

Chapter 3

COMPARISON OF INCIDENCE RATES

The leading sites of cancer with their modified CR (CR-M) and AAR (AAR-M) in Area 1 and Area 2 and the results of their comparisons by Wilcoxon test (Non-parametric test) are summarized in Table 3.1. The corresponding year-wise rates for all anatomical sites of cancer and selected leading sites, with the results of the comparison between the two areas are shown in Tables 3.2–3.14.

Cancer of All sites:

For both males and females, the modified AARs for all sites of cancer were higher in Area 1 as compared to Area 2.

Males:

The modified AARs of cancers of the tongue, mouth, hypopharynx, oesophagus and lung showed significantly higher incidence rates in Area 1 as compared to Area 2.

Females:

The modified AARs of cancers of the mouth and cervix were higher in Area 1. However, the modified AAR of cancer breast was higher in Area 2.

Comparison of Incidence Rates of Tobacco Related Cancers

The results above suggest that AARs of cancers of some (tongue, mouth, oesophagus, lung) anatomical sites associated with use of tobacco (TRCs) are apparently higher in the affected Area 1 as compared to unaffected Area 2. Further, the comparison between the areas in the AARs of all TRCs over the years (Table 3.15) showed a significantly higher AAR of TRCs in Area 1 as compared to Area 2.

In view of this, the tobacco habits of the population in the two areas were examined. In the year 2005, a random sample survey was carried out on 2000 households covering approximately 10,000 populations in each of the Areas 1 and Area 2. Besides the tobacco habits, the survey also provided information on the age distribution of the population in the two areas. The results of the survey showed that 50.7% of males (above 21 years of age) in Area 1 as opposed to 34.2% of males of the same age group in Area 2 were tobacco users (Annexure II). Likewise, the corresponding figures in females were 15.5% and 5.9% in Area 1 and 2 respectively.

Since the information on tobacco habits was available for the year 2005 through NCRP survey 2005, it was thought logical to relate them to TRC incidence of the year 2005 in Area 1 and Area 2, respectively. As a first step, the TRC incidence to tobacco habit ratio was obtained for both the areas. Under the assumption that both the areas have common tobacco habits, the pooled tobacco habit was obtained using weighted average and then the pooled TRC incidence to Tobacco habit ratio was obtained which was used to obtain the expected TRC incidence by multiplying it with the tobacco habit. The Expected TRC incidence cases

Table 3.1: Comparison between Area 1 and Area 2 of Modified CR and AAR Bhopal (1988-2007)**Males**

	CR-M		AAR-M	
	Z value	P-value	Z value	P-value
All sites	3.435	<0.01	3.472	<0.01
Tongue	3.621	<0.01	3.883	<0.01
Mouth	3.211	<0.01	3.323	<0.01
Hypopharynx	2.501	<0.01	2.688	<0.01
Oesophagus	3.173	<0.05	3.323	<0.01
Stomach	0.112	NS	0.299	NS
Larynx	2.315	<0.05	1.829	NS
Lung	2.128	<0.05	2.464	<0.05
Prostate	-1.493	NS	-1.083	NS
Brain NS	-1.493	NS	-1.680	NS
NHL	0.040	NS	0.724	NS
Myeloid leukaemia	-0.262	NS	-0.201	NS

Females

	CR-M		AAR-M	
	Z value	P-value	Z value	P-value
All sites	-0.373	NS	2.576	<0.05
Mouth	1.755	NS	3.024	<0.05
Oesophagus	1.207	NS	1.736	NS
Stomach	0.161	NS	0.336	NS
Gall bladder	-1.027	NS	-0.597	NS
Lung	-0.821	NS	-0.485	NS
Breast	-3.920	<0.01	-3.883	<0.01
Cervix	3.397	<0.01	3.808	<0.01
Corpus uteri	-0.467	NS	-0.672	NS
Ovary	-1.269	NS	-0.971	NS
Brain NS	-0.885	NS	-0.915	NS
Myeloid leukaemia	0.762	NS	-1.167	NS

were calculated by multiplying the Expected TRC incidence to respective populations and then dividing it by 100,000. It gave the expected number of TRC incidence cases under the assumption that both the areas have common tobacco habits. The Chi-square was used to test the significant difference between observed and expected number of cases.

Table 3.2: Comparison between Area 1 and Area 2 of yearwise modified CR and AAR - All sites of Cancer (ICD10: C00-C96) - Bhopal (1988-2007)

Year	MALES				FEMALES			
	CR-M		AAR-M		CR-M		AAR-M	
	Area 1	Area 2	Area 1	Area 2	Area 1	Area 2	Area 1	Area 2
1988	54.24	44.27	95.86	87.76	50.80	55.61	89.56	95.95
1989	59.22	49.46	105.26	91.04	57.98	45.49	97.95	78.83
1990	62.92	46.85	110.70	83.99	62.15	56.96	94.32	89.69
1991	66.32	55.22	114.02	99.51	64.18	56.99	102.92	89.81
1992	65.36	61.93	114.68	104.34	65.36	66.08	104.96	100.30
1993	67.09	67.27	114.16	111.12	63.34	73.58	101.91	110.29
1994	74.87	66.41	124.11	109.29	67.81	75.96	107.40	110.92
1995	73.26	74.96	122.29	119.52	69.59	67.33	112.29	101.25
1996	77.23	72.19	127.72	119.09	70.01	82.83	113.71	120.00
1997	80.18	78.02	130.29	122.49	74.49	88.80	120.73	126.06
1998	80.21	79.72	132.92	122.49	73.28	83.20	114.43	114.85
1999	91.35	75.22	150.95	114.60	79.53	87.76	124.97	118.86
2000	94.32	78.75	148.31	123.78	84.43	91.46	132.30	122.25
2001	96.84	83.81	155.25	122.88	85.26	94.53	133.66	126.79
2002	105.58	84.06	161.61	126.59	96.03	97.89	150.57	126.39
2003	108.33	94.18	162.29	129.96	95.60	96.07	144.80	113.54
2004	114.86	91.55	167.78	134.84	110.51	100.60	173.81	155.15
2005	119.34	105.29	174.40	156.00	109.18	101.73	167.20	161.64
2006	109.50	118.15	152.86	169.10	118.37	98.66	179.44	157.42
2007	122.42	118.14	164.82	157.23	132.00	113.13	192.39	174.97
Wilcoxon Z	3.435		3.472		-0.373		2.576	
P value	<0.01		<0.01		NS		<0.01	

The results (Table 3.15) show that the differences in the incidence of TRC cancers between the areas when adjusted for the tobacco habits of the population became comparable. Thus the differences in AARs of all TRCs can be explained due to differences in tobacco habits of the population and not due to their exposure status per se. The incidence rates of specific anatomical sites: mouth, tongue, oesophagus and hypopharynx were also compared between the areas (Area 1 and Area 2) after adjusting for the tobacco habits. The incidence rates were found to be again comparable suggesting that the differences in AARs of these sites between Area 1 and 2 are again due to the differences in the tobacco habits of the population in the two areas (Tables 3.16–3.20).

However, one limitation of this exercise is that the information on tobacco habits among cancer cases from PBCR areas was not available, throughout the period of the study.

Table 3.3: Comparison between Area 1 and Area 2 of yearwise modified CR and AAR - Cancer of Tongue and Mouth (ICD10: C01-C02 & C03-06) Bhopal - Males (1988-2007)

Year	TONGUE (ICD10: C01-C02)				MOUTH (ICD10: C03-06)			
	CR-M		AAR-M		CR-M		AAR-M	
	Area 1	Area 2	Area 1	Area 2	Area 1	Area 2	Area 1	Area 2
1988	7.25	0.00	13.33	0.00	4.94	3.67	9.03	8.67
1989	6.46	7.12	12.40	12.43	5.17	4.58	10.26	7.92
1990	7.27	5.43	13.77	11.69	1.26	2.96	2.51	4.76
1991	5.73	3.43	11.21	5.37	2.87	0.98	4.87	1.84
1992	6.70	2.42	12.87	5.41	3.83	4.83	6.95	7.77
1993	5.44	4.76	10.49	7.79	5.12	6.19	8.34	8.82
1994	6.41	4.70	10.55	8.90	6.41	5.64	11.03	9.56
1995	6.43	4.63	10.81	7.38	8.35	6.48	13.97	9.95
1996	7.74	4.10	13.51	6.63	7.74	5.46	12.85	8.14
1997	7.12	6.27	12.54	10.44	8.74	6.72	13.34	8.95
1998	6.83	5.29	12.36	8.17	7.48	7.50	11.46	12.01
1999	9.47	7.38	15.25	11.07	8.17	4.34	11.72	6.87
2000	8.54	6.42	12.93	9.57	8.87	4.28	12.76	6.47
2001	10.25	8.02	17.00	11.20	9.92	5.06	14.80	8.20
2002	11.66	5.00	17.31	7.32	10.00	5.00	14.26	7.19
2003	11.48	8.18	18.01	11.29	9.43	8.18	14.00	10.44
2004	14.27	7.74	21.73	11.10	16.31	4.48	20.52	6.32
2005	13.41	9.28	19.34	12.92	16.85	6.05	23.81	8.46
2006	12.58	14.30	19.60	17.35	14.67	10.04	19.94	14.52
2007	12.09	10.81	16.52	14.70	11.38	10.01	14.70	12.90
Wilcoxon Z	3.621		3.883		3.211		3.323	
P value	< 0.01		< 0.01		< 0.01		< 0.01	

Table 3.4: Comparison between Area 1 and Area 2 of yearwise modified CR and AAR - Cancer of Hypopharynx and Oesophagus (ICD10: C12-13 & C15) Bhopal - Males (1988-2007)

Year	HYPOPHARYNX (ICD10: C12-13)				OESOPHAGUS (ICD10: C15)			
	CR-M		AAR-M		CR-M		AAR-M	
	Area 1	Area 2	Area 1	Area 2	Area 1	Area 2	Area 1	Area 2
1988	1.98	3.67	3.82	8.15	3.30	2.62	5.05	6.29
1989	5.17	2.54	9.65	5.28	4.52	2.54	8.19	5.97
1990	5.69	3.45	10.85	6.30	6.96	2.96	13.31	5.99
1991	4.46	2.94	7.27	4.86	4.14	3.43	8.56	6.81
1992	4.47	5.31	8.81	9.72	5.11	1.93	9.14	3.48
1993	5.44	4.29	10.49	7.96	5.44	2.38	10.37	4.90
1994	4.81	5.17	8.22	9.51	5.77	5.17	10.62	7.99
1995	5.14	2.78	9.68	4.50	3.86	6.48	6.90	9.85
1996	3.55	5.01	6.74	8.78	5.16	5.92	9.25	9.59
1997	5.82	3.14	10.46	5.01	6.47	6.27	11.90	10.56
1998	5.20	3.97	9.40	7.05	7.15	6.17	11.75	10.41
1999	4.90	5.21	8.72	8.87	7.84	5.21	14.24	8.31
2000	6.24	3.00	10.25	4.73	8.22	4.71	14.42	6.77
2001	5.62	5.06	10.14	8.17	7.94	4.22	13.43	6.38
2002	5.67	4.58	9.78	7.21	7.33	6.66	11.63	11.10
2003	5.50	5.97	9.65	8.46	7.86	4.72	13.05	7.50
2004	5.78	5.29	9.30	8.52	6.12	6.19	9.90	9.53
2005	4.47	4.03	6.95	6.39	5.50	3.63	8.99	5.54
2006	8.73	6.43	13.53	10.06	11.88	6.02	18.71	8.59
2007	8.18	3.60	12.70	5.87	7.11	5.61	10.21	8.46
Wilcoxon Z	2.501		2.688		3.173		3.323	
P value	<0.01		<0.01		<0.01		<0.01	

Table 3.5: Comparison between Area 1 and Area 2 of yearwise modified CR and AAR - Cancer of Lung and Prostate (ICD10: C33-34 & C61) Bhopal - Males (1988-2007)

Year	LUNG (ICD10: C33-34)				PROSTATE (ICD10: C61)			
	CR-M		AAR-M		CR-M		AAR-M	
	Area 1	Area 2	Area 1	Area 2	Area 1	Area 2	Area 1	Area 2
1988	4.61	6.29	9.60	11.99	0.99	0.52	2.25	1.05
1989	6.14	7.12	12.39	15.32	2.91	1.53	6.40	3.25
1990	7.59	3.95	14.30	5.97	2.85	2.96	6.50	6.85
1991	7.65	7.83	15.61	15.34	2.55	2.94	5.87	6.74
1992	9.89	7.25	18.84	11.98	2.55	2.42	4.91	5.90
1993	7.99	8.58	14.88	16.94	3.52	2.38	7.58	4.26
1994	8.33	7.04	14.54	10.96	2.56	1.88	5.40	4.63
1995	9.00	8.33	16.13	14.12	2.25	3.70	4.54	7.23
1996	10.96	7.28	18.95	12.71	2.58	5.01	5.30	9.19
1997	11.65	8.51	19.48	14.77	4.21	3.58	7.61	6.87
1998	10.73	6.61	20.70	10.49	4.55	6.17	9.05	11.12
1999	12.41	6.95	20.65	11.27	3.92	5.21	7.45	9.52
2000	11.50	6.85	19.39	10.86	3.94	5.99	7.47	11.32
2001	12.90	6.75	21.80	10.37	2.98	5.06	5.88	9.29
2002	10.00	12.50	16.54	19.13	4.33	5.42	8.63	8.97
2003	11.16	11.95	18.31	18.30	4.25	3.46	8.02	5.39
2004	12.23	8.55	18.59	12.45	5.44	4.48	9.54	7.09
2005	11.01	12.91	16.22	19.72	4.47	6.86	7.90	11.55
2006	19.22	14.46	29.67	20.30	7.34	6.43	12.10	10.77
2007	11.38	14.82	17.53	20.78	4.27	6.41	7.27	9.96
Wilcoxon Z	2.128		2.464		-1.493		1.083	
P value	<0.05		<0.01		NS		NS	

Table 3.6: Comparison between Area 1 and Area 2 of yearwise modified CR and AAR - Cancer of Stomach and Larynx (ICD10: C16 & C32) Bhopal - Males (1988-2007)

Year	STOMACH (ICD10: C16)				LARYNX (ICD10: C32)			
	CR-M		AAR-M		CR-M		AAR-M	
	Area 1	Area 2	Area 1	Area 2	Area 1	Area 2	Area 1	Area 2
1988	1.98	2.62	3.74	5.08	2.97	3.15	4.91	6.47
1989	2.91	0.51	5.12	1.65	1.29	1.02	2.37	2.51
1990	3.16	2.47	4.95	5.38	1.90	1.48	2.61	2.50
1991	2.87	3.92	4.23	6.32	1.91	2.94	3.12	6.39
1992	2.87	0.97	4.70	1.77	2.55	2.42	4.22	3.74
1993	1.28	1.91	2.71	3.38	1.60	2.38	2.81	5.00
1994	3.20	0.94	5.44	1.58	3.20	1.88	5.47	3.40
1995	0.96	3.24	1.73	5.51	2.57	2.78	4.44	4.75
1996	3.22	1.37	4.67	2.79	3.55	2.73	6.90	5.56
1997	2.59	2.69	4.38	3.52	2.59	4.48	3.88	7.78
1998	0.98	3.97	2.02	6.08	5.20	4.41	8.65	6.79
1999	2.29	0.87	3.62	1.74	4.57	4.34	8.25	6.71
2000	1.64	3.42	2.71	5.32	4.27	3.42	7.36	5.25
2001	1.98	0.84	3.43	1.24	4.96	3.80	8.68	6.07
2002	1.33	2.08	2.10	2.71	5.00	3.75	8.94	6.35
2003	1.89	2.20	2.50	2.94	4.87	4.72	7.93	6.36
2004	2.04	2.44	3.13	3.49	7.82	3.26	12.05	4.87
2005	2.75	3.63	3.64	5.19	6.88	3.23	10.54	5.25
2006	4.89	4.02	6.70	6.39	6.29	4.02	9.44	5.69
2007	2.13	2.40	3.01	3.90	6.76	4.41	10.15	6.18
Wilcoxon Z	0.112		0.299		2.315		1.829	
P value	NS		NS		<0.05		NS	

Table 3.7: Comparison between Area 1 and Area 2 of yearwise modified CR and AAR - Cancer of Brain NS and NHL (ICD10: C70-72 & C82-85, C96) Bhopal - Males (1988-2007)

Year	BRAIN NS (ICD10: C70-72)				NHL (ICD10: C82-85, C96)			
	CR-M		AAR-M		CR-M		AAR-M	
	Area 1	Area 2	Area 1	Area 2	Area 1	Area 2	Area 1	Area 2
1988	0.99	0.00	1.51	0.00	0.33	1.57	0.39	2.83
1989	1.94	2.04	3.10	2.52	0.65	0.51	0.80	0.42
1990	1.26	0.49	2.27	1.38	1.90	1.97	2.30	2.86
1991	3.19	1.86	3.86	2.19	0.32	1.47	0.86	1.66
1992	3.06	2.42	3.68	4.05	1.60	0.97	2.33	1.57
1993	2.24	5.24	3.51	6.65	3.20	1.43	4.38	2.58
1994	1.03	3.76	0.86	5.13	1.67	0.94	2.82	1.44
1995	2.57	3.70	2.45	4.23	2.25	1.85	3.48	1.78
1996	2.26	4.01	2.99	5.41	1.55	1.37	1.71	2.02
1997	1.62	1.61	2.14	1.28	2.14	3.40	2.89	4.92
1998	2.08	3.26	2.52	3.76	2.60	1.76	4.22	2.52
1999	1.63	3.56	1.63	4.61	3.59	1.74	5.41	1.75
2000	2.96	2.57	3.75	3.57	4.27	3.85	5.76	6.11
2001	2.58	5.49	3.43	6.69	2.25	2.95	2.71	5.36
2002	2.53	2.50	3.06	3.49	4.33	2.92	4.39	4.37
2003	3.30	3.46	3.79	4.67	0.00	0.00	0.00	0.00
2004	3.74	1.63	5.30	1.80	4.49	5.38	4.93	7.59
2005	0.69	2.82	0.79	4.36	3.44	3.63	4.59	4.88
2006	2.38	1.61	2.44	2.32	3.84	4.42	5.40	6.41
2007	1.14	4.00	1.05	4.66	3.20	6.41	3.89	8.41
Wilcoxon Z	-1.493		-1.680		0.040		0.724	
P value	NS		NS		NS		NS	

Table 3.8: Comparison between Area 1 and Area 2 of yearwise modified CR and AAR - Cancer of Myeloid Leukaemia (ICD10: C92-94) Bhopal - Males (1988-2007)

Year	CR-M		AAR-M	
	Area 1	Area 2	Area 1	Area 2
1988	1.12	2.62	1.42	2.30
1989	0.65	1.02	0.56	0.76
1990	1.26	0.49	1.26	0.39
1991	2.48	0.98	3.17	1.49
1992	1.47	3.38	1.84	3.08
1993	3.52	3.34	3.64	3.43
1994	3.53	0.47	3.97	0.33
1995	1.29	0.46	1.10	0.32
1996	0.97	2.28	0.94	2.56
1997	1.62	3.14	1.71	3.22
1998	1.63	3.53	1.50	4.09
1999	1.31	2.17	1.80	1.93
2000	3.29	1.71	4.37	2.10
2001	1.52	5.06	1.56	5.71
2002	3.00	2.75	4.23	2.82
2003	0.00	0.00	0.00	0.00
2004	2.45	1.22	2.62	1.70
2005	5.16	3.63	5.95	4.61
2006	3.35	1.93	3.32	2.71
2007	1.85	2.80	2.13	2.97
Wilcoxon Z	-0.262		-0.201	
P value	NS		NS	

Table 3.9: Comparison between Area 1 and Area 2 of yearwise modified CR and AAR - Cancer of Cervix and Corpus Uteri (ICD10: C53 & C54) Bhopal (1988-2007)

Year	CERVIX (ICD10: C53)				CORPUS UTERI (ICD10: C54)			
	CR-M		AAR-M		CR-M		AAR-M	
	Area 1	Area 2	Area 1	Area 2	Area 1	Area 2	Area 1	Area 2
1988	13.31	13.04	21.09	23.38	1.85	1.19	3.26	2.46
1989	14.82	10.31	25.64	15.99	3.25	0.00	6.09	0.00
1990	15.89	10.51	24.69	17.01	1.06	1.11	1.77	1.40
1991	17.08	14.27	28.75	21.99	1.78	0.55	2.67	0.98
1992	16.73	13.00	25.57	19.36	2.49	0.54	4.12	0.94
1993	15.68	17.62	24.58	24.71	1.07	1.60	1.73	2.66
1994	18.18	16.31	27.78	22.96	0.71	1.05	1.04	1.72
1995	18.91	13.47	28.27	19.85	0.36	1.55	0.54	2.50
1996	18.59	16.79	28.75	24.59	1.07	1.02	1.89	1.51
1997	19.36	17.00	29.97	23.39	0.72	2.00	0.93	2.79
1998	19.78	14.75	30.85	19.42	1.44	1.48	2.55	2.27
1999	18.76	17.90	30.96	25.19	2.17	1.94	3.38	2.95
2000	19.57	18.10	32.12	23.27	2.90	0.95	4.82	1.86
2001	17.09	19.69	28.32	25.25	2.91	0.94	5.55	1.22
2002	25.21	13.40	41.18	16.51	0.00	1.39	0.00	1.94
2003	24.06	11.64	38.44	14.15	0.31	2.36	0.38	2.41
2004	25.89	15.53	40.38	25.35	3.33	1.85	4.81	2.66
2005	22.73	12.67	36.02	19.47	1.49	4.10	2.45	7.19
2006	23.80	16.62	37.31	26.59	3.40	1.13	5.46	1.87
2007	27.61	18.41	37.53	26.45	2.30	3.83	4.03	6.32
Wilcoxon Z	3.397		3.808		0.467		0.672	
P value	<0.01		<0.01		NS		NS	

Table 3.10: Comparison between Area 1 and Area 2 of yearwise modified CR and AAR - Cancer of Mouth and Oesophagus (ICD10: C03-06 & C15) Bhopal - Females (1988-2007)

Year	MOUTH (ICD10: C03-06)				OESOPHAGUS (ICD10: C15)			
	CR-M		AAR-M		CR-M		AAR-M	
	Area 1	Area 2	Area 1	Area 2	Area 1	Area 2	Area 1	Area 2
1988	2.22	2.37	4.92	3.71	4.81	2.96	8.14	5.43
1989	4.70	1.15	8.33	2.22	2.17	2.29	4.43	4.66
1990	3.18	1.66	5.55	2.55	2.12	1.66	3.94	3.61
1991	1.42	2.75	3.01	5.40	2.49	2.20	3.69	3.55
1992	3.56	3.25	7.88	5.27	2.85	2.71	5.92	5.66
1993	3.21	3.20	5.53	5.50	3.21	4.27	5.72	7.35
1994	3.92	3.16	7.64	4.98	4.28	2.63	7.84	5.10
1995	3.93	2.59	6.98	4.32	5.35	0.52	10.12	0.84
1996	3.58	4.58	6.79	6.47	3.58	3.56	6.04	6.87
1997	5.02	4.00	9.43	5.87	4.30	2.50	9.02	4.49
1998	5.03	5.41	9.24	7.27	2.52	1.97	4.16	2.84
1999	3.97	6.77	7.02	9.84	2.53	3.87	4.81	5.13
2000	5.44	5.72	10.23	9.30	2.90	2.38	4.95	3.72
2001	4.73	3.75	8.44	5.52	3.64	2.81	6.54	3.81
2002	6.58	2.77	11.33	3.80	2.56	4.16	4.50	5.73
2003	5.82	4.72	10.12	5.80	4.09	3.77	6.53	5.15
2004	6.29	2.96	10.31	4.38	3.70	3.70	7.43	6.58
2005	3.73	5.59	6.04	8.57	5.59	3.73	10.22	6.31
2006	6.42	3.40	11.20	4.21	4.91	5.67	8.54	9.07
2007	8.82	4.22	14.35	6.79	6.52	8.82	10.46	13.65
Wilcoxon Z	1.755		3.024		1.207		1.736	
P value	NS		<0.01		NS		NS	

Table 3.11: Comparison between Area 1 and Area 2 of yearwise modified CR and AAR - Cancer of Stomach and Gall bladder (ICD10: C16 & C23-24) Bhopal - Females (1988-2007)

Year	STOMACH (ICD10: C16)				GALL BLADDER (ICD10: C23-24)			
	CR-M		AAR-M		CR-M		AAR-M	
	Area 1	Area 2	Area 1	Area 2	Area 1	Area 2	Area 1	Area 2
1988	1.11	0.00	2.13	0.00	1.85	2.37	3.87	5.44
1989	0.36	1.15	0.63	1.53	1.08	4.01	2.72	8.66
1990	0.35	1.11	0.29	1.73	0.71	1.11	1.26	2.61
1991	3.20	0.55	5.46	0.98	1.07	0.55	1.90	0.97
1992	1.78	0.00	3.40	0.00	0.71	2.17	1.19	3.85
1993	0.36	1.60	0.64	3.07	2.14	1.60	3.60	3.11
1994	1.78	0.53	2.77	0.82	1.78	0.00	3.01	0.00
1995	1.43	1.04	1.94	1.62	2.85	2.59	5.26	3.81
1996	1.43	2.04	2.54	2.39	1.79	3.56	3.64	5.98
1997	1.08	1.00	1.91	1.97	1.43	4.50	3.08	7.46
1998	1.44	1.97	1.82	2.69	1.80	2.95	3.39	4.86
1999	1.44	0.48	2.47	0.67	2.89	3.39	4.25	4.66
2000	0.72	2.38	1.33	3.48	3.62	5.72	7.59	8.76
2001	1.82	1.88	3.19	2.69	3.27	4.69	5.31	6.09
2002	0.73	0.92	0.78	1.34	4.02	4.62	6.29	6.21
2003	0.79	1.42	1.11	2.25	5.82	3.77	9.08	5.56
2004	0.74	0.74	1.11	1.21	4.81	4.07	8.07	6.30
2005	1.12	0.75	2.27	1.37	5.22	4.10	8.79	6.76
2006	0.76	3.02	1.37	5.35	4.53	2.64	7.08	4.30
2007	1.92	0.38	3.95	0.71	4.83	5.75	7.06	10.12
Wilcoxon Z	0.161		0.336		-1.027		-0.597	
P value	NS		NS		NS		NS	

Table 3.12: Comparison between Area 1 and Area 2 of yearwise modified CR and AAR - Cancer of Lung and Breast (ICD10: C33-34 & C50) Bhopal - Females (1988-2007)

Year	LUNG (ICD10: C33-34)				BREAST (ICD10: C50)			
	CR-M		AAR-M		CR-M		AAR-M	
	Area 1	Area 2	Area 1	Area 2	Area 1	Area 2	Area 1	Area 2
1988	0.37	1.19	1.03	1.78	9.98	13.04	17.06	22.03
1989	0.72	2.29	1.56	4.76	10.84	12.61	19.17	21.83
1990	1.06	0.00	1.89	0.00	11.30	15.49	18.32	23.67
1991	0.36	1.10	0.77	1.89	12.81	13.18	21.93	20.11
1992	2.49	0.54	5.16	1.13	12.10	18.42	17.71	29.21
1993	1.78	2.67	2.92	3.37	13.18	19.22	20.44	29.20
1994	1.43	2.10	2.90	3.93	12.84	21.04	19.81	30.32
1995	1.78	3.63	4.07	6.33	12.13	20.72	17.77	29.72
1996	2.15	2.04	3.43	2.50	14.66	19.84	21.54	27.16
1997	1.79	2.00	3.19	3.05	12.91	24.50	19.16	33.55
1998	0.36	2.46	0.71	4.67	15.46	25.08	23.65	34.37
1999	1.44	0.48	2.52	0.71	14.43	30.00	21.39	38.36
2000	2.90	2.38	5.34	3.27	18.84	25.25	26.21	33.77
2001	1.82	3.28	2.80	4.91	17.46	28.14	24.29	36.91
2002	1.46	2.31	2.11	3.45	19.73	30.51	29.46	37.93
2003	0.79	0.94	1.50	1.51	21.23	30.82	31.12	35.94
2004	2.22	1.11	4.38	1.92	21.82	30.33	32.47	45.04
2005	1.49	3.73	2.34	6.64	29.81	30.18	41.27	46.53
2006	3.02	0.76	4.77	1.41	28.71	29.08	39.64	45.92
2007	3.45	3.07	5.34	5.82	26.69	29.53	35.81	43.36
Wilcoxon Z	-0.821		-0.485		-3.920		3.883	
P value	NS		NS		<0.01		<0.01	

Table 3.13: Comparison between Area 1 and Area 2 of yearwise modified CR and AAR - Cancer of Ovary and Brain NS (ICD10: C56 & C70-72) Bhopal - Females (1988-2007)

Year	OVARY (ICD10: C56)				BRAIN NS (ICD10: C70-72)			
	CR-M		AAR-M		CR-M		AAR-M	
	Area 1	Area 2	Area 1	Area 2	Area 1	Area 2	Area 1	Area 2
1988	1.48	3.56	2.06	6.67	0.00	0.59	0.00	1.09
1989	3.61	2.86	5.81	4.78	1.08	0.80	1.63	0.67
1990	4.24	2.21	5.98	3.31	1.77	1.66	2.45	1.36
1991	2.85	6.04	3.68	9.71	2.49	1.65	3.29	3.14
1992	6.76	4.87	9.90	5.21	0.71	1.08	0.56	1.61
1993	2.99	5.34	4.93	7.63	1.07	1.60	1.69	1.79
1994	3.21	5.79	4.03	8.47	1.07	3.79	1.55	4.07
1995	4.64	5.18	7.51	7.43	0.71	0.52	0.60	0.78
1996	4.29	3.56	7.00	5.28	1.00	1.02	0.79	0.75
1997	4.01	5.00	5.42	6.40	1.08	1.00	1.80	1.16
1998	3.60	5.90	5.40	7.20	1.44	2.16	1.81	2.75
1999	4.33	2.90	8.10	4.02	2.17	1.94	1.91	2.59
2000	3.99	3.81	5.31	4.77	1.09	1.43	1.31	1.33
2001	5.46	6.00	7.41	8.21	1.45	0.47	1.86	0.35
2002	4.75	8.78	7.35	10.69	1.46	1.39	2.12	1.40
2003	5.03	6.45	4.70	8.98	1.10	1.89	0.00	1.19
2004	6.36	12.20	9.01	17.49	2.96	2.22	3.63	2.63
2005	6.71	7.45	9.50	10.86	1.12	1.86	1.51	2.24
2006	9.06	7.86	13.93	13.32	1.81	1.81	2.54	3.14
2007	11.35	6.52	16.39	9.96	0.77	2.30	0.51	2.91
Wilcoxon Z	-1.269		-0.971		-0.885		0.915	
P value	NS		NS		NS		NS	

Table 3.14: Comparison between Area 1 and Area 2 of yearwise modified CR and AAR - Cancer of Myeloid Leukaemia (ICD10: C92-94) Bhopal - Females (1988-2007)

Year	CR-M		AAR-M	
	Area 1	Area 2	Area 1	Area 2
1988	0.00	1.78	0.00	1.30
1989	0.36	1.15	0.30	0.83
1990	0.71	1.66	0.85	1.24
1991	1.07	0.00	0.93	0.00
1992	1.78	0.54	1.84	0.41
1993	1.92	1.60	2.72	1.34
1994	1.14	0.53	1.47	0.87
1995	1.43	0.52	2.86	0.42
1996	1.79	1.02	3.18	1.46
1997	1.79	1.50	1.94	1.96
1998	2.30	2.16	2.33	2.08
1999	2.53	1.06	3.02	1.23
2000	1.09	2.38	1.25	2.87
2001	1.45	3.75	1.83	4.15
2002	1.10	0.92	0.85	0.75
2003	0.00	0.00	0.00	0.00
2004	2.29	1.85	3.14	3.76
2005	3.35	1.49	4.27	2.53
2006	1.13	0.76	1.36	0.63
2007	1.53	1.53	1.95	2.16
Wilcoxon Z	0.762		-1.167	
P value	NS		NS	

Table 3.15: Comparison of TRC and Non-TRC Incidence rates in Area 1 and Area 2 - Bhopal (1988-2007)

Year	TRC-Incidence		Non TRC-Incidence	
	Area 1	Area 2	Area 1	Area 2
1988	24.05	20.02	27.44	21.48
1989	27.81	23.64	26.92	21.78
1990	29.53	19.80	27.83	22.44
1991	25.36	21.29	33.16	27.25
1992	29.37	22.96	26.93	30.34
1993	27.34	24.88	28.93	32.38
1994	30.57	27.38	31.35	27.76
1995	29.33	28.20	30.09	32.97
1996	31.84	26.81	30.35	30.69
1997	34.68	29.90	25.77	30.58
1998	33.38	28.14	27.03	31.74
1999	36.71	27.10	29.60	28.36
2000	34.71	22.76	31.80	34.90
2001	37.37	25.43	29.94	34.49
2002	34.98	26.18	34.34	32.94
2003	34.97	32.80	33.93	27.11
2004	38.40	27.94	32.51	35.25
2005	31.73	26.91	36.48	39.73
2006	34.06	36.57	33.09	39.23
2007	31.92	30.55	36.07	47.81
Wilcoxon-Z	3.73		0.336	
P-values	< 0.01		NS	

Fig. 3.1: Comparison of TRC incidence rates in Area 1 and Area 2 in Bhopal (1988-2007)

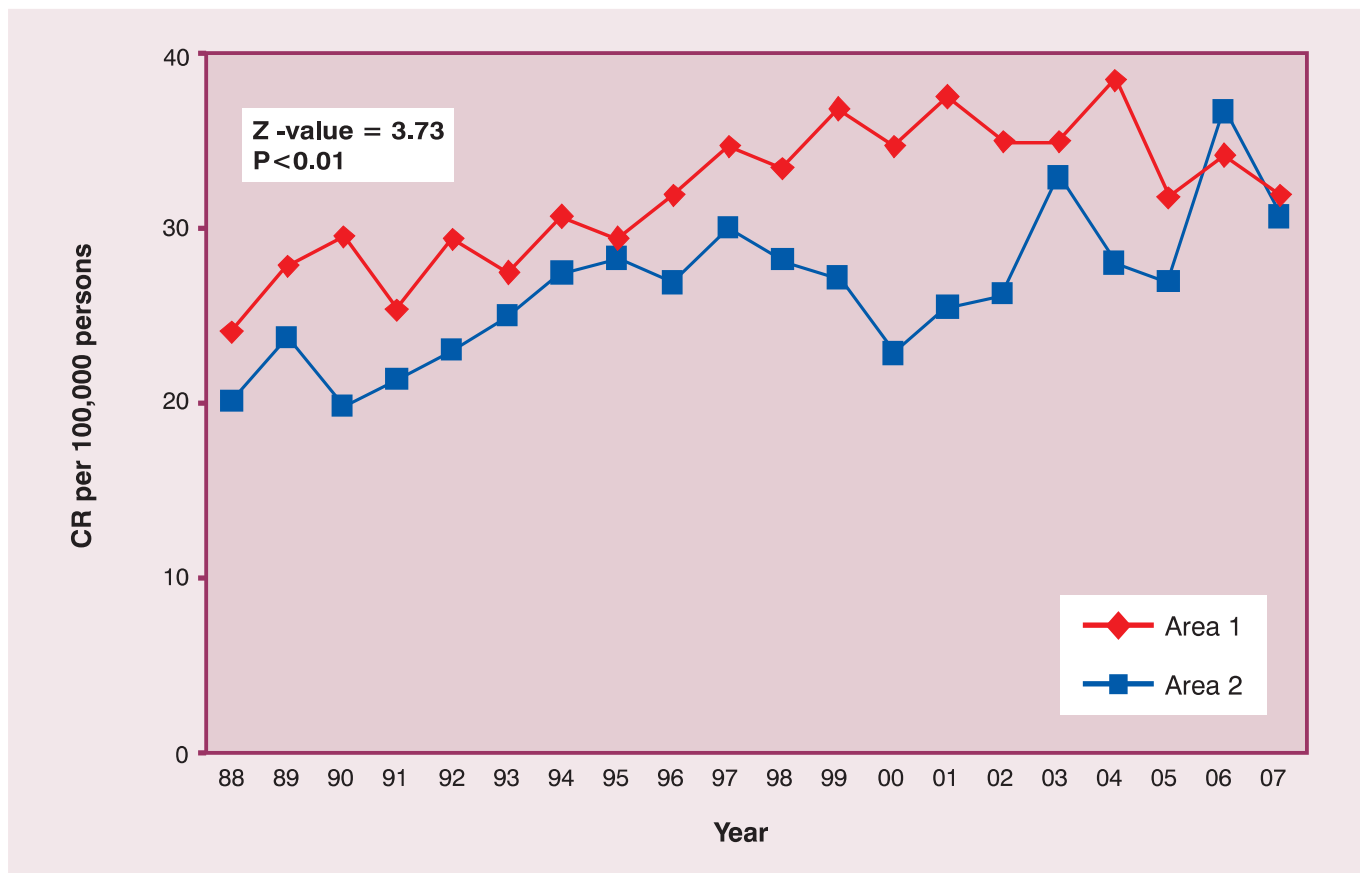


Fig. 3.2: Comparison of Non-TRC incidence rates in Area 1 and Area 2 in Bhopal (1988-2007)

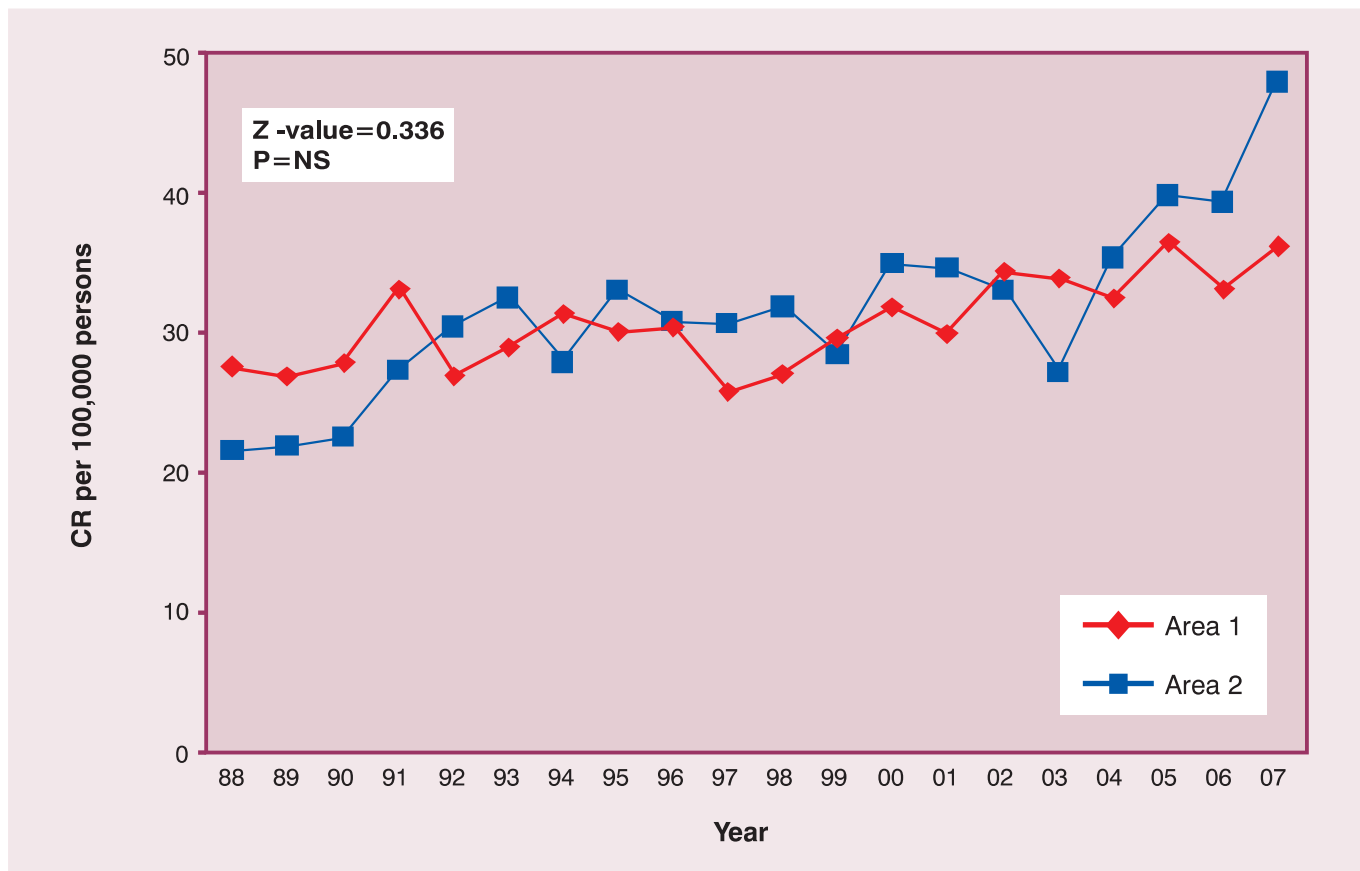


Table 3.16: Adjustment of TRC incidence by Tobacco habits and Area in Bhopal - Males - TRC Cases - 2005

Variable name	Affected	Unaffected	Total / Average
Cases = a	145	98	243
Population = b	504325	397686	902011
TRC Inc (a/b)*100000 = K	28.75	24.64	26.94
Total covered = d	3048	3474	6522
No. of Tobacco users = c	1544	1188	2732
Tobacco habit* = (c/d)*100 = L	50.7	34.2	41.9
(TRC Inc/Tobacco habit) ratio = (K/L) = M	0.57	0.72	0.64
Expected TRC Inc = (L* avg. M) = N	32.58	21.99	26.94
Expected TRC cases (b * N) /100000)	164.30	87.46	243.00
Chi square value	2.267	1.270	3.537
P-value	0.132	0.260	0.171
Significance	NS	NS	NS

* - Based on NCRP Survey 2005; NS – Non-significant.

Table 3.17: Adjustment of incidence by Tobacco habits and Area in Bhopal - Males - Mouth - 2005

Variable name	Affected	Unaffected	Total / Average
Cases = a	40	14	54
Population = b	504325	397686	902011
TRC Inc (a/b)*100000 = K	7.93	3.52	5.99
Total covered = d	3048	3474	6522
No. of Tobacco users = c	1544	1188	2732
Tobacco habit* = (c/d)*100 = L	50.7	34.2	41.9
(TRC Inc/Tobacco habit) ratio = (K/L) = M	0.16	0.10	0.14
Expected TRC Inc = (L* avg. M) = N	7.24	4.89	5.99
Expected TRC cases (b * N) /100000)	36.51	19.44	54.00
Chi square value	0.333	1.520	1.854
P-value	0.564	0.218	0.396
Significance	NS	NS	NS

* - Based on NCRP Survey 2005; NS – Non-significant.

Table 3.18: Adjustment of incidence by Tobacco habits and Area in Bhopal Males - Tongue - 2005

Variable name	Affected	Unaffected	Total / Average
Cases = a	28	21	49
Population = b	504424	397874	902298
TRC Inc (a/b)*100000 = K	5.55	5.28	5.43
Total covered = d	3048	3474	6522
No. of Tobacco users = c	1544	1188	2732
Tobacco habit* = (c/d)*100 = L	50.7	34.2	41.9
(TRC Inc/Tobacco habit) ratio = (K/L) = M	0.11	0.15	0.13
Expected TRC Inc = (L* avg. M) = N	6.57	4.43	5.43
Expected TRC cases (b * N) /100000)	33.13	17.64	49.00
Chi square value	0.793	0.640	1.434
P-value	0.373	0.424	0.488
Significance	NS	NS	NS

* - Based on NCRP Survey 2005; NS – Non-significant.

Table 3.19: Adjustment of incidence by Tobacco habits and Area in Bhopal Males - Oesophagus - 2005

Variable name	Affected	Unaffected	Total / Average
Cases = a	14	10	24
Population = b	504325	397686	902011
TRC Inc (a/b)*100000 = K	2.78	2.51	2.66
Total covered = d	3048	3474	6522
No. of Tobacco users = c	1544	1188	2732
Tobacco habit* = (c/d)*100 = L	50.7	34.2	41.9
(TRC Inc/Tobacco habit) ratio = (K/L) = M	0.05	0.07	0.06
Expected TRC Inc = (L* avg. M) = N	3.22	2.17	2.66
Expected TRC cases (b * N) /100000)	16.23	8.64	24.00
Chi square value	0.306	0.215	0.520
P-value	0.580	0.643	0.771
Significance	NS	NS	NS

* - Based on NCRP Survey 2005; NS – Non-significant.

**Table 3.20: Adjustment of incidence by Tobacco habits and Area in Bhopal
Males - Hypopharynx - 2005**

Variable name	Affected	Unaffected	Total / Average
Cases = a	9	4	13
Population = b	504325	397686	902011
TRC Inc (a/b)*100000 = K	1.78	1.01	1.44
Total covered = d	3048	3474	6522
No. of Tobacco users = c	1544	1188	2732
Tobacco habit* = (c/d)*100 = L	50.7	34.2	41.9
(TRC Inc/Tobacco habit) ratio = (K/L) = M	0.04	0.03	0.03
Expected TRC Inc = (L* avg. M) = N	1.74	1.18	1.44
Expected TRC cases (b * N) /100000)	8.79	4.68	13.00
Chi square value	0.005	0.099	0.104
P-value	0.943	0.754	0.9495
Significance	NS	NS	NS

* - Based on NCRP Survey 2005; NS – Non-significant.