

Chapter 5

PROJECTION OF BURDEN OF CANCER

Cancer projections are useful especially in a developing country like India, to plan and prioritise health care services that would include both diagnostic and treatment facilities. It therefore aids in formulation of government policies and budget allocation. The numbers of cancers by place and type also constitute baseline information and act as indicators of cancer control.

Projection of cancer burden means a systematic way of prediction of number of cancer cases for all anatomical sites or for a specific site and for a specified period of time. One way could be to use the change in incidence rates over time and derive the expected or projected incidence rate and apply the same to the projected population of that year.

Methodology

The following data/assumptions/methods including some of the lines followed in the previous report (NCRP, 2009) were used to provide the table of projection.

1. The Crude Incidence Rate (CR) was considered suitable for assessing the future load (magnitude) of cancer cases in the country. The CR has been preferred to AAR as the latter is more suitable for comparison of rates between areas than for assessing the disease burden for the area.
2. The Pooled Crude rate (CR) of Three-year report of Population Based Cancer Registries (2009-2011) was used to estimate the burden of cancer for the year 2010. For the estimates of cancer for the population of the North East the pooled CR of the six older North East PBCRs at Dibrugarh, Mizoram, Manipur, Cachar, Kamrup Urban and Sikkim was used. For estimating the cancers for the population of the rest of India the pooled CR of 15 (which is combinations of urban, rural and semi urban) PBCRs were used. The data of four newer PBCRs at Meghalaya, Tripura, Nagaland and Wardha were not taken into account as these were considered preliminary data.
3. The trends in crude incidence rate generated by five older PBCRs at Bangalore, Bhopal, Chennai, Delhi and Mumbai for the years 2000-2009 formed the sources of data for determining the Annual Percentage Change (APC). The Log-Linear Regression method by using Joinpoint regression, SEER program, US National Cancer Institute (Version 4.0.1) was used to assess the APC in crude incidence rates and the statistical significance (Kim *et al*, 2000).

4. The percentage change observed in decadal growth rate of the population of India from 2001-2011 as compared to the decadal growth of 1991-2001 (Census of India, Registrar general of India) was assumed to continue. Correspondingly, the growth rate of the population India was calculated separately for males and females and the same applied to obtain the yearly populations for the years 2011 to 2020.
5. The APC was applied to the 2010 India estimates and the population estimate by time was used to arrive at the projection for each of the projected calendar years, viz., 2013, 2014, 2015 and 2020.
6. For sites of cancer where the trend was not found to be statistically significant (either increase or decrease), the crude incidence rate from the recent Three-year report of Population Based Cancer Registries (2009-2011) (NCDIR-NCRP, 2013) was assumed to be constant.
7. As in the previous report (NCRP, 2009) the crude incidence rate of cancers of cervix and breast of the rural registry at Barshi was taken into account to represent the rural areas of India and five old urban registries (Bangalore, Bhopal, Chennai, Delhi and Mumbai) were taken to represent urban areas of India. Using the same methodology listed above, the estimates were derived for cancers of the cervix and breast.

Limitations

The projections of the numbers of cancers give a fair idea of the burden, overall and by specific anatomical site and would certainly help in meeting the objects outlined at the beginning of this chapter. However, there are certain limitations that need to be kept in mind. India being a vast country with diverse cultures, habits, living conditions and environment the PBCRs cover just 7.0% of the population. Though the PBCRs cover 16 states and one union territory, several remaining states are still uncovered. Secondly, in giving projections, one of the assumptions is that the risk factors/behaviour will be the same in the coming years and that no change would take place. Improved techniques for detecting cancer could arise and more importantly in our setting access to diagnosis of cancer could improve. These cannot be factored in the projections. Lastly, only simple statistical methods similar to that followed in the previous report (NCRP, 2009) have been employed. No sophisticated models, such as the age period cohort models (Bray and Moller, 2006; Stewart & Xie 2009; Rostgaard *et al.* 2001) as used in developed countries have been utilised.

Table 5.1(a) shows Projected Cases at India level for selected sites and selected time periods 2013, 2014, 2015 and 2020 by sex.

Table 5.1(b) shows Projected Cases at India level for selected sites and selected time periods 2013, 2014, 2015 and 2020 for both sexes.

Table 5.2 shows the number of cases and relative proportion of cancer burden projection by broad anatomical sites for the year 2013 and 2015.

**Table 5.1(a): Projected Cases at India level for Selected Sites and Selected Time Periods
(2013, 2014, 2015 and 2020)**

Males

ICD-10	Site Name	2013	2014	2015	2020
C00-C97	All Sites	522164	535324	548844	622203
C01-C02	Tongue	33160	34768	36457	46254
C03-C06	Mouth	45669	48430	51362	68977
C12-C13	Hypopharynx	13078	13023	12969	12727
C15	Oesophagus	22529	22343	22161	21319
C16	Stomach	22343	22616	22893	24359
C18	Colon	15966	16655	17376	21489
C19-C20	Rectum	15925	16544	17188	20825
C22	Liver	18224	18946	19697	23954
C23-C24	Gall Bladder	10730	11162	11613	14176
C25	Pancreas	8653	8910	9175	10628
C32	Larynx	23590	23877	24169	25696
C33-C34	Lung	52685	54235	55834	64615
C61	Prostate	35029	37055	39200	51979
C64	Kidney	10567	10895	11232	13091
C67	Urinary Bladder	17713	18147	18593	21003
C70-C72	Brain	14988	14922	14857	14547
C82-C85, C96	NHL	21498	21759	22025	23414
C91	Lymphoid Leuk.	10594	10923	11262	13130
C92-C94	Myeloid Leuk.	10785	10916	11049	11747

Females

ICD-10	Site Name	2013	2014	2015	2020
C00-C97	All Sites	564619	581945	599847	698725
C01-C02	Tongue	11289	11846	12432	15846
C03-C06	Mouth	17958	18406	18866	21366
C12-C13	Hypopharynx	3160	3201	3244	3470
C15	Oesophagus	15380	15280	15183	14739
C16	Stomach	13187	13560	13944	16060
C18	Colon	12917	13657	14440	19113
C19-C20	Rectum	12035	12629	13253	16895
C22	Liver	8514	8835	9168	11049
C23-C24	Gall Bladder	20388	21504	22686	29712
C32	Larynx	3022	3062	3102	3315
C33-C34	Lung	21234	22649	24164	33511
C50	Breast	94208	97328	100611	119782
C53	Cervix	92731	93786	94857	100479
C54	Corpus Uteri	20875	22347	23925	33696
C56	Ovary	36423	37726	39080	46661
C67	Urinary Bladder	5336	5623	5925	7709
C70-C72	Brain	10672	10812	10954	11704
C73	Thyroid	16389	17104	17852	22808
C82-C85, C96	NHL	13671	13850	14032	14994
C91	Lymphoid Leuk.	5906	5983	6062	6477
C92-C94	Myeloid Leuk.	11542	12741	14068	23137

**Table 5.1(b): Projected Cases at India level for Selected Sites and Selected Time Periods
(2013, 2014, 2015 and 2020)**

Both Sexes

ICD-10	Site Name	2013	2014	2015	2020
C00-C96	All Sites	1086783	1117269	1148692	1320928
C01-02	Tongue	44449	46614	48888	62099
C03-06	Mouth	63627	66836	70228	90342
C12-13	Hypopharynx	16238	16224	16213	16196
C15	Oesophagus	37909	37623	37344	36058
C16	Stomach	35531	36176	36837	40419
C18	Colon	28883	30312	31816	40601
C19-20	Rectum	27960	29173	30442	37720
C22	Liver	26738	27781	28866	35003
C23-24	Gall Bladder	31118	32666	34299	43888
C32	Larynx	26612	26939	27271	29012
C33-34	Lung	73919	76884	79998	98126
C67	Urinary Bladder	23049	23770	24518	28712
C70-72	Brain	25660	25734	25811	26251
C82-85,C96	NHL	35169	35610	36057	38408
C91	Lymphoid Leuk.	16500	16906	17324	19607
C92-94	Myeloid Leuk.	22327	23657	25117	34884

Table 5.2: Cancer Burden by Broad Anatomical Sites - 2013 and 2015

	2013		2015	
	No. of Cases	Approx. Relative Proportion	No. of Cases	Approx. Relative Proportion
All Sites	1086783		1148692	
Tobacco Related Cancers	298457	27	318186	28
Gastro Intestinal Tract	207861	19	221526	19
Cervix	92731	9	94857	8
Breast	94208	9	100611	9
Corpus Uteri and Ovary	57298	5	63005	5
Lymphoid & Haemopoietic Malignancies	109484	10	115525	10
Prostate	35029	3	39200	3
Central Nervous System	25660	2	25811	2