Hamburg University of Applied Sciences
Postgraduate Course 'Master of Public Health'

Limited-Duration Cancer Prevalence in Hamburg (1995-2009): Analysis of Population-Based Hamburg Cancer Registry Data with Comprehensive Investigation of Breast Cancer Prevalence in Women

- Master Thesis -

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by

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1 Abbreviations

ADT	German Tumor Centres Work Group (*Arbeitsgemeinschaft der deutschen Tumorzentren*)
ASR	Age Standardized Rate
BKRG	Federal Cancer Registry Act (*Bundeskrebsregisterdatengesetz*)
CA	Carcinoma
CDC	Center for Disease Control and Prevention
Cis	Carcinoma in situ
CP	Complete Prevalence
CR	Cancer Registry /Cancer Registries
CUP	Cancer of unknown Primary Origin (*Metastasen bei unbekanntem Primarius*)
DCO	Death Certificate Only
DCN	Death Certificate Notified
DGS	German Association of Senology (*Deutsche Gesellschaft für Senologie*)
DIMDI	German Institute of Medical Documentation and Information (*Deutsches Institut für Medizinische Dokumentation und Information*)
DKG	German Association of Cancer (*Deutsche Krebsgesellschaft*)
EKR	Epidemiological Cancer Registries (*Epidemiologische Krebsregister*)
EMA	Registration Office (*Einwohnermeldeamt*)
ENCR	European Network of Cancer Registries
ESP	European Standard Population
5-YPP	5-Year Partial Prevalence(s)
GEK*ID*	Association of population-based Cancer Registries in Germany (*Gesellschaft der epidemiologischen Krebsregister in Deutschland*)
HCR	Hamburg Cancer Registry
HKR	Hamburgisches Krebsregister
HmbKrebsRG	Hamburg Cancer Registry Act (*Hamburgisches Krebsregistergesetz*)
IACR	International Association of Cancer Registries
IARC	International Agency for Research on Cancer
ICD-10	International Classification of Diseases, 10th revision
ICD-O-3	International Classification of Diseases for Oncology, 3rd Edition
LDP	Limited-duration Prevalence
M/I Ratio	Mortality /Incidence Ratio
No.	Number

NOS	Not Otherwise Specified
SEER	Surveillance, Epidemiology, and End Results
Tis	Tumour in situ
TNM	Tumour- Nodulus- Metastasis
TSD	Time since diagnosis
UICC	Union for International Cancer Control
WSP	World Standard Population
YSD	Years-since-Diagnosis
ZfKD	Centre for Cancer Registry Data (*Zentrum für Krebsregisterdaten*)

2 Abstract

Background:

Rising numbers in cancer diagnoses and improving survival, as well as demographic changes, have increased cancer prevalence in Germany. Few data on prevalence on international, national and regional level are yet available. Population-based cancer registries hold valid and reliable data on incidences and follow-up for death and migration. This thesis provides direct calculation of cancer prevalence in Hamburg with an overview of the ten leading cancers in Hamburg for men and women. Detailed analysis of breast cancer prevalence in women is conducted to describe and evaluate temporal trends in prevalence and in relation to incidence. 'Time-since-diagnosis' -groups are formed and correlated to cancer treatment guidelines to estimate minimum health care needs in female breast cancer patients in Hamburg for the year 2009.

Methods:
Incidence data and follow-up information on death and migration from the population-based Hamburg Cancer Registry and data of residential registration office and the statistical office of Hamburg were linked to calculate 15-year limited-duration point prevalence of 10 leading cancers for men and women in Hamburg. Breast cancer in women was analysed for age distribution, time-since-diagnosis and correlated to german up-to-date 'S3'- treatment and follow-up guideline. 5-year partial prevalences were investigated by age, tumour sizes according to TNM-Classification and UICC-stages. 10-year partial prevalences were analysed according to time-since-diagnosis.

Results:
As of 31/12/2009, 51,810 cases of cancer are registered of persons alive and resident in Hamburg on the index date (cases diagnosed from 01/01/1995 to 31/12/2009), not including 18,099 registered cases of ICD-10 'C44'. 5-year prevalence is 1,54% in women and 1,51% in men.
The 10 leading cancer sites prevalent in men were: prostate (8,907), bladder (2,600), colon (1,622), malign melanoma (1,352), lung (1,212 cases), kidney (926), rectum (888), testicular cancer (827), lymphatic leukaemia (433) and stomach (398). In women, most prevalent were breast cancer (12,718), colon (1,903), melanoma (1,597), corpus uteri (1,340), bladder (868), lung (819), cervix uteri (790), ovary (768), rectum (763) and kidney (539).
Of 12,718 cancer cases in women, who received the diagnosis breast cancer, 47% were of the age 65 to 75. 6,099 cases were diagnosed within the last 5 years (48%), 3,997 (31%) '6-10' years before the index date and 2,622 (21%) '11-15' years before. Distribution of cases in 5 years-since-diagnosis was: 1,659 cases (13% of total 15-year prevalence) within previous year, 2,500 (20%) '2-3' years before and 1,940 (15%) '4-5' years before.
5-year partial prevalence of breast cancer showed a defined increase in age-specific prevalence proportion from 540 to 672 per 100,000. The group of '6-10' years-since-diagnosis in 10-year partial prevalences increased 15% from 2004 to 2009. For the 15-year limited duration point prevalence group of 31/12/2009 an estimated minimum medical care, calculated according to the current evidence-based treatment and follow-guidelines (“*S3-Brustkrebs Leitlinie*”) were 12,704 mammographies and 27,135 ultrasound examinations of the breast (plus physical examination & clinical investigations). According to analysis time trends the need of medical care will continue to increase.

Conclusion:
Cancer prevalence in Hamburg represents a significant burden to the health care system. Temporal trends show a defined increase in breast cancer prevalence in women. Analysis of 5-year prevalence and 'time-since-diagnosis' indicate trends and minimum health care needs according to current guidelines. Changes in prevalences of tumour-size and UICC stages have to be evaluated including incidences and considering multicausal influences on survival.

3 Introduction

Cancer represents a significant burden of disease world-wide, in Germany 426,800 new cases of cancer were estimated for the year 2006 (RKI/GEK*ID,* 2010). Health systems are confronted with rising need of medical care in oncology, while mortality due to other diseases like cardiovascular diseases is decreasing, especially in developed countries (Gaber, 2011).

The prevalence of cancer is an important indicator for health care planners to estimate the existing need of medical care and allocation of resources. With the parameter prevalence, not only incidences (the new diagnoses of cancer each year) are measured, but also all preceding diagnoses of malignancies. Assessed are either all cases, who were ever diagnosed with cancer, – this is called 'complete prevalence'- , or those, who were diagnosed within a defined time frame, a 'limited-duration prevalence'.

A special characteristic of cancer is the long duration of disease, if diagnosed early, and the difficulty to define the point in time to have achieved a complete cure. Common is a 'cut-off' at five 'years-since-diagnosis', but this does not apply to all malignancies: the malign melanoma is an example for earlier cut-off of after one or two years-since-diagnosis (RKI/GEK*ID,* 2010), on the other hand, breast cancer may recur up to fifteen years after diagnosis (Chia, 2004, Fisher, 2004). The assessment of 'time-since-diagnosis' in prevalence data may open a path for the estimation of a minimum of medical care needs existing and may be used by local health care planners. A detailed plan for the needed health care is still not possible though, due to inadequate information on several factors like the individual courses of disease, differing complications and co-morbidities.

The Hamburg Cancer Registry is one of the oldest registries in the world (Curado, 2007). Established as early as 1926 it has gained wide experience in the documentation of malignancies. Since 1986 several new legacies, profound structural changes and also fundamental innovations in electronic registration, have enhanced possibilities of documentation essentially.

This work analyses data of the Hamburg Cancer Registry from 1995 to 2009 in order to quantify the prevalence of cancer in the Free and Hansecity of Hamburg, for men and women respectively, summarizing the ten leading cancer according to gender. Furthermore, breast cancer, being the malignancy with the highest incidence and prevalence in women, is analysed in detail for time trends in 5-year partial prevalence groups and time, that has passed since diagnosis ('time-since-diagnosis'). The correlation of 'time-since-diagnosis'-groups to the current evidence-based treatment and follow-up guideline (*Stufe 3(S3)-Leitlinie*) indicates the minimum health care need for the prevalence cases in female breast cancer.

4 Hamburg Cancer Registry

4.1 History and Legislation

The Hamburg Cancer Registry (*Hamburgisches Krebsregister*) is one of the oldest epidemiological cancer registries in the world and the oldest in Germany, having started population-based cancer registration as early as 1926 (Curado, 2007, Matti, 1973). While there is little information on the morbidity of the pre-world- war-years, data on the mortality was already assessed in Hamburg during the last decades of the 19th century.

In the 'statistical reference books' of Hamburg („*Statistische Handbücher für den Hamburgischen Staat*“, 1885), quantitative information is available on cancer sites (in age-groups) in the deaths of Hamburg „in an average year“ for the years of 1872-1896 (Evans, 2005). The publication ‘About the statistics of carcinoma’ (“*Zur Statistik des Carcinoms*”) distinguishes even 18 cancer sites by gender and age (Reiche, 1900). A further early publication is ‘*Death cases by cancer in Hamburg 1900-1929’* (“*Sterbefälle an Krebs in Hamburg 1900-1929”) which* gives a summary on the mortality at the beginning of the last century (Schwanke, 1930). Even though it may be assumed that some of the data was rather suggestive, it was nevertheless an important step towards an assessment of disease burden (Evans, 2005).

In 1926 a continuous notification system started, based on tumour cards which were developed by Professor Bierich, head of the Cancer Institute at the general hospital in Hamburg-Eppendorf, and the Statistical State Office (Matti, 1973, HKR, 2009). Participating general hospitals were to complete their tumour cards for each patient on a regular basis, the cards being collected at the end of year by the health authorities. Statistical state officers sorted these tumour cards and returned the cards of the surviving back to the hospitals. In 1929 a cancer welfare service (*“nachgehender Krankenhilfsdienst”*) was developed to care for patients after their hospital release. Soon after its start it was directly attached to the statistical assessment of cancer. Professor H.G. Sieveking, the city´s physician in charge (“*Stadtphysikus*”) strongly supported the establishing of a central Hamburg cancer register and a complete assessment of cancer cases in Hamburg (Matti, 1973). The freshly founded Hamburg Cancer Registry (HCR) was associated with the statistical state office for data processing. The files of cards were kept in alphabetical order to allow the social welfare personnel to control the notification for double tumour cards.

The Hamburg Cancer Registry underwent two recessions during its existence: the first during World War II and post-war period and the second in the eighties due to strong discussions on data privacy protection also in cancer registration.

In 1952 the HCR restarted with organizational changes in the cooperation of health authorities and the statistical state office, as well as with a systematic review of the existing tumour card registry in 1954: Double notifications, cases of death, migration and residential registration in other federal states were removed of the data set. From 1956, after the revision of the tumour cards, a regular notification programme was established on the basis of standardized tabulation programmes (Matti, 1973, HCR, 2009).

In 1955, Hamburg was represented at a cancer registry meeting of 10 European countries hosted by Denmark, which had the target to inform and learn about the different organization and concepts of cancer registries (Heinsohn, 1957). The Public Health Board of the Western European Union aimed at a standardization in cancer registration for international comparability. In 1958, the preliminary design of the tumour card was tested in a pilot study run of three months in the HCR, also a new tabulation programme was created. Main criteria were:

1) medical perspective: differentiation of first treatment and follow-up care, new notification and death during follow-up

2) regional perspective: place of residence

3) technical/organizational perspectives: death certificates notifications with and without pre-existing tumour cards (Matti, 1973).

HCR data of the years 1960-1962 and 1963-1966 were published in the first two volumes “Cancer Incidence in Five Continents” of the UICC (Union for International Cancer Control), which contained the data of 32 registries in 24 countries.

In the late seventies notification of cancer was voluntarily performed by medical staff from hospitals, radiotherapy and pathology departments. Death certificates were passed on by the health authorities for control of the cancer registry´s data completeness. Electronic data processing influenced the process of registration naturally, for example automatic data keeping.

In 1973 the first of the consecutive 'Hamburg Cancer Documentations' (*“Hamburger Krebs-dokumentation*”) covering 1956-1971 was published.

Concerning the legislative basis for the documentation of cancer cases in 1983 the Federal Government and its States agreed upon the need of regional cancer registries and their comprehensive establishment.

The public discussions on data privacy protection in the 1980´s led to restructuring measures and due to the lack of a law regulation the handling of data privacy the first Hamburg Cancer Registry Data Act (*Hamburgisches Krebsregisterdatengesetz (HmbKrebsRG))* of 1984 came into force on the 1st of January, 1985. Two of the main points were the obligation to obtain an informed consent

of the cancer patient prior to report and a voluntary cooperation by the physicians and hospitals (HmbKrebsRG, 1984) (see Appendix A). In the following years HCR became a self-reliant section of the Department for Health and Environment (*Gesundheitsbehörde*), independent of the cancer welfare service, statistical state office and the central city´s electronic data processing.

In 1991 the remuneration of physicians for the notification was established to consolidate the Cancer Registry (CR) and systematic trace back of the cancer cases, which were only notified by death certificates (DCN= death certificate notification), started (Nennecke, 2006, HKR, 2009). 1995 the Federal Cancer Registry Data Act (*Bundeskrebsregisterdatengesetz (BKRG)*) came into effect, obliging all federal states to initiate cancer registries until 31/12/1999 (GEK*ID* 2010) (see Appendix B). Standardized methods for the capture of information on cancer cases and persons were recommended, but not made obligatory. Modifications of the act were accepted, which enabled preexisting CR´s to maintain their concepts, but also resulted in a diverse culture of data registration. Legislative premises, methods of data assessment, completeness of incidence and mortality, and technical equipment differ (GEK*ID* 2010). Therefore one of the aims of the 'Association of population-based cancer registries in Germany' (GEK*ID*), founded in 1996, is to create comparability and transferability of data for all federal states (Hentschel, 2008).

Since the beginning of the Millennium, according to §9(7) HmbKrebsRG, physicians and hospitals notifying cancer cases can receive data on the vital status of reported cases (HKR, 2009), contributing to a working group focus on 'long-term survival of cancer patients in Hamburg'. To minimize the loss due to migration or, especially in Hamburg, the notified cases of federal residencies other than Hamburg, an amendment was passed that the data of surrounding federal states can be transferred to the responsible cancer registry (HmbKrbsRG 2004, §2 (6)). For further improvement of the data quality (e.g. missing date of death) the HCR started the record linkage of HCR Data with the residential registration office, beginning with a data set in 2004 (HmbKrebsRG §4 (2)). Throughout all transfers high standards of data privacy have to be fulfilled. The information of person and cancer are stored separately and may only be merged, if it is necessary to carry out functions and duties of the public authority (HmbKrebsRG §5 (3)).

To fulfill the additional task of providing information to the public, the HCR´s aggregated data can be accessed online since 2004.

The pseudonomyzed reporting obligation for pathologists started in 2007, allowing the HCR to optimize the generation of detailed information for each notified cancer (Amendment to HmbKrbsRG, 24/04/2007).

With the Federal Cancer Registry Data Act (*Bundeskrebsregisterdatengesetz* (BKRG)) of 2009, a foundation has been created for the complete coverage of Germany with epidemiological cancer

registries (GEK*ID* 2010). The act ascertains the foundation of the “German Centre for Cancer Registration Data” (“*Zentrum für Krebsregisterdaten*” (ZfKD)), which succeeds the RKI´s working group “Federal Cancer Surveillance Unit” after 20 years, with further extended functions (GEK*ID*, 2010). The Centre is an independent division within the Robert Koch Institute´s Department of Epidemiology and Health Reporting. The data of the Hamburg Cancer Registry is – together with all federal cancer registries` data - pooled, documented and analyzed in cooperation with RKI and GEK*ID*. Multiple submissions and estimation of completeness have to be reported to the federal cancer registries within 6 months of data transfer. Estimation and analysis of prevalences and risk of disease are reported on a regular basis.

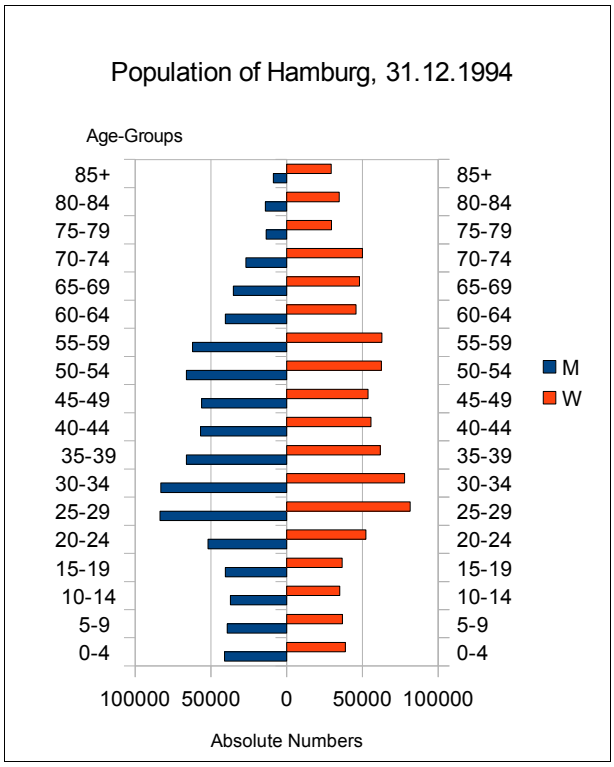
The HCR itself publishes the registration data on incidence and mortality every 3rd year, in 2012 adding prevalence as a special topic (HKR, 2012). Furthermore it takes part in various projects, among others currently joining the dkfz in the project 'Marie II' (risk factors for breast cancer) together with the German Cancer Help and UKE, ' Incidences in Turkish migrants' with the Department for Public Health in Bielefeld.

4.2 Registry Population and Quantitative Information on Hamburg

The Hamburg Cancer Registry is a person and case oriented, dynamic, population-based cancer registry. The population includes all persons living in the administrative borders of the Free and Hanseatic City of Hamburg.

Hamburg is Germany´s second largest city with approximately 1,786,500 inhabitants (Statistisches Amt für Hamburg, 31/12/2010). The city is characterized by its traditional port, being the 2nd largest in Europe, central hub for Eastern and Northern Europe. The biggest employers are Airbus Deutschland GmbH (11,800 employees), Deutsche Lufthansa AG (10,900) and the Asklepios Hospitals Hamburg GMBH (10,500), followed by Deutsche Bahn AG (8,200) and the University Hospital Hamburg Eppendorf (7,400) (metropolregion.hamburg.de, 2011).

The city of Hamburg has 60 hospitals (of which 24 have private hospital concessions) and approximately 11,650 beds. The University Medical Centre Hamburg-Eppendorf has a contingent of 1,248 beds (BGV, 2011). For the specialized care of breast cancer, 8 centres have been certified in Hamburg. Seven centres with the ONKOZERT certification according to the German guidelines developed by the German Association of Cancer (DKG) and German Association of Senology (DGS) and one certified according to EUSOMA guidelines(European Society of Breast Cancer Specialists) (Onkozert, 2011, EUSOMA, 2012).



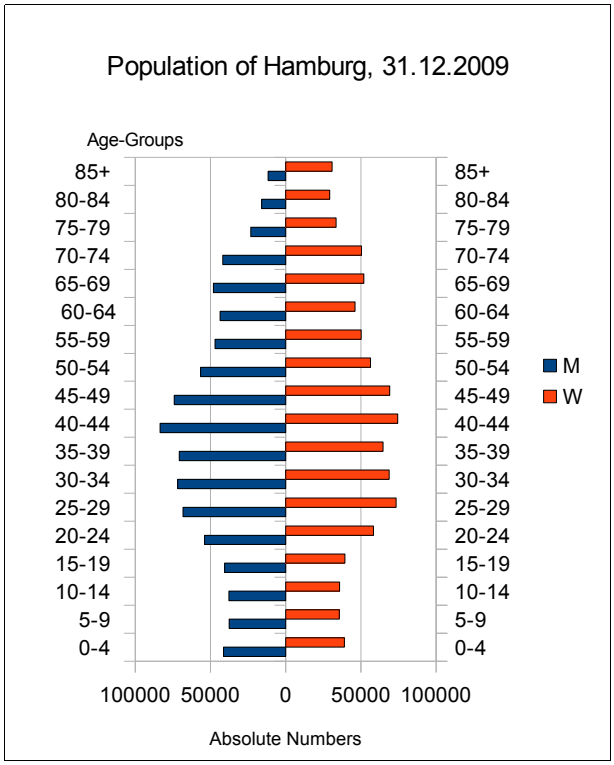


Figure 1: Population of Hamburg according to Gender and Age-Groups on 31/12/1994 and 31/12/2009 (Source: Statistisches Amt für Hamburg und Schleswig-Holstein (2011), Bevölkerungsstatistiken)

On the 31st of December, 1994, a total of 1,716,993 persons lived in Hamburg: 893,193 women (52.0%) and 823,800 men (48.0%). In both genders combined, the percentage of under twenty-year-olds represented 17.8%, the 20 to 65-year-olds 65.3% and the above 65-year-olds 16.9%. Women showed in the distribution of age groups respectively: 16.5% (<20 year-olds), 62.0% (20-65 year-olds) and 21.5% (>65 year-olds), and a surplus of almost 70,000.

At the end of 2009, the population had augmented 3.3% to 1,774,224 persons: 907,601 women (51.2%) and 866,623 men (48.9%) (Statistisches Amt für Hamburg, 2010). The percentage of under 20-year-olds in both sexes represented 17.3%, the 20 to 65-year-olds 63.7% and the above 65-year-olds 19.0% (only women respectively 16.5%, 62.0% and 21.5%). The female population increased 1.6%, the male 5.2%. The surplus of the female population was reduced to about 40,000.

Table 1: Female Population of Hamburg according to Years and Distribution in Age-Groups in Absolute Numbers and Increase in Absolute Numbers from 1994 to 2009

Female Population Hamburg	31.12.94	31.12.09	Increase in Absolute Numbers
0-19	147,292	149,943	2,651
20-29	133,916	131,731	-2,185
30-39	139,780	133,679	-6,101
40-49	109,265	143,666	34,401
50-59	125,299	106,457	-18,842
60-69	93,873	98,167	4,294
70-79	79,635	83,822	4,187
80+	64,133	60,136	-3,997
Total	893,193	907,601	14,408

Table 1 shows the increase or decrease of Hamburg´s female population between 1995 and 2009, measured at the end of each year, respectively. An overall growth of 14,408 women can be seen, with the absolute highest increase in the age group of 40 to 49 with 34,401 women. In percentages, this corresponds to a growth of more than 3 %. At the same time, the age group of 50 to 59 year-olds decreases by 3%, older age groups (70+) only decreasing approximately by 1%.

Geographically Hamburg has a size of 755.16 km², on one square kilometre lived approximately 2,274 persons at the end of 1994, which augmented to 2,349 /km² in 2009. Hamburg has a high migration to and from the city, with a constant increase of the population since 1995, whereby more and more people with a migration background (approximately 30%) were registered (Statistisches Amt für Hamburg, 2011).

4.3 Data Acquisition and Methods of Registration in Hamburg

All population-based cancer registries of Germany work in accordance with the guidelines and recommendations of the International Association of Cancer Registries (IARC) and European Network of Cancer Registries (ENCR). Technical reports give a standardized foundation for registration, for example considering coding, multiple notifications for a single tumour, quality indicators and analysis procedures (Hentschel, 2008). The standard of registration in the HCR is described in the following subchapters.

The Hamburg Cancer Registry Act (HmbKrbsRG) authorizes doctors and dentists to notify the HCR with basic information on personal and medical data of a patient with a diagnosis of cancer, who has given his informed consent (see table 2).

Table 2: Content of Personal and Medical Data Authorized for Notification to Population-based Cancer Registry in Hamburg (see Appendices C)

Personal data	Medical data concerning the cancer
- name and surname - former names - resident address - date of birth - date of death - nationality - gender - smoker/ non-smoker status (source: HCR, 2009)	- First date of diagnosis - Exact diagnosis (text and ICD-10 code) - Topography ("*Lokalisation*") - Staging (TNM-Classification) - Breslow/Gleason-Score (if applicable) - Morphology ("*Histologie*") - Confirmation of diagnosis by… - Histopathologic grading - further primary cancer (if applicable)

Carcinoma in situ and tumours with uncertain behaviour (e.g. polycythaemia vera, myelofibrosis) are registered, but not included for the calculation of incidences and prevalences. An exception is the in-situ cancer of the urinary bladder (ICD-10 'D09.0'), due to its malign characteristics in rapid progress and recurrence. Benign tumours or "suspection of"- cancer[1] are not filed.

Methods of registration:

Doctors and dentists in Hamburg can either notify via the traditional data entry form of the HCR (see Appendix C) or use the hospital or practice software, which is specially conceptualized by the HCR. Pathologists are obliged to report and therefore equipped with the free software for the process of pseudonymising the patients' data. The USB sticks are sent to the HCR for transfer of information, while at the same time the software on the stick is updated and a check-up is performed. Some pathologists additionally also chose to send a written form to the clinicians. These forms are then completed for clinical details and forwarded to the HCR. The level of EDV-notification has reached 75% in the HCR (HKR, 2012).

1 These cases come into existence in death certificates, for example, when a suspected diagnosis of cancer is documented by the medical doctor completing the death certificate (e.g. "suspection of abdominal tumour").

Annually, the HCR analyses and reports statistics concerning case numbers, major sites and survival for more than 50 oncological institutions. High data quality in the HCR is pertained by plausibility check-ups (see Table 3) based on national and international rules and manuals, several plausibility tests run constantly (HCR, 2009):

Table 3: Exemplary List of National and International Sources for Plausibility Check-Ups of the HCR

- Das Manual der epidemiologischen Krebsregistrierung (Hentschel, 2008) - Check and Conversion programs for cancer registries (IARC/IACR, 2005) - International rules for multiple primary cancers (IARC, 2004) - ICD-10-GM (DIMDI, 2005) - ICD-O-3 (DIMDI, 2003) - ICD-9 (Der Bundesminister, 1979) - TNM-Klassifikation maligner Tumoren (Wittekind, 2011) - Histological groups for comparative studies (Parkin, 1998) - Cancer Registration Principles and Methods (Jensen, 1991) - EUROCIM User Manual (IARC, 1995) - Electronic Database of 'Cancer Incidence in Five Continents (Ferlay, 1997) - Manual for cancer registry personnel (Esteban, 1995) - Manual of clinical oncology (UICC, 1982) - SEER (2010)
(Source: HKR, 2009)

Plausibility checks are implemented in the software of notification to avoid false entries and regularly updated (Burkhardt, Norbert,& Funk, Anni, personal communication, November 2011).

4.4 Multiple Primary Cancers

The aim is to document each single cancer entity according to its site and characteristics. Recurrences, metastases or the spreading of tumour to another organ are not counted as a multiple primary. Multiple primary cancers are defined as malign tumours independent of other pre-existing malign tumours. The HCR works according to the "International Rules For Multiple Primary Cancers", which have been developed by a working group of the WHO, ENCR, IACR and IARC (IARC 2004) for a better international comparability (see Appendix D). In the special case of breast cancer, several histologies form a group and are therefore counted only once[2]:

2 For example: A person, having had a ductal cancer of the breast in 2000 and a lobular cancer of the breast in 2005 will only be filed once for breast cancer: ductal cancer in 2000, because both histology codes (ICD-O-3) 8500/3 and 8520/3 belong to the same group 3. of the adenocarcinomas.

The most common histologies in breast cancer are ductal and lobular cancers, which both belong to the group of the adenocarcinomas (RKI/GEK*ID*, 2010). The cancer cases are documented according to the updated International Classification of Diseases, their morphology and topography according to the International Statistical Classification of Diseases for Oncology (ICD-10-WHO and ICD-O-3 both translated by DIMDI/ Federal Ministry of Health) (DIMDI, 2010a, DIMDI, 2010b, WHO, 2012a). In the calculation of this work all primary cancers except ICD-10 'C44' ('other malignant neoplasms of skin' (including basal cell carcinoma) were counted for 'prevalence of cancer cases' (WHO 2012a).

4.5 Best-Of

For most tumours the Hamburg Cancer Registry receives more than one notification. Each notification is saved separately, but a “Best-Of” for each tumour is generated continuously, updated for more detailed information, which is then used for epidemiological analysis. The time frame for receiving information on one cancer is usually set to six months (Hentschel, 2008).

This “Best-Of” information is reported annually to the Centre of Cancer Registration Data (ZfKD) in Berlin and the International Agency for Cancer Registries (IACR) in Lyon. These data is foundation for the estimation of completeness for all population-based cancer registries and for the estimation of Germany´s national cancer incidences (Hentschel, 2008).

4.6 DCN-DCO Cases

All death certificates from Hamburg, which are collected at the Hamburg health authorities, are passed on to the Hamburg Cancer Registry. The HCR controls and matches the data of cancer patients and corrects the “Best-Of”.

Cancer cases, which first report is a *death certificate notification* (DCN) are initially registered as cancer diagnosed in the year of death. They are in course actively investigated through contact with the respective general practitioner, hospital or doctor (which signed the death certificate) and corrected for more precise information. Research is started no sooner than 12 months after the DCN, to avoid a death certificate notification´s “report-lag” (notification by the physician AFTER the patient´s death). If no further information can be obtained, the case receives the label *death certificate only* (DCO).

The percentage of DCO´s is an important indicator on the completeness of a cancer registry´s data, and is in general expected to be less than 10% in a “complete” cancer register. Certain cancer sites are prone to DCO-status due to their low survival rates, for example pancreas carcinoma.

4.7 Completeness

An important indicator for the quality of cancer registries is the 'completeness' (“*Vollzähligkeit”*): the relation of the registered cases to the expected total cases of the defined population. Registered cases of cancer are supposed to reach a completeness level of 90 to 100% of the expected total. This estimation is indirectly calculated in a complex mathematical model, using data on incidence and mortality, as well as age groups and gender and taking demographical trends into account (Haberland, 2003). The maturity of the Hamburg Cancer Registry allows a data use back to 1995, where the completeness has reached a stable level for most cancer entities (Nennecke, 2006). The most recent results for the calculation of completeness can be seen in table 4, showing an overall completeness of more than 95% with the exceptions of the topographical sites corpus uteri, prostate and kidney, which are 80 to 90%. Breast cancer achieves a completeness of 102 % without DCO´s and 104% with DCO´s respectively.

4.8 Follow-Up (Mortality, Morbidity, Emigration)

Follow-up data is mainly obtained on mortality and emigration. Further notices on known tumours are corrected for the higher TNM classification and more detailed information added, if received in a defined time frame (6 months). Passive mortality follow-up is accomplished with the investigations of DCN´s and record linkage with the residential registration office of Hamburg, as well as emigration is captured within this process. The result of passive mortality follow-up may be an overestimation of true survival rates, the size of error associated to both accuracy in the matching process and emigration of registered cancer cases elsewhere (Parkin, 1991). Continuous record linkage of the HCR data with the residential registration office is performed since 2004 and identifies migration, death and possible doublettes of similar names[3]. The last full matching process of all HCR data was performed in September 2011.

Active follow-up or medical follow-up is performed for defined cases in the context of research. A cohort study by a working group of GEK*ID* showed, that a combination of active trace back of DCN ´s and record linkage with the residential registration offices result in the lowest error ratio in vital status (GEK*ID*, 2010). Furthermore a regular check of migration is advisable to reduce „lost to follow-up“.

3 In example: Ännchen Müller/ Annemarie Müller with the same address and date of birth.

Table 4: Completeness of Hamburg Cancer Registry according to Topography, Gender, in- and excluding DCO´s and Completeness Categories (HCR, October 2011)

Topography	ICD-10	Gender	Completeness in %		
			without DCO	with DCO	Completeness Categories
			according to RKI	HCR 10/2011	
Cancer, Total	C00-C97, ohne C44	M	99	104	>95
		W	104	109	>95
Mouth, Pharynx	C00-C14	M	131	133	>95
		W	120	122	>95
Oesophagus	C15	M	116	122	>95
		W	141	144	>95
Stomach	C16	M	111	115	>95
		W	119	127	>95
Colon+Rectum	C18-C21	M	96	99	>95
		W	97	102	>95
Liver	C22	M	127	138	>95
		W	144	151	>95
Pancreas	C25	M	118	129	>95
		W	123	139	>95
Lung	C33-C34	M	102	109	>95
		W	102	110	>95
Maligne Melanoma	C43	M	105	107	>95
		W	104	106	>95
Breast (Women)	C50	W	102	104	>95
Cervix Uteri	C53	W	107	109	>95
Corpus Uteri	C54-C55	W	89	91	80 -> 90
Ovary	C56	W	112	118	>95
Prostate	C61	M	89	92	80 -> 90
Kidney	C64	M	91	93	>90
		W	84	90	80 - 90
Bladder	C67	M	118	122	>95
		W	126	131	>95
Meninges, Brain	C70-C72	M	101	108	>95
		W	109	120	>95
Non-Hodgkin-Lymphoma	C82-C85	M	108	110	>95
		W	97	102	>95
Leukaemia	C91-C95	M	110	116	>95
		W	132	140	>95

5 15-Year Limited-Duration Point Prevalence of Cancer in Hamburg on 31/12/2009

5.1 Keywords and Definitions

Cancer

"Cancer is a generic term for a large group of diseases that can affect any part of the body – synonyms are malignant tumours and neoplasms. One defining feature of cancer is the rapid creation of abnormal cells that grow beyond their usual boundaries, and which can then invade adjoining parts of the body and spread to other organs. This process is referred to as metastasis. Metastases are the major cause of death from cancer. " (WHO, 2012b)

In the special case of 'cancer', its progress is most similar to that of a chronic disease. The attribute of 'being a cancer patient'/'having received a cancer diagnosis' does not cease. A complete 'cure' can seldom be related to an exact time. Conventionally, most cancer patients are considered „cured" after 5 years without recurrence or spreading of disease, but, depending on the cancer type, this is not adequate. While patients with melanoma are considered "cured" after two years without recurrence or spreading, in breast cancer the recurrence can be as late as 15 years (Chia, 2004, Fisher, 2004).

Prevalence

Prevalence is defined as the number of existing cases of a disease in a defined population at a notional point in time (*point prevalence* at index date) or at any time during a specified period (*period prevalence*). It can be expressed in crude (absolute) numbers or as a rate (in the denominator the according population at that time) (Last, 1987).

Point prevalence itself can be divided into *complete prevalence* and *limited-duration point prevalence*.

Complete prevalence includes all cases of persons alive at the index date, which were ever diagnosed in the particular population. Ideally this would result in a complete outline of all cancer cases in the defined population. Precondition for the exact calculation of a complete cancer prevalence is a cancer registration with sufficient completeness for a time period long enough to include the oldest citizen of the registry population for all his life. Complete prevalence of cancer can therefore only be estimated, for instance with the completeness index method (Capoccaccia, 2002) or the ComPrev software (SEER, 2010).

Measuring a ***limited-duration point prevalence*** refers to a limited period of registration of cancer diagnoses in people alive on the index date (SEER, 2011). With this method only the time period of

cancer registration is selected, which fulfils the criteria of high data quality. Advantage of this measurement is a better comparability and reliability of results for the defined time period. Nevertheless constricting the time of observation results in an underestimation of cancer prevalence for disregarding long-term survivors, which were diagnosed with cancer before the time frame.

Person-based prevalence and tumour-based prevalence

It is necessary to distinguish between 'tumour' or 'case-based' prevalence and 'person-based' prevalence: tumour/case-based prevalence reports on all cancer cases within the given time period. One reason to measure tumour-based prevalence is, that each incidence of a tumour will lead to the offer of an appropriate medical treatment, regardless of preexisting or following cancer diagnoses.

Person-based prevalence will naturally depict a lower number than cancer case-prevalence, since some persons are diagnosed for more than one cancer in their life-time. To use only person-based figures underestimates the actual burden of disease (Statistics Canada, 2009, Capocaccia 2002).

Time-since-diagnosis

Time-since-diagnosis (TSD) or years-since-diagnosis (YSD) describe the time, that has passed since the date of diagnosis and can be an important indicator for the differing need of medical care. Treatment is significantly higher in cost and complexity during the first 2 and respectively 5 years after diagnosis than in the 5-to-10-year period (STATISTICS AUSTRIA, 2010). Internationally common is also a splitting to 1-, 3-, 5- 10-year prevalence counts (NordCan, 2011). The time-periods chosen should be selected according to the characteristics of the analysed cancer site and aim of study.

5.2 Methods

For the overview of cancer prevalence for men and women in Hamburg a tumour-based point prevalence analysis with index date on the 31/12/2009 and 15-year limited-duration for date of diagnosis from 01/01/1995 to 31/12/2009 was conducted. Cancer cases were captured by ICD-10 codes. The data quality of the Hamburg Cancer Registry has been valid and reliable for follow-up information and histological verification since the mid-nineties (Nennecke, 2006).

Methods of registration of the Hamburg Cancer Registry are in length discussed in chapter 4 (4.3-Data Acquisition and Methods of Registration, 4.4-Multiple Primary Cancers, 4.5-Best-Of, 4.6 DCN-DCO Cases and 4.7 Completeness).

Population size and information was retrieved from the Statistical Office for Hamburg and Schleswig-Holstein with regard to the 31/12/1994 and for the index date, 31/12/2009, data on migration from the residential registration office.

Death certificates are investigated continuously in the HCR and include all death certificates until 12 months prior to September 2011. 22 months after the index date the trace-back of DCN´s up to 31/12/2009 are completed. For the calculation of prevalence DCO´s were only included in the dataset, if a specification of the date of first diagnosis was given on the death certificate in between 1995 and 2009 AND the patient date of death was after the index date 31/12/2009.

The last comprehensive “follow-up” with the residential registration office was conducted in September 2011. This matching was run for all registered cases of the Hamburg Cancer Registry.

Calculation of prevalence data is direct and without extrapolation. The dataset was taken on the 8th of November, 2011. Datasets taken at other times may differ slightly for the cancer registry files being dynamic and in continuous flow.

Included in the prevalence dataset were all notified cancer cases of the respective 15-year time frame from persons being alive and resident to Hamburg on the index date 31/12/2009. After retrieving all cases and analysis for completeness of medical information, personal information was deleted accordingly to the Hamburg Cancer Registry Date Act (HmbKrebsRG).

Absolute numbers represent cancer cases and not persons. For comparison of absolute numbers the total incidence of each cancer entity is the sum of all notified cases from 01/01/1995 to 31/12/2009.

5.3 Results

As of 31/12/2009, a total of 51,810 cancer cases were registered of persons alive and resident in Hamburg, not including 18,099 registered cases of ICD-10 'C44' (other malignant neoplasms of skin-basal cell carcinoma).
Of the 51,810 cases, 24,419 tumours were documented for men, 27,391 for women (47.1%: 52.8%). In terms of individuals, 46,294 persons had been diagnosed with one or more primary invasive cancers in the previous fifteen years and were still alive on 31/12/2009 and living in Hamburg.
Of all cases for men and women, 27,901 (52.3%) cases had been diagnosed within previous last five years and 13,731(26.5%) in the previous two years. Further 15,695 (30.3%) cases were diagnosed '6-10' years before the index date and 9,024 (17.4%) cases '11-15' years before the date of measuring. These numbers correspond to 2.6% of the population of Hamburg on the 31st of

December, 2009, or approximately 1 in 38 persons (15-year limited-duration prevalence (LDP)), 2.1%, or 1 in 47 (10-year LDP); 1.3% ,or 1 in 76 (five-year LDP) and 0.7%, or 1 in 152 (two-year LDP).

Cancer Incidence in men

In the fifteen years from 1995 to 2009 82,092 new malignancies were diagnosed in men, the most frequently being cancer of the prostate (15,301), followed by cancer of the lung (11,674) and bladder (5,996) (see figure 2). For the malignancies of the bladder ICD-10 'C67' and 'D09.0'[4] was summarized. Cancer of the colon ('C18'-'C19') succeeded with 5,381 cases, then ensued by stomach (2,650) and rectum (2,523). Cancer of the rectum and colon together make up a total of 7,904 cases for the time-period. The seventh to 10th most frequent diagnosis were malignancies of pancreas (2,070), melanoma (1,997), cancer of kidney (1,982) and oesophagus (1,577).

Cancer Prevalence in men

The analysis of point prevalence shows similar rank order (see figure 3), with differences for malignancies with low survival prognosis and also for diseases, that have a low completeness for incidence and show high migration in the risk population, like cancer of the testes.

Of 24,419 prevalent cancer cases in men on the 31/12/2009 in Hamburg, the most frequent site is the malign tumour of the prostate with 8,907 cases, followed by bladder (2,600) and colon ('C18'-'C19'=1,700). The fourth most present cancer is the malign melanoma with 1,352 cases registered. Lung cancer amounts to 1,212 cases, in the kidney 926 and rectum 888 cases for the male population. There are 827 cases of testes cancer documented in the HCR, which were diagnosed from 1995 to 2009, and 433 cases of lymphatic leukaemia[5].The 10th most prevalent site is cancer of the stomach with 398 cases.

Cancer Incidence in women

There are 81,230 registered malignancies for women from 1995 to 2009, the most frequent being breast cancer (20,626), followed by colon ('C18'-'C19'=6,787) and lung (6,090). Cancer of the ovaries were documented with 2,913 cases, pancreas with 2,425, rectum with 2,357 and bladder with 2,334. Cancer of the rectum and colon make up a total of 9,144 cases for the time-period. Malignancies of the corpus uteri (2,304), melanoma (2,267) and cancer of the stomach (2,172) follow as 8th-10th most frequent diagnoses (figure 4).

4 ICD-10: D09.0 Bladder (Carcinoma in situ of other and unspecified sites)

5 To the group of 'C91.0' – 'C91.9' belong: acute lymphoblastic leukaemia, chronic lymphocytic leukaemia of B-cell type, prolymphocytic leukaemia of B-cell type, hairy-cell leukaemia, adult T-cell lymphoma/ leukaemia (HTLV-1-associated), prolymphocytic leukaemia of T-cell type, other lymphoid leukaemia, mature B-cell leukaemia Burkitt-type and all unspecified lymphoid leukaemia.

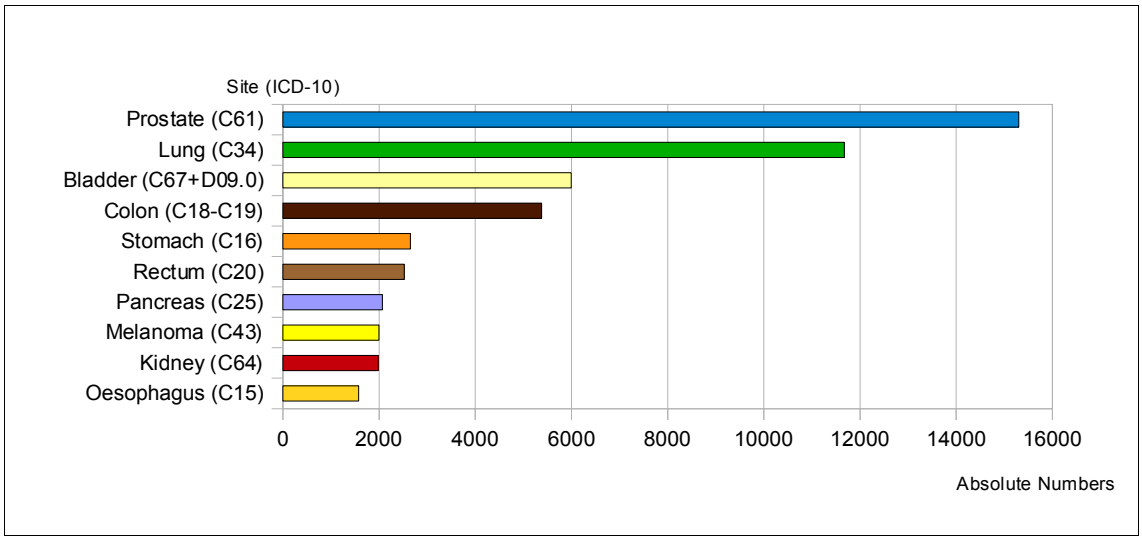


Figure 2: Incidence of 10 Leading Cancer Sites in Men in Absolute Numbers for Cancer Cases. Hamburg, Time of Diagnoses 01/01/1995 – 31/12/2009

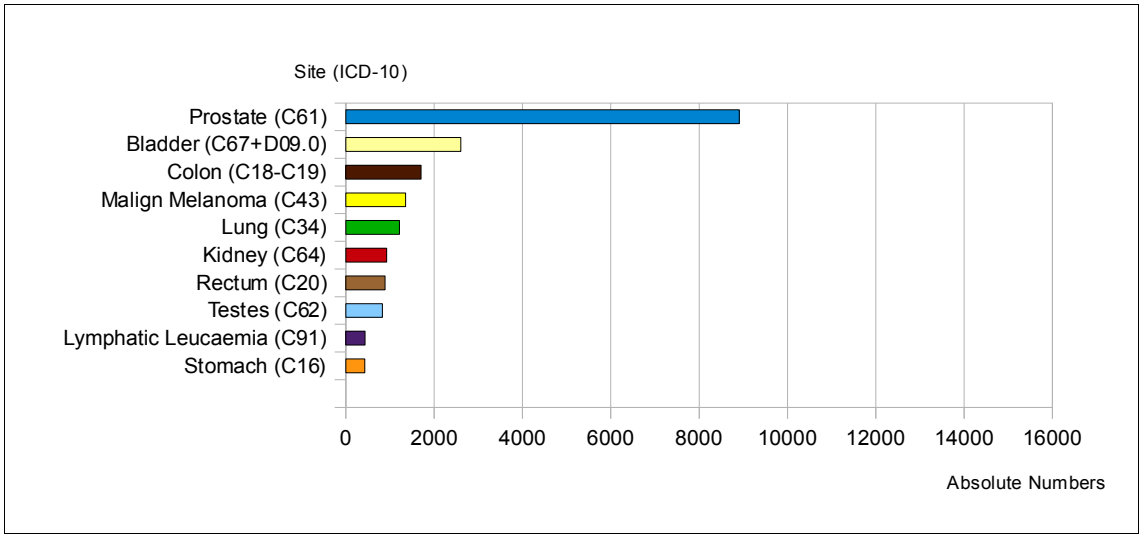


Figure 3: Prevalence of 10 Leading Cancer Sites in Men in Absolute Numbers for Cancer Cases. Hamburg, Index Date: 31/12/2009, Time of Diagnoses 01/01/1995 – 31/12/2009

Cancer Prevalence in women

Of 27,391 prevalent cancer cases in women, breast cancer is by far the most frequent with 12,718 cases (46.6% of total prevalence). Cancer of colon ('C18'-'C19') amount to 1,977 cases, there are 1,597 registered melanoma and 1,340 cancers of the corpus uteri. Then follow the cancers in the organs bladder (868), lung (819), cervix uteri (790) and ovary (768), sequenced by malignancies of rectum and kidney being with 763 and 539 cases the 9th and 10th most prevalent (figure 5).

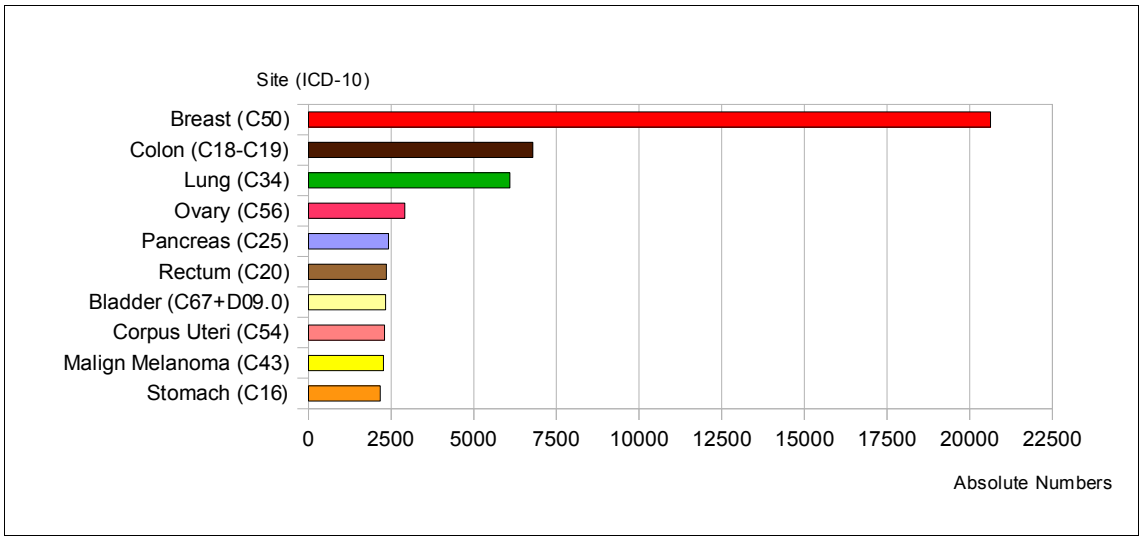


Figure 4: Incidence of 10 Leading Cancer Sites in Women in Absolute Numbers for Cancer Cases. Hamburg, Time of Diagnoses 01/01/1995 – 31/12/2009

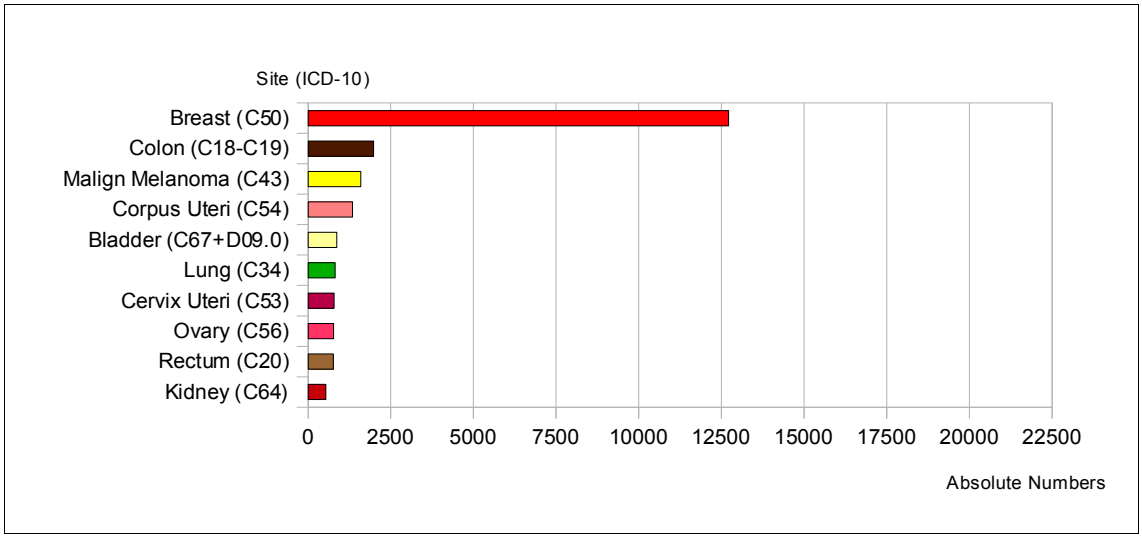


Figure 5: Prevalence of 10 Leading Cancer Sites in Women in Absolute Numbers for Cancer Cases. Hamburg, Index Date: 31/12/2009, Time of Diagnoses 01/01/1995 – 31/12/2009

6 ICD-10 'C50'- Analysis and Evaluation of Breast Cancer in Hamburg from 1995-2009

Opposed to incidence, prevalence data can not only quantify the cases of cancer on an specified date in a defined population for a set time-period of notification, but also give more detailed information on duration of disease, the 'time-since-diagnosis'. What kind of care and how much medical care might be needed in the prevalence groups is indicated by evidence-based medical guidelines for the treatment and cancer, which give explicit recommendation on treatment and follow-up care. Trends in defined partial prevalences (in example 5-year partial prevalence) may indicate resulting changes, either in- or decreasing, in health care needs.

Breast cancer in women was chosen for more precise analysis of cancer prevalence, being very suitable for its high quantities of incidences and prevalences, long-duration of disease (late recurrences possible) and good quality of data with sufficient information on TNM-Classification for the calculation of UICC-stages.

6.1 Methods

15-year breast cancer prevalence was analysed for both men and women according to general attributes as absolute numbers, prevalence proportion (per 100,000), distribution of histology types, incidences, follow-up and migration. More specific analysis was conducted for breast cancer prevalence in women. The results for women is of special public health interest for its high burden of disease, furthermore absolute numbers of breast cancer in men do not qualify for further evaluation.

15-year limited-duration point prevalence was calculated according to the methods presented in chapter 5. Histology codes were analysed quantitatively for the point prevalence, the six most frequent are listed in chapter 6.2 with respective numbers. Incidences, death and migration are recorded for each year in table 6. Death was counted if notified, no specification being made on cause of death. It is important to notice that the numbers do not represent death caused by breast cancer. The analysed data file for breast cancer include 11 DCN´s (0,1%) and 1 case of DCO in 2009, all death certificates in women, who died after the index date of 31/12/2009. Migration includes those cancer cases, who were notified in the defined time-period 1995-2009, and migrated in the course of time. Data on immigration with the information on a preexisting cancer diagnosis is not yet available.

In women, 15-year limited-duration breast cancer point prevalence was analysed for distribution in age groups, time-since-diagnosis, tumour size classification and UICC-stages (according to TNM-Classification, 6th edition (Wittekind, 2002). Age was calculated for the endpoint being the index date, 31/12/2009 and measured in five-year age-groups starting from '0-4' up to '80+' for cancer

prevalence. For the site 'breast cancer (ICD-10 'C50')' in women an analysis was performed to calculate the number of affected individuals. Time-since-diagnosis (TSD) for all cancer sites was measured in intervals of '0-1', '2-3', '4-5', '6-10' and '10-15' 'years-since-diagnosis' (YSD). These time-periods are chosen in correlation to specific recommendations of treatment and follow-up in the medical guidelines for the treatment of breast cancer. In table 5 the basic recommendations for treatment, follow up and additional care are summarized according to the effective treatment and follow-up guidelines for breast cancer (*"Interdisziplinäre Stufe 3 (S3)-Leitlinie für die Diagnostik, Therapie und Nachsorge des Mammakarzinoms"*)[6] (DKG/DGGG, 2008).

Table 5: Routine Treatment and Follow-up Care in Breast Cancer According to 'S3'-Guidelines Breast Cancer (DKG/DGGG, 2008)

Time-Since-Diagnosis	**Treatment**	**Other**	**Follow-Up Care**
0- 1 year	- surgery adjuvant treatments: - radiotherapy - chemotherapy - hormone therapy - biological therapy (targeted therapy)	- rehabilitation - psychosocial support - breast reconstruction	
x - 3 years	- hormone therapy - targeted therapy	Complications: - menopausal symptoms - lymhoedema - arm mobility affected - work disability (partial)	quarterly: - physical examination - imaging - clinical investigations
>3 - 5 years	- hormone therapy - targeted therapy	see above	semi-annually: - physical examination - imaging - clinical investigations
>5 years		see above	annually: - physical examination - imaging - clinical investigations

Up to five years, the 'S3-guidelines' for breast cancer give detailed recommendation on treatment and follow-up care. For the time period following 5 years-since-diagnosis, an annually check-up is

6 Medical evidence-based guideline with systematic development including logical, decision and "outcome"-analysis, judgement of clinical relevance of scientific papers and updates on a regular basis (Cox, 2007)

encouraged. As the individual course of disease, staging at diagnosis, co-morbidities, age and other factors influence the treatment and follow-up care needed, only the need of physical examination, imaging and clinical investigations are calculated and presented as an example for the correlation of prevalence data on time-since-diagnosis with treatment guidelines.

To analyse cancer prevalence changes or trends in the time period 1995 to 2009, the author chose internationally and nationally accepted 5-year partial prevalences (Colonna, 2002, RKI/GEK*ID*, 2010). 5-year partial prevalences for breast cancer cases were measured on the 31st of December of each year from 1999 to 2009 (diagnoses from 01/01/1995 to 31/12/2009), thus resulting in 10 consecutive 5-year partial prevalences. These were calculated as prevalence proportions (per 100,000) to the respective Hamburg female population on the same date. The different population data were retrieved from the 'Statistical Office for Hamburg' (*Statistisches Amt für Hamburg und Schleswig-Holstein)*. A standardization was conducted for the old European Standard Population[7] and World Standard Population (figure 10).

Five-year partial prevalences were estimated for each age group separately from 1999 to 2009. The age was calculated with the point of measurement being the last day of each 5-year period respectively (31st of December). Age groups were summarized to '0-39', '40-49', '50-59', '60-69', '70-79' and '80+' for better differentiation in the graphical presentation. Changes were also determined in percentages and are presented in table 8. Histology codes were calculated and analysed according to their absolute numbers and percentage changes, the eight leading histology codes (representing 93.1-95.3% of total cases) shown in table 9.

The distribution of tumour-size classification (according to documented TNM-classification[8]) and UICC-stages were calculated for each 5-year partial prevalence of breast cancer. Age-groups were formed in 5-year periods, starting with '0-4' years up to 80 years and more ('80+').

Furthermore 10-year partial prevalences was calculated accordingly to investigate prevalence-duration with focus on the '6-10' years-since-diagnosis group. This is of special interest in breast cancer, in which recurrence or metastases can occur up to 15 years (Chia, 2004, Fisher, 2004). Cancer sites with late recurrences are connected with a high need of medical care, -such as follow-up clinical investigations and imaging-, than other cancer sites, which are considered to be 'cured' after 5 years-since-diagnosis (RKI/GEKID, 2010). Time-since-diagnosis (TSD) was measured in intervals of '<=1', '2-3', '4-5' and '6-10' years-since-diagnosis.

7 The 'old' WHO European Standard Population of 1976 assumes the same age structure for men and women (gbe-bund, 2011).

8 From 1995-2009 three different editions of TNM-Classification (4th-6th edition) were in use. The 6th edition was used for this analysis, being most suitable for the registry data of HCR (more detailed informaton in the Chapter 6.3 Limitations).

6.2 Results

The total of 15-year point prevalence of breast cancers for both men and women in Hamburg on the 31st December of 2009 adds up to 12,792 cancer cases. The data file was analysed for multiple primary breast malignancies per identification code prior to deleting the personal information records: in the years 1995 to 2009 only 14 women (0.11%) and no men were affected with more than one breast cancer diagnosis of different histology groups (see appendices D and F). Therefore the tumour-based prevalence (12,792) is close to equal to persons-based prevalence (12,778).

The tumour-based prevalence of the 31/12/2009 showed 74 cases in men and 12,718 in women with a prevalence proportion (per 100,000) of 9,5 in men and 1401,3 in women respectively.

8,555 women (55 men) were living post-diagnosis with a 'infiltrative duct carcinoma (CA)' of the breast, 1,961 women (3 men) a 'lobular carcinoma', 488 women (1 man) an 'infiltrative duct and lobular carcinoma', 456 women (4 men) a 'carcinoma without other specification'. In 264 women (1 man) the histological analysis showed an 'infiltrative duct CA mixed with other types of carcinoma', in 257 (1) a 'tubular adeno CA' and in 96 women a 'medullary carcinoma'.

6.2.1 Breast Cancer - Incidences, Death and Migration

From the 1st of January 1995 to 31st of December 2009 a sum of 20,787 breast cancers were diagnosed for residents of Hamburg. Of these, 161 malignancies were diagnosed in men and 20,626 in women (Table 6).

Of 161 cases of cancer diagnosed from 1995 to 2009, 64 men had died until the end of 2009, which equals to 40% of all incidences (no differentiation being made for cause of death). Of the total of 20,626 cancer cases in women, 6,453 had died until or on 31st of December 2009, which is equivalent to 31% of all incidences. In the time period under investigation 2,5% of men and 4,7% of all women who had received a diagnosis migrated abroad or state-to-state in Germany and were lost to follow-up. The steady rise in yearly loss to emigration, with a lapse to more than hundred emigrations yearly, is also explained by a steady yearly increase of persons and cases under observation from 1995 to 2009.

The incidences in women show an increase of 40,1% from 1995 to 2009, while the cancer diagnoses in men change more arbitrarily and can not be evaluated sufficiently due to a very small number of diagnoses.

Table 6: Breast Cancer Incidences from 1995 to 2009 and Follow-Up for Death (All Causes) and Migration

Breast Cancer – Follow Up for Death (all Causes) and Emigration												
Incidences				Deaths in Group of Cases (all causes)				Loss to Emigration			
	Male	Female	Total		Male	Female	Total		Male	Female	Total
1995	6	1266	**1272**	**1995**	0	219	**219**	**1995**	0	1	**1**
1996	11	1319	**1330**	**1996**	3	291	**294**	**1996**	0	11	**11**
1997	3	1297	**1300**	**1997**	2	309	**311**	**1997**	0	23	**23**
1998	19	1338	**1357**	**1998**	3	322	**325**	**1998**	0	33	**33**
1999	12	1269	**1281**	**1999**	1	360	**361**	**1999**	0	39	**39**
2000	11	1281	**1292**	**2000**	4	373	**377**	**2000**	0	43	**43**
2001	10	1308	**1318**	**2001**	3	399	**402**	**2001**	0	36	**36**
2002	11	1454	**1465**	**2002**	5	423	**428**	**2002**	0	57	**57**
2003	7	1308	**1315**	**2003**	8	481	**489**	**2003**	0	50	**50**
2004	12	1316	**1328**	**2004**	3	490	**493**	**2004**	0	88	**88**
2005	12	1331	**1343**	**2005**	2	513	**515**	**2005**	1	102	**103**
2006	13	1388	**1401**	**2006**	8	528	**536**	**2006**	2	114	**116**
2007	12	1403	**1415**	**2007**	10	551	**561**	**2007**	0	114	**114**
2008	9	1574	**1583**	**2008**	4	574	**578**	**2008**	0	125	**125**
2009	13	1774	**1787**	**2009**	8	620	**628**	**2009**	1	142	**143**
Total	**161**	**20626**	**20787**	**Total**	**64**	**6453**	**6517**	**Total**	**4**	**978**	**982**

There is no information on 2,4% or in absolute numbers 496 breast cancer cases (19 in men and 477 in women). For further analysis breast cancer men are excluded.

6.2.2 15-Year Point Prevalence - Distribution of Breast Cancer Diagnoses in Age Groups and 'Time- Since-Diagnosis' in Women

Figure 6 illustrates the prevalence distribution of breast cancer cases across the different age groups in women in Hamburg. The graph shows a steady increase beginning in the age group '20-24' with one prevalent case, rising to 29 cases from '25-29' and 59 cases in the age group '30-34'. In the age group '35-39' there are 148 cases or an age-specific rate of 228/ 100,000[9], rising up to 2,204 cases or an age-specific rate of 4,236/100,000 in the ages '65-69'. There are slightly more cases prevalent in the following group of '70-74' with 2,219 cases (4,411/100,000). The abrupt fall in the age group '75-79' to 1,299 prevalent cases equals a moderate, but still decided decrease in the age-specific rate to 3,876/100,000. The age-groups '0-4' to '10-14' have no cases and are therefore not included in the graph.

9 The age-specific rate of 228 per 100,000 refers to 100,000 of the female population of that specific age-group in Hamburg (calculated for the female population of Hamburg on 31.12.2009 with data from the Statistical Office for Hamburg and Schleswig-Holstein).

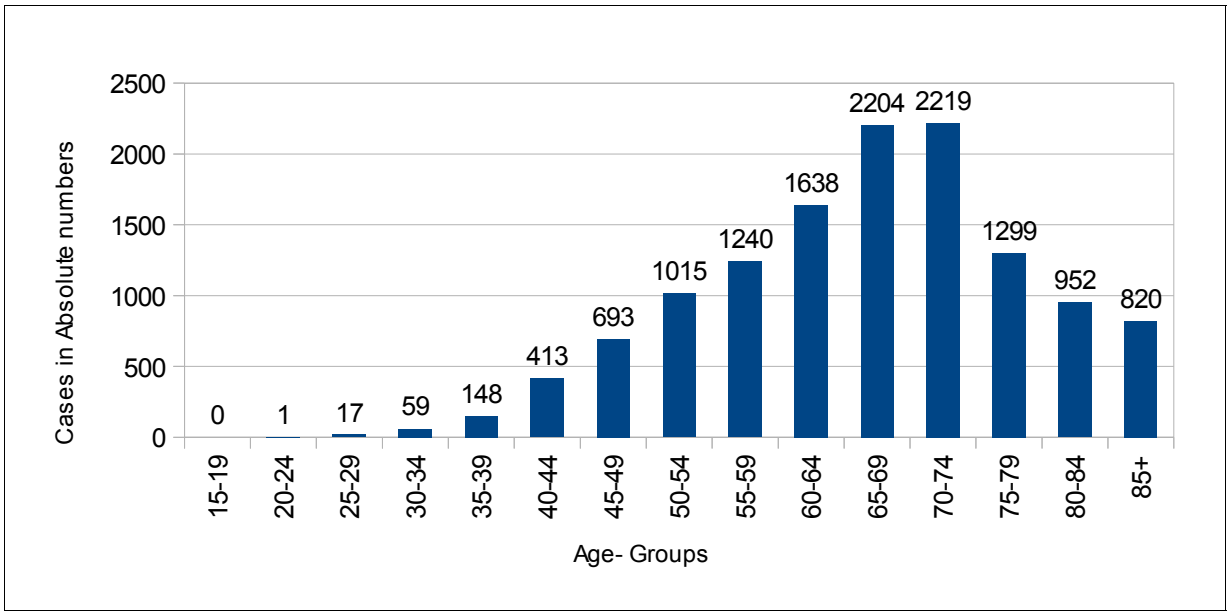


Figure 6: Breast Cancer – 15-Year Limited-Duration Point Prevalence in Women According to Age Groups, Hamburg, December 31, 2009

On the 31st of December 2009 a total of 6,099 prevalent cancer cases had been diagnosed in the prior five years (figure 7). This correlates to 48% of all prevalent breast cancer cases on the index date and is correlating with the time-period of highest need of medical care. Of these '≤ 5' years-since-diagnosis' cases, 1,659 cases are calculated to be in the first phase of treatment (surgery, chemo- and radiotherapy, rehabilitation) and further 2,500 cases in 2-3 years-since-diagnosis, in which stages quarterly follow-up care with clinical check-up and ultrasound imaging is conducted.

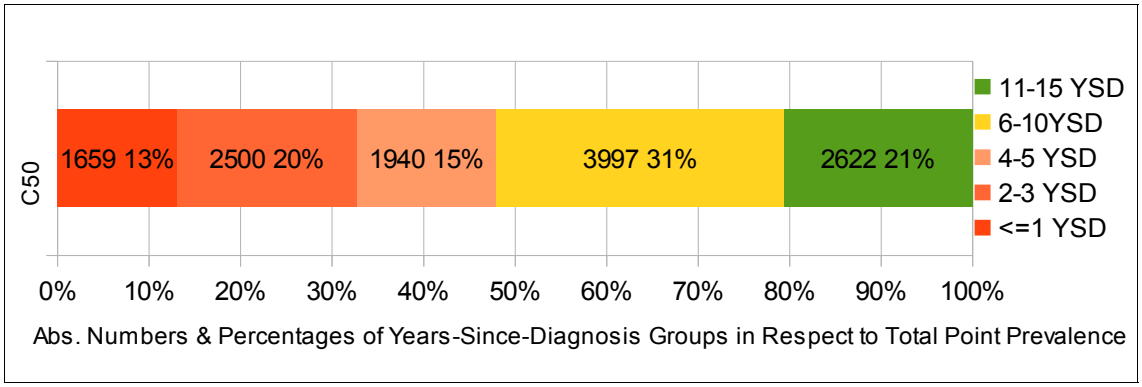


Figure 7: Breast Cancer- Distribution of Total 15-Years Limited-Duration Point Prevalence on 31.12.2009 in Five 'Time-Since-Diagnosis' Groups in Absolute Numbers and Percentages, Hamburg, Women

A mammography is carried out annually for each cancer case. 1,940 cases were diagnosed '4-5' years before the index date and represent a group of women, who, according to the guidelines of breast cancer, are recommended to do a semi-annually check including ultrasound imaging and monitoring for side effects of the adjuvant therapies, which usually continue up to five years ((DKG/DGGG, 2008).

31% of all prevalent cases (3,997 in absolute numbers) were diagnosed '6-10' years before the index date in 2009. For this group the guidelines recommend a yearly check-up, including a mammography. 2,622 cases (21% of all prevalent breast cancers) had been diagnosed '11-15' years ahead and do not differ in recommendation from the group of '6-10' YSD.

The correlation of the 15-year breast cancer prevalence with the treatment guideline leads to an estimation of 12,704 mammographies for all known breast cancer patients (only one breast cancer case per person counted) and 27,135 ultrasound examinations. Each ultrasound examination is accompanied by physical examination and clinical investigations looking for possible side effects of therapies previously given or still in treatment, like hormone or targeted therapies.

6.2.3 15-Year Point Prevalence - Distribution of Tumour Size According to TNM-Classification and UICC -Stages in Breast Cancer in Women

Of the prevalent 12,718 breast cancer cases in women at the end of 2009, 11,069 (87%) hold a classification of tumour size according to the TNM-Classification[10] of Malignant Tumours (Wittekind, 2002). Most cases were diagnosed with the tumour-size of T1 consistent with a diameter of ≤2cm. The peak of cases in this group are prevalent in the age groups '60-64' to '70-74' (1,836-2,201/100,000) (see Figure 8). The total of cases in T1 amount to 6,193 (817/100,000).

With 3,968 cases (524/100,000) second most prevalent T-Classification is T2 (diameter >2-≤5 cm), showing a peak in the same ages, with a maximum of 662 cases in the age group '70-74' (1,316/100,000). There are 498 prevalent cases (66/100,000) of breast cancer with T3 (>5 cm) and and 368 cases (49/100,000) of T4 (tumour invasion of thorax or skin),with a peak of 78 and 59 cases respectively in the age group '70 to 74' (155 and 117/100,000). The line of cases with 'no information' rises accordingly to the general age-distribution with a peak at '70-74', sloping downwards to '80-84' and then rising again at the age above 80.

10 The TNM staging system describes the size of tumour (T), involvement of regional lymph nodes (N) and existence of distant metastasis (M) to classify the progress of cancer. It was developed and is maintained by the International Union Against Cancer (UICC) (Wittekind, 2011).

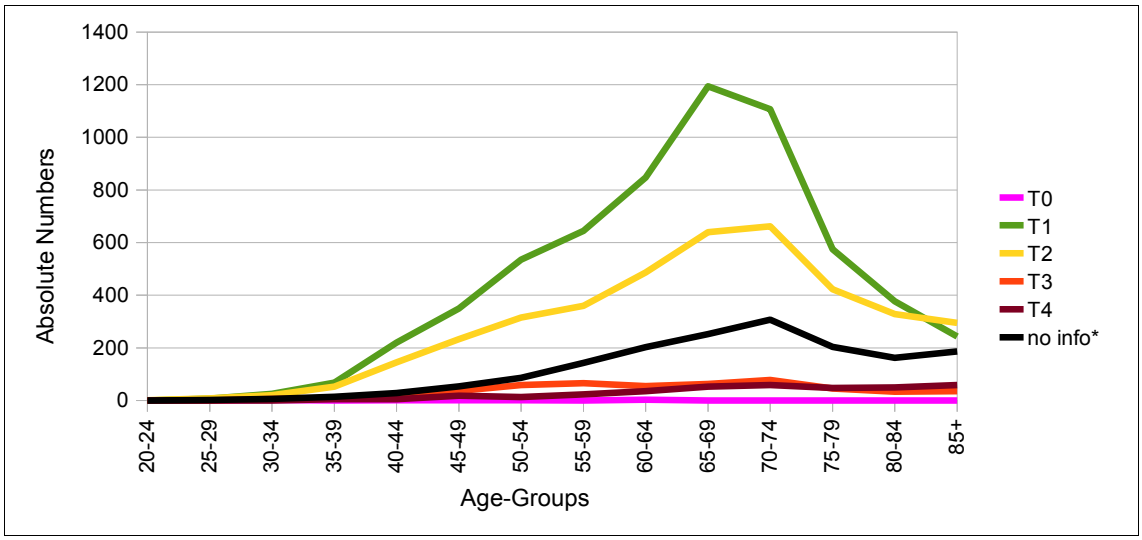


Figure 8: Breast Cancer - Distribution of Tumour-Size (According to TNM-Classification) in 15-Year Point Prevalence Group, Hamburg, Women, 31.12.2009

The Union for International Cancer Control (UICC)-stages are composed of the TNM staging system, offering different combinations of T, N and M with different treatment recommendations and characteristics (see table 7).

Table 7: UICC-Stages and their correlating TNM-Classification , 6th edition (Wittekind, 2002)

UICC-Stage	**T**	**N**	**M**
UICC I	T1	N0	M0
UICC IIA	T0, T1 T2	N1 N0	M0 M0
UICC IIB	T2 T3	N1 N0	M0 M0
UICC IIIA	T0, T1, T2 T3	N2 N1, N2	M0
UICC IIIB	T4	N0, N1, N2	M0
UICC IIIC	Any T	N3	M0
UICC IV	Any T	Any N	M1

9,307 (73.2%) of 12,718 cases fulfil the criteria to be classified according to UICC-stages (see figure 9). 4,084 (rate: 539/100,000) of the prevalent breast cancer cases were diagnosed as UICC-stage I, 2,654 (350/100,000) cases as UICC IIA, 1,284 (169/100,000) cases as UICC IIB, 682 (90/100,000) cases as UICC IIIA, 194 (26/100,000) as UICC IIIB, 59 (8/100,000) cancer cases as UICC IIIC and 350 (46/100,000) in total as UICC-stage IV.

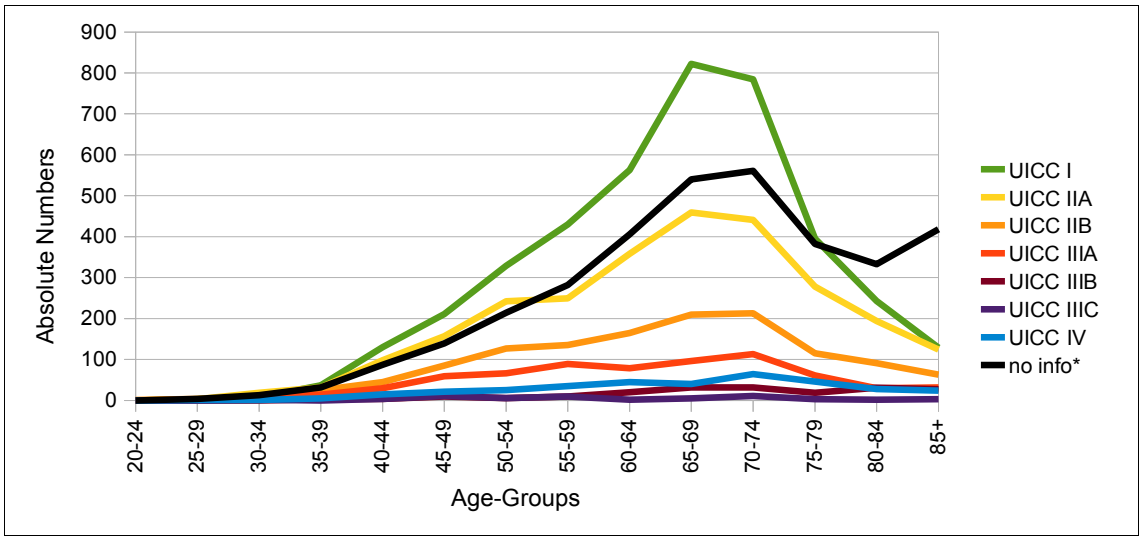


Figure 9: Breast Cancer - Distribution of UICC-Stages in 15-Year Point Prevalence Group, Hamburg, Women, 31.12.2009

The distribution in age groups shows a clear peak for the UICC stages I to IIB from '50-54' to '70-74' , representing tumour sizes T1 to T3 with up to lymph node value N1 (<1-3 affected axillary lymph nodes), with no metastases (M0). The rate is highest in UICC I in the ages from 60 to 74 with 1,220–1,559/100,000). High numbers in these age groups can also be seen in the other stages. Younger age groups show especially more prevalent cases in the groups '50-54' and '55-59' (UICC IIIA), UICC IV with a second peak at '70-74'. UICC IIIC shows no specific trend, the case numbers also being very low (maximum per age group =11). The line of cases with 'no information' available is showing a distribution according to the general age distribution of prevalent breast cancer cases with a peak at '65-74' and above 80 years of age.

6.2.4 5- Year Partial Prevalences of Breast Cancer in Women from 1995-2009

Five-year partial prevalence (5-YPP) was chosen to analyse temporal trends in prevalences. The prevalence proportion (per 100,000 female population of Hamburg) starts off at 540/100,000 in 1999 and rises up to 607/100,000 in the 5-YPP of 2005, levelling out from 2002 up to 2007. There is a defined increase in 2008, which continues into the 5-year partial prevalence of 2009, reaching a maximum rate of 672/100,000 (figure 10).

The green and lilac line in figure 10 represent the age-standardized rate in the old European Standard Population (ESP) and World Standard Population (WSP).

The pattern being the same, the absolute numbers are a rate of 325/100,000 in ESP in 2009, respectively 220/100,000 in the WSP with an increase up to 514/ 100,000 in the ESP and

373/100,000 in the WSP. While the prevalence proportion per 100,000 in Hamburg is increasing 24% from 1999 to 2009, the changes in standardized cases in a ESP are 58% and 70% in the World Standard Population, due to the different age distribution of the standard populations.

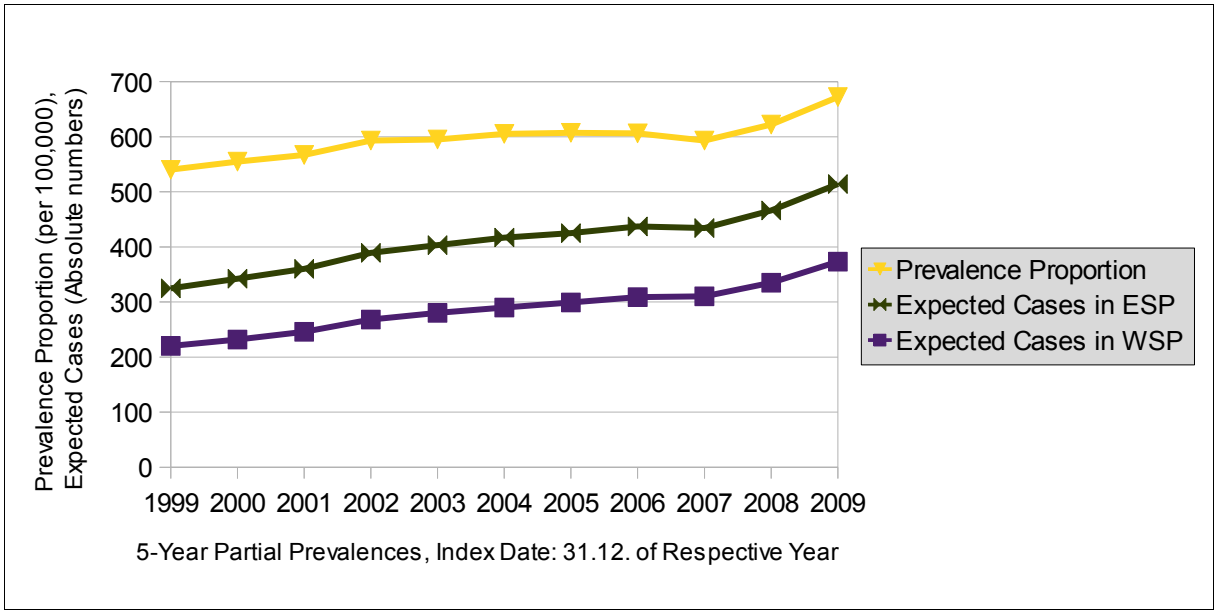


Figure 10: Breast Cancer - Prevalence Proportion (per 100,000), Expected Cases in European Standard Population (ESP) and World Standard Population (WSP) in 5-Year Partial Prevalences from 1999-2009, Hamburg, 31.12. of Respective Year

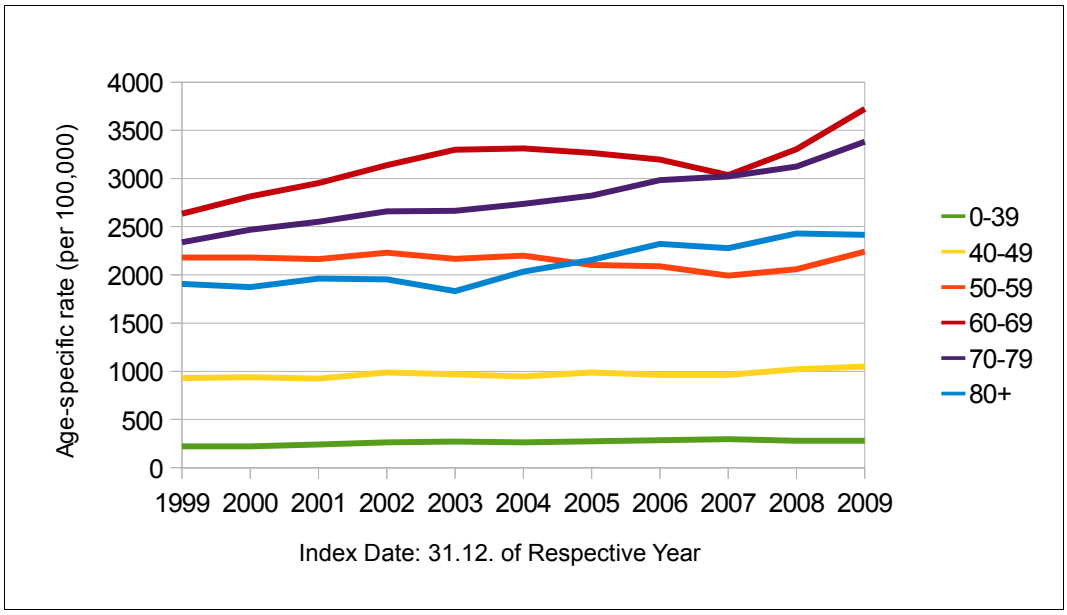


Figure 11: Breast Cancer - Age-specific, 5-Year Prevalence Proportions (per 100,000), Hamburg, Women, measured on December 31 of Respective Year

Looking at the age-specific rate changes in 5-year partial prevalence, there are clear disparities in the different age groups. The age group '0-39' increases from a rate of 221/100,000 in 1999 to 296/100,000 in 2007, but is – in comparison – low in numbers, which is why the increase does not impose as such in the scale of figure 11. The age group '40-49' remains rather stable, while first changes can be seen from 1999 to 2009 in the '50-59' year-old women. Starting 2002 there is a slight slope downwards up to 2008. Overall a slight increase can be seen from 1999 with 2,181/100,000 to the 5-year partial prevalence of 2009 with 2,243/100,000.

The 5-YPP of the age group '60-69' increases from 1999 (2,634/100,000) onwards to 2004 (3,267/100,000), showing a slight fall until 2007 (3,036/100,000), similar to the group '50-59' and increases than up to 3,722/ 100,000 in 2009, representing the highest value throughout all age groups. The age-specific rates of the '70-79' increase nearly steadily from 1999 on, stabilizing for one year from 2002 to 2003 and growing up to 3,382/ 100,000 at the end of 2009.

The curve of the '80 years- and older' women remains rather stable in the first five years, but is then increasing from 2003 on up to 2,321/100,000 in 2006. Table 8 shows the changes in between each 5-year prevalence and from 1999 to 2009 in percentages.

Table 8: Percentage of In- or Decrease in Age-specific Rates of 5-Year Partial Prevalences, Hamburg, Women, measured from 5-YPP to 5-YPP and summarized for 1999-2009[11]

Age Groups	1999-2000	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	1999-2009
0-39	0%	9%	9%	3%	-3%	4%	4%	3%	-5%	-1%	**+ 26 %**
40-49	1%	-1%	7%	-2%	-2%	4%	-2%	0%	6%	3%	**+ 13 %**
50-59	0%	-1%	3%	-3%	2%	-4%	-1%	-5%	3%	9%	**+ 3 %**
60-69	7%	5%	6%	5%	0%	-1%	-2%	-5%	9%	13%	**+ 41 %**
70-79	6%	3%	4%	0%	3%	3%	6%	1%	3%	8%	**+ 45 %**
80+	-2%	5%	0%	-6%	11%	6%	8%	-2%	7%	-1%	**+ 27 %**
Crude Rate	3%	2%	4%	0%	2%	0%	0%	-2%	5%	8%	**+ 24 %**

The age-groups with the highest changes in age-specific rates are the '60-69' and '70-79' year-old women with an increase of 41% and 45% from the '1999'- to '2009'- 5-YPP, as could be already seen in the description of age-specific rates.

The '0-39' year-old women have a total growth of 26%, but this increase mainly appeared from 2000 to 2007, while the absolute numbers are actually decreasing from 2007 to 2009.

The age group '50-59' has an overall increase of 3%, but an increase as high as 14% from 2007 to 2009. The age group of '80+' shows an overall increase of 27%, which is strongly fluctuating in its

11 The change in percentage from 1999-2009 does not equal the sum of percentages listed for the individual years in every case. This is due to mathematical up- and down rounding of the percentages.

course, but showing a defined increase 2008-2009. The overall crude rate of breast cancer prevalence in women (prevalence proportion (per 100,000)), shows an increase of 24%.

The analysis of histologies in 5-year partial prevalence is shown in table 9. The eight leading histology types of 2009 (95.3% of total cases) were evaluated for their absolute numbers and percentage growth was calculated.

The infiltrating duct carcinoma is by far the most frequent type of histology, having increased constantly from 59% (2,817 cases) in the 5-YPP of 1999 to 70.6% (4,307 cases) in 2009. The histology of a lobular carcinoma presents an interesting pattern of rising in the 5-YPP from 1999 (16.6%) to 2003 (18.6%), in the following declining down to 12.9%. Respective absolute numbers can be seen in the appendices (G). While the 'infiltrating duct carcinoma mixed with other types of carcinoma' is increasing from 24 to 205 cases, the tubular adenocarcinoma is decreasing from 154 to 43 cases.

Table 9: Leading 8 Histology Codes (ICD-O-3) in Percent in Breast Cancer: Analysis of 5-Year Partial Prevalences in Women, Hamburg, Index Date: 31.12 of Respective Year, Diagnoses 01/01/1995-31/12/2009

Histology Code (ICD-O-3)	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
infiltrating duct carcinoma (8500/3)	59.3	60.4	62.0	62.9	63.7	65.3	66.9	68.8	69.2	70.4	70.6
lobular carcinoma, NOS (8520/3)	16.6	17.7	18.4	18.3	18.6	16.9	15.6	14.1	13.1	12.6	12.9
infiltrating duct and lobular carcinoma (8522/3)	3.3	2.9	2.8	2.8	2.7	3.7	4.1	4.0	4.6	4.5	4.3
infiltrating duct carcinoma mixed with other types of carcinoma (8523/3)	0.5	0.6	0.5	0.8	1.0	1.2	1.5	1.9	2.2	3.0	3.4
carcinoma, NOS (8010/3)	9.5	8.9	7.7	6.9	5.7	5.1	3.9	3.2	3.1	2.4	2.0
tubular adenocarcinoma(8211/3)	3.2	3.3	3.0	2.9	2.5	2.1	1.8	1.6	1.1	0.9	0.7
infiltrating lobular carcinoma mixed with other types of carcinoma (8524/3)	0.1	0.1	0.1	0.1	0.2	0.3	0.5	0.6	0.8	0.9	0.7
mucinous adenocarcinoma (8480/3)	0.6	0.6	0.7	1.0	1.3	1.2	1.1	1.1	0.9	0.7	0.7
sum of leading 8 histology codes	93.1	94.5	95.2	95.7	95.7	95.8	95.4	95.3	95.0	95.4	95.3

6.2.5 5- Year Partial Prevalences - Distribution of Tumour Size According to TNM-Classification and UICC -Stages

The distribution of tumour sizes according to the TNM-Classification in T1-4, Tx and T0[12] in 5-year partial prevalences is shown in figure 12.

There is a total of 8 T0-cases, of which six were diagnosed in 2009. T1 (diameter ≤2cm) and T2 (diameter >2cm-≤5cm) are both strongly increasing up to 2003-2004, when the 5-year partial prevalence stabilizes and increases again in 2008. T3 (>5cm) is increasing from 158 cases in 5-year partial prevalence of 1999 to 294 cases in the 5-YPP of 2009. T4 (cancer cases with tumour invasion of thorax or skin) reaches a maximum in 2003 with 279 cases and is then slowly

12 TNM-Classification, 6th edition (Wittekind, 2002): Tx= tumour can not be evaluated, T0= no sign of tumour.

decreasing and levelling out at 210-224 cases (2008/2009). Figures demonstrating the changes in prevalence and incidence separately for each tumour size can be seen in the appendices (see appendix H, figures 17-20). The cases, where the tumour can not be classified (Tx), range from a minimum of 8 to a maximum of 24 cases. The cases, for which 'no information' on tumour size is available, are decreasing from 1999 to 2007, stabilizing in the last three 5-YPP´s of 2007 to 2009.

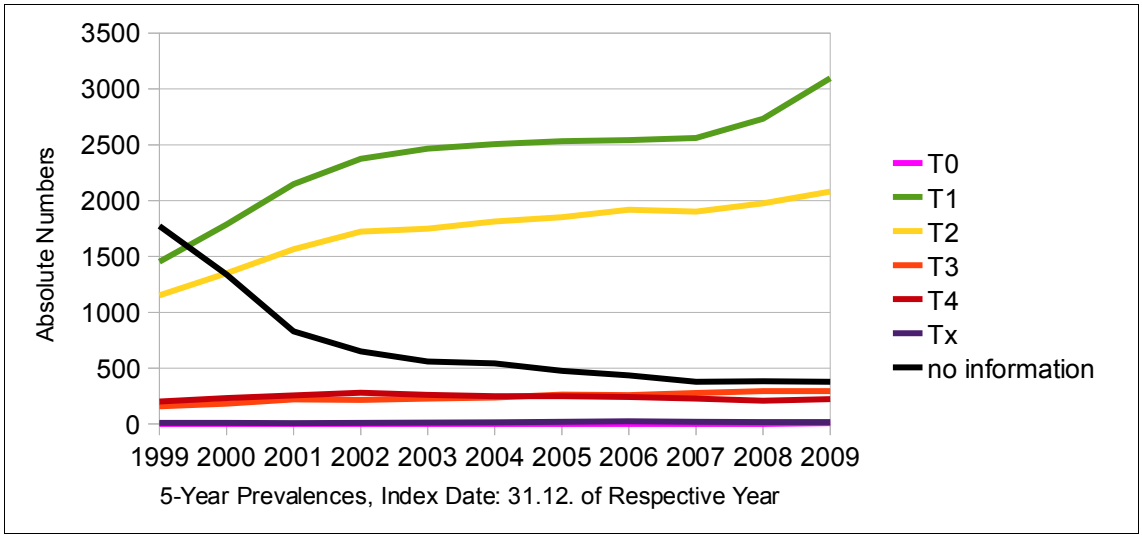


Figure 12: Distribution of Tumour Size (According to TNM-Classification) in 5-Year Partial Prevalences of Breast Cancer in Hamburg, Women, Point of Measurement: 31.12. of Respective Year

The stages of the Union for International Cancer Control (UICC) are highly relevant indicators for treatment options and prognosis of cancer disease (DKG/DGGG, 2008).

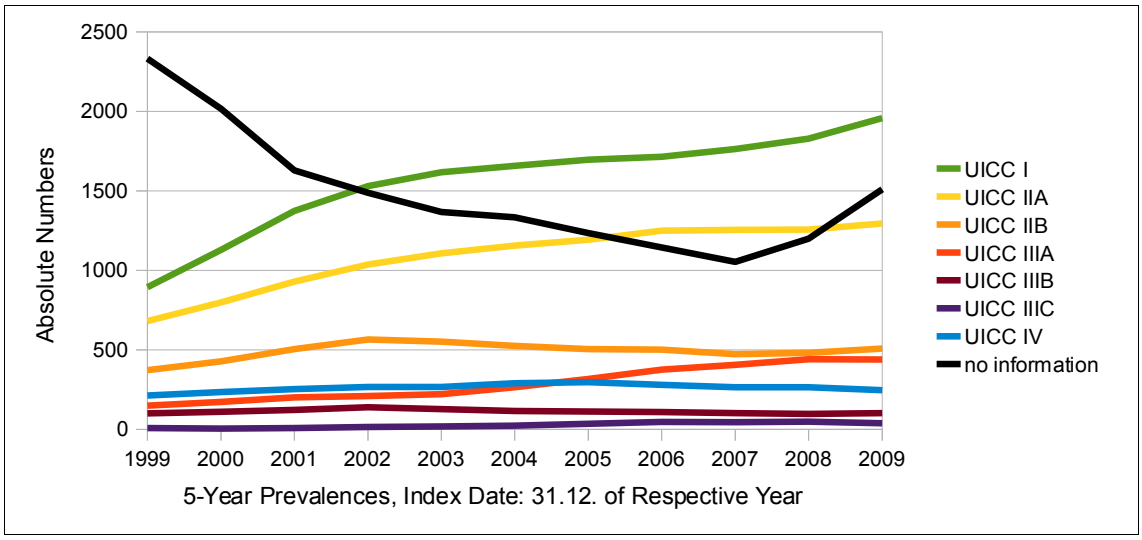


Figure 13: Distribution of UICC-Stages in 5 - Year Partial Prevalences of Breast Cancer in Hamburg, Women, Point of Measurement: 31.12. of Respective Year

UICC I and UICC IIA start off with a steep increase from 895 cases in the 5-YPP of 1999 (UICC I) and 681 cases (UICC IIA) respectively. The steeper increase in the beginning is probably due to decrease in cases 'with no information'. Levelling out from 2003 to 2006 a further defined increase can be seen from 2007 to 2009 in UICC I, a little less pronounced in UICC IIA, reaching 1,958 cases and 1,296 cases respectively.

UICC IIB is increasing from 372 cases in the 5-YPP of 1999 to 566 cases in the 2002 5-YPP. It then slowly decreases to 473 (2007) to rise again up to 508 cases in 2009. The 5-YPP of UICC IIIA is more than doubling from 149 in 1999 to 441 cases (2008), only decreasing 2 cases in the 5-YPP of 2009. UICC IIIB shows a slight increase up to 2002 (from 100 to 149 cases), to then slowly decrease downwards to 102 cases in the 5-year partial prevalence of 2009.

The following UICC-stage IIIC has only few cases and rises from a 5-YPP of 9 cases in 1999 to 49 cases in 2008, and drops then to 39 cases in 2009. The curve progression of UICC-Stage IV shows a decided increase from 213 cases in 1999 to 297 cases in 2005. In the following 5-YPP´s the case number sinks only slowly, reaching 246 cases in the 5-year partial prevalence of 2009.

Figures 21 to 27 in appendix (I) present the changes in 5-year partial prevalences for each UICC stage separately and compare to the respective 5-year incidences. The curves show a similar course of curves for all stages except UICC IIIC and IV.

6.2.6 10-Year Partial Prevalences: Changes in 'Time-Since-Diagnosis'-Groups

Recurrences in breast cancer may come into existence as late as 15 years-since-diagnosis, wherefore this time period is also of interest in evaluating prevalence. For analysis of a time trend the group of '6-10' years-since-diagnosis can be analysed with five consecutive 10-YPP`s. As figure 14 shows graphically the absolute numbers in 10-year partial prevalences are increasing 14% in total from 2004 to 2009 (for percentual changes see appendix J). These changes are mainly due to increasing case numbers in the prevalence group with less than one year-since-diagnosis (41%) and therefore reflecting the strong increase of breast cancer incidences. The numbers in the '6-10' years-since-diagnosis are also of influence, increasing 13% from 2004 to 2007 and then levelling out to a total growth of 15%.

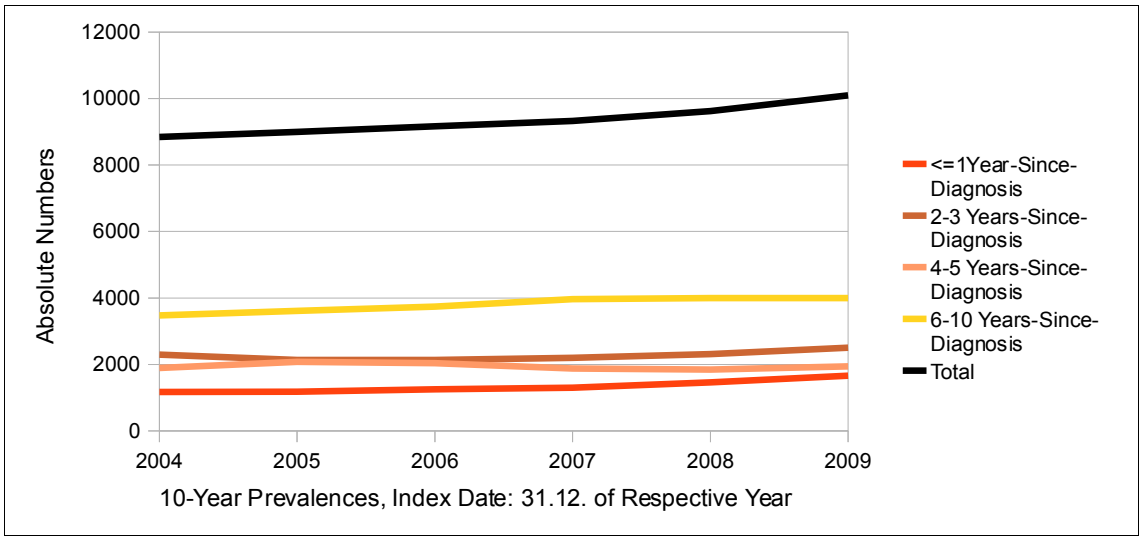


Figure 14: Changes in 'Time-Since-Diagnosis -Groups from 2004 to 2009, 10-Year Partial Prevalences in Breast Cancer, Women, Hamburg, Diagnoses from 01/01/1995 to 31/12/2009

6.3 Limitations

There are several limitations which have to be considered for this thesis. First of all, the information registered in a population-based cancer registry is restricted to clearly defined details (see chapter 4). Recurrences or later metastases are not generally notified. If a person has a further tumour of the same organ, this is not registered, if the second tumour is in the same histology group. This is very likely in breast cancer. These factors lead to a general underestimation of breast cancer cases or severity of disease. Furthermore, long-term incidence data (>15 years-since-diagnosis) are not captured or discussed in this work. Data of the HCR has been analysed starting from 1995 to 2009, for reasons of quality of data (Nennecke, 2008). Also, information on co-morbidities or cause of death have not been available in all cases and therefore not been considered. Therefore, conclusions concerning survival have to made very carefully. The number of deaths by cancer is of course an important indicator for need of palliative care and terminal care (Forman, 2003), but is beyond the methodical scope of this work.

Secondly, the direct calculation of prevalence leads to underestimation of cases due to the fact that persons immigrating have not been estimated for their probability to have cancer, for instance by considering gender and age. The intention of this thesis is to give a direct calculation without any adjustment for influencing variables with unknown values. There are currently official intentions to facilitate the exchange between cancer registries to avoid double notifications or loss to follow-up due to state-to-state migration (BKRG, 2009, Hentschel, 2008), but so far, no valid information is available on the percentage of persons with cancer moving into Hamburg.

Thirdly, prevalence is a product of incidence and mortality (Tulchinsky, 2009). It was shown, that incidence has a very strong influence in breast cancer, because the survival is fairly good. In higher UICC-stages the influence is decreasing (figures 21-27). Mortality itself underlies more than one factor and especially so in the older age-groups. These are difficult to evaluate with the data pool used for this work. Because of prevalence data being so dependent on its factor incidence, questions concerning diagnostic interventions and first-line treatment should be prospectively analysed using incidence data, considering not only its UICC-stage, but also co-morbidities, recurrence, course of disease, et cetera.

Fourthly, concerning the evaluation of breast cancer, population-based cancer registries receive and capture information on incidences and conduct follow-up concerning death and migration as a routine. Certain detailed information on tumours (first-line treatment, recurrence, side-effects, complications) have not been registered so far on a sufficient scale, also due to its belonging to clinical registers. The information on in situ-tumour captured by a population-based cancer registry is not adequate for evaluation, also D05 and D48.6[13] are non-malignant breast tumours or neoplasms of unknown behaviour, that are not necessarily in 100% notified to a population-based cancer registry, and hence documentation is not complete and can furthermore not be quantified in percentages.

In the time-period of this analysis three different editions of TNM-Classfication were in use: the 4th edition until 1997, 5th edition until 2002 and the 6th edition. In the Hamburg Cancer Registry all data was transformed from 3rd and 4th edition to the norms of the 5th edition. The differences between 5th and 6th edition are marginal, mainly concerning the classification of affected lymph nodes, which was more specific in the 5th edition. In effect, there has been no difference in the entry of data. It can not be known, what edition the notifier used. Since notifications of the 4th edition were adapted by the HCR itself, and differences between 5th and 6th editions are marginal, the resulting error should be neglectable (Burkhardt, N., personal communication, February 2012).

13 D05: carcinoma in situ of the breast (mamma), D48.6: Neoplasm of unknown or uncertain behaviour (breast) (DIMDI 2010b, WHO, 2012)

7 Discussion

This thesis presents a comprehensive analysis of cancer prevalence in Hamburg at the end of 2009 including all cancer diagnoses notified from 01/01/1995 to 31/12/2009.

As of 31/12/2009, of persons alive and resident in Hamburg 51,810 cases of cancer are registered, not including 18,099 registered cases of C44 ('other malignant neoplasms of skin- basal cell carcinoma'). 27,391 cancer cases in women and 24,419 in men were calculated by the counting method and represent a prevalence rate of 3.0% (crude rate 3017.96) in women, or 2.8% (2817.72) in men. The respective percentages for the 10-year prevalence rate are 2.5% (crude rate 2442.48) in women and 2.4% (2379.12) in men, for the 5-year prevalence 1.5% (crude rate 1539.0) in women and 1,5% (1514.27) in men. The percentage of prevalence in the population corresponds to estimations of the Centre for Cancer Registry Data for Germany in 2004, and is slightly less than estimated national average projected for Germany in 2010 (RKI/GEKID, 2010).
The 10 leading cancer prevalence sites in men were: prostate (8,907 cases), bladder (2,600), colon (1,622), melanoma (1,352), lung (1,212 cases), kidney (926), rectum (888), scrotum cancer (827), lymphatic leukaemia (433) and stomach (398). In the female population, most frequent were breast cancer (12,718), cancer of colon (1,903), melanoma (1,597), corpus uteri (1,340), bladder (868), lung (819), cervix uteri (790), ovary (768), rectum (763) and kidney (539). Cancer of the prostate constitute 36.5% of all prevalent cancer cases in men, representing together with malignancies of the bladder (10.7%) nearly half of all prevalent cancers in Hamburg´s male population. In women, breast cancer constitutes to 46.4% of all cases.
The distribution of prevalent cancer cases differ throughout the age-groups, women showing a higher prevalence from 35 to 64, and in the over 80-year-olds. The high numbers in prevalent cancer cases in men from 65 to 79 is mainly due to cancer of the prostate. This typical distribution of cancer prevalence in age groups of men and women has previously been presented in several publications (Feldmann, 1986, Ellison, 2009).

For ICD-10 'C50', the cancer of the breast, 74 prevalent cases are found in men and 12,718 cases in women with a prevalence proportion (per 100,000) of 9.5 in men and 1401.3 in women respectively. The tumour-based 15-year prevalence is close to equal to the person-based cancer prevalence with only 14 cases of multiple primary breast cancer (only women).

Temporal trends were examined in 5-year partial prevalences for women by age, histology codes and TNM-Classification/UICC-stages. The age-specific rate or prevalence proportion (per 100,000 female population in Hamburg on the respective index date) increased from 540/100,000 in 1999 to 672/100,000 in 2009. This is concordant with the trend estimated for Germany by the Centre for Cancer Registry Data (ZfKD). The ZfKD calculated an increase of 5-year partial prevalence rate from 559/100,000 (population of Germany, 2004) to 600 (population of Germany 2010, projection)

per 100,000 (RKI/GEK*ID*, 2010). Adjusted to the old European Standard Population and World Standard Population, the rates in Hamburg increased from 417 to 514/100,000 (WSP: 303 to 373/100,000). Women aged '50 to 79' show the highest age-specific prevalence rates. This was also shown in other national and international publications (RKI/GEK*ID*, 2010, Ellison, 2009).

For the age groups aimed for by breast cancer screening programs in Germany, rates range from 2,243/100,000 ('50-59') to 3,722/100,000 ('60-69'). With 2,416/ 100,000 , the age specific rate in the age band '70-79' is higher than in the ages '50-59'. With the start of breast cancer screening in Hamburg, a defined increase can be seen for '50-69' year-old women. Nevertheless, the 5-year partial prevalences of the '70-79' year-old women has as well been increasing strongly, starting from 1999 up to 2009. In international comparison, the highest age-specific prevalence rates in the ages '70 to 79' could also be found in an up-to-date Canadian publication on cancer prevalence (Ellison, 2009).

In national comparison to RKI estimates, the evaluation of data in Hamburg shows not only a higher prevalence in absolute numbers of the age group '70-79' in comparison to '50-59', but also a defined increase in temporal trends for this age group, while the RKI estimates extrapolate declining prevalence rates for the age group '70-79' (RKI, 2010). The reason for this should firstly be investigated with data on incidences, as incidence has proven to be of high influence in breast cancer prevalence. A recent publication of the Hamburg Cancer Registry showed high incidence numbers for breast cancer in the age groups up to 79 for the years 2007 to 2009, age-specific rates being higher in the age bands '70-79' than '50-59' (HCR, 2012).

So far, breast cancer screening programmes in Germany are aimed at the ages 50 to 69 (Gemeinsamer Bundesausschuss, 2009, RKI/GEK*ID*, 2010), while other countries, in example Canada, offer screening to women aged 50 years and older (Canadian Cancer Society, 2012). The result of these 5-year prevalence age-specific rates, combined with the results of rising incidences in this group, might be an indication, that affected age groups might profit from an enhancement of age groups up to 79 years.

Evaluation of temporal trends in histology codes showed, that the infiltrating duct carcinoma increased constantly not only in absolute numbers but also percentage of 'all diagnosed histologies' (from 59.3% (2,817 cases) in 1999 to 70.6% (4,307 cases) in 2009). Partly this will be due to the decrease of carcinoma 'notified without further specification' (from 9.5% to 2.0%). The percentage of invasive lobular carcinoma rises from 1999 (16.6%) to 2003 (18.6%), and is declining down to 12.9% in the following. This pattern might be explained by the stop of menopausal hormone therapy (Newcomer, 2003, Hentschel, 2010). Hentschel et al. found a statistically significant decline in incidence of all invasive breast cancers in 2002/2003 in Hamburg,

the decline being most pronounced in the age group 50-69 and in invasive lobular cancer, while at the same time prescription of menopausal hormone therapy declined between 2002 and 2005. This thesis shows a further decrease of absolute numbers of invasive lobular cancer (and in percentage of the total of notified histology types as well). Prevalence of invasive lobular cancer was highest in 2003 with a percentage of 18.6% of total cases, steadily declining to 12.6% in 2008. The slight increase to 12.9% in 2009 might be connected to the start of breast cancer screening in Hamburg.

The results of the evaluation of tumour size data emphasises the beginning of the screening in 2008. In comparison with the incidences, especially the 5-year prevalences of small tumour sizes (T1 and T2) are increasing, showing a nearly parallel curve to incidence, being only slightly lower in absolute numbers (figure 17-20). This also reflects the influence of a good survival on prevalence (Micheli, 2002). The analysis of UICC stages in 5-year partial prevalences demonstrated the importance of comparing incidence data when evaluating prevalences (figure 21-27): While the stages UICC I to IIIB presented similar, nearly parallel curves for incidence and prevalence (indicating a high influence of incidence on the prevalence), the curves of UICC stage IIIC and IV differed especially in the latest 5-year partial prevalences from 2005 on. While prevalence in UICC IIIC could be fluctuating due to low absolute numbers, UICC IV shows a trend which might need investigation in its course. In UICC-stage IV the incidence is rising significantly from 2003 to 2008 (approximately 450 up to nearly 700 cases). Prevalence does not take up this trend (figure 27). Possible reasons could be an enforced grey screening of breast cancer at the same time, as the legal basis was approved in 2004 and breast cancer screening starting in Hamburg as late as 2008 (RKI/GEK*ID*, 2010). Influences on survival are multi causal and could be age- and co-morbidity related. Diagnoses of especially highly advanced malignancies could explain a persistent prevalence with incidence rising at the same time. Further observation of these UICC stages will be of interest.

The evaluation of 10-year partial prevalences showed an 14% increase overall, mainly due to recent cancer diagnoses (46% growth in the '<1 year-since-diagnosis' group). The '6-10' years-since-diagnosis - group presents a growth of 15.0%, with the main increases from 2004 to 2007, levelling out up to 2009. This may as well be explained by the comparatively steep increase in incidences and lower YSD-groups during the start of comprehensive screening in Hamburg.

Detailed information on up-to-date need of health care is of high interest to public health planning and not readily available. This thesis provides information on the minimum of medical care needed in Hamburg during the index year of 2009, according to current S3-guidelines for breast cancer, which give a detailed recommendation for treatment and follow-up care for the first five years-

since-diagnosis. The correlation of the prevalence data to the guidelines results in the minimal medical care needed, if prevalence is subfractioned to time-since-diagnosis groups and guidelines are implemented as recommended.

The 15-year point prevalence of the index date 31/12/2009 shows, that a total of 4,159 cancer cases were diagnosed only three years prior to the index date (23% of total). This group is recommended to undertake quarterly physical examination and ultrasound imaging, additionally clinical investigations (for example the control of possible side-effects of hormone or targeted therapies). 1,940 women (15%) received the diagnosis '4-5' years before 31/12/2009 and are recommended a semi-annually check-up. Patients, who live with the diagnosis of breast cancer more than five years are counselled to have annually follow-up investigations including ultrasound examination. All breast cancer patients are recommended a yearly mammography.

The additional needs of medical care in the group '6-10' years-since-diagnosis can not be generalized, since recurrence or metastases may occur up to fifteen years after diagnosis, and the extent of medical care consumed varies immensely. Population-based cancer registries does not dispose of data on recurrences, further spreading of disease or complications as side-effects of former chemo-therapies. These do increase the costs of health care immensely and are difficult to calculate.

Therefore, the correlation of the 15-year breast cancer prevalence with the treatment guideline leads to an estimation of minimum health care need for the year 2009 of a total of 12,704 mammographies for all known breast cancer patients and 27,135 ultrasound examinations (in connection with physical examination and clinical investigations). Other possible health needs, such as rehabilitation, physiotherapy and psychosocial support could not be considered in this thesis for the lack of available detailed information.

The treatment of non-Hamburg-residents and immigration of possible cancer cases leads to further underestimation. 20% of patients in Hamburg breast centres are estimated to be non-residents (Bernhardt, A., Lindner, Ch., personal communication, December 2011). Im- and emigration of cancer patients in Hamburg can not be evaluated for the lack of a sufficient exchange of data in between cancer registries so far. The analysis of immigration and emigration from 2000 to 2009 in the age group '55-79' showed, that more women emigrated (29,895) from Hamburg, than moved into the state (18,974) (see appendix E). Immigration of possible cancer cases still leads to an underestimation of prevalence, since cancer patients emigrating are to a certain extent known to the cancer registry, while immigrating women with breast cancer are not captured. Analysing the population changes from 1994 to 2009, a further increase in incidence and prevalence of breast cancer is likely, due to a defined increase in the age band '40-49'.

Due to the diversity of methods of prevalence estimation methods and differences in cancer registration, interpretation of results is rather difficult. Primarily, any changes in calculation of prevalence estimates (for instance of survival calculation) will lead to a change in prevalence, without changing underlying absolute numbers. Population-based cancer registries are quite diverse, ranging from estimations which base on capture data of a representative 15% of the population like in France, or the intent to achieve a comprehensive national covering with cancer registries as in Germany (Hentschel, 2008). Secondly, there are multiple methods of calculating cancer prevalence, starting from direct counting method, to combined counting and estimation of only a few cancer sites, or calculations with estimation of specific survival rates (Colonna, 2007). Techniques of cancer registration and calculation of survival might change nationally throughout the decades. Thirdly, there are diverse possibilities of presenting results, starting with absolute numbers, age-specific rates, prevalence proportion, age standardized rates, distributions according to time-since-diagnosis et cetera.

Several publications offer prevalence proportion or age standardized rates for the World Standard Population (GLOBOCAN, 2008), or European Standard Population. In example, Colonna et al. estimated an age standardized rate of 369/100,000 for 1993 and 515/100,000 in 2002 for breast cancer in women in France. Hamburg shows with 458/100,000 (adjusted for ESP) for the respective 5-year partial prevalence of 2002 a lower rate. The Scandinavian countries (NORDCAN database) provide 5-year prevalence proportion per 100,000, standardized to ESP for the end of 2009, ranging from 430/100,000 in Sweden to 557/100,000 in Finland. With an age standardized rate of 514/100,000 (ESP) at the same time-period the prevalence in Hamburg is placed behind Finland, but significantly higher than in Sweden, Denmark (489/100,000) or Norway (465/100,000).

Non-standardized, age-specific rates in Canada for 2005 are with 530/100,000 compared to 607/100,000 in Hamburg in the same 5-year prevalence proportion also lower, although showing a similar pattern in the distribution of age groups, with high 5-year partial prevalence numbers in the ages above 70 (Ellison, 2009).

A national comparison to German data (RKI, 2010) for 5-year partial prevalences per 100,000 for the German population of 2004 shows a higher rate in Hamburg with 616/100,000 compared to a rate of 559/100,000 calculated by the RKI for the German population of 2004[14].

The prevalence data as such does not offer the possibility to extract a direct reason for the differences. The formerly described wide variety of factors influencing prevalence clearly hinders an easy interpretation of causal relations.

14 To compare the prevalence proportions the Hamburg results were standardized to the German population used by the RKI for the year 2004.

This thesis provides the first detailed information on up-to-date cancer prevalence in Hamburg including a detailed analysis of breast cancer in women and estimation of minimal need of medical care in this group. Knowledge on cancer prevalence on national and regional level is still scarce and needs further research, as cancer prevalence is rising, not only due to increasing incidences, but also to better survival. Results of trends in 5-year partial prevalences of breast cancer in women show defined increases, very important to health care planners due to the high use of medical care during the first five years after a cancer diagnosis. Analysis of tumour size and UICC-stages in breast cancer 5-year prevalence showed a very strong influence of breast cancer incidence on prevalence, reflecting the relative survival of more than 86% in Hamburg (HCR, 2012). Correlation of time-since-diagnosis in cancer with treatment and follow-up care guidelines can be helpful in calculating minimum needs in medical care in a defined population and be important for resource allocation looking at temporal trends in 5-year partial prevalences. Further data availability on treatment and the course of disease, like recurrence, progress and individual side-effects or complications are additionally needed to estimate even more detailed resource requirements.

8 Index of Figures

9 Index of Tables

10 Glossary of Terms

Age Standardize Rate

An age-standardised rate (ASR) is a summary measure of the rate that a population would have if it had a standard age structure. Standardization is necessary when comparing several populations that differ with respect to age because age has a powerful influence on the risk of cancer. The ASR is a weighted mean of the age-specific rates; the weights are taken from population distribution of the standard population. The most frequently used standard population is the World Standard Population. The calculated incidence or mortality rate is then called age-standardised incidence or mortality rate (world). It is also expressed per 100,000.]. The age-standardised rate is calculated using 10 age-groups. The result may be slightly different from that computed using the same data categorised using the traditional 5 year age bands (GLOBOCAN,2010).

Cancer prevalence

The number of instances of illness or of persons ill, or of any other event such as accidents, in a specified population, without any distinction between new and old cases. Prevalence may be recorded at a stated moment (point prevalence) or during a given period of time (period prevalence). (WHO, 2001(Prevalence and Incidence. WHO Bulletin, 1966; 35:783-784)).

The latter includes cases commencing before the observed period, as well as the measured attribute arising and ending within the observed period and cases commencing and continuing.

Lifetime prevalence is the total number of individuals in a statistical population that are known to have had the disease or attribute for at least part of their life.

Crude Rate / Prevalence Proportion (per 100,000)

Data on incidence, mortality or prevalence are often presented as rates. For a specific tumour and population, a crude rate is calculated simply by dividing the number of new cancers or cancer deaths observed during a given time period by the corresponding number of person years in the population at risk. For cancer, the result is usually expressed as an annual rate per 100,000 persons at risk.

Incidence

Incidence is the number of new cases arising in a given period in a specified population. This information is collected routinely by cancer registries. It can be expressed as an absolute number of cases per year or as a rate per 100,000 persons per year (see Crude rate and ASR below). The rate provides an approximation of the average risk of developing a cancer.

Point prevalence

Number of previously diagnosed cases of cancer in a given population, among people alive on a specified date

Total Cancer Prevalence

All prevalent cancer cases at the index date, diagnosed at any previous time

Limited-duration prevalence

Prevalent cases diagnosed within a specified number of years (Ellison 2009; SEER, 2011)

Mortality

Mortality is the number of deaths occurring in a given period in a specified population. It can be expressed as an absolute number of deaths per year or as a rate per 100,000 persons per year (GLOBOCAN, 2010).

Definitions, if not otherwise specified are adopted from the following textbooks: 'A Dictionary of Epidemiology' (Last, 1987), 'Lehrbuch der Hygiene' (Gundermann, 1991), 'Gesundheits-berichterstattung und Surveillance' (Hentschel, 2007b).

11 Internet Links

- Association of Population-based Cancer Registries in Germany (Gesellschaft der epidemiologischen Krebsregister in Deutschland e.V. (GEKID)) : www.gekid.de
- Center for the Data of Cancer Registries (Zentrum für Krebsregisterdaten) at the Robert Koch Institute: www.rki.de
- Deutsche Krebshilfe: www.krebshilfe.de
- German Tumour Centres Work Group (Arbeitsgemeinschaft der deutschen (klinischen) Tumorzentren (ADT)): www.tumorzentren.de
- Hamburg Cancer Registry: www.hamburg.de/krebsregister
- International Agency for Research on Cancer (IARC): www.dep.iarc.fr
- Statistical Office for Hamburg and Schleswig-Holstein: http://www.statistik-nord.de

12 References

Angeli, E., Wagner, J., Lawrick, E., Moore, K., Anderson, M., Soderlund, L., & Brizee, A. (2011, October 25). *General Format*. Retrieved from http://owl.english.purdue.edu/owl/resource/560/01

Behörde für Gesundheit und Verbraucherschutz (BGV) (2011). *Krankenhausverzeichnis 2011.* Retrieved from http://www.hamburg.de/krankenhaus/veroeffentlichungen/123492/ver-oeffentlichungen.html

Bertz, J., Dahm, S., Haberland, J., Kraywinkel, K., Kurth, B.M., & Wolf, U. (2010). *Verbreitung von Krebserkrankungen in Deutschland. Entwicklung der Prävalenzen zwischen 1990 und 2010*. Centre for Cancer Registry Data (Ed.). Berlin: Ruksaldruck.

Bonita, R., Beaglehole, R., & Kjellström, T. (2006). *Einführung in die Epidemiologie*. Bern: Hans Huber Verlag.

Bundeskrebsregisterdatengesetz (BKRG) (2009). *Bundeskrebsregisterdatengesetz vom 10. August 2009* (BGBl. I S. 2707). Retrieved from *www.gesetze-im-internet.de/bundesrecht/bkrg/gesamt.pdf*

Canadian Cancer Society (2011, November 11). *Ontario Breast Cancer Screening Programs.* Retrieved from http://www.cancer.ca/ontario/prevention/get%20screened/od-ontario%20breast%20cancer%20screening%20programs.aspx

Capocaccia, R.,& Colonna, M. (2002). On behalf of the EUROPREVAL Working Group. Measuring Cancer Prevalence in Europe: the EUROPREVAL Project. *Annals of Oncology* 13, 831 - 839.

Carpenter, W. R., Yeh, W., Wobker, S.E., & Godley, P.A. (2011). Getting cancer prevalence right: using state cancer registry data to estimate cancer survivors. *Cancer Causes Control,* 22, 765-773. doi: 10.1007/s10552-011-9749-0

Center for Disease Control and Prevention (2011). Cancer Survivors – United States, 2007. *Morbidity and Mortality Weekly Report* 60 (9), 269-272.

Chia S., Speers C.H., Bryce C.J., Hayes M.M.,& Olivotto I.A. (2004). Ten-year outcomes in a population-based cohort of node-negative, lymphatic and vascular invasion-negative early breast cancers without adjuvant systemic therapies. *J Clin Oncol* 22,1630-1637.

Colonna, M., Danzon, A., Delafosse, P., Mitton, N., Bara, SO., Bouvier, A., Ganry, O., Guizard, A., Launoy, G., Molinie, F., Sauleau, E., Schvartz, C., Velten, M., Grosclaude, P., & Tretarre, B. (2008). Cancer prevalence in France: Time trend, situation in 2002 and extrapolation to 2012. *European Journal of Cancer* 44, 115-222. doi:10.1016/j.ejca.2007.10.022

Cox, M., Kopp, I., König, I., Lelgemann, M., Müller, W., Ollenschläger, G., Rütters, D., Sänger, S., Thalau, F., Thole, H., & Trapp, H. (2007). *Leitlinien-Glossar. Begrifflichkeiten und Kommentare zum Programm für National Versorgungsleitlinien*. Arbeitsgemeinschaft der Wissenschaftlichen Medizinischen Fachgesellschaften (Eds.). Neukirchen: Verlag Mage a Book.

Curado, M.P., Edwards, B., Shin, H.R., Storm, H., Ferlay, J., Heanue, M., & Boyle, P. (Eds.) (2007). *Incidence in Five Continents* (9th ed). IARC Scientific Publication. Geneva: WHO Press.

Deutsches Institut für Medizinische Dokumentation und Information (DIMDI) (2010a, September 15). *Diagnosis related classifications.* Retrieved from http://www.dimdi.de/static/en/klassi/diagnosen/index.htm

DIMDI (2010b, November 25). *ICD-10 WHO 2011*. Retrieved from http://www.dimdi.de/static/ de/klassi/diagnosen/icd10/htmlamtl2011/block-d00-d09.htm

Deutsche Krebsgesellschaft E.V. (DKG) und Deutsche Gesellschaft für Gynäkologie und Geburtshilfe (DGGG) (2008). *Interdisziplinäre S3-Leitlinie für die Diagnostik, Therapie und Nachsorge des Mammakarzinoms*. 1. Aktualisierung 2008. München: G. Zuckschwerdt Verlag GmbH.

Ellison, L.F., & Wilkins, K. (2009). Cancer Prevalence in the Canadian Population. *Statistics Canada* : *Health Reports*, Vol. 20 (1), 7-19.

European Union Public Health Information System (EUPHIX) (2009, December 17). *European Standard Population*. Retrieved from http://www.euphix.org/object_document/o5338n27620.html

European Society of Breast Cancer Specialists (EUSOMA) (2012, March 4). *Initial Certified Units*. Retrieved from http://www.eusoma.org/Engx/BreastUnits/AccreditationProcess.aspx?cont=ap_accredited

Evans R.J. (2005). *Death in Hamburg. Society and Politics in the Cholera Years*. London: Penguin Books.

Feldman, A.R., Kessler, L., Myers M.H., & Naughton, M.D. (1986). The prevalence of cancer. Estimates based upon the Connecticut tumor registry. *The New England Journal of Medicine* 315, 1394-1397.

Fisher B., Jeong J., Bryant J., et al (2004). Treatment of lymph-node-negative, estrogen receptor-positive breast cancer: long-term findings from National Surgical Adjuvant Breast and Bowel Project randomized clinical trials. *Lancet* 364, 858-868.

Forman, D., Stockton, D., Moller, H., Quinn, M., Babb, P., De Angelis, R., & Micheli, A. (2003). Cancer Prevalence in the UK: results from the EUROPREVAL study. *Annals of Oncology* 14 (4), 648-654.

Gaber, E., & Wildner, M. (2011). Sterblichkeit, Todesursachen und regionale Unterschiede. *Gesundheitsberichterstattung des Bundes. RKI (Ed.). Heft* 52.

Gemeinsamer Bundesausschuss (GBA) (2011). Richtlinie des Gemeinsamen Bundesausschusses über die Früherkennung von Krebserkrankungen (Krebsfrüherkennungs-Richtlinie/ KFE-RL) zuletzt geändert am 16. Dezember 2010, veröffentlicht im Bundesanzeiger 2011; Nr. 34: S. 864, in Kraft getreten am 3. März 2011

Gesellschaft der epidemiologischen Krebsregister in Deutschland (GEK*ID)* (2010). Sachbericht zu dem Projekt der Gesellschaft der epidemiologischen Krebsregister in Deutschland e.V. (GEK*ID*). *Validierung der Vergleichbarkeit und der Qualität von Mortalitäts- und Migrationserfassung in den epidemiologischen Landeskrebsregistern (EKR)*.

Gesundheitsberichterstattung des Bundes (gbe-bund) (2011, November 13). *Standardbevölkerungen*. Retrieved from http://www.gbe-bund.de/oowa921-install/-servlet/oova/aw92-dboowasys921.xwdevkit/xwd_ini/gbe.isgebtol/xs_start_neu/&p_aid=3&p_aid=86357940&nummer=1000&p_sprache_D&p_indsp=-&p_aid=81023466

Giersiepen, K., Haartje, U., Hentschel, S., Katalinic, A., & Kieschke, J. (2004). *Brustkrebsregistrierung in Deutschland: Tumorstadienverteilung in der Zielgruppe für das Mammographie-Screening*. Deutsches Ärzteblatt 101(30): A2117/ B-1769/ C-1701.

GLOBOCAN (2010). *Glossary of Terms*. Retrieved from http://globocan.iarc.fr

Gundermann K.O., Rüden, H., & Sonntag, H. G. (1991). *Lehrbuch der Hygiene*. Stuttgart: Gustav Fischer Verlag.

Haberland, J., Schön, D., Bertz, J., Görsch, B. (2003). *Vollzähligkeitsschätzungen von Krebsregisterdaten in Deutschland*. Bundesgesundheitsblatt- Gesundheitsforschung-Gesundheitsschutz. 46:770-774.

Hamburgisches Krebsregister (HKR) (2009). *Hamburger Krebsdokumentation 2005-2006. Neuerkrankungen und Sterbefälle*. Freie und Hansestadt Hamburg, Behörde für Soziales, Familie, Gesundheit und Verbraucherschutz (Ed.). Soltau: Mundschenk Druck- und Verlagsgesellschaft MbH.

Hamburgisches Krebsregister (HKR) (2012). *Hamburger Krebsdokumentation 2007-2009*. Behörde für Gesundheit und Verbraucherschutz (Ed.). Soltau: Mundschenk Druck- und Verlagsgesellschaft mbH.

Hamburgisches Krebsregistergesetz (HmbKrebsRG). *Hamburgisches Krebsregistergesetzvom 27. Juni 1984* (HmbGVBl. Teil I, Nr. 31 vom 3. Juli 1984, S. 129-132). Retrieved from *www.hamburg.de/contentblob/123998/data/hmbkrebsrges.pdf*

Heinsohn, W. (1957). Methoden und erste Ergebnisse der Krebsstatistik. Statistisches Landesamt der Freien und Hansestadt Hamburg (Ed.). Hamburg in *Hamburg in Zahlen* (4) pp. 27-41.

Hentschel, S., Haartje, U., Burkhardt, N., Funk, A., Nennecke, A. (2007a). Cancer Incidence in Germany, Hamburg (1998-2002). In Curado, M.P., Edwards, B., Shin, H.R. et al (Eds.). *Cancer Incidence in Five Continents*, Vol. IX. Lyon: IARC Scientific Publications No. 160.

Hentschel, S., & Nennecke, A. (2007b). Gesundheitsberichterstattung und Surveillance. In Krebsregistrierung und -berichterstattung (180-185). Reintjes, R. (Ed.). Bern: Hans Huber Verlag.

Hentschel, S., & Katalinic, A. (2008). *Das Manual der epidemiologischen Krebsregistrierung*. München: W. Zuckerschwerdt Verlag.

Hentschel, S., Heinz, J., Schmid-Höpfner, S., Obi, N., Vettorazzi, E., Chang-Claude, J., & Flesch-Janys, D. (2010). The impact of menopausal hormone therapy on the incidence of different breast cancer types- Data from the Cancer Registry Hamburg 1991-2006. Cancer Epidemiology. Doi:10.1016/j.canep.2010.07.010

IARC/ IACR/ENCR. 2004. International Agency for Research on Cancer/ International Association of Cancer Registries/ European Network of Cancer Registries. *International Rules for Multiple Primary Cancers* (ICD-O-Third Edition). International Report No. 2004/02. Lyon, 2004.

IARC (2010). GLOBOCAN 2008. *Cancer Incidence and Mortality worldwide in 2008*. Retrieved from http://globocan.iarc.fr.

Katalinic, A., Holzmann, M., & Kunze, U. (2003). Abhängigkeit der Tumorstadien von der Vollzähligkeit der Registrierung bei Brustkrebs in einem bevölkerungsbezogenen Krebsregister. Das Gesundheitswesen. 65 (8-9): 509-515.

Last J. M. (1987). *Dictionary of Epidemiology, 2nd Edition.* Oxford University Press: New York.

Lutz, J.M., Francisci, S., et al. (2003). On behalf of the EUROPREVAL Working Group. 2003. Cancer Prevalence in Central Europe: the EUROPREVAL-Study. *Annals of Oncology* 14, 313-322.

Maddams, J., Brewster, D., Gavin, A., Steward, J., Elliott, J., Utley, M., & Moller, H. (2009). Cancer Prevalence in the United Kingdom: estimates for 2008. British Journal of Cancer 101, 521-547. doi: 10.1038/sj.bjc.6605148

Matti, W. (1973). Methoden und Verfahren der Krebsstatistiken in Hamburg – Morbidität und Mortalität. Statistisches Landesamt in Verbindung mit der Gesundheitsbehörde der Freien und Hansestadt Hamburg (Eds). *Hamburger Krebsdokumentation 1956 bis 1971*. Sonderdruck des Heftes 105 der Reihe „*Statistik des Hamburger Staates*“.

Memon, A. (2008). Part 2 (Chapter 2.3) Using data and evidence in Oxford Handbook of Public Health Practice. 2nd edition. Eds. Pencheon, D., Guest, C., Melzer, D.& Muir Gray, J.A.. Oxford University Press: Oxford.

Micheli, A., Mugno, E., Krogh, W., Quinn, M. J., Coleman, M., Hakulinen, T., Gatta, G., Berrino F., Capocaccia, R. & the EUROPREVAL Working Group (2002). Cancer Prevalence in European registry areas. *Annals of Oncology* 13 (6), 840-865.

Nennecke, A. L. (2006). Feasibility and use of registry-based cancer survival analysis, demonstrated for malignancies of the colon, breast, prostate and bladder in Hamburg. (Unpublished master thesis). Hamburg University of Applied Sciences, Hamburg.

Nennecke A. L., Hentschel S., Reintjes R. (2008). Cancer survival analysis in Hamburg 1995-2003: Assessing the data quality within a population-based registry. *Acta Oncologica* 48 (1), 34-43.

Newcomer L.M., Newcomb P.A., Potter, J.D., Yasui, Y., Trentham-Dietz, A., Storer B.E., Longnecker, M.P., Baon J.A., & Daling J.R. (2003). Postmenopausal hormone therapy and risk of breast cancer by histologic type. *Cancer Causes Control,* 3, 225-233.

NORDCAN (2011, December 14). *Glossary of Statistical Terms*. Retrieved from http://www.dep.iarc.fr/nordcan/English/frame.asp

Onkozert (2011). Zertifizierte Brustzentren - Hamburg. Retrieved from http://onkozert.de/deutschland/hamburg_tabell.htm

Parkin D.M., Hakulinen T. (1991). Analysis of survival. In O.M. Jensen, D.M. Parkin & R. Maclennan (Eds.), *Cancer Registration, Principles and Methods* (pp. 159-176). IARC Scientific Publications No. 95. Lyon, France: International Agency for Research on Cancer.

Pisani P., Bray F., & Parkin M. (2002). Estimates of the world-wide prevalence of cancer for 25 sites in the adult population. *Int. J. Cancer,* 97, 72-81.

Ravdin, P. M., Cronin, K., Howlader, N., Berg, C., Chlebowski, R. T., Feuer, E., Edwards, B., & Berry, D. A. (2007). The Decrease in Breast-Cancer Incidence in 2003 in the United States. *New England Journal of Medicine,* 356 (16), 1670-1674.

Reiche, F. (1900). Beiträge zur Statistik des Carcinoms. *Deutsche Medicinische Wochenschrift.* 26 (7), 120-121 and (8), 135-137.

Robert Koch Institute (RKI) and Association of Population-based Cancer Registries in Germany (GEKiD). (Eds.). (2010). *Cancer in Germany 2005/2006. Incidence and Trends* (7th ed.). Berlin: Ruksaldruck.

Schwanke, W. (1930) Krebs in Hamburg, in *Bruns Beiträge zur klinischen Chirurgie* 151 (46), 326-330.

Surveillance Epidemiology and End Results (SEER) (2009, December 4). *ICD-O3 SEER Site/ Histology Validation List*. Retrieved from http://www.seer.cancer.gov/icd-o-3/sitetype.icdo3.d20091204.pdf

Surveillance Epidemiology and End Results (SEER) (2010, December 21). *Complete Prevalence.* Retrieved from http://surveillance.cancer.gov/prevalence/complete.html

Surveillance Epidemiology and End Results (SEER) (2011, April 11). *Prevalence Statistics.* Retrieved from http://surveillance.cancer.gov/prevalence

Stark, A (2011). *Metropolregion Hamburg. Die 100 größten Unternehmen in Hamburg.* Retrieved from http://metropolregion.hamburg.de

STATISTIK AUSTRIA (2010). Bundesanstalt Statistik Österreich. Krebsinzidenz und Krebsmortalität in Österreich. HANS JENTZSCH & Co GesmbH: Wien.

Statistisches Amt für Hamburg und Schleswig-Holstein (2011, October 19). Statistik informiert…Nr. 84/2011. Bevölkerung in Hamburg am 31.12.2010. Accessed at 19.10.2011 at http://www.statistik-nord.de/uploads/tx_standocuments/SI11_084.pdf

Statistisches Amt für Hamburg und Schleswig-Holstein. Statistik (2011, November 1). *Statistisches Jahrbuch Hamburg 2010/ 2011*. Retrieved from www.statistik-nord.de/publikationen/ publikationen/jahrbücher/jahrbuch-hamburg/

Tulchinsky, T.H., Varavikova, E. (2009). Measuring and Evaluating the Health of a Population (Chapter 3) in *The New Public Health.* 2nd edition. Londom: Elsevier Academic Press.

Urbschat, I., Kieschke, J.., Schlanstedt-Jahn, U., v. Gehlen, S., Thiel, A., & Jensch, P. (2005). Beiträge bevölkerungsbezogener Krebsregister zur Evaluation des bundesweiten Mammographie-Screenings. Erste Beiträge zur Brustkrebszinzidenz und T-Stadienverteilung von Teilnehmerinnen des Mammographie-Screening Weser-Ems im bevölkerungsbezogenen Vergleich. *Gesundheitswesen.* 67, 448-454.

Verbeek, A.L.M., & Broeders, M.J.M. (2003). Evaluation of The Netherlands breast cancer screening programme. *Annals of Oncology*, 14 (8),1203-1205.

Weiß, C. (2002). Chapter 6: Spezielle Wahrscheinlichkeiten in der Medizin in Basiswissen Medizinische Statistik. 2nd edition. Springer Verlag: Heidelberg.

World Health Organisation (WHO) (2001). *Protocol for the Assessment of National Communicable Disease Surveillance and Response System*. Guidelines for Assessment Teams. Retrieved from www.who.int/csr/resources/publications/surveillance/whocdscsrisr20012.pdf

WHO (2012a). International Statistical Classification of Diseases and Related Health Problems 10th Revision. Retrieved from http://apps.who.int/classifications/ icd10/browse/2010/en

WHO (2012b, February). Cancer. Fact Sheet No. 297. Retrieved from http://www.who.int/ mediacentre/factsheets/fs297/en/

Wittekind, C., & Meyer, H.-J. (Eds.) (2002). *TNM Klassifikation maligner Tumoren* (6th ed.). Weinheim: Wiley-VCH.

Wittekind, C., & Meyer, H.-J. (Eds.) (2011). *TNM Klassifikation maligner Tumoren* (7th ed.). Weinheim: Wiley-VCH.

Zielonke, N. (2011). Die Krebslast in Österreich. Berechnung der Krebsprävalenz auf Basis der Daten des österreichischen Krebsregisters. *Statistische Nachrichten*, 3.

13 Declaration

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person nor material which to a substantial extent has been accepted for the award of any other degree or diploma of the university or other institute of higher learning, except where due acknowledgement has been made in the text.

14 Appendices

A) Hamburg Cancer Registry Data Act (*Hamburgisches Krebsregistergesetz* (HmbKrebsRG)) of 2007

B) Federal Cancer Registry Data Act (*Bundeskrebsregisterdatengesetz* (BKRG)) of 2009

C) Cancer Notification Sheet (*Erhebungsbogen des Hamburgischen Krebsregisters*)

D) International Rules for Multiple Primary Cancers of the IARC, 2004

E) Migration of Women To and From Hamburg 1995-2009

F) Histology Codes for Women in Hamburg with notification for >1 breast cancer

G) Leading 8 Histology Codes (ICD-O-3) in Absolute Numbers in Breast Cancer, 5-Year Partial Prevalences in Women, Hamburg, Index Date: 31.12 of Respective Year, Diagnoses 01/01/1995-31/12/2009

H) 5-Year Incidences and 5-Year Prevalences of Tumour Size according to TNM-Classification, Breast Cancer in Women, Hamburg, Diagnoses from 01/01/1995 to 31/12/2009

I) 5-Year Incidences and 5-Year Prevalences of UICC stages, Breast Cancer in Women, Hamburg, Diagnoses from 01/01/1995 to 31/12/2009

J) Percentual Increase in the respective 'Time-Since-Diagnosis'-Groups in 10-Year Partial Prevalences, Breast Cancer in Women, Hamburg, Diagnoses 01/01/1995-31/12/2009

A)

Hamburgisches Krebsregistergesetz (HmbKrebsRG)
vom 27. Juni 1984 (HmbGVBl. Teil I, Nr. 31 vom 3. Juli 1984, S. 129-132)

in der zur Zeit geltenden Fassung, zuletzt geändert durch Gesetz vom 24.04.2007, Hamburgisches Gesetz- und Verordnungsblatt 2007, S. 156.

Der Senat verkündet das nachstehende von der Bürgerschaft beschlossene Gesetz:

§ 1
Zweck und Aufgaben des Hamburgischen Krebsregisters

(1) Für Zwecke der Krebsforschung führt die zuständige Behörde das Hamburgische Krebsregister.

(2) Das Hamburgische Krebsregister hat die Aufgabe, fortlaufend Daten über das Entstehen, das Auftreten und den Verlauf bösartiger Neubildungen einschließlich ihrer Frühstadien nach Maßgabe dieses Gesetzes zu sammeln, zu verarbeiten, für die wissenschaftliche Forschung zur Verfügung zu stellen und statistisch-epidemiologisch auszuwerten sowie die Ergebnisse zu veröffentlichen.

§ 2
Meldungen

(1) Ärzte und Zahnärzte sind berechtigt, dem Hamburgischen Krebsregister die in § 3 genannten Angaben über in Hamburg untersuchte oder behandelte Patienten mit deren Einwilligung zu machen. Der Patient ist zuvor über den Zweck der Meldung und über die Aufgaben des Hamburgischen Krebsregisters zu unterrichten.

(2) Die Meldung kann ausnahmsweise ohne Einwilligung des Patienten erfolgen, wenn der Patient

1. nicht nur vorübergehend einwilligungsunfähig ist oder

2. nicht um seine Einwilligung gebeten werden kann, weil er wegen der Gefahr einer sonst eintretenden ernsten Gesundheitsverschlechterung über das Vorliegen einer Krebserkrankung nicht unterrichtet worden ist,

und wenn außerdem kein Grund zu der Annahme besteht, daß der Patient die Einwilligung verweigert hätte. Der Meldende hat die Gründe dafür, dass er die Einwilligung nicht eingeholt hat, aufzuzeichnen.

(3) Ist der Patient verstorben, so darf die Meldung erfolgen, sofern kein Grund zu der Annahme besteht, daß der Patient die Einwilligung verweigert hätte.

(4) Ärzte, die durch spezielle Untersuchungsmethoden die Tumordiagnose stellen, ohne unmittelbaren Patientenkontakt zu haben, sind unabhängig davon, ob die Voraussetzungen der Absätze 1 bis 3 vorliegen, zu einer pseudonymisierten Meldung an das Hamburgische Krebsregister verpflichtet. Das Pseudonym ist so zu gestalten, dass das

Hamburgische Krebsregister es nur entschlüsseln und die Daten zuordnen kann, wenn ihm zu derselben Person eine Meldung nach den Absätzen 1 bis 3 vorliegt.

(5) Die zuständige Behörde stellt die Formblätter für die Meldungen sowie die für die Pseudonymisierung nach Absatz 4 notwendigen Datenverarbeitungsprogramme und Transportmedien kostenlos zur Verfügung.

(6) Das Hamburgische Krebsregister ist berechtigt, Meldungen über Personen mit gewöhnlichem Aufenthalt außerhalb Hamburgs an das zuständige Krebsregister oder dessen Vertrauensstelle weiterzuleiten sowie Meldungen über Personen mit gewöhnlichem Aufenthalt in Hamburg von anderen Krebsregistern oder deren Vertrauensstellen entgegenzunehmen.

§ 3
Inhalt der Meldungen

(1) Die Meldungen dürfen folgende Angaben enthalten:

1. Angaben über die persönlichen Verhältnisse des Patienten

a) Familiennamen, Vornamen, frühere Namen
b) Anschrift
c) Geburtsdatum
d) Sterbedatum
e) Staatsangehörigkeit
f) Geschlecht
g) bei Frauen: Zahl der Geburten
h) derzeitiger Beruf und am längsten ausgeübte Ber ufstätigkeit
i) Wirtschaftszweig
j) Rauchgewohnheiten,

2. medizinische Angaben

a) Tumordiagnose einschließlich des histologischen Befundes
b) Lokalisation des Tumors
c) Grad der Tumorausbreitung
d) Art der Sicherung der Diagnose
e) Datum der Tumordiagnose
f) Anlaß der Untersuchung
g) Art der Therapie
h) frühere Tumorleiden mit Datum der Diagnose
i) Todesursache.

(2) Jede Meldung muß den Meldenden und die Einrichtung, in der die Untersuchung oder Behandlung vorgenommen worden ist, nennen. Außerdem ist anzugeben, ob der Patient in die Meldung eingewilligt hat.

(3) Bei Meldungen nach § 2 Absatz 4 werden die Daten nach Absatz 1 Nummer 1 Buchstaben a bis c automatisch durch pseudonymisierende Angaben ersetzt.

§ 4
Auswertung anderer Unterlagen

(1) Zur Vervollständigung und Fortschreibung des Registers kann das Hamburgische Krebsregister die in § 3 Absatz 1 genannten Angaben auch den in Hamburg ausgestellten oder aufbewahrten Todesbescheinigungen entnehmen. Die für die Aufbewahrung der Todesbescheinigungen zuständigen Behörden haben auf Anforderung dem Hamburgischen Krebsregister die Todesbescheinigungen für längstens einen Monat zur Auswertung zu überlassen.

(2) Zur Fortschreibung und Berichtigung des Registers übermittelt die Meldebehörde dem Hamburgischen Krebsregister Namensänderungen sowie Wegzüge und Todesfälle von Einwohnern unter Angabe des Datums und der zur Identifizierung des jeweiligen Einwohners erforderlichen Daten. Zur Identifizierung dürfen dabei höchstens folgende Daten übermittelt werden:

1. Familiennamen
2. Vornamen
3. frühere Namen
4. Geburtsdatum
5. Staatsangehörigkeit
6. Geschlecht.

§ 5
Speicherung der Daten

(1) Die nach § 2 gemeldeten und die nach § 4 aus anderen Unterlagen gewonnenen Daten sind nach folgenden Datengruppen zu ordnen und nach diesen Datengruppen getrennt zu speichern:

1. Erste Datengruppe:

   a) Meldender
   b) Einrichtung, in der die Untersuchung oder Behandlung vorgenommen worden ist
   c) Familiennamen, Vornamen, frühere Namen des Patienten
   d) Anschrift
   e) Geburtsdatum
   f) Datum des Wegzugs
   g) Sterbedatum
   h) Staatsangehörigkeit
   i) bei Frauen: Zahl der Geburten
   j) derzeitiger Beruf und am längsten ausgeübter Beruf
   k) Wirtschaftszweig.

2. Zweite Datengruppe

a) Einwilligung des Patienten in die Meldung
b) Geschlecht
c) Wohnort Hamburg: ja/nein
d) Geburtsjahr
e) deutsche Staatsangehörigkeit: ja/nein
f) Rauchgewohnheiten
g) Jahr des Wegzugs
h) Todesjahr
i) Tumordiagnose einschließlich des histologischen Befundes
j) Lokalisation des Tumors
k) Grad der Tumorausbreitung
l) Art der Sicherung der Diagnose
m) Datum der Tumordiagnose
n) Anlaß der Untersuchung
o) Art der Therapie
p) frühere Tumorleiden mit Datum der Diagnose
q) Todesursache
r) Pseudonym nach § 2 Absatz 4.

(2) Eine Zusammenführung von Daten aus beiden Datengruppen ist nur zulässig, soweit dies für die Zwecke und Aufgaben des Krebsregisters erforderlich ist. Jede Zusammenführung und die Gründe hierfür sind aufzuzeichnen.

(3) Die nach § 2 übersandten Formblätter sind spätestens nach drei Monaten zu vernichten.

§ 6
Veröffentlichungen

Das Hamburgische Krebsregister wertet die bei ihm gespeicherten Daten aus und veröffentlicht die Ergebnisse in Abständen von höchstens drei Jahren. Einzelangaben sind dabei so zusammenzufassen oder zu verändern, daß sie keine bestimmte Person erkennen lassen.

§ 7
Übermittlung aggregierter Daten

(1) Das Hamburgische Krebsregister kann auf Antrag die bei ihm gespeicherten Daten zu einer vom Antragsteller gestellten Frage auswerten. Es soll dies tun, wenn der Antragsteller die Ergebnisse der Auswertung für Zwecke der wissenschaftlichen Forschung benötigt.

(2) Die Ergebnisse der Auswertung dürfen dem Antragsteller nur übermittelt werden, wenn die Einzeldaten so zusammengefaßt sind, daß sie keine bestimmte Person erkennen lassen (aggregierte Daten).

§ 8
Übermittlung anonymisierter Einzeldaten

(1) Aus dem Krebsregister dürfen Einzeldaten in anonymisierter Form zu dem in § 1 Absatz 1 bestimmten Zweck an Hochschulen, wissenschaftliche Institute und vergleichbare Einrichtungen übermittelt werden. Anonymisierte Einzeldaten dürfen an Einzelpersonen nur übermittelt werden, wenn sie die Daten für ein für die Verbesserung der Krebsverhütung oder Krebsbekämpfung bedeutsames Forschungsvorhaben benötigen, das ohne solche Daten nicht durchgeführt werden kann. Anonymisierte Einzeldaten dürfen darüber hinaus an eine staatliche Stelle übermittelt werden, zu deren Aufgaben es gehört, über den Bereich eines Bundeslandes hinaus epidemiologische Daten zu sammeln und auszuwerten.

(2) Daten sind anonymisiert, wenn sie keine bestimmte Person erkennen lassen. Diese Voraussetzung gilt in der Regel als erfüllt, wenn über eine Person nur die in § 5 Absatz 1 Nummer 2 genannten Daten übermittelt werden.

(3) Ein Anspruch auf die Übermittlung anonymisierter Daten aus dem Krebsregister besteht nicht.

§ 9
Übermittlung personenbezogener Daten

(1) Aus dem Krebsregister dürfen personenbezogene Daten nur an Hochschulen, wissenschaftliche Institute und andere öffentliche Einrichtungen auf deren Antrag für die Durchführung eines bestimmten Vorhabens der Krebsforschung übermittelt werden.

(2) Über den Antrag entscheidet im Einzelfall der Präses oder der Staatsrat der zuständigen Behörde nach Anhörung des Hamburgischen Beauftragten für Datenschutz und Informationsfreiheit und der Ärztekammer Hamburg. Die Übermittlung darf nur zugelassen werden, wenn das Forschungsvorhaben ohne die personenbezogenen Daten nicht durchgeführt werden kann und schutzwürdige Belange der Patienten nicht beeinträchtigt werden. Ein Anspruch auf die Übermittlung personenbezogener Daten aus dem Krebsregister besteht nicht.

(3) Wird die Übermittlung zugelassen, so muß die Entscheidung

1. den Empfänger der Daten und den für das Forschungsvorhaben Verantwortlichen,

2. die Art der zu übermittelnden personenbezogenen Daten und den Kreis der Patienten,

3. das Forschungsvorhaben, zu dem die übermittelten personenbezogenen Daten verwendet werden dürfen, einschließlich der Forschungsmethoden,

4. den Tag, bis zu dem die übermittelten personenbezogenen Daten aufbewahrt werden dürfen,

genau bezeichnen. Sie steht auch ohne besonderen Hinweis unter dem Vorbehalt der nachträglichen Aufnahme, Änderung oder Ergänzung einer Auflage.

(4) Der Empfänger der Daten hat der zuständigen Behörde jede Veränderung von Umständen unverzüglich anzuzeigen, die für die Entscheidung über den Antrag wesentlich waren.

(5) Die übermittelten personenbezogenen Daten dürfen nur von dem in der Entscheidung bezeichneten Empfänger und nur für die darin bezeichneten Zwecke verarbeitet oder sonst genutzt werden Sie dürfen nicht an Dritte weiterübermittelt werden. Bis zu dem in Absatz 3 Satz 1 Nummer 4 genannten Tag sind sie zu löschen. Die Löschung ist dem Hamburgischen Krebsregister mitzuteilen und auf Verlangen glaubhaft zu machen.

(6) Eine Verarbeitung personenbezogener Daten im Auftrag des Datenempfängers ist nur durch öffentliche Stellen und nur dann zulässig, wenn der Datenschutz beim Auftragnehmer den Anforderungen genügt, die für den Auftraggeber gelten. Der Auftragnehmer darf die zur Datenverarbeitung überlassenen Daten nicht anderweitig verwenden und nicht länger aufbewahren, als der Auftraggeber bestimmt.

(7) Das Hamburgische Krebsregister ist berechtigt, einem meldenden Arzt oder der meldenden Einrichtung die im Krebsregister vorhandenen Informationen zum Langzeitüberleben (lebend bzw. Sterbemonat, Sterbejahr und Todesursache) der benannten Patienten weiterzugeben.

§ 10
Befragung des Patienten

(1) Zur Durchführung eines Forschungsvorhabens mit aus dem Krebsregister übermittelten personenbezogenen Daten dürfen Fragen nur an solche Patienten gerichtet werden, die in die Meldung an das Hamburgische Krebsregister eingewilligt hatten.

(2) Vor einer Befragung soll bei dem behandelnden Arzt oder, falls dieser nicht bekannt ist, bei dem Meldenden oder bei der Einrichtung, in der die Untersuchung oder Behandlung vorgenommen worden ist, nachgefragt werden, ob gegenwärtig Bedenken gegen eine Befragung des Patienten bestehen.

(3) Eine mündliche Befragung ist dem Patienten vorher schriftlich anzukündigen. Dabei ist er über den Zweck des Forschungsvorhabens zu unterrichten und darauf hinzuweisen, daß seine Mitarbeit bei der Befragung freiwillig ist. Bei einer schriftlichen Befragung sind diese Hinweise den Fragen voranzustellen oder beizufügen.

§ 11
Befragung Dritter

(1) Zur Durchführung eines Forschungsvorhabens mit aus dem Krebsregister übermittelten personenbezogenen Daten darf ein Dritter nur mit schriftlicher Einwilligung des Patienten befragt werden, es sei denn, daß die Erkrankung des Patienten bei der Befragung nicht erkennbar wird oder dem Dritten schon bekannt ist. Vor der Einwilligung ist der Patient über den Zweck des Forschungsvorhabens zu unterrichten.

(2) Ist der Patient verstorben, so kann die zuständige Behörde die nach Absatz 1 erforderliche Einwilligung erteilen, wenn der Zweck des Forschungsvorhabens eine Befragung Dritter erfordert und kein Grund zu der Annahme besteht, daß der Patient die Einwilligung verweigert hätte. 88

§ 12
Rechte des Betroffenen

(1) Der Betroffene kann Auskunft über die im Krebsregister zu seiner Person gespeicherten Daten verlangen. Abweichend von § 14 Absatz 1 des Hamburgischen Datenschutzgesetzes wird die Auskunft nur einem vom Betroffenen zu benennenden Arzt erteilt. Soweit es sich um eine Erkrankung des Mundes handelt, wird die Auskunft auch einem vom Betroffenen benannten Zahnarzt erteilt.

(2) Hatte der Patient in die Meldung an das Hamburgische Krebsregister nicht eingewilligt, so soll der vom Patienten benannte Arzt oder Zahnarzt mit dem Arzt oder Zahnarzt, der die Erkrankung gemeldet hat, erörtern, in welchem Umfang und auf welche Weise dem Patienten die Auskunft mitgeteilt werden kann.

(3) Das Verlangen Dritter an den Betroffenen auf Vorlage einer Bescheinigung über die Datenspeicherung und den Inhalt der gespeicherten Daten ist unzulässig.

(4) Der Patient kann seine Einwilligung in die Meldung an das Hamburgische Krebsregister jederzeit durch eine Erklärung diesem gegenüber widerrufen. Sind die Daten bereits im Krebsregister gespeichert worden, so sind die in § 5 Absatz 1 Nummer 1 genannten Daten zu löschen, soweit sie nicht zugleich nach § 5 Absatz 1 Nummer 2 gespeichert werden können. Sind diese Daten an Dritte übermittelt worden, so sind sie auch dort zu löschen.

(5) Der Patient kann für den Fall, daß eine Meldung ohne seine Einwilligung erfolgt, durch eine Erklärung gegenüber dem Hamburgischen Krebsregister der Speicherung der in § 5 Absatz 1 Nummer 1 genannten Daten, soweit sie nicht zugleich nach § 5 Absatz 1 Nummer 2 gespeichert werden können, widersprechen. Sind diese Daten bereits im Krebsregister gespeichert worden, so sind sie zu löschen. Absatz 4 Satz 3 gilt entsprechend

§ 13
Löschung

Die in § 5 Absatz 1 Nummer 1 Buchstaben a bis h genannten Daten sind innerhalb von 30 Jahren nach dem Tode des Patienten, spätestens jedoch 120 Jahre nach der Geburt des Patienten zu löschen. Angaben über das Gebiet, in dem die Wohnung lag, und über das Alter des Patienten bei seinem Wegzug oder Tode dürfen weiterhin gespeichert werden.

§ 14
Straftaten

Wer aus dem Krebsregister übermittelte personenbezogene Daten unbefugt weiterübermittelt, wird mit Freiheitsstrafe bis zu einem Jahr oder mit Geldstrafe bestraft.

§ 15
Ordnungswidrigkeiten

(1) Ordnungswidrig handelt, wer vorsätzlich oder fahrlässig

1. aus dem Krebsregister übermittelte personenbezogene Daten

   a) über den in der Entscheidung nach § 9 bezeichneten Umfang hinaus oder entgegen einer vollziehbaren Auflage nach § 9 Absatz 3 Satz 2 verarbeitet oder sonst nutzt,

   b) entgegen § 9 Absatz 5 Satz 3, § 12 Absatz 4 Satz 3 oder § 12 Absatz 5 Satz 3 nicht oder nicht rechtzeitig löscht,

   c) als Auftragnehmer entgegen § 9 Absatz 6 Satz 2 anderweitig verwendet oder länger als vom Auftraggeber bestimmt aufbewahrt,

2. entgegen § 10 Absatz 1 Fragen an Patienten richtet, die in die Meldung an das Hamburgische Krebsregister nicht eingewilligt hatten,

3. entgegen § 10 Absatz 3 eine mündliche Befragung dem Patienten nicht schriftlich ankündigt oder vor einer Befragung den Patienten nicht auf die Freiwilligkeit seiner Mitarbeit hinweist,

4. entgegen § 12 Absatz 3 die Vorlage einer Bescheinigung über die Datenspeicherung oder den Inhalt der gespeicherten Daten verlangt.

(2) Die Ordnungswidrigkeit kann mit einer Geldbuße bis zu fünftausend Euro geahndet werden.

§ 16
Überleitungsvorschriften

(1) Zur Berichtigung des Datenbestandes des Registers hat die Meldebehörde dem Hamburgischen Krebsregister auf Antrag einmalig die in § 4 Absatz 2 Satz 2 genannten Daten über die in Hamburg gemeldeten Einwohner zu übermitteln.

(2) §§ 5 und 13 Satz 1 sind auf die bei In-Kraft-Treten dieses Gesetzes im Krebsregister bereits gespeicherten Daten ab 1. Juli 1986 entsprechend anzuwenden. Bis zu diesem Zeitpunkt sind die vor In-Kraft-Treten dieses Gesetzes dem Hamburgischen Krebsregister übersandten Formblätter zu vernichten.

(3) § 12 Absatz 2 gilt entsprechend, wenn bei vor In-Kraft-Treten dieses Gesetzes im Krebsregister gespeicherten Daten nicht erkennbar ist, ob der Patient in die Meldung eingewilligt hatte.

§ 17
In-Kraft-Treten

Dieses Gesetz tritt am 1. Januar 1985 in Kraft. Abweichend davon tritt § 4 Absatz 1 am Tage nach der Verkündung in Kraft.

Ausgefertigt Hamburg, den 27. Juni 1984.
Der Senat

B)

Bundeskrebsregisterdatengesetz (BKRG)

BKRG

Ausfertigungsdatum: 10.08.2009

Vollzitat:

"Bundeskrebsregisterdatengesetz vom 10. August 2009 (BGBl. I S. 2707)"

Fußnote

(+++ Textnachweis ab: 18.8.2009 +++)

Das G wurde als Art. 5 des G v. 10.8.2009 I 2702 vom Bundestag mit Zustimmung des Bundesrates beschlossen. Es ist gem. Art. 13 Abs. 1 dieses G mWv 18.8.2009 in Kraft getreten.

§ 1 Einrichtung eines Zentrums für Krebsregisterdaten

(1) Beim Robert Koch-Institut wird ein Zentrum für Krebsregisterdaten eingerichtet.

(2) Zur fachlichen Beratung und Begleitung des Zentrums für Krebsregisterdaten wird ein Beirat eingerichtet. Die Mitglieder des Beirats werden vom Bundesministerium für Gesundheit berufen.

§ 2 Aufgaben

Das Zentrum für Krebsregisterdaten hat folgende Aufgaben:

1. die Zusammenführung, Prüfung der Vollzähligkeit und Schlüssigkeit sowie Auswertung der von den epidemiologischen Krebsregistern der Länder, im Nachfolgenden Landeskrebsregister genannt, nach § 3 Absatz 1 übermittelten Daten, die Durchführung eines länderübergreifenden Datenabgleichs zur Feststellung von Mehrfachübermittlungen und die Rückmeldung an die Landeskrebsregister,
2. die Erstellung, Pfege und Fortschreibung eines Datensatzes aus den von den Landeskrebsregistern nach § 3 Absatz 1 Nummer 1 bis 3 übermittelten und nach Nummer 1 geprüften Daten,
3. die regelmäßige Schätzung und Analyse
   a) der jährlichen Krebsneuerkrankungszahlen und Krebssterberaten,
   b) der Überlebensraten von Krebspatientinnen und Krebspatienten,
   c) der Stadienverteilung bei Diagnose der Krebskrankheit,
   d) weiterer Indikatoren des Krebsgeschehens, insbesondere Prävalenz, Erkrankungsrisiken und Sterberisiken sowie deren zeitliche Entwicklung,
4. die länderübergreifende Ermittlung regionaler Unterschiede bei ausgewählten Krebskrankheiten,
5. die Bereitstellung des Datensatzes nach Nummer 2 zur Evaluation gesundheitspolitischer Maßnahmen zur Krebsprävention, Krebsfrüherkennung, Krebsbehandlung und der Versorgung,
6. die Durchführung von Analysen und Studien zum Krebsgeschehen,
7. die Erstellung eines umfassenden Berichts zum Krebsgeschehen in der Bundesrepublik Deutschland alle fünf Jahre,
8. die Mitarbeit in wissenschaftlichen Gremien, europäischen und internationalen Organisationen mit Bezug zu Krebsregistrierung und Krebsepidemiologie.

§ 3 Datenübermittlung

(1) Die Landeskrebsregister übermitteln an das Zentrum für Krebsregisterdaten zur Erfüllung seiner Aufgaben nach § 2 spätestens bis 31. Dezember des übernächsten Jahres zu allen bis zum Ende eines Jahres erfassten Krebsneuerkrankungen folgende Daten:

1. Angaben zur Person:
   a) Geschlecht,
   b) Monat und Jahr der Geburt,
   c) die ersten fünf Zifern der Gemeindekennzifer des Wohnortes,
2. Angaben mit Bezug zur Tumordiagnose:
   a) Tumordiagnose nach dem Schlüssel der Internationalen Klassifkation der Krankheiten (ICD) in der jeweiligen vom Deutschen Institut für Medizinische Dokumentation und Information im Auftrag des Bundesministeriums für Gesundheit herausgegebenen und vom Bundesministerium für Gesundheit in Kraft gesetzten Fassung,
   b) Histologiebefund nach dem Schlüssel der aktuellen Internationalen Klassifkation der onkologischen Krankheiten (ICD-O),
   c) Lokalisation des Tumors, einschließlich der Angabe der Seite bei paarigen Organen (ICD-O),
   d) Monat und Jahr der ersten Tumordiagnose,
   e) frühere Tumorerkrankungen,
   f) Art der Diagnosesicherung: ausschließlich über die Todesursache (DCO), klinisch, zytologisch, histologisch, durch Obduktion, sonstige,
   g) Stadium der Erkrankung, insbesondere nach dem aktuellen TNM-Schlüssel zur Darstellung der Größe und des Metastasierungsgrades der Tumoren,
   h) Art der Primärtherapie,
3. Angaben im Sterbefall:
   a) Sterbemonat und Sterbejahr,
   b) Todesursache (Grundleiden),
   c) Durchführung einer Obduktion,
4. Kontrollnummer nach § 4.

(2) Die zuständigen Landesbehörden stellen sicher, dass die Daten nach Absatz 1 fächendeckend und vollzählig erhoben, nach Prüfung auf Mehrfachmeldungen bereinigt und vollständig in einem einheitlichen Format übermittelt werden. Die Daten klinischer Krebsregistrierung sind zu nutzen.

§ 4 Kontrollnummer, Datenabgleich

(1) Für den Datenabgleich der Landeskrebsregister untereinander und mit dem Zentrum für Krebsregisterdaten ist nach einem für alle Landeskrebsregister einheitlichen Verfahren, das die Wiederherstellung des Personenbezugs durch den Empfänger ausschließt, für jede an Krebs erkrankte Person eine eindeutige Kontrollnummer zu bilden.

(2) Die Kontrollnummer wird im Zentrum für Krebsregisterdaten getrennt von dem Datensatz nach § 3 Absatz 1 Nummer 1 bis 3 gespeichert und darf mit ihm nur zum Zweck des Datenabgleichs zusammengeführt werden. Nach Abschluss des Datenabgleichs, spätestens drei Jahre nach Übermittlung, ist die Kontrollnummer zu löschen.

(3) Das Bundesministerium für Gesundheit wird ermächtigt, durch Rechtsverordnung mit Zustimmung des Bundesrates Vorgaben für die Bildung der Kontrollnummer nach Absatz 1 sowie für den Umgang mit den vom Zentrum für Krebsregisterdaten festgestellten Mehrfachübermittlungen der Landeskrebsregister festzulegen.

§ 5 Datennutzung

(1) Das Zentrum für Krebsregisterdaten nutzt den Datensatz nach § 3 Absatz 1 Nummer 1 bis 3 zur Erfüllung seiner Aufgaben nach § 2 Nummer 3 bis 8.

(2) Das Zentrum für Krebsregisterdaten stellt den Landeskrebsregistern auf Verlangen den in Absatz 1 genannten Datensatz zur Nutzung zur Verfügung. Die Weiterleitung an Dritte bedarf eines Antrags nach Absatz 3.

(3) Das Zentrum für Krebsregisterdaten kann Dritten auf Antrag gestatten, den Datensatz nach Absatz 1 zu nutzen, soweit ein berechtigtes, insbesondere wissenschaftliches Interesse glaubhaft gemacht wird. Der Antrag ist, insbesondere zu Zweck und Umfang der Nutzung, zu begründen und wird dem Beirat zur Stellungnahme vorgelegt. Umfang der Nutzung und Veröffentlichungsrechte sind vertraglich zu regeln.

(4) Das Zentrum für Krebsregisterdaten veröffentlicht Auswertungen und stellt Auswertungswerkzeuge auf einer interaktiven Internetplattform zur Verfügung.

§ 6 Zusammenarbeit des Zentrums für Krebsregisterdaten mit den Landeskrebsregistern

(1) Das Zentrum für Krebsregisterdaten übermittelt dem zuständigen Landeskrebsregister die nach § 2 Nummer 1 geprüften Daten sowie das Ergebnis der Vollzähligkeitsprüfung innerhalb von sechs Monaten nach deren Übermittlung nach § 3 Absatz 1. Das Zentrum für Krebsregisterdaten unterrichtet die Landeskrebsregister über wesentliche Erkenntnisse, die sich aus der Datenauswertung nach § 2 Nummer 3 und 4 ergeben.

(2) Das Zentrum für Krebsregisterdaten veröffentlicht im Einvernehmen mit den Landeskrebsregistern alle zwei Jahre einen Bericht zu Häufgkeiten und Entwicklungen von Krebserkrankungen in der Bundesrepublik Deutschland.

(3) Das Zentrum für Krebsregisterdaten entwickelt gemeinsam mit den Landeskrebsregistern Methoden und Standards zur einheitlichen Datenerfassung und Datenübermittlung sowie zur Analyse der Daten weiter. Dabei ist der aktuelle Stand der Technik zu beachten.

C)

HAMBURGISCHES KREBSREGISTER
BEHÖRDE FÜR WISSENSCHAFT UND GESUNDHEIT
Billstraße 80, 20539 Hamburg
Telefon: 428 37-2211

Erhebungsbogen

Text in Druckbuchstaben/Zutreffendes bitte ankreuzen ☒

1. **Meldende Einrichtung/Abteilung:**

2. **Meldung mit Einwilligung des Patienten:** ☐
   Ausnahmemeldung nach § 2 Abs. 2 HmbKrebsRG ohne Einwilligung:
   (Dokumentation für Ihre Akte auf der Rückseite) ☐
   Patient verstorben am: Tag Monat Jahr ☐

Patient
3. **Nachname:**

4. **Vorname(n):**

5. **Frühere Namen:** (einschl. Geburtsname)

6. **Geburtsdatum:** Tag Monat Jahr

7. **Geschlecht:** männlich ☐ weiblich ☐

8. **Anschrift:**
   Straße Hausnummer

9. **Staatsangehörigkeit:** deutsch ☐ andere

10. **Rauchgewohnheiten:** Raucher ☐ Ex-Raucher ☐ seit nie geraucht ☐

11. **Datum der Erstdiagnosestellung:** Tag Monat Jahr

12. **Sitz des Primärtumors** (Tumorlokalisation, bitte in Klartext):
    und ggf. **ICD-10** C/D

13. **Seitenlokalisation:** beidseitig ☐ links ☐ rechts ☐ nicht zutreffend ☐

14. **TNM bei Erstdiagnose:** T N M **Wenn nicht vorhanden:**
    Stadium bei Erstdiagnose: in situ ☐ lokal ☐ regional ☐ Fernmetastasen ☐

15. **Breslow beim Melanom:** ,

16. **Gleason-Score bei Prostatakarzinom:** +

17. **Patho-anatomische Tumordiagnose:** (Tumor-Histologie, bitte in Klartext):
    und ggf. M- /

18. **Diagnosesicherung:** klin. ☐ zytol. ☐ biopt. ☐ histol. ☐ autopt. ☐

19. **Histopath. Grading bei Erstdiagnose:** G 1 ☐ G 2 ☐ G 3 ☐ G 4 ☐ T-Zell. ☐ B-Zell. ☐ Null-Zell. ☐ unbek. ☐

Bei weiterem Primärtumor bitte zweiten Bogen ausfüllen außer bei Basaliomen

20. **Vor- und Nachname des meldenden Arztes (bitte leserlich in Druckbuchstaben ausfüllen)**

21. **Datum:** Tag Monat Jahr 2 0

22. **Unterschrift:**

02/05

Original an das Hamburgische Krebsregister
Kopie: Patientenkarte/Kartei

D)

IACR

IARC

International Agency for Research on Cancer
World Health Organization
International Association of Cancer Registries
European Network of Cancer Registries

INTERNATIONAL RULES FOR MULTIPLE PRIMARY CANCERS (ICD-O Third Edition)

IARC, Lyon, 2004

Internal Report No. 2004 / 02

WORKING GROUP

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MULTIPLE PRIMARY NEOPLASMS

Cancer registries use different rules for defining multiple primaries when registering cancer cases. The rules given here are for reporting data on cancer incidence and survival, so that cancer risk and outcome are comparable between different populations.

For collection, it is recommended that registries collect and register more detailed data and some suggestions are given in the Recommendations for Recording which follow. Such cases should be collapsed to conform to the international rules for analysis.

RULES FOR REPORTING INCIDENCE AND SURVIVAL

1. The recognition of the existence of two or more primary cancers does not depend on time.

2. A primary cancer is one that originates in a primary site or tissue and is not an extension, nor a recurrence, nor a metastasis.

3. Only one tumour shall be recognised as arising in an organ or pair of organs or tissue.
   Some groups of codes are considered to be a single organ for the purposes of defining multiple tumours. These topography code groups are shown in Table 1.

   Multifocal tumours # – that is, discrete masses apparently not in continuity with othe primary cancers originating in the same primary site or tissue, for example bladder # – are counted as a single cancer.

4. Rule 3 does not apply in two circumstances:

   4.1 Systemic (or multicentric) cancers potentially involving many different organs are only counted once in any individual. These are Kaposi sarcoma (group 15 in Table 2) and tumours of the haematopoietic system (groups 8-14 in Table 2).

   4.2 Neoplasms of different morphology should be regarded as multiple cancers (even if they are diagnosed simultaneously in the same site).

   If the morphological diagnoses fall into one category in Table 2, and arise in the same primary site, they are considered to be the same morphology for the purpose of counting multiple primaries. If the morphological diagnoses fall into two or more of the categories in Table 2, even if they concern the same site, the morphology is considered to be different, and two or more cases should be counted.

   Single tumours containing several different histologies which fall into one histological group in Table 2 are registered as a single case, using the numerically highest ICD-O morphology code.

   If, however, one morphology is not specific (groups (5), (14) and (17)) and a specific morphology is available, the case should be reported with the specific histology and the non-specific diagnosis should be ignored.

Table 1. Groups of topography codes considered a single site in the definition of multiple cancers

ICD-O-2/3 site code	Label	If diagnosed at different times, code first diagnosis. If diagnosed at the same time use codes given below.
C01	Base of tongue	
C02	Other and unspecified parts of tongue	C02.9
C00	Lip	
C03	Gum	
C04	Floor of mouth	
C05	Palate	
C06	Other and unspecified parts of mouth	C06.9
C09	Tonsil	
C10	Oropharynx	
C12	Pyriform sinus	
C13	Hypopharynx	
C14	Other and ill-defined sites in lip, oral cavity and pharynx	C14.0
C19	Rectosigmoid junction	
C20	Rectum	C20.9
C23	Gallbladder	
C24	Other and unspecified parts of biliary tract	C24.9
C33	Trachea	
C34	Bronchus and lung	C34.9
C40	Bones, joints and articular cartilage of limbs	
C41	Bones, joints and articular cartilage of other and unspecified sites	C41.9
C65	Renal pelvis	
C66	Ureter	
C67	Bladder	
C68	Other and unspecified urinary organs	C68.9

Table 2. Groups of malignant neoplasms considered to be histologically # 'different# ' for the purpose of defining multiple tumours (adapted from Berg JW. Morphologic classification of human cancer. In: Schottenfeld D & Fraumeni JF Jr. Cancer Epidemiology and Prevention, 2 nd edition, Chapter 3 of Section 1: Basic Concepts. Oxford, New York, Oxford University Press, pp. 28-44 , 1996).

Group	
Carcinomas	
1. Squamous and transitional cell carcinoma	8051-8084, 8120-8131
2. Basal cell carcinomas	8090-8110
3. Adenocarcinomas	8140-8149, 8160-8162, 8190-8221, 8260-8337, 8350-8551, 8570-8576, 8940-8941
4. Other specific carcinomas	8030-8046, 8150-8157, 8170-8180, 8230-8255, 8340-8347, 8560-8562, 8580-8671
(5) Unspecified carcinomas (NOS)	8010-8015, 8020-8022, 8050
6. Sarcomas and soft tissue tumours	8680-8713, 8800-8921, 8990-8991, 9040-9044, 9120-9125, 9130-9136, 9141-9252, 9370-9373, 9540-9582
7. Mesothelioma	9050-9055
Tumours of haematopoietic and lymphoid tissues	
8. Myeloid	9840, 9861-9931, 9945-9946, 9950, 9961-9964, 9980-9987
9. B-cell neoplasms	9670-9699, 9728, 9731-9734, 9761-9767, 9769, 9823-9826, 9833, 9836, 9940
10. T-cell and NK-cell neoplasms	9700-9719, 9729, 9768, 9827-9831, 9834, 9837, 9948
11. Hodgkin lymphoma	9650-9667
12. Mast-cell Tumours	9740-9742
13. Histiocytes and Accessory Lymphoid cells	9750-9758
(14) Unspecified types	9590-9591, 9596, 9727, 9760, 9800-9801, 9805, 9820, 9832, 9835, 9860, 9960, 9970, 9975, 9989
15. Kaposi sarcoma	9140
16. Other specified types of cancer	8720-8790, 8930-8936, 8950-8983, 9000-9030, 9060-9110, 9260-9365, 9380- 9539
(17) Unspecified types of cancer	8000-8005

RECOMMENDATIONS FOR RECORDING

1. Two tumours of different laterality, but of the same morphology, diagnosed in paired organs (e.g. breast) should be registered separately unless stated to have originated from a single primary.

   Exceptions to this rule are:
   a) Tumours of the ovary (of the same morphology)
   b) Wilm# 's tumour (nephroblastoma) of the kidney.
   c) Retinoblastoma

   which should be recorded as a single bilateral registration when they occur on both sides.

   Reminder: tumours in paired organs of completely different histology should be registered separately.

2. Cancers which occur in any 4th character subcategory of colon (C18) and skin (C44) should be registered as multiple primary cancers.

E)

Table 10: Immigration and Emigration to and from Hamburg 1995-1999 according to Age Groups (Women)

Age Groups	1995		1996		1997		1998		1999	
	Immigration	Emigration	Immigration	Emigration	Immigration	Emigration	Immigration	Emigration	Immigration	Emigration
0-17	5 149	4 896	4 787	4 900	4 819	5 227	4 792	5 476	5 233	5 102
18-64	27 251	23 278	26 944	23 902	26 980	25 393	28 021	26 345	30 042	25 006
65+	1 412	2 211	1 234	2 242	1 315	2 561	1 325	2 726	1 411	2 570
Total	**33 812**	**30 385**	**32 965**	**31 044**	**33 114**	**33 181**	**34 138**	**34 547**	**36 686**	**32 678**

Table 11: Immigration and Emigration to and from Hamburg 2000-2009 according to Age Groups (Women)

Age Groups	2000		2001		2002		2003		2004	
	Immigration	Emigration	Immigration	Emigration	Immigration	Emigration	Immigration	Emigration	Immigration	Emigration
0-4	1 605	1 955	1 449	1 877	1 441	1 861	1 419	1 925	1 311	1 877
05-09	1 216	1 220	1 207	1 198	1 075	1 267	993	1 227	1 025	1 323
10-14	1 134	996	1 123	1 017	1 052	1 065	939	1 045	886	1 016
15-19	3 091	1 549	3 112	1 518	3 190	1 555	3 035	1 517	3 098	1 680
20-24	8 910	4 294	9 534	4 669	10 139	5 203	9 991	5 217	10 663	5 673
25-29	7 401	4 908	7 463	5 048	7 278	5 423	7 369	5 365	8 203	6 288
30-34	5 194	5 214	5 072	4 940	4 628	5 059	4 316	4 660	4 500	5 176
35-39	2 876	3 258	3 058	3 314	2 883	3 716	2 814	3 426	2 926	3 923
40-44	1 672	1 794	1 875	1 842	1 771	2 136	1 786	2 003	1 961	2 443
45-49	1 206	1 116	1 219	1 153	1 213	1 383	1 178	1 263	1 262	1 646
50-54	849	965	856	971	816	1 045	867	991	911	1 235
55-59	**613**	**807**	**488**	**737**	**557**	**871**	**582**	**753**	**544**	**944**
60-64	**532**	**866**	**536**	**882**	**546**	**909**	**488**	**778**	**519**	**948**
65-69	**300**	**447**	**318**	**488**	**292**	**541**	**344**	**557**	**390**	**752**
70-74	**258**	**389**	**235**	**345**	**212**	**358**	**226**	**293**	**202**	**556**
75-79	**287**	**439**	**238**	**403**	**245**	**406**	**229**	**418**	**223**	**578**
55-79	**1 990**	**2 948**	**1 815**	**2 855**	**1 852**	**3 085**	**1 869**	**2 799**	**1 878**	**3 778**
80-84	180	392	235	399	233	476	258	483	258	652
85+	296	700	275	709	271	729	289	675	304	819
Total	**37 620**	**31 309**	**38 293**	**31 510**	**37 842**	**34 003**	**37 123**	**32 596**	**39 186**	**37 529**

Age Groups	2005		2006		2007		2008		2009	
	Immigration	Emigration	Immigration	Emigration	Immigration	Emigration	Immigration	Emigration	Immigration	Emigration
0-4	1 314	1 674	1 387	1 600	1 304	1 596	1 428	1 664	1 274	1 651
05-09	960	1 209	970	1 229	890	1 033	998	1 197	875	1 079
10-14	866	891	846	898	786	842	924	1 067	929	903
15-19	3 019	1 611	2 946	1 516	2 962	1 565	3 082	1 954	3 116	1 614
20-24	9 515	5 094	9 407	5 115	9 622	4 804	10 152	5 762	10 395	6 096
25-29	7 798	5 970	8 339	6 037	8 951	5 866	9 319	7 440	9 215	7 479
30-34	4 282	4 442	4 462	4 351	4 602	4 242	4 876	5 164	4 690	5 256
35-39	2 755	3 223	2 676	3 017	2 777	2 856	2 708	3 416	2 623	3 357
40-44	1 915	2 119	1 925	2 006	2 018	2 046	2 102	2 618	2 093	2 745
45-49	1 321	1 349	1 285	1 375	1 453	1 405	1 467	1 917	1 603	2 186
50-54	853	965	909	970	855	957	926	1 297	973	1 137
55-59	**573**	**801**	**592**	**741**	**603**	**698**	**630**	**958**	**612**	**823**
60-64	**449**	**799**	**404**	**708**	**437**	**674**	**427**	**786**	**439**	**719**
65-69	**402**	**588**	**387**	**560**	**432**	**552**	**350**	**644**	**400**	**601**
70-74	**240**	**377**	**247**	**368**	**272**	**352**	**251**	**481**	**293**	**509**
75-79	**246**	**331**	**246**	**342**	**191**	**302**	**217**	**357**	**230**	**359**
55-79	**1 910**	**2 896**	**1 876**	**2 719**	**1 935**	**2 578**	**1 875**	**3 226**	**1 974**	**3 011**
80-84	222	494	228	433	239	406	264	440	242	433
85+	274	675	262	691	256	648	294	678	318	726
Total	**37 004**	**32 612**	**37 518**	**31 957**	**38 650**	**30 844**	**40 415**	**37 840**	**40 320**	**37 673**

F)

Table 12: Histology Codes for Women in Hamburg with > 1 breast cancer (ICD-O-3) according to International Rules for Multiple Primary Cancers of the IARC, 2004

No.	Histology Code 1		Histology Code 2	
1	9120/3	hemangiosarcoma	8522/3	infiltrating duct and lobular CA
2	9120/3	hemangiosarcoma	8500/3	infiltrating duct CA
3	8070/3	squamous cell CA, NOS	8500/3	infiltrating duct CA
4	9120/3	hemangiosarcoma	8520/3	lobular CA, NOS
5	8810/3	fibrosarcoma, NOS	8500/3	infiltrating duct CA
6	8980/3	carcinosarcoma, NOS	8500/3	infiltrating duct CA
7	9120/3	hemangiosarcoma	8500/3	infiltrating duct CA
8	8520/3	lobular CA, NOS	8980/3	carcinosarcoma, NOS
9	8500/3	infiltrating duct CA	8230/3	solid CA, NOS
10	8500/3	infiltrating duct CA	8980/3	carcinosarcoma, NOS
11	8850/3	liposarcoma, NOS	8074/3	squamous cell CA, spindle cell
12	8800/3	sarcoma, NOS	8575/3	metaplastic CA, NOS
13	8072/3	squamous cell CA, large cell, non- keratotic	8530/3	inflammatory CA
14	8523/3	infiltrating duct CA mixed with other types of carcinoma	8071/3	squamous cell CA, keratotic type, NOS

G)

Table 13: Leading 8 Histology Codes (ICD-O-3) in Absolute Numbers in Breast Cancer: Analysis of 5-Year Partial Prevalences in Women, Hamburg, Index Date: 31.12 of Respective Time Period, Diagnoses 01/01/1995-31/12/2009

Histology Code (ICD-O-3)	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
infiltrating duct carcinoma (8500/3)	2817	2957	3118	3305	3360	3506	3609	3729	3711	3957	4307
lobular carcinoma, NOS (8520/3)	790	866	927	964	980	905	841	763	701	710	786
infiltrating duct and lobular carcinoma (8522/3)	158	140	141	147	144	196	219	218	246	253	261
infiltrating duct carcinoma mixed with other types of carcinoma (8523/3)	24	27	27	40	54	66	83	102	120	166	205
carcinoma, NOS (8010/3)	450	436	389	360	299	276	208	174	164	136	122
tubular adenocarcinoma(8211/3)	154	162	152	151	133	114	95	86	61	49	43
infiltrating lobular carcinoma mixed with other types of carcinoma (8524/3)	3	4	4	6	8	16	26	33	43	52	43
mucinous adenocarcinoma (8480/3)	29	30	36	52	66	62	61	57	50	42	42

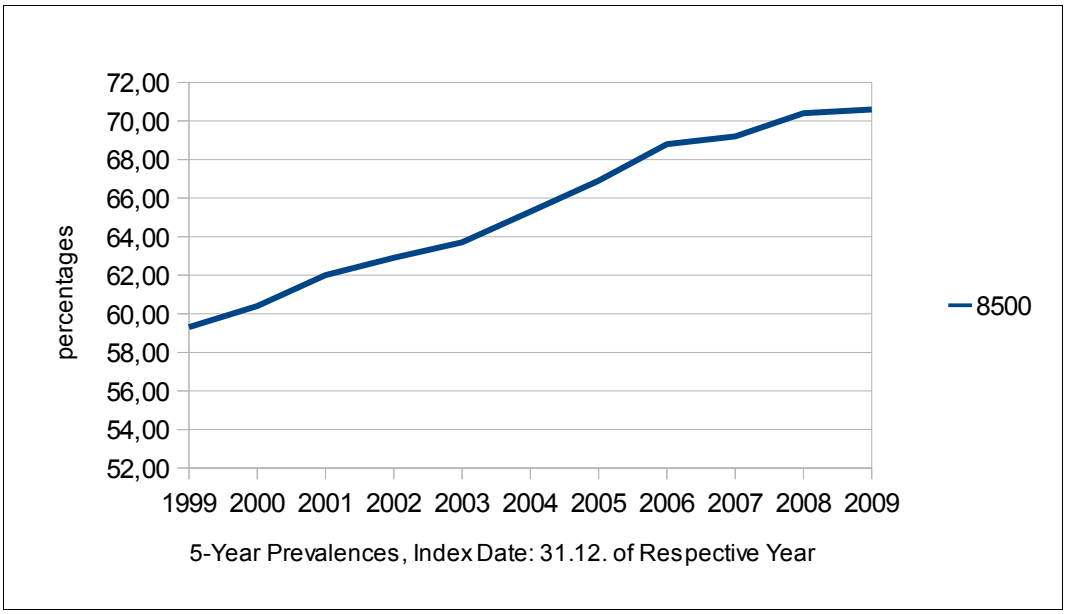

Figure 15: Leading Histology Code 8500/3 'invasive duct carcinoma' (ICD-O-3) in percent of all cancer cases existent in Hamburg residents alive at the respective index date of 5-Year Partial Prevalences (diagnoses from 1995-2009)

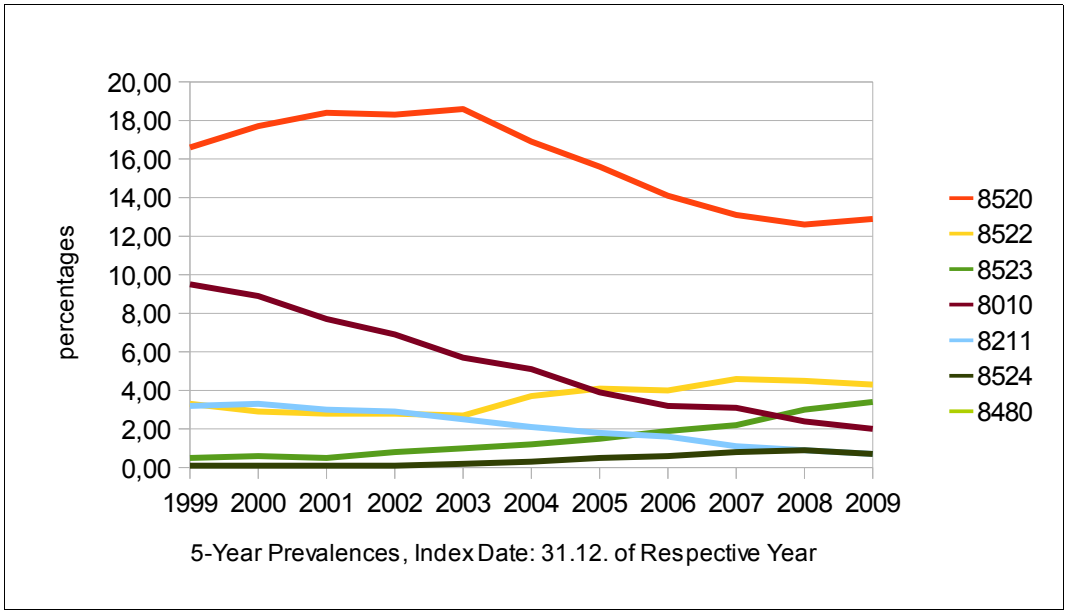

Figure 16: 2nd to 8th Leading Histology Codes (ICD-O-3) in percent of all cancer cases existent in Hamburg residents alive at the respective index date of 5-Year Partial Prevalences (diagnoses from 1995-2009)

H)

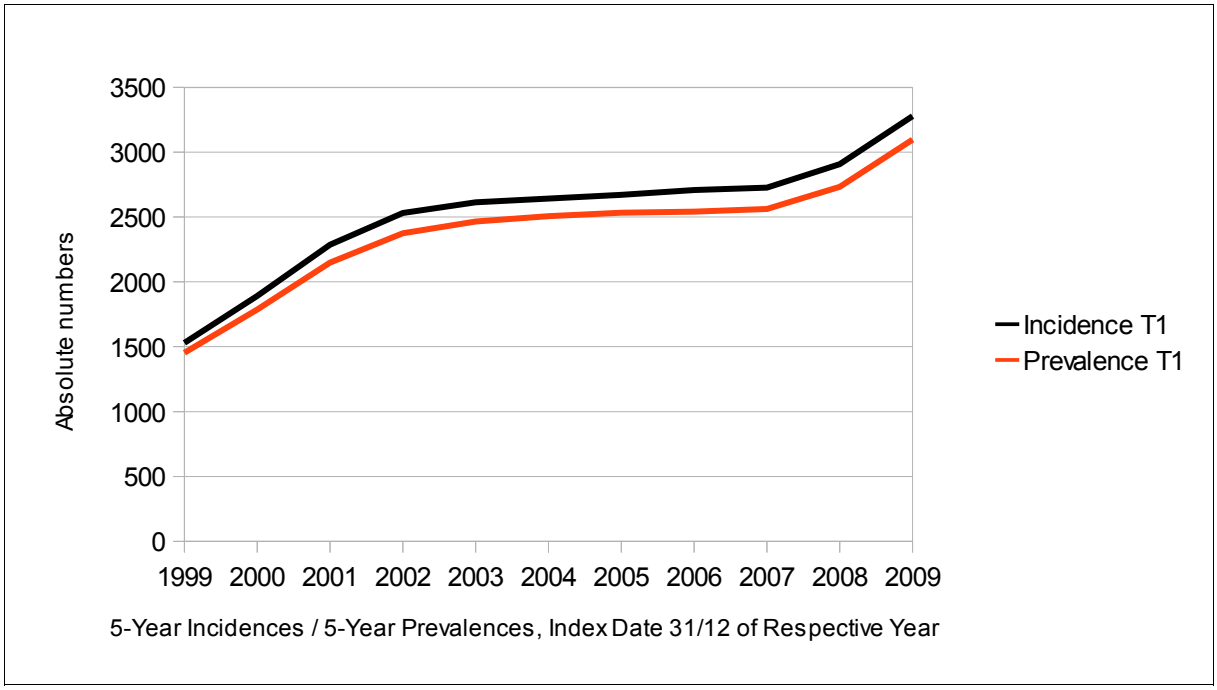

Figure 17: 5-Year Incidences and 5-Year Prevalences of Tumour Size according to TNM-Classification, Breast Cancer in Women, Hamburg, Diagnoses from 01/01/1995 to 31/12/2009

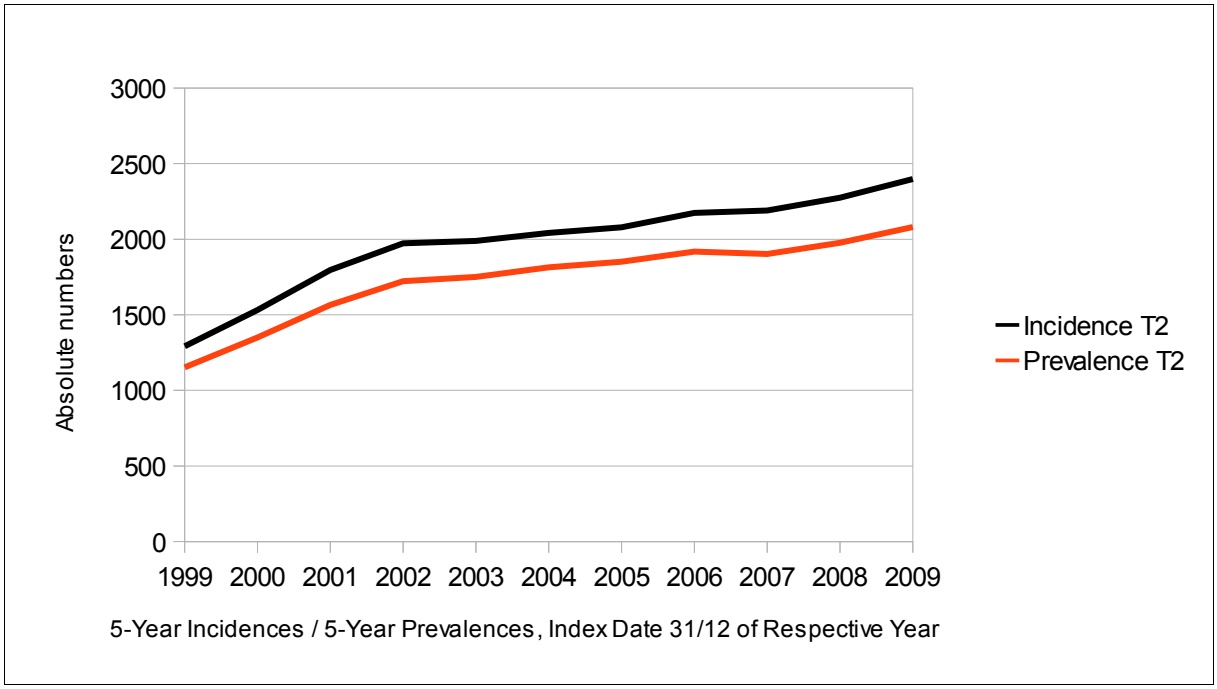

Figure 18: 5-Year Incidences and 5-Year Prevalences of Tumour Size according to TNM-Classification, Breast Cancer in Women, Hamburg, Diagnoses from 01/01/1995 to 31/12/2009

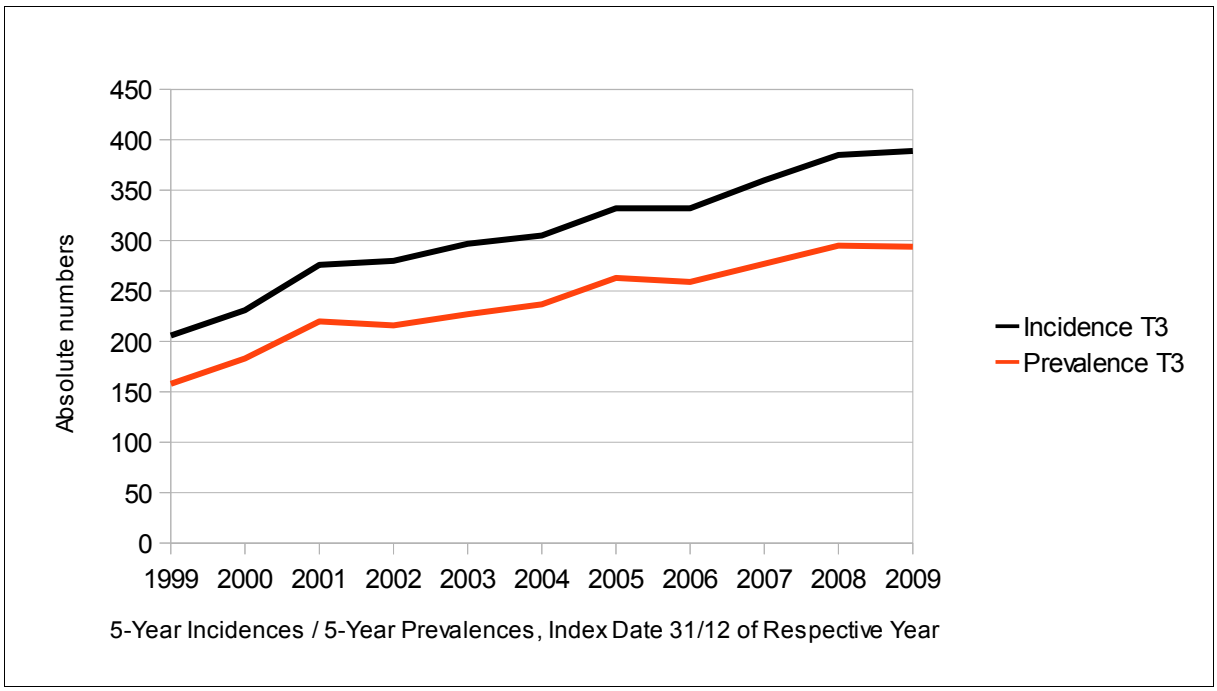

Figure 19: 5-Year Incidences and 5-Year Prevalences of Tumour Size according to TNM-Classification, Breast Cancer in Women, Hamburg, Diagnoses from 01/01/1995 to 31/12/2009

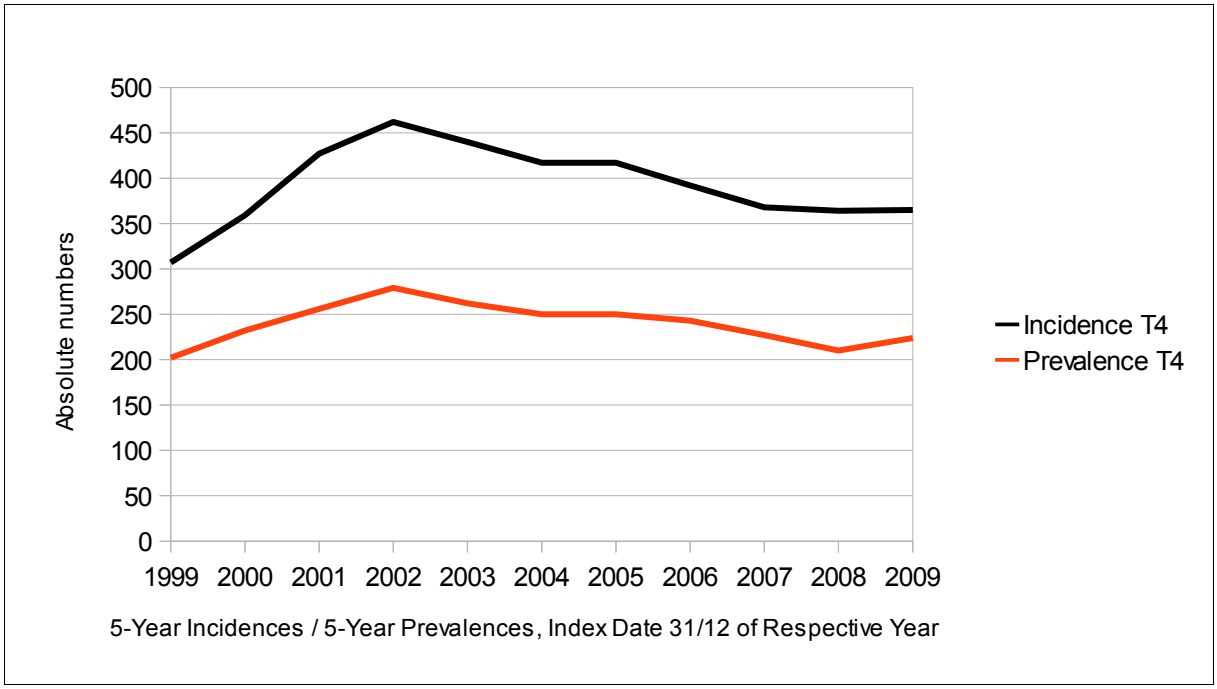

Figure 20: 5-Year Incidences and 5-Year Prevalences of Tumour Size according to TNM-Classification, Breast Cancer in Women, Hamburg, Diagnoses from 01/01/1995 to 31/12/2009

I)

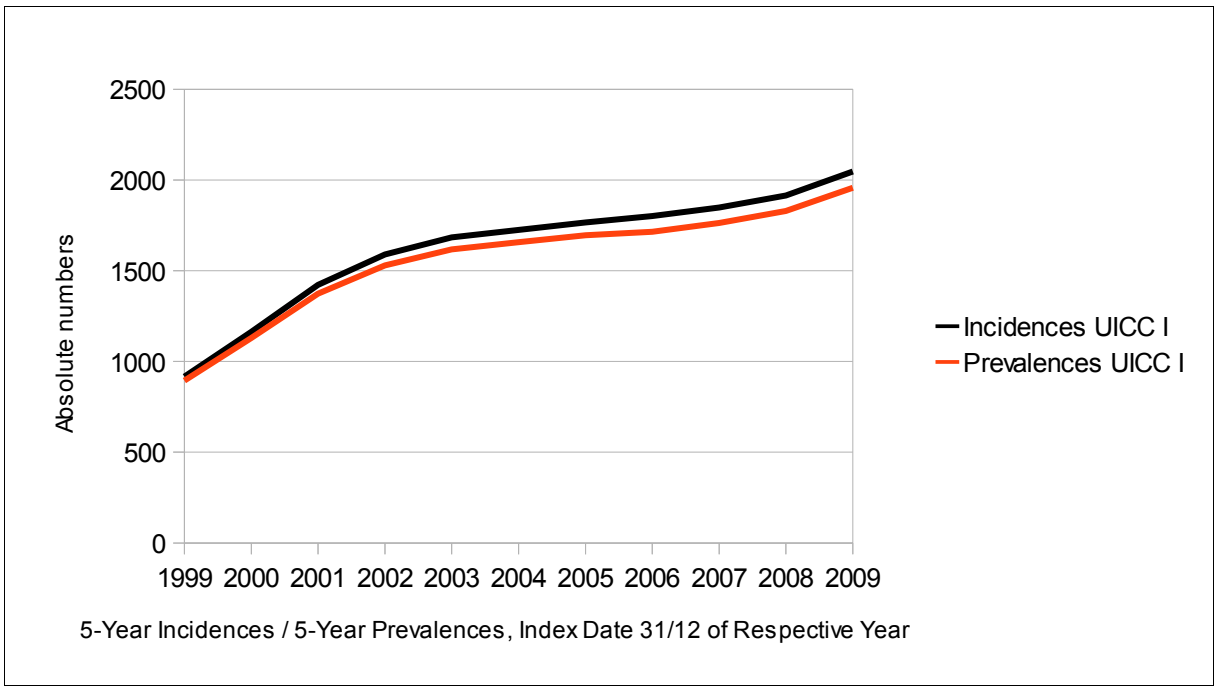

Figure 21: 5-Year Incidences and 5-Year Prevalences of UICC Stages, Breast Cancer in Women, Hamburg, Diagnoses from 01/01/1995 to 31/12/2009

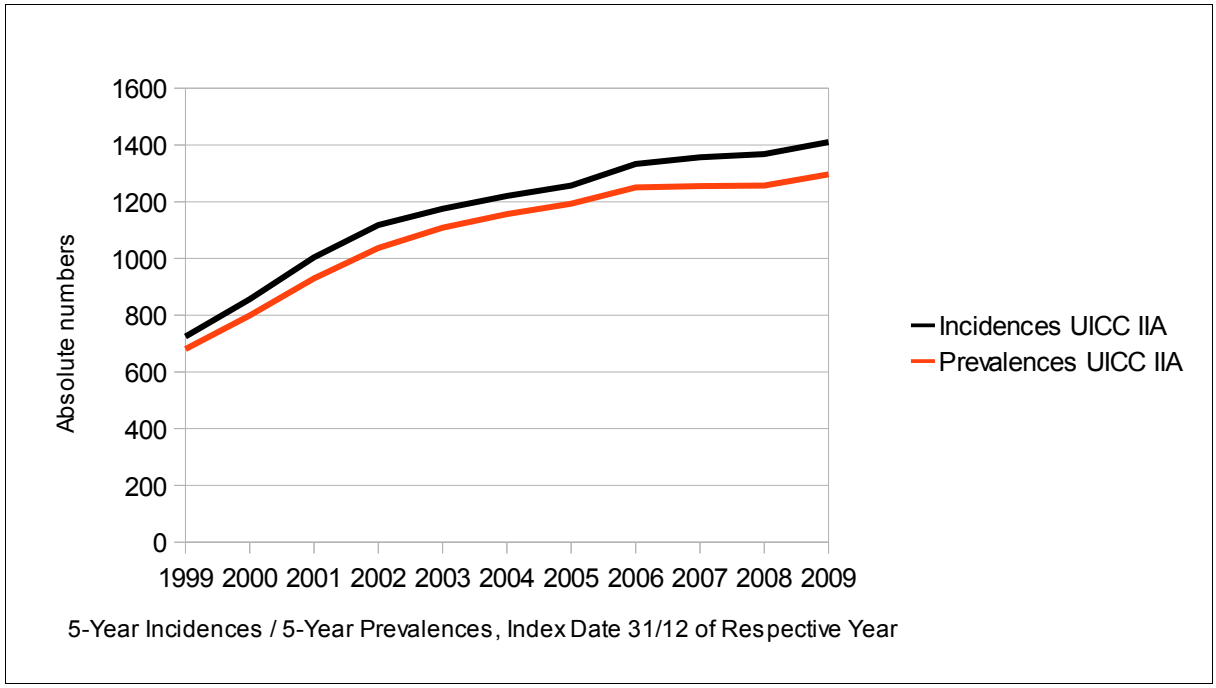

Figure 22 : 5-Year Incidences and 5-Year Prevalences of UICC Stages, Breast Cancer in Women, Hamburg, Diagnoses from 01/01/1995 to 31/12/2009

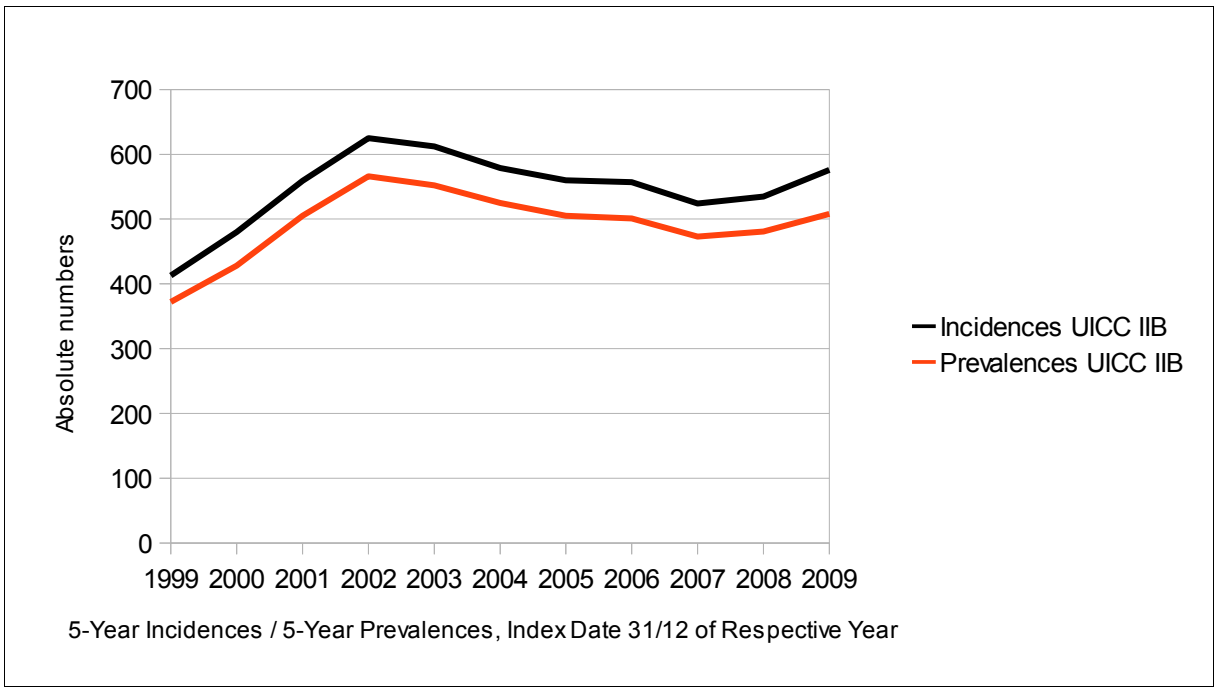

Figure 23: 5-Year Incidences and 5-Year Prevalences of UICC Stages, Breast Cancer in Women, Hamburg, Diagnoses from 01/01/1995 to 31/12/2009

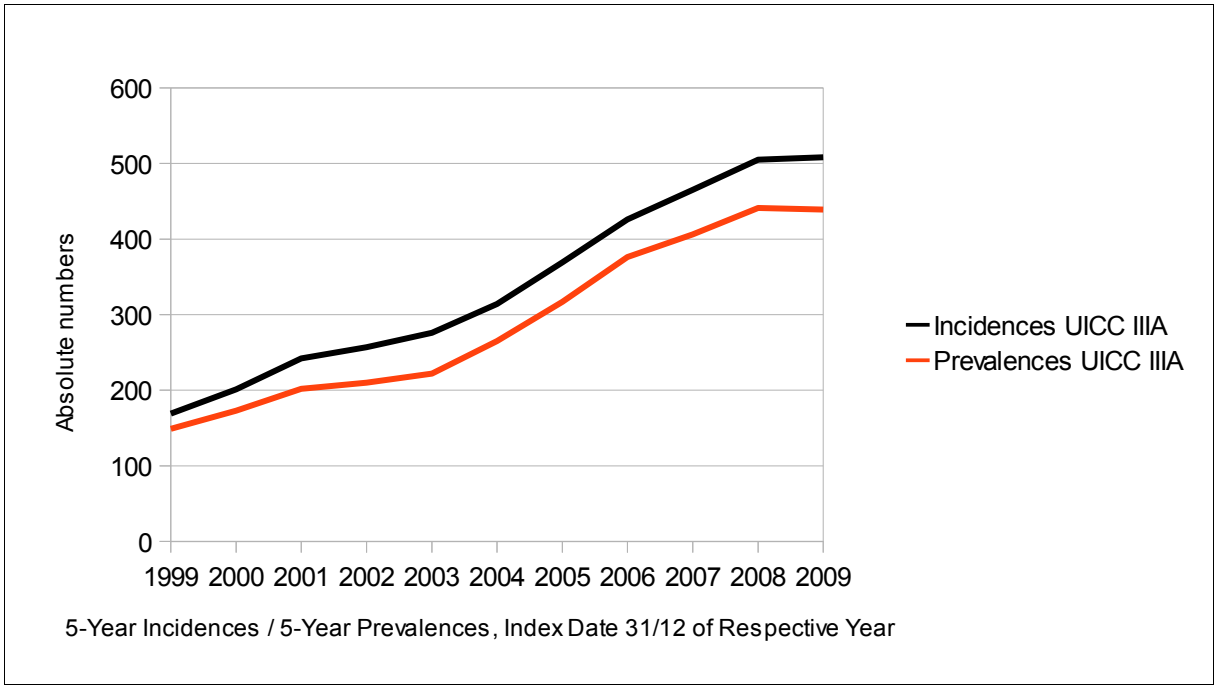

Figure 24: 5-Year Incidences and 5-Year Prevalences of UICC Stages, Breast Cancer in Women, Hamburg, Diagnoses from 01/01/1995 to 31/12/2009

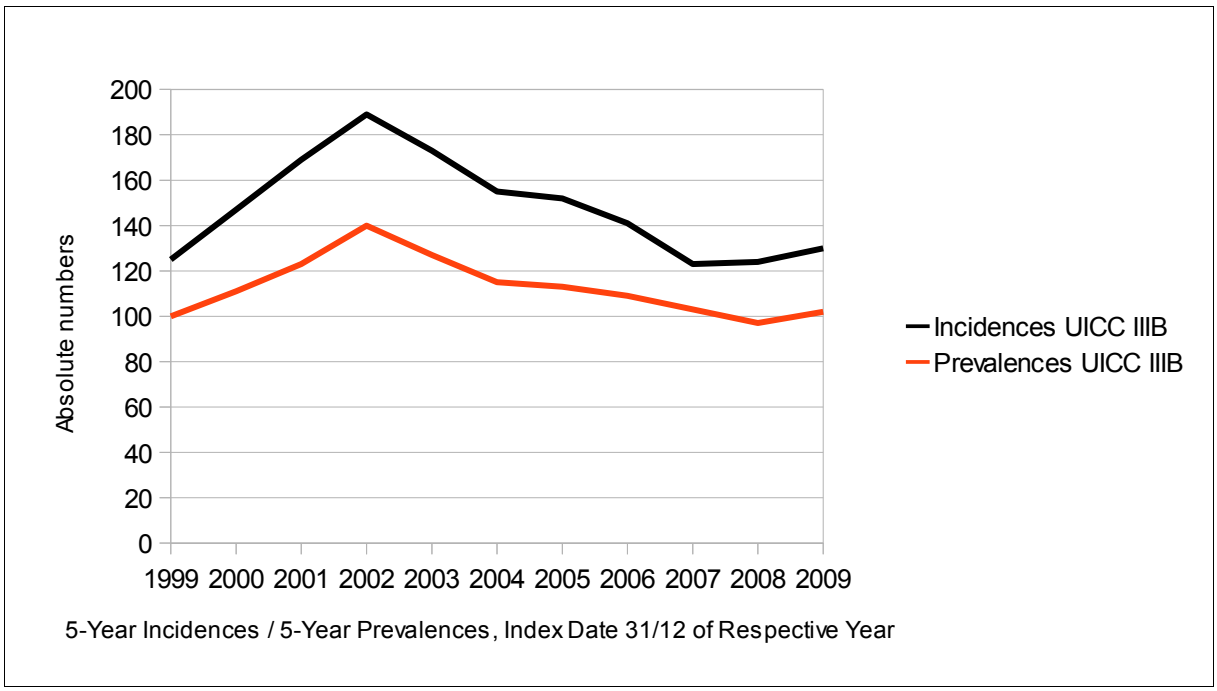

Figure 25: 5-Year Incidences and 5-Year Prevalences of UICC Stages, Breast Cancer in Women, Hamburg, Diagnoses from 01/01/1995 to 31/12/2009

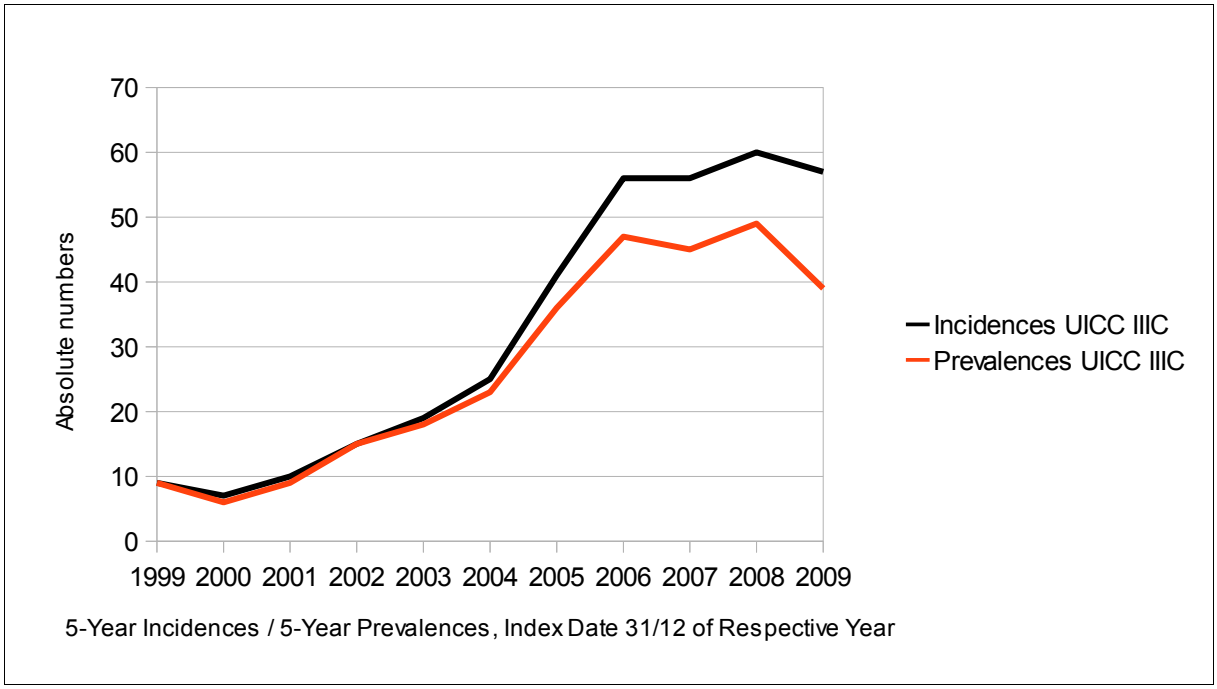

Figure 26: 5-Year Incidences and 5-Year Prevalences of UICC Stages, Breast Cancer in Women, Hamburg, Diagnoses from 01/01/1995 to 31/12/2009

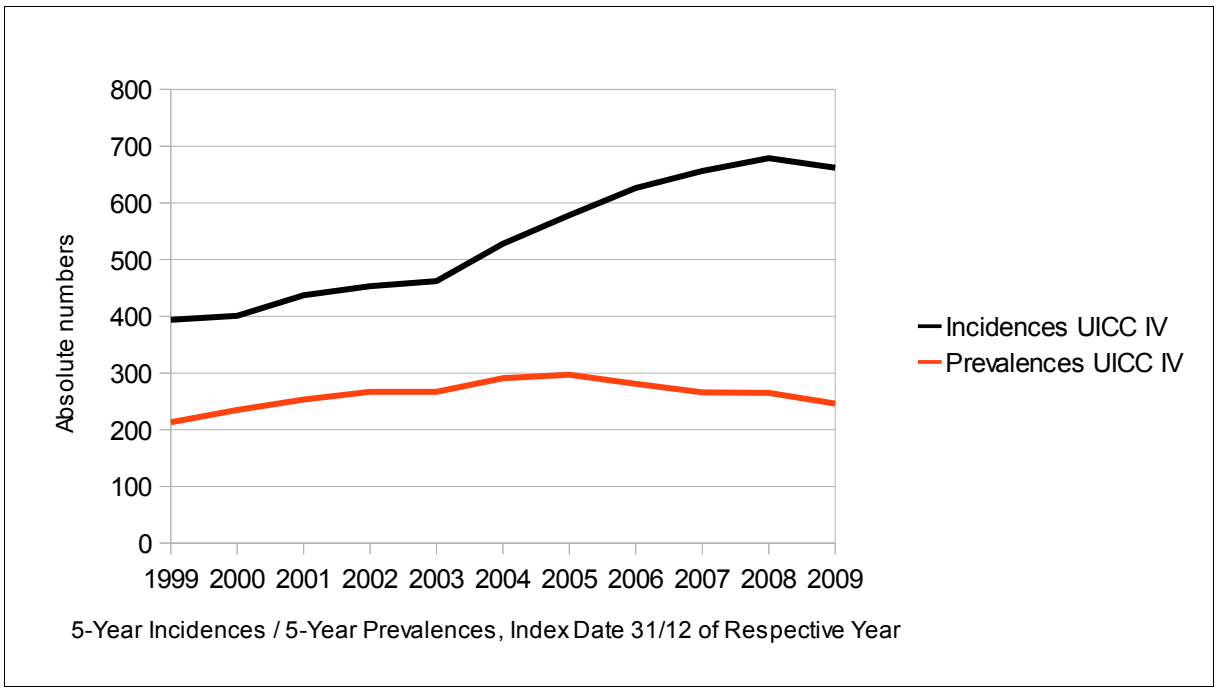

Figure 27: 5-Year Incidences and 5-Year Prevalences of UICC Stages, Breast Cancer in Women, Hamburg, Diagnoses from 01/01/1995 to 31/12/2009

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Table 14: Percentual Increase in the respective 'Time-Since-Diagnosis'-Groups in 10-Year Partial Prevalences, Breast Cancer in Women, Hamburg, Diagnoses 01/01/1995-31/12/2009

Percentual Growth of 'Time-Since-Diagnosis'-Groups from 2004 to 2009 (1o-Year Partial Prevalences)						Total Increase
<=1Year-Since-Diagnosis	0.60	6.09	3.35	12.96	13.32	41.19
2-3 Years-Since-Diagnosis	-7.15	-0.09	3.10	5.28	8.18	8.93
4-5 Years-Since-Diagnosis	9.65	-1.88	-8.14	-1.65	5.26	2.32
6-10 Years-Since-Diagnosis	3.71	3.69	5.94	0.93	-0.03	14.96