hypothesis that bowel cancer can be reduced by a diet rich in fibre has been questioned by Giovannicci (1998). The role of vitamins (Betacarotin, vitamin C and vitamin E) is more controversial, although some studies have proved there is a relevant protective effect in vitamin C and carotin. A folic acid supplement of more than 400mg daily is recognised as a preventative measure (Giovannucci 1994). Vegetarians have a lower risk of colorectal cancer, but occasional consumption of meat is not likely to influence risk. Although determined by eating habits, higher salary and better education have a remarkable impact on the occurrence of colorectal cancer. Adventists and Mormons are at low risk. There is an increased incidence in patients who have, on a long term, suffered from colitis ulcerosa and Morbus Crohn. Obesity is also a risk factor.

For about 10% of patients with a certain genetic risk, additional tumourigenic factors are of great importance.
Appropriate screening programs can reduce the incidence and mortality of colorectal carcinoma. In 1993, Winawer already demonstrated a significant reduction in the incidence of colorectal carcinomas through periodically performed colonoscopy including polypectomia. A decrease of about 33% in the mortality rate can be achieved through annually performed haemoccult tests (Mandel 1999). Selbi (1978) emphasized the importance of testing every year. A metanalysis of 4 randomised and 2 non-randomised examples by Towler (1996) confirmed the evident reduction of mortality (about 16%) using a haemoccult screening program.
Recent improvements in diagnostic tools (video endoscopy, staining methods of hemoccult tests and more) are expected to increase the value of early detection of pre- and malignant lesions. As a result of these improvements in Austria and Italy, according to the national preventive plan (2005/20007), scientific boards have recommended colonoscopy for people over the age of 50. From 01/2006 on, costs of screening colonoscopy will be paid for by health insurance companies. Moreover, the WHO has proclaimed 2006 to be the year of prevention of colorectal cancer.

### 4.4.4 Survival

Survival of colorectal cancer is rather good; according to the Eurocare Study, the five year relative survival rate in Europe is 48% for females and 51% for males. However, survival for advanced stages is below 10%.

### 4.4.5 Geographical variation

Only small variation is seen for females. There are some individual regions with slightly higher risk but no pattern for higher risk is seen. For males, we see lower risk in northern regions (Vorarlberg and Tyrol). There are slightly higher risks in some parts of Trentino and South Tyrol and some regions in lower Carinthia, where the picture is less clear.

**Tab. 13**: Colon and Rectum - Incidence

| Region | FEMALES | | | | MALES | | | |
|---|---|---|---|---|---|---|---|---|
| | New cases | Rates x 100,000 | | SIR | New cases | Rates x 100,000 | | SIR |
| | | Crude | Std | | | Crude | Std | |
| **Trentino** | 756 | 64.0 | 27.3 (25.0,29.6) | 0.99 (0.92,1.06) | 885 | 78.8 | 43.7 (40.7,46.7) | 1.07 (1.00,1.14) |
| **South Tyrol** | 692 | 59.7 | 28.2 (25.8,30.6) | 1.07 (1.00,1.16) | 804 | 71.3 | 45.4 (42.2,48.6) | 1.11 (1.04,1.19) |
| **Carinthia** | 844 | 58.1 | 25.4 (23.4,27.4) | 1.00 (0.94,1.07) | 958 | 70.2 | 42.6 (39.8,45.4) | 1.05 (0.98,1.12) |
| **Tyrol** | 815 | 48.0 | 23.9 (22.1,25.8) | 0.95 (0.89,1.02) | 795 | 48.9 | 35.2 (32.7,37.7) | 0.85 (0.80,0.91) |
| **Vorarlberg** | 419 | 48.0 | 26.6 (23.8,29.3) | 1.01 (0.91,1.11) | 410 | 47.6 | 36.7 (33.2,40.3) | 0.90 (0.81,0.99) |
| **TOTAL** | **3,526** | **55.4** | **26.1 (25.1,27.0)** | | **3,852** | **63.1** | **40.8 (39.5,42.2)** | |

**Tab. 14**: Colon and Rectum - Mortality

| Region | FEMALES | | | | MALES | | | |
|---|---|---|---|---|---|---|---|---|
| | Deaths | Rates x 100,000 | | SMR | Deaths | Rates x 100,000 | | SMR |
| | | Crude | Std | | | Crude | Std | |
| **Trentino** | 338 | 28.6 | 9.0 (7.8,10.2) | 0.95 (0.85,1.05) | 384 | 34.2 | 17.8 (16.0,19.7) | 1.08 (0.97,1.19) |
| **South Tyrol** | 301 | 26.0 | 9.5 (8.3,10.7) | 1.04 (0.93,1.17) | 361 | 32.0 | 19.4 (17.3,21.4) | 1.18 (1.06,1.31) |
| **Carinthia** | 366 | 25.2 | 8.7 (7.7,9.8) | 0.97 (0.88,1.08) | 380 | 27.8 | 15.2 (13.6,16.8) | 0.97 (0.88,1.08) |
| **Tyrol** | 387 | 22.8 | 9.3 (8.3,10.4) | 1.01 (0.91,1.12) | 312 | 19.2 | 13.2 (11.7,14.7) | 0.79 (0.71,0.88) |
| **Vorarlberg** | 198 | 22.7 | 10.8 (9.1,12.5) | 1.08 (0.93,1.24) | 196 | 22.8 | 17.2 (14.8,19.6) | 1.05 (0.91,1.21) |
| **TOTAL** | **1,590** | **25.0** | **9.3 (8.8,9.9)** | | **1,633** | **26.8** | **16.3 (15.5,17.1)** | |

**Tab. 15**: Colon and Rectum - Data Quality

| Region | FEMALES | | | MALES | | |
|---|---|---|---|---|---|---|
| | % DCO | % MV | M/I | % DCO | % MV | M/I |
| **Trentino** | 2.0 | 91.5 | 0.45 | 0.8 | 94.0 | 0.43 |
| **South Tyrol** | 0.9 | 92.4 | 0.43 | 0.4 | 94.6 | 0.45 |
| **Carinthia** | 8.8 | 94.8 | 0.43 | 6.4 | 96.1 | 0.40 |
| **Tyrol** | 2.8 | 95.2 | 0.47 | 1.0 | 97.5 | 0.39 |
| **Vorarlberg** | 6.8 | 99.8 | 0.46 | 2.2 | 99.0 | 0.47 |
| **TOTAL** | **3.9** | **94.3** | **0.45** | **2.2** | **95.9** | **0.42** |

## Colon and Rectum – Females /
## Colon e Retto – Femmine /
## Kolon und Rektum – Weiblich

***Fig. 15:*** **Incidence/Incidenza/Inzidenz**

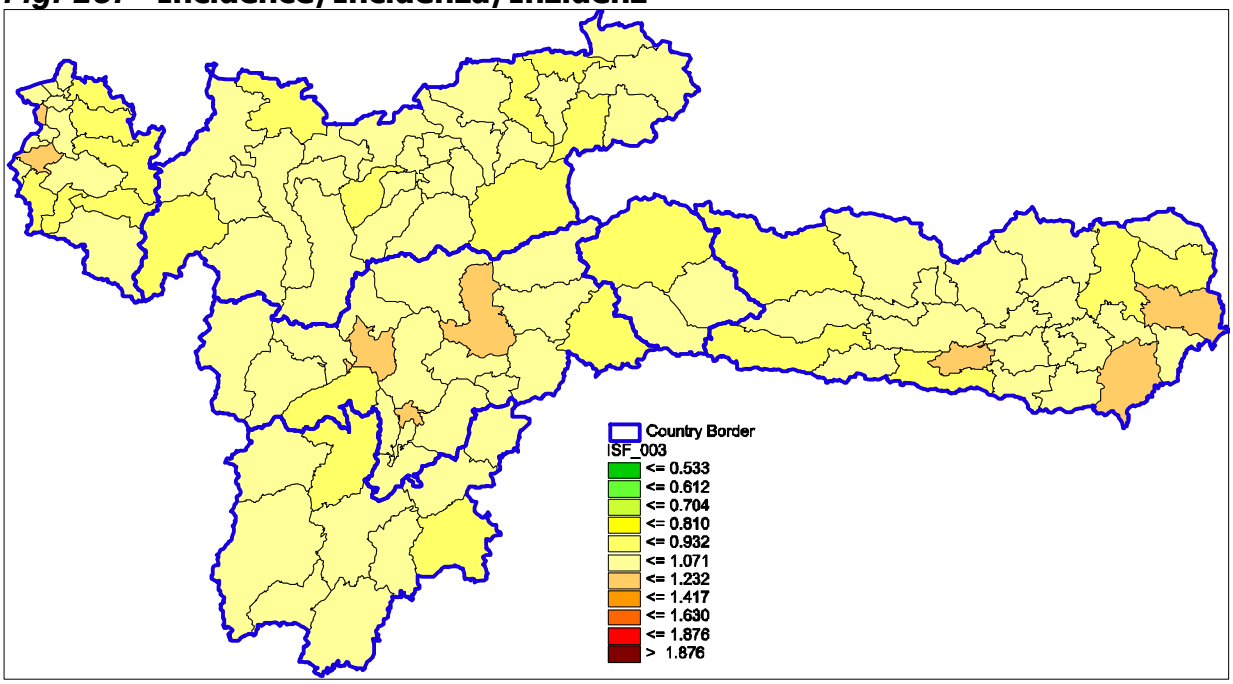
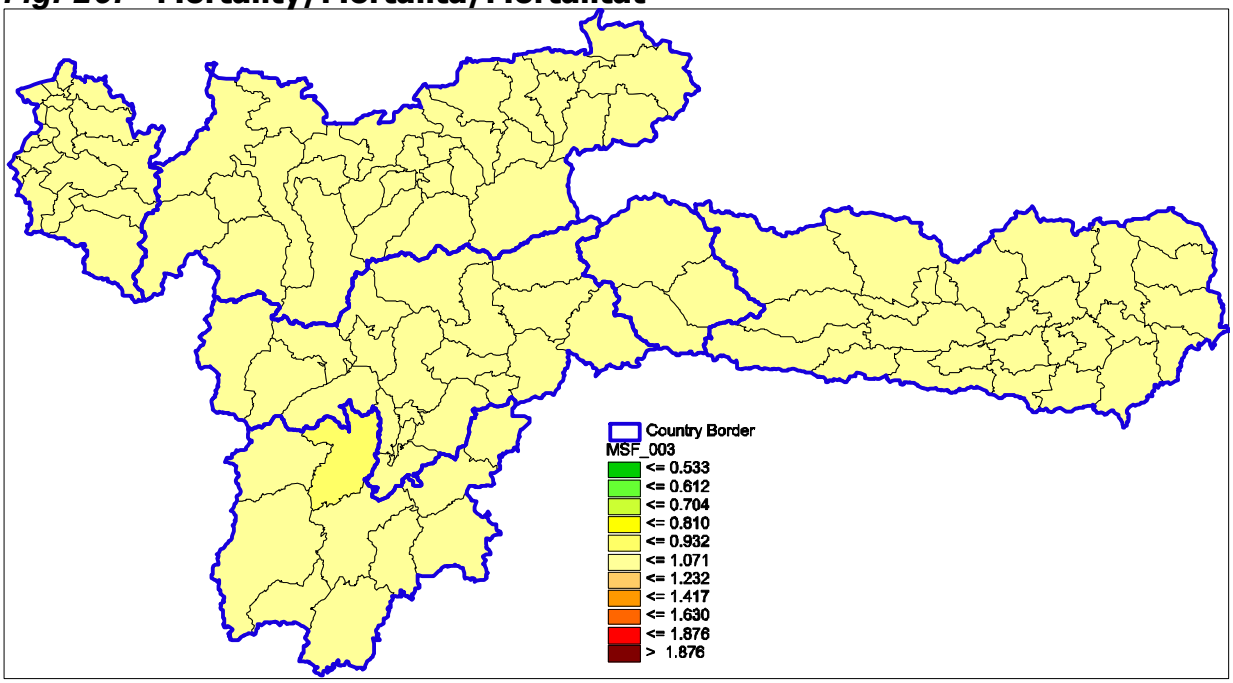



***Fig. 16:*** **Mortality/Mortalità/Mortalität**



## Colon and Rectum – Males / Colon e Retto – Maschi / Kolon und Rektum – Männlich

***Fig. 17:*** **Incidence/Incidenza/Inzidenz**

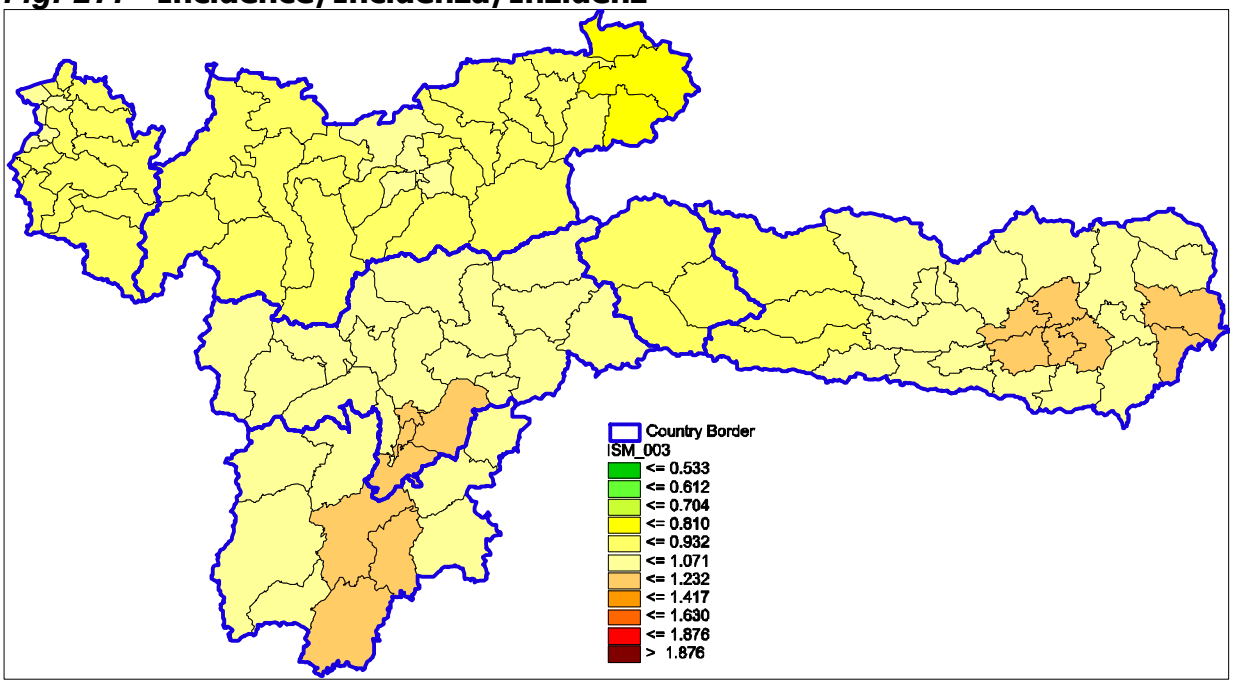
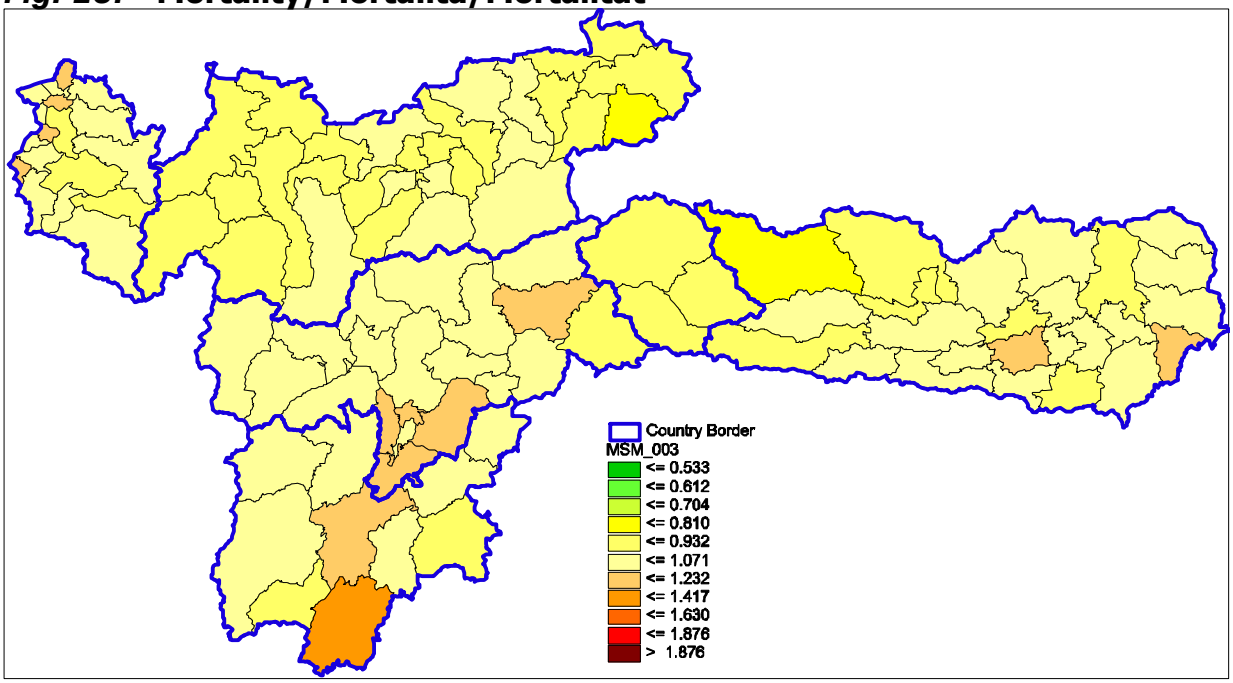



***Fig. 18:*** **Mortality/Mortalità/Mortalität**



### 4.4.6 Summary and Call for Action

**We do not see any geographic patterns for females, however, there is higher risk for males in some areas of Trentino and lower Carinthia. In addition to screening programs, general recommendations for a more healthy lifestyle (diet, physical activity and weight control) should be followed.**

### *Sintesi e proposte operative*

*Per la popolazione femminile non emerge un chiaro pattern della distribuzione del rischio, tuttavia tra i maschi alcune zone del Trentino e della Carinzia meridionale presentano un rischio elevato. Oltre all'attivazione di programmi di screening, vanno ricordate le raccomandazioni generali per uno stile di vita più sano (dieta, attività fisica e controllo del peso).*

### Zusammenfassung und Empfehlungen

In der geographischen Verteilung ist bei den Frauen kein klares Muster zu erkennen, bei den Männern gibt es Regionen mit höherem Risiko in Trentino und Unterkärnten. In Ergänzung zu den bestehenden Empfehlungen für Früherkennung von kolorektalen Karzinomen sollten Empfehlungen in Richtung gesunder Lebensstil (Ernährung, körperliche Aktivitität und Gewichtskontrolle) umgesetzt werden.

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## *4.5 Bronchus, Lung* (Willi Oberaigner)

ICD-9 Code: 162

### 4.5.1 Introduction

In the study area, for men, lung cancer is the most frequent cancer specific cause of death and the cancer site with the second most frequent incidence. For females, lung cancer takes the third position in cancer mortality and the fourth position in incidence.

### 4.5.2 Epidemiology

For females, we observe a broad range of SMR values from 0.7 to 1.2: age standardised incidence rates range from 8.6 in Trentino to 15.0 in Tyrol and mortality rates from 6.8 in Trentino to 11.3 in Carinthia. The range is smaller for men. Age standardised rates are smallest in South Tyrol (43.0 for incidence and 34.6 for mortality), whereas we see a small variation in all other provinces: incidence rates range from 47.3 in Tyrol to 50.4 in Carinthia and mortality rates from 41.5 in Tyrol to 45.9 in Carinthia.

For females, age standardised incidence rates in the study area fall within the range of western Europe (10.7). For men however, rates in the study area are below western European rates (53.2). Worldwide, age standardised rates in developed countries are twice as high as in developing countries. Sex distribution varies worldwide, where in the USA, the ratio of males to females is about 1.4, in central Europe the ratio is about 3.

### 4.5.3 Data quality

DCO rates vary considerably between the provinces. For South Tyrol, Trentino, and Tyrol, DCO-rates are in the range of 4%, whereas in Vorarlberg we observe DCO-rates between 8% and 9% and in Carinthia between 12% and 15%. The percentage of microscopically verified cases (MV) varies quite a bit as well from 55% in Carinthia to 96% in Vorarlberg. This could be due to underestimation in Vorarlberg, where MV seems to be very high in international comparison, and to some documentation problems in Carinthia. The M/I-ratio also varies from 0.82 to 0.98. This also could reflect some potential completeness problems. Summarising, it seems that some problems could exist with regard to the completeness of incidence data. The interpretation of incidence rates should therefore take these facts into consideration.

### 4.5.4 Risk factor, early detection and screening

There is one dominating risk factor for lung cancer, namely smoking. About 85% of lung cancer cases are attributed to smoking [1]. Most regional variations can be attributed to smoking, which is also true for time trends. In alpine regions, at least in Tyrol, radon exposure is responsible for some local effects. In general, radon is seen as the second leading risk factor [2,3].

Until now, there is no efficient means for the early detection of lung cancer. However, as smoking is the main risk factor for lung cancer, smoking cessation programs are a good choice for the primary prevention of lung cancer.

### 4.5.5 Survival

Survival is rather poor, five year relative survival rates are in the range of 10 to 15 [4,5]. Consequently, we expect great similarities of regional distribution between incidence and mortality[4].

### 4.5.6 Geographical variation

For females, we see excess risk mainly in the city area of Innsbruck and in eastern Carinthia. In Innsbruck, the main reason is probably smoking, which is known to differ between urban and rural areas, at least when we look at the last 5-35 years that are responsible for the incident cases that we see now, taking latency period into account [6,7]. The eastern part of Carinthia is dominated by the city of Klagenfurt and its surroundings. Observed SMR are between 1.7 and 2 and these SMRs are highly statistically significant above 1. A similar, but not as clear, picture is shown by mortality. In addition we see some regions in Trentino with very low risk in incidence but not in mortality.

Strong effects are seen less for males. We see higher risk in western Vorarlberg where most of the population of Vorarlberg is concentrated and where more urban areas are situated. In addition, we see slightly higher risk in southern Trentino (the picture shown by mortality is much clearer than by incidence) and again in the eastern part of Carinthia. Except for Vorarlberg, the consistency between incidence and mortality is less clear. The highest observed SMRs are about 1.4 for incidence and smoothed SMRs are no greater than 1.2. The reason that SMRs are much higher for females than for males could be attributed to the fact that smoking habits differ much more for females than for males. This is mainly due to urban effects [6].

**Tab. 16**: Bronchus, Lung - Incidence

| Region | FEMALES | | | | MALES | | | |
|---|---|---|---|---|---|---|---|---|
| | New cases | Rates x 100,000 | | SIR | New cases | Rates x 100,000 | | SIR |
| | | Crude | Std | | | Crude | Std | |
| **Trentino** | 220 | 18.6 | 8.6 (7.3,9.8) | 0.72 (0.63,0.83) | 951 | 84.7 | 48.3 (45.1,51.5) | 1.01 (0.95,1.08) |
| **South Tyrol** | 240 | 20.7 | 10.5 (9.0,11.9) | 0.92 (0.80,1.04) | 753 | 66.8 | 43.0 (39.8,46.1) | 0.91 (0.85,0.98) |
| **Carinthia** | 387 | 26.7 | 13.8 (12.2,15.3) | 1.14 (1.03,1.26) | 1,089 | 79.8 | 50.4 (47.3,53.5) | 1.05 (0.99,1.12) |
| **Tyrol** | 424 | 25.0 | 15.0 (13.5,16.6) | 1.22 (1.10,1.34) | 1,040 | 64.0 | 47.3 (44.3,50.2) | 0.98 (0.92,1.04) |
| **Vorarlberg** | 155 | 17.7 | 11.3 (9.4,13.2) | 0.90 (0.77,1.06) | 552 | 64.1 | 50.2 (46.0,54.5) | 1.04 (0.96,1.13) |
| **TOTAL** | **1,426** | **22.4** | **12.1 (11.4,12.8)** | | **4,385** | **71.9** | **47.9 (46.4,49.3)** | |

**Tab. 17**: Bronchus, Lung - Mortality

| Region | FEMALES | | | | MALES | | | |
|---|---|---|---|---|---|---|---|---|
| | Deaths | Rates x 100,000 | | SMR | Deaths | Rates x 100,000 | | SMR |
| | | Crude | Std | | | Crude | Std | |
| **Trentino** | 208 | 17.6 | 6.8 (5.7,7.9) | 0.79 (0.68,0.90) | 931 | 82.9 | 45.2 (42.2,48.2) | 1.10 (1.03,1.17) |
| **South Tyrol** | 199 | 17.2 | 8.0 (6.8,9.3) | 0.89 (0.77,1.02) | 619 | 54.9 | 34.6 (31.8,37.4) | 0.84 (0.77,0.90) |
| **Carinthia** | 351 | 24.2 | 11.3 (9.9,12.6) | 1.20 (1.08,1.33) | 948 | 69.5 | 42.2 (39.4,45.0) | 1.01 (0.95,1.08) |
| **Tyrol** | 334 | 19.7 | 10.9 (9.6,12.2) | 1.12 (1.01,1.25) | 931 | 57.3 | 41.5 (38.8,44.2) | 0.98 (0.92,1.05) |
| **Vorarlberg** | 131 | 15.0 | 8.8 (7.2,10.5) | 0.90 (0.76,1.07) | 509 | 59.1 | 45.9 (41.9,49.9) | 1.09 (1.00,1.19) |
| **TOTAL** | **1,223** | **19.2** | **9.4 (8.8,9.9)** | | **3,938** | **64.6** | **41.8 (40.5,43.1)** | |

**Tab. 18**: Bronchus, Lung - Data Quality

| Region | FEMALES | | | MALES | | |
|---|---|---|---|---|---|---|
| | % DCO | % MV | M/I | % DCO | % MV | M/I |
| **Trentino** | 3.2 | 71.4 | 0.95 | 1.4 | 78.3 | 0.98 |
| **South Tyrol** | 0.4 | 83.3 | 0.83 | 1.6 | 86.1 | 0.82 |
| **Carinthia** | 15.2 | 55.2 | 0.91 | 12.4 | 62.1 | 0.87 |
| **Tyrol** | 4.2 | 89.7 | 0.79 | 3.1 | 90.0 | 0.90 |
| **Vorarlberg** | 9.4 | 93.1 | 0.82 | 8.0 | 95.6 | 0.89 |
| **TOTAL** | **6.7** | **77.5** | **0.86** | **4.9** | **81.0** | **0.90** |

## Bronchus, Lung – Females/
## Bronchi, Polmone – Femmine/
## Bronchien, Lunge – Weiblich

***Fig. 19:*** **Incidence/Incidenza/Inzidenz**

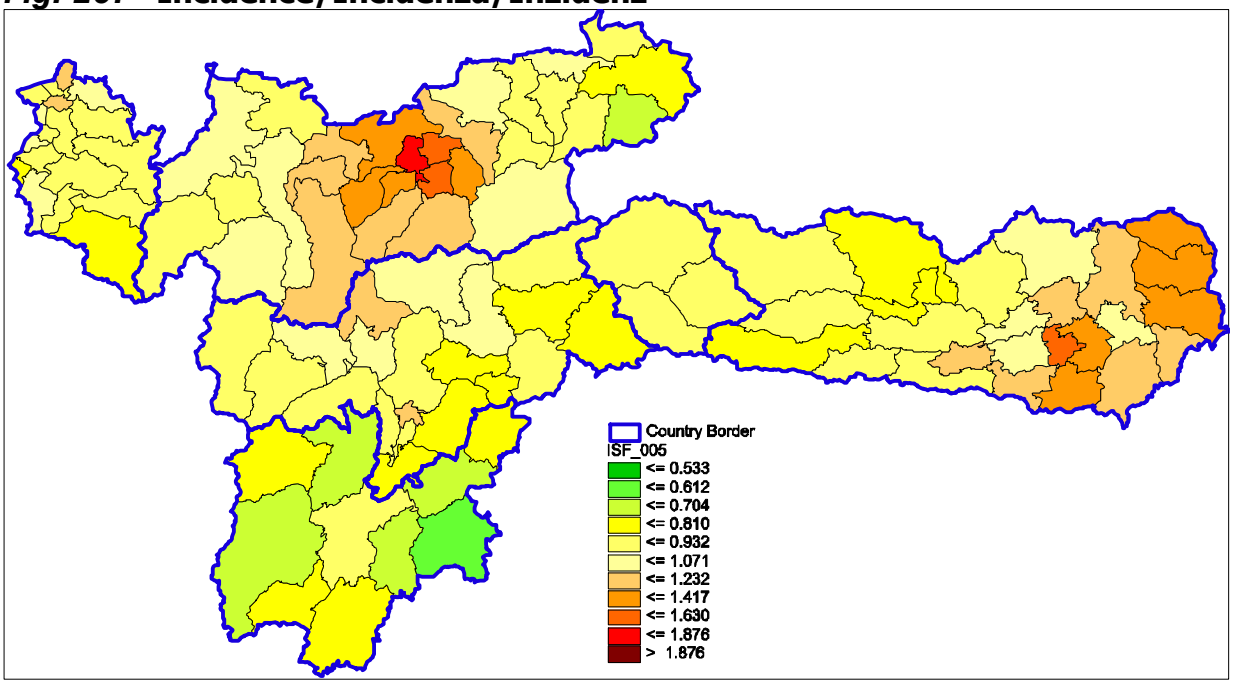
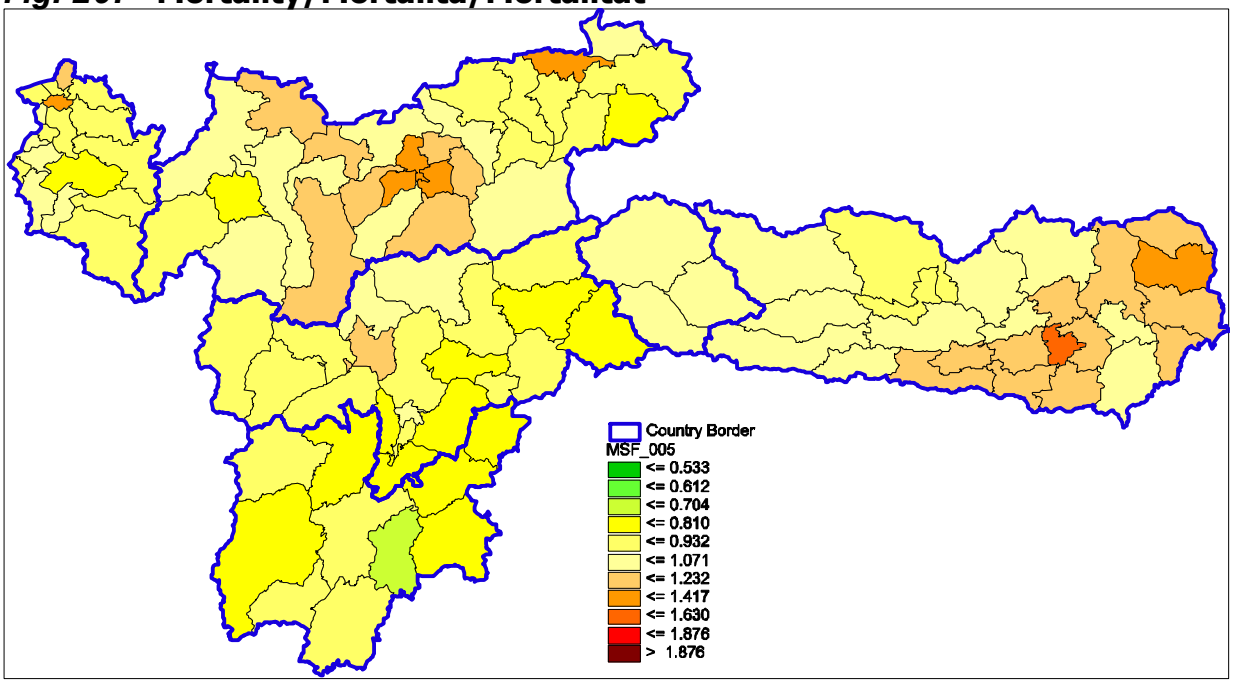



***Fig. 20:*** **Mortality/Mortalità/Mortalität**



## Bronchus, Lung – Males /
## Bronchi, Polmone – Maschi /
## Bronchien, Lunge – Männlich

***Fig. 21:*** **Incidence/Incidenza/Inzidenz**

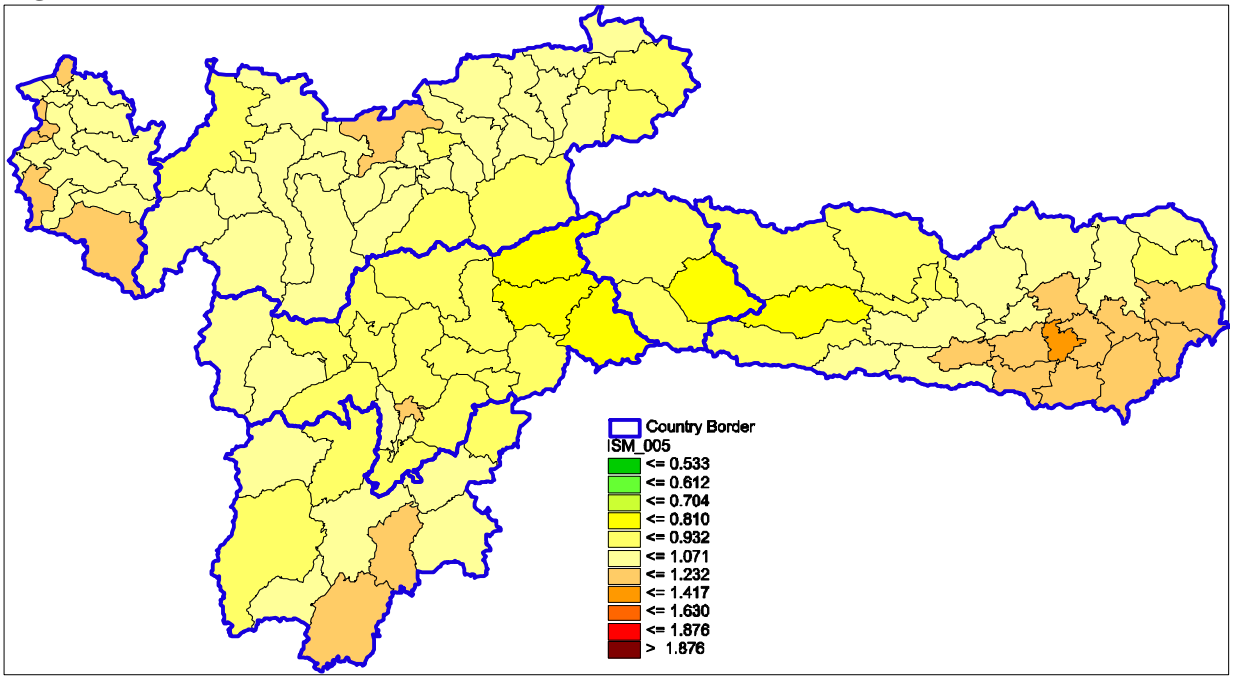
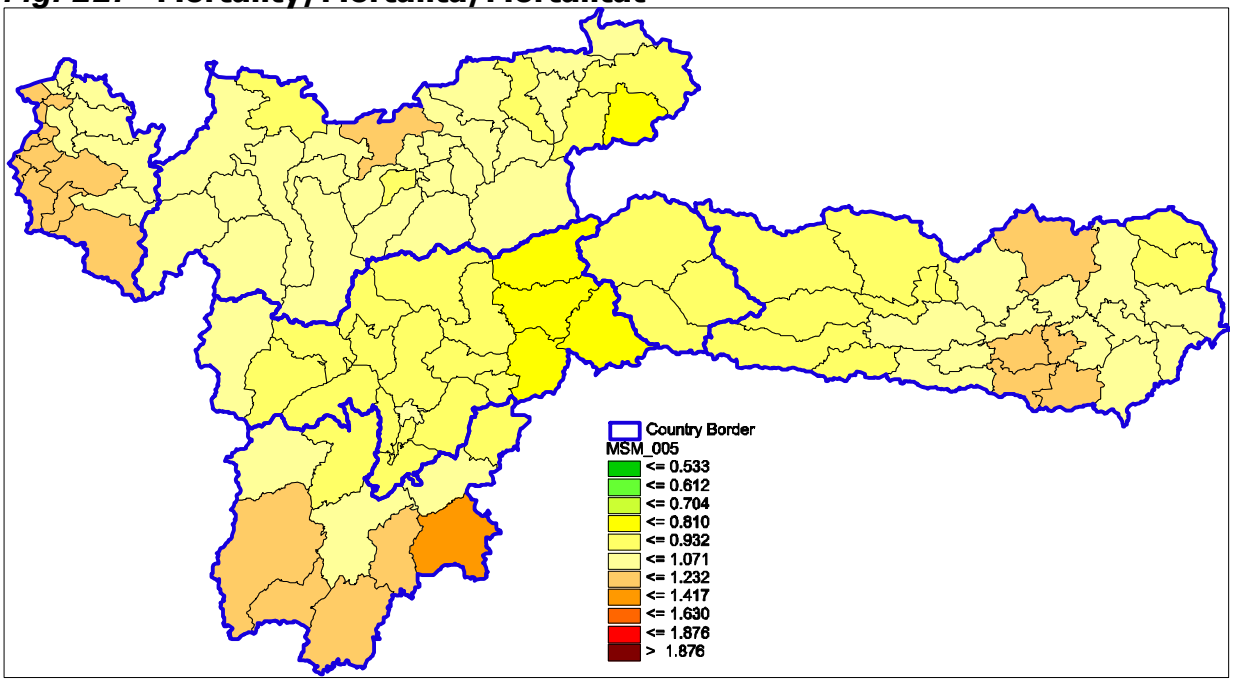



***Fig. 22:*** **Mortality/Mortalità/Mortalität**



### 4.5.7 Summary and Call for action

**We see clear geographic patterns for females, namely excess risk in Innsbruck and its surroundings, and in lower Carinthia. Especially for females, most of the geographic variation is correlated to smoking. In addition, we know from various data sources that smoking rates increase in young people and we highly recommend well organised primary prevention programs to prevent the general population from smoking. Based on our data, these programs should mainly focus on young women. This could help prevent lung cancer cases for the next generations and could also help prevent cancer cases in general. As in Italy, we also recommend a ban on smoking in public places in Austria, including bars, coffee houses and restaurants.**

### *Sintesi e proposte operative*

*Si manifesta un chiaro pattern geografico per le femmine, vale a dire un'eccedenza di rischio a Innsbruck e dintorni e nella Carinzia meridionale. Particolarmente per le femmine, la maggior parte della variazione geografica è correlata all'abitudine al fumo. Inoltre, sappiamo da più fonti che la percentuale di fumatori è in aumento tra i giovani, raccomandiamo quindi caldamente l'attivazione di programmi di prevenzione primaria bene organizzati che contrastino nella popolazione l'inizio al fumo. Sulla base dei nostri dati, questi programmi dovrebbero concentrarsi principalmente sulle donne giovani. Tali iniziative potrebbero contribuire a prevenire nelle future generazioni il tumore del polmone ed il cancro in generale. Sull'esempio dell' Italia, suggeriamo inoltre l'introduzione in Austria del divieto di fumare nei posti pubblici, compresi bar, caffè e ristoranti.*

### Zusammenfassung und Empfehlungen

Wie sehen ein klares Bild in der geographischen Verteilung bei den Frauen, nämlich erhöhtes Risiko in Innsbruck und Umgebung und in Unterkärnten. Die wahrscheinlichste Erklärung ist ein Unterschied im Rauchverhalten. Wir wissen aus verschiedenen Untersuchungen, dass Rauchen vor allem in den jüngeren Jahrgängen zunimmt. Daher empfehlen wir gut organisierte Programme, die auf Reduzierung des Rauchverhaltens abzielen. Auf Grund unserer Daten sollten sich diese Programme insbesondere auf jüngere Frauen konzentrieren. Viele internationale Studien belegen, dass solche Maßnahmen Lungenkarzinome in zukünftigen Jahren reduzieren werden, es sind aber auch positive Auswirkungen auf eine Reihe anderer Karzinomgruppen zu erwarten. Weiters empfehlen wir auch für Österreich ein Rauchverbot in öffentlichen Plätzen und besonders in Restaurants und Kaffeehäusern.

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## *4.6 Breast* (Silvano Piffer)

ICD-9 Code: 174

### 4.6.1 Introduction

Worldwide, breast cancer is the most common cancer in women, accounting for about 25 percent of all malignancies in women; the proportion is higher in women in western, developed, countries. Incidence has been rising in many parts of the world, including many European countries [1]. Breast cancer is also the most common cancer in females in Europe. It is estimated that in the year 2000 there were 350,000 new breast cancer cases in Europe, while the number of deaths from breast cancer was estimated at around 130,000. Breast cancer is responsible for 26.5% of all new cancer cases among women in Europe, and 17.5% of all cancer deaths [2].

### 4.6.2 Epidemiology

Per year, an average of 1,477 breast cancer cases are diagnosed in the whole area. Breast cancer accounts for 27.2% of all incident cancer cases (from 25.2% in Carinthia to 28.8% in Trentino). The incidence rate for the whole area is higher than the average E.U. estimated value, where Belgium presents the highest value for 1998 (80.4) [3]. Rates in the study area are coherent with corresponding country profiles, as reported by Globocan-IARC in 2002 [4].
Breast cancer accounts for 17.9% of all cancer deaths (from 15.6% for Carinthia to 20.6% for Vorarlberg).

### 4.6.3 Data quality

The quality of registered data is good in the whole area, considering that DCO percentage is 1.8% and that the percentage of cases microscopically verified is 96.7%, in line with the data of the rest of European cancer registries. Mortality/incidence ratio per 100 is 0.31, with no differences among regions.

### 4.6.4 Risk factor, early detection, screening

Most of the known risk factors for breast cancer relate to women's reproductive history: early menarche, late first pregnancy, low parity, and late menopause; endogenous hormones, estrogens and androgens, probably have an important role, specially linked with dietary factors such as alcohol and fats. In fact, avoiding obesity may decrease the risk of post-menopausal breast cancer, and switching from a high-fat and low-vegetable diet to a lower-fat, higher-vegetable diet may also contribute to a reduced risk. Some kinds of benign breast diseases increase the risk of developing malignant breast cancer [5,6]. None of these risk factors are currently amenable to primary prevention. Oral contraceptive use and hormone replacement therapy have been linked to increased risk [7]. Studies of migrant populations have suggested that differences in incidence between countries are social and environmental, rather than genetic, in origin; only about 5 percent of breast cancer cases are due to the inheritance of dominant genes, such as BRCA-1 and BRCA-2 [8,9].

Mammography screening is a well proven method for reducing mortality due to breast cancer and there are recommendations for all EU member states to implement programs for women between the ages of 50 and 69.

### 4.6.5 Survival

Survival strongly depends on stage at diagnosis and implemented therapy. In Europe, there are substantial differences in staging of breast cancer at the time of diagnosis. The average 5-year relative survival of breast cancer patients is 76.1%; it is highest in the Nordic countries and lowest in eastern European countries (80% vs. 60-70%). Survival in Italy is around 80%. In Austria the survival coincides with the European average [10, 11, 12].

### 4.6.6 Geographical variation

Trentino shows the highest incidence rates all regions. The highest (Trentino) to the lowest (Vorarlberg) rate ratio is 1.42. Standardized rate confirms the highest value in Trentino.
Trentino is one of Italy's regions with the highest incidence for breast cancer, as reported by the Italian cancer registry [13].
The differences between Trentino and the other regions are remarkable, considering the potential cultural affinity of the compared female populations. Some differences in reproductive histories at the population level could partially explain these differences between Trentino and the other regions, although there are no hard facts to prove this hypothesis. The trend of age specific rates is similar to those reported for western countries with a high incidence of breast cancer. On the map the whole area appears substantially homogenous even if some *excess risk areas* are evident: south-west Trentino, Bolzano and eastern Carinthia. Scattered *excess risk areas* are also present in Tyrol (Innsbruck) and in Vorarlberg (Montafon).
Trentino shows the highest value of crude mortality rate, as for incidence. In spite of scattered excess risk areas, Austrian regions and South Tyrol present crude rates that are lower than Trentino and very close to each other. The highest (Trentino) and the lowest (South Tyrol) rate ratio is 1.37. Standardized rates show Tyrol as the region with the highest mortality with a statistically significant difference when compared to expected value, but the difference is not very large (SMR 1.10). The map does not show any intra or inter-regional differences, with the exception of the Innsbruck area of Tyrol and some areas in Vorarlberg. On this basis one could presume that there is homogeneous use of standard diagnostic and therapeutic protocols across the regions such as to avoid any area-related excesses in mortality.

**Tab. 19**: Breast - Incidence

| Region | FEMALES | | | |
|---|---|---|---|---|
| | New cases | Rates x 100,000 | | SIR |
| | | Crude | Std | |
| **Trentino** | 1,684 | 142.6 | 80.3 (76.0,84.5) | 1.10 (1.05,1.15) |
| **South Tyrol** | 1,317 | 113.6 | 70.0 (65.9,74.1) | 0.98 (0.92,1.03) |
| **Carinthia** | 1,710 | 117.8 | 71.9 (68.1,75.6) | 0.98 (0.94,1.03) |
| **Tyrol** | 1,799 | 105.9 | 70.0 (66.6,73.5) | 0.97 (0.93,1.02) |
| **Vorarlberg** | 877 | 100.4 | 67.3 (62.5,72.0) | 0.95 (0.89,1.02) |
| **TOTAL** | **7,387** | **116.0** | **72.0 (70.3,73.8)** | |

**Tab. 20**: Breast - - Mortality

| Region | FEMALES | | | |
|---|---|---|---|---|
| | Deaths | Rates x 100,000 | | SMR |
| | | Crude | Std | |
| **Trentino** | 524 | 44.4 | 19.9 (17.9,21.9) | 1.06 (0.97,1.16) |
| **South Tyrol** | 374 | 32.2 | 17.0 (15.1,19.0) | 0.89 (0.80,0.99) |
| **Carinthia** | 474 | 32.6 | 15.6 (14.0,17.3) | 0.88 (0.80,0.96) |
| **Tyrol** | 618 | 36.4 | 20.0 (18.2,21.8) | 1.10 (1.02,1.19) |
| **Vorarlberg** | 299 | 34.2 | 18.7 (16.3,21.0) | 1.09 (0.97,1.22) |
| **TOTAL** | **2,289** | **36.0** | **18.2 (17.4,19.1)** | |

**Tab. 21**: Breast - Data Quality

| Region | FEMALES | | |
|---|---|---|---|
| | % DCO | % MV | M/I |
| **Trentino** | 0.8 | 96.5 | 0.31 |
| **South Tyrol** | 0.4 | 93.1 | 0.28 |
| **Carinthia** | 3.5 | 96.5 | 0.28 |
| **Tyrol** | 2.0 | 98.5 | 0.34 |
| **Vorarlberg** | 4.1 | 99.1 | 0.33 |
| **TOTAL** | **1.8** | **96.7** | **0.31** |

## Breast – Females / Mammella – Femmine / Brust – Weiblich

***Fig. 23:*** **Incidence/Incidenza/Inzidenz**

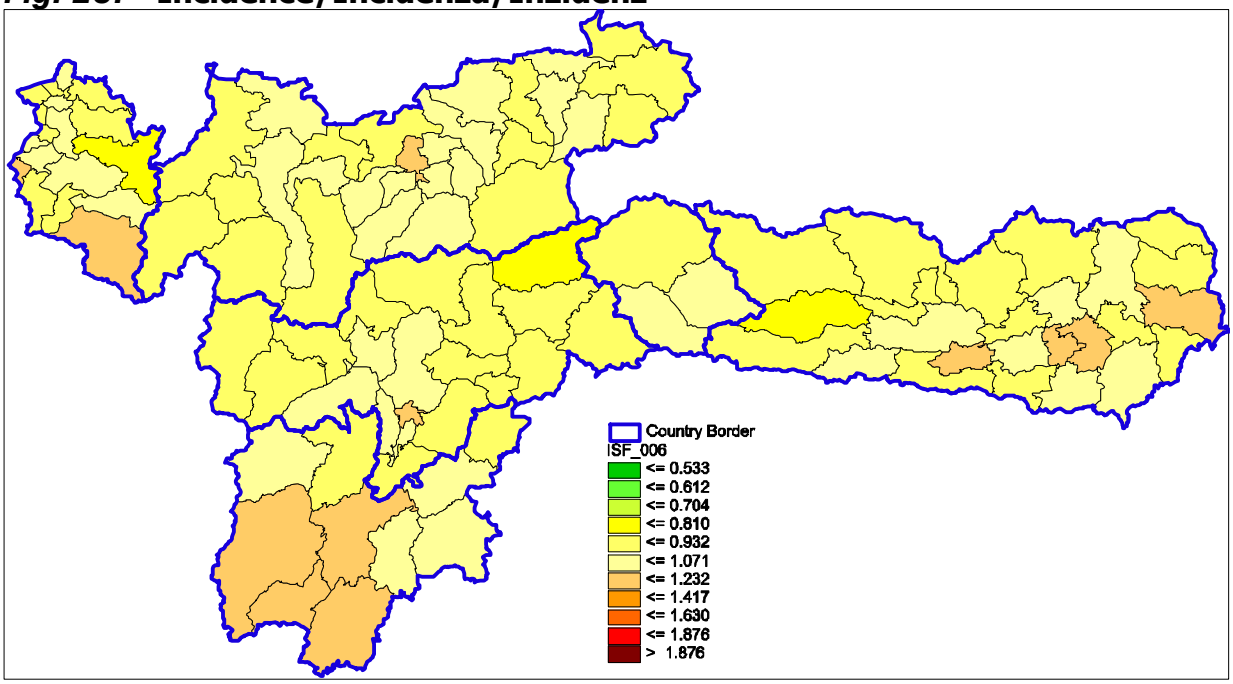
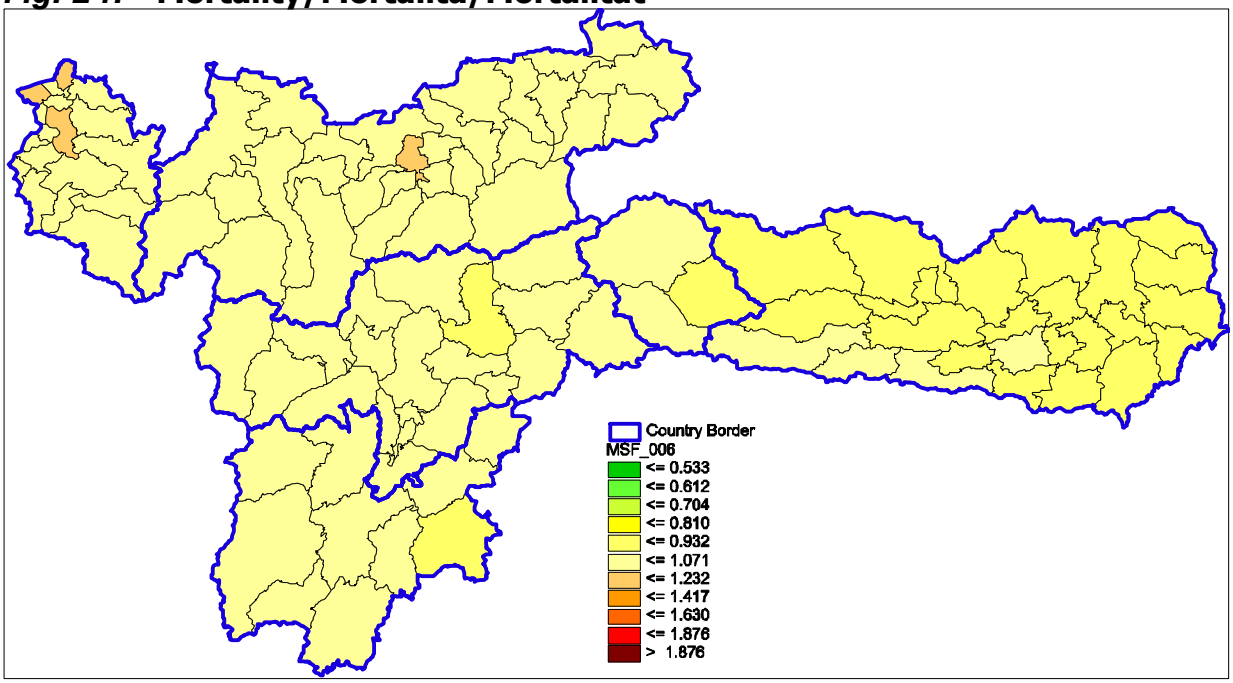



***Fig. 24:*** **Mortality/Mortalità/Mortalität**



### 4.6.7 Summary and Call for action

**We see an excess of risk in south-west Trentino and in some areas in other regions. The map does not show any inter-regional differences about mortality with the exception of Innsbruck area in Tyrol and some areas in Vorarlberg. Strengthening and promoting breast cancer screening by mammography across the whole region represents the major tool for controlling the disease at the population level.**

#### *Sintesi e proposte operative*

*Si osserva un maggior rischio nella parte sud-occidentale del Trentino ed in altre zone sparse nelle altre regioni. La mappa non mostra comunque differenze interregionali rilevanti rispetto alla mortalità con l'eccezione dell'area di Innsbruck nel Tirolo e di qualche area nel Vorarlberg. Il rafforzamento e la promozione dei programmi di screening mammografico in tutte le regioni rappresenta lo strumento più efficace per controllare la malattia a livello di popolazione.*

#### Zusammenfassung und Empfehlungen

Wir sehen ein erhöhtes Risiko im südwestlichen Trentino und in einigen anderen Gebieten. Die Karte zeigt keine interregionalen Unterschiede in der Mortalität mit Ausnahme von Innsbruck und einigen Gebieten in Vorarlberg. Die Umsetzung von Mammographiescreening bzw. Vertiefung von bestehenden Programmen im gesamten Studiengebiet sind sicherlich die beste Methode, um Mammakarzinom auf Bevölkerungsebene positiv zu beeinflussen.

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## *4.7 Cervix uteri* (Hans Concin)

ICD-9 Code: 180

### 4.7.1 Introduction

Cervical cancer is one of the rare malignancies in which pre-stages of the disease (pre-invasive lesions, so called cervical intraepithelial neoplasie/CIN) can be detected even before the actual invasive cancer develops. Through gynaecological preventive care in the form of regular PAP smears, these pre-invasive lesions and early stages of cervical cancer can be detected and treated with a success rate of more than 90%. Thus, high regional incidence primarily argues for failure in performing efficient cervical cytology screening.
Therefore, when comparing regions with low and high incidences and mortality rates of cervical cancer, the percentage of the female population participating in screening programs has to be evaluated. In the case of comparable participation in screening programs, the quality of the cytological screening (procedure of taking a PAP smear, pathological evaluation) has to be examined.

### 4.7.2 Epidemiology

The disease is rare in people below the age of 20, but incidence rates rise rapidly to a first peak in the 35-39 age group; there is then a slight decline in rates, followed by a rise to a second, slightly higher peak in women in their 70s.
There is a clear link between incidence and mortality rates and socio-economic deprivation.

### 4.7.3 Data quality

In Carinthia, despite a higher incidence and mortality, it has been noticed that the DCO rate of 5.1% is considerably greater than in the other regions, with 0.0 in South Tyrol and 2.7 in Vorarlberg. The proportion of microscopically verified invasive cervical carcinomas lies between 95 and 100%, with the average being 97.8%.

### 4.7.4 Risk factors, early detection and screening

A young age at first intercourse, multiple sexual partners, cigarette smoking, high parity, and low socioeconomic status are risk factors for cervical cancer.
Furthermore, the use of oral contraception per se leads to a slight increase in risk. In addition, women using oral contraception commonly tend to have more unprotected intercourse. Is it possible that the women living in Bregenzerwald and Trentino have a substantially different lifestyle from the lifestyle of women living in the Tyrolean Unterland and Carinthia? One hypothesis explaining the differences in cervical cancer incidence and mortality is the more frequent use of oral contraception in the Tyrolean Unterland and Carinthia. This hypothesis is in accordance with the lower incidence and mortality of corpus cancer found in these regions (one would expect the same finding for ovarian cancer after another 10 years). At least for the comparison between the Tyrolean Oberland and Unterland, the relationship between frequency of oral contraception on one

hand and the incidence of cervical and corpus cancer, respectively, on the other, fits together. It would be helpful to have data on the distribution of risk factors. But still, these regional differences cannot be explained without the occurrence of screening failure.

An organized, quality assured cervical cancer screening program was introduced in Vorarlberg in 1970 and in Trentino in 1993, while in South Tyrol there is an opportunistic program resulting in high coverage since the 1970s. Since then, the percentage of the female population attending cervical cytology screenings has been high. As a consequence, incidence and mortality of cervical cancer in Vorarlberg and Trentino is lower than in Tyrol and Carinthia.

### 4.7.5 Survival

The precursors that can be diagnosed through screening (CIN) lead to 100% survival in young women with screening and in the rare cases where screening is omitted, invasive carcinomas appear.
5 year survival for stages I to IIa lies between 80 and 90%. Higher stages have a survival rate between 20 and 65%.

### 4.7.6 Geographical variation

Among all malignant diseases, the most predominant differences in incidence and mortality are seen in cervical cancer. High regional differences exist, for example there is very low risk in incidence and mortality in Trentino and in the northern part of Vorarlberg (Laiblachtal, Vorderer and Mittlerer Bregenzerwald), while very high risk is observed in the Tyrolean Unterland and most parts of Carinthia.

These maps show how important it is to base the analysis on small regions. While the average SMR in the province of Tyrol is 1.4, the respective rates within the Tyrolean regions lie between a maximum of 1.9 and a minimum of 0.8.

**Tab. 22**: Cervix uteri - Incidence

| Region | FEMALES | | | |
|---|---|---|---|---|
| | New cases | Rates x 100,000 | | SIR |
| | | Crude | Std | |
| **Trentino** | 81 | 6.9 | 4.6 (3.5,5.7) | 0.51 (0.41,0.64) |
| **South Tyrol** | 122 | 10.5 | 6.8 (5.5,8.2) | 0.84 (0.70,1.01) |
| **Carinthia** | 255 | 17.6 | 12.4 (10.8,14.0) | 1.39 (1.22,1.57) |
| **Tyrol** | 262 | 15.4 | 11.2 (9.8,12.6) | 1.28 (1.13,1.44) |
| **Vorarlberg** | 74 | 8.5 | 6.5 (5.0,8.1) | 0.72 (0.57,0.90) |
| **TOTAL** | **794** | **12.5** | **8.8 (8.1,9.4)** | |

**Tab. 23**: Cervix uteri - Mortality

| Region | FEMALES | | | |
|---|---|---|---|---|
| | Deaths | Rates x 100,000 | | SMR |
| | | Crude | Std | |
| **Trentino** | 28 | 2.4 | 1.1 (0.6,1.5) | 0.53 (0.35,0.77) |
| **South Tyrol** | 39 | 3.4 | 1.7 (1.1,2.3) | 0.86 (0.61,1.17) |
| **Carinthia** | 73 | 5.0 | 2.7 (2.0,3.3) | 1.23 (0.97,1.55) |
| **Tyrol** | 87 | 5.1 | 3.1 (2.3,3.8) | 1.40 (1.12,1.73) |
| **Vorarlberg** | 23 | 2.6 | 1.7 (1.0,2.5) | 0.75 (0.48,1.13) |
| **TOTAL** | **250** | **3.9** | **2.2 (1.9,2.4)** | |

**Tab. 24**: Cervix uteri - Data Quality

| Region | FEMALES | | |
|---|---|---|---|
| | % DCO | % MV | M/I |
| **Trentino** | 1.2 | 95.0 | 0.35 |
| **South Tyrol** | 0.0 | 95.9 | 0.32 |
| **Carinthia** | 5.1 | 97.5 | 0.29 |
| **Tyrol** | 0.8 | 99.2 | 0.33 |
| **Vorarlberg** | 2.7 | 100.0 | 0.31 |
| **TOTAL** | **2.1** | **97.8** | **0.31** |

## Cervix uteri /
## Collo dell'utero /
## Gebärmutterhals

***Fig. 25:*** **Incidence/Incidenza/Inzidenz**

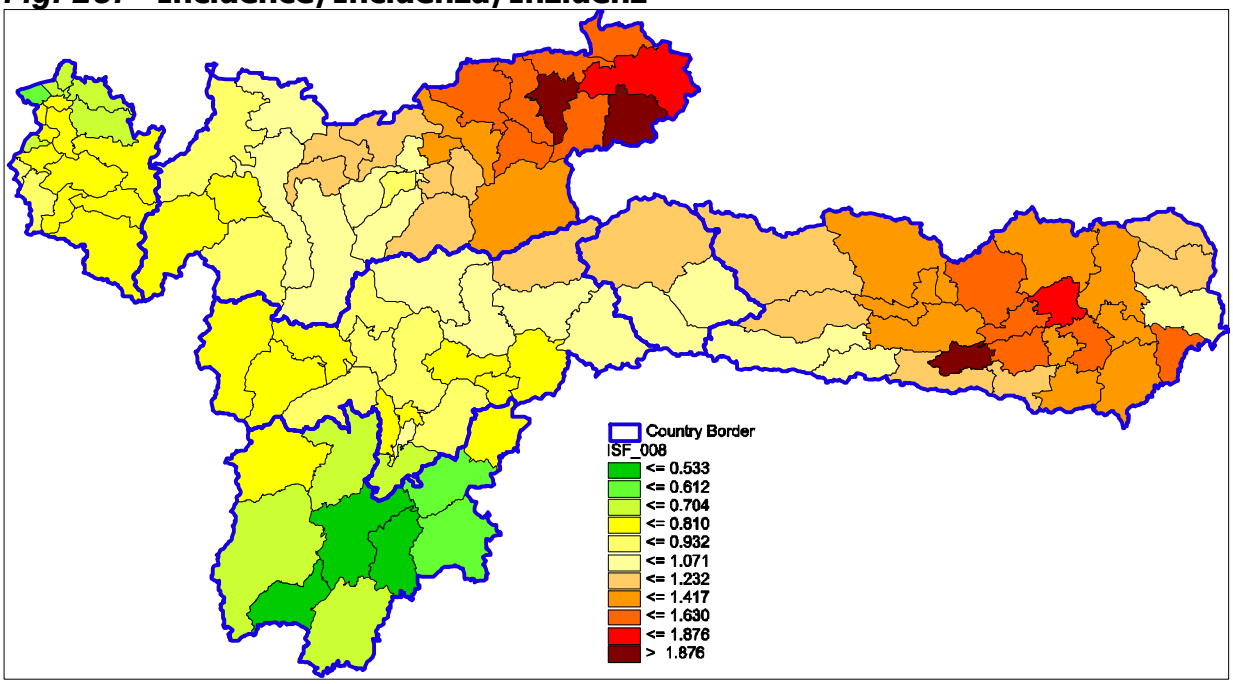
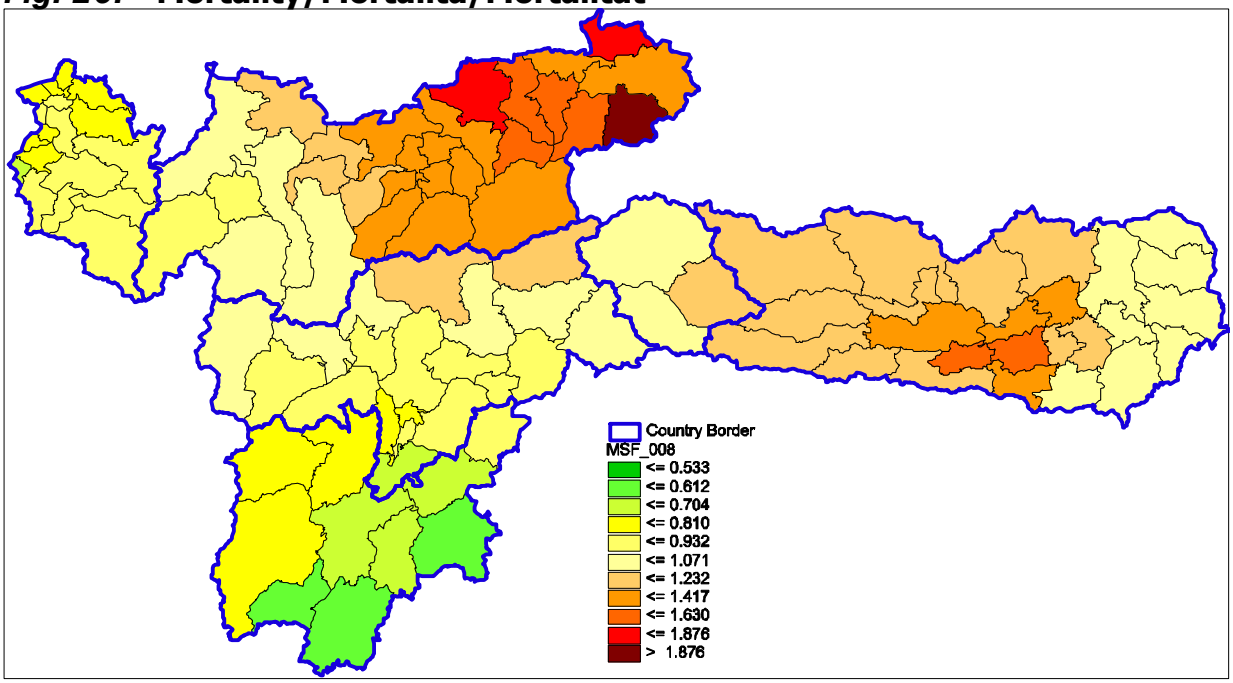



***Fig. 26:*** **Mortality/Mortalità/Mortalität**



### 4.7.7 Summary and Call for action

**The geographical picture is very clear and shows a consistent distribution of incidence and mortality. The north-eastern regions (Carinthia and the eastern part of Tyrol) have high risk, while in comparison, the western part of Tyrol, Vorarlberg, South Tyrol and Trentino show very low incidence and mortality rates.**
**The rate of participation in cervical cytology screening needs to be increased in all regions, especially in Carinthia and Tyrol. In South Tyrol, an organised program was already introduced in 2001 (see country specific text). It is crucial to include all women over the age of 20. This successful strategy has been well known for decades.**
**For a better understanding of the available data, besides invasive cancer, we have to document the incidence and treatment of pre-invasive lesions (CIN) in the whole study area and include these findings in our analyses.**

#### *Sintesi e proposte operative*

*L'immagine geografica è molto chiara sia per l'incidenza che per la mortalità. Le regioni nord-orientali (Carinzia e la parte orientale del Tirolo) evidenziano un alto rischio, mentre la zona occidentale del Tirolo, il Vorarlberg, l'Alto Adige ed il Trentino presentano tassi molto bassi di mortalità e di incidenza. Il tasso di partecipazione della popolazione femminile ai programmi di screening con pap-test deve essere aumentato in tutte le regioni, particolarmente nella Carinzia e nel Tirolo. In Alto Adige un programma organizzato è già stato introdotto nel 2001 (si veda il paragrafo specifico al paese). È cruciale coinvolgere tutte le donne a partire dall'età di 20 anni. Da molti anni è noto il successo di questa strategia. Per una migliore comprensione dei dati disponibili, oltre ai tumori invasivi andrebbero analizzati l'incidenza ed il trattamento delle lesioni pre-invasive (CIN) nell'intera area ed includere questi risultati nelle nostre analisi.*

#### Zusammenfassung und Empfehlungen

Das Bild der geographischen Verteilung ist sehr klar und zeigt Gebiete mit hohem Risiko im Nordosten Kärntens und im Tiroler Unterland. Im Tiroler Oberland, in Vorarlberg, Südtirol und Trentino beobachten wir erniedrigtes Risiko.
Die Teilnahmerate an Zervixscreening-Programmen muss in allen Regionen erhöht werden, besonders in Tirol und Kärnten. In Südtirol wurde bereits 2001 ein organisiertes Zervixscreening-Programm etabliert (siehe auch Beschreibung Südtirol). Es ist wesentlich, alle Frauen ab Alter 20 einzuladen. Diese erfolgreiche Methode ist seit Jahrzehnten bekannt.
Für ein besseres Verständnis der Daten sollten in Zukunft auch die präinvasiven Läsionen (CIN) systematisch dokumentiert und analysiert werden.

## *4.8 Corpus uteri* (Hans Concin)

ICD-9 Code: 182

### 4.8.1 Introduction

In central Europe, the mortality rate due to corpus cancer decreased in the 70s and since then has been relatively stable on a low niveau.

### 4.8.2 Epidemiology

A high incidence of endometrial cancer is seen in Vorarlberg and in the Tyrolean Oberland, and an inconsistent pattern is found in Carinthia. A low incidence attracts attention in Trentino. Overall, regional distinctions are high.
Regarding mortality rates, there seems to be a decrease when moving from western to eastern regions. High mortality from endometrial cancer in Vorarlberg, the western parts of Tyrol, South Tyrol and Trentino is opposed by low mortality in eastern Carinthia.
There is no unequivocal explanation for this gap between east and west. One can speculate on the reasons. We know that there is an association between corpus cancer incidence and oral contraception use (see details in the Risk factor paragraph). Was oral contraception used in earlier days and more frequently in Carinthia than in the western regions? The birth control pill was introduced in Austria in 1965. Prescribing the pill was done with hesitation in the beginning and oral contraception was possibly prescribed more liberally in the eastern part of the study area. Women who used oral contraception in the seventies and eighties at ages between 20 and 40 are currently 50 to 70 years of age and therefore at the peak age for endometrial cancer. With the suggested reduction of 40% of risk of endometrial cancer through the use of oral contraception one would expect an influence of different regional use on the incidence and mortality.

### 4.8.3 Data quality

The DCO-rates are very good in all regions and on average are only 0.5%. On average, the proportion of microscopically verified endometrial cancers lies at 99.1%. Clear differences with respect to the above mentioned can be found in the mortality to incidence ratio, which lie between 0.10 in Carinthia and 0.20 in South Tyrol.

### 4.8.4 Risk factors and screening

By far the most relevant risk factor is the lifelong, cumulative activity of estrogen without opposing progesterone, for example through ovulatory cycles, polycystic ovary syndrome (PCO), adipositas with a high activity of the aromatase, and application of exogenous estrogen without progesterone substitution. Use of oral contraception has a strong protective effect regarding the development of endometrial cancer. This fact should be considered and mentioned to the patient when advising women in their fifth decade on contraceptive methods.
There is no well accepted method of early detection of corpus cancer.

### 4.8.5 Geographical variation

Clear differences in geographical distribution can be seen with regard to incidence and mortality for endometrial cancer. Despite a low incidence rate, high mortality can be seen in Vorarlberg. A similar picture is seen in Trentino. The eastern part of Tyrol shows low incidence and low mortality, while high incidence and low mortality are present in Carinthia.

The geographical differences in incidence and mortality are very difficult to interpret.

The differences in risk factors, in particular adiposity, number of fully carried out pregnancies and use of hormonal contraceptives, are questioned.

The mortality rates due to cervical and corpus cancer are inversely related, i.e. regions with a high rate of cervical cancer have a low rate of endometrial cancer, and vice versa.

**Tab. 25**: Corpus uteri - Incidence

| Region | FEMALES | | | |
|---|---|---|---|---|
| | New cases | Rates x 100,000 | | SIR |
| | | Crude | Std | |
| **Trentino** | 221 | 18.7 | 10.4 (8.9,11.9) | 0.76 (0.66,0.86) |
| **South Tyrol** | 259 | 22.3 | 12.1 (10.5,13.7) | 1.02 (0.90,1.15) |
| **Carinthia** | 353 | 24.3 | 13.7 (12.1,15.2) | 1.07 (0.96,1.19) |
| **Tyrol** | 387 | 22.8 | 13.7 (12.2,15.2) | 1.14 (1.03,1.26) |
| **Vorarlberg** | 162 | 18.5 | 12.4 (10.4,14.5) | 0.97 (0.82,1.13) |
| **TOTAL** | **1,382** | **21.7** | **12.5 (11.8,13.2)** | |

**Tab. 26**: Corpus uteri - Mortality

| Region | FEMALES | | | |
|---|---|---|---|---|
| | Deaths | Rates x 100,000 | | SMR |
| | | Crude | Std | |
| **Trentino** | 40 | 3.4 | 1.4 (0.9,1.9) | 0.87 (0.62,1.19) |
| **South Tyrol** | 52 | 4.5 | 1.7 (1.1,2.2) | 1.37 (1.02,1.79) |
| **Carinthia** | 34 | 2.3 | 1.0 (0.6,1.4) | 0.69 (0.48,0.96) |
| **Tyrol** | 52 | 3.1 | 1.3 (0.9,1.8) | 1.03 (0.77,1.36) |
| **Vorarlberg** | 30 | 3.4 | 1.9 (1.1,2.6) | 1.23 (0.83,1.76) |
| **TOTAL** | **208** | **3.3** | **1.4 (1.2,1.6)** | |

**Tab. 27**: Corpus uteri - Data Quality

| Region | FEMALES | | |
|---|---|---|---|
| | % DCO | % MV | M/I |
| **Trentino** | 0.0 | 96.8 | 0.18 |
| **South Tyrol** | 0.4 | 99.2 | 0.20 |
| **Carinthia** | 0.8 | 100.0 | 0.10 |
| **Tyrol** | 0.5 | 99.2 | 0.13 |
| **Vorarlberg** | 0.6 | 99.4 | 0.19 |
| **TOTAL** | **0.5** | **99.1** | **0.15** |

## Corpus uteri /
## Corpo dell'utero /
## Gebärmutterkörper

***Fig. 27:*** **Incidence/Incidenza/Inzidenz**

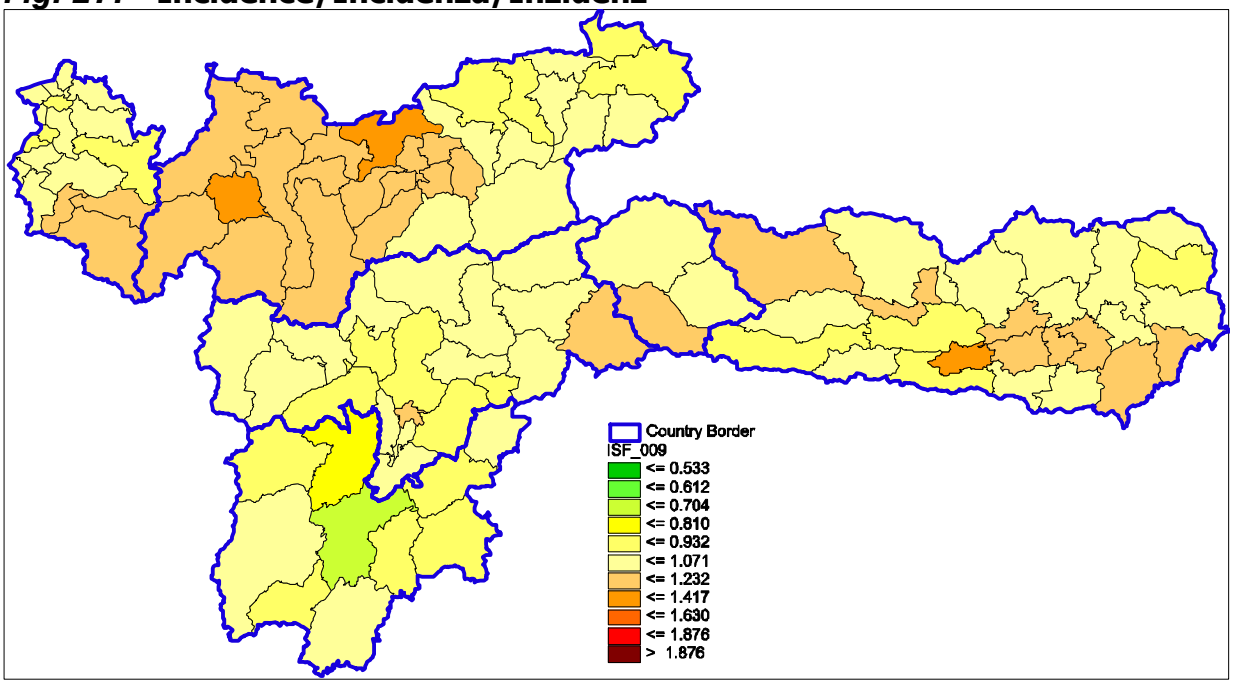
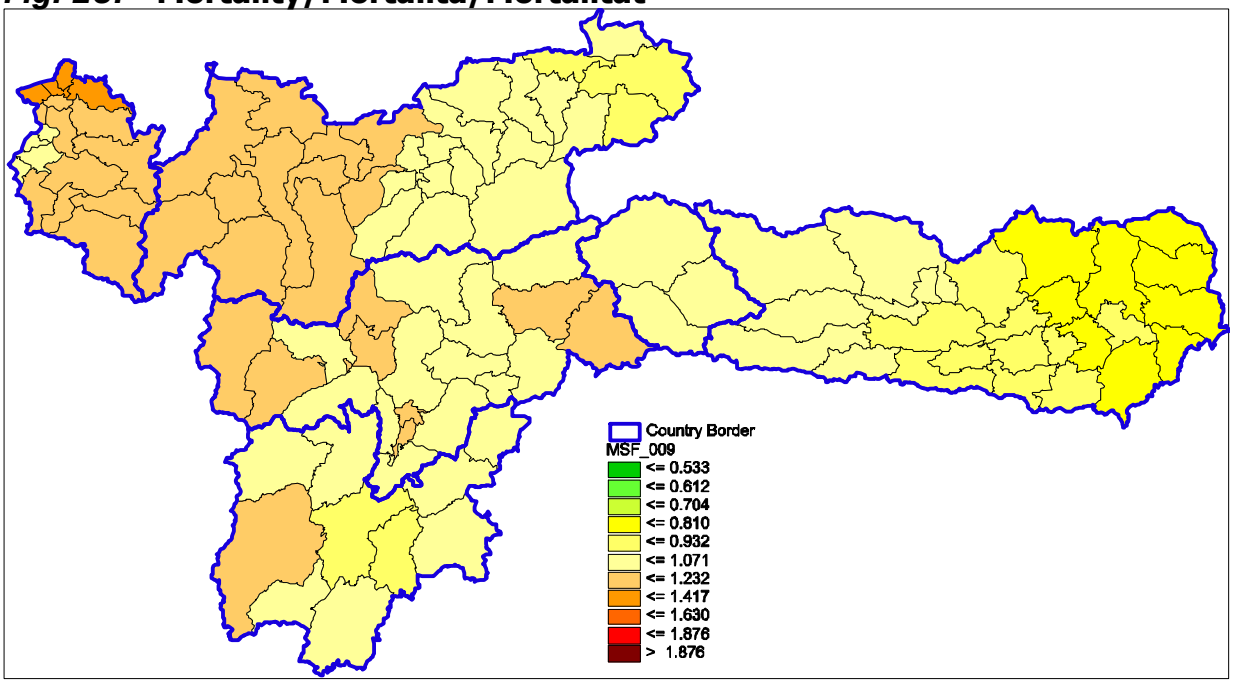



***Fig. 28:*** **Mortality/Mortalità/Mortalität**



### 4.8.6 Summary and Call for action

**The geographical distribution shows some differences between incidence an mortality. We observe consistently higher risk in the Tyrolean Oberland and Vorarlberg. Some singular regions with higher risk could be – despite our smoothing method - due to small numbers.**
**The differences in incidence and mortality due to endometrial cancer must be clarified. First of all, the risk factors of the different regions need to be verified.**
**In high risk patients, effective prevention can be achieved through the cyclic administration of progesterone before menopause. An increase in the routine use of vaginal ultrasounds in the gynaecological examination of postmenopausal women, together with conservative approaches for clarifying striking endometrial findings without bleeding will probably lead to more frequent diagnoses of endometrial cancer at an early, curable stage of disease.**

#### *Sintesi e proposte operative*

*La distribuzione geografica del rischio mostra alcune differenze fra incidenza e mortalità. Si osserva un rischio maggiore nel Tyrolean Oberland e nel Vorarlberg. Per alcune zone il rischio elevato potrebbe essere - malgrado la tecnica di lisciamento - dovuto ai piccoli numeri. La differenza tra incidenza e mortalità per cancro endometriale deve essere chiarita. Innanzitutto, si dovranno verificare i fattori di rischio presenti nelle varie regioni. Nelle donne a rischio, una prevenzione efficace può essere ottenuta attraverso la periodica somministrazione di progesterone prima della menopausa. Un aumento nell'uso sistematico della ultrasonografia vaginale durante l'esame ginecologico nelle donne dopo la menopausa, insieme ai metodi conservativi per chiarire gli strisci endometriali ottenuti senza sanguinamento probabilmente porteranno ad una diagnosi più frequente di cancro dell'endometrio in una fase iniziale e curabile della malattia.*

#### Zusammenfassung und Empfehlungen

Die geographische Verteilung zeigt konsistent erhöhtes Risiko im Tiroler Oberland sowie in Vorarlberg. Einige singuläre Regionen mit höherem Risiko könnten trotz der angewandten Glättungsverfahren durch kleine Fallzahlen bedingt sein.
Die Unterschiede in der Verteilung zwischen Inzidenz und Mortalität müssen untersucht werden. Dies bedeutet primär eine Untersuchung der Risikofaktoren. Für Patientinnen mit hohem Risiko ist eine Prävention mit zyklischer Gabe von Progesteron vor der Menopause sinnvoll. Eine Zunahme der vaginalen Ultraschalluntersuchungen von postmenopausalen Frauen in Kombination mit konservativen Untersuchungen zur Abklärung von blutungslosen Symptomen im Endometrium könnte zu einer Verschiebung zu frühen und damit heilbaren Stadien führen.

## *4.9 Ovary* (Hans Concin)

ICD-9 Code: 183

### 4.9.1 Introduction

Up to 70% of ovarian cancers are still diagnosed at advanced stages. There is only approximately a 30% chance of surviving for 5 years at stage III, and only 11% at stage IV.

### 4.9.2 Epidemiology

Except for Vorarlberg, the standardized incidence rate lies near the average. As opposed to Carinthia and Tyrol, Vorarlberg shows a statistically significant lower incidence of 0.74. Research into why the incidence is significantly lower in Vorarlberg shows that the borderline lesions in Vorarlberg aren't coded as malignant diseases and thus do not contribute the the incidende rate. This confirms why incidence is lower where an average mortality exists.
Carinthia shows high incidence and mortality, while Tyrol and Northern Tyrol are clearly lower with a mortality of 0.84.

### 4.9.3 Data Quality

Registration of incident ovarian cancer cases was not consistent throughout the study region: while in Tyrol and Carinthia borderline cases were coded as malignant, in the other regions borderline cases were coded as in situ case and thus did not contribute to the incidence rates. DCO-rates range from 0.4 (South Tyrol) to 15.0 (Carinthia). Microscopically verified ovarian cancers in Trentino are only at 82.4%, with an average of 90.4% across all regions. So evidently there are some severe problems in data quality regarding incidence and this fact must be taken into consideration when interpreting incidence maps.

### 4.9.4 Risk factors, early defection and screening

Risk factors are polycystic ovary disease, diet high in saturated animal fats, and family history (10% of cases have genetic predisposition).
Massive effort has been put into finding a screening method for ovarian cancer, but no suitable method for early detection could be established so far. There have been discussions around intensifying diagnostic investigations in women with a high risk of ovarian cancer. However, this approach didn't reduce the number of unnecessarily performed surgeries to a tolerable degree.
The number of life-long ovulations directly correlates with the risk for ovarian cancer.
Not having children is another well know risk factor. As is true for all hormone-dependent tumors, ovarian cancer seems to be related to the consumption of meat and animal fat. Oral contraception has a protective effect and this effect continues till the peak-age for development of ovarian cancer at about 65 years.

### 4.9.5 Survival

The 5 year survival rate for epithelial tumors in stage I is 90%, while it is approximately 70% for stage II, 30% for stage III and 10% for stage IV.

### 4.9.6 Geographical variation

A more favourable incidence is seen in Vorarlberg (without borderline lesions) and Trentino than in Carinthia, while Tyrol and South Tyrol lie in between. In this context, the question of the influence of screening and the frequency of surgery arises. It is not uncommon that ovarian cancer is diagnosed by accident during gynaecological surgery that has been performed for reasons other than oncological ones. The frequencies of gynaecological surgeries vary strongly within Austria, and could therefore possibly influence the incidence and mortality of ovarian cancer.
Regarding ovarian cancer mortality, eastern Carinthia exhibits a high rate, while an average mortality rate is seen in the other regions. This demonstrates that the therapeutic options for ovarian cancer, which is diagnosed in an advanced stage in 70% of cases, are limited.

**Tab. 28**: Ovary - Incidence

| Region | FEMALES | | | |
|---|---|---|---|---|
| | New cases | Rates x 100,000 | | SIR |
| | | Crude | Std | |
| **Trentino** | 248 | 21.0 | 12.3 (10.5,14.0) | 0.90 (0.79,1.02) |
| **South Tyrol** | 234 | 20.2 | 11.2 (9.6,12.8) | 0.97 (0.85,1.10) |
| **Carinthia** | 347 | 23.9 | 14.3 (12.7,16.0) | 1.12 (1.00,1.24) |
| **Tyrol** | 369 | 21.7 | 14.2 (12.6,15.7) | 1.12 (1.01,1.24) |
| **Vorarlberg** | 121 | 13.8 | 9.0 (7.3,10.8) | 0.74 (0.62,0.89) |
| **TOTAL** | **1,319** | **20.7** | **12.5 (11.8,13.3)** | |

**Tab. 29**: Ovary - Mortality

| Region | FEMALES | | | |
|---|---|---|---|---|
| | Deaths | Rates x 100,000 | | SMR |
| | | Crude | Std | |
| **Trentino** | 147 | 12.4 | 5.8 (4.7,6.9) | 0.84 (0.71,0.99) |
| **South Tyrol** | 124 | 10.7 | 4.6 (3.7,5.5) | 0.84 (0.70,1.00) |
| **Carinthia** | 219 | 15.1 | 7.1 (6.0,8.1) | 1.14 (1.00,1.30) |
| **Tyrol** | 219 | 12.9 | 6.7 (5.7,7.7) | 1.11 (0.97,1.27) |
| **Vorarlberg** | 97 | 11.1 | 6.5 (5.1,8.0) | 1.01 (0.82,1.24) |
| **TOTAL** | **806** | **12.7** | **6.2 (5.7,6.6)** | |

**Tab. 30**: Ovary - Data Quality

| Region | FEMALES | | |
|---|---|---|---|
| | % DCO | % MV | M/I |
| **Trentino** | 1.6 | 82.4 | 0.59 |
| **South Tyrol** | 0.4 | 90.6 | 0.53 |
| **Carinthia** | 15.0 | 89.8 | 0.63 |
| **Tyrol** | 4.9 | 95.4 | 0.59 |
| **Vorarlberg** | 5.6 | 93.2 | 0.78 |
| **TOTAL** | **6.0** | **90.4** | **0.61** |

## Ovary / Ovaio / Eierstock

***Fig. 29:*** **Incidence/Incidenza/Inzidenz**

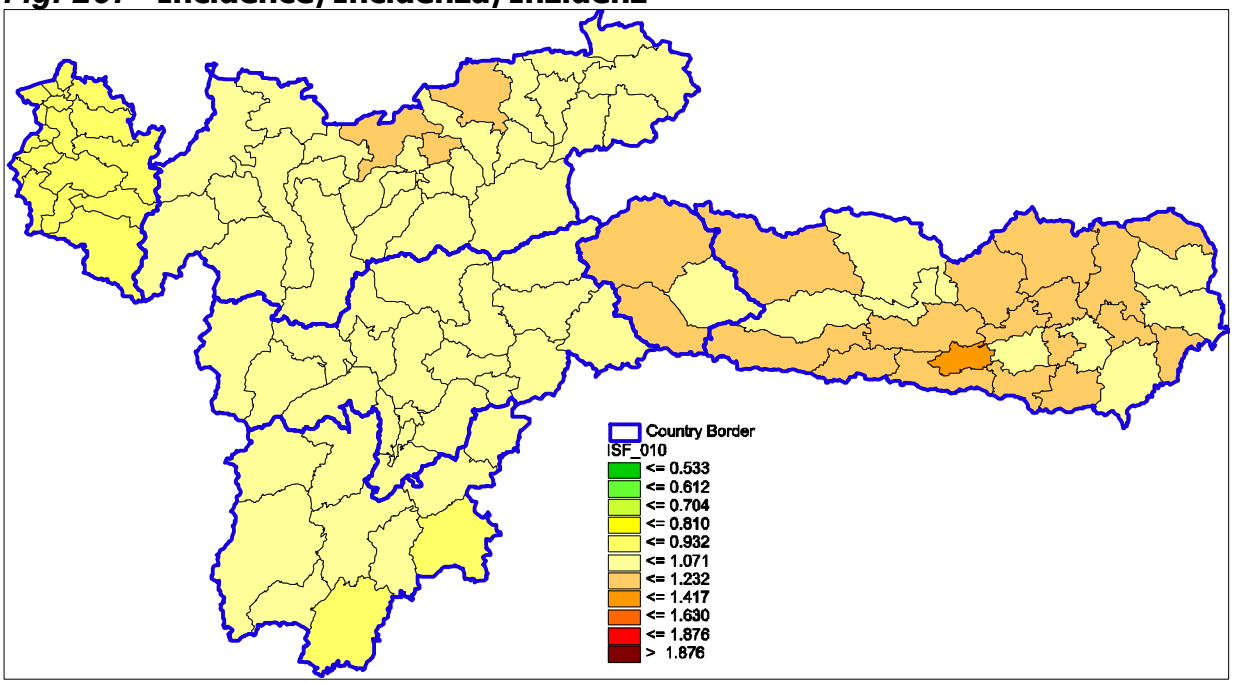
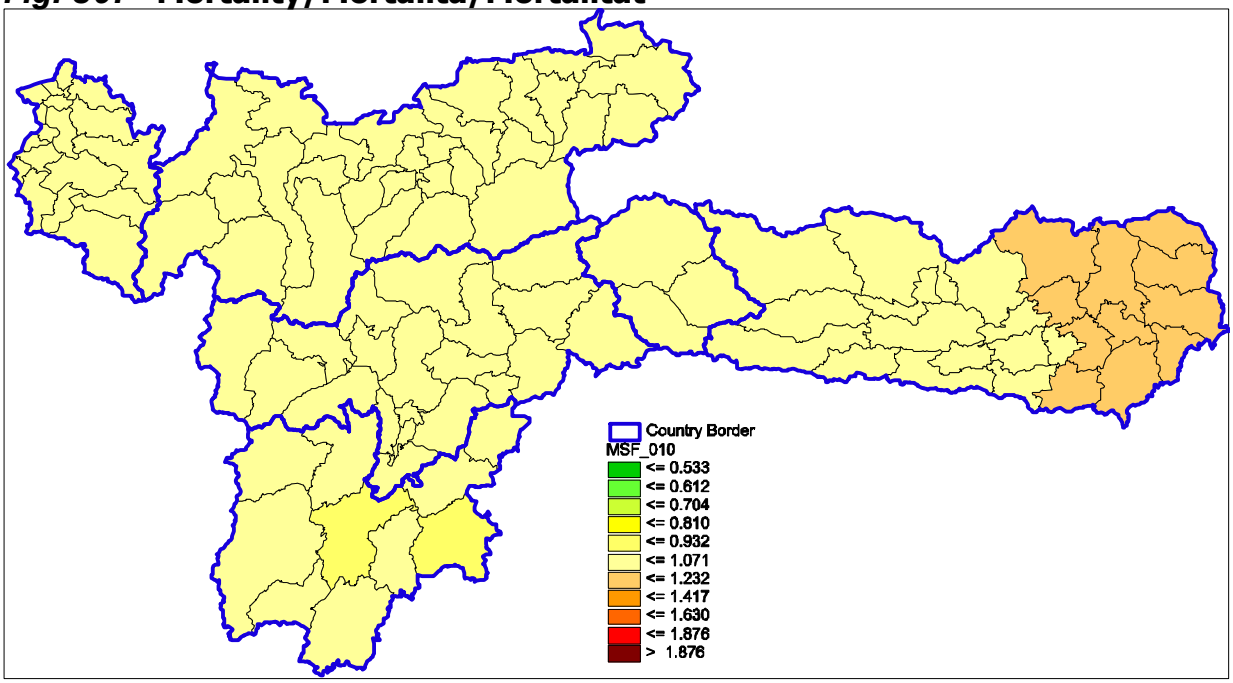



***Fig. 30:*** **Mortality/Mortalità/Mortalität**



### 4.9.7 Summary and Call for action

**We see some higher risk for ovarian cancer mortality in the eastern part of Carinthia. We don't have any clear strategic suggestions at the moment. With the exception of the extremely rare cases of women with BRCA I or BRCA II mutations, for which an ovarectomy is recommended following family planning, everything else is still only at the stage of scientific discussion. Ultrasounds, doppler ultrasounds, tumor markers, genomics and proteomics all haven't fulfilled set expectations.**

#### *Sintesi e proposte operative*

*L'analisi evidenzia un rischio elevato di mortalità per tumore ovarico nella parte orientale della Carinzia. Al momento non siamo in grado di fornire alcun suggerimento di carattere strategico. Con l'eccezione di casi estremamente rari di donne con mutazioni di BRCA I o di BRCA II, nei quali viene raccomandato l'intervento di asportazione dell'ovaio dopo la nascita della prole, ogni indicazione è ancora soltanto dibattuta a livello scientifico. Gli ultrasuoni, il doppler, i marker tumorali, la genomica e la proteomica non hanno ancora raggiunto le aspettative prefissate.*

#### Zusammenfassung und Empfehlungen

Für Ovarialkarzinome sehen wir ein höheres Risiko in Unterkärnten.
Es gibt derzeit keine etablierten Methoden für Früherkennung oder Screening. Mit Ausnahme von seltenen Fällen mit BRCA I oder BRCA II Mutationen, für die eine Familienplanung gefolgt von Ovarektomie empfohlen wird, sind alle anderen Ansätze im Stadium der wissenschaftlichen Diskussion. Keine der Untersuchungen wie Ultraschall, Doppleruntersuchung, Tumormarker, Genomik oder Proteomik, haben bisher die Erwartungen erfüllt.

## *4.10 Prostate* (Willi Oberaigner)

ICD-9 Code: 185

### 4.10.1 Introduction

With the exception of Trentino, in all areas of the study region prostate cancer is now the most frequent incident cancer site for males. In terms of mortality, prostate cancer takes the second position in Austrian provinces and the third position (after lung cancer and colorectal cancer) in the Italian parts of our study region. In Tyrol, the province with the highest rate of PSA testing in the study area, about 1/3 of incident cancer cases are prostate cancers and 1/8 of cancer deaths are due to prostate cancer [1]. In the other provinces in the study area, the respective percentages for incidence range from 13% in Trentino and 20% in South Tyrol to 25% in Vorarlberg and Carinthia, whereas for mortality, they range from 8-9% in Trentino and South Tyrol to 12-13% in Vorarlberg and Carinthia.

### 4.10.2 Epidemiology

For incidence, we observe a wide range of SMR from 0.55 in Trentino to 1.43 in Tyrol. Age standardised rates vary from 39.1 in Trentino to 110.7 in Tyrol. The main reason is the different level of PSA testing. Concerning mortality, the range in SMR is much smaller from 0.88 in Trentino to 1.21 in Vorarlberg. Age standardised rates vary from 13.3 in Trentino to 17.9 in Vorarlberg. Tyrol – the province with the highest incidence rate – has a mortality rate of 14.2 which is closer to the rates in the Italian provinces than in the Austrian parts.

In most central European countries, prostate cancer is the second leading cancer cause of death and the first leading incident cancer site for males. In Europe, prostate cancer mortality has a wide range and we observe higher mortality rates in France and the Scandinavian countries [2,3]. In northern Europe, the incidence rate is 45.4 and the mortality rate is 20.0. In contrast, prostate cancer rates are considerably smaller in southern parts of Europe with an incidence rate of 23.9 and a mortality rate of 13.0.

### 4.10.3 Data quality

DCO-rates are fairly small, ranging from 0.7 in South Tyrol and 0.8 in Trentino to 2.5 in Vorarlberg and 6.0 in Carinthia. The percentage of microscopically verified cases is very high in the Austrian regions (96.2 to 98.9) and smaller in the Italian ones (93.5 in South Tyrol and 84.6 in Trentino). Mortality to incidence ratio (M/I) is expected to have a broad range due to the big differences in incidence. M/I is 0.16 in Tyrol, 0.24-0.25 in South Tyrol, Vorarlberg and Carinthia and 0.39 in Trentino.

### 4.10.4 Risk factor, early detection, screening

Few facts are known about risk factors. Some authors conclude that risk factors for prostate cancer remain poorly understood. Only a few facts on family history of prostate cancer [4] and ethnic groups [5,6] are known, but many questions remain unanswered, notably concerning aspects of lifestyle (diet, tobacco etc.).

Several analyses show a reduction in prostate cancer mortality in Tyrol after the introduction of PSA screening. In Tyrol, PSA screening seems to be an efficient screening method but for a final recommendation we have to wait for the results of two large randomised studies, which won't be available before 2010 [1].

### 4.10.5 Survival

Prostate cancer survival is rather favourable in the early stages but still poor in the advanced stages [1,7,8]: where we see five year relative survival rates between 90 and 100 in the early stages, the respective rates for advanced stages are between 10 and 20 [9]. There is no curative therapy for late stages, so a shift towards early stages - as it appears as a consequence of screening programs - should substantially improve survival rates.

### 4.10.6 Geographical variation

The regional distribution of prostate cancer mortality should show the true underlying risk of prostate cancer death. In contrast, prostate cancer incidence is heavily influenced by PSA testing and has more than doubled in Tyrol in the last decade. Many of the very early incident prostate cancers are still to be coded as malignant cancer cases and therefore contribute to the number of incident cancer cases. This is in contrast to cervical cancer where early detection results mainly in an increase of in situ cases which do not count as malignant cases. In addition, in South Tyrol, Vorarlberg and Carinthia, time trend analyses show a clear increase and we estimate that prostate cancer incidence in other provinces is also heavily influenced by PSA activities. So what we see in incidence is indeed much more a picture of PSA testing than a picture of what we could call true prostate cancer incidence and there are no means to estimate the true prostate cancer incidence.

If we first look at mortality, we see some higher risk in Vorarlberg and in eastern Carinthia. Observed SMRs in Vorarlberg regions range up to 1.8 and smoothed SMRs are about 1.2. In Eastern Carinthia, observed SMRs are up to 2.0 and smoothed SMRs in the eastern regions are 1.2 to 1.3. Regions of higher risk are consistent between incidence and mortality.

As argued before, the picture seen in incidence is mainly a picture of PSA activities. So we cannot draw any conclusions concerning underlying risk. At least in Tyrol, we do not see any excess risk in mortality. But we know from other sources that prostate cancer mortality is decreasing, at least in some age classes, which could be contributed to PSA testing.

**Tab. 31**: Prostate - Incidence

| Region | MALES | | | |
|---|---|---|---|---|
| | New cases | Rates x 100,000 | | SIR |
| | | Crude | Std | |
| **Trentino** | 857 | 76.3 | 39.1 (36.4,41.8) | 0.55 (0.51,0.59) |
| **South Tyrol** | 1,201 | 106.5 | 65.1 (61.3,68.9) | 0.89 (0.84,0.94) |
| **Carinthia** | 1,795 | 131.5 | 76.0 (72.3,79.6) | 1.05 (1.00,1.10) |
| **Tyrol** | 2,461 | 151.5 | 110.7 (106.3,115.2) | 1.43 (1.37,1.49) |
| **Vorarlberg** | 877 | 101.9 | 78.0 (72.8,83.2) | 1.04 (0.98,1.12) |
| **TOTAL** | 7,191 | 117.9 | 74.9 (73.2,76.7) | |

**Tab. 32**: Prostate - Mortality

| Region | MALES | | | |
|---|---|---|---|---|
| | Deaths | Rates x 100,000 | | SMR |
| | | Crude | Std | |
| **Trentino** | 332 | 29.6 | 13.3 (11.8,14.7) | 0.88 (0.79,0.98) |
| **South Tyrol** | 291 | 25.8 | 14.0 (12.3,15.6) | 0.93 (0.82,1.04) |
| **Carinthia** | 447 | 32.8 | 16.4 (14.8,17.9) | 1.10 (1.00,1.20) |
| **Tyrol** | 397 | 24.4 | 14.2 (12.8,15.7) | 0.98 (0.89,1.08) |
| **Vorarlberg** | 215 | 25.0 | 17.9 (15.5,20.3) | 1.21 (1.05,1.38) |
| **TOTAL** | 1,682 | 27.6 | 14.9 (14.1,15.6) | |

**Tab. 33**: Prostate - Data Quality

| Region | MALES | | |
|---|---|---|---|
| | % DCO | % MV | M/I |
| **Trentino** | 0.8 | 84.6 | 0.39 |
| **South Tyrol** | 0.7 | 93.5 | 0.24 |
| **Carinthia** | 6.0 | 96.2 | 0.25 |
| **Tyrol** | 1.5 | 98.9 | 0.16 |
| **Vorarlberg** | 2.5 | 99.7 | 0.24 |
| **TOTAL** | **2.4** | **95.7** | **0.23** |

## Prostate /
## Prostata /
## Prostata

***Fig. 31:*** **Incidence/Incidenza/Inzidenz**

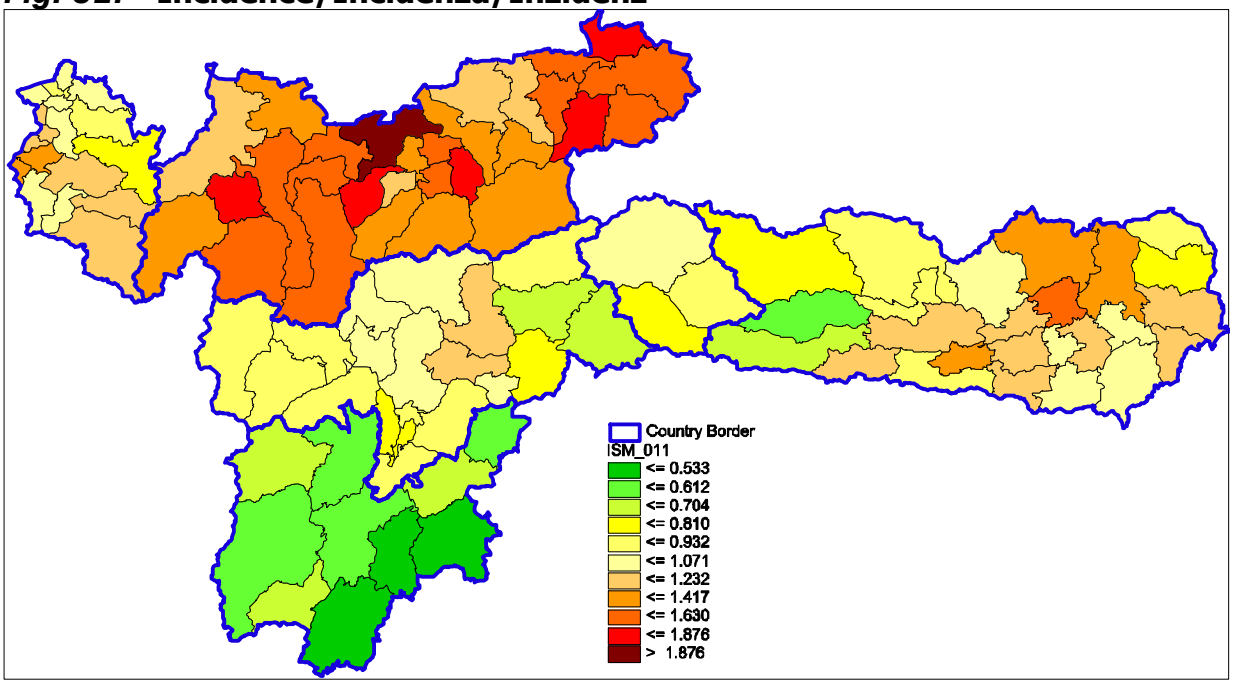
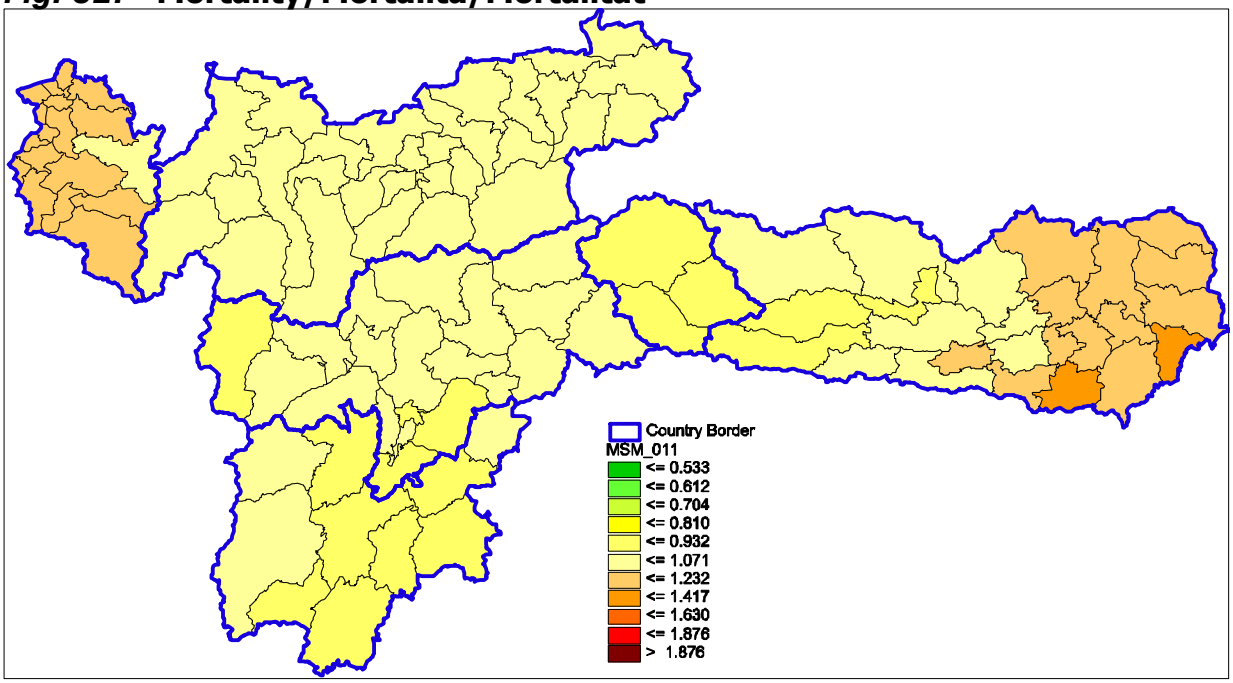



***Fig. 32:*** **Mortality/Mortalità/Mortalität**



### 4.10.7 Summary and Call for action

**We see a clear geographic pattern in incidence, namely very high risk in Tyrol which is correlated to intensive PSA testing. In mortality, the geographical pattern is not so clear, but we observe some higher risks in Vorarlberg and lower Carinthia.**
**PSA testing is discussed very controversially worldwide. Although some studies show benefits, it is too early to provide final recommendations. However, an analysis of time trends in Tyrol has shown a statistically significant decrease of prostate cancer mortality whereas in Austria without Tyrol, prostate cancer mortality shows no decrease.**

### *Sintesi e proposte operative*

*La mappa di incidenza evidenzia un chiaro pattern geografico, ovvero un rischio molto elevato nel Tirolo che è correlato allo screening con PSA. Riguardo alla mortalità, la distribuzione geografica non è altrettanto chiara, ma si osserva un rischio maggiore in Vorarlberg e nella bassa Carinzia. Il test del PSA è attualmente al centro di una discussione molto controversa. Anche se alcuni studi esprimono risultati a favore del PSA, è prematuro fornire una raccomandazione conclusiva in merito. Tuttavia, un'analisi dei trend temporali ha indicato per il Tirolo una diminuzione statisticamente significativa della mortalità per tumore della prostata, mentre in Austria (ad esclusione del Tirolo) la mortalità per il medesimo tumore non è diminuita.*

### Zusammenfassung und Empfehlungen

Wir sehen ein klares Muster in der geographischen Verteilung der Inzidenzraten, nämlich sehr stark erhöhte Raten in Tirol, die aber durch die große Inanspruchnahme von PSA-Untersuchungen bedingt sind. Die Verteilung der Mortalitätsrate ist nicht so klar, wir beobachten aber Regionen mit höherem Risiko in Vorarlberg und Unterkärnten.
Screening mit PSA-Untersuchungen wird weltweit kontroversiell diskutiert. Obwohl einige Studien Vorteile zeigen, ist es zu früh, endgültige Empfehlungen auszusprechen. Eine ganz aktuelle Untersuchung in Tirol hat aber eine statistisch signifikante Abnahme der Prostatakarzinommortalität in Tirol um ca. 33% gezeigt, während in Österreich außer Tirol ein konstanter Verlauf der Mortalitätsrate zu beobachten ist.

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## *4.11 Bladder* (Silvano Piffer)

ICD-9 Code: 188

### 4.11.1 Introduction

Bladder cancer is the 7th most common cancer worldwide, accounting for 3.2% of all cancers. There were an estimated 260,000 new cases in the year 2000 in men and 76,000 in women. In Europe, each year approximately 36,500 deaths occur due to bladder cancer in males and nearly 13,000 in females. It is 7th most common cancer in males in Europe and 14th most common cancer in women.

### 4.11.2 Epidemiology

2,936 new cancers of the urinary bladder are registered in the whole area, 587 per year, 5.0% of all new cancers. About three-quarters of these tumours occur in men. Males appear to have two to three times higher rates than females.

In **Females,** bladder cancer accounts for, in the whole area, 2.7% of all incident cancer cases (from 2.1% for Tyrol and Vorarlberg to 3.1% for Carinthia). The incidence rate for the whole area is higher than the estimated average E.U. value, where Spain presents the highest value for 1998 (5.2) [1]. Area values are coherent with country profiles in which the areas belong, as reported by Globocan-IARC in 2002 [2].

In the entire area, bladder cancer accounts for 2.1% of all cancer deaths (from 1.8% in Vorarlberg to 2.6% in South Tyrol).

In **Males,** bladder cancer accounts for, on the whole area, 7.1% of all incident cancer cases (from 4.8 in Vorarlberg to 8.6 in Trentino and South Tyrol). The incidence rate for the whole area is higher than the estimated average E.U. value, where Spain presents the highest value for 1998 (30.2) [1]. Area values are coherent with country profiles in which the areas belong, as reported by Globocan-IARC in 2002 [2].

In the entire area, bladder cancer accounts for 4.3% of all cancer deaths (from 2.9 in Carinthia to 5.3 in Trentino).

### 4.11.3 Data quality

The quality of registered data in the whole area is good. The DCO percentage is different in the different regions. Carinthia and Vorarlberg have the highest values; this variability is particularly accentuated for female patients (0.6% - 8.3%).

On average, the percentage of cases microscopically verified is satisfactory: 94.2% for females and 96.9% for males, with greater values in Austrians regions. The mortality/incidence ratio varies from 0.29 to 0.47 for females and from 0.19 to 0.35 for males.

### 4.11.4 Risk factor, early detection, screening

Several epidemiological reports support a relationship between bladder cancer and cigarette smoking. It has been suggested that up to 40% of all male and 10% of female cases might be

attributable to this exposure [3,4]. The relationship of risk to duration and intensity of smoking is similar to that of lung cancer, although the risks are lower. Bladder cancer is also strongly linked, particularly in males, to occupational and environmental exposure to chemicals. Occupational exposure is estimated to be the cause of around 20% of current bladder cancer cases. In the 1950s, studies in the dye intermediates industry and the rubber industry already indicated that arylamines such as 2-napthylamine, benzidine and (in the USA) 4-aminobiphenyl are all human bladder carcinogens [5,6,7,8]. Some slight excess risk of bladder cancer has also been reported in leather workers, painters, truck drivers, aluminium workers, and those in jobs with high exposure to printing inks, cutting oils and solder [9].

### 4.11.5 Survival

The European average 5-year relative survival rate for bladder cancer is almost 70%. The female rates are slightly lower (67.1% vs. 69.5%) than those of males [10,11].

### 4.11.6 Geographical variation

**Females.** Incidence standardized rates show heterogeneity among Austrians regions: Carinthia presents the highest values compared to all regions with a statistically significant difference. Vorarlberg and Tyrol show rates lower than the expected value with a statistically significant difference. The map shows an increasing trend from north-west to south-east. For Austrian regions, the highest incidence areas are concentrated in Carinthia, for South Tyrol in the Bolzano area and Bassa Atesina, for Trentino in Bassa Valsugana.

Standardized mortality rates show South Tyrol with the highest value but the differences are not statistically significance. The map does not show any differences on the whole area with the exception of Bolzano, which presents the highest value. On this basis one could presume homogeneous accessibility to diagnostic and therapeutic procedures across the whole region.

**Males.** With regard to incidence, an increasing trend appears from north to south. *Excess risk areas* with highest values are concentrated in the north-east of Trentino and in the south of South Tyrol. The highest (Trentino) and lowest (Vorarlberg) rate ratio is 2.74. Standardized rates confirm higher incidence in Italian regions and lower incidence in Austrian regions, particularly in Tyrol and Vorarlberg. The differences are statistically significance. The map confirms an increasing trend from north to south with scattered *excess risk areas* in Trentino (Valle di Fassa, Valle di Non, Alto Garda) and in South Tyrol (Bolzano, Merano, Val Gardena, Val d'Ega-Sciliar, Bassa Atesina). Austrian regions present incidence rates homogeneously lower than the Italians ones, with the lowest value in Vorarlberg. Standardized rates show Trentino as the region with the highest value, followed by South Tyrol. In both regions standardized rates are higher than the expected value, with a statistically significant difference. An increasing trend from north to south is also confirmed.

**Tab. 34**: Bladder - Incidence

| Region | FEMALES | | | | MALES | | | |
|---|---|---|---|---|---|---|---|---|
| | New cases | Rates x 100,000 | | SIR | New cases | Rates x 100,000 | | SIR |
| | | Crude | Std | | | Crude | Std | |
| **Trentino** | 164 | 13.9 | 5.7 (4.7,6.7) | 1.03 (0.88,1.20) | 574 | 51.1 | 27.7 (25.3,30.0) | 1.20 (1.10,1.30) |
| **South Tyrol** | 147 | 12.7 | 5.4 (4.4,6.4) | 1.10 (0.93,1.29) | 518 | 45.9 | 28.5 (26.0,31.1) | 1.25 (1.15,1.36) |
| **Carinthia** | 216 | 14.9 | 6.5 (5.5,7.5) | 1.24 (1.08,1.42) | 515 | 37.7 | 22.1 (20.1,24.1) | 0.98 (0.90,1.07) |
| **Tyrol** | 142 | 8.4 | 4.0 (3.3,4.8) | 0.80 (0.67,0.94) | 438 | 27.0 | 18.7 (16.9,20.5) | 0.83 (0.75,0.91) |
| **Vorarlberg** | 62 | 7.1 | 3.5 (2.5,4.5) | 0.72 (0.55,0.93) | 160 | 18.6 | 14.0 (11.8,16.2) | 0.62 (0.53,0.73) |
| **TOTAL** | **731** | **11.5** | **5.1 (4.7,5.5)** | | **2,205** | **36.1** | **22.7 (21.7,23.7)** | |

**Tab. 35**: Bladder - Mortality

| Region | FEMALES | | | | MALES | | | |
|---|---|---|---|---|---|---|---|---|
| | Deaths | Rates x 100,000 | | SMR | Deaths | Rates x 100,000 | | SMR |
| | | Crude | Std | | | Crude | Std | |
| **Trentino** | 60 | 5.1 | 1.2 (0.8,1.6) | 0.97 (0.74,1.24) | 199 | 17.7 | 8.5 (7.3,9.7) | 1.38 (1.19,1.59) |
| **South Tyrol** | 60 | 5.2 | 1.8 (1.3,2.4) | 1.22 (0.93,1.57) | 146 | 12.9 | 7.1 (5.9,8.2) | 1.21 (1.02,1.42) |
| **Carinthia** | 63 | 4.3 | 1.4 (1.0,1.8) | 0.98 (0.75,1.25) | 99 | 7.3 | 3.7 (2.9,4.4) | 0.63 (0.52,0.77) |
| **Tyrol** | 59 | 3.5 | 1.1 (0.8,1.4) | 0.91 (0.69,1.17) | 147 | 9.0 | 5.7 (4.7,6.6) | 0.94 (0.80,1.11) |
| **Vorarlberg** | 30 | 3.4 | 1.2 (0.8,1.7) | 0.97 (0.65,1.38) | 56 | 6.5 | 4.8 (3.5,6.1) | 0.80 (0.60,1.04) |
| **TOTAL** | **272** | **4.3** | **1.3 (1.2,1.5)** | | **647** | **10.6** | **6.0 (5.5,6.4)** | |

**Tab. 36**: Bladder - Data Quality

| Region | FEMALES | | | MALES | | |
|---|---|---|---|---|---|---|
| | % DCO | % MV | M/I | % DCO | % MV | M/I |
| **Trentino** | 0.6 | 89.6 | 0.37 | 0.2 | 93.4 | 0.35 |
| **South Tyrol** | 1.4 | 91.7 | 0.41 | 0.8 | 97.3 | 0.28 |
| **Carinthia** | 8.3 | 98.5 | 0.29 | 2.1 | 98.8 | 0.19 |
| **Tyrol** | 1.4 | 94.3 | 0.42 | 1.8 | 98.1 | 0.34 |
| **Vorarlberg** | 6.3 | 98.3 | 0.47 | 3.1 | 99.4 | 0.34 |
| **TOTAL** | **3.4** | **94.2** | **0.37** | **1.2** | **96.9** | **0.29** |

## Bladder – Females / Vescica – Femmine / Harnblase – Weiblich

***Fig. 33:*** **Incidence/Incidenza/Inzidenz**

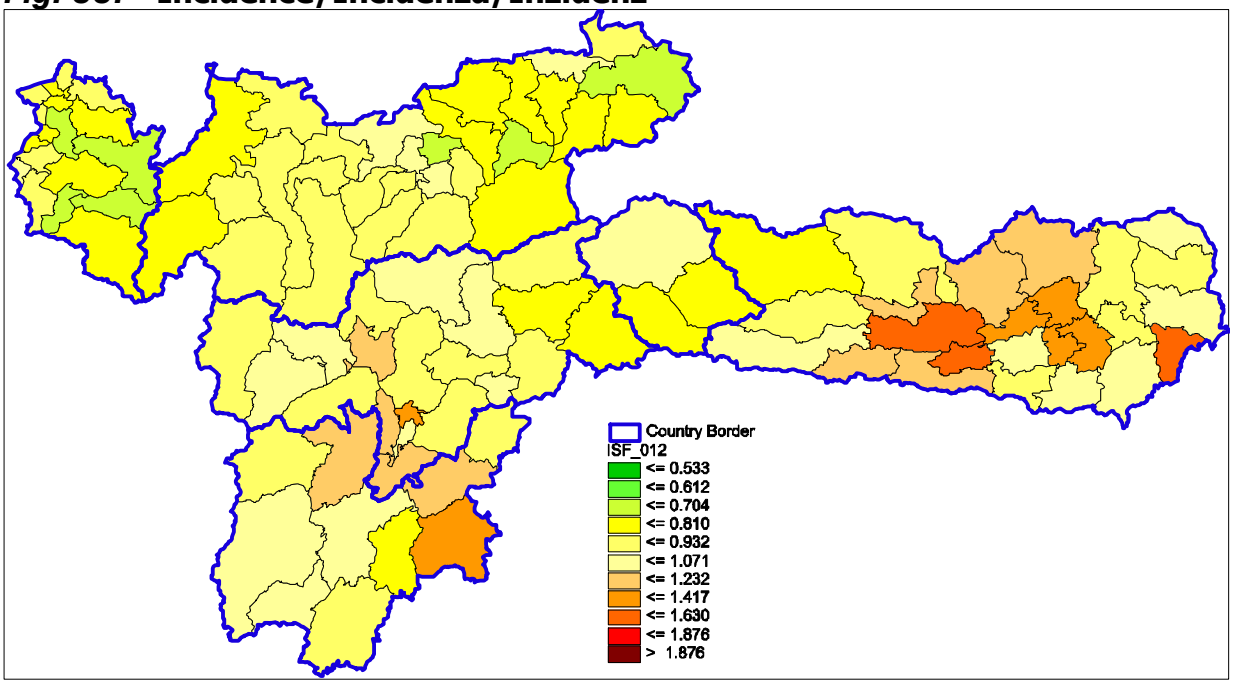
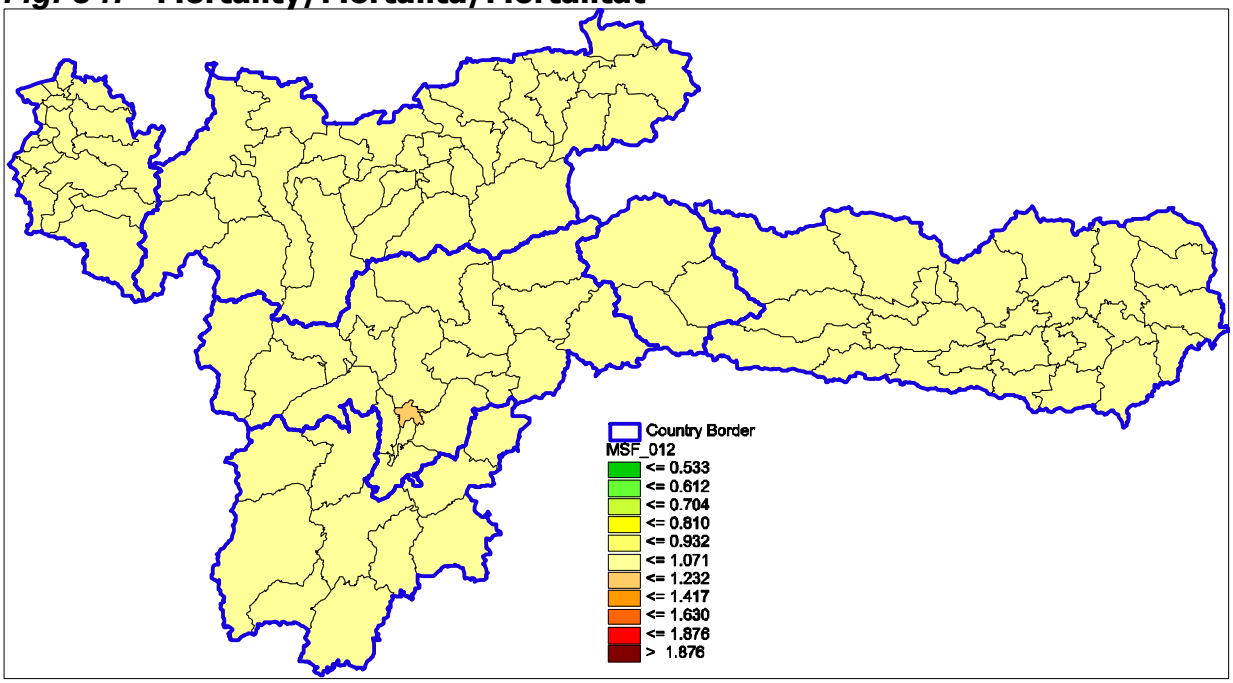



***Fig. 34:*** **Mortality/Mortalità/Mortalität**



## Bladder – Males /
## Vescica – Maschi /
## Harnblase – Männlich

***Fig. 35:*** **Incidence/Incidenza/Inzidenz**

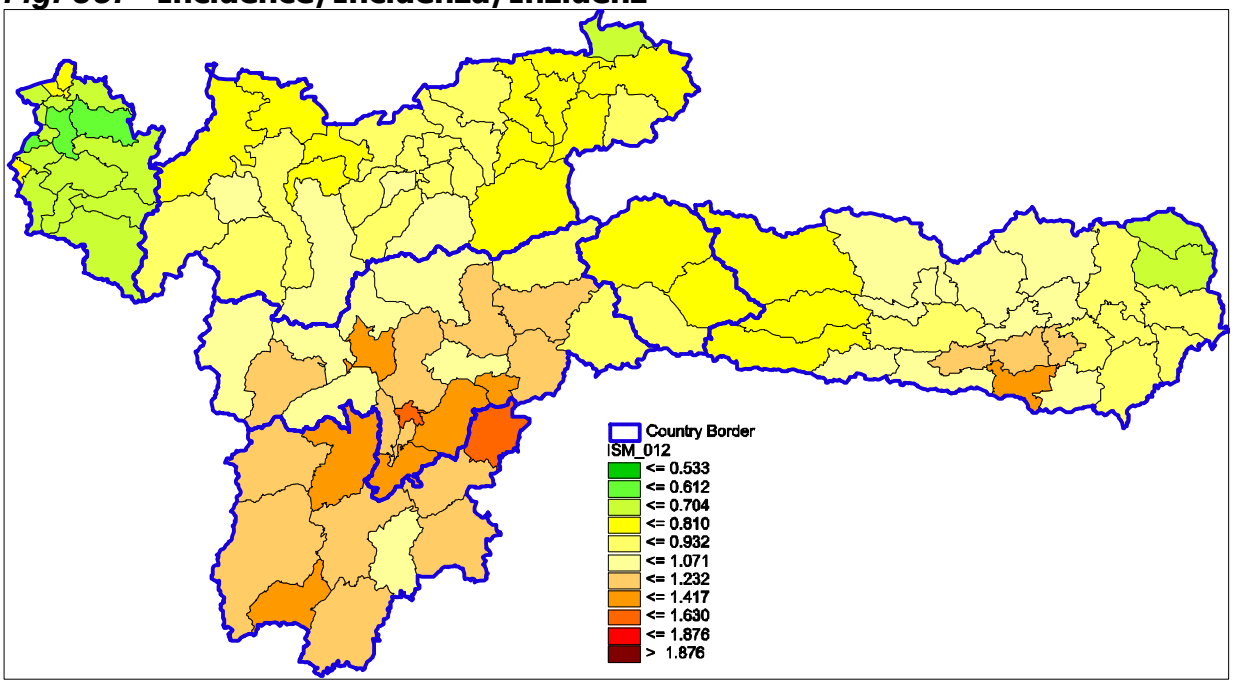
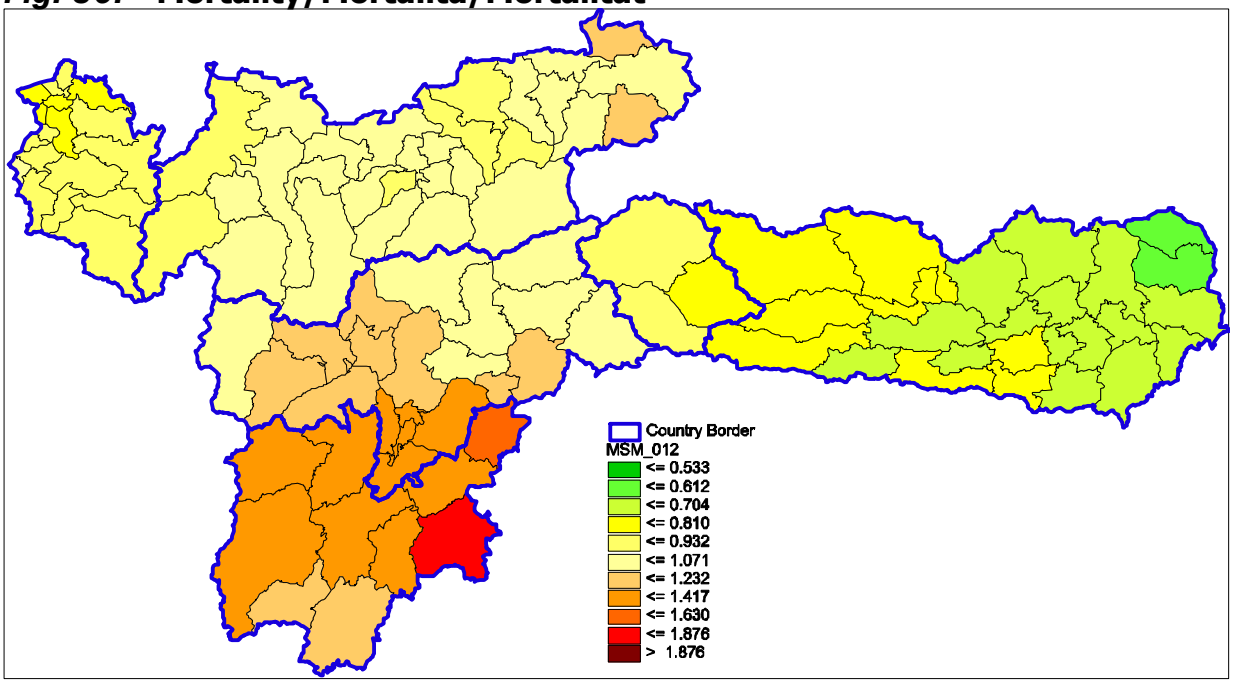



***Fig. 36:*** **Mortality/Mortalità/Mortalität**



### 4.11.7 Summary and Call for action

**We see for females some excess risk areas in south-east Trentino, lower south Tyrol and Carinthia. There are no differences for mortality, with the exception of Bolzano, which presents the highest value. For males there is an increasing trend from north to south, both for incidence and for mortality, similarly for head and neck cancers.**
**Considering the causal factors reported for bladder cancer, especially in men, strategies to control smoking and smoking cessation have to be considered as a priority. We expect a decrease in incidence and mortality in Italy due to the recently introduced smoking ban in public places.**

#### *Sintesi e proposte operative*

*Per le femmine emergono delle aree di maggior rischio nella parte sud orientale del Trentino, nella parte meridionale dell'Alto Adige ed in Carinzia. Non ci sono differenze inter-regionali significative rispetto alla mortalità, con l'eccezione di Bolzano, che presenta i valori più elevati.*
*Per i maschi, risulta apparente un gradiente crescente da nord a sud, sia per l'incidenza che per la mortalità, con i valori più elevati in Trentino, similmente a quanto riportato per i tumori del capo-collo.*
*Considerando i fattori causali riportati per le neoplasie vescicali, specialmente nei maschi, un'azione di controllo rispetto al fumo deve essere considerata come una priorità. Ci si aspetta una riduzione sia dell'incidenza che della mortalità in relazione alla legge che vieta il fumo nei luoghi pubblici, recentemente introdotta in Italia.*

#### Zusammenfassung und Empfehlungen

Wie beobachten für die Frauen ein leicht erhöhtes Risiko der Inzidenz im südöstlichen Trentino, im südlichen Südtirol und in Kärnten, aber keine Unterschiede der Mortalität mit Ausnahme von Bozen, wo die höchsten Raten beobachtet werden. Für die Männer gibt es eine klare Zunahme des Risikos von Norden nach Süden, sowohl der Inzidenz als auch der Mortalität.
Betrachtet man die Risikofaktoren des Blasenkarzinoms, besonders für Männer, so sollten Strategien zur Reduzierung des Rauchverhaltens höchste Priorität haben. Wir erwarten eine Abnahme der Inzidenz und Mortalität des Blasenkarzinoms in Italien durch die vor kurzem eingeführten Rauchverbote in öffentlichen Plätzen.

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## *4.12 Hematologic and Lymphatic Systems* (Francesco Bellù)

ICD-9 Code: 200-208

### 4.12.1 Introduction

Here we consider a very heterogeneous group composed of various hematological diseases, characterized by very different history and survival (for example, the behavior of chronic lymphatic leukemia or of multiple myeloma is very different from acute myeloblastic leukemia or high malignity T-lymphoma) [1]. Nowadays, the most part of these affections are deeply modified, during their course, by oncological-hematological therapies. These hematological tumors seem to be uniformly distributed between two sexes, presenting a light prevalence among males: 2,056 new cases against 1,967 females. This group represents approximately 7% of all cases (6.6% for males and 7.2% for females): its weight doesn't significantly change from region to region. In fact, among females it ranges from nearly 8% (Trentino and South Tyrol) to 6-7% (Austrian regions); for males, the range is between 7% (Italian regions) and 6% (Austrian area).

### 4.12.2 Epidemiology

Epidemiological data are obtained by aggregating incidence and mortality rates available for each site considered in this group, that is, all tumors afferent in the hematologic and lymphatic systems. The standardized incidence rates calculated in our area (24.0 per 100,000 males and 17.9 per 100,000 females) are rather close to the average values estimated for the more developed countries (respectively 25.1 x 100,000 and 16.5 x 100,000). The incidence rates in Northern American countries are higher for both sexes (males: 36.0, females: 23.7), while the population living in Eastern Europe presents the lowest rates (approximately 16.1 and 11.0). In the rest of Europe, great differences generally do not appear among average values estimated for Northern Europe (26.6 for males, 18.2 for females), Southern Europe (25.6 and 17.2 for females) and Western Europe (27.3 and 18.5). Belgium, Italy, France and Denmark are the countries with the highest incidence. Mortality rates are lower, generally included for European countries between 10 and 15 per 100.000 males, and 5 to 10 per 100.000 females. Northern American countries present the worst average rate for the female population (10.9) [2].

### 4.12.3 Data quality

Data quality doesn't seem to be homogeneous in the whole area, since DCO percentages assume high values in some Austrian regions (Vorarlberg: 10.3% for males, 11.6% for females; Carinthia: 12.2% for males, 12.2% for females). This situation could indicate some data incompleteness due to well known technical difficulties related to the registration of these pathologies (the greater part of these pathologies are outpatient, cyto-hematological data are not always easily available). Moreover, if it is believed that a remarkable part of subjects affected by these pathologies (LLC, gastric maltoms, mycosis fungoides in early stage, etc...) have a good survival rate, then they cannot be tracked by DCO. This means that DCO rates (10-12%) observed for Carinthia and

Vorarlberg can contribute to estimate a greater percentage of lacking data (15-20%). Moreover, in remaining regions, a loss of data equal to 5-10% should be hypothesized, particularly in Trentino with its automatic registration procedure.
However, percentages of microscopic verification (histological and cyto-haematological reports) are very high, as often occurs for these neoplasms: 96.1% for males and 95.8% for females. The M/I ratio is well aligned with known values (0.52 for males and 0.51 for females), with no sensible differences among the regions under consideration.

### 4.12.4 Risk factor, early detection, screening

The discussion about the etiology of risk excesses revealed by the maps cannot be supported by scientific data, even if multi-factorial theories (like infective viral and no viral agents, immunodeficiency, chemical and physical agents, et cetera) represent the most accepted hypotheses today [3,4,5,6]. Nowadays, screening programs do not seem to be applicable for these tumors. Nevertheless, a simple annual hemochromocytometric examination is recommended for subjects over the age of fifty-sixty.

### 4.12.5 Survival

The most recent data on survival rates available for this group of malignancies indicate that the overall 5-year relative survival rate is about 80% for Hodgkin's lymphoma and nearly 50% for non-Hodgkin's lymphoma. The range in 5-year age-adjusted European survival rates is wider concerning non-Hodgkin's lymphoma, for which the variation is between 29 and 65% in men and 33-75% in women. Multiple myeloma has a poorer diagnosis than lymphoma; acute lymphatic leukemia, more diffused in childhood than in adults, presents a 5-year relative survival rate close to 20%. With reference to all hematological cancers, women show a better prognosis than men, moreover, survival changes for the worse with advancing age [7].

### 4.12.6 Geographic variation

There is a great variability in geographical units' SIR and SMR values, both for females and for males, due to a low number of events observed for all of these tumors: the smoothing procedure leads to a more homogeneous representation of the risk of hematological tumors in the whole area. However, some areas point out a greater relative risk.

**Females.** With reference to cancer incidence in the female population, a risk excess is evident in the central-southern zone of Trentino (moreso in Valle dell'Adige and Alta Valsugana, less so in Bassa Valsugana and Tesino, Vallagarina, Giudicarie and Rendena, Alto Garda and Ledro). Some urban areas of South Tyrol (districts of Bolzano, Laives-Bronzolo-Vadena, Merano, Chiusa) are characterized by a moderately higher risk as well. Maps clearly indicate good consistency between incidence and mortality. Looking to smoothed maps, mortality due hematological tumors appears to be uniformly distributed in the whole Alpine region. Only, there is a slightly higher female mortality rate in Vallagarina (Trentino) and in western districts of Vorarlberg.

**Males.** Concerning cancer incidence in the male population, the smoothed map shows a relative risk distribution rather similar to that of the female population. Higher risks are confirmed in some mentioned districts: Valle dell'Adige and Alta Valsugana in Trentino, Bolzano and Laives-Bronzolo-Vadena in South Tyrol. An incidence rate higher than the average value is evident in Alto Garda and Ledro, Fiemme and Ladino di Fassa in the Trentino region, and in Bassa Atesina, Val d'Ega-Sciliar, Salto-Val Sarentino, Merano, Alta Val Isarco, Tures-Aurina, and Val Badia in South Tyrol.

In all Austrian regions the risk is adjusted to the average value (or is lower), with the exception of a higher incidence only among males in Tyrol in Salzstrasse and Seefeld, Hall and Schwaz. Male mortality is homogeneous over the whole area, except around the city of Bolzano.

The risk excesses indicated before are not to be considered as absolutely ascertained and sure, considering the great uncertainties, the strong heterogeneity of these pathologies and the remarkable technical difficulties concerning the registration of hematology cases. Likely, with reference to contents of the section on "Data Quality", the incidence of hematological tumors in Austrian regions is not really different from South Tyrol, while Trentino could have an even higher incidence. Better results of mortality in comparison with incidence, observed in the whole area, are probably due to excellent specialization reached by oncology-hematology centers operating in these regions.

Conclusively, Alpine regions considered in our study belong to the middle-high incidence level of European distribution of these pathologies.

**Tab. 37**: Hematologic and Lymphatic Systems - Incidence

| Region | FEMALES | | | | MALES | | | |
|---|---|---|---|---|---|---|---|---|
| | New cases | Rates x 100,000 | | SIR | New cases | Rates x 100,000 | | SIR |
| | | Crude | Std | | | Crude | Std | |
| **Trentino** | 496 | 42.0 | 22.4 (19.9,24.9) | 1.22 (1.11,1.33) | 490 | 43.6 | 28.0 (25.2,30.8) | 1.15 (1.05,1.26) |
| **South Tyrol** | 397 | 34.2 | 19.8 (17.5,22.1) | 1.12 (1.01,1.23) | 446 | 39.6 | 28.0 (25.2,30.8) | 1.17 (1.06,1.28) |
| **Carinthia** | 392 | 27.0 | 14.8 (13.0,16.5) | 0.85 (0.77,0.94) | 386 | 28.3 | 18.3 (16.3,20.2) | 0.81 (0.73,0.89) |
| **Tyrol** | 459 | 27.0 | 17.1 (15.3,18.9) | 0.95 (0.86,1.04) | 496 | 30.5 | 24.2 (22.0,26.5) | 0.98 (0.90,1.07) |
| **Vorarlberg** | 201 | 23.0 | 15.8 (13.4,18.2) | 0.85 (0.73,0.97) | 221 | 25.7 | 21.2 (18.4,24.1) | 0.88 (0.77,1.00) |
| **TOTAL** | **1,945** | **30.6** | **17.9 (16.9,18.8)** | | **2,039** | **33.4** | **24.0 (22.9,25.2)** | |

**Tab. 38**: Hematologic and Lymphatic Systems - Mortality

| Region | FEMALES | | | | MALES | | | |
|---|---|---|---|---|---|---|---|---|
| | Deaths | Rates x 100,000 | | SMR | Deaths | Rates x 100,000 | | SMR |
| | | Crude | Std | | | Crude | Std | |
| **Trentino** | 231 | 19.6 | 7.4 (6.3,8.6) | 1.06 (0.93,1.20) | 233 | 20.7 | 11.7 (10.1,13.4) | 1.02 (0.90,1.16) |
| **South Tyrol** | 173 | 14.9 | 6.4 (5.2,7.5) | 0.95 (0.81,1.10) | 229 | 20.3 | 12.2 (10.6,13.8) | 1.16 (1.01,1.32) |
| **Carinthia** | 221 | 15.2 | 6.5 (5.5,7.6) | 0.93 (0.81,1.06) | 229 | 16.8 | 10.0 (8.6,11.4) | 0.91 (0.79,1.03) |
| **Tyrol** | 232 | 13.7 | 6.5 (5.5,7.5) | 0.95 (0.84,1.09) | 254 | 15.6 | 10.8 (9.4,12.2) | 0.98 (0.87,1.11) |
| **Vorarlberg** | 142 | 16.3 | 8.7 (7.1,10.3) | 1.21 (1.02,1.43) | 114 | 13.2 | 10.5 (8.5,12.4) | 0.93 (0.76,1.11) |
| **TOTAL** | **999** | **15.7** | **6.9 (6.4,7.5)** | | **1,059** | **17.4** | **11.0 (10.3,11.7)** | |

**Tab. 39**: Hematologic and Lymphatic Systems - Data Quality

| Region | FEMALES | | | MALES | | |
|---|---|---|---|---|---|---|
| | % DCO | % MV | M/I | % DCO | % MV | M/I |
| **Trentino** | 0.6 | 98.2 | 0.47 | 0.6 | 98.6 | 0.48 |
| **South Tyrol** | 0.3 | 97.7 | 0.44 | 0.2 | 98.7 | 0.51 |
| **Carinthia** | 12.2 | 84.0 | 0.56 | 12.2 | 82.9 | 0.59 |
| **Tyrol** | 3.9 | 98.6 | 0.51 | 1.8 | 99.0 | 0.51 |
| **Vorarlberg** | 11.6 | 100.0 | 0.66 | 10.3 | 100.0 | 0.49 |
| **TOTAL** | **4.2** | **95.8** | **0.51** | **3.6** | **96.1** | **0.52** |

## Hematologic and Lymphatic Systems – Females/ Sangue e Sistema linfatico – Femmine/ Blut und lymphatisches System – Weiblich

***Fig. 37:*** **Incidence/Incidenza/Inzidenz**

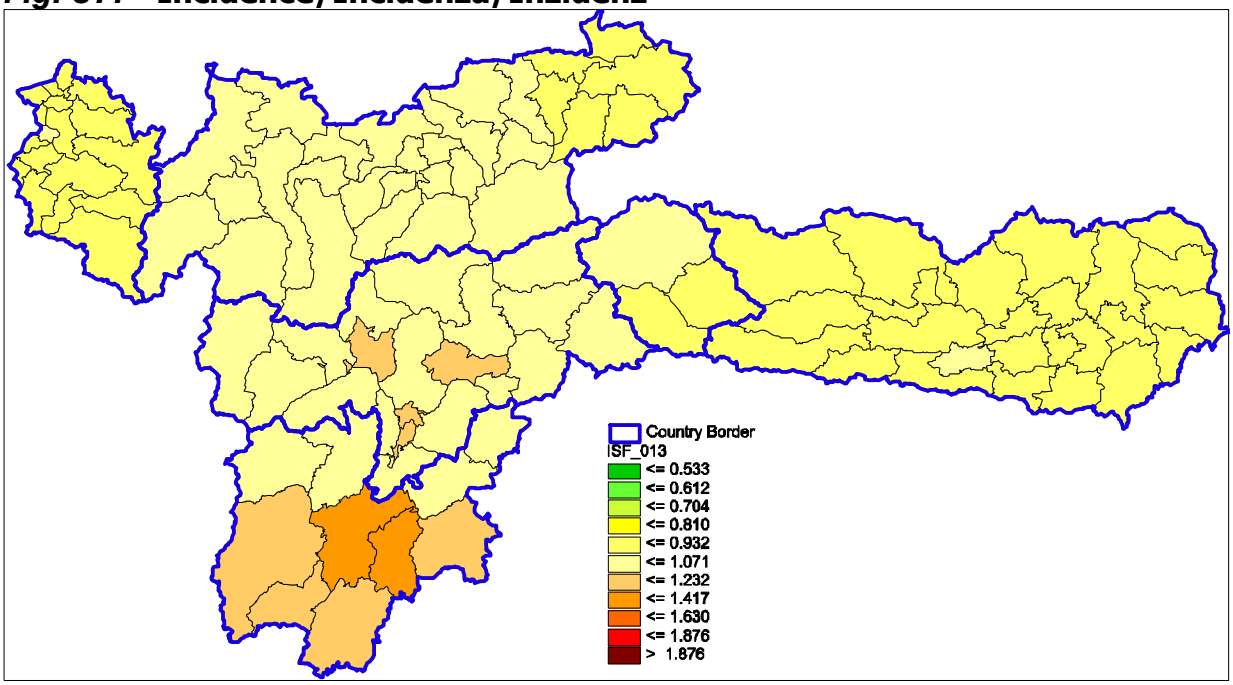
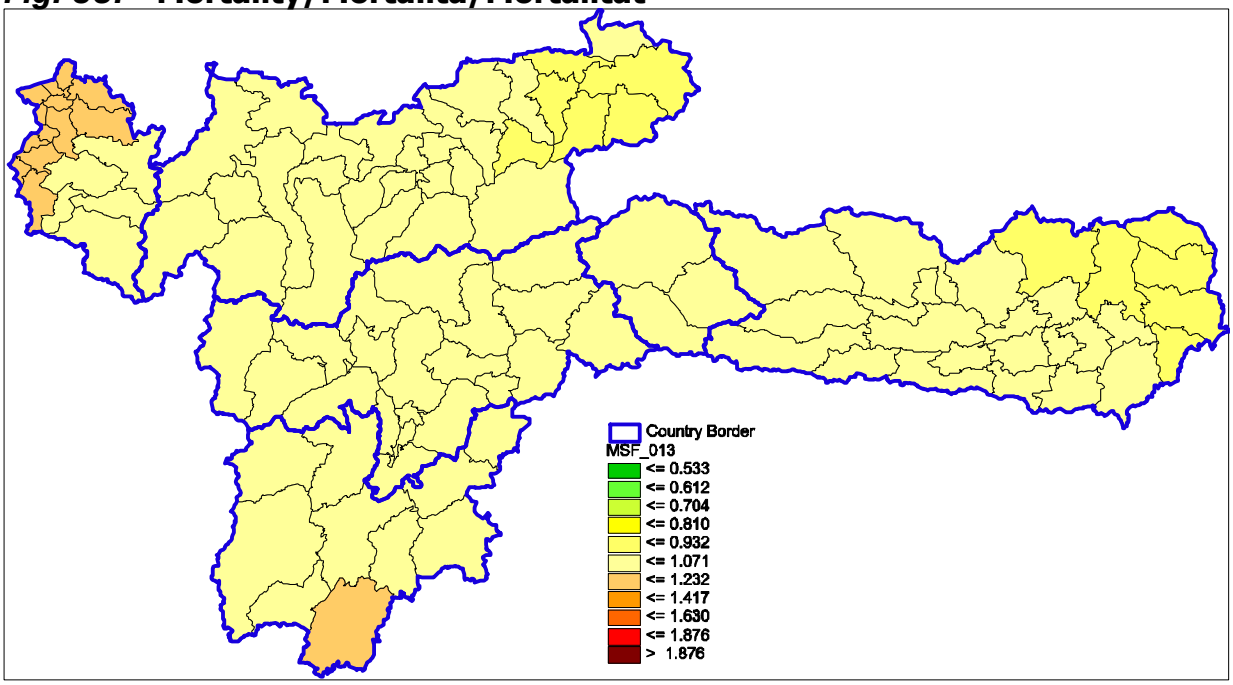



***Fig. 38:*** **Mortality/Mortalità/Mortalität**



## Hematologic and Lymphatic Systems – Males/ Sangue e Sistema linfatico – Maschi/ Blut und lymphatisches System – Männlich

***Fig. 39:*** **Incidence/Incidenza/Inzidenz**

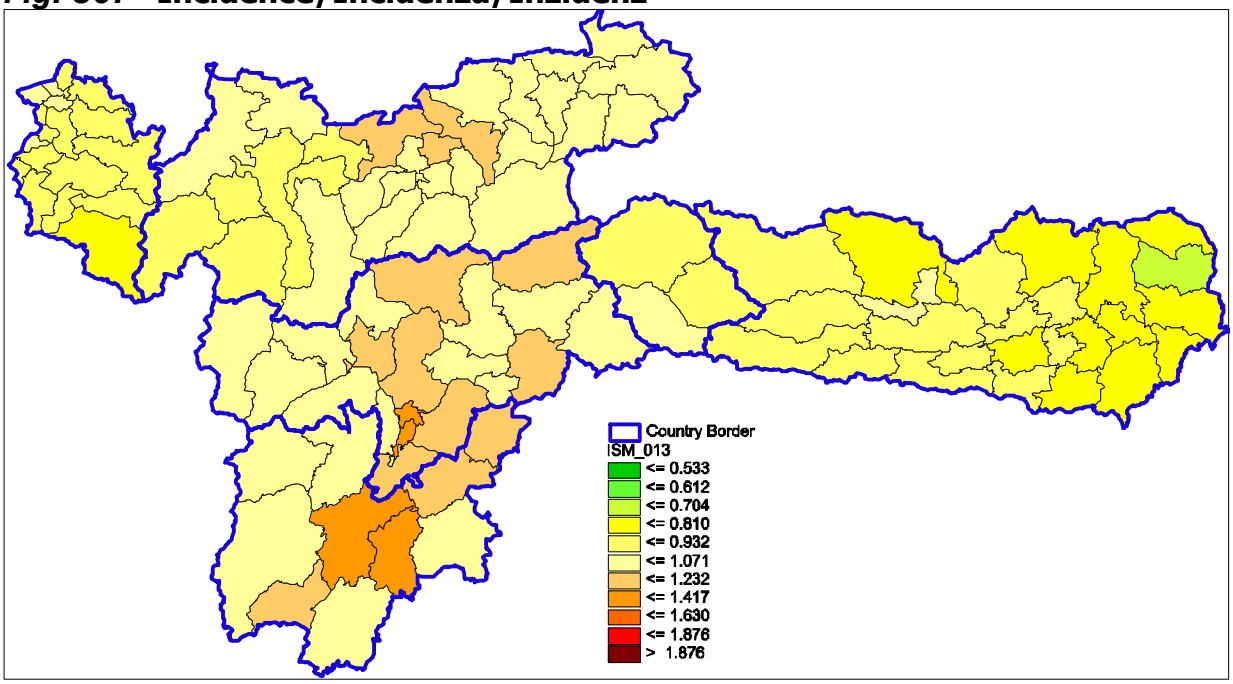
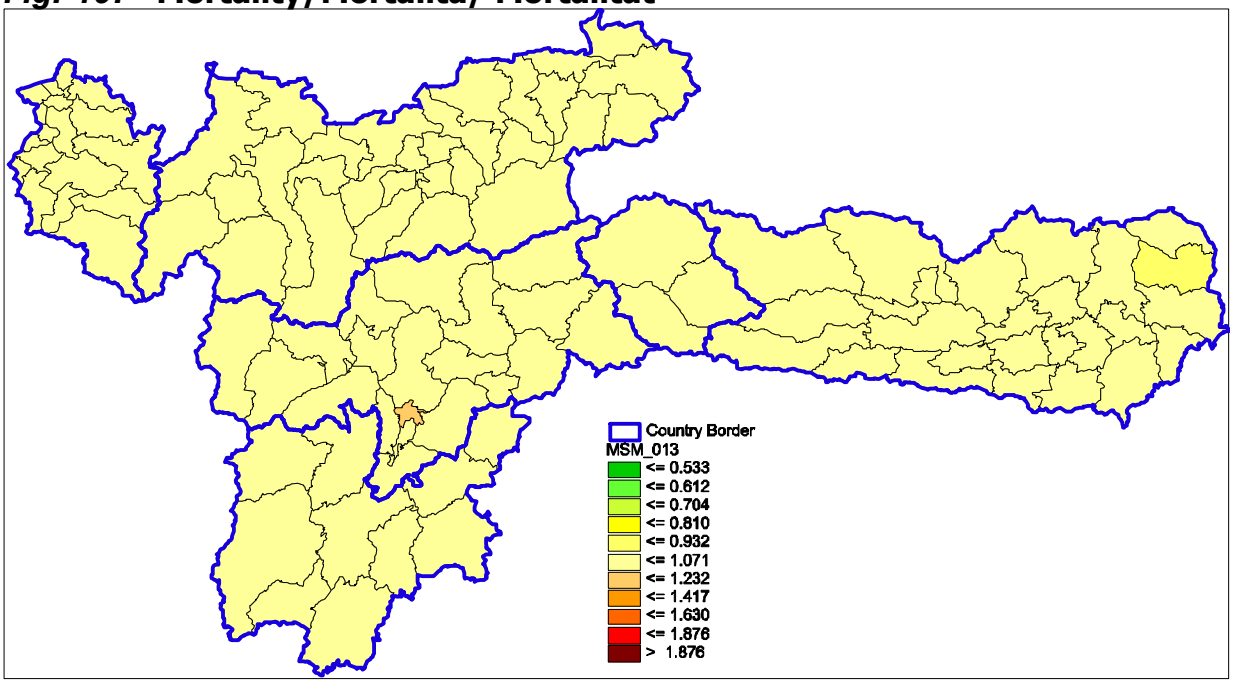



***Fig. 40:*** **Mortality/Mortalità/ Mortalität**



### 4.12.7 Summary and Call for action

**The interpretation of the maps of these tumors is rather complex, due to their characteristics of heterogeneity, data quality problems and registration techniques. In summary, incidence and mortality are close to average European values observed for these pathologies. Concerning the area, only some districts of Trentino show an excess of risk for both sexes.**
**Actions to engage in fighting these neoplastic affections are not easy to propose due to their diversity. A hemochromocytometric examination seems to be the simplest and the most practicable recommendation, particularly for subjects over the ages of fifty-sixty. The environmental control of carcinogenic substances is surely advisable and technically possible in many situations.**

### *Sintesi e proposte operative*

*L'interpretazione delle mappe è piuttosto complessa, per l'eterogeneità dei tumori considerati, per problemi di qualità dei dati e per le tecniche di registrazione. In generale, i valori di incidenza e di mortalità sono vicini alle medie europee osservate per queste patologie. Per quanto riguarda l'area analizzata, soltanto alcuni distretti del Trentino mostrano un eccesso di rischio per entrambi i sessi. Le azioni da intraprendere per fronteggiare queste affezioni neoplastiche non sono facili da proporre a causa della loro diversità. Un esame emocromocitometrico sembra essere la raccomandazione più semplice e più praticabile, specialmente per le persone con più di 50-60 anni. Il controllo delle sostanze cancerogene presenti negli ambienti di vita e di lavoro è un'azione sicuramente consigliabile e, oggigiorno, tecnologicamente possibile in molti casi.*

### Zusammenfassung und Empfehlungen

Die Interpretation der Landkarten ist sehr komplex, bedingt durch die Heterogenität der Diagnosen, Probleme in der Datenqualität und der Technik der Registrierung. Zusammenfassend liegen Inzidenz- und Mortalitätsrate im europäischen Durchschnitt. Einige Regionen in Trentino weisen ein erhöhtes Risiko auf, und zwar für beide Geschlechter.
Maßnahmen für die Bekämpfung dieser bösartigen Neubildungen sind auf Grund der unterschiedlichen Krankheitsbilder schwierig. Ein Blutbild erscheint die einfachste und praktikabelste Empfehlung zu sein, insbesondere für Personen ab dem fünfzigsten bis sechzigsten Lebensjahr. Eine Kontrolle der Umweltkarzinonogene ist sicherlich anzuraten und in vielen Fällen technisch möglich.

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# 5 Summary

We analysed data on cancer incidence and mortality in the years 1996 to 2000. The study region covers the provinces of Trentino, South Tyrol in Italy and Carinthia, Tyrol and Vorarlberg in Austria, with a total population of nearly 2.5 million people. The study area is an alpine region which is characterised by small villages and valleys, separated by high mountains. The study area was divided into small regions with average population of 20,000. Consequently, to properly deal with sparse data, it was necessary to apply smoothing techniques in order to come to stable estimates of the regional distribution. We applied a BMY model that took adjacency into consideration.

Figures on **data quality** show that the quality of incidence data is good in the average, but is not homogeneous throughout the study region. However our conclusion is that differences in completeness are not large enough to cause a relevant bias in the regional distribution. There is some need to improve the completeness of cancer incidence figures in parts of the study area (Carinthia and Vorarlberg).

For **females**, we see high risk for cervical cancer in the eastern part of Tyrol and Carinthia. The most plausible cause is regional differences in providing cervical cytology screening. For lung cancer, we observe a higher risk in Innsbruck and its surroundings as well as in lower Carinthia. Data on smoking prevalence show that most parts of excess risk can be attributed to smoking habits in urban areas. For corpus cancer, there is some slightly higher risk in western parts of Tyrol and some parts of Carinthia; the reason is less clear.

For bladder cancer incidence, we see higher risks in Carinthia, however the picture is not consistent with mortality. For haematological neoplasms, we see higher risks of incidence in Trentino, but again the picture is not consistent with mortality data.

For **males**, we see high risks for head and neck cancers in South Tyrol and Trentino. The most plausible explanation is differences in smoking and alcohol abuse. The very strong risk of prostate cancer incidence in Tyrol is due to PSA screening which causes high incidence rates. However, there is no corresponding excess risk in mortality and other investigations show some possible benefits of PSA screening in terms of the reduction of mortality. For bladder cancer, we see higher risk in Trentino and some parts of South Tyrol; there are no data on risk factors which could help find an explanation for these higher risks.

For stomach cancer, we see some higher risks throughout the study area, but there is no clear picture in the geographical distribution. However, we must keep in mind that although stomach cancer has decreased in the past decade, both incidence and mortality rates in the study area are high when compared to other European countries.

Summarising, a great part of the high risk of lung cancer and head and neck cancer can be reduced through smoking cessation programs which have already been introduced in Italy, and should be introduced in Austria. Additionally, the introduction of organised screening programs for cervical cancer would also reduce the risks of this cancer in the Austrian parts of the study region.

# *Sintesi*

*Il presente studio analizza l'incidenza delle patologie tumorali e la mortalità per tumore dal 1996 al 2000 nelle province di Trento e Bolzano in Italia, Carinzia, Tirolo e Vorarlberg in Austria, con una popolazione complessiva di circa 2,5 milioni di persone. L'area studiata è una regione alpina caratterizzata dalla presenza di centri abitati di piccole dimensioni e da lunghe vallate, separate da imponenti massicci montuosi. Tale area è stata suddivisa in piccole regioni, in media con circa 20.000 abitanti. La necessità di operare con piccoli numeri ha reso indispensabile l'applicazione di tecniche statistiche di lisciamento, in modo da stabilizzare le stime delle distribuzioni dei tassi regionali. Abbiamo applicato un modello BMY che ha tenuto in considerazione la distanza tra le diverse regioni.*

*Gli indicatori relativi alla qualità dei dati sono nel complesso buoni, anche se emerge una eterogeneità tra le regioni incluse nello studio. Le differenze osservate nel grado di completezza dei dati non sono comunque tali da indurre una distorsione significativa della distribuzione regionale. Si presenta tuttavia la necessità di migliorare la completezza dei dati di incidenza delle patologie tumorali in alcune parti dell'area studiata (Carinzia e Vorarlberg).*

*Con riferimento alla popolazione femminile, si osserva l'elevato rischio per cancro della cervice uterina nella parte orientale del Tirolo e della Carinthia. La causa più probabile è la diversità di copertura nelle singole regioni di programmi di screening tramite Pap-test. Per il tumore al polmone, si evidenzia un maggiore rischio a Innsbruck e nelle zone limitrofe così come nella parte meridionale della Carinzia.*

*Per il tumore della vescica, la Carinzia si caratterizza per una incidenza più elevata, che comunque non risulta coerente con la mappa relativa alla mortalità. L'incidenza dei tumori ematologici appare più elevata in Trentino; anche in questo caso, però, la mappa della mortalità non conferma quanto osservato in quella relativa all'incidenza.*

*Per quanto riguarda la popolazione maschile, l'Alto Adige ed il Trentino evidenziano un elevato rischio per i tumori del capo-collo. La spiegazione più plausibile è data dalle differenze tra le popolazioni nell'abitudine al fumo e nell'abuso di alcool. Il rischio più elevato di incidenza del cancro della prostata nel Tirolo è dovuto all'attivazione in questa regione di un programma di screening basato sull'esame del PSA (Prostatic Specific Antigene), che causa un'elevazione dei tassi di incidenza. Tuttavia, non appare un corrispondente eccesso di rischio nella mortalità ed altre indagini mostrano alcuni possibili benefici dello screening mediante PSA in termini di riduzione della mortalità. Per il cancro della vescica, si nota un maggiore rischio in Trentino ed in alcune zone dell'Alto Adige; non ci sono dati sui fattori di rischio in grado di contribuire alla spiegazione di questi rischi elevati.*

*Per il cancro dello stomaco, pur osservando alcuni eccessi di rischio in più parti dell'area oggetto di studio, non emerge una immagine chiara della distribuzione geografica del rischio. Tuttavia, dobbiamo tenere presente che anche se il cancro dello stomaco è diminuito nella decade passata, sia i tassi di incidenza che di mortalità osservati nell'area in studio risultano elevati se confrontati con altri paesi europei.*

*In conclusione, una parte importante dell'elevato rischio dei tumori del polmone e del collo e della testa può essere ridotta attraverso iniziative di lotta al fumo che già sono state introdotte in Italia e che dovrebbero essere attivate in Austria. Inoltre, l'introduzione di programmi di screening organizzati contro il cancro della cervice uterina ridurrebbe il rischio di questo tumore nelle regioni austriache considerate nello studio.*

# *Zusammenfassung*

*Wir haben Inzidenzdaten und Mortalitätsdaten der Jahre 1996 bis 2000 analysiert. Die Studienregion umfasst die italienischen Provinzen Trentino und Südtirol und die österreichischen Bundesländer Kärnten, Tirol und Vorarlberg mit einer Gesamtbevölkerung von ungefähr 2.5 Millionen. Das Studiengebiet liegt im alpinen Raum, der charakterisiert ist durch homogene Talschaften und kleine Gemeinden. Wir haben das Studiengebiet in Regionen mit einer durchschnittlichen Bevölkerungszahl von 20000 Personen unterteilt. Daher war es auf Grund der zum Teil kleinen Fallzahlen notwendig, Glättungsmethoden einzusetzen, um stabilen Risikoschätzer zu erhalten. Es wurde ein BMY-Modell angewandt, das auch Nachbarschaftsverhältnisse berücksichtigt.*

*Kennzahlen zeigen, dass die* ***Qualität*** *der Inzidenzdaten im Durchschnitt gut ist, aber nicht homogen verteilt über die Regionen. Wir ziehen nach sorgfältiger Überprüfung den Schluss, dass die Unterschiede nicht groß genug sind, um die regionale Verteilung relevant beeinflussen zu können. Dennoch besteht die Notwendigkeit, die Qualität der Inzidenzdaten in Vorarlberg und Kärnten zu verbessern.*

*Bei den* ***Frauen*** *sehen wir ein hohes Risiko an Zervixkarzinom im Tiroler Unterland sowie in Kärnten. Die wahrscheinlichste Erklärung liegt in unterschiedlichen Teilnahmeraten an den Screening-Programmen für Zervixkarzinom. Beim Lungenkrebs beobachten wir ein erhöhtes Risiko in Innsbruck und Umgebung sowie in Unterkärnten. Daten über Rauchverhalten belegen, dass der größte Teil dieses Risikos durch stärkeres Rauchverhalten in städtischen Gebieten erklärt werden kann. Beim Korpuskarzinom beobachten wir ein leicht erhöhtes Risiko im Tiroler Oberland und einigen Gebieten Kärntens, die Ursachen sind unklar. Bei der Inzidenz von Harnblasenkrebs sehen wir Gebiete mit höherem Risiko in Kärnten, allerdings ist die Verteilung nicht konsistent zur Mortalitätsverteilung. Ähnliches gilt für die bösartigen hämatologischen Neubildungen: wir beobachten höheres Risiko in Teilen Trentinos, aber kein dazu konsistentes Bild der Mortalitätsdaten.*

*Bei den* ***Männern*** *sehen wir ein hohes Risiko an HNO-Tumoren in Südtirol und Trentino. Die wahrscheinlichste Erklärung sind Unterschiede im Rauch- und Trinkverhalten. Das stark erhöhte Risiko an Prostatakarzinominzidenz in Tirol ist durch PSA-Untersuchungen bedingt, wodurch die Inzidenz klar ansteigt. Aber wir beobachten kein erhöhtes Risiko an Prostatakarzinommortalität in Tirol und andere Untersuchungen haben einen Rückgang der Mortalität nach Einführung der PSA-Untersuchungen um ca. 1/3 gezeigt. Harnblasenkrebs ist in Südtirol und Trentino erhöht, es liegen aber keine Daten über Risikofaktoren vor, die das erhöhte Risiko erklären können. Beim Magenkrebs sehen wir einige Gebiete mit leicht erhöhtem Risiko, aber kein klares Muster der geographischen Verteilung. Dabei muss unbedingt berücksichtigt werden, dass trotz Rückgang der Magenkrebsraten sowohl Inzidenz als auch Mortalität an Magenkrebs im Studiengebiet sehr hoch ist im europäischen Vergleich.*

*Zusammenfassend kann das erhöhte Lungen- und Harnblasenkrebsrisiko durch Anti-Raucher-Kampagnen zu einem großen Teil reduziert werden. Solche Programme wurden in Italien eingeführt und wir empfehlen auch in Österreich ein konsequentes Rauchverbot nicht nur in öffentlichen Plätzen, sondern auch in Restaurants und Kaffeehäusern. Weiters kann das erhöhte Risiko an Zervixkarzinom im Tiroler Unterland und Kärnten durch Einführung von organisierten Screening-Programmen stark reduziert werden.*

# 6 Glossary / Glossario / Glossar

**Age-standardised rate** / *Tasso Standardizzato per età* / Altersstandardisierte Rate

**An incidence or mortality rate statistically modified in order to eliminate the effect of different age distributions in the different populations.**

*Tasso di mortalità o di incidenza statisticamente modificato per eliminare l'effetto dovuto alle differenti strutture per età delle diverse popolazioni a confronto.*

Inzidenz- oder Mortalitätsrate, bei der der unterschiedliche Altersaufbau von Bevölkerungen ausgeglichen wird, um Raten zwischen verschiedenen Bevölkerungen vergleichen zu können.

**Cancer** / *Tumore* / Krebs

**Disease in which abnormal cells divide without control, invading nearby tissues and spreading through the bloodstream and lymphatic system to other parts of the body.**

*Malattia in cui le cellule anormali si dividono senza controllo, propagandosi nei tessuti vicini e diffondendosi ad altre parti del corpo attraverso la circolazione sanguigna ed il sistema linfatico.*

Erkrankung, bei der Körperzellen unkontrolliert wachsen, sich teilen und gesundes Gewebe verdrängen, zerstören oder Tochtergeschwülste (Metastasen) in anderen Körperteilen ausbilden können.

**Census** / *Censimento* / Volkszählung

**The enumeration of an entire population, usually with details being recorded on residence, age, sex, occupation, ethnic group, marital status, birth history, and relationship to head of household.**

*Enumerazione esaustiva di una popolazione, solitamente con la registrazione di dati individuali sulla residenza, sull'età, sul sesso, sull'occupazione, sul gruppo etnico, sullo stato civile, sulla nascita e sul rapporto con il capofamiglia.*

Erhebung von statistischen Bevölkerungsdaten wie Alter, Geschlecht, Wohnort, wobei die Bürger bei der herkömmlichen Methode der Zählung per Fragebogen zur Auskunft verpflichtet sind.

**CIN: Cervical Intraepithelial Neoplasia** / *Neoplasia cervicale intraepiteliale* / Cervikale intraepitheliale Neoplasie

**It's a classification based on how much of the cervical surface tissue is affected and on the kind and degree of cell changes that are found. It ranges from CIN I (mild) to CIN III (severe).**

*Classificazione basata sulla valutazione dell'entità dell'interessamento neoplastico del tessuto superficiale della cervice uterina, sul genere e sul grado di mutazione delle cellule. Varia da CIN I (leggero) a CIN III (severo).*

Vorform eines Zervixkarzinoms, die per Definition nicht zu den bösartigen Zervixkarzinomen gezählt wird.

**Colonoscopy** / *Colonscopia* / Koloskopie (Darmspiegelung)

**An examination of the inside of the colon using a thin, lighted tube, called a colonoscope, inserted into the rectum. Samples of tissues may be collected for examination under a microscope.**

*Esame della superficie mucosa del colon per mezzo di un tubo sottile e illuminato, denominato colonscopio, inserito per via rettale. Durante l'esame possono essere prelevati campioni di tessuto per essere sottoposti ad esame microscopico.*

Untersuchung des Darms mit einem flexiblen optischen Instrument (Koloskop) zur Entdeckung insbesondere von Polypen (die zu Dickdarmkrebs führen können). Dabei ist es möglich, Gewebsproben zu entnehmen und kleine Auswachsungen direkt zu entfernen

**Crude rate** / *Tasso grezzo* / Rohe Rate

**Number of new cancer cases registered in a population, during a defined time period, divided by the number of persons at risk in the same period. Usually it is expressed per 100,000 persons.**

*Numero di nuovi casi di tumore registrati in una popolazione, durante un periodo di tempo definito, rapportato al numero di persone a rischio nello stesso periodo. Viene solitamente espresso per 100.000 persone.*

Anzahl der Personen mit einer bestimmten Diagnose in einem Zeitraum, dividiert durch die Anzahl der Personen, die am Beginn des Zeitraums unter Risiko für die Erkrankung standen. Meist angegeben pro 100,000 Personen.

**DCN: Death Certificate Notified**

**Cases first coming to registry's attention by means of death certificate mentioning, whose cancer diagnosis is successively confirmed by other clinical information.**

*Caso sottoposto per la prima volta alla valutazione del registro grazie alla notifica del certificato di morte; la diagnosi di tumore viene successivamente confermata da altre informazioni cliniche.*

Tumorfälle, deren Registrierung primär durch einen Totenschein ausgelöst wurde. In vielen Krebsregistern wird versucht, solche Fälle durch klinische oder pathologische Informationen zu bestätigen.

**DCO: Death Certificate Only**

**Cases where the only evidence of a tumor is provided by the death certificate and no other clinical documentation on the pathology can be traced back.**

*Caso in cui l'unica evidenza di patologia tumorale è fornita dal certificato di morte, senza altra documentazione clinica sulla patologia.*

Tumorfälle, die nur durch einen Totenschein bekannt sind und für die keine klinischen Informationen gefunden werden konnten.

**Death certificate** / *Certificato di morte* / Totenschein

**The official legal document issued at a person's death, that reports information to the time, circumstances and causes of the death. These are those diseases, morbid conditions, or injuries which either resulted in or contributed to death. From the information provided on the death certificate the primary cause of death is coded according to the ninth revision of the International Classification of Diseases (ICD-9) of the World Health Organization (WHO). The death certificate also represents a source of identifying cancer cases, when it mentions malignant tumor as a cause of a person's death.**

*Documento giuridico ufficiale che attesta il decesso di una persona, riportando informazioni relative alla data, alle circostanze ed alle cause della morte. Per cause si intendono quelle malattie, circostanze morbose, o ferite che hanno provocato o contribuito al decesso. Partendo dalle informazioni riportate sul certificato di morte, la causa principale del decesso viene codificata secondo la nona revisione della Classificazione Internazionale delle Malattie (ICD-9) dell'Organizzazione Mondiale della Sanità (OMS). Il certificato di morte rappresenta inoltre una fonte di individuazione di un caso di tumore maligno, quando questo viene indicato tra le causa di decesso.*

Offizielles Dokument, das bei der Totenbeschau von besonders ausgebildeten Ärzten ausgefüllt wird. Insbesondere wird dabei die Haupt- und Nebentodesursache beschrieben. Diese Todesursache wird dann (in Österreich zentral in der Statistik Austria) nach internationale Richtlinien codiert (im Analysezeitraum ICD-9). Totenscheine mit Todesursache Krebs sind neben anderen Datenquellen auch eine Informationsbasis für Krebsregister.

**Early detection** / *Diagnosi precoce* / Frühentdeckung

**It means applying a strategy that makes it possible to diagnose a cancer at the first stage. Earlier detection of cancer means a better chance of effective treatment.**

*Indica l'applicazione di una strategia che permetta la diagnosi di un tumore nella fase iniziale. L'individuazione di un cancro nella sua forma iniziale aumenta l'efficacia del trattamento e la prognosi a distanza.*

Methode, um eine Krebserkrankung in einem möglichst frühen Stadium zu entdecken (weil damit die Heilungschancen meist wesentlich besser sind).

**Excess risk** / *Eccesso di rischio* / Erhöhtes Risiko

**The probability by which an individual has been affected by, or died from, a cancer within a place, a period or age span is higher than expected one.**

*Probabilità superiore a quella attesa con cui un individuo si è ammalato o è deceduto per tumore in un luogo, periodo o arco di vita.*

Erhöhte Wahrscheinlichkeit, dass eine Personen an einer Krebserkrankung leidet oder stirbt.

**Fertility rate** / *Tasso di fecondità* / Fertilitätsrate

**Is the average number of children a woman would have, assuming that current age-specific birth rates will remain constant throughout her childbearing years (usually considered to be ages 15-49).**

*Numero medio di bambini per donna, supponendo che i tassi di natalità età -specifici correnti rimangano costanti durante il suo periodo di fertilità (solitamente dai 15 ai 49 anni).*

Gibt an, wie viele Kinder eine Frau durchschnittlich im Laufe des Lebens hätte, wenn die aktuellen Geburtenzahlen für den gesamten Zeitraum gelten würden, oft eingeschränkt auf Alter 15-49.

**GDP: Gross Domestic Product** / *PIL: Prodotto interno lordo* / BIP: Bruttoinlandsprodukt

**The market value of all goods and services produced by labour and property within a state in a period of time (usually, 1 year)**

*Valore di mercato di tutti i beni ed i servizi prodotti in uno stato dal lavoro e dalla proprietà in un periodo di tempo (solitamente 1 anno).*

Ein Maß für die wirtschaftliche Leistung eines Landes.

**Hemocult** / *Test del sangue occulto* / Hämokkult

**A fecal occult blood test that checks stool samples for traces of blood that cannot be seen with the naked eye, used in programs for early detection of colon cancer.**

*Test del sangue occulto fecale che verifica in campioni di feci eventuali tracce di sangue non visibili ad occhio nudo, usato nei programmi per l'individuazione precoce del cancro del colon.*

Das Testverfahren zum Nachweis von makroskopisch nicht sichtbarem (okkultem) Blut im Stuhl, Methode zur Früherkennung von Darmkrebs.

**Hospital discharge records** / *Archivio dei ricoveri ospedalieri* / Entlassungsdiagnose

**A data base referring information collected on patients checks out of a hospital: it has one record for each episode of hospital care, each record containing a unique patient identifier, code of the hospital department, the main diagnosis, a maximum of five contributing conditions and codes for any surgery performed.**

*Banca dati comprendente le informazioni raccolte sui pazienti ricoverati in ospedale: ad ogni record corrisponde un episodio di ricovero ospedaliero, contenente un identificativo univoco per ciascun paziente, i codici del reparto ospedaliero, della diagnosi principale e delle diagnosi concomitanti (fino ad un massimo di cinque) ed i codici per ogni intervento/procedura effettuato.*

Diagnose, die bei einem Krankenhausaufenthalt gestellt wird. Besteht aus Haupt- und Nebendiagnosen.

**IARC: International Agency for Research on Cancer**

**Part of the World Health Organization that coordinates and conducts research on the causes of human cancer.**

*Organismo dell'Organizzazione Mondiale della Sanità che coordina e conduce la ricerca sulle cause delle neoplasie nell'uomo.*

Teil der WHO, die Forschung auf dem Gebiet der Krebserkrankungen durchführt und koordiniert.

**ICD-9: International Classification of Diseases, 9th revision**

**International Classification of Diseases, 9th revision, published by the World Health Organization (WHO) in 1975. The neoplasms chapter comprises the categories running from 140 to 239 inclusive.**

*Classificazione Internazionale delle malattie, nona revisione, pubblicata dall'Organizzazione Mondiale della Sanità (OMS) nel 1975. Il capitolo riguardante i tumori comprende le categorie di codici che vanno dal 140 al 239.*

Die 9. Auflage der internationalen Klassifikation von Krankheiten und Verletzungen, herausgegeben von der WHO (Weltgesundheitsorganisation) im Jahr 1975. Die bösartigen Neubildungen werden mit Zahlen von 140 bis 239 codiert.

**ICD-10: International Classification of Diseases, 10th revision**

**International Classification of Diseases, 10th revision (WHO, 1990). Although the overall content is similar, it differs from the 9th Revision (ICD-9) principally because ICD-10 has alphanumeric categories rather than numeric categories, and has almost twice as many categories as ICD-9.**

*Classificazione internazionale delle malattie, decima revisione (OMS, 1990). Anche se il contenuto generale è simile, la decima versione differisce dalla nona revisione (ICD-9) principalmente perché le categorie sono in formato alfanumerico (e non numerico) e sono in numero pressoché doppio.*

Die 10. Auflage der internationalen Klassifikation von Krankheiten und Verletzungen, die von vielen Ländern ungefähr seit dem Jahr 2000 verwendet wird, unterscheidet sich von der 9. Auflage formal durch Verwendung von alphanumerischen Kategorien und enthält etwa doppelt so viele Einträge wie ICD-9.

**ICD-O: International Classification of Diseases for Oncology**

**International Classification of Diseases for Oncology: an extension of the classification of the neoplasm chapter, i.e. Chapter II of ICD-9. All neoplasm are coded according to topography, histology, grading.**

*Classificazione internazionale delle malattie per l'oncologia: è un'estensione della classificazione ICD-9 del capitolo relativo ai tumori (capitolo II). Ogni tumore è codificato secondo topografia, istologia e grado di differenziazione.*

Der internationale Schlüssel für onkologische Diagnosen besteht im Gegensatz zu ICD-9 aus zwei Dimensionen und gestattet eine getrennte Codierung nach Lokalisation und der Histologie von Tumoren.

**Incidence** / *Incidenza* / Inzidenz

**The number of cases of disease, such as a new cases of cancer, having their onset in a population over a prescribed period of time.**

*Numero di casi di una malattia, ad esempio il tumore, sorti in una popolazione durante uno intervallo di tempo specificato.*

Anzahl der Personen, die neu an einer Diagnose erkranken, meist angegeben für einen bestimmten Zeitraum.

**Mammography** / *Mammografia* / Mammografie

**The use of x-rays to create a picture of the breast, in order to detect cancer and changes that may lead to cancer.**

*L'uso dei raggi X per generare un'immagine del seno, per rilevare un eventuale tumore ed i cambiamenti che possono evolvere in una patologia tumorale.*

Röntgenuntersuchung der weiblichen Brust zur Früherkennung von Brustkrebs.

**Microscopically verified diagnosis** / *Diagnosi confermata con esame microscopico* / Mikroskopisch verifizierte Diagnosen

**The cancer diagnosis is based on a microscopic confirmation, as cytology or haematology, histology of metastasis, histology of primary and autopsy with concurrent or previous histology.**

*Diagnosi di tumore corredata da una conferma microscopica, quale la citologia o l'esame ematologico, l'istologia della metastasi, l'istologia del tumore primitivo o l'autopsia con esame istologico simultaneo o precedente.*

Diagnosen, die mit mikroskopischen Methoden bestätigt werden. Dabei handelt es sich um zytologische, histologische, hämatologische oder autopische Methoden zur Bestätigung der Diagnose eines Primärtumors oder einer Metastase.

**Mortality** / *Mortalità* / Mortalität

***A measure of the frequency of occurrence of death in a defined population during a specified interval of time.***

*Misura della frequenza dell'evento morte in una data popolazione, in uno specifico intervallo di tempo.*

Anzahl der Personen, die an einer bestimmten Diagnose versterben, meist angegeben für einen bestimmten Zeitraum.

**Mortality-Incidence ratio** / *Tasso di mortalità-incidenza* / Mortalität-Inzidenz Verhältnis

**The ratio between the number of deaths and the number of new cases per each tumor site in the same period provides a measure of disease severity. For cancers with a poor prognosis, the ratio will be close to one. If M/I exceeds one, the cancer is being under-registered.**

*Misura della severità della malattia definita dal rapporto fra il numero di decessi ed il numero di nuovi casi per tumore occorsi nello stesso periodo di tempo. Per i tumori con bassa sopravvivenza, il rapporto sarà vicino ad uno. Se M/I è superiore a uno, si sta sottostimando la registrazione del numero di nuovi casi.*

Das Verhältnis zwischen Mortalität und Inzidenz pro Tumorlokalisation ist ein Maß für die Schwere der Erkrankung: für Tumoren mit einer schlechten Prognose ist das Verhältnis nahe bei 1. Das Verhältnis ist aber im Vergleich verschiedener Register auch ein Maß für die Vollständigkeit der Dokumentation unter der Annahme von ähnlichen Überlebensraten.

**NMSC**

**Non melanoma skin cancer**

*Tumore della pelle non melanoma*

Bösartiger Hautkrebs mit Ausnahme der Melanome

**PAP-test**

**A procedure in which cells are scraped from the cervix for examination under a microscope. It is used to detect cancer and changes that may lead to cancer.**

*Procedura in cui le cellule sono raschiate dalla cervice uterina per essere sottoposte ad esame microscopico. Si ricorre al Pap-test per rilevare un eventuale tumore e le modificazioni cellulari che possono evolvere in una patologia tumorale.*

Ein Verfahren zur Früherkennung des Zervixkarzinoms, bei dem Zellen aus dem Muttermund der Frau entnommen und die gefärbten Zellabstriche beurteilt werden.

**PSA: Prostate-specific antigen** / *Antigene specifico prostatico* / Prostataspezifisches Antigen

**A substance produced by the prostate that may be found in an increased amount in the blood of men who have prostate cancer, benign prostatic hyperplasia, or infection or inflammation of the prostate.**

*Sostanza prodotta dalla prostata che può essere trovata in una quantità superiore alla norma nel sangue di soggetti con tumore della prostata, iperplasia prostatica benigna, infezione o infiammazione della prostata.*

Eine Substanz, die von der Prostata gebildet wird. Ein erhöhter PSA-Wert kann ein Hinweis auf eine gutartige oder bösartige Vergrößerung des Prostata sein; wird sowohl zur Diagnostik als auch als Früherkennungsmaßnahme eingesetzt

**Record linkage**

**A procedure by which different sources (hospital discharges, pathology laboratory, death certificates) are linked to the same patient. This allows a registry to complete the details of each patient and to avoid duplicate registrations for the same tumor.**

*Procedura secondo cui fonti di dati differenti (ricoveri ospedalieri, referti istologici, certificati di morte) vengono incrociate con riferimento allo stesso soggetto. Un registro può così raccogliere più informazioni su ogni paziente ed evitare di duplicare la registrazione di un medesimo tumore.*

Verfahren, mit dem Daten aus unterschiedlichen Quellen (Entlassungsdiagnosen, Pathologiebefunde, Totenscheine) für eine Person zusammengeführt werden auf Basis von Namen, Geburtsdatum und Adresse, falls es keine eindeutige Personennummer gibt. Krebsregister setzen diese Methode auch ein, um Doppelerfassungen zu vermeiden.

**Screening**

**The use of quick procedure (tests and examinations) to differentiate in a asymptomatic population persons who have a disease (or high risk of disease) from those who probably have not the disease.**

*Uso di una procedura rapida (attraverso test ed esami) valida, di basso costo ed accettabile da parte della popolazione, per differenziare nelle persone asintomatiche di una popolazione coloro che sono verosimilmente affetti da una malattia (o hanno un elevato rischio di ammalarsi) da coloro che probabilmente non sono ammalati.*

Systematisches Testverfahren, um in einer Bevölkerung Personen zu identifizieren, die eventuell eine bestimmte Krankheit aufweisen.

**Smoothing** / *Lisciamento* / Glättung

**Disease mapping is an exploratory analysis used to get an impression of the geographical or spatial distribution of disease. But, when expected numbers of cases are small, the large random component may predominate disease rates across limited areas. For this the disease map should be based on smoothed estimates, clean of "noise" due to casual variation.**

*Il "disease mapping" è un'analisi esplorativa usata per osservare la distribuzione geografica o spaziale della malattia. Quando però le numerosità dei casi attesi sono piccole, la componente casuale può incidere sul tasso della malattia calcolato per piccole zone. Per questo motivo la costruzione della mappa della malattia dovrebbe essere basata su stime lisciate, al netto del "rumore" dovuto alle variazioni casuali.*

Die Darstellung der geografischen Verteilung von Erkrankungen ist eine beschreibende Analyse, um einen Eindruck von der geografischen Verteilung zu erhalten. Bei kleinen Fallzahlen kann der Einfluss von Zufallskomponenten in bestimmten Gebieten dominieren. Daher werden Glättungsverfahren eingesetzt, um das zufällige „Rauschen" wegzufiltern und zu einer möglichst guten Darstellung der tatsächlichen Verteilung zu kommen.

**Stage at diagnosis** / *Stadio del tumore* / Tumorstadium

**The extent of a cancer in the body at diagnostic time. Staging is usually based on the size of the tumor.**

*Livello di diffusione di un tumore nell'organismo al momento della diagnosi. La stadiazione è basata solitamente sulla dimensione del tumore, sul livello di coinvolgimento delle strutture linfonodali e sulla diffusione a distanza delle cellule maligne.*

Ausdehnung des Tumors zum Zeitpunkt der Diagnose.

**SMR – SIR: Standardized mortality - incidence ratio** / *Tasso standardizzato di mortalità – incidenza* / Standardisiertes Inzidenz- oder Mortalitätsratio

**In a group of subjects, it is calculated by comparing the observed number of cancer cases with that expected in the same period by applying a standard set of age-specific incidence rates.**

*In una specifica popolazione, in un determinato periodo di tempo, rapporto fra il numero osservato di casi di tumore e il numero atteso nello stesso periodo ottenuto applicando un set di tassi di incidenza età – specifici di una popolazione riferimento.*

Verhältnis von beobachteten zu erwarteten Fällen, wobei bei der Berechnung der erwarteten Fälle ein Standard zugrundegelegt wird (z.B. Rate im gesamten Studiengebiet). Ein Wert von 100 bedeutet, dass gleich viele Fälle beobachtet werden wie nach dem Standard erwartet sind.

**Survival** / *Sopravvivenza* / Überleben

**In a study or in a treatment group, the assessment of subjects who are alive for a given period of time after cancer diagnosis. Five year survival is the assessment of subjects who are alive for 5 years after cancer diagnosis**

*In uno studio o in un gruppo di trattamento, la valutazione dei soggetti in vita dopo un dato periodo di tempo dalla diagnosi di tumore. La sopravvivenza a cinque anni è la verifica dello stato in vita nei soggetti dopo 5 anni dalla diagnosi di tumore.*

In einer Studien- oder Behandlungsgruppe der Anteil der Patienten, die nach einer bestimmten Zeit nach der Diagnose noch am Leben sind. Fünfjahresüberleben: Anteil der Patienten, die fünf Jahre nach der Diagnosestellung noch am Leben sind.

**Tumor board /** *Gruppo multidisciplinare* **/** Tumorboard

**According to an European recommendation every cancer patient should be introduced to an interdisciplinary assessment, at least consisting of a surgeon, medical oncologist and radiooncologist.**

*Sulla base di una raccomandazione espressa dall'Unione Europea, ogni paziente ammalato di tumore dovrebbe essere esaminato da un gruppo multidisciplinare di specialisti, composto almeno da un chirurgo, un medico oncologo ed un radioterapista.*

Nach einer europäischen Empfehlung sollte jeder Krebspatient einer interdisziplinären Gruppe vorgestellt werden, die zumindest aus einem Chirurgen, einem Onkologen sowie einem Radioonkologen besteht.

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