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Global and regional estimates of cancer mortality and incidence by site: II. results for the global burden of disease 2000

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Abstract

Background: Mortality estimates alone are not sufficient to understand the true magnitude of cancer burden. We present the detailed estimates of mortality and incidence by site as the basis for the future estimation of cancer burden for the Global Burden of Disease 2000 study.

Methods: Age- and sex- specific mortality envelope for all malignancies by region was derived from the analysis of country life-tables and cause of death. We estimated the site-specific cancer mortality distributions from vital records and cancer survival model. The regional cancer mortality by site is estimated by disaggregating the regional cancer mortality envelope based on the mortality distribution. Estimated incidence-to-mortality rate ratios were used to back calculate the final cancer incidence estimates by site.

Results: In 2000, cancer accounted for over 7 million deaths (13% of total mortality) and there were more than 10 million new cancer cases world wide in 2000. More than 60% of cancer deaths and approximately half of new cases occurred in developing regions. Lung cancer was the most common cancers in the world, followed by cancers of stomach, liver, colon and rectum, and breast. There was a significant variations in the distribution of site-specific cancer mortality and incidence by region.

Conclusions: Despite a regional variation, the most common cancers are potentially preventable. Cancer burden estimation by taking into account both mortality and morbidity is an essential step to set research priorities and policy formulation. Also it can be used for setting priorities when combined with data on costs of interventions against cancers.

Background

Mortality estimates alone are not sufficient to understand the true magnitude and trends of cancer problems and to evaluate the interventions against cancer, in particular preventive programmes [1]. Although cancer is still a fatal disease in many developing countries [2], the disability

among cancer survivors should be taken into account since there is a growing evidence that cancer survival in some developing countries are continuously improving [3,4] and, when setting priorities, cancer control interventions are compared with other health interventions which aims at reducing morbidity [5]. For this reason, estimates

of both mortality and incidence of cancer by region are essential inputs for setting research and intervention priorities in cancer control policies.

The present study is aimed at estimating the magnitude of global and regional cancer mortality and incidence as a part of detailed analysis of all-cause levels and cause of death distributions for 191 Member States of the World Health Organization (WHO) for the Global Burden of Disease 2000 (GBD 2000) study [6]. GBD 2000 employs a time-based composite measure of disease burden in terms of disability-adjusted life years (DALYs) which consist of years lived with disability (morbidity) and years of life lost (mortality). To estimate the burden from each disease sequelae, detailed information of incidence, duration, and mortality by age, sex and region is required [5]. This study serves as a basis for the future estimation of cancer burden for the GBD 2000.

The GBD 2000 project classified WHO's 6 regions into 17 sub regions according to the levels of child and adult mortality (Table 1). On the basis of available published information on age-, sex-, and site-specific cancer incidence and survival, we developed an algorithm to estimate region-specific overall cancer mortality, and site-specific survival, death distributions, and incidence for the year 2000.

In the previous paper, we presented the cancer survival model as a key input to estimate the distribution of cancer deaths by site for the regions where mortality data are either scarce or unavailable and tested its performance and validity [7]. In this paper, we present a detailed approach to estimating mortality and incidence of cancer by site and the results of mortality and incidence estimation by site for the year 2000.

Table 1: Global Burden of Disease 2000 (GBD 2000) project: regions and sub regions

WHO region	Mortality stratum	Sub region	WHO Member States
AFRO	D	AfrD	Algeria, Angola, Benin, Burkina Faso, Cameroon, Cape Verde, Chad, Comoros, Equatorial Guinea, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Madagascar, Mali, Mauritania, Mauritius, Niger, Nigeria, Sao Tome And Principe, Senegal, Seychelles, Sierra Leone, Togo, Djibouti, Somalia, Sudan
AFRO	E	AfrE	Botswana, Burundi, Central African Republic, Congo, Côte d'Ivoire, Democratic Republic Of The Congo, Eritrea, Ethiopia, Kenya, Lesotho, Malawi, Mozambique, Namibia, Rwanda, South Africa, Swaziland, Uganda, United Republic of Tanzania, Zambia, Zimbabwe
AMRO	A	AmrA	Canada, United States Of America
AMRO	B	AmrB	Antigua And Barbuda, Argentina, Bahamas, Barbados, Belize, Brazil, Chile, Colombia, Costa Rica, Dominica, Dominican Republic, El Salvador, Grenada, Guyana, Honduras, Jamaica, Mexico, Panama, Paraguay, Saint Kitts And Nevis, Saint Lucia, Saint Vincent And The Grenadines, Suriname, Trinidad And Tobago, Uruguay, Venezuela Cuba
AMRO	D	AmrD	Bolivia, Ecuador, Guatemala, Haiti, Nicaragua, Peru
EMRO	B	EmrB	Bahrain, Cyprus, Iran (Islamic Republic Of), Jordan, Kuwait, Lebanon, Libyan Arab Jamahiriya, Oman, Qatar, Saudi Arabia, Syrian Arab Republic, Tunisia, United Arab Emirates
EMRO	D	EmrD	Egypt, Iraq, Morocco, Yemen
EURO	A	EurA	Andorra, Austria, Belgium, Croatia, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Luxembourg, Malta, Monaco, Netherlands, Norway, Portugal, San Marino, Slovenia, Spain, Sweden, Switzerland, United Kingdom
EURO	B1	EurB1	Albania, Bosnia And Herzegovina, Bulgaria, Georgia, Poland, Romania, Slovakia, The Former Yugoslav Republic Of Macedonia, Turkey, Yugoslavia
EURO	B2	EurB2	Armenia, Azerbaijan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan
EURO	C	EurC	Belarus, Estonia, Hungary, Kazakhstan, Latvia, Lithuania, Republic of Moldova, Russian Federation, Ukraine
SEARO	B	SearB	Indonesia, Sri Lanka, Thailand Malaysia, Philippines Brunei Darussalam, Singapore
SEARO	D	SearD	Bangladesh, Bhutan, India, Maldives, Nepal Afghanistan, Pakistan
WPRO	A	WprA	Australia, Japan, New Zealand
WPRO	B1	WprB1	China, Mongolia, Republic Of Korea DPR Korea
WPRO	B2	WprB2	Cambodia, Lao People's Democratic Republic, Viet Nam Myanmar
WPRO	B3	WprB3	Cook Islands, Fiji, Kiribati, Marshall Islands, Micronesia (Federated States Of), Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu

Material and Methods

Overview of analysis

The Global Burden of Disease 2000 (GBD 2000) study deals with the problem of systemic bias in cause-specific mortality by estimating total mortality for each Member State, starting from an analysis of the overall mortality envelope for each region, in order to ensure that the cause-specific estimates add to the total all cause mortality by age and sex and that there is not systematic over- or under-estimation or double counting of deaths. This regional cause-specific mortality envelope serves as an upper bond of mortality from a certain cause and partly ensures the internal consistency among incidence, prevalence and mortality rates [6]. The approaches to estimating mortality and incidence of cancer by site also follows this process (Figure 1).

Firstly, we obtained the age- and sex- specific mortality envelope for all malignancies by region derived from the analysis of country life-tables and cause of death models in each region. Secondly, we estimated the site-specific cancer mortality distributions from vital records or cancer survival models depending on the availability and quality of detailed cause of death data. Cancer sites for which survival was calculated were: mouth and pharynx (ICD-10 C00-C14), oesophagus (C15), stomach (C16), colon and rectum (C18-C21), liver (C22), pancreas (C25), trachea, bronchus and lung (C33-C34), melanoma (C43), female breast (C50), cervix uterine (C53), corpus uteri (C54-55), ovary (C56), prostate (C61), bladder (C67), lymphomas and multiple myeloma (C81-C90, C96), leukaemia (C91-C95), and other malignant neoplasms (balance of ICD-10 C00-C97). The GBD 2000 assigns Kaposi's sarcoma and non-Hodgkin lymphomas (NHL) attributable to HIV/AIDS among AIDS sequela and their burden is included separately with HIV/AIDS. Thirdly, the final regional cancer mortality by site is estimated by disaggregating the regional cancer envelope based on the mortality distribution by site. Finally, we applied the incidence-to-mortality rate ratios to back calculate the final cancer incidence estimates by site.

GBD 2000 regional mortality estimates by age, sex, and cause

Complete or incomplete vital registration data together with sample registration systems now cover 74% of global mortality in 128 countries. Survey data and indirect demographic techniques provide information on levels of child and adult mortality for the remaining 26% of estimated global mortality. The available sources of mortality data for the WHO sub regions of the GBD 2000 are summarised in Table 1.

Causes of death for the WHO sub regions and the world have been estimated based on data from national vital

registration systems that capture about 17 million deaths annually. In addition, information from sample registration systems, population laboratories and epidemiological analyses of specific conditions have been used to improve estimates of the cause of death patterns [6,8,9]. As a general rule, vital registration data, suitably corrected for ill-defined coding and probable systematic biases in certifying deaths to non-specific vascular, cancer and injury codes were used to estimate the cause of death pattern. The GBD 2000 approach adjusts the cause-specific mortality to include a proportion of deaths coded to ill-defined causes in vital registration data and redistributes these deaths pro-rata among broader communicable and non-communicable causes.

Cause of death data have been carefully analysed to take into account incomplete coverage of vital registration in countries and the likely differences in cause of death patterns that would be expected in the uncovered and often poorer sub-populations [10]. For countries lacking sufficient vital registration data, cause of death models were used to firstly estimate the maximum likelihood distribution of deaths across the broad categories of communicable, non-communicable and injuries, based on estimated total mortality rates and income [8]. A regional model pattern of specific causes of death was then constructed based on local vital registration and verbal autopsy data, and this proportionate distribution was then applied within each broad cause group. Finally, the resulting estimates were then adjusted based on other epidemiological evidence from specific disease studies. Methods used to estimate global all-cause and cause-specific mortality from these data are described elsewhere [6].

In the GBD 1990 [5], deaths coded to ICD-9 195-199 (i.e., malignant neoplasm of other and unspecified sites including those whose point of origin cannot be determined, secondary and unspecified neoplasm) were redistributed pro-rata across all malignant neoplasm categories within each age-sex group, so that the category 'Other malignant neoplasms' includes only malignant neoplasms of other specified sites. Reviews of the cancer registry and methods of diagnosis suggest that four sites (mouth and pharynx, liver, breast and cervix uteri) where there did not appear to be any significant mis-coding of cancer deaths, since these can be diagnosed clinically without any further diagnostic tests even in developing regions [11]. Accordingly, the cancer garbage code redistribution algorithm was revised for the GBD 2000 to redistribute cancer deaths in ICD C76-C80 pro-rata across the sites other than the four sites above.

Estimation of cancer mortality and incidence

Given the regional cancer mortality envelope by age and sex, the site-specific distributions of cancer mortality are

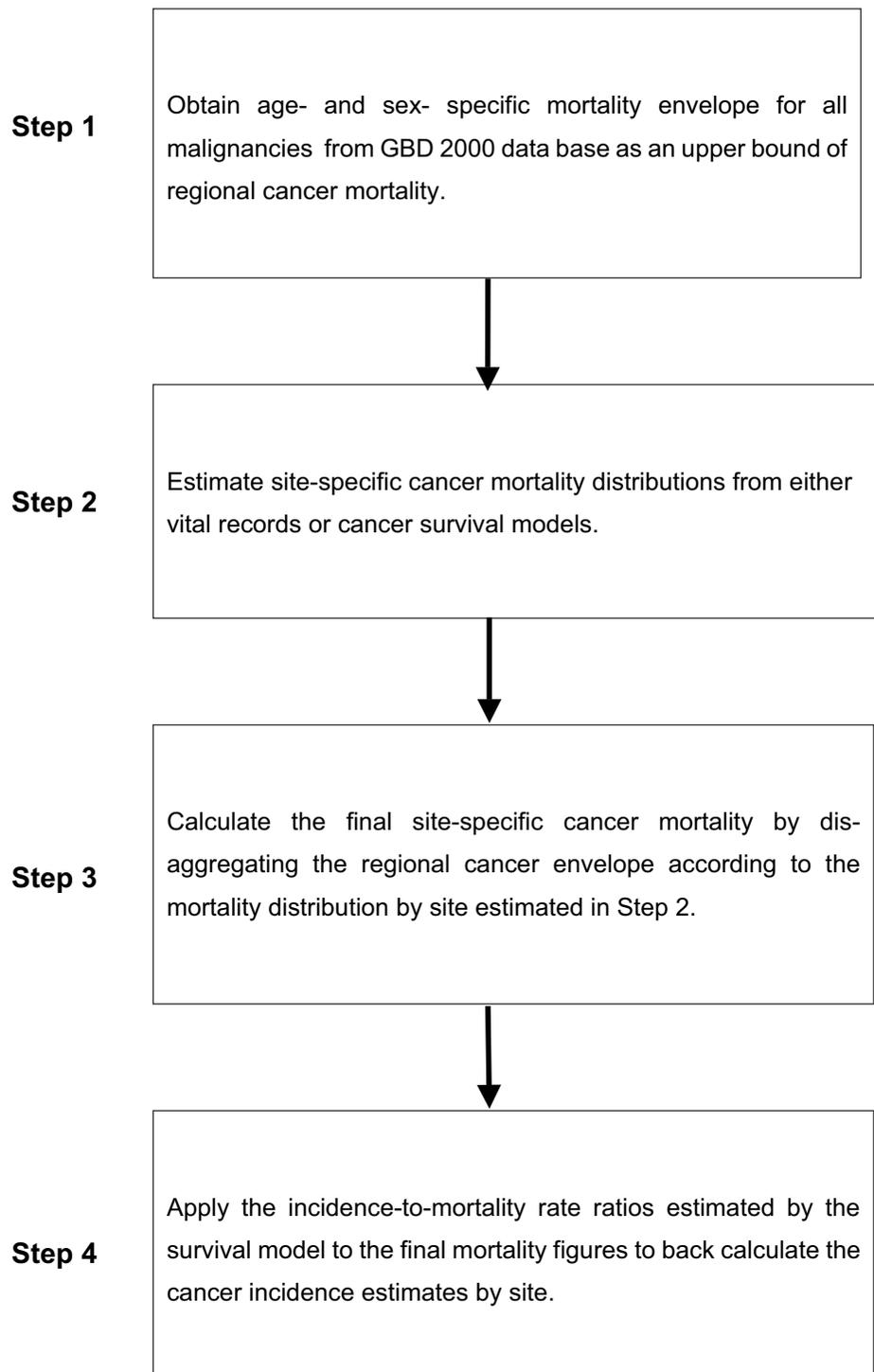


Figure 1
Approaches to estimating global and regional cancer mortality and incidence by site for the Global Burden of Disease 2000 (GBD 2000)

necessary to disaggregate the estimated total cancer deaths by age and sex for each region. The approaches to estimating mortality distributions were different depending on the availability and quality of data on detailed causes of death.

Direct estimates of the site-specific distributions of cancer mortality were possible for the regions where established vital registration records with high coverage and ICD-coding are available, including countries in the A sub regions (AmrA, EurA and WprA) and countries in AmrB, EurB1, EurB2 and EurC [6]. For the other regions of the world (AfrD, AfrE, AmrD, EmrB, EmrD, SearB, SearD, WprB1, WprB2 and WprB3 sub regions), a site-specific model for relative interval survival adjusted for each region was developed and applied to the regional incidence estimated by International Agency for Research on Cancer (IARC) to calculate the mortality distribution by site for the year 2000 [7,12]. The region-specific incidence estimates of the Globocan 2000 was adjusted to ensure the consistency with the GBD 2000 definitions [7]. Our survival model and adjusted incidence estimates of the Globocan 2000 were primarily used to estimate the distribution, but not the magnitude, of cancer by site, sex, and age group.

The final site-specific cancer mortality was then estimated by multiplying age- and sex- specific regional cancer mortality envelope by estimated cancer mortality distribution by site. The cancer survival model is flexible enough to yield the survival estimates of various age, years and period as well as mean duration of time of cancer by site [7]. We estimated incidence-to-mortality rate ratios at each age group from the survival model and, by using the final cancer mortality, applied the ratios to back calculate the final incidence by age and sex for each cancer site in all regions of the world for the year 2000.

Results

Cancer mortality by region

The GBD 2000 classifies the cause of deaths into three broad categories: communicable disease, non-communicable disease, and injuries. In 2000, approximately 56 million deaths occurred world wide and non-communicable disease accounted for 58% of total number of deaths, followed by communicable disease (33%) and injuries (9%) (Figure 2). Cancer was estimated to account for over 7 million deaths (13% of total mortality and 22% of non-communicable disease mortality) world wide in 2000, only preceded by cardiovascular diseases (29 % of total) and infectious and parasitic diseases (19%). Depending on the extent of health transition, cancer mortality as a proportion of total mortality differed substantially by region, from less than 5% in AfrE to approximately 30% in WprA sub region.

Tables 2,3,4,5 show the regional estimates of total number of deaths and age-specific mortality rates of all cancers for the GBD 2000. More than 60% of cancer deaths occurred in developing regions, particularly in SearD (mainly India) and WprB1 (mainly China) sub regions due to their large population size. On average global cancer mortality rates among males and females were 128.2 and 104.6 per 100,000, respectively. Not surprisingly crude mortality rates from all cancers vary significantly and are much higher in developed regions (AmrA, EurA, and WprA). However, since age-specific mortality rate is generally higher in developing regions, regional mortality rates, age-standardised to the world population, showed less variations compared to crude mortality rates and higher mortality rates were observed in regions such as AfrD, AfrE, AmrB, EurC, and WprB (Figure 3).

Cancer mortality envelope was disaggregated by applying the distribution of cancer mortality by site estimated from both the detailed analysis of vital records and the use of survival model and incidence data from the International Agency for Research on Cancer (IARC). Tables 6 and 7 show the estimated global and regional numbers of deaths and age-standardised mortality rates by sex for 17 cancer sites. Generally higher mortality rates were observed in developing regions except cancers of lung and pancreas which are more prevalent in developed regions and highly fatal.

Tables 8 and 9 represent the ranking of the number of deaths by cancer site in the world and three selected sub regions: a high child and adult mortality/low income region (AfrE), a very low child and adult mortality/high income region (EurA), and a low child and adult mortality/middle income region (SearB). Lung cancer was the leading cause of cancer deaths in the world, accounting for 17% of total cancer mortality, followed by cancers of stomach (12% of total), liver (9%), colon and rectum (9%), and breast (7%). In males, lung, stomach, and liver cancers were the three most common cause of cancer deaths. The leading cause of cancer deaths among females was breast but lung cancer was already the second largest cause of cancer deaths.

There is a significant variation in the distribution of site-specific cancer mortality by region. In AfrE, the leading causes of cancer mortality in males and females were liver and cervix uteri cancers, respectively, both of which are primarily due to viral infections. Liver cancer accounted for approximately one quarter of all male cancer deaths and cervical cancer accounted for more than one-third of female cancer deaths. In EurA, the pattern of cancer mortality distribution is a typical one observed in industrialised countries: lung, colorectal, and prostate cancers accounted for a large proportion of male cancer mortality

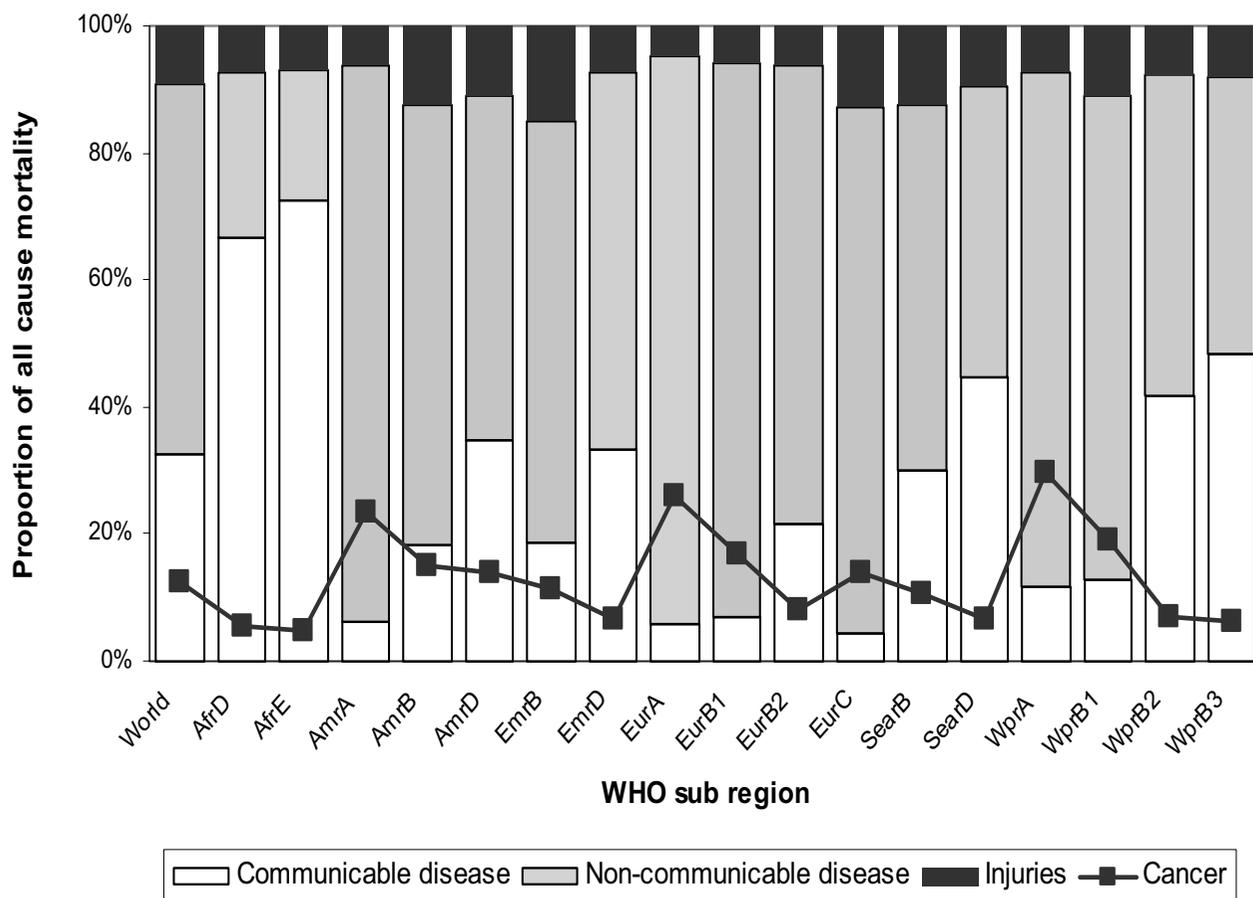


Figure 2
Regional distribution of mortality by cause, 2000

while breast, colorectal, and lung cancers were major causes among females. Site-specific cancer mortality distribution in SearB lay somewhere between the two sub regions, although lung and breast cancers were already leading causes of cancer deaths in males and females, respectively.

Cancer incidence by site

Regional incidence was back calculated from multiplying mortality by site-specific incidence-to-mortality rate ratios by age, sex, and region. As shown in Table 10, (age-standardised) incidence-to-mortality rate ratio was generally higher in cancers with relatively better prognosis including lymphoma, leukaemia, and cancers of colon and rectum, breast, uterus, and ovary. As a result, the new cases of such cancers as a proportion of total new cases were higher than the proportion of mortality from same cancers. Although this pattern was consistent across the

regions, the ratios varied substantially by age, sex, and region (data not shown).

Tables 11,12,13 show the regional estimates of total new cases and age-specific incidence rates of all cancers in 2000. More than 10 million new cancers cases occurred world wide. Due to the differences in survival by region, estimated incidence-to-mortality rate ratios were generally much higher in developed regions and the proportion of cancer incidence in developing regions was approximately 50% of total cancer incidence in the world. Despite their much smaller population size, the number of new cases in AmrA and EurA are comparable to those in SearD and WprB1. On average global cancer incidence rates among males and females were 169.7 and 171.1 per 100,000, respectively (Figure 4). Regional age-standardised incidence rates also suggest that female incidence was slightly higher than male incidence in developing regions, particularly in

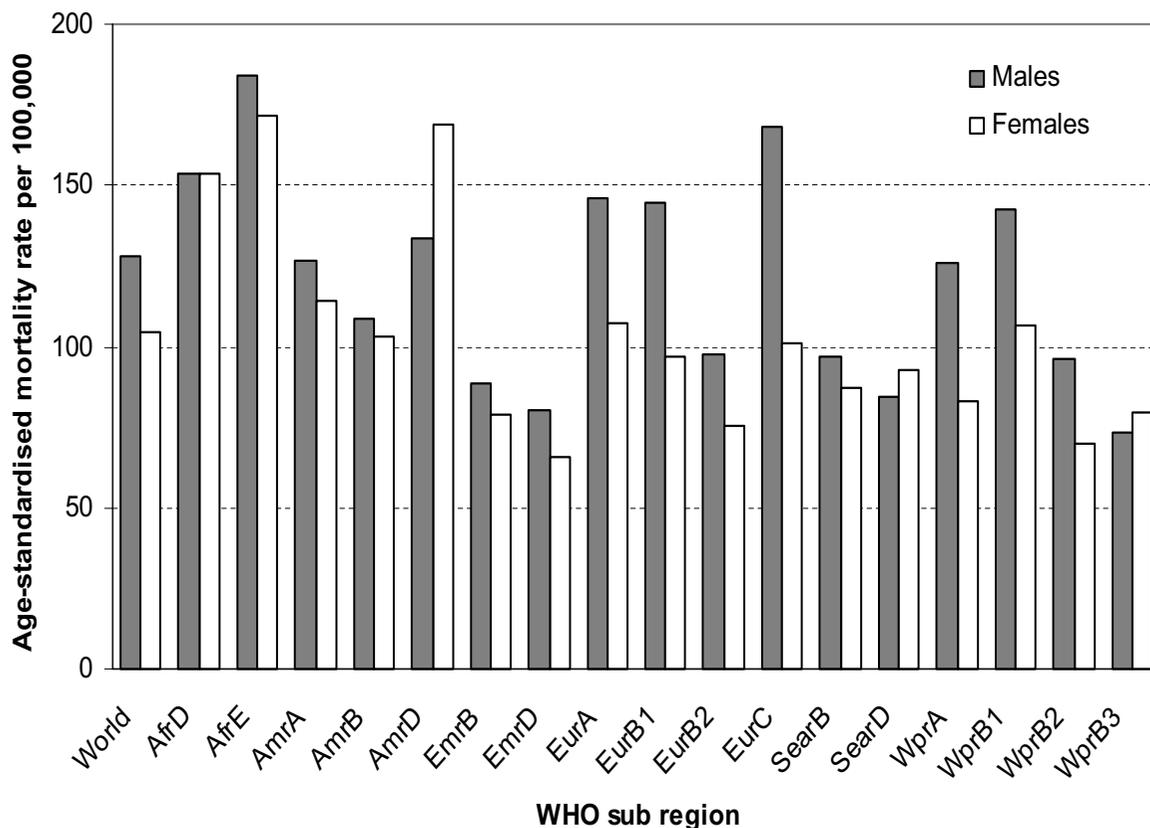


Figure 3
Age-standardised mortality rate from all cancers by region, 2000

AmrD where the number of deaths female cancers was high. On the other hand, male and female incidence rates were almost the same in all A sub regions (AmrA, EurA, and WprA).

Estimated global and regional numbers of new cases and age-standardised incidence rates for 17 cancer sites by sex are shown in Tables 14 and 15. As in mortality distribution, there is a significant variations in the distribution of site-specific cancer incidence by region (Tables 16 and 17). The distribution of cancer incidence was almost similar to that of mortality: lung cancer was the most common cancer in the world in 2000, accounting for 13% of total cancer mortality, followed by cancers of stomach (10% of total), liver (10%), colon and rectum (10%), and breast (6%). The variations in the distribution of site-specific new cases of cancer by region were also similar to those observed in mortality distribution. In all regions,

compared to proportion of total mortality, the proportion of lung cancer decreased while that of colon and rectum, breast, uterus and prostate increased, suggesting the difference in survival by cancer site as suggested above.

Discussion

Various attempts have been made to quantify the global burden of cancer and to estimate site-specific cancer mortality and morbidity [1,12-15]. More recently, the efforts made by the International Agency for Research on Cancer (IARC) have led to the Globocan 2000 estimates, which has also used information on incidence and survival to estimate cancer death for the year 2000 from various sources including cancer registries [12,13]. The analyses reported here have built extensively on the IARC work to synthesis and estimate cancer mortality and incidence distributions by site for all regions of the world. Compared to the estimates of the Globocan 2000, the GBD 2000 estimates

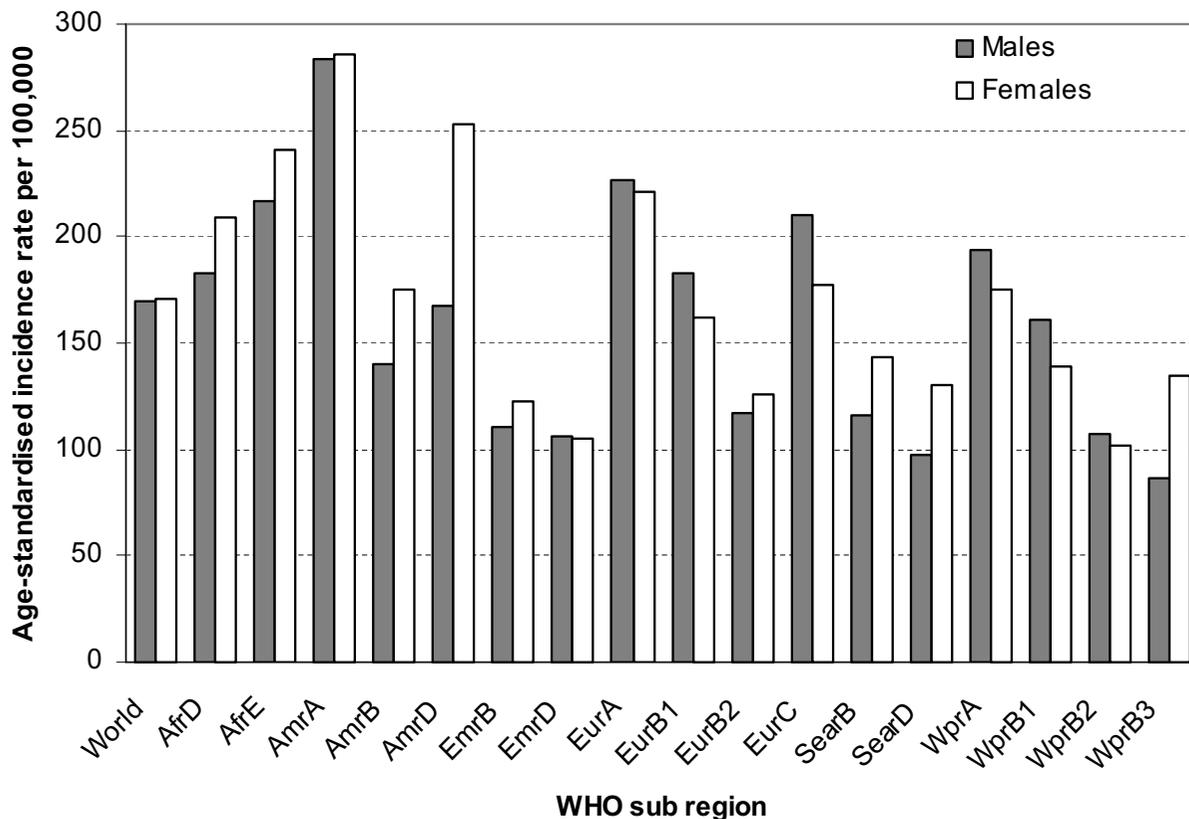


Figure 4
Age-standardised incidence rate from all cancers by region, 2000

for global cancer mortality and incidence are 11% and 3% higher, respectively. Although the overall difference in terms of proportion is small, the absolute difference between the two estimates remains relatively large. This difference is predominantly due to a substantially large difference in the AFRO, EMRO, and SEARO regions.

Some researchers suggest that model-based estimates of cancer mortality in GBD 1990 bear little relation to the actual profile of cancer recorded at the regional registries [1,16]. The proposed approach here is substantially different from the previous estimates and, although broader cause of death to estimate cancer envelope is still based on cause of death models in some countries, majority of the data sources of cause of death is now vital registration and/or sampling data. The total number of mortality from cancer is not extrapolated by model alone and the survival model was used to estimate the distribution of death by

site, not the actual magnitude of cancer mortality in regions where no or little data on detailed cause of death is available. The model estimates were consistent with mortality distribution of vital records and the Globocan 2000 [7]. Therefore, the major source of discrepancy is not the estimated cancer mortality distribution but the overall mortality envelope applied to each region.

The Globocan 2000 estimates are based on either cancer incidence data from cancer registries in the region (with a survival model used to estimate deaths) or on mortality data collected by regional cancer registries or other sources. Both these sources of data are likely to be incomplete and to result in underestimation of cancer deaths. On the other hand, the GBD 2000 starts with data on the level of all-cause mortality, and uses all available data on cause of death and cause of death models where such data is not available, to estimate the distribution of major

Table 2: Mortality data sources (number of Member States with recent deaths coverage) by WHO sub region for the GBD2000

Subregion	Category I: Complete vital statistics (95%+ coverage)	Category II: Incomplete vital statistics	Category III: Sample registration and surveillance systems	Category IV: Child mortality estimated from surveys and censuses	Category V: No recent data on child or adult mortality	Number of countries
AfrD	2	2	0	19	3	26
AfrE	0	2	1	14	3	20
AmrA	3	0	0	0	0	3
AmrB	17	9	0	0	0	26
AmrD	0	4	0	2	0	6
EmrB	4	3	0	6	0	13
EmrD	0	2	0	5	2	9
EurA	26	0	0	0	0	26
EurB	7	9	0	0	0	16
EurC	8	1	0	0	0	9
SearB	1	1	0	1	0	3
SearD	0	1	2	3	1	7
WprA	4	1	0	0	0	5
WprB	3	12	1	6	0	22
World	75	47	4	56	9	191

Table 3: Estimated global and regional number of total cancer deaths (thousands) and mortality rate (per 100,000) by age, both sexes, 2000

Region	Age-group								Total
	0-4	5-14	15-29	30-44	45-59	60-69	70-79	80+	
	Number of deaths (000s)								
World	46.0	49.4	141.3	462.1	1,503.0	1,852.4	1,901.0	1,078.7	7,033.9
AfrD	5.0	2.5	10.7	26.3	59.2	70.0	66.5	31.5	271.6
AfrE	4.9	2.6	15.2	33.1	65.0	76.4	72.1	31.5	300.8
AmrA	0.6	1.2	3.9	23.1	102.4	132.3	194.5	168.1	626.2
AmrB	3.2	4.4	10.7	31.7	86.4	94.3	103.5	66.6	400.8
AmrD	1.0	1.4	2.7	6.4	14.8	16.0	18.9	11.5	72.9
EmrB	1.2	2.0	3.8	8.0	19.2	18.2	17.8	7.7	77.8
EmrD	1.9	2.5	4.3	10.6	17.8	15.1	13.2	4.3	69.7
EurA	0.7	1.5	5.3	31.3	154.1	238.2	350.9	279.8	1,061.7
EurB1	0.7	1.1	3.9	16.6	59.3	76.6	69.8	26.5	254.5
EurB2	0.2	0.6	1.4	4.3	7.9	10.9	7.5	1.9	34.8
EurC	0.8	1.7	5.8	28.4	114.2	162.1	146.1	44.5	503.7
SearB	2.9	4.0	7.9	30.9	90.0	79.8	59.1	25.9	300.6
SearD	12.9	11.9	32.7	65.1	189.0	262.1	192.2	109.2	875.1
WprA	0.2	0.4	1.6	7.7	49.6	77.6	104.2	90.4	331.6
WprB1	8.9	10.6	28.5	128.2	451.6	503.1	467.5	165.6	1,764.0
WprB2	0.9	1.0	3.0	9.5	21.4	18.9	16.7	13.3	84.8
WprB3	0.0	0.1	0.2	0.6	1.2	0.7	0.4	0.2	3.4
	Age-specific mortality rate per 100,000								
World	7.6	4.1	9.0	36.3	186.8	548.2	965.1	1,702.1	116.5
AfrD	9.1	2.8	11.6	49.5	210.0	667.6	1,386.4	2,799.0	81.4
AfrE	8.5	2.7	16.3	63.6	243.8	798.9	1,612.8	2,932.2	89.1
AmrA	2.9	2.6	6.3	31.5	178.2	581.8	1,074.1	1,901.0	203.1
AmrB	7.0	4.9	8.6	34.1	159.9	463.9	895.3	1,773.8	90.7
AmrD	10.7	8.2	13.3	51.0	211.0	593.4	1,354.4	2,827.8	102.3
EmrB	7.3	5.7	9.1	31.5	144.0	374.6	688.6	1,182.8	55.8
EmrD	10.2	7.5	11.0	41.5	129.5	305.6	540.6	716.3	50.5
EurA	3.2	3.1	6.6	33.1	196.8	570.4	1,109.9	2,089.7	259.6

Table 3: Estimated global and regional number of total cancer deaths (thousands) and mortality rate (per 100,000) by age, both sexes, 2000 (Continued)

EurB1	5.7	4.2	9.0	47.1	226.3	602.5	874.0	1,325.3	153.5
EurB2	3.7	4.8	10.0	41.5	172.8	450.4	584.6	550.4	68.4
EurC	6.7	5.1	10.4	51.3	266.1	656.0	911.4	1,012.8	205.4
SearB	7.1	5.0	7.0	36.7	192.9	442.1	679.3	1,109.6	76.2
SearD	8.0	3.9	8.8	24.9	124.6	448.9	681.4	1,499.2	64.9
WprA	2.4	2.3	5.1	25.9	153.3	471.8	927.3	1,907.7	222.6
WprB1	8.6	4.5	8.4	38.1	218.2	617.6	1,080.7	1,435.2	130.0
WprB2	5.9	3.3	7.2	31.7	152.4	312.2	525.6	1,540.4	59.7
WprB3	4.3	4.3	8.2	47.8	173.4	280.3	378.4	1,162.9	49.1

Table 4: Estimated global and regional number of total cancer deaths (thousands) and mortality rate (per 100,000) by age, males, 2000

Region	Age-group								Total
	0-4	5-14	15-29	30-44	45-59	60-69	70-79	80+	
	Number of deaths (000s)								
World	22.6	27.4	79.9	228.3	844.8	1,121.7	1,074.6	502.6	3,901.9
AfrD	2.1	1.3	6.2	14.3	29.2	34.2	34.8	17.1	139.3
AfrE	2.6	1.5	9.6	20.3	33.3	36.2	36.1	17.0	156.8
AmrA	0.3	0.6	2.3	10.5	54.0	74.5	105.8	77.1	325.1
AmrB	1.7	2.5	6.0	12.4	41.4	51.7	57.6	33.9	207.1
AmrD	0.4	0.8	1.4	2.2	5.4	7.5	9.6	5.9	33.3
EmrB	0.7	1.2	1.9	3.0	10.0	11.6	11.6	4.8	44.9
EmrD	1.2	1.5	2.4	5.1	9.0	8.8	7.6	2.7	38.2
EurA	0.4	0.9	3.2	15.2	90.1	151.1	205.8	127.8	594.3
EurB1	0.4	0.7	2.1	8.7	37.2	49.5	39.9	12.1	150.5
EurB2	0.1	0.3	0.8	2.0	4.4	6.6	3.9	0.7	18.9
EurC	0.4	1.0	3.3	13.8	70.1	101.2	73.5	15.9	279.2
SearB	1.5	2.0	4.2	11.8	45.4	48.4	35.7	12.8	161.8
SearD	6.0	6.0	15.5	31.0	88.4	148.3	106.4	48.7	450.1
WprA	0.1	0.2	0.8	3.4	29.2	52.8	67.0	44.9	198.5
WprB1	4.1	6.2	18.7	69.7	285.7	327.5	268.6	73.8	1,054.3
WprB2	0.5	0.6	1.6	4.6	11.4	11.7	10.3	7.2	47.9
WprB3	0.0	0.0	0.1	0.2	0.6	0.4	0.2	0.1	1.6
	Age-specific mortality rate per 100,000								
World	7.3	4.5	10.0	35.3	209.6	694.5	1,264.5	2,095.6	128.2
AfrD	7.6	2.9	13.5	54.6	214.0	697.7	1,607.5	3,446.7	83.9
AfrE	9.0	3.3	20.6	78.4	258.1	824.4	1,866.5	4,078.5	93.5
AmrA	3.0	2.8	7.2	28.4	190.0	689.9	1,353.3	2,286.9	213.1
AmrB	7.4	5.4	9.6	27.1	158.5	546.5	1,139.1	2,145.2	94.5
AmrD	9.0	8.9	13.5	36.2	158.0	583.7	1,505.9	3,264.8	93.6
EmrB	8.9	6.6	9.1	22.2	137.7	461.9	904.8	1,444.8	62.1
EmrD	12.9	8.9	11.8	39.2	134.5	385.5	704.1	1,014.3	54.8
EurA	3.4	3.6	7.7	31.7	230.9	762.6	1,576.8	2,711.7	295.6
EurB1	6.3	5.0	9.7	48.8	288.5	847.1	1,225.6	1,657.4	183.0
EurB2	4.8	5.6	10.9	38.8	197.1	598.0	772.0	676.4	75.0
EurC	7.0	5.6	11.6	50.4	351.0	1,001.0	1,453.4	1,541.1	242.3
SearB	7.0	4.9	7.3	28.0	199.0	569.2	905.5	1,264.7	82.0
SearD	7.1	3.8	8.0	22.7	113.7	516.9	792.8	1,419.2	64.8
WprA	2.9	2.9	5.4	22.9	181.1	668.2	1,387.3	2,603.3	270.5
WprB1	7.5	5.1	10.6	40.3	267.2	796.0	1,372.3	1,729.7	151.1
WprB2	5.9	3.8	7.6	31.3	175.1	431.4	784.9	2,303.2	68.1
WprB3	5.1	5.5	7.0	29.3	162.4	329.5	476.3	1,404.1	46.7

Table 5: Estimated global and regional number of total cancer deaths (thousands) and mortality rate (per 100,000) by age, females, 2000

Region	Age-group								Total
	0-4	5-14	15-29	30-44	45-59	60-69	70-79	80+	
	Number of deaths (000s)								
World	23.4	22.0	61.4	233.8	658.2	730.6	826.4	576.2	3,132.0
AfrD	2.9	1.2	4.4	12.0	30.0	35.8	31.7	14.4	132.3
AfrE	2.3	1.0	5.6	12.8	31.7	40.2	35.9	14.4	144.0
AmrA	0.3	0.5	1.6	12.6	48.4	57.8	88.7	91.1	301.1
AmrB	1.5	2.0	4.7	19.3	45.0	42.6	45.9	32.7	193.8
AmrD	0.6	0.6	1.4	4.2	9.4	8.5	9.3	5.6	39.6
EmrB	0.4	0.8	1.8	5.0	9.2	6.6	6.2	2.9	32.9
EmrD	0.7	1.0	1.9	5.5	8.8	6.4	5.6	1.6	31.4
EurA	0.3	0.6	2.1	16.2	64.0	87.1	145.1	152.0	467.4
EurB1	0.3	0.4	1.8	7.9	22.1	27.1	29.9	14.4	104.0
EurB2	0.1	0.2	0.6	2.3	3.6	4.3	3.6	1.1	15.9
EurC	0.4	0.7	2.5	14.6	44.1	60.9	72.6	28.7	224.5
SearB	1.5	2.0	3.7	19.1	44.6	31.4	23.4	13.1	138.8
SearD	6.9	5.9	17.2	34.2	100.6	113.8	85.8	60.5	425.0
WprA	0.1	0.1	0.7	4.3	20.4	24.9	37.2	45.5	133.1
WprB1	4.8	4.3	9.8	58.5	165.9	175.7	198.8	91.8	709.7
WprB2	0.4	0.4	1.4	5.0	9.9	7.2	6.4	6.2	36.9
WprB3	0.0	0.0	0.1	0.4	0.6	0.3	0.2	0.1	1.7
	Age-specific mortality rate per 100,000								
World	8.0	3.8	8.0	37.3	163.9	414.3	737.9	1,462.6	104.6
AfrD	10.6	2.6	9.6	44.6	206.1	641.3	1,204.5	2,286.7	78.9
AfrE	8.1	2.2	12.0	48.9	230.4	777.2	1,418.8	2,202.6	84.8
AmrA	2.7	2.4	5.3	34.7	166.6	484.1	862.1	1,663.3	193.4
AmrB	6.6	4.4	7.7	40.9	161.3	392.0	705.7	1,504.1	86.9
AmrD	12.5	7.5	13.2	65.1	260.9	602.3	1,226.6	2,479.1	110.8
EmrB	5.5	4.8	9.2	42.1	151.7	280.7	474.5	909.5	49.0
EmrD	7.4	5.9	10.1	43.8	124.7	237.8	411.1	481.1	46.1
EurA	2.9	2.6	5.4	34.6	162.9	397.0	781.7	1,751.8	224.7
EurB1	5.0	3.4	8.3	45.3	166.0	394.8	632.1	1,134.8	124.4
EurB2	2.5	4.1	9.1	44.1	150.2	326.0	463.3	491.3	61.9
EurC	6.4	4.5	9.1	52.2	192.2	417.0	661.6	851.5	172.7
SearB	7.3	5.1	6.6	45.4	187.2	329.0	491.8	991.1	70.5
SearD	8.8	4.0	9.7	27.2	136.1	383.2	580.4	1,570.4	65.1
WprA	2.0	1.7	4.7	29.0	125.6	290.5	580.5	1,509.3	176.2
WprB1	9.9	3.9	6.0	35.7	165.9	435.6	839.7	1,262.3	107.6
WprB2	6.0	2.9	6.8	32.1	132.6	215.4	342.3	1,113.7	51.5
WprB3	3.5	3.0	9.5	68.4	184.5	233.3	294.1	960.7	51.7

cause groups, including cancers. For regions with insufficient vital registration such as AFRO and SEARO regions, this process significantly increases the mortality envelope for these two broad cause categories. It is possible that these methods result in an overestimate of total cancer deaths in some regions, and continuous efforts are being made to obtain additional data from these regions in order to check the validity of these estimates, and where appropriate, to improve them.

Although cancer is still a fatal disease in many developing countries[2], there is a growing evidence that cancer survival even in developing countries is continuously improving [3,4]. The present study suggests that in all regions mortality was much higher in males while incidence were almost the same due to relatively good prognosis of breast and cervix cancers compared to common cancers among males such as liver and lung cancers. Due to the differences in survival by region, incidence-to-mortality rate ratios were higher in developed in which increasing disability among cancer survivors is warranted

Table 6: Estimated global and regional number of cancer deaths and age-standardised mortality rate by site, males, 2000

Site	WHO sub region																	
	World	AFRO		AMRO		EMRO		EURO			SEARO		WPRO					
		D	E	A	B	D	B	D	A	BI	B2	C	B	D	A	BI	B2	B3
	Number of deaths (000s)																	
Mouth and oropharynx cancers	222.4	10.7	14.3	6.6	8.5	0.7	2.0	1.5	19.2	6.0	0.8	14.7	13.1	88.9	4.1	25.5	5.4	0.4
Oesophagus cancer	273.6	4.9	13.8	11.6	10.5	0.7	1.8	0.7	21.4	3.4	1.7	10.0	3.3	41.9	9.4	135.7	2.9	0.0
Stomach cancer	512.0	12.0	9.8	10.0	25.8	7.6	7.5	2.3	38.9	14.9	3.5	42.2	7.1	28.1	34.3	261.1	6.8	0.1
Colon and rectum cancers	311.8	7.4	8.8	36.1	14.4	1.6	2.2	2.3	72.1	14.3	1.0	28.7	13.9	19.6	23.1	63.3	2.9	0.1
Liver cancer	414.9	20.6	23.5	8.7	9.3	2.8	3.0	2.3	25.3	5.8	0.7	7.8	25.9	17.3	23.8	231.5	6.3	0.2
Pancreas cancer	117.0	1.5	2.7	16.0	7.9	1.1	0.9	1.0	26.7	5.8	1.0	11.2	3.5	7.6	11.2	18.4	0.5	0.0
Trachea, bronchus, lung cancers	877.3	7.0	9.4	101.4	36.1	1.6	8.7	7.1	158.0	46.6	3.8	83.6	40.8	102.7	43.2	214.6	12.4	0.3
Melanoma of the skin	35.1	2.4	2.2	7.7	3.3	0.6	0.2	0.1	8.3	2.0	0.2	2.5	0.7	1.4	1.7	1.6	0.1	0.0
Breast cancer	2.6	0.0	0.0	0.5	0.3	0.0	0.0	0.0	0.9	0.2	0.1	0.5	0.0	0.0	0.1	0.0	0.0	0.0
Cervix uteri cancer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Corpus uteri cancer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ovary cancer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prostate cancer	263.6	26.0	19.2	39.6	30.4	5.8	2.1	1.7	70.2	9.4	0.5	13.3	8.1	19.8	10.4	6.1	0.9	0.0
Bladder cancer	123.9	6.9	4.3	10.3	4.9	0.5	2.6	7.7	27.1	7.1	0.7	10.4	4.4	15.9	4.1	15.9	1.0	0.0
Lymphomas, multiple myeloma	168.6	15.9	13.7	23.1	9.6	2.1	4.1	3.6	27.6	5.6	0.9	5.4	9.6	26.1	7.8	11.2	2.0	0.1
Leukaemia	145.3	5.2	6.9	14.5	9.6	2.0	2.3	3.7	20.0	5.4	0.8	7.8	7.6	21.0	4.9	31.9	1.7	0.1
Other malignant neoplasms	425.2	18.7	25.6	39.0	36.5	6.0	7.5	4.2	79.1	24.0	3.2	41.3	16.6	60.5	20.4	37.4	5.0	0.2
	Age-standardized mortality rate per 100,000																	
Mouth and oropharynx cancers	7.3	11.7	16.6	2.8	4.5	2.8	4.0	3.1	5.5	5.9	4.0	9.0	8.0	16.7	2.8	3.4	10.7	18.4
Oesophagus cancer	9.0	5.5	16.4	4.8	5.6	3.0	3.6	1.6	5.6	3.2	9.0	5.9	2.1	7.9	6.1	18.3	6.1	1.9
Stomach cancer	16.8	13.5	11.7	3.9	13.7	31.5	15.1	4.9	9.3	14.2	18.7	25.1	4.5	5.3	21.5	35.5	14.2	3.3
Colon and rectum cancers	10.2	8.1	11.0	13.7	7.6	6.5	4.2	4.8	17.0	13.6	5.2	17.0	8.9	3.7	14.6	8.7	6.0	4.1
Liver cancer	13.6	20.9	25.6	3.6	4.9	11.1	6.2	5.0	6.2	5.6	3.6	4.6	15.9	3.1	15.7	30.5	12.2	10.1
Pancreas cancer	3.8	1.6	3.4	6.3	4.2	4.7	1.8	2.2	6.6	5.6	5.3	6.7	2.2	1.5	7.1	2.5	1.0	0.2
Trachea, bronchus, lung cancers	28.8	7.9	11.5	40.1	19.3	6.5	17.7	15.9	39.5	44.2	19.7	48.9	26.0	19.4	26.3	29.1	25.1	13.8
Melanoma of the skin	1.2	2.7	2.6	3.2	1.7	2.5	0.4	0.2	2.2	2.0	1.1	1.6	0.5	0.3	1.1	0.2	0.2	2.4

Table 6: Estimated global and regional number of cancer deaths and age-standardised mortality rate by site, males, 2000 (Continued)

Breast cancer	0.1	0.0	0.0	0.2	0.2	0.1	0.0	0.0	0.2	0.2	0.3	0.3	0.0	0.0	0.1	0.0	0.0	0.0
Cervix uteri cancer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Corpus uteri cancer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ovary cancer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prostate cancer	8.7	33.3	27.9	12.7	16.2	24.9	4.5	4.3	14.3	8.8	2.9	7.8	5.6	4.1	5.7	0.9	1.9	1.5
Bladder cancer	4.1	8.4	5.8	3.6	2.6	2.2	5.6	17.7	6.0	6.7	4.0	6.1	2.9	3.1	2.3	2.3	2.3	0.8
Lymphomas, multiple myeloma	5.5	15.1	13.5	9.2	4.9	8.3	7.3	6.3	7.1	5.7	4.4	3.5	5.8	4.6	5.1	1.5	3.6	5.5
Leukaemia	4.8	4.9	6.7	5.9	4.7	6.5	3.7	5.9	5.4	5.7	3.4	5.3	4.2	3.3	3.9	4.6	2.6	2.6
Other malignant neoplasms	14.0	20.2	31.0	16.6	18.9	23.0	14.6	8.4	21.4	23.6	16.0	26.1	10.2	11.3	13.6	5.2	10.3	8.5

Table 7: Estimated global and regional number of cancer deaths and age-standardised mortality rate by site, females, 2000

Site	WHO sub region																	
	World	AFRO		AMRO		EMRO		EURO			SEARO		WPRO					
		D	E	A	B	D	B	D	A	BI	B2	C	B	D	A	BI	B2	B3
	Number of deaths (000s)																	
Mouth and oropharynx cancers	97.2	5.3	7.1	3.3	2.7	0.5	1.1	0.6	5.7	1.5	0.3	2.9	5.5	42.7	1.7	13.6	2.6	0.2
Oesophagus cancer	157.6	4.0	6.8	3.7	3.8	0.3	1.5	0.5	7.8	1.0	1.3	3.5	2.3	33.6	2.0	83.6	2.0	0.0
Stomach cancer	324.2	8.9	7.2	7.0	16.5	7.1	3.7	1.6	27.9	8.6	2.2	30.6	5.5	16.1	19.0	157.7	4.6	0.1
Colon and rectum cancers	295.5	5.6	5.3	37.2	16.1	2.1	2.2	1.7	69.7	11.8	1.1	33.6	3.6	14.01	9.4	59.72	2.2	0.1
Liver cancer	191.0	11.0	9.8	5.3	9.1	3.2	1.2	1.1	13.3	3.8	0.5	5.6	10.6	10.4	10.5	93.5	2.2	0.2
Pancreas cancer	105.6	1.5	2.5	16.9	8.7	1.2	0.7	0.6	26.9	4.6	0.7	9.8	3.3	5.2	9.4	13.0	0.5	0.0
Trachea, bronchus, lung cancers	323.8	2.9	4.5	70.5	14.9	0.9	2.5	2.3	49.2	9.8	1.1	16.2	7.5	23.2	16.9	97.6	3.7	0.2
Melanoma of the skin	30.1	2.4	3.0	4.3	2.7	0.6	0.2	0.1	7.2	1.9	0.2	3.0	1.0	1.0	1.1	1.2	0.1	0.0
Breast cancer	466.3	18.6	23.0	53.3	30.7	4.0	5.1	7.0	91.8	18.5	2.5	39.4	29.0	67.0	12.4	57.5	6.3	0.2
Cervix uteri cancer	259.6	24.1	36.8	5.3	19.3	4.6	3.5	2.6	8.3	6.3	1.0	11.7	15.4	86.2	2.6	26.1	5.4	0.3
Corpus uteri cancer	72.9	1.4	1.7	8.2	10.4	3.5	0.4	0.3	16.0	4.3	0.8	11.0	4.0	3.2	3.3	4.1	0.2	0.0
Ovary cancer	128.6	3.9	6.7	15.5	7.0	1.1	0.9	0.9	25.7	5.7	0.6	12.9	8.7	18.5	4.9	13.8	1.6	0.1
Prostate cancer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bladder cancer	53.5	2.3	2.0	4.9	2.1	0.3	0.5	2.0	10.5	1.7	0.2	2.8	1.4	14.2	1.9	6.3	0.6	0.0
Lymphomas, multiple myeloma	163.7	6.6	5.2	21.7	8.0	1.6	2.8	2.4	27.4	4.3	0.5	4.8	6.1	54.8	6.2	9.4	1.8	0.1
Leukaemia	114.7	4.4	4.9	12.0	8.4	1.9	1.7	2.5	17.2	3.8	0.7	7.2	7.2	14.7	3.6	23.1	1.4	0.1

Table 7: Estimated global and regional number of cancer deaths and age-standardised mortality rate by site, females, 2000 (Continued)

Other malignant neoplasms	344.5	29.4	14.8	32.0	33.2	6.9	5.1	5.1	63.0	16.4	2.4	29.6	15.5	19.9	18.3	49.5	3.4	0.2
	Age-standardized mortality rate per 100,000																	
Mouth and oropharynx cancers	3.2	6.6	8.8	1.3	1.5	2.2	2.5	1.3	1.4	1.4	1.4	1.3	3.7	9.9	1.0	2.0	4.9	10.8
Oesophagus cancer	5.3	5.0	8.8	1.3	2.1	1.4	3.8	1.1	1.6	0.9	6.1	1.4	1.6	7.7	1.2	12.7	3.8	1.7
Stomach cancer	10.8	11.3	9.2	2.5	9.1	32.2	9.0	3.6	5.8	7.9	10.6	13.0	3.7	3.8	11.5	24.1	8.7	2.6
Colon and rectum cancers	9.9	7.0	7.0	13.0	8.9	9.4	5.6	3.7	14.4	10.7	5.3	13.9	9.3	3.3	11.6	9.1	4.2	2.6
Liver cancer	6.4	12.4	11.5	2.0	5.0	13.9	3.0	2.4	2.9	3.4	2.2	2.4	7.1	2.1	6.2	13.9	3.9	6.9
Pancreas cancer	3.5	1.7	3.4	6.1	4.8	5.6	1.7	1.5	5.7	4.1	3.4	4.1	2.3	1.2	5.5	2.0	0.9	0.3
Trachea, bronchus, lung cancers	10.8	3.2	5.3	27.4	8.0	4.0	6.0	5.2	11.6	9.0	5.1	6.9	4.9	4.9	10.1	14.5	6.8	7.7
Melanoma of the skin	1.0	3.1	4.1	1.7	1.5	2.6	0.4	0.3	1.7	1.8	1.0	1.5	0.7	0.2	0.7	0.2	0.1	1.5
Breast cancer	15.6	21.4	27.7	21.1	16.0	16.1	12.2	14.4	22.8	17.4	12.0	18.7	17.6	14.5	9.4	8.1	11.3	12.0
Cervix uteri cancer	8.7	27.4	43.8	2.4	9.8	18.7	8.7	5.5	2.3	6.1	4.7	5.9	9.3	18.0	2.0	3.9	9.7	15.5
Corpus uteri cancer	2.4	1.9	2.3	3.1	5.5	1.5	1.0	0.8	3.5	3.9	3.8	4.7	2.6	0.8	2.1	0.6	0.4	1.2
Ovary cancer	4.3	4.3	8.1	6.1	3.7	4.4	2.2	1.8	6.3	5.3	3.0	6.0	5.3	4.1	3.5	2.0	2.9	3.2
Prostate cancer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bladder cancer	1.8	2.9	2.6	1.6	1.2	1.2	1.4	4.6	2.0	1.5	0.9	1.1	1.1	3.1	1.0	1.0	1.1	0.2
Lymphomas, multiple myeloma	5.5	6.7	5.6	7.9	4.2	6.5	6.3	4.8	6.1	4.1	2.4	2.3	3.9	11.7	3.8	1.4	3.0	3.1
Leukaemia	3.8	4.7	5.1	4.6	4.1	6.5	3.1	4.3	4.1	3.8	2.8	3.8	4.1	2.6	2.7	3.6	2.1	2.2
Other malignant neoplasms	11.5	34.3	18.0	12.5	17.6	28.6	12.5	10.9	14.6	15.3	11.0	14.1	10.1	4.9	11.0	7.7	6.3	8.2

Table 8: Ranking of the global cancer deaths by site, 2000

site	Number of death (000s)	Proportion of total (%)
Both sexes		
Trachea, bronchus, and lung	1211.5	17.2
Stomach	835.1	11.9
Liver	611.4	8.7
Colon and rectum	608.0	8.6
Breast	473.8	6.7
Oesophagus	430.4	6.1
Lymphomas and myeloma	329.9	4.7
Mouth and oropharynx	320.0	4.5
Prostate	264.0	3.8
Leukaemia	263.8	3.8
Cervix uteri	254.2	3.6
Pancreas	222.3	3.2
Bladder	179.4	2.6
Ovary	130.1	1.8

Table 8: Ranking of the global cancer deaths by site, 2000 (Continued)

Corpus uteri	73.5	1.0
Melanoma of the skin	65.3	0.9
Males		
Trachea, bronchus, and lung	877.2	22.5
Stomach	511.3	13.1
Liver	419.4	10.7
Colon and rectum	312.3	8.0
Oesophagus	272.8	7.0
Prostate	264.0	6.8
Mouth and oropharynx	222.0	5.7
Lymphomas and myeloma	169.6	4.3
Leukaemia	145.4	3.7
Bladder	126.1	3.2
Pancreas	116.8	3.0
Melanoma of the skin	35.0	0.9
Females		
Breast	471.2	15.0
Trachea, bronchus, and lung	334.2	10.7
Stomach	323.7	10.3
Colon and rectum	295.7	9.4
Cervix uteri	254.2	8.1
Liver	192.1	6.1
Lymphomas and myeloma	160.2	5.1
Oesophagus	157.6	5.0
Ovary	130.1	4.2
Leukaemia	118.4	3.8
Pancreas	105.5	3.4
Mouth and oropharynx	98.0	3.1
Corpus uteri	73.5	2.3
Bladder	53.4	1.7
Melanoma of the skin	30.3	1.0

Table 9: Ranking of selected regional cancer deaths by site, 2000

WHO sub region								
AfrE (high child and adult mortality)			EurA (very low child and adult mortality)			SearB (low child and adult mortality)		
site	Number of death (000s)	Proportion of total (%)	site	Number of death (000s)	Proportion of death of total (%)	site	Number of death (000s)	Proportion of death of total (%)
Both sexes								
Cervix uteri	37.3	12.4	Trachea, bronchus, and lung	207.1	19.5	Trachea, bronchus, and lung	48.3	16.1
Liver	35.3	11.7	Colon and rectum	141.6	13.3	Liver	39.4	13.1
Breast	23.8	7.9	Breast	92.7	8.7	Breast	29.4	9.8
Mouth and oropharynx	21.6	7.2	Prostate	70.1	6.6	Colon and rectum	28.5	9.5
Oesophagus	20.7	6.9	Stomach	66.7	6.3	Mouth and oropharynx	19.4	6.5
Lymphomas and myeloma	19.2	6.4	Lymphomas and myeloma	55.0	5.2	Lymphomas and myeloma	16.2	5.4
Prostate	19.2	6.4	Pancreas	53.6	5.0	Cervix uteri	15.6	5.2
Stomach	17.1	5.7	Liver	38.5	3.6	Leukaemia	15.1	5.0
Colon and rectum	14.3	4.8	Bladder	37.6	3.5	Stomach	13.1	4.3

Table 9: Ranking of selected regional cancer deaths by site, 2000 (Continued)

Trachea, bronchus, and lung	14.0	4.6	Leukaemia	37.2	3.5	Ovary	8.8	2.9
Leukaemia	12.4	4.1	Oesophagus	29.2	2.7	Prostate	8.5	2.8
Ovary	6.9	2.3	Ovary	25.7	2.4	Pancreas	7.0	2.3
Bladder	6.3	2.1	Mouth and oropharynx	24.9	2.3	Bladder	6.2	2.1
Melanoma of the skin	5.3	1.8	Corpus uteri	16.0	1.5	Oesophagus	5.9	2.0
Pancreas	5.3	1.8	Melanoma of the skin	15.5	1.5	Corpus uteri	4.1	1.4
Corpus uteri	1.7	0.6	Cervix uteri	8.3	0.8	Melanoma of the skin	1.8	0.6
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Males								
Liver	24.9	15.9	Trachea, bronchus, and lung	158.0	26.6	Trachea, bronchus, and lung	40.8	25.2
Prostate	19.2	12.2	Colon and rectum	72.0	12.1	Liver	28.4	17.6
Mouth and oropharynx	14.4	9.2	Prostate	70.1	11.8	Colon and rectum	14.6	9.1
Lymphomas and myeloma	14.0	8.9	Stomach	38.8	6.5	Mouth and oropharynx	13.8	8.5
Oesophagus	13.8	8.8	Lymphomas and myeloma	27.6	4.6	Lymphomas and myeloma	10.0	6.2
Stomach	9.9	6.3	Bladder	27.1	4.6	Prostate	8.5	5.3
Trachea, bronchus, and lung	9.4	6.0	Pancreas	26.7	4.5	Leukaemia	7.8	4.8
Colon and rectum	9.0	5.7	Liver	25.3	4.3	Stomach	7.5	4.6
Leukaemia	7.3	4.7	Oesophagus	21.4	3.6	Bladder	4.7	2.9
Bladder	4.3	2.7	Leukaemia	20.0	3.4	Pancreas	3.6	2.2
Pancreas	2.8	1.8	Mouth and oropharynx	19.2	3.2	Oesophagus	3.6	2.2
Melanoma of the skin	2.3	1.4	Melanoma of the skin	8.3	1.4	Melanoma of the skin	0.7	0.5
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Females								
Cervix uteri	37.3	25.9	Breast	91.8	19.6	Breast	29.3	21.1
Breast	23.8	16.5	Colon and rectum	69.6	14.9	Cervix uteri	15.6	11.3
Liver	10.3	7.2	Trachea, bronchus, and lung	49.2	10.5	Colon and rectum	13.9	10.0
Stomach	7.2	5.0	Stomach	27.8	6.0	Liver	11.0	7.9
Mouth and oropharynx	7.2	5.0	Lymphomas and myeloma	27.4	5.9	Ovary	8.8	6.3
Ovary	6.9	4.8	Pancreas	26.9	5.8	Trachea, bronchus, and lung	7.5	5.4
Oesophagus	6.8	4.8	Ovary	25.7	5.5	Leukaemia	7.2	5.2
Colon and rectum	5.3	3.7	Leukaemia	17.2	3.7	Lymphomas and myeloma	6.2	4.5
Lymphomas and myeloma	5.3	3.7	Corpus uteri	16.0	3.4	Mouth and oropharynx	5.6	4.0
Leukaemia	5.1	3.5	Liver	13.3	2.8	Stomach	5.6	4.0
Trachea, bronchus, and lung	4.5	3.2	Bladder	10.5	2.2	Corpus uteri	4.1	2.9
Melanoma of the skin	3.0	2.1	Cervix uteri	8.3	1.8	Pancreas	3.4	2.4
Pancreas	2.5	1.8	Oesophagus	7.8	1.7	Oesophagus	2.4	1.7
Bladder	2.0	1.4	Melanoma of the skin	7.2	1.5	Bladder	1.5	1.1
Corpus uteri	1.7	1.2	Mouth and oropharynx	5.7	1.2	Melanoma of the skin	1.0	0.7

Table 10: Estimated global site-specific cancer incidence-to-mortality rate ratios by sex

Site	Male	Female
Mouth and oropharynx	1.20	1.57
Oesophagus	1.05	1.05
Stomach	1.15	1.19
Colon and rectum	1.69	1.75
Liver	1.01	1.06
Pancreas	1.02	1.01
Trachea, bronchus, and lung	1.07	1.10
Melanoma of the skin	3.37	2.93
Breast		2.19
Cervix uteri		1.91
Corpus uteri		4.45
Ovary		1.70
Prostate	2.08	
Bladder	2.21	2.01
Lymphomas and multiple myeloma	1.40	1.51
Leukaemia	1.35	1.44
Other malignant neoplasms	1.49	1.63

Table 11: Estimated global and regional number of new cases (thousands) and incidence rate (per 100,000) of all cancers by age, both sexes, 2000

Region	Age group								Total
	0-4	5-14	15-29	30-44	45-59	60-69	70-79	80+	
	Number of new cases (000s)								
World	136.8	96.5	360.1	923.3	2459.3	2641.4	2514.5	1160.2	10292.1
AfrD	12.5	4.6	24.7	41.9	87.6	90.8	74.5	31.9	368.6
AfrE	12.8	4.9	33.8	49.1	99.2	102.4	81.0	31.9	415.1
AmrA	3.0	3.3	22.7	110.4	306.3	308.4	404.2	176.4	1334.8
AmrB	10.0	8.5	31.5	76.1	150.8	137.5	127.6	69.2	611.1
AmrD	2.9	2.6	7.5	15.6	28.5	23.8	22.7	11.9	115.5
EmrB	3.5	4.3	8.8	15.7	28.4	24.0	20.5	7.9	113.2
EmrD	5.4	4.7	9.3	20.0	28.2	19.9	15.1	4.4	106.9
EurA	2.7	3.6	23.8	96.6	323.0	421.1	531.4	322.2	1724.3
EurB1	2.1	2.2	11.0	33.8	91.6	105.0	84.4	27.1	357.2
EurB2	0.6	1.2	3.7	8.4	11.7	14.0	8.7	1.9	50.2
EurC	2.6	3.5	18.0	60.8	172.9	222.9	180.5	46.1	707.3
SearB	8.8	7.5	18.9	65.1	138.9	103.9	67.6	26.7	437.5
SearD	39.6	24.2	85.1	111.0	277.0	317.7	208.4	110.8	1173.9
WprA	0.9	0.9	6.8	25.7	108.2	133.0	153.0	107.7	536.1
WprB1	26.9	18.3	47.7	176.3	575.8	593.2	516.0	170.3	2124.4
WprB2	2.5	2.0	6.6	15.6	29.5	22.9	18.2	13.6	110.8
WprB3	0.1	0.1	0.4	1.2	1.9	0.9	0.5	0.2	5.2
	Age-specific incidence rate per 100,000								
World	22.6	8.1	23.0	72.4	305.6	781.8	1276.6	1830.7	170.4
AfrD	22.9	5.2	26.8	78.9	310.4	866.4	1554.9	2834.8	110.4
AfrE	22.3	5.2	36.3	94.3	371.8	1070.3	1812.2	2975.0	123.0
AmrA	14.4	7.5	36.4	150.7	532.9	1356.3	2232.0	1994.7	433.0
AmrB	21.9	9.5	25.4	82.0	279.1	676.3	1103.7	1842.4	138.2
AmrD	30.8	15.1	36.5	123.3	406.3	881.5	1623.0	2921.2	162.0
EmrB	21.4	12.3	21.4	62.2	213.6	494.3	793.5	1206.4	81.1
EmrD	28.9	14.2	23.8	78.2	205.5	401.7	619.9	728.7	77.5
EurA	12.4	7.5	29.6	102.1	412.5	1008.3	1681.0	2406.4	421.6

Table 11: Estimated global and regional number of new cases (thousands) and incidence rate (per 100,000) of all cancers by age, both sexes, 2000 (Continued)

EurB1	17.0	8.5	25.3	95.7	349.8	826.0	1056.8	1355.2	215.4
EurB2	10.5	9.7	26.6	81.0	254.7	577.3	674.1	560.0	98.7
EurC	20.6	10.3	32.4	109.7	403.0	901.9	1125.9	1048.5	288.5
SearB	21.4	9.3	16.8	77.4	297.8	575.8	776.5	1142.3	110.9
SearD	24.4	7.9	22.9	42.4	182.7	544.1	738.9	1521.0	87.1
WprA	10.9	5.8	22.1	86.1	334.2	808.6	1361.9	2273.3	360.0
WprB1	26.1	7.8	14.0	52.3	278.2	728.1	1193.0	1475.8	156.5
WprB2	16.6	6.3	15.8	51.7	210.3	378.2	572.8	1565.2	78.0
WprB3	11.7	7.7	21.6	93.3	271.0	364.6	422.9	1174.1	76.4

Table 12: Estimated global and regional number of new cases (thousands) and incidence rate (per 100,000) of all cancers by age, males, 2000

Region	Age group								Total
	0-4	5-14	15-29	30-44	45-59	60-69	70-79	80+	
	Number of new cases (000s)								
World	64.5	50.9	154.0	257.7	1174.2	1528.4	1380.8	556.5	5167.1
AfrD	5.2	2.3	10.4	13.0	37.9	45.1	39.0	17.3	170.2
AfrE	6.6	2.8	15.3	18.3	42.5	47.2	40.0	17.2	189.9
AmrA	1.6	1.7	11.0	28.3	134.7	174.3	226.6	109.9	688.2
AmrB	5.3	4.4	13.9	15.7	56.1	70.5	68.2	34.6	268.7
AmrD	1.2	1.4	2.8	2.6	7.2	10.5	11.2	6.0	42.9
EmrB	2.2	2.5	3.6	3.4	13.2	14.7	13.1	4.9	57.5
EmrD	3.4	2.7	4.3	6.3	13.3	11.5	8.5	2.7	52.8
EurA	1.5	2.0	11.5	26.4	153.8	250.2	291.4	139.6	876.3
EurB1	1.1	1.3	4.8	10.8	49.4	63.2	45.7	12.2	188.5
EurB2	0.4	0.7	1.6	2.2	5.3	7.9	4.3	0.7	23.1
EurC	1.4	1.8	8.1	17.5	90.3	126.3	84.3	16.0	345.6
SearB	4.3	3.3	7.0	11.8	57.2	59.7	39.5	13.0	195.8
SearD	16.2	11.8	27.0	29.8	110.2	173.8	113.7	49.1	531.6
WprA	0.5	0.5	3.0	5.8	51.0	86.0	94.3	51.3	292.3
WprB1	12.3	10.5	27.1	61.4	337.9	373.6	289.8	74.8	1187.5
WprB2	1.2	1.0	2.5	4.2	13.5	13.5	11.0	7.2	54.2
WprB3	0.1	0.1	0.1	0.2	0.7	0.5	0.3	0.1	2.0
	Age-specific incidence rate per 100,000								
World	20.8	8.3	19.2	39.8	291.3	946.2	1624.8	2320.5	169.7
AfrD	18.7	5.2	22.6	49.5	277.5	921.0	1801.5	3472.3	102.4
AfrE	23.1	5.9	32.8	70.5	328.9	1075.5	2067.8	4109.5	113.2
AmrA	15.3	7.6	34.8	76.6	474.1	1614.6	2897.4	3261.5	451.0
AmrB	22.6	9.6	22.4	34.4	215.1	745.8	1347.6	2190.5	122.6
AmrD	25.6	16.0	27.0	42.0	212.4	814.8	1742.9	3320.7	120.7
EmrB	26.0	13.8	17.2	25.2	181.4	584.4	1018.0	1464.3	79.6
EmrD	36.1	16.2	21.6	48.4	199.2	503.8	791.2	1024.4	75.6
EurA	13.3	8.2	27.9	55.2	394.2	1262.9	2233.2	2960.3	435.9
EurB1	18.5	9.5	21.8	60.5	383.2	1081.9	1403.2	1668.1	229.1
EurB2	13.5	10.6	22.9	43.2	238.3	710.9	851.6	678.2	91.7
EurC	21.4	10.7	28.7	63.8	451.9	1248.4	1667.0	1551.3	299.9
SearB	20.3	8.0	12.3	28.1	250.5	702.6	1001.8	1284.1	99.2
SearD	19.4	7.5	14.0	21.8	141.7	606.1	847.2	1430.6	76.5
WprA	12.8	6.7	18.9	38.6	316.3	1088.7	1953.2	2971.8	398.4
WprB1	22.7	8.6	15.4	35.5	316.0	908.2	1480.4	1753.4	170.2
WprB2	15.4	6.6	11.6	28.6	207.3	500.1	835.9	2327.7	77.2
WprB3	13.5	9.0	10.5	27.9	214.4	400.7	515.2	1412.7	57.5

Table 13: Estimated global and regional number of new cases (thousands) and incidence rate (per 100,000) of all cancers by age, females, 2000

Region	Age group								Total
	0-4	5-14	15-29	30-44	45-59	60-69	70-79	80+	
	Number of new cases (000s)								
World	72.3	45.6	206.1	665.6	1285.1	1112.9	1133.6	603.7	5125.0
AfrD	7.4	2.3	14.2	28.9	49.6	45.8	35.6	14.7	198.4
AfrE	6.1	2.1	18.5	30.8	56.7	55.1	41.0	14.8	225.2
AmrA	1.4	1.6	11.7	82.1	171.6	134.2	177.7	66.5	646.7
AmrB	4.7	4.1	17.5	60.4	94.7	66.9	59.5	34.6	342.4
AmrD	1.7	1.2	4.7	13.0	21.3	13.3	11.5	5.9	72.6
EmrB	1.3	1.8	5.2	12.4	15.2	9.3	7.4	3.0	55.6
EmrD	1.9	2.0	5.0	13.7	14.9	8.4	6.6	1.7	54.1
EurA	1.2	1.6	12.3	70.2	169.2	170.9	240.0	182.7	848.0
EurB1	0.9	0.9	6.2	23.0	42.2	41.8	38.7	14.9	168.8
EurB2	0.2	0.5	2.1	6.2	6.4	6.1	4.4	1.2	27.1
EurC	1.2	1.6	9.9	43.3	82.7	96.7	96.2	30.2	361.7
SearB	4.5	4.2	11.9	53.3	81.7	44.2	28.1	13.7	241.7
SearD	23.4	12.4	58.1	81.2	166.8	143.8	94.7	61.7	642.2
WprA	0.3	0.4	3.8	19.9	57.2	47.1	58.7	56.4	243.8
WprB1	14.6	7.8	20.6	114.8	237.8	219.6	226.2	95.5	936.9
WprB2	1.3	0.9	4.1	11.4	15.9	9.3	7.2	6.3	56.5
WprB3	0.0	0.1	0.3	1.0	1.1	0.4	0.2	0.1	3.2
	Age-specific incidence rate per 100,000								
World	24.6	7.9	27.0	106.1	320.0	631.1	1012.3	1532.5	171.1
AfrD	27.2	5.1	30.9	107.8	341.2	818.6	1352.1	2330.7	118.3
AfrE	21.6	4.6	39.8	117.9	412.0	1065.8	1616.9	2253.0	132.6
AmrA	13.5	7.4	38.1	226.2	590.3	1123.0	1726.5	1214.7	415.3
AmrB	21.2	9.3	28.4	127.8	339.0	615.8	914.1	1589.7	153.5
AmrD	36.2	14.2	46.1	200.8	588.6	942.4	1521.8	2602.4	203.0
EmrB	16.6	10.7	25.8	104.3	252.3	397.3	571.2	937.3	82.8
EmrD	21.5	12.1	26.1	109.2	211.4	315.0	484.3	495.4	79.3
EurA	11.5	6.8	31.5	150.3	430.7	778.6	1292.8	2105.4	407.8
EurB1	15.4	7.4	29.0	131.6	317.4	608.6	818.5	1175.8	202.0
EurB2	7.5	8.8	30.4	117.2	270.0	464.6	559.4	504.5	105.5
EurC	19.7	9.9	36.1	154.6	360.5	661.9	876.5	895.0	278.3
SearB	22.5	10.8	21.3	126.4	343.1	463.0	589.7	1033.9	122.7
SearD	29.8	8.3	32.6	64.8	225.9	484.2	640.6	1601.5	98.4
WprA	9.0	4.9	25.5	134.4	351.9	550.0	916.0	1873.2	322.7
WprB1	29.8	7.0	12.5	70.1	237.8	544.5	955.4	1312.9	142.1
WprB2	17.9	6.1	20.2	73.7	212.9	279.2	386.9	1138.6	78.8
WprB3	9.6	6.3	33.4	166.5	328.3	330.2	343.6	973.9	96.5

[17-19]. It is suggested that data on incidence as well as mortality are necessary to understand the magnitude and trends of cancer problems and to evaluate the interventions against cancer in the context of prevention [1]. When setting priorities, interventions against cancers need to be compared with other health interventions which aims at reducing only morbidity [5,20].

GBD 2000 employs a composite measure of disease burden in terms of disability-adjusted life years (DALYs) which consist of years lived with disability (morbidity)

and years of life lost (mortality) [5]. As a part of this exercise, we have estimated both mortality and incidence of cancers by site. We will further estimate the years lived with disability to derive cancer burden in DALYs once weights assigned to disabling conditions are revised based on the estimates from the on-going population-based surveys from more than 70 countries [21].

The presents study also suggests that there is a significant variation in the distribution of cancer mortality and incidence by region depending on age and population struc-

Table 14: Estimated global and regional number of new cases and age-standardised incidence rate of cancer by site, males, 2000

Site	World	WHO sub region																
		AFRO		AMRO				EMRO			EURO			SEARO		WPRO		
		D	E	A	B	D	B	D	A	BI	B2	C	B	D	A	BI	B2	B3
Number of new cases (000s)																		
Mouth and oropharynx cancers	267.1	12.1	16.5	11.3	10.4	0.9	2.6	1.7	28.7	7.4	0.9	17.8	16.0	98.1	6.5	29.7	6.1	0.5
Oesophagus cancer	286.5	5.1	14.1	12.4	11.1	0.7	1.9	0.8	22.8	3.6	1.8	10.7	3.8	42.0	10.1	142.7	3.0	0.0
Stomach cancer	589.3	13.3	10.9	11.8	29.7	8.7	8.6	2.5	45.6	17.2	4.0	48.6	8.6	30.1	40.6	300.9	7.6	0.1
Colon and rectum cancers	527.8	9.5	12.0	85.6	21.2	2.2	3.2	3.1	133.8	21.5	1.4	42.8	21.4	25.7	49.2	91.0	3.8	0.1
Liver cancer	422.0	20.0	23.6	9.0	9.5	2.9	3.1	2.3	26.1	6.0	0.7	7.9	28.6	18.4	24.6	232.8	6.2	0.2
Pancreas cancer	119.3	1.5	2.8	16.5	8.1	1.2	0.9	1.0	27.4	5.9	1.0	11.4	3.7	7.3	11.5	18.7	0.5	0.0
Trachea, bronchus, lung cancers	939.9	7.4	9.8	112.1	38.5	1.7	9.3	7.4	172.0	49.5	3.9	89.3	43.1	107.8	46.9	227.8	13.1	0.3
Melanoma of the skin	118.2	3.5	3.4	61.8	5.3	0.9	0.3	0.2	22.6	3.2	0.3	4.0	1.2	2.1	6.7	2.6	0.1	0.1
Breast cancer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cervix uteri cancer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Corpus uteri cancer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ovary cancer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prostate cancer	550.2	36.5	28.2	165.7	46.0	8.6	3.2	2.7	139.1	15.2	0.8	22.3	13.4	29.6	28.1	9.5	1.2	0.0
Bladder cancer	277.2	10.6	7.3	60.3	8.1	0.8	4.1	14.4	65.1	12.1	1.2	17.8	7.7	27.8	13.5	24.8	1.5	0.0
Lymphomas, multiple myeloma	238.5	20.3	18.6	36.2	13.4	2.8	6.5	5.2	39.3	7.8	1.3	7.4	13.3	36.5	11.8	15.2	2.6	0.2
Leukaemia	195.2	6.3	9.2	20.6	13.1	2.9	3.4	5.3	25.6	6.6	1.1	9.3	10.7	28.2	6.7	44.0	2.2	0.1
Other malignant neoplasms	635.8	24.2	33.5	84.8	54.2	8.6	10.3	6.2	128.4	32.5	4.7	56.3	24.2	77.8	35.8	47.7	6.4	0.3
Age-standardised incidence rate per 100,000																		
Mouth and oropharynx cancers	8.8	12.9	18.4	5.0	5.5	3.3	4.9	3.6	8.6	7.4	4.5	10.9	9.3	18.5	4.7	3.9	12.0	21.7
Oesophagus cancer	9.4	5.7	16.8	5.1	5.9	3.1	3.8	1.7	6.0	3.4	9.4	6.3	2.2	8.2	6.6	19.2	6.3	2.0
Stomach cancer	19.4	15.0	13.0	4.6	15.8	35.8	17.4	5.5	11.0	16.4	21.3	28.8	5.2	5.9	25.6	40.8	15.9	3.8
Colon and rectum cancers	17.3	10.4	14.6	34.4	11.3	9.2	6.3	6.5	33.0	20.4	7.1	25.1	12.9	4.9	32.4	12.3	7.8	5.8
Liver cancer	13.7	20.3	24.7	3.7	5.0	11.4	6.4	5.0	6.4	5.7	3.6	4.8	16.0	3.2	16.2	30.8	12.1	9.9
Pancreas cancer	3.9	1.6	3.5	6.5	4.3	4.8	1.8	2.3	6.8	5.7	5.3	6.8	2.2	1.5	7.3	2.5	1.0	0.2
Trachea, bronchus, lung cancers	30.9	8.3	12.0	44.8	20.6	6.9	18.9	16.6	43.3	47.1	20.6	52.2	27.5	20.3	28.9	30.8	26.4	14.7
Melanoma of the skin	3.9	3.8	3.7	27.2	2.8	3.7	0.6	0.3	6.6	3.1	1.6	2.6	0.7	0.4	4.9	0.3	0.3	3.6

Table 14: Estimated global and regional number of new cases and age-standardised incidence rate of cancer by site, males, 2000 (Continued)

Breast cancer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cervix uteri cancer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Corpus uteri cancer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ovary cancer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prostate cancer	18.0	45.0	38.9	63.7	24.8	36.3	6.9	6.5	31.8	14.1	4.4	12.8	8.6	5.8	17.1	1.3	2.5	2.3
Bladder cancer	9.0	12.0	8.8	24.4	4.3	3.3	8.5	30.5	16.1	11.6	6.4	10.7	4.6	4.8	8.7	3.5	3.1	1.4
Lymphomas, multiple myeloma	7.8	18.2	17.0	15.3	6.8	10.7	10.6	8.6	10.9	8.1	6.2	5.1	7.6	6.1	8.2	2.1	4.5	7.1
Leukaemia	6.4	5.5	7.7	8.9	6.3	8.6	5.1	7.8	7.5	7.2	4.3	6.8	5.7	4.3	5.8	6.7	3.3	3.3
Other malignant neoplasms	20.8	24.1	37.1	39.9	27.2	31.0	19.1	11.3	39.1	32.8	22.4	37.5	13.5	13.7	27.0	6.6	12.4	11.2

Table 15: Estimated global and regional number of new cases and age-standardised incidence rate of cancer by site, females, 2000

Site	WHO sub region																	
	World	AFRO		AMRO		EMRO		EURO			SEARO		WPRO					
		D	E	A	B	D	B	D	A	BI	B2	C	B	D	A	BI	B2	B3
	Number of new cases (000s)																	
Mouth and oropharynx cancers	153.6	8.2	11.4	5.9	4.6	0.8	2.2	1.1	9.9	2.5	0.5	4.6	9.4	63.6	3.0	21.2	4.2	0.4
Oesophagus cancer	166.2	4.2	7.2	3.3	4.0	0.3	1.6	0.5	8.4	1.0	1.3	3.8	2.5	34.9	2.1	89.0	2.0	0.0
Stomach cancer	383.9	10.3	8.4	7.1	19.7	8.4	4.5	2.0	33.9	10.2	2.6	36.3	6.7	18.1	23.7	186.7	5.1	0.1
Colon and rectum cancers	517.3	8.5	8.2	73.8	26.2	3.3	4.0	2.8	131.0	19.0	1.8	54.1	22.8	21.1	41.7	95.5	3.3	0.1
Liver cancer	204.4	11.9	11.1	4.7	9.7	3.4	1.3	1.2	14.0	4.0	0.5	5.9	11.7	12.0	11.1	99.6	2.2	0.2
Pancreas cancer	106.9	1.6	2.6	14.3	9.1	1.3	0.8	0.7	28.1	4.8	0.7	10.2	3.6	5.3	9.8	13.6	0.5	0.0
Trachea, bronchus, lung cancers	365.7	3.1	5.0	74.6	16.4	1.0	3.0	2.6	55.3	10.8	1.1	17.7	8.3	25.9	18.9	117.7	4.0	0.2
Melanoma of the skin	88.5	3.3	4.3	26.5	5.7	0.9	0.4	0.3	26.5	3.5	0.3	5.9	1.9	1.7	5.0	2.2	0.1	0.1
Breast cancer	1031.9	28.3	39.8	226.5	59.3	7.2	10.2	13.6	221.8	32.6	4.5	68.5	53.9	109.0	43.7	102.1	10.2	0.5
Cervix uteri cancer	487.5	43.3	67.9	16.1	40.6	9.2	6.7	5.6	18.8	12.6	1.9	22.5	32.8	146.7	6.6	45.0	10.2	0.8
Corpus uteri cancer	326.3	4.6	6.0	46.0	48.8	8.6	1.6	1.3	68.3	17.9	3.8	43.6	19.9	11.7	17.3	17.4	0.8	0.1
Ovary cancer	221.3	7.1	12.2	22.4	13.2	2.1	2.1	2.0	39.4	10.0	1.2	21.6	18.1	31.9	8.4	26.6	2.9	0.2
Prostate cancer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bladder cancer	105.7	3.6	3.4	14.9	3.5	0.4	0.8	3.7	21.4	2.7	0.3	4.4	2.4	28.9	4.6	9.7	1.0	0.0

Table 15: Estimated global and regional number of new cases and age-standardised incidence rate of cancer by site, females, 2000 (Continued)

Lymphomas, multiple myeloma	242.6	10.2	8.0	32.2	12.4	2.3	5.0	4.0	40.9	6.9	1.0	7.3	9.6	74.9	9.7	15.2	2.7	0.1
Leukaemia	169.5	5.9	7.0	14.7	12.4	2.9	2.6	3.8	23.0	4.9	0.9	9.0	10.8	24.9	5.2	39.4	1.9	0.1
Other malignant neoplasms	553.9	44.2	22.7	63.6	56.7	11.7	8.9	8.9	107.3	25.3	4.4	46.5	27.3	31.7	32.7	56.1	5.3	0.3
Age-standardised incidence rate per 100,000																		
Mouth and oropharynx cancers	5.1	9.2	12.6	2.6	2.4	3.4	4.6	2.2	2.7	2.5	2.5	2.2	5.7	13.5	2.2	3.1	7.7	18.6
Oesophagus cancer	5.6	5.2	9.2	1.3	2.2	1.5	4.0	1.1	1.8	1.0	6.5	1.5	1.7	8.0	1.3	13.4	3.9	1.8
Stomach cancer	12.8	12.7	10.5	2.9	10.7	37.4	10.9	4.3	7.3	9.4	12.4	15.6	4.4	4.3	14.9	28.2	10.1	3.1
Colon and rectum cancers	17.3	9.9	10.2	29.8	14.1	14.4	9.4	5.9	29.2	17.2	8.6	23.0	14.7	4.7	26.7	14.2	6.3	4.2
Liver cancer	6.8	13.0	12.0	1.9	5.2	14.6	3.1	2.5	3.1	3.6	2.3	2.5	7.5	2.3	6.6	14.8	4.2	7.6
Pancreas cancer	3.6	1.8	3.5	5.6	5.0	5.8	1.9	1.6	6.0	4.3	3.6	4.3	2.4	1.3	5.8	2.1	0.9	0.4
Trachea, bronchus, lung cancers	11.9	3.5	5.8	30.5	8.8	4.4	6.7	5.6	13.4	9.9	5.5	7.6	5.4	5.3	11.6	16.0	7.4	8.4
Melanoma of the skin	2.9	3.9	5.3	12.6	2.9	4.0	0.8	0.6	7.9	3.4	1.4	3.2	1.2	0.3	4.2	0.3	0.2	2.8
Breast cancer	34.2	29.9	41.6	103.5	29.7	27.6	22.5	26.2	64.1	32.0	21.2	35.4	30.7	20.9	38.6	14.1	18.5	21.9
Cervix uteri cancer	16.6	43.3	69.8	8.2	19.8	34.9	15.0	10.7	6.2	12.8	9.0	12.7	18.4	30.2	6.0	6.6	18.0	33.1
Corpus uteri cancer	10.8	5.2	6.8	20.3	24.5	32.8	3.7	2.8	18.4	17.1	18.1	21.2	11.5	2.1	13.3	2.4	1.5	5.2
Ovary cancer	7.3	6.8	12.1	9.8	6.6	7.9	4.3	3.7	10.8	9.9	5.6	11.2	10.2	6.2	6.8	3.6	5.0	6.3
Prostate cancer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bladder cancer	3.6	4.1	3.9	6.0	1.9	1.8	2.2	7.9	4.6	2.4	1.5	1.9	1.6	5.7	2.7	1.5	1.8	0.6
Lymphomas, multiple myeloma	8.3	9.1	7.7	13.8	6.3	9.2	9.9	7.2	10.6	7.0	4.4	4.0	5.8	15.7	6.7	2.2	4.4	4.8
Leukaemia	5.5	5.6	6.1	6.6	6.0	9.1	4.3	5.9	6.0	5.2	3.8	5.2	6.0	3.9	4.4	5.8	3.0	2.9
Other malignant neoplasms	18.8	45.9	24.0	30.2	28.6	44.0	20.0	17.2	29.6	24.9	19.6	25.8	16.1	6.1	23.3	10.7	9.4	129

Table 16: Ranking of the global cancer incidence by site, 2000

site	Number of death (000s)	Proportion of total (%)
Both sexes		
Trachea, bronchus, and lung	1305.6	12.7
Stomach	1045.0	10.2
Liver	1031.9	10.0
Colon and rectum	973.1	9.5
Breast	626.4	6.1
Oesophagus	550.2	5.3
Lymphomas and myeloma	487.5	4.7
Mouth and oropharynx	481.1	4.7

Table 16: Ranking of the global cancer incidence by site, 2000 (Continued)

Prostate	452.7	4.4
Leukaemia	420.7	4.1
Cervix uteri	382.9	3.7
Pancreas	364.7	3.5
Bladder	326.3	3.2
Ovary	226.2	2.2
Corpus uteri	221.3	2.2
Melanoma of the skin	206.7	2.0
Males		
Trachea, bronchus, and lung	939.9	18.2
Stomach	589.3	11.4
Liver	550.2	10.6
Colon and rectum	527.8	10.2
Oesophagus	422.0	8.2
Prostate	286.5	5.5
Mouth and oropharynx	277.2	5.4
Lymphomas and myeloma	267.1	5.2
Leukaemia	238.5	4.6
Bladder	195.2	3.8
Pancreas	119.3	2.3
Melanoma of the skin	118.2	2.3
Females		
Breast	1031.9	20.1
Trachea, bronchus, and lung	517.3	10.1
Stomach	487.5	9.5
Colon and rectum	383.9	7.5
Cervix uteri	365.7	7.1
Liver	326.3	6.4
Lymphomas and myeloma	242.6	4.7
Oesophagus	221.3	4.3
Ovary	204.4	4.0
Leukaemia	169.5	3.3
Pancreas	166.2	3.2
Mouth and oropharynx	153.6	3.0
Corpus uteri	106.9	2.1
Bladder	105.7	2.1
Melanoma of the skin	88.5	1.7

Table 17: Ranking of the selected regional cancer incidence by site, 2000

WHO sub region								
AfrE (high child and adult mortality)			EurA (very low child and adult mortality)			SearB (low child and adult mortality)		
site	Number of (000s)	Proportion (%)	site	Number of (000s)	Proportion (%)	site	Number of (000s)	Proportion (%)
Both sexes								
Cervix uteri	67.9	16.4	Trachea, bronchus, and lung	264.7	15.4	Trachea, bronchus, and lung	53.9	12.3
Liver	39.8	9.6	Colon and rectum	227.3	13.2	Liver	51.4	11.7
Breast	34.7	8.3	Breast	221.8	12.9	Breast	44.3	10.1
Mouth and oropharynx	28.2	6.8	Prostate	139.1	8.1	Colon and rectum	40.3	9.2

Table 17: Ranking of the selected regional cancer incidence by site, 2000 (Continued)

Oesophagus	27.9	6.7	Stomach	86.5	5.0	Mouth and oropharynx	32.8	7.5
Lymphomas and myeloma	26.6	6.4	Lymphomas and myeloma	80.2	4.7	Lymphomas and myeloma	25.4	5.8
Prostate	21.2	5.1	Pancreas	79.6	4.6	Cervix uteri	22.9	5.2
Stomach	20.3	4.9	Liver	68.3	4.0	Leukaemia	21.5	4.9
Colon and rectum	19.4	4.7	Bladder	55.5	3.2	Stomach	19.9	4.5
Trachea, bronchus, and lung	16.2	3.9	Leukaemia	49.1	2.8	Ovary	18.1	4.1
Leukaemia	14.8	3.6	Oesophagus	48.6	2.8	Prostate	15.3	3.5
Ovary	12.2	2.9	Ovary	40.1	2.3	Pancreas	13.4	3.1
Bladder	10.7	2.6	Mouth and oropharynx	39.4	2.3	Bladder	10.1	2.3
Melanoma of the skin	7.7	1.8	Corpus uteri	38.6	2.2	Oesophagus	7.2	1.7
Pancreas	6.0	1.4	Melanoma of the skin	31.2	1.8	Corpus uteri	6.2	1.4
Corpus uteri	5.4	1.3	Cervix uteri	18.8	1.1	Melanoma of the skin	3.1	0.7
Males								
Liver	28.2	14.8	Trachea, bronchus, and lung	172.0	19.6	Trachea, bronchus, and lung	43.1	22.0
Prostate	23.6	12.4	Colon and rectum	139.1	15.9	Liver	28.6	14.6
Mouth and oropharynx	18.6	9.8	Prostate	133.8	15.3	Colon and rectum	21.4	11.0
Lymphomas and myeloma	16.5	8.7	Stomach	65.1	7.4	Mouth and oropharynx	16.0	8.2
Oesophagus	14.1	7.4	Lymphomas and myeloma	45.6	5.2	Lymphomas and myeloma	13.4	6.9
Stomach	12.0	6.3	Bladder	39.3	4.5	Prostate	13.3	6.8
Trachea, bronchus, and lung	10.9	5.8	Pancreas	28.7	3.3	Leukaemia	10.7	5.5
Colon and rectum	9.8	5.2	Liver	27.4	3.1	Stomach	8.6	4.4
Leukaemia	9.2	4.9	Oesophagus	26.1	3.0	Bladder	7.7	3.9
Bladder	7.3	3.8	Leukaemia	25.6	2.9	Pancreas	3.8	1.9
Pancreas	3.4	1.8	Mouth and oropharynx	22.8	2.6	Oesophagus	3.7	1.9
Melanoma of the skin	2.8	1.5	Melanoma of the skin	22.6	2.6	Melanoma of the skin	1.2	0.6
Females								
Cervix uteri	67.9	30.2	Breast	221.8	26.2	Breast	53.9	22.3
Breast	39.8	17.7	Colon and rectum	131.0	15.4	Cervix uteri	32.8	13.6
Liver	12.2	5.4	Trachea, bronchus, and lung	68.3	8.1	Colon and rectum	22.8	9.4
Stomach	11.4	5.1	Stomach	55.3	6.5	Liver	19.9	8.2
Mouth and oropharynx	11.1	4.9	Lymphomas and myeloma	40.9	4.8	Ovary	18.1	7.5
Ovary	8.4	3.7	Pancreas	39.4	4.6	Trachea, bronchus, and lung	11.7	4.8

Table 17: Ranking of the selected regional cancer incidence by site, 2000 (Continued)

Oesophagus	8.2	3.7	Ovary	33.9	4.0	Leukaemia	10.8	4.5
Colon and rectum	8.0	3.6	Leukaemia	28.1	3.3	Lymphomas and myeloma	9.6	4.0
Lymphomas and myeloma	7.2	3.2	Corpus uteri	26.5	3.1	Mouth and oropharynx	9.4	3.9
Leukaemia	7.0	3.1	Liver	23.0	2.7	Stomach	8.3	3.4
Trachea, bronchus, and lung	6.0	2.7	Bladder	21.4	2.5	Corpus uteri	6.7	2.8
Melanoma of the skin	5.0	2.2	Cervix uteri	18.8	2.2	Pancreas	3.6	1.5
Pancreas	4.3	1.9	Oesophagus	14.0	1.7	Oesophagus	2.5	1.0
Bladder	3.4	1.5	Melanoma of the skin	9.9	1.2	Bladder	2.4	1.0
Corpus uteri	2.6	1.2	Mouth and oropharynx	8.4	1.0	Melanoma of the skin	1.9	0.8

ture, distribution of risk factors, and opportunity of detection and treatment [2,22]. However, the frequent cancers such as lung, liver and cervical cancers are potentially preventable [23]. For example, Parkin has estimated that there would have been 23% fewer cases of cancers in the developing world in 1990, if infections such as hepatitis B and C virus and human papilloma virus had been prevented [24]. Another estimate suggests that 230,000 deaths (more than 4% of all cancer deaths) from liver cancer could have been avoided with only immunisations against hepatitis B [13]. Smoking was estimated to be responsible for another 20% of all cancer deaths, all of which are preventable [13].

Given a high incidence of cancers which are potentially preventable in both developed and developing countries, the role of primary prevention, early detection as well as treatment should be evaluated more carefully [2]. Cost-effectiveness analysis plays a role for this purpose, which should be generalisable and comparable across various interventions including both currently delivered and potentially feasible ones [20]. Estimating the magnitude of cancer mortality and incidence is a key input for setting research and intervention priorities. Combined with costs of each intervention, mortality and incidence estimates provide a basis for effectiveness calculation in cost-effectiveness analysis of cancer control programmes.

Conclusions

Based on the algorithm to estimate region-specific overall cancer mortality, and site-specific survival, death distributions, and incidence as a part of GBD 2000 study, it is estimated that cancers accounted for over 7 million deaths (13% of total mortality) and more than 10 million new cases occurred world wide in 2000. Cancer mortality and incidence in developing countries already accounted for over 60% and about half of the global total, respectively.

Although there was a significant variation in the distribution of cancer mortality and incidence by region, many of the common cancers are potentially preventable. Magnitude of cancer burden estimation by taking into account both mortality and morbidity is an essential information to set research priorities and policy formulation and can be used for setting cancer control priorities when combined with data on costs of interventions.

Competing interests

None declared.

Author's Contributions

KS conceived of the study, analysed the data, and drafted the manuscript. CDM participated in the design of the study, and performed statistical analyses. CBP carried out the data compilation and drafted the manuscript. ADL participated in the design of the study and in the mortality analysis. CJLM conceived of the study and participated in its design and coordination. All authors read and approved the final manuscript.

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