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**Cancer Incidence Patterns Among Chinese Immigrant
Populations in Alberta**

by

© WEI LUO

**Faculty of Medicine,
Department of Epidemiology and Community Medicine**

**To be submitted in partial fulfilment
of the requirements for the degree of
Master of Science**

**School of Graduate Studies and Research
The University of Ottawa
Ottawa, Ontario**

June, 1998

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0-612-36715-0

ABSTRACT

Objectives:

To examine the incidence of cancer among Chinese immigrants in Alberta and compare these rates to those of Canadian-born Alberta residents as well as to the Chinese in China.

Methods:

Cancer cases among Chinese immigrants and Canadian-born Alberta residents were identified from the Alberta Cancer Registry (1974-1993). Statistics Canada provided population counts by age group, sex, and birthplace for Alberta residents for each of the census years (1971, 1981, 1986, and 1991). Direct age-standardized incidence rates (ASIRs) were calculated using the 'world population' as standard. ASIRs for Chinese in China were acquired from 'Cancer Incidence in Five Continents', Vol IV-VII. Descriptive analysis and Poisson regression modeling were employed to obtain the rate ratios for certain cancer sites among the three populations. Age-period-cohort analysis was used to examine the secular effect on cancer development of certain cancer sites.

Results:

Chinese immigrants had lower ASIRs for *all cancer (excl. 173)* than Canadian-born Alberta residents and Chinese in China for both males and females. Chinese immigrants had significantly higher ASIRs for liver, stomach, esophagus, and kidney cancers than the Canadian-born population but lower than Chinese in China. Chinese immigrants had

significantly lower ASIRs for breast and prostate cancer than the Canadian-born population but higher than Chinese in China.

Conclusions:

First generation migrants' risk for overall cancer incidence was intermediate between that for Chinese in China and Canadian-born populations. There also appeared to be transition in risk towards the Canadian-born pattern for liver, colon, stomach. These findings are generally in line with those from other studies of this kind and extend the work on cancer mortality rates in Chinese migrants in Ontario by Hanley.

ACKNOWLEDGEMENTS

I could not have been able to undertake this project without the encouragement, support, assistance and advice of a great many people. I gratefully acknowledge the contributions of:

My supervisor Dr. Nick Birkett for his consultation and guidance in many areas, whose assistance and feedback has helped me through every step of this project. Dr. Yang Mao, my thesis co-supervisor who provided me with the opportunity to undertake this study, his support for the project was inspirational.

Occupational & Environmental Health Research Section, Health Statistics Division, Statistics Canada, which provided work space, access to data, and the enthusiastic assistance of its staff, especially Ms. Maureen Carpenter, Ms. Martha Fair, Ms. Luling Mao, Ms. Christine Poliquin and Mr. Marc Thomson.

The Alberta Cancer Registry who permitted the release of their data for the purposes of this study. Dr. Heather Bryant and Mr. Tomas Snodgrass were especially helpful in providing information on the data quality.

The Shanghai Cancer Institute who provided their data. Many thanks to Dr. Fan Jin who provided valuable information.

Environmental Risk Assessment and Case Surveillance Division, Cancer Bureau, Health Canada, which provided census tables.

The helpful comments and thoughtful criticisms provided by my examining committee: Dr. Don Wigle, Dr. Rama Nair and Dr. Robert A. Spasoff, director of the graduate program.

The Department of Epidemiology and Community Medicine at the University of Ottawa, whose faculty and students have contributed to my learning experience over the past two and half years. Many thanks to Ms. Fay Draper and Ms. Mariella Peca who have provided invaluable assistance.

And many thanks to my colleagues, particularly Robert Semenciw, Shiliang Liu, Larry Ellison and Mark Vanderkloot who provided invaluable information in many aspects.

Final, and most importantly, many thanks to my husband, daughter, parents and brother, for their inspiration, confidence and patience.

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CHAPTER 1. INTRODUCTION

1. General

Immigrant populations are of special interest to the cancer epidemiologist since migration provides a kind of 'natural experiment' allowing the comparison of disease risk in populations of similar genetic background living in different environments.¹ The most basic comparisons are between 1) the disease rates in the immigrants and people in their country of origin 2) Populations of different genetic background living in the same environment (e.g. between rates in the immigrants and people born in the host country). The differences in risk observed, and the rapidity with which the differences develop after migration, provide valuable clues to the relative importance of environmental and genetic factors in the etiology of different cancers. The term "migrant study" is generally reserved for analyses involving 'descriptive epidemiological' material - that is mortality or incidence data from routine disease surveillance systems.

Immigrant studies of cancer have been conducted in many countries for different nationalities. Special attention has been paid to Japanese immigrants to Hawaii in the US.² Italian immigrant populations have been well studied in several countries.¹ Jewish migration to Israel has stimulated research projects in various medical and social fields.³ Cancer patterns of Asian and European immigrants to Australia have been reported.⁴

Canada, with its multi cultural population, provides a suitable population base for cancer migration studies. Previous cancer immigrant studies have been reported for

European and Chinese immigrants to Canada, but they were all based on cancer mortality.^{5,6,7,8,9} The province of Alberta, with its substantial foreign-born population, makes it possible to conduct immigrant cancer epidemiology research in that population. Large and recent waves of Chinese immigrants were mainly from Hong Kong and the People's Republic (PR) of China.¹⁰ It is now timely and appropriate to conduct analytical studies in these populations. This thesis will describe the cancer incidence trends among the Chinese immigrant population in Alberta and will compare these rates to the Canadian-born population as well as to the Chinese population in China.

‘Immigrant population’, and ‘immigration’ do not have unequivocal meanings and are used in various research projects to describe different concepts. For the purpose of this study, the concept of immigrant (foreign-born) population will be defined as: persons who are living in Canada and who are not Canadian citizens by birth, but have legal resident status either as Canadian citizens by naturalization or as permanent residents (not considered here are persons with legal but temporary status such as students, workers, visitors, etc., regardless of their length of stay in Canada).¹¹

Immigrants may be determined according to several criteria, depending on the data sources used. The most frequently used is place of birth, which is a relatively well defined unchanging attribute and likely to be comparable between data sources (census, vital statistics, registration). Citizenship or nationality is less useful than place of birth since immigrants will become naturalized to varying degrees, and there are more problems of

definition. Ethnic group has been widely used in comparative studies of populations of different genetic background living in similar environments. The combination of place of birth and ethnic group to delineate first-generation immigrants and their offspring will be much more informative than either one alone.

2. Migration and cancer in Chinese population

2.1 Brief history of Chinese immigration to Canada

The first major wave of Chinese immigration to Canada occurred during the late 1800s when Chinese labourers arrived in Western Canada to work on the construction of the Canadian Pacific Railway.¹² However, Chinese immigration was no longer encouraged after the completion of the railway. In 1885, a federal bill imposed a head tax of \$50 on people of Chinese origin entering Canada. To further discourage immigration, this tax was increased to \$100 in 1900 and to \$500 in 1903. At that time, the tax exceeded the average annual income of many Canadians (about \$300).¹³ By 1923, immigration of Chinese people was halted with the passing of the Chinese Immigration Act. This Act, which prohibited Chinese people from entering Canada, remained in effect until 1947, when it was repealed.

Admission of Chinese immigrants remained restricted until 1967,¹⁰ when a point system to evaluate potential immigrants was introduced. Since then, Chinese people have been admitted to Canada under the same criteria as other immigrants. Since 1967, the Chinese population in Canada increased greatly, reaching 120,000 in 1971. Rapid growth

has continued and by 1991, 653,000 people with Chinese ancestry were living in Canada, a 58% increase from 1986.

Of the Chinese born outside Canada, most were born in the People's Republic of China (34%) and Hong Kong (33%). The remainder were born in Viet Nam (10%), Taiwan (4%), Malaysia (3%) and other countries (15%).¹⁰ Part of the reason for this growth in immigration is that on June 30, 1997, Hong Kong was handed over to Chinese from British rule and many people from Hong Kong immigrated to Canada in anticipation of the transfer. A large increase in immigration in 1990 and 1991 occurred following the events in Tiananmen Square in 1989. This was partly because Chinese citizens in Canada with student visas were given the opportunity, under a special measure, to remain in Canada as landed immigrants.

Large scale Chinese immigration to Alberta did not occur until the Canadian Pacific (CP) railroad was completed late in the nineteenth century. Con and coworker¹² reported that in 1901, there were only 235 Chinese individuals in Alberta (compared to almost 14,885 in BC), although this number had grown to 3,122 in 1941. By 1971, there were almost 13,000 Chinese in the province, representing 10.9% of the total population of this ethnic group in Canada. Based on the 1991 census, there were 78,360 people with Chinese ancestry living in Alberta, accounting for 12% of the total people with Chinese ancestry in Canada.¹⁰

2.2 Geographic differences in cancer occurrence between Shanghai China and Alberta in Canada

It is well known that the site-specific pattern of cancer in PR China differs markedly from that in Occidental countries. Cancer Incidence in Five Continents, Volume VI¹⁴ reported data from both the Shanghai cancer registry in China and the Alberta cancer registry between 1983-1987 (table 1). It was not surprising to see that cancer incidence was very different between those two places. For Alberta males, the most frequently occurring cancer was prostate at (54.9 per 10^5 person year) while the incidence was only (1.7 per 10^5) in Shanghai Chinese males. The second most frequently occurring cancer was lung cancer (51.5 per 10^5), with a similar rate in Shanghai (53.0 per 10^5). Colon cancer had an incidence of (21.8 per 10^5) in Alberta but only (9.2 per 10^5) in Chinese males. The fourth major cancer was bladder cancer (18.5 per 10^5) which was the 7th most common cancer for Chinese males in Shanghai.

In contrast, the most frequently occurring cancer in Shanghai was lung cancer (53.0 per 10^5) followed by stomach cancer (51.7 per 10^5) and liver cancer (30.6 per 10^5). Liver cancer was relatively rare among Alberta males incidence (2.2 per 10^5). Esophageal cancer was the fourth major cancer of Chinese males in Shanghai (14.9 per 10^5) but had an incidence of only (3.3 per 10^5) in Alberta males.

Table 1. Age standardized (world population) incidence rate of 5 leading cancer sites, per 100,000, 1983-1987

Males				Females			
Alberta		Shanghai		Alberta		Shanghai	
Sites	Rate	Sites	Rate	Sites	Rate	Sites	Rate
Prostate	54.9	Lung	53.0	Breast	71.1	Stomach	21.9
Lung	51.5	Stomach	51.7	Lung	21.3	Breast	21.2
Colon	21.8	Liver	30.6	Colon	19.0	Lung	18.1
Bladder	18.5	Esophagus	14.9	Corpus uteri	16.5	Liver	10.7
Rectum	16.2	Colon	9.2	Ovary etc.	12.0	Colon	8.7

For females in Alberta, the most common cancer was breast (71.1 per 10⁵), followed by lung cancer (21.3 per 10⁵) and colon cancer (19.0 per 10⁵), and the corpus uteri cancer ranked as the fourth common cancer. In Shanghai females, stomach cancer was the most frequently occurring cancer but was ranked 13th for Alberta females. The second most frequently occurring cancer was breast and lung was the 3rd. Liver cancer was the 4th common cancer for Shanghai females but only had an age standardized incidence rate (ASIR, the standard population for comparison is the world million, unless otherwise specified) of (0.8 per 10⁵) among Alberta females.

Parkin et al¹⁵ estimated the worldwide incidence of eighteen major cancers for 1985 in 24 areas in the world. The results showed that the most common cancer (excluding non-melanoma skin cancer) in the world today is lung cancer, accounting for 17.6% of cancers

of men worldwide, and 22.0% of cancer in men in the developed countries. Stomach cancers are now second in frequency and breast cancer - by far the most important cancer of women (19.1% of the total) - is third. There are very large differences in the relative importance of the different cancers by world area. The major cancers of developed countries (other than the above 3 cancers) are cancers of the colon-rectum and prostate, and, in developing countries, cancers of the cervix uteri, mouth and pharynx, liver and esophagus.

Within China, cancer incidence rates also vary markedly by region.¹⁶ Esophageal cancer incidence is very high in Linxian county,¹⁷ Henan province (ASIR male - 435 per 10⁵, female - 23 per 10⁵), compared to Yunnan province where the ASIR of esophageal cancer is less than 10 per 10⁵.¹⁸ The ASIR of liver cancer in Qidong county, Jiangsu province is very high (ASIR male - 267 per 10⁵, female - 73 per 10⁵)¹⁴ compared to Yunnan province. And nasopharyngeal cancer in the south of China (Zhongshan county, Guangdong province ASIR male - 40 per 10⁵, female - 25 per 10⁵)¹⁹ is markedly higher than in the Gansu province which is in north China, (table 2 & Map 1 on page 9) while being much lower in the Canadian population.

Since Chinese immigrants to Alberta arrived from different regions of China, it would be preferable to compare the cancer incidence with that of their residence of origin. Unfortunately, there is no information available of the residence of origin within China for Chinese immigrants either from the census files or from the Alberta cancer registry data. In

the absence of population-based data for entire country of China, it is only possible to use the Shanghai cancer registry data as the native Chinese comparison group.

Table 2. Regional Age Standardized (world population) Cancer Incidence Rates in PR China

The region with the highest rate				The region with the lowest rate			Shanghai	
Sites	region name	rate (per 10 ⁵)	year	region name	rate (per 10 ⁵)	year	rate (per 10 ⁵)	year
Esophageal	Linxian	435 (m) 23 (f)	1988	Yunnan	<10*	1979	12.3 (m) 4.8 (f)	90-92
Liver	Qidong	267 (m) 73 (f)	1983-87	Yunnan	8.3* (m) 4.0* (f)	1979	27.6 (m) 9.4 (f)	90-92
Nasopharynx	Zhongshan	40 (m) 25 (f)	1979	Gansu	<2*	1979	4.4 (m) 1.7 (f)	90-92

* for liver and esophageal cancers (which are relatively fatal), it was assumed that the incidence rate is equal to the mortality rate.^{14,19} For nasopharynx cancer, the mortality rate is half of the incidence rate.^{14,19}

3. Cancer migration studies of Chinese population

3.1 Descriptive studies

Descriptive epidemiology is usually used to investigate the occurrence of cancer in different population groups. Variations in the incidence rates of cancer in different population groups, as defined by personal ('demographic') variables or by place of residence, may suggest the importance of environmental factors in the causation of a particular cancer. Cancer incidence patterns of Chinese immigrants have been reported in different countries. The focus of this review will be on studies that examine cancer incidence of solid tumors in various organs. (table 3, page 10)

[illegible]

Table 3. Cancer studies of Chinese immigrants

Study design	Author, date	Geographical area	Study period	Number of cases	Standard rates/ population; year	Standardization technique	Cancer sites
Descriptive	Kolonel LN. 1980	US, Hawaii	1967-1976*	males 586 females 666	1970 US white population	direct method	27 sites
	Grulich AE, et al, 1995	Australia, NSW	1972-1990*	males 732 females 654	Australia-born residents, 1972-90	indirect	22 sites
	Mills PK, Yang R 1997	US, California	1987-1994*	males 69 females 114	1970 US population	direct & indirect	20 sites
Case-control	Whittemore AS, et al., 190	US, China	1981-1986	cases 905 controls 2488	n/a	n/a	colonrectal
	Ziegler RG, et al, 1993	US	1983-1987	cases 597 controls 966	n/a	n/a	breast
	Whittemore AS, et al., 1995	US	1987-1991	cases 1655 controls 1645	n/a	n/a	prostate
Cohort	Lee HP, et al, 1988	Singapore	1968-1982*	total 46783	world population	log-linear modeling dialect groups of Chinese	18 sites
	Hanley AJG 1992	Canada, Ontario	1980-1984**	males 341 females 259	Ontario residents and native Chinese, 1980-84	indirect	all sites (ICD9 140-208)

* incidence

** mortality

n/a - not available

3.1.1 Cancer incidence

Kolonel²⁰ conducted a study to compare cancer risks in four ethnic groups with those in the US white population over 10 years (1967-1976). The analysis used standardized incidence ratios (SIR) based on the US white incidence rates for 1970. In general, the risks for many major cancers in the Japanese, Chinese, and Philippine were lower in relation to US whites, whereas those for Hawaiians were higher. The SIR (75, $p < 0.01$) for all cancers combined among Chinese men was significantly lower than those among whites. More specifically, Chinese males had significantly lower rates of 4 cancers: lip (SIR 11), prostate (50), bladder cancer (43) and melanoma (20). Chinese females had a significantly lower risk of ovary cancer (62) than white women. Ethnic-specific data on smoking, alcohol consumption, and dietary habits and on sociologic and demographic factors were examined in relation to the SIR findings. Overall, compared with Caucasians, Chinese males and females had a lower obesity index value and a lower percentage of current and ex-smokers. Both Chinese males and females consumed less alcohol, total daily protein and fat than Caucasians. The authors suggested that the patterns of low SIR among four ethnic groups and their correlation with various exposure data support the belief that environmental agents cause most cancers. The frequent and plausible associations with dietary factors in particular offer further evidence that diet and nutrition are important elements in the causal web of cancer. Data limitations of the time plagued Kolonel's work in some aspects (e.g. absence of comparison rates from Asia). The inconsistent classification of ethnicity between cancer cases and population at risk was also a concern.

Recently, Grulich et al.²¹ reported the cancer incidence during 1972-90 in Asian immigrants to New South Wales, Australia. They found that overall cancer incidence was lower than in the Australia born in most immigrant groups and that this reached statistical significance in immigrants born in China/Taiwan and the Philippines. For cancers of the breast, colorectal and prostate, rates were relatively low in the countries of origin, but immigrants generally exhibited high rates nearer to those of the Australia born. For cancers of the liver and cervix, incidence was relatively high in the countries of birth but tended to be lower in immigrants, closer to the rates in the Australia-born. For these cancers, the authors concluded that environmental factors related to the immigrant's adopted country, and immigrant selection, appeared to have a major effect on the risk of cancer.

For certain other cancers, incidence was more similar to that in the countries of birth. For nasopharyngeal cancer, rates were highest in China/Taiwan and Hong Kong - born immigrants. Rates of lung cancer were significantly higher in women born in China/Taiwan. There were low melanoma rates in both the immigrants and in their countries of birth. For these cancers, it was probable that genetic factors or environmental factors acting prior to migration were important in causation.

Grulich et al.²¹ incorporated several methodological advances, including delineation of "Chinese Immigrants" by nativity group and use of comparison data from Asian settings, which represent the state-of-the art in this area. It allowed them to describe the degree of convergence between immigrant and host population incidence rates (or divergence from

country of origin). It is unfortunate that the study did not include the cancer incidence comparison between first generation immigrants in Australia and their offspring.

In 1997, Mills and Yang²² examined cancer incidence in the Hmong of Central California (1987-1994). The Hmong are an ethnic minority in southern China. Cancer incidence in the Hmong was evaluated by calculating age-adjusted incidence rates as well as proportional incidence ratios (PIR). Compared with all races combined in California, elevated rates of cancer in the Hmong were observed for the following sites: nasopharynx, stomach, liver, pancreas, leukemia, and non-Hodgkin's lymphoma. Cervical cancer incidence overall was elevated, but more noteworthy, invasive cervix cancer rates were much higher than expected. Lower cancer rates were found for breast, prostate, and colorectal cancer. Hmong also experienced advanced stage and grade of disease at diagnosis for many cancer sites in addition to cervical cancer, which may be explained by cultural factors, including avoidance of Western medical care and low rates of participation in screening programs. The major limitation of this study was that the population estimates of Hmong in California may provide unreliable denominator data for the calculation of incidence rates due to ethnic misclassification by the census as well as secondary migration of Hmong. Another concern was that the PIR analysis may not have been suitable for comparison of the Hmong ethnic group with others given the very young age distribution in this population.

3.1.2 Cancer Mortality

Cancer mortality in Chinese immigrants has been examined in several studies (table 4 & 5). The results in males were consistent. Overall cancer mortality in first generation Chinese immigrant males was significantly higher than the population in host country, except in the study carried out by Hanley and Gallagher & Ellwood. Results for females were less consistent. Fraumeni²³ and King²⁴ reported that Chinese females had significantly lower risk than people in the host country, while Wang found excess risk for Chinese females. For both males and females, overall cancer mortality in second generation Chinese immigrants was reduced compared to the white population in the host country. Specifically, an elevated risk was found in first generation Chinese immigrants for cancers of the nasopharynx, liver, esophagus and stomach for both sexes. The SMR remained high for nasopharyngeal and liver cancer in the second generation immigrants. The excess mortality for esophageal and stomach cancer in the first generation immigrants did not show in the second generation immigrants. Results for cancers of the lower digestive tract tended to be higher in males and lower in females for both first and second generation immigrants compared to Ontario residents. Reduced risk for female breast cancer and prostate cancer has been observed in first and second generation Chinese immigrants.

Cancer mortality studies in Chinese immigrants have been reviewed in detail by Hanley et al.²⁵ They concluded that cancer risk at several sites (colon and rectum for both genders, female breast and male prostate cancers) among Chinese immigrants appears to be

Table 4. Results from studies of cancer mortality among Chinese migrants (males)

Authors	Standardized(S) Mortality(M) Ratio				A(age)SMRR	Rate Ratio	
	King & Haenszel	Hanley		Wang et al.		Fraumeni & Mason	Gallagher & Ellwood
Publishing year	1973		1992	1989	1996	1974	1979
Study period	1959-1962		1980-1984	1980-1984	1988-1992	1950-1969	1964-1973
Geographic area	Hawaii, US		Ontario, Canada	Canada	New York, US	US	British Columbia, Canada
Comparison group	US Whites		Ontario population	Canadian	NYC White	US population	IARC European population
Cancer sites	1 st gen.	2 nd gen.	1 st gen.	1 st gen	1 st generation	1 st generation	1 st generation
All sites	137*	97	96	141*	0.62*	1.09**	1.00
Nasopharynx	3435*	2500*	2166*	3976*	11.78*	26.59**	34.6**
Esophagus	294*	191	81	147	0.52*	2.02**	2.00*
Stomach	137*	108	108	188*	1.4*	1.13	0.6*
Colon	130*	71	126	159*	0.5* (colorectal)	1.12	1.30
Rectum	131	87	93	174*	0.5* (colorectal)	1.20**	1.40
Liver	621*	449*	992*	1046*	3.44*	9.66**	7.70**
Gallbladder	n/a	n/a	110	1046*	n/a	1.56	1.80
Pancreas	102	94	58	99	n/a	0.92	0.60*
Lung	135*	85	77*	126*	0.66*	1.15**	0.9
Prostate	29*	35*	23*	47*	n/a	0.3**	0.5**
Bladder	n/a	62	98	117	n/a	0.47**	0.3**
Kidney	73	80	77	117	n/a	0.79	n/a
Thyroid Gland	n/a	n/a	207	n/a	n/a	3.37	3.10

* Significant at 5% level, $p < 0.05$ ** Significant at 1% level, $p < 0.01$ n/a - not available

Table 5. Results from studies of cancer mortality among Chinese migrants (females)

Authors	Standardized(S) Mortality(M) Ratio				A(age)SMRR	Rate Ratio	
	King & Haenszel	Hanley	Wang, et al.			Fraumeni & Mason	Gallagher & Ellwood
Study period	1959-1962	1980-1984	1980-1984		1988-1992	1950-1969	1964-1973
Geographic area	Hawaii, US	Ontario, Canada	Canada		New York, US	US	British Columbia, Canada
Comparison group	US Whites	Ontario population	Canadian		NYC White	US population	IARC European population
Cancer sites	1 st gen.	2 nd gen.	1 st gen.		1 st generation	1 st generation	1 st generation
All sites	106	77	85	17*	116*	0.70**	0.90
Nasopharynx	2940*	n/a	3165*	0	5124*	22.68**	15.0**
Esophagus	n/a	n/a	53	0	110	2.70	n/a
Stomach	187*	116	91	0	113	0.96	1.30
Colon	75	65	39*	30	87	0.54**	0.40**
Rectum	184	n/a	87	0	116	0.63**	0.40
Liver	109	n/a	355*	0	302*	4.31**	2.50
Gallbladder	n/a	n/a	79	0	302*	0.80	0.80
Pancreas	78	n/a	53	0	79	0.62**	0.90
Lung	226*	311*	128	19*	176*	2.12**	2.20**
Breast	61*	34*	42*	0	63*	0.40**	0.40**
Cervix	67	83	137	0	176*	0.56*	1.60
Uterus	127	n/a	119	132	107	2.03**	0.60
Ovary	76	100	63	82	68*	0.63	0.40**
Bladder	n/a	n/a	119	0	125	0.67	0.60
Kidney	n/a	n/a	102	0	125	0.76	n/a
Thyroid Gland	n/a	n/a	173	0	n/a	2.65	1.70

* Significant at 5% level, $p < 0.05$ ** Significant at 1% level, $p < 0.01$

n/a - not available

in between the rates for Chinese in China and those for Caucasians in the host country, and that these findings are consistent across studies.

3.2 Case-control studies

Colorectal cancer incidence rates among Chinese Americans are four to seven times greater than rates among the general population in the People's Republic of China. A population-based case-control study²⁶ was conducted in North America and China to examine diet and physical activity in colorectal cancer among Chinese American and native Chinese. The results showed that risk for cancers of both the colon and rectum were positively associated with intakes of saturated fat and with lack of physical activity. Chinese-American men had relatively higher colorectal cancer incidence than the women due to longer duration of physical inactivity and having lived longer in North America. Attributable risk calculation suggested that, if these associations are causal, saturated fat intakes exceeding 10g/day, particularly in combination with physical inactivity, could account for 60% of colorectal cancer incidence among Chinese-American men and 40% among Chinese-American women.

Breast cancer incidence rates have historically been 4-7 times higher in the United States than in China or Japan. To quantify the breast cancer risks associated with the various migration patterns of Asian-American women, Ziegler et al.²⁷ conducted a population-based case-control study during 1983-1987 in San Francisco-Oakland, California, Los Angeles, California, Oahu, and Hawaii. A six fold gradient in breast cancer

risk by migration patterns was observed. Asian-American women born in the US had a breast cancer risk 60% higher than Asian-American women born in Asian countries. Immigrants who had lived in the US for a decade or longer had a risk 80% higher than more recent immigrants. Immigrants from urban areas had a risk 30% higher than immigrants from rural areas. The conclusions were that exposure to Western lifestyles had a substantial impact on breast cancer risk in Asian immigrants to the United States during their lifetime.

Similarly, Chinese-Americans and Japanese-Americans have lower prostate cancer incidence than US whites and blacks, but higher than those of their counterparts in Asia. The incidence rate of prostate cancer in China and Japan is less than one tenth of the rate of US blacks. Therefore, Whittemore et al.²⁸ conducted a population-based case-control study of prostate cancer among blacks (very high risk), whites (high risk), and Asian-American (low risk) in Los Angeles, San Francisco, Hawaii, Vancouver, and Toronto to evaluate the roles of diet, physical activity patterns, body size, and migration characteristics on risk in these ethnic groups and to assess how much of the interethnic differences in risk might be attributed to interethnic differences in such lifestyle characteristics. A positive statistically significant association of prostate cancer risk and total fat intake was found for all ethnic groups combined. Among foreign-born Asian-Americans, risk increased independently with the number of years of residence in North America and with saturated fat intake. The authors concluded that the results of this study support a causal role in prostate cancer for saturated fat intake but suggest that other factors are largely responsible for interethnic differences in risk.

3.3 Age-Period-Cohort Analyses

In 1988, Lee et al²⁹ found substantial changes in incidence for cancers at various sites during the period 1968-1982, in Singapore Chinese populations. These seem to represent a shift from the pattern of cancer incidence in China towards that prevailing in the West. More specifically, they pointed out the following notable changes: increases in the rates of cancers of the lung, colon, rectum, skin, breast and ovary, and decreases in the rates of cancers of the stomach and esophagus. For several sites, the secular changes differed among age groups: among women under 50 years of age, breast cancer increased particularly sharply and lung cancer decreased. The authors pointed out that it is reasonable to speculate that these changes are at least partly attributable to recent changes in the lifestyle of the Chinese community.

These investigators used information on dialect groups to determine place of origin in China. The results indicated that the dialect groups of Hainanese and Hakka males had lower incidence rates of esophageal, stomach, lung and skin cancers than the baseline comparison group (Hokkiens, the largest dialect group). The risk of lung cancer among Cantonese females was high in comparison with that in all other dialect groups, whereas the risk for Cantonese males was lower than that for Hokkien and Teochew males. The Cantonese, both males and females, had high rates of nasopharyngeal cancer. The results also showed that in males, high relative risks associated with foreign birth were present for cancer of the stomach and esophagus (which are on the decline), and also for lung cancer (rates of which are increasing in the older groups but declining among the young).

Age-period-cohort modeling method was employed in this study. Estimation and testing of relative risks were performed by log-linear modeling. This analysis helped to explain the temporal changes in cancer incidence more effectively. The results indicated that in both males and females an age and cohort interpretation was suitable for cancers of the stomach, esophagus, lung, breast (females only) and non-Hodgkin's lymphoma (males only). Thus, for these diseases, it seems that the changes in incidence have affected some age groups more than others. For colorectal (both males and females) and prostate cancers, incidence can be modeled equally well by a period or a cohort effect. For cancer of the skin (both males and females) and ovary, an age-period interpretation was suitable. For sites such as liver, no significant period or cohort effect was observed, indicating that neither a temporal nor a secular change was taking place.

In 1992, Hanley⁶ completed his masters thesis titled "Cancer Mortality Patterns Among Chinese Immigrant Population in Ontario". Cohort analysis was employed to compare cancer mortality between Chinese immigrants and the Canadian born population in Ontario. The results showed that first generation Chinese immigrant males had significantly ($p < 0.05$) fewer than expected deaths compared to Ontario-born males for cancer of the lung, prostate, and brain and other central nervous system. Significantly ($p < 0.05$) elevated SMRs for male immigrants were recorded for cancers of the nasopharynx (SMR=2166) and liver (992). The high SMR for colon cancer (126) is also notable. The results indicated that mortality from cancer for first generation female immigrants was significantly lower than

expected (SMR=85). Excess mortality in females was recorded for cancer of the nasopharynx, liver, connective tissue, lung and cervical cancers.

When mortality in first generation immigrants was analyzed using rates from the People's Republic of China, a different pattern emerged. Both males and females had significantly higher mortality from cancer overall, and specifically, for cancers of the nasopharynx, colon and rectum, lung, bladder, leukemia (males), and breast (females). These individuals experienced significantly fewer than expected deaths from cancers of the esophagus and stomach (both sexes), as well as liver and cervix uteri (females only).

Results for second generation immigrants revealed overall mortality from cancer that was significantly lower than expected for males and females using standard rates from both Ontario and China. The limitation in this study, as the author pointed out, is that mortality is inferior to incidence as a measure of the disease burden. In addition, it is likely there exists some misclassification in the second generation of Chinese immigrants.

4. Discussion

The review has drawn attention to the following results: Chinese immigrants carry with them the high risks for "traditional" cancers found in the countries of origin, such as nasopharyngeal, esophageal, liver and stomach, at the same time experiencing low risk for certain "Western" cancers, such as prostate, female breast, and bladder. During 1970 to 1980, the cancer incidence pattern of the Chinese population in PR China had notable

changes: increases in rates of cancers of the lung, colon, rectum, skin, breast and ovary, and decreases in rates of cancers of the stomach, esophagus and the female cervix.

To date, there was no literature found comparing cancer incidence between Chinese immigrants and the Canadian-born population in Canada. The overall validity of cancer incidence data supplied by cancer registries is better than that of cancer mortality data in certain respects. From the biological viewpoint, the date of diagnosis of cancer is closer in time to the causal exposure(s) than the date of death, particularly for the less rapidly fatal cancers. For many cancers therefore, incidence data are more relevant for understanding etiology and for determining the priorities for cancer prevention.¹ The cancer incidence comparison between Chinese immigrants and Canadian-born populations as well as Chinese in China will be conducted in this project. It should be kept in mind that the risk of death is only an indirect measure of the risk of cancer occurrence, particularly because of recent increases in survival.³⁰

The value of immigrant studies can be greatly enhanced if a time dimension can be introduced (i.e. time since immigration),¹ to study the speed with which any change in disease risk occurs. Unfortunately, the existing surveillance data base in Alberta does not include information about the age at immigration and period of immigration. Therefore, it is impossible to adopt this method. Likewise, there was no information available to identify second generation Chinese immigrants in the Alberta Cancer Registry data which was provided for this project.

CHAPTER 2. MATERIAL AND METHODS

1. Source of Data

1.1 Cancer incident cases

1.1.1 Canadian Cancer Data Base (CCDB)

Canada is one of the countries operating a total population cancer registration system. Supported by provincial and territorial cancer registries, the Health Statistics Division at Statistics Canada manages the National Cancer Incidence Reporting System (NCIRS, 1969-1991) and Canadian Cancer Registry (CCR, 1992 onwards) both of which contributed to the Canadian Cancer Data Base (CCDB).³¹ The autonomous provincial/territorial registries have provided data to the CCDB annually since 1969. This was implemented with the goal of providing a standardized, patient-oriented, updatable data base of cancer incidence and survival information for Canada. All provincial cancer registries are responsible for performing standard data edits before providing data to the CCR since 1992. The standard record layouts and definitions were established by the CCR Data Dictionary.³² For the NCIRS, registries occasionally submitted revised data to ensure updates and changes made to their dynamic data bases are reflected at the national level. For the CCR, this will be done on an ongoing basis through the submission of update and delete records. Data reported in various formats from 1969-1991 have all been converted to one standard layout at Statistics Canada to facilitate access.³¹

Alberta has a multicultural population with people of European descent (UK, Germany, the Netherlands, France), as well as many of Indian, Chinese and Vietnamese extraction. Also a large part of the population has Eastern-European (Ukrainian) ancestry. According to the 1991 census, the total population of Alberta was 2,519,180. The Chinese ethnic populations (71,635) accounted for 2.8% of total Alberta population.

The Alberta Cancer Registry has existed since the early 1940s. In the early 1960s, a population-based cancer registry was developed and was further enhanced with the computerization of the registry in 1974, when all previous paper records were recorded and computerized.¹⁴

The Alberta Cancer Registry (ACR) is administered, operated and maintained by the Division of Epidemiology and Preventive Oncology of the Alberta Cancer Board. Under provincial legislation, the ACR obtains all reports mentioning a malignancy from six main sources: cancer agencies, pathology laboratories, haematology laboratories, death certificates, hospitals and autopsy reports.³³ From 1969 to 1988, 92-94% of all cancer cases were microscopically confirmed in ACR (Band, 1992). The ACR is a patient registry, rather than a tumour registry, thus making the recording and finding of multiple primaries, bilateral tumours, etc. more accurate.¹⁴ All death certificates can be linked with cancer records by computer through the Department of Vital Statistics. An annual follow-up programme has been initiated to supplement the data collected on the initial events regarding diagnosis and treatment. All the cancer cases are classified according to the 4-digit rubrics of the 9th

Revision of the International Classification of Disease (ICD9) and International Classification of Disease Oncology (ICD-O, version 1 pre 1992, version 2 after 1992).¹⁴

Alberta residents were chosen as the study population since among the twelve provincial/territorial cancer registries, the Alberta Cancer Registry has the highest percentage of availability of birthplace. There is also a substantial population of Chinese origin (accounting for 12% of the total population of Chinese ancestry in Canada, 1991).³⁴ The other provinces with large proportions of Chinese either do not record birthplace (Ontario 47% of total Chinese), or have incomplete data (BC 30% of total Chinese).¹⁰ Inasmuch as the population of Chinese immigrants in Alberta is less than 100,000,³⁵ it does not yield a sufficient number of cancer cases for the analysis of short time intervals. Hence this project examines all cancer cases diagnosed during a 25-year period (1969-1993).

The data items in the study file which could be used for epidemiological research are: date of diagnosis, date of birth, age at diagnosis (calculated), recorded age group, patient status (alive or dead), sex, primary site number, birthplace code, residence, method of diagnosis, ICDO-Topography, ICDO-Morphology, ICD-9 code and reporting province. Ethnicity codes are not available for the province of Alberta in the CCDB.^{32,36} The birthplace variable was used to identify Canadian-born and Chinese-born populations of Alberta residents. In order to be comparable with other studies and to obtain sufficient cancer cases, people born in Hongkong, PR China and Taiwan were grouped as "Chinese immigrants".

The agreement for access to the CCDB for Alberta (1969-1993) was received on November 20, 1996 from the Alberta Cancer Board (Appendix A). Abstracted from the CCDB, the study file for this project was provided by Health Statistics Division of Statistics Canada on April 04, 1997.

The study file was produced containing individuals with Chinese birthplace codes 9574 (PR China), 9577 (Hongkong), and 9585 (Taiwan) from 1969-1991³⁶ and birthplace codes 156, 344, and 158 respectively for years 1992-1993³² who were diagnosed with malignant neoplasms (ICD-9 140 - 208, excl. 173) during the period of 1969-1993. This study file also contained all the data items mentioned before (page 1). However, since an individual's ethnicity and surnames were not available in the study file, it was impossible to identify the second generation of Chinese immigrants. As a consequence, the analysis addressed only the first generation Chinese immigrants who were identified by the birthplace of PR China, Hongkong, and Taiwan.

Canadian-born incident cases were identified by Canadian birthplace codes 1000-6100 (with provincial coding) and 9995 (without provincial codes) for 1969-1991³⁶ and birthplace codes 910-961 and 909 respectively from 1992-1993.³² Both Canadian-born population and Chinese-born immigrants were limited to Alberta residents (place of residence code 48) in order to match the population at risk (census population).

According to the frequency table of cancer cases by diagnosis year, it was decided to group the diagnosis years into four time periods: 1974-1978, 1979-1983, 1984-1988, and 1989-1993 with intervals centred on the Census years. The data for 1969-1971 were excluded from the analysis due to a substantial percentage (over 70%) of missing birthplace variables. The 1972 and 1973 data were excluded due to the uneven period intervals. The frequency of cancer cases by age was examined and it was decided to group the age at diagnosis into six age groups: 0-24, 25-49, 50-59, 60-69, 70-79 and 80+. The large intervals at the younger age groups are due to the low incidence of cancer in these age groups.

1.1.2 Data From Shanghai Cancer Registry

The population-based Shanghai Cancer Registry was established in 1963. It started systematically collecting information on cancer mortality in 1963 and cancer incidence in 1972.³⁷ Shanghai is the largest city in China and the population of the urban area was 13 million people in 1992. Under the legislation concerning the notification of cancer cases issued by the Shanghai Municipal Bureau of Public Health, all medical facilities in Shanghai are obliged to report all newly diagnosed cancer cases of in- and out-patients.

A standardized notification card, which includes information on name, date of birth, sex, address, occupation, cancer site, date and methods of diagnosis is used for reporting cancer cases. Since 1987, a computerized cancer registration system has been established based on Chinese characters. The basic functions of the system mainly consist of: data

management, duplication deletion, statistics and graphing.¹⁴ Every year the registry obtains information on the vital status of cancer patients by passive follow-up. The cancer registry obtains monthly notifications of all deaths of people diagnosed with cancer from the section of vital statistics which is linked with the notification cards of cancer cases at the end of a year. All the cancers are classified according to ICD9.¹⁴ Both Alberta and Shanghai are contributing registries to the International Agency for Research on Cancer (IARC) and International Association of Cancer Registries (IACRs) in 1978.

The Shanghai Cancer Registry is the only cancer registry with a long history and high data quality in the PRChina. Cancer incidence data of Chinese in Shanghai were obtained from the series of publications 'Cancer Incidence in Five Continents, Vol IV-VII' for the period of 1975 to 1992.^{38,39,14,40} The original source of the data was the Shanghai Cancer Registry.

1.1.3 Cancer Sites for Analysis

Since the main purpose of the project is to compare the cancer incidence rate between Canadian-born population in Alberta (developed country) and Chinese-born immigrants (developing country) to Alberta, it was decided to limit analysis to cancer sites which were either: 1) common sites in developed countries (e.g. breast, prostate, colon, rectum) or developing countries (e.g. cervix, stomach, liver); or 2) common sites for both countries (e.g. lung). The following cancer sites were chosen for the analysis:

For both males and females: (ICD9 coding)

nasopharynx (147)	esophagus (150)	stomach (151)	colon (153)
rectum (154)	liver (155)	gallbladder (156)	pancreas (157)
lung (162)	bladder (188)	kidney (189)	thyroid gland (193)

For males only: prostate (185)

For females only: breast (174) cervix (180) uterus (182) ovary (183)

The remaining cancer sites were grouped as "others". "All cancer combined, except 173" referred to all cancer sites (ICD9 140-208 (excl. 173, non-melanoma skin cancer)).

"All cancer combined", referred to all cancer sites (ICD9 140-208).

1.2 Population Data

1.2.1 Alberta Populations

The national census of Canada, conducted every five years since 1940, provides a wide range of demographic data on the Canadian population,⁴¹ including age, sex, ethnicity, and birthplace, etc. The population counts by birthplace are estimates based on a 20% census sample of households. The census did not collect the information of birthplace for residents of institutions.⁴²

Statistics Canada publications provided age- and sex-specific tables for self-reported places of birth outside Canada.⁴³ The counts are presented in five- and ten-year age groupings up to the age of 65 with the number of individuals older than 65 being summarized in a single category. Since cancer largely affects older individuals, it was necessary to obtain more detailed age structure data for the age categories over 65.⁴³

Customized tabulations were requested from the Reference Centre of Statistics Canada. Four tables (for census years of 1971, 1981, 1986, and 1991) were obtained for Alberta residents by birthplace, ethnic origin, five-year age groups (0-4, 5-9, ... 80-84, 85+) sex, age at immigration, and period of immigration. The birthplace was coded as: Canada, Hongkong (HK), PRChina (PRC), and Taiwan (TW). Data from three geographic locations (HK, PRC, TW) were pooled to identify the first generation immigrants from 'China'. The population counts of Alberta residents also included the subtotals for the specific age groups of 0-24, 25-49, 50-59, 60-69, 70-79, and 80+. In the census year of 1976, the information of birthplace was not collected in the census questionnaire.⁴² Therefore, the population by birthplace of 1976 was interpolated by adding the census 1971 and 1981 population then dividing by 2 for each age group. Only the 1991 custom table for Chinese immigrants was presented for three birthplaces (HK, PRC, TW) separately; the others 3 census tables reported only a combined count for the three countries mentioned above. The table of census year 1991 was released on May 16, 1997 and the other three tables were ready on July 22, 1997. The census 1991 table was in spreadsheet format and the census tables of 1971-1986 were in C91 (software for storing and retrieving data) format.⁴⁴

1.2.2 Age Distribution of Alberta Residents

The age distribution of Chinese immigrants and the Canadian-born population in Alberta in the five census years is presented in table 6. Overall, 16%-21% of male, and 14-21% of female, Chinese immigrants were under the age of 24, while 43%-57% of male and 42%-57% of female Canadian-born Alberta residents were under the age of 24. 19-30% of

Table 6. Age distribution (by sex) of Canadian-born (Ca) and Chinese-born (Ch) populations of Alberta residents, 1971-91 (%)											
Age groups		1971		1976		1981		1986		1991	
Males		Ca	Ch	Ca	Ch	Ca	Ch	Ca	Ch	Ca	Ch
Total #		682870	3570	814134	6896	945395	10220	994405	13295	1065850	17180
0-24		57.18	21.29	53.73	21.51	51.24	21.58	45.93	17.90	43.16	15.98
25-49		29.70	50.84	32.72	56.96	34.94	59.10	38.72	54.12	40.37	53.17
50-59		7.95	4.34	7.51	8.85	7.20	10.42	7.56	13.39	7.47	12.92
60-69		3.40	10.78	4.18	6.67	4.73	5.23	4.99	8.65	5.39	10.42
70-79		1.19	8.12	1.42	4.06	1.58	2.64	2.42	4.63	3.01	5.79
80+		0.63	4.63	0.44	1.96	0.30	1.03	0.38	1.32	0.59	1.72
Females											
Total #		662730	2990	783078	6616	903425	10240	973230	13460	1047835	17750
0-24		56.96	21.57	53.39	21.01	50.77	20.85	45.36	16.98	42.10	14.59
25-49		29.36	45.65	32.08	50.86	34.08	52.39	37.89	50.63	39.80	52.54
50-59		8.07	12.37	7.62	11.56	7.29	11.33	7.47	13.04	7.41	11.04
60-69		3.43	13.88	4.59	9.27	5.43	7.91	5.64	10.33	5.72	11.52
70-79		1.39	4.85	1.74	5.18	2.00	5.27	3.05	6.95	3.99	7.07
80+		0.79	1.68	0.59	2.12	0.43	2.25	0.59	2.08	0.99	3.24

male and 26%-32% of female Chinese immigrants, and 13%-16% of male and 14%-18% of female Canadian-born residents were over 50. For the age group of 25-49, both Chinese male (50%-59%) and female (45%-52%) immigrants had a higher percentage than Canadian-born male (29%-40%) and females (29%-39%). It is obvious that Canadian-born Alberta residents were younger than Chinese immigrants.

1.2.3 Period of immigration and age at immigration

The information on period of immigration and age at immigration was only available for the population data (denominator) which was obtained from census custom tables (1971, 1981, 1986 and 1991) but not for the Alberta Cancer Registry data (numerator).

Chinese male and female immigrants had similar observations for period of immigration in 1991 census. About half of Chinese immigrants immigrated after 1981 (46.6% of male and 50.6% of female). One third of Chinese immigrants came during 1971-80 (33.7% of males and 32.6% of females). 10.5% of male and 10.7% of female Chinese immigrated to Alberta between 1961-1970. 8.5% of male and 6.1% of female came between 1946 and 1960. Only a small portion came before 1946 (0.7% of male, 0.2% of female).

More than half of the Chinese immigrants immigrated to Canada when they were aged 25-49 (53.2% of male and 52.6% of female). 16.0% of male and 14.6% of female Chinese immigrants immigrated when they were 20-24 years old. 12.9% of male and 11.1%

of female Chinese immigrants came to Alberta when they were 50-59. 10.4% of male and 11.5% of female Chinese immigrants immigrated when they were 60-69. 7.5% of male and 10.3% of female Chinese immigrants immigrated when they were 70 or over.

Table 7 shows the period of immigration for Chinese immigrants in each census. The highest percentage of Chinese immigrants immigrated during 1971-1980 in census 1981, 1986 and 1991. In census 1971, most Chinese immigrants came during 1961-1970. Male and female Chinese immigrants had a similar percentage in each time period of immigration except 'pre 1946' in each census. The percentage of male Chinese immigrants arriving before 1946 was much higher than females in each census.

Table 8 presents the percentage of age groups at immigration for each age group. For age 50-59, most of them came to Canada when they were 25-49 but 1/3 came when they were at the age of 50-59. For age group 60-69, most of them immigrated at the age of 50-69. For age group 70-79, most of which came when they were 60-79. For age group 80+, male and female had different distribution, most of male Chinese immigrants at this age groups immigrated at 0-24, but female Chinese immigrants came when they were 70-79.

Table 7. Period of immigration of Chinese immigrants in each census

Period of immigration	Years of stay	Total male migrants (%)	Total female migrants (%)
1971 census			
Before 1946	>25	23.63	7.36
1946-1960	11-25	39.24	37.29
1961-1970	1-10	35.02	54.35
After 1971	<1	1.83	1.51
1981 census			
Before 1946	>35	2.94	0.63
1946-1960	21-35	16.19	12.01
1961-1970	11-20	20.94	23.08
1971-1980	1-10	56.46	60.27
After 1981	<1	3.52	3.95
1986 census			
Before 1946	>40	1.47	0.45
1946-1960	26-40	11.14	9.36
1961-1970	16-25	16.85	16.12
1971-1980	6-15	46.46	46.38
After 1981	<5	24.08	27.66
1991 census			
Before 1946	>45	0.67	0.14
1946-1960	31-45	8.49	6.08
1961-1970	21-30	10.47	10.67
1971-1980	11-20	33.74	32.56
After 1981	<10	46.63	50.55

Table 8. Percentage of Age at immigration in each census

Age at census year	age at immi.	1981 census (%)		1986 census (%)		1991 census (%)	
		Males	Females	Males	Females	Males	Females
25-49	0-24	62.33	56.29	61.01	57.49	47.45	46.97
	25-49	37.83	43.71	38.99	42.44	52.55	53.03
50-59	0-24	15.96	5.60	40.17	13.68	35.23	22.96
	25-49	55.40	56.47	40.45	52.14	51.40	53.06
	50-59	28.17	37.93	19.10	34.47	13.42	23.98
60-69	0-24	4.67	1.23	0	1.08	9.78	2.20
	25-49	9.35	19.75	18.26	14.44	31.84	28.85
	50-59	37.38	36.42	36.96	52.35	35.75	48.41
	60-69	47.66	40.12	43.48	31.05	22.63	20.54
70-79	0-24	53.70	3.70	14.63	3.21	2.34	0
	25-49	5.56	29.63	5.69	21.39	5.89	17.93
	50-59	5.56	24.07	7.32	21.39	19.59	27.09
	60-69	16.67	28.70	53.66	40.64	58.17	44.62
	70-79	16.67	13.89	15.45	12.30	14.01	10.36
80+	0-24	80.95	0	40.00	0	22.03	0
	25-49	16.40	0	0	8.93	0	19.13
	50-59	3.30	15.22	0	21.43	0	16.52
	60-69	0	21.74	14.29	19.64	28.81	17.39
	70-79	0	39.13	8.57	32.14	40.68	36.52
	80+	0	13.01	22.86	12.50	8.47	10.40

2. Cancer Incidence Rates

2.1 Cancer Incidence Rates for Alberta Residents

2.1.1 Data Editing

A frequency table of each variable (detailed data items see CCDB) was produced to find outliers and mis-codings. Scattergrams and histograms were used to present the distribution of continuous and categorical variables respectively. The SAS “proc freq”⁴⁵ was used to conduct this analysis. There were no outliers and mis-codings found in the data. It is believed that this data had been cleaned previously by the staff in Statistics Canada.

2.1.2 Missing Data for Birthplace

Birthplace was used as an indicator to identify Canadian-born and Chinese-born cancer cases. It was found that for the period 1969-1971, about 85% of the records in the study file had a missing birthplace. Therefore, those 3 years (1969-1971) were excluded from the study. During the remaining period (1972-1993), there were between 9.3% and 43.4% (table 9 and figure 1) of missing birthplace information. Therefore, it is important to adjust the cancer incidence frequencies to avoid under estimation due to missing birth place.

2.1.3 Age groups-, sex-specific cancer incidence rates

Numerator

The numbers of age group-, site-, and sex-specific cancer cases for the periods 1974-78, 1979-83, 1984-88, and 1989-93 for Alberta residents by birthplace (Canadian-born and Chinese-born) were obtained by using SAS Version 6.11⁴⁵ (program see appendix B).

Table 9. birthplace availability % and frequency for all invasive neoplasms (ICD9 140-208, excl. 173) for Alberta residents

Year	Availability (%)	Missing (%)	Frequency of availability
1969	14.29	85.71	410
1970	14.11	85.89	436
1971	16.25	83.75	511
1972	66.00	34.00	2176
1973	67.06	32.94	2512
1974	57.18	42.82	2206
1975	69.16	30.84	2713
1976	71.49	28.51	2977
1977	71.58	28.42	3052
1978	69.00	31.00	3316
1979	56.56	43.44	2814
1980	68.95	31.05	3549
1981	88.83	11.17	4786
1982	90.70	9.30	5023
1983	87.94	12.06	5288
1984	88.15	11.85	5499
1985	86.07	13.93	5634
1986	83.94	16.06	5555
1987	78.57	21.43	5267
1988	77.57	22.43	5608
1989	78.15	21.85	5639
1990	78.39	21.61	5762
1991	78.48	21.52	6126
1992	82.39	17.61	6939
1993	80.12	19.88	6895

Figure 1. Percentage of Birthplace Available, Alberta Data, 1969-1993

Denominators

The person years of each study period by birthplace were estimated from population data provided by the Reference Centre of Statistics Canada for census years (i.e. 1971, 1981, 1986, 1991), multiplied by five. The underlying assumption was that the population in each age group structure was linearly increasing.

Specific rates

Age group-, site-, sex-specific cancer incidence rates (per 100,000) were calculated using the numerator in the each age group and study period divided by denominators in the corresponding groups. The Microsoft Excel software was used to conduct this calculation.

2.1.4 Age standardized cancer incidence rate

Age-standardized incidence rates (ASIRs) were estimated by the direct method using the weights of the 'world standard' population.⁴⁶ ASIRs per 100,000 person-years were calculated using the six age groups (0-24, 25-49, 50-59, 60-69, 70-79, and 80+) during each of the four periods (74-78, 79-83, 84-88, and 89-93) for each cancer site of interest. The standard error and the 95% confidence interval of the ASIRs were calculated using the method provided in "Cancer Registration Principles and Methods".⁴⁷ A Poisson approximation was used to calculate the standard error of the ASIR. For cancer cases less than 15, the 95% confidence interval for weighted sums of Poisson parameters was obtained by using the method provided by Dobson AJ⁴⁸ (see formula in appendix C).

2.1.5 Method of ‘adjusting for missing birthplace’

The age, sex, and ICD 9 frequency distribution of birthplace missing cases is similar to that of the non-missing cases (figure 2 and figure 3). It was therefore assumed that the birthplace missing cancer cases were similar to those with known birthplace. A birthplace frequency correction factor based on the cases of non-missing birthplace was applied to the frequency of cases with missing birthplace. Since the frequency of missing birthplace is different through diagnosis years, the correction factors developed were year-specific.

Procedures for obtaining adjusted cases: (example see appendix D: table I-V)

- 1) Produce the percentage and frequency of cancer cases for four birthplace groups (missing, Canadian-born, Chinese-born (PR China, Hongkong, Taiwan), and Others), by sex, six age groups and four time periods (Table I). SAS frequency procedure was used to obtain Table I.
- 2) Similarly, produce the percentage and frequency of cancer cases for the three birthplace groups (excluding missing group from table I) by sex, six age groups and four time periods (Table II).
- 3) To obtain birthplace-missing adjusted Canadian-born and Chinese-born cancer cases, use the total frequency of each age group of table I, and multiply the column percentage of the same age group of table II (Table III).
- 4) Use SAS to obtain site-, sex-, age groups-, and time period-specific cancer cases by birthplace of Canada and China from the study file (Table IV).

Figure 2. Site-specific Cancer Cases as Percentage of Total Cancer Cases For Birthplace-missing, Canadian-born, Chinese-born and Alberta Residents, Males, 1974-1993

Figure 3. Site-specific Cancer Cases as Percentage of Total Cancer Cases For Birthplace-missing, Canadian-born, Chinese-born and Alberta Residents, Females, 1974-1993

- 5) To obtain birthplace-missing adjusted site-, sex-, age group-, and time period-specific cancer cases, use the calculated frequencies of Canadian-born and Chinese-born cancer cases from table III as the total frequencies and multiply the column percentage in table IV for each cancer site (Table V). The final calculated numbers of cancer cases in table V will be used in the analysis of the missing data adjusted rates.

The analysis of birthplace missing adjusted and unadjusted cases was done separately in the study.

2.2 Cancer Incidence Rates from the Shanghai Cancer Registry

The International Agency for Research on Cancer (IARC) has published a series of monographs 'Cancer Incidence in Five Continents' for each five-year period since 1966.⁴⁹ The average annual incidence per 100,000 by five-year age groups (0-4, 5-9, ... 80-84, 85+) and sex for the Shanghai urban population was published for 1975 in the monographs Volume IV,³⁸ for 1978-82 in volume V,³⁹ for 1983-87 in volume VI¹⁴ and for 1988-1992 in volume VII.⁴⁰ The population counts for the corresponding years were also presented in the monographs. With the available information in the monographs, the number of cancer cases in each age group could be calculated using the average annual incidence rate multiplied by the population in each age group. The age specific cancer incidence rate for the age groups (0-24, 25-49, 50-59, ..., 80+) was obtained from the books. The standard error (SE) and ASIRs of those age groups were calculated (appendix C). Age group- and sex-specific cancer incidence rates for the Shanghai population in 1975 were compared with the Alberta

residents cancer incidence rate of 1974-78. Similarly, 1978-82 was compared with 1979-83, 1983-87 was compared with 1984-88 and 1989-1993 was compared with 1988-1992.

3. Methods of Analysis

3.1 Descriptive comparison analysis

The age-standardized incidence rate ratio (ASIRR) for Chinese immigrants was calculated by dividing the ASIR of Chinese immigrants by the ASIR of the Canadian-born population. This provides a comparison of the difference between these two populations in the four study periods (Canadian-born population as reference group). The ASIRR of Chinese immigrants was also calculated during the four study periods using Shanghai Chinese as the reference group. The confidence interval (95%CI, formula see appendix C) of the ASIRR was calculated to test the significance of the ASIRR. If the 95%CI includes 1.0, the standardized rates of two populations are not significantly different (at the 5% level if $Z_{\alpha/2} = 1.96$ has been used). The method was adopted from Breslow & Day.⁵⁰

3.2 Poisson regression analysis

Statistical modeling has several advantages over standardization and related techniques.⁴⁹ First, estimates of relative risk obtained by model-fitting generally have greater numerical stability than those computed from standardized rates; second, it facilitates consideration of the simultaneous effects of different variables on risk and adjustment of the estimates for several factors; third, the effect of quantitative variables that characterize the timing and degree of exposure can be described in terms of dose-response relationships.

The Poisson distribution is often used to model the occurrence of rare events with data consisting of rates of less than 0.01 (i.e. one case in one hundred person-years), such as the number of new cases of certain cancer developing in some population over a certain period of time.⁵¹ When the population (denominator) is available, the logarithm of the rate is expressed as a linear function of the independent variables. The resulting regression coefficients provide estimates of the relative risks for the independent variables. Estimation of the regression coefficients is based on the maximum likelihood principle. Measures of goodness of fit of Poisson models are obtained from comparisons of maximized likelihood values.⁵¹ The agreement between observed and fitted values is commonly assessed through the log-likelihood ratio statistic, which is known as the 'deviance' in the SAS package terminology.⁵² Provided that the Poisson assumption holds, and the regression model is correctly specified, the deviance should be of the same magnitude as the degrees of freedom, or smaller for small cell sample sizes.

A Poisson regression model was applied to study the effect of immigration in relation to cancer development, with limited control of confounding factors. A confounder in the framework of immigrant studies is a variable which is associated both with the disease under study and with birthplace, and as such may either partially or totally account for apparent differences in disease risk between immigrants and domestic-born, or may mask an underlying true difference. Age and sex are obviously confounders in immigrant studies, and both were adjusted in the model. Other potential confounders include occupation,

education and marital status, which we were unable to control due to the limitation of the registry data.

Comparisons among the incidence in Chinese-born, Canadian-born, and Chinese in Shanghai was carried out by estimating relative risks of cancer occurrence for each population group, using as reference category the Canadian-born. The SAS GENMOD program was used to carry out the analysis.⁵² The relative risks were estimated from the following model:

$$\ln(ID) = \beta + \beta_1age + \beta_2period + \beta_3birthplace$$

where $ID = ASIR$; β = intercept; β_1 = coefficient of age; β_2 = coefficient of period; β_3 = coefficient of birthplace; β_4 = coefficient of period*birthplace; β_5 = coefficient of birthplace*age. The following models containing interactions were also considered:

- a) $\ln(ID) = \beta + \beta_1age + \beta_2period + \beta_3birthplace + \beta_4period*birthplace$;
- b) $\ln(ID) = \beta + \beta_1age + \beta_2period + \beta_3birthplace + \beta_5birthplace*age$;
- c) $\ln(ID) = \beta + \beta_1age + \beta_2period + \beta_3birthplace + \beta_4period*birthplace + \beta_5age*birthplace$.

Given that the statistical analysis was based mainly on modeling, a general problem was to assess the models' goodness of fit. The agreement between observed and fitted values is commonly assessed through the log-likelihood ratio statistic. The phenomenon of 'over dispersion', that is greater deviance than predicted by the usual distribution model, often occurs with very large data-sets, when information on important factors relevant to the response has not been recorded. A lack of fit with count data means that the observations

could not originate from a single Poisson distribution: they are very much dispersed, and the variance is larger than the mean, rather than equal to it.⁵³

Two techniques, both based on modeling the residual distribution, are usually used to cope with overdispersion. The first one adopted a maximum likelihood approach, but employed with a residual distribution that allows a broader range of variation, such as the negative binomial in place of the Poisson or the beta-binomial in place of the binomial.⁵⁴ The other one is to model only the residual variance of the observed value, rather than completely specify the residual distribution. Fitting methods that employ this approach are discussed by various authors under the topics of quasi-likelihood, pseudo-likelihood, and estimating-equation methods.⁵⁴ In this project, the over dispersion problem was handled by the latter: assuming that the actual variance of the outcome data is equal to the variance predicted by the underlying model and multiplying the variance by a constant coefficient, which was estimated by dividing the residual deviance by its degree of freedom.¹

3.3 Age Period Cohort Analysis

A display of summary rates, such as directly standardized rates over time is one approach to the analysis of time trends in disease incidence and mortality. However, important details in the age variations are lost in the averaging process involved in generating a summary rate.⁵⁵

Conventional age-period-cohort analysis of variation in disease rates over time assume a log-linear relation of age, calendar period, and birth cohort effect and invoke Poisson maximum likelihood methods to estimate the corresponding parameters.⁵⁶ Both age and period were divided into 5-year intervals. If i ($= 1, 2, \dots, 12$) is the index representing age group, and j ($= 1, 2, \dots, 4$) represents period, then a particular birth cohort can be identified by $k = j - i + I$ ($= 1, 2, \dots, 15$). For example, a man diagnosed in 1979 ($j = 2$) at age 50 ($i = 6$, $I = 12$) would fall into birth cohort $k = 2 - 6 + 12 = 8$, which is 1929-38.

The model fitted to the data as:

$$\log \lambda_{ijk} = \mu + \alpha_i + \pi_j + \gamma_k$$

where α_i , π_j and γ_k represent the effects of age, period, and cohort respectively. It was assumed that the number of cases followed a Poisson distribution with mean $\lambda_{ijk} \times T_{ijk}$, where T_{ijk} represents person-year experience. The maximum likelihood estimates were obtained using the regression package, SAS procedure GENMOD.⁵²

Ideally, one would like to be able to analyze time trends, in order to assess the degree of risk due to age, that due to the year of birth and that associated with the year of diagnosis. Age, birth cohort and calendar time period are linearly dependent on each other: when two of these are known, the third is fixed; thus, given a person's age at a particular date, his birth cohort is also known. Various approaches have been made to modeling the effects of age, cohort and period.⁵⁵ When strong environmental factors are responsible for changing risk, they generally affect successive birth cohorts. Clear 'period' effects are

generally the result of improvements in therapy or the introduction of successful screening programs.

Age-period-cohort analysis was used in this project to examine the temporal variations of cancer incidence rates for Canadian-born and Chinese-born populations in Alberta. The aim of the analysis was to determine if the temporal variations were due to purely secular (period) influences or if they were attributable to generational (cohort) influences.

Due to the limited number of cases in the immigrant group, this analysis was only used with the most common site (lung cancer for Chinese-born and Canadian-born males), based on categorized data from the ten age groups and the four time periods of diagnosis. Table 10 and 11 illustrate the relationship between age, period, and cohort. A total of 14 overlapping, 10-year birth cohorts (1889-1898 through 1954-1963) were created from the 11 age groups (from 24-30 through 80-84) and four time periods (1974-78 through 1989-93). Each case diagnosed with cancer in a given 5-year age group and 5-year time period of diagnosis was assigned to only one 10-year birth cohort, though the cohort intervals overlap.⁵⁷

Table 11 displays the relationship between age, period, and cohort from a different perspective, with age groups on the rows, birth cohorts on the columns, and time periods on the diagonals. Persons diagnosed at an early age were born fairly recently and persons

Table 10. Ten-year Birth Cohorts implied by 5-year age and Period Intervals

Age at diagnosis	Time period, year of diagnosis			
	1974-1978	1979-1983	1984-1988	1989-1993
25-29	1944-1953	1949-1958	1954-1963	1959-1968
30-34	1939-1948	1944-1953	1949-1958	1954-1963
35-39	1934-1943	1939-1948	1944-1953	1949-1958
40-44	1929-1938	1934-1943	1939-1948	1944-1953
45-49	1924-1933	1929-1938	1934-1943	1939-1948
50-54	1919-1928	1924-1933	1929-1938	1934-1943
55-59	1914-1923	1919-1928	1924-1933	1929-1938
60-64	1909-1918	1914-1923	1919-1928	1924-1933
65-69	1904-1913	1909-1918	1914-1923	1919-1928
70-74	1899-1908	1904-1913	1909-1918	1914-1923
75-79	1894-1903	1899-1908	1904-1913	1909-1918
80-84	1889-1898	1894-1903	1899-1908	1904-1913

Table 11. Five-year time periods corresponding to specific 5-year age groups and 10-year birth cohorts

Age at diagnosis	Birth Cohort, Year of Birth														
	1889-1898	1894-1903	1899-1908	1904-1913	1909-1918	1914-1923	1919-1928	1924-1933	1929-1938	1934-1943	1939-1948	1944-1953	1949-1958	1954-1963	1959-1968
25-29												74-78	79-83	84-88	89-93
30-34											74-78	79-83	84-88	89-93	
35-39										74-78	79-83	84-88	89-93		
40-44									74-78	79-83	84-88	89-93			
45-49								74-78	79-83	84-88	89-93				
50-54							74-78	79-83	84-88	89-93					
55-59						74-78	79-83	84-88	89-93						
60-64					74-78	79-83	84-88	89-93							
65-69				74-78	79-83	84-88	89-93								
70-74			74-78	79-83	84-88	89-93									
75-79		74-78	79-83	84-88	89-93										
80-84	74-78	79-83	84-88	89-93											

diagnosed much later in life were born long ago. The filled cells in Table 11 indicate the combinations of age, period, and cohort for which we have data. Poisson regression modeling was used to analysis the data. The log-linear Poisson model used incidence data observed recently in older persons to reconstruct what incidence rates would have been in earlier birth cohorts.^{58,59} To assess the effect of time period on the risk of developing cancer, a log-linear Poisson model was developed that expresses cancer incidence as an explicit function of age and period for each sex separately. The period relative risk (RRp) in the age-period model is the ratio of the incidence rate for a given time period compared with the incidence rate for the baseline period of 1974-78. The cohort relative risk (RRc) in the age-cohort model compares the incidence rate for a given birth cohort to that of the baseline cohort 1889 through 1897. The 95% CIs associated with its relative risk were calculated.

Clayton & Schifflers^{58,59} introduced the idea of 'drift' which is described as a constant change over time which could be predicted either by the age-period model or by the age-cohort model. 'Age drift' describes the linear increase with age of cancer incidence rates on log scale. This development assumes the primacy of the effect of age on disease. The introduction of the idea of drift led Clayton and Schifflers⁵⁹ to suggest a hierarchy of models:

- 1) Age
- 2) Age + (Period or Cohort) Drift
- 3) a. Age + Period
b. Age + Cohort
- 4) Age + Period + Cohort

A significance test that compares the fit of model 2) with either models 3)a or 3)b, is equivalent to a test for period or cohort curvature that adjusts for age and the corresponding drift. The comparisons between 3)b or 3)a with 4) give the tests for period adjusted for cohort and vice versa. This approach effectively carries the idea of linear and curvature components of effect down to the level of the two factor model, which can help to clarify the comparison of the adjusted and the unadjusted effects of period and cohort.⁵⁵

CHAPTER 3 RESULTS

1. Data quality of CCDB for Alberta Province 1974-1993

1.1 Age distribution of the missing birthplace data

For male Alberta residents, the percentage of cancer cases with missing birthplace increased with age up to age group 80 and older during 1974-93 (see table 12 and Appendix E for the SAS program to obtain the cancer cases with missing birthplace). The age group 70-79 had the highest percentage of missing birthplace for all the four study periods. During the most recent study period 1989-1993, the percentage of cases with missing birthplace for age groups 60-69 to 70-79 was higher than the other study periods. The age groups 0-24 and 80 and older had the highest percentage of missing birthplace in 1974-1978. For female Alberta residents, the percentage of cases with missing birthplace increased with age, and the age group 60-69 had the highest percentage of missing birthplace during three study periods (1974-78 to 1984-88). During 1989-1993, the highest percentage of missing birthplace occurred in the age group 70-79. For the age groups 0-24 and 50-59, the highest percentage of missing birthplace was during 1979-83 and 1974-78 respectively.

1.2 Histologically confirmed cancer cases

The percentage of registered cases which have been verified histologically is an indicator of the validity of information in a cancer registry. Figure 4 and 5 show the percent of histologically confirmed cases by age, sex and birthplace. Overall, Canadian-born and Chinese-born Alberta residents had 86.1% and 81.1% histologically confirmed cases

Table 12. Cancer cases with birthplace missing by sex, age groups and diagnosis years, 1974-1993 (%)

Males						
Diag. Year	Age					
	0-24	25-49	50-59	60-69	70-79	80+
1974-78	114 (2.97)	383 (9.98)	498 (12.98)	872 (22.73)	1151 (30.00)	814 (21.21)
1979-83	94 (2.83)	358 (10.79)	516 (15.55)	854 (25.74)	930 (28.03)	561 (16.91)
1984-88	105 (3.12)	366 (10.87)	493 (14.64)	936 (27.79)	947 (28.12)	521 (15.47)
1989-93	96 (1.99)	422 (8.75)	607 (12.59)	1386 (28.74)	1511 (31.33)	800 (16.59)
Females						
Diag. Year	Age					
	0-24	25-49	50-59	60-69	70-79	80+
1974-78	90 (3.09)	471 (16.16)	574 (19.70)	661 (22.68)	608 (20.86)	507 (17.40)
1979-83	99 (4.34)	393 (17.21)	395 (17.30)	502 (21.99)	467 (20.46)	424 (18.57)
1984-88	92 (3.83)	535 (22.25)	374 (15.55)	557 (23.16)	519 (21.58)	327 (13.60)
1989-93	84 (2.61)	612 (19.04)	448 (13.93)	739 (22.99)	805 (25.04)	526 (16.36)

Figure 4. Percentage of Histologically Confirmed Cases by Birthplace and Age group, Males, 1974-1993

Figure 5. Percentage of Histologically Confirmed Cases, by Birthplace and Age group, Female, 1974-1993

respectively during the 20 years (1974-1993). For age groups under 14 and 80+, the percentage of histologically confirmed cases were less than 80% for both male and female Alberta residents regardless of birthplace. For Chinese female immigrants, the histologically confirmed cases for age groups 20-24 and 25-29 were lower than 80% during the 20 years. The percentage of histologically confirmed cases in the Shanghai Cancer Registry was 10-30% less than in the Canadian Cancer Registries based on the information provided in the series of IARC publication 'Cancer Incidence in Five Continents, Vol IV - VII'. However, in a study of colon cancer, Yu et al.⁶⁰ estimated that the Shanghai Cancer Registry had histologically verified cancer cases approximately 5-10% less than did Surveillance, Epidemiology and End Results (SEER) Tumour Registries in the US.

2. Ecological Descriptive Results

2.1 Age-, sex-specific cancer incidence rates

A total of 31,576 male and 32,536 of female cancer cases (ICD9 140-208, excl. 173) were diagnosed in Canadian-born Alberta residents during the period of 1974-1993. During the same time, a total of 640 male and 583 female cancer cases were diagnosed in Chinese immigrants. For Chinese in Shanghai, the total cancer cases during the year of 1975 (only one year of data was available) and 1978-1992 were 142,999 for males and 103,156 for females. Overall, there were an estimated 19,098,940 and 18,539,913 person years follow-up in the male and female Canadian-born populations respectively. Person years for Chinese-born immigrants were 237,951 for males and 240,326 for females. For Shanghai Chinese, the estimated person years were 52,575,653 for males and 50,724,716 for females.

Tables 13-15 present the incident cancer cases in the three populations by cancer sites, age groups, and sex in 20 years (1974-93). Appendix F presents the incident cancer cases in the 3 populations in each of the study periods. Table 16 shows the person years in three populations in each of the study period and table 17 presents the world population.⁴⁶ Tables 18-20 show the age-, sex-specific cancer incidence rates of selected cancer sites of Canadian-born populations, Chinese immigrants in Alberta and Shanghai Chinese in China during the whole study period 1974-1993. The age-, sex-specific cancer incidence rates of the individual study periods are presented in appendix G.

Figure 6 & 7 present age-, sex-specific cancer incidence rates for all cancers combined in Canadian-born, Chinese immigrants of Alberta residents and Shanghai Chinese during 20 years. The three populations had similar age-, sex-specific cancer incidence rates for age groups 0-24 and 25-49 for males and females. Chinese male immigrants had the lowest age-, sex-specific cancer incidence rates for age groups 50-59, 60-69, and 70-79 compared to the other two populations. Shanghai Chinese males had higher age-, sex-specific cancer incidence rates for age groups 50-59 and 60-69 than Canadian males. For the age group 70-79, Canadian-born males had marginally higher age-, sex-specific cancer incidence rates than Shanghai Chinese males. For the age group 80+, the age-, sex-specific cancer incidence rates of Shanghai Chinese males decreased dramatically, while Canadian-born and Chinese-born males had higher age-, sex-specific cancer incidence rates than age group 70-79. For females, the Canadian-born populations had the highest age-, sex-specific cancer incidence rates compared to the other two populations for all the age groups older

Table 13. Number of cancer cases by site, sex and age groups of Canadian-born Alberta residents (1974-1993)

Age groups	0-24	25-49	50-59	60-69	70-79	80+	0-24	25-49	50-59	60-69	70-79	80+
Site (ICD9)	Males						Females					
Nasopharynx (147)	3	15	19	15	4	0	5	8	8	6	6	2
Esophagus (150)	1	25	102	127	91	14	0	7	17	45	36	9
Stomach (151)	2	119	225	339	292	104	2	63	80	142	149	79
Colon (153)	6	241	411	727	647	242	6	217	373	654	609	313
Rectum (154)	4	192	379	589	457	122	2	140	263	372	302	116
Liver (155)	20	21	44	61	62	24	8	19	20	25	25	23
Gallbladder (156)	0	18	35	47	49	21	0	11	37	64	78	37
Pancreas (157)	0	90	207	326	264	98	1	56	125	225	269	126
Lung (162)	9	419	1280	2368	1753	379	1	368	775	1018	715	174
Prostate (185)	2	36	504	2029	2308	734	n/a	n/a	n/a	n/a	n/a	n/a
Bladder (188)	2	80	192	406	405	156	3	29	55	117	97	78
Kidney (189)	37	134	221	271	198	60	40	89	95	156	104	42
Thyroid g. (193)	18	106	40	38	17	4	86	303	96	58	37	8
Breast (174)	n/a	n/a	n/a	n/a	n/a	n/a	10	3316	2627	2671	1569	483
Cervix (180)	n/a	n/a	n/a	n/a	n/a	n/a	37	941	162	183	100	38
Uterus (182)	n/a	n/a	n/a	n/a	n/a	n/a	2	247	622	767	410	84
Ovary (183)	n/a	n/a	n/a	n/a	n/a	n/a	69	483	396	419	241	63
Others	1178	2791	1966	2429	1612	493	795	1703	1168	1454	1236	515
All (140-208, ex 173)	1282	4287	5625	9772	8159	2451	1067	8000	6919	8376	5983	2190
All (140-208)	1297	4961	6490	11307	9404	3011	1096	8605	7553	9285	6775	2634

Table 14. Number of cancer cases by site, sex and age groups of Chinese migrants (1974-1993)

Age groups	0-24	25-49	50-59	60-69	70-79	80+	0-24	25-49	50-59	60-69	70-79	80+
Site (ICD9)	Males						Females					
Nasopharynx (147)	0	30	15	14	3	2	1	10	4	6	0	1
Esophagus (150)	0	1	4	4	6	3	0	0	0	1	0	0
Stomach (151)	0	3	3	10	9	6	0	3	2	2	6	7
Colon (153)	0	6	7	11	14	10	0	6	8	18	18	4
Rectum (154)	1	8	9	7	13	8	0	2	2	6	7	3
Liver (155)	1	9	15	15	4	8	0	4	4	4	3	6
Gallbladder (156)	0	1	3	0	3	4	0	1	2	1	5	0
Pancreas (157)	0	2	2	7	7	7	0	2	0	1	3	7
Lung (162)	0	5	24	40	56	21	3	7	7	15	26	12
Prostate (185)	0	0	4	8	15	17	n/a	n/a	n/a	n/a	n/a	n/a
Bladder (188)	0	0	3	5	6	4	0	0	0	2	2	4
Kidney (189)	0	2	2	5	5	1	0	0	1	3	0	3
Thyroid g. (193)	0	3	1	0	1	0	0	2	4	3	2	1
Breast (174)	n/a	n/a	n/a	n/a	n/a	n/a	0	45	34	30	11	10
Cervix (180)	n/a	n/a	n/a	n/a	n/a	n/a	0	15	8	9	3	4
Uterus (182)	n/a	n/a	n/a	n/a	n/a	n/a	0	9	10	7	4	5
Ovary (183)	n/a	n/a	n/a	n/a	n/a	n/a	1	12	5	6	2	3
Others	5	23	20	28	29	12	4	15	20	20	19	15
All (140-208,ex 173)	7	93	112	154	171	103	9	133	111	134	111	85
All (140-208)	8	94	116	156	175	103	9	134	113	137	117	88

Table 15. Number of cancer cases by site, sex and age groups of Shanghai Chinese (1975-1992)

Age groups	0-24	25-49	50-59	60-69	70-79	80+	0-24	25-49	50-59	60-69	70-79	80+
Site (ICD9)	Males						Females					
Nasopharynx(147)	70	966	809	632	230	25	47	476	298	241	110	21
Esophagus (150)	2	403	1812	3550	3147	772	4	188	851	1595	1521	588
Stomach (151)	60	3018	6604	11611	8862	1814	87	2344	2944	4816	4199	1355
Colon (153)	56	984	1259	2001	1589	334	54	966	1434	1987	1488	388
Rectum (154)	59	988	1178	1674	1349	312	64	944	1133	1460	997	334
Liver (155)	123	3891	5852	5683	3246	627	58	771	1646	2380	1980	635
Gallbladder (156)	3	105	255	432	384	96	3	154	446	802	617	143
Pancreas (157)	7	346	705	1312	1001	231	8	190	563	991	838	247
Lung (162)	35	1644	6482	13571	10246	1791	24	974	2356	4716	3950	1003
Prostate (185)	2	26	85	345	521	166	n/a	n/a	n/a	n/a	n/a	n/a
Bladder (188)	16	313	668	1415	1315	392	4	91	188	429	400	147
Kidney (189)	51	165	334	449	275	54	41	132	212	273	153	40
Thyroid (193)	55	310	161	125	62	12	176	1055	326	270	111	27
Breast (174)	n/a	n/a	n/a	n/a	n/a	n/a	36	5350	3736	3161	1608	486
Cervix (180)	n/a	n/a	n/a	n/a	n/a	n/a	7	441	1155	1411	934	228
Uterus (182)	n/a	n/a	n/a	n/a	n/a	n/a	10	438	962	571	197	31
Ovary (183)	n/a	n/a	n/a	n/a	n/a	n/a	165	1078	881	778	400	84
Others	1773	4502	4401	5758	4070	972	1284	4017	3251	4011	2884	1097
All (140-208,ex 173)	2308	17655	30599	48551	36293	7595	2067	19603	22375	29886	22379	6847
All (140-208)	2318	17778	30793	48857	36553	7699	2075	19695	22507	30086	22575	7006

Table 16. Person years of the three population in each of the study period

Age groups	0-24	25-49	50-59	60-69	70-79	80+	0-24	25-49	50-59	60-69	70-79	80+
Periods	Males						Females					
Canadian-born												
1974-1978	2187263	1332000	305850	169963	57713	17875	2090452	1256100	298225	179588	68100	22950
1979-1983	2422250	1651575	340225	223725	74875	14325	2293475	1539275	329150	245475	90150	19600
1984-1988	2283850	1925275	375825	248275	120125	18675	2207255	1844025	363475	274375	148375	28675
1989-1993	2300275	2151400	398225	287100	160650	31600	2206375	2086175	388275	299725	208975	51725
Chinese immigrants												
1974-1978	7413	19638	3050	2300	1400	675	6950	16825	3825	3063	1713	700
1979-1983	11025	30200	5325	2675	1350	525	10675	26825	5800	4050	2700	1150
1984-1988	11900	35975	8900	5750	3075	875	11425	34050	8775	6925	4675	1400
1989-1993	13700	45675	11100	8950	4975	1475	12950	46625	9800	10225	6275	2875
Shanghai Chinese												
1975	1302440	961452	320703	177971	61921	8256	1208154	931992	319430	187732	92615	22358
1978-1982	5330435	5873465	1892000	1128395	470965	77535	5110125	5350955	1954275	1227775	597950	171255
1983-1987	5235665	7253200	2190535	1394630	605245	116090	4870100	6579075	2239570	1524695	735795	225885
1988-1992	5045975	8637460	1972470	1607585	740990	170270	4624950	7693700	1982370	1833140	941180	299625

Table 17. World populations used for the computation of age-standardized incidence rates

Age (years)	World	Age groups (years)	World
0-	2,400	0-24	48,000
1-	9,600		
5-	10,000		
10-	9,000		
15-	9,000		
20-	8,000		
25-	8,000	25-49	32,000
30-	6,000		
35-	6,000		
40-	6,000		
45-	6,000		
50-	5,000	50-59	9,000
55-	4,000		
60-	4,000	60-69	7,000
65-	3,000		
70-	2,000	70-79	3,000
75-	1,000		
80-	500	80+	1,000
85+	500		
Total	100,000		100,000

Table 18. Age groups, sex-specific incidence rates (per 100,000) in Canadian-born Alberta residents (1974-1993)

Age groups	0-24	25-49	50-59	60-69	70-79	80+	Crude r.	0-24	25-49	50-59	60-69	70-79	80+	Crude r.
Site (ICD9)	Males							Females						
Nasopharynx (147)	0.03	0.21	1.34	1.61	0.97	0.00	0.29	0.06	0.12	0.58	0.60	1.16	1.63	0.19
Esophagus (150)	0.01	0.35	7.18	13.67	22.01	16.96	1.88	0.00	0.10	1.23	4.50	6.98	7.32	0.61
Stomach (151)	0.02	1.69	15.84	36.49	70.64	126.02	5.66	0.02	0.94	5.80	14.21	28.90	64.25	2.78
Colon (153)	0.07	3.41	28.94	78.25	156.52	293.24	11.91	0.07	3.23	27.05	65.45	118.11	254.58	11.72
Rectum (154)	0.04	2.72	26.69	63.40	110.56	147.83	9.13	0.02	2.08	19.07	37.23	58.57	94.35	6.45
Liver (155)	0.22	0.30	3.10	6.57	15.00	29.08	1.21	0.09	0.28	1.45	2.50	4.85	18.71	0.65
Gallbladder (156)	0.00	0.25	2.46	5.06	11.85	25.45	0.89	0.00	0.16	2.68	6.41	15.13	30.09	1.22
Pancreas (157)	0.00	1.27	14.58	35.09	63.87	118.75	5.16	0.01	0.83	9.06	22.52	52.17	102.48	4.33
Lung (162)	0.10	5.93	90.13	254.88	424.08	459.25	32.50	0.01	5.47	56.20	101.89	138.67	141.52	16.46
Prostate (185)	0.02	0.51	35.49	218.39	558.35	889.42	29.39	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Bladder (188)	0.02	1.13	13.52	43.70	97.98	189.03	6.50	0.03	0.43	3.99	11.71	18.81	63.44	2.04
Kidney (189)	0.40	1.90	15.56	29.17	47.90	72.70	4.82	0.45	1.32	6.89	15.61	20.17	34.16	2.84
Thyroid (193)	0.20	1.50	2.82	4.09	4.11	4.85	1.17	0.98	4.51	6.96	5.80	7.18	6.51	3.17
Breast (174)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.11	49.30	190.48	267.32	304.31	392.84	57.58
Cervix (180)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.42	13.99	11.75	18.32	19.39	30.91	7.88
Uterus (182)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.02	3.67	45.10	76.76	79.52	68.32	11.50
Ovary (183)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.78	7.18	28.71	41.94	46.74	51.24	9.01
Others	12.81	39.53	138.44	261.45	389.97	597.39	54.81	9.04	25.32	84.69	145.52	239.72	418.87	37.06
All (140-208, ex 173)	13.94	60.72	396.09	1051.81	1973.81	2969.97	165.33	12.13	118.95	501.69	838.30	1160.40	1781.21	175.49
All (140-208)	14.11	70.27	457.00	1217.03	2275.00	3648.55	190.95	12.46	127.94	547.67	929.28	1314.00	2142.33	193.90

Table 19. Age groups, sex-specific incidence rates (per 100,000) in Chinese-born Alberta residents (1974-1993)

Age groups	0-24	25-49	50-59	60-69	70-79	80+	Crude r.	0-24	25-49	50-59	60-69	70-79	80+	Crude r.
Site (ICD9)	Males							Females						
Nasopharynx (147)	0.00	22.82	52.86	71.16	27.78	56.34	26.90	2.38	8.04	14.18	24.70	0.00	16.33	9.15
Esophagus (150)	0.00	0.76	14.10	20.33	55.56	84.51	7.56	0.00	0.00	0.00	4.12	0.00	0.00	0.42
Stomach (151)	0.00	2.28	10.57	50.83	83.33	169.01	13.03	0.00	2.41	7.09	8.23	39.05	114.29	8.32
Colon (153)	0.00	4.56	24.67	55.91	129.63	281.69	20.17	0.00	4.83	28.37	74.11	117.16	65.31	22.47
Rectum (154)	2.27	6.08	31.72	35.58	120.37	225.35	19.33	0.00	1.61	7.09	24.70	45.56	48.98	8.32
Liver (155)	2.27	6.84	52.86	76.24	37.04	225.35	21.85	0.00	3.22	14.18	16.47	19.53	97.96	8.74
Gallbladder (156)	0.00	0.76	10.57	0.00	27.78	112.68	4.62	0.00	0.80	7.09	4.12	32.55	0.00	3.74
Pancreas (157)	0.00	1.52	7.05	35.58	64.81	197.18	10.51	0.00	1.61	0.00	4.12	19.53	114.29	5.41
Lung (162)	0.00	3.80	84.58	203.30	518.52	591.55	61.36	0.00	5.63	24.82	61.76	169.24	195.92	27.88
Prostate (185)	0.00	0.00	14.10	40.66	138.89	478.87	18.49	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Bladder (188)	0.00	0.00	10.57	25.41	55.56	112.68	7.56	0.00	0.00	0.00	8.23	13.02	65.31	3.33
Kidney (189)	0.00	1.52	7.05	25.41	46.30	28.17	6.30	0.00	0.00	3.55	12.35	0.00	48.98	2.91
Thyroid g. (193)	0.00	2.28	3.52	0.00	9.26	0.00	2.10	7.14	1.61	14.18	12.35	13.02	16.33	6.24
Breast (174)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.00	36.19	120.57	123.52	71.60	163.27	54.09
Cervix (180)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.00	12.06	28.37	37.06	19.53	65.31	16.23
Uterus (182)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.00	7.24	35.46	28.82	26.04	81.63	14.56
Ovary (183)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	2.38	9.65	17.73	24.70	13.02	48.98	12.07
Others	11.35	17.49	70.48	142.31	268.52	338.03	49.17	9.52	12.06	70.92	82.35	123.67	244.90	38.70
All (140-208,ex 173)	15.89	70.73	394.71	782.72	1583.33	2901.41	268.96	21.43	106.96	393.62	551.71	722.52	1387.76	242.59
All (140-208)	18.16	71.49	408.81	792.88	1620.37	2901.41	274.01	21.43	107.76	400.71	564.06	761.57	1436.73	248.83

Table 20. Age groups, sex-specific incidence rates (per 100,000) in Shanghai Chinese (1975-1992)

Age groups	0-24	25-49	50-59	60-69	70-79	80+	Crude r.	0-24	25-49	50-59	60-69	70-79	80+	Crude r.
Site (ICD9)	Males							Females						
Nasopharynx(147)	0.41	4.25	12.68	14.65	12.22	6.71	5.19	0.30	2.31	4.57	5.05	4.63	2.90	2.35
Esophagus(150)	0.01	1.77	28.42	82.39	167.47	207.44	18.42	0.02	0.91	13.09	33.40	64.21	81.76	9.35
Stomach (151)	0.35	13.28	103.58	269.48	471.60	487.42	60.80	0.55	11.40	45.32	100.89	177.32	188.30	31.03
Colon (153)	0.33	4.33	19.74	46.42	84.55	89.74	11.83	0.34	4.70	22.08	41.62	62.81	53.94	12.45
Rectum (154)	0.35	4.35	18.47	38.84	71.78	83.83	10.57	0.40	4.59	17.44	30.58	42.09	46.33	9.72
Liver (155)	0.72	17.12	91.79	131.89	172.74	168.48	36.94	0.36	3.75	25.33	49.86	83.62	88.29	14.72
Gallbladder(156)	0.01	0.46	3.99	10.01	20.40	25.55	2.42	0.02	0.75	6.86	16.79	26.06	19.87	4.26
Pancreas (157)	0.04	1.52	11.05	30.44	53.22	62.08	6.85	0.05	0.92	8.66	20.76	35.38	34.33	5.59
Lung (162)	0.21	7.23	101.67	314.96	545.26	481.24	64.23	0.15	4.74	36.26	98.79	166.81	139.36	25.67
Prostate (185)	0.01	0.11	1.33	7.99	27.72	44.35	2.17	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Bladder (188)	0.09	1.38	10.46	32.84	69.98	105.08	7.83	0.02	0.44	2.89	8.98	16.89	20.43	2.48
Kidney (189)	0.30	0.72	5.23	10.40	14.59	14.51	2.52	0.26	0.64	3.26	5.71	6.44	5.43	1.67
Thyroid g.(193)	0.33	1.36	2.51	2.89	3.26	3.22	1.37	0.11	5.13	5.02	5.65	4.65	3.63	3.87
Breast (174)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.23	26.03	57.51	66.20	67.91	67.57	28.34
Cervix (180)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.04	2.15	17.77	29.54	39.43	31.68	8.23
Uterus (182)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.06	2.13	14.80	11.96	8.32	4.30	4.35
Ovary (183)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1.04	5.24	13.56	16.28	16.86	11.56	6.67
Others	10.48	19.81	69.02	133.63	216.59	261.06	40.84	40.04	19.54	50.04	84.03	121.78	152.43	32.61
All (140-208,ex 173)	13.64	77.69	479.93	1126.83	1931.37	2040.7	271.99	410.06	95.36	344.45	626.09	945.22	952.12	203.36
All (140-208)	13.70	78.22	482.97	1133.94	1945.22	2068.7	273.88	1761.04	95.81	346.49	630.29	953.52	974.24	204.92

Figure 6. All Cancer Combined Male Age-Specific Incidence Rate of Canadian-born, Chinese-born Population in Alberta and Chinese in Shanghai, 1974-1993

Figure 7. All Cancer Combined Female Age-Specific Incidence Rate of Canadian-born Chinese-born Population in Alberta and Chinese in Shanghai, 1974-1993

than 50-59. The age-, sex-specific cancer incidence rates in Chinese immigrants were in between Canadian-born populations and Shanghai Chinese for age group 50-59. Chinese immigrants had lower age-, sex-specific cancer incidence rates than Shanghai Chinese for age groups 60-69 and 70-79. Shanghai Chinese females aged 80 and over had lower age-, sex-specific cancer incidence rates than the age group 70-79, while Canadian-born and Chinese-born females had increased age-, sex-specific cancer incidence rates and the rate of Chinese immigrant was in the middle.

Figures 8-11 show age- and sex-specific cancer incidence rates of lung (both male and female), male prostate and female breast in the three populations in over all twenty years. Age- and sex-specific cancer incidence rates of male lung cancer in the three populations were similar for age groups 0-24, 25-49, and 50-59. For age group 60-69 and 70-79, the Shanghai Chinese had the highest age-, sex-specific cancer incidence rates compared to the other two populations, while Chinese immigrants had the lowest age-, sex-specific cancer incidence rates for age group 60-69 and Canadian-born males had the lowest age-, sex-specific cancer incidence rates for age group 70-79. For age group 80 and over, the Shanghai Chinese had lower age-, sex-specific cancer incidence rates than the age group of 70-79, while Chinese immigrant and Canadian-born males had higher age-, sex-specific cancer incidence rates than the age group of 70-79. Chinese immigrants had the highest age-, sex-specific cancer incidence rates for this age group compared to the other two populations. A similar pattern was observed for female lung cancer.

Figure 8. Lung Cancer Age-Specific Incidence Rate of Canadian-born, Chinese-born Population in Alberta and Chinese in Shanghai, 1974-1993 (Males)

Figure 9. Lung Cancer Age-Specific Incidence Rate of Canadian-born Chinese-born Population in Alberta and Chinese in Shanghai, 1974-1993 (Female)

Figure 10. Age-Specific Incidence Rate of Prostate Cancer of Canadian-born, Chinese-born Population in Alberta and Chinese in Shanghai, 1974-1993

Figure 11. Age-Specific Incidence Rate of Female Breast Cancer of Canadian-born, Chinese-born Population in Alberta and Chinese in Shanghai, 1974-1993

For prostate cancer, a dramatic increase was seen for age group of 60-69 in Canadian-born males with further increase for age groups 70-79 and 80+. Chinese immigrants had lower age-, sex-specific cancer incidence rates than Canadian-born males but higher age-, sex-specific cancer incidence rates than the Shanghai Chinese. A rapid increase occurred for age group 70-79 in Chinese immigrants. Age-, sex-specific cancer incidence rates of prostate cancer for Shanghai Chinese remained consistently low for all the age groups.

For female breast cancer, Canadian-born females had the highest age-, sex-specific cancer incidence rates and Chinese immigrants had lower age-, sex-specific cancer incidence rates than Canadian-born females but higher than Shanghai Chinese females. Overall, the age-, sex-specific cancer incidence rates were increasing with age, except in age groups 60-69 and 70-79 for Chinese immigrants. Sharp increases were observed in age group 50-59 for both Canadian-born and Chinese-born females. Chinese female immigrants had decreased age-, sex-specific cancer incidence rates for age group 60-69 and 70-79 compared to the age group 50-59. When they reached age 80+, the age-, sex-specific cancer incidence rates increased dramatically compared to the age group 70-79.

2.2 Age Standardized Incidence Rates (ASIRs, world population)

Table 21 and 22 show the ASIRs for all the cancers combined (ICD9 140-208, excl. 173), and the 95% confidence intervals (95%CI) for the three populations during the four study periods. Overall, Chinese male immigrants had the lowest ASIR compared to

Table 21. Age-standardized (world population) cancer incidence rate (ASIR) per 100,000 person-years of all cancer sites (ICD9 140-208, excl. 173), and 95% confidence intervals (in the parentheses) in three populations (males)

Study Periods	Canadian-born, 1974-1993		Chinese migrants, 1974-1993		Shanghai Chinese, 1975-1992	
	ASIR	95 % CI	ASIR	95 % CI	ASIR	95 % CI
1974-1993	224.31	(221.76, 226.86)	197.09	(181.17, 213.00)	231.83	(230.60, 233.05)
1974-1978	153.50	(148.65, 158.34)	143.33	(104.46, 182.19)	240.88	(234.64, 247.12)
1979-1983	221.04	(215.46, 226.62)	243.43	(198.43, 288.42)	243.76	(241.29, 246.23)
1984-1988	247.46	(242.16, 252.76)	200.96	(169.94, 231.98)	222.88	(220.76, 224.99)
1989-1993	246.82	(242.18, 251.46)	200.82	(176.50, 225.14)	228.77	(226.78, 230.76)

Table 22. Age-standardized (world population) cancer incidence rate (ASIR) per 100,000 person-years of all cancer sites (ICD9 140-208, excl. 173), and 95% confidence intervals (in the parentheses) in three populations (females)

Study Periods	Canadian-born, 1974-1993		Chinese migrants, 1974-1993		Shanghai Chinese, 1975-1992	
	ASIR	95 % CI	ASIR	95 % CI	ASIR	95 % CI
1974-1993	200.34	(198.14, 202.55)	154.11	(140.32, 167.90)	149.93	(149.00, 150.85)
1974-1978	152.41	(147.95, 156.87)	123.48	(89.88, 157.08)	165.73	(161.06, 170.40)
1979-1983	194.08	(189.38, 198.78)	151.30	(212.79, 180.81)	154.68	(152.86, 156.50)
1984-1988	217.13	(212.68, 221.59)	171.69	(146.18, 197.20)	142.46	(140.87, 144.06)
1989-1993	216.76	(212.70, 220.83)	159.04	(133.03, 185.05)	150.47	(148.92, 152.02)

Canadian-born and Chinese in Shanghai over the whole 20 years and in each of the 4 study periods (marginal differences in 1979-83). The ASIRs of Canadian-born males were lower than those of Shanghai Chinese during the 20 years and the first two study periods (1974-78 & 1979-83), but were higher in the last two study periods (1984-88 & 1989-93). The ASIRs of Chinese female immigrants were higher than Shanghai females but lower than Canadian-born females overall and during 1984-88. In the study period of 1974-78, Chinese female immigrants had the lowest ASIR, while the ASIR of the Shanghai Chinese was higher than Canadian-born females. The ASIR of Chinese female immigrants was similar to that of the Shanghai Chinese but lower than that of Canadian-born females during 1979-83 and 1989-1993.

The results of the site specific ASIRs among the three populations for the entire 20 years (1974-1993) are presented in table 23-24 and figures 12-15. The ASIRs in each of the four study periods are presented in appendix H and appendix I. For male Chinese immigrants, the ASIRs of esophageal and liver cancer were consistently much lower than Shanghai Chinese but were higher than Canadian-born males in Alberta during the four study periods. A similar pattern occurred for stomach cancer in three of the four study periods (1984-88 was the exception). In contrast, the ASIRs of prostate cancer in Chinese male immigrants were consistently higher than that in Shanghai males but lower than in Canadian-born males in the four study periods. A similar pattern was found for the ASIRs of rectal and kidney cancer for Chinese immigrants in three study periods (1979-83 was the exception). For the female Chinese immigrants, the ASIRs of liver and stomach cancers

Table 23. Age-standardized (world population) incidence rates (per 100,000) and 95% confidence intervals (in parentheses) for Canadian-born Alberta residents, Chinese migrants in Alberta, and Shanghai Chinese, Males, 1974-1993.

Cancer Sites (ICD9)	Canadian-born	Chinese migrants	Shanghai Chinese (1975-92)
All cancers	260.31 (257.56, 263.07)	201.51 (185.33, 217.69)	233.49 (232.26, 234.72)
All cancer (excl. 173)	224.31 (221.76, 226.86)	197.09 (181.17, 213.00)	231.83 (230.60, 233.05)
Nasopharynx (147)	0.35 (0.25, 0.44)	18.44 (13.86, 23.01)	4.16 (4.00, 4.32)
Esophagus (150)	2.55 (2.28, 2.82)	5.45 (2.91, 7.98)	16.00 (15.67, 16.32)
Stomach (151)	7.91 (7.42, 8.40)	9.43 (6.08, 12.78)	51.63 (51.05, 52.20)
Colon (153)	16.83 (16.12, 17.55)	14.30 (10.22, 18.38)	10.00 (9.75, 10.25)
Rectum (154)	12.53 (11.92, 13.13)	14.25 (9.82, 18.67)	8.93 (8.69, 9.17)
Liver (155)	1.68 (1.46, 1.90)	16.74 (11.91, 21.57)	30.19 (29.76, 30.62)
Gallbladder (156)	1.27 (1.07, 1.46)	3.16 (1.29, 5.02)	2.08 (1.97, 2.20)
Pancreas (157)	7.28 (6.81, 7.75)	7.53 (4.55, 10.50)	5.85 (5.65, 6.04)
Lung (162)	45.21 (44.07, 46.36)	44.53 (37.26, 51.80)	54.78 (54.19, 55.37)
Prostate (185)	44.30 (43.11, 45.48)	13.07 (9.19, 16.95)	2.00 (1.88, 2.11)
Bladder (188)	9.48 (8.94, 10.02)	5.52 (2.96, 8.09)	6.87 (6.66, 7.09)
Kidney (189)	6.41 (5.98, 6.83)	4.57 (2.24, 6.90)	2.16 (2.04, 2.27)
Thyroid g. (193)	1.29 (1.11, 1.46)	1.33 (0.16, 2.49)	1.15 (1.06, 1.24)
Others	67.23 (65.90, 68.57)	38.79 (30.94, 46.64)	36.04 (35.55, 36.54)

Table 24. Age-standardized (world population) incidence rates (per 100,000) and 95% confidence intervals (in parentheses) for Canadian-born Alberta residents, Chinese migrants in Alberta, and Shanghai Chinese, Females, 1974-1993.

Cancer Sites (ICD9)	Canadian-born	Chinese migrants	Shanghai Chinese (1975-92)
All cancers	222.10 (219.78, 224.43)	157.53 (143.63, 171.44)	150.61 (149.68, 151.54)
All cancer (excl. 173)	200.34 (198.78, 202.55)	154.11 (140.32, 167.90)	149.50 (148.57, 150.42)
Nasopharynx (147)	0.21 (0.14, 0.28)	6.89 (3.55, 10.22)	1.82 (1.71, 1.92)
Esophargus (150)	0.74 (0.60, 0.88)	0.29 (0.07, 1.61)	6.56 (6.38, 6.75)
Stomach (151)	3.34 (3.05, 3.63)	4.30 (2.36, 6.25)	22.25 (21.90, 22.60)
Colon (153)	14.17 (13.57, 14.77)	13.45 (9.79, 17.12)	8.99 (8.77, 9.21)
Rectum (154)	7.70 (7.26, 8.14)	4.74 (2.61, 6.87)	7.10 (6.90, 7.30)
Liver (155)	0.77 (0.63, 0.91)	5.02 (2.81, 7.24)	10.54 (10.29, 10.78)
Gallbladder (156)	1.50 (1.30, 1.69)	2.16 (0.72, 3.61)	3.02 (2.89, 3.15)
Pancreas (157)	5.25 (4.89, 5.62)	2.53 (1.12, 3.94)	3.96 (3.81, 4.10)
Lung (162)	19.52 (18.82, 20.22)	15.39 (11.61, 19.18)	18.16 (17.85, 18.48)
Breast (174)	64.75 (63.50, 65.99)	34.86 (28.78, 40.94)	20.96 (20.62, 21.30)
Cervix (180)	7.91 (7.50, 8.32)	10.25 (6.98, 13.51)	5.87 (5.69, 6.05)
Uterus (182)	13.69 (13.10, 14.27)	9.12 (6.03, 12.21)	3.17 (3.04, 3.31)
Ovary (183)	10.11 (9.62, 10.60)	8.44 (4.89, 11.98)	5.16 (4.98, 5.34)
Bladder (188)	2.53 (2.27, 2.79)	1.62 (0.46, 2.78)	1.75 (1.65, 1.85)
Kidney (189)	3.30 (3.02, 3.59)	1.67 (0.39, 2.96)	1.27 (1.18, 1.36)
Thyroid g. (193)	3.22 (2.96, 3.49)	6.64 (2.34, 10.94)	3.20 (3.05, 3.35)
Others	41.63 (40.63, 42.63)	26.74 (20.23, 33.25)	25.72 (25.31, 26.13)

**Figure 12. ASIRs Among Canadian-born, Chinese Migrants and Shanghai Chinese
Chinese by Cancer Sites, 1974-1993 (Males)**

**Figure 13. ASIRs Among Canadian-born, Chinese Migrants and Shanghai Chinese
Chinese by Cancer Sites, 1974-1993 (Males)**

**Figure 14. ASIRs Among Canadian-born, Chinese Migrants and Shanghai Chinese
by Cancer Sites, 1974-1993 (Females)**

Figure 15. ASIRs Among Canadian-born, Chinese Migrants and Shanghai Chinese by Cancer Sites, 1974-1993 (Females)

were much lower than in the Shanghai female Chinese but higher than in the Canadian-born females in three study periods, except in 1979-83 when Chinese female immigrants had the lowest ASIR of stomach cancer (based on only one case of cancer). In contrast, the ASIRs of breast and uterus cancers in Chinese female immigrants were lower than in Canadian-born females but higher than in Shanghai Chinese females in four study periods. A similar pattern is observed for ovarian cancer in three study periods (1989-93 was the exception).

For both Chinese male and female immigrants, the ASIR of nasopharyngeal cancer was the highest compared to Canadian-born and Shanghai males and females respectively during all the study periods. The ASIRs of cervical cancer of Chinese female immigrants, and pancreatic and gallbladder cancers of Chinese male immigrants were the highest compared to the other two populations in three study periods (1974-1978 was exception). The ASIRs of bladder, rectal, and pancreatic cancers of Chinese female immigrants were the lowest compared to the other two populations during three study periods. Chinese male immigrants had the lowest ASIRs of bladder and lung cancers during two study periods (1979-83, 1989-93 for bladder cancer and 1984-88, 1989-93 for lung cancer). The ASIR of lung cancer in Shanghai female Chinese and Chinese immigrants was decreasing while for the Canadian-born females it was increasing over time.

During the most recent study period 1989-1993, breast cancer was the leading cancer for females in all three populations. Lung cancer was the second most common cancer for Canadian-born females, the third most common cancer for Shanghai Chinese

females, and the fifth most common cancer for Chinese female immigrants. Colon cancer was the third most common cancer for Canadian-born females and the fourth most common cancer site for both Chinese female immigrants and Shanghai Chinese females.

The leading cancer for Chinese male immigrants was lung cancer which was the second most common cancer for both Canadian-born and Shanghai males. The leading cancer for Canadian-born males was prostate cancer while stomach cancer was the most common cancer in Shanghai Chinese. Colon cancer was the second most common site for Chinese male immigrants and nasopharynx was the third (a much less common cancer in both Canadian-born and Shanghai males). The third most common cancer was colon cancer for Canadian-born males and liver cancer for Shanghai male Chinese.

2.3 Age Standardized Incidence Rate Ratios (ASIRRs)

Table 25 present the relative risks (ASIRRs) of cancer in Chinese immigrants and Chinese in Shanghai relative to Canadian-born populations for the entire 20-year period of follow up. Results for each study period are presented in appendix J. Figures 16-19 illustrate site-specific cancer relative risks among three populations during the 20 years (1974-93).

Results of more detailed descriptive analysis among Canadian-born populations, Chinese immigrants and Shanghai Chinese appended in the appendices K - M.

Table 25. Estimates of ASIRRs for Chinese immigrants and Chinese in Shanghai relative to Canadian-born adjusted for age, by sex and site, 1974-1993

Cancer Sites	Chinese Migrants		Chinese in Shanghai	
	Males	Females	Males	Females
	RR (95%CI)	RR (95%CI)	RR (95%CI)	RR (95%CI)
Nasopharynx	53.3 (19.5, 145.6)*	32.7 (5.7, 186.9)*	12.0 (10.7, 13.5)*	8.6 (7.3, 10.2)*
Esophagus	2.1 (1.1, 4.2)*	0.4 (0.1, 1.3)	6.3 (5.9, 6.6)*	8.8 (8.1, 9.6)*
Stomach	1.2 (0.8, 1.8)	1.3 (0.8, 2.2)	6.5 (6.3, 6.7)*	6.7 (6.4, 6.9)*
Colon	0.8 (0.7, 1.1)	0.9 (0.7, 1.2)	0.6 (0.5, 0.7)*	0.6 (0.5, 0.7)*
Rectum	1.1 (0.8, 1.6)	0.6 (0.4, 0.9)*	0.7 (0.6, 0.8)*	0.9 (0.8, 0.9)*
Liver	10.0 (4.8, 20.9)*	6.5 (2.4, 17.3)*	17.9 (17.1, 18.9)*	13.6 (12.7, 14.7)*
Gallbladder	2.5 (1.0, 6.2)*	1.4 (0.6, 3.2)	1.6 (1.4, 1.9)*	2.0 (1.8, 2.2)*
Pancreas	1.0 (0.7, 1.6)	0.5 (0.3, 0.7)*	0.8 (0.7, 0.9)*	0.8 (0.7, 0.8)*
Lung	1.0 (0.8, 1.2)	0.8 (0.6, 0.9)*	1.2 (1.1, 1.3)*	0.9 (0.8, 0.9)*
Prostate	0.3 (0.2, 0.4)*	n/a	0.1 (0.04, 0.05)*	n/a
Breast	n/a	0.5 (0.4, 0.6)*	n/a	0.3 (0.3, 0.4)*
Cervix	n/a	1.3 (0.9, 1.9)	n/a	0.7 (0.6, 0.8)*
Uterus	n/a	0.7 (0.5, 0.9)*	n/a	0.2 (0.2, 0.3)*
Ovary	n/a	0.8 (0.6, 1.2)	n/a	0.5 (0.4, 0.6)*
Bladder	0.6 (0.4, 0.8)*	0.6 (0.4, 1.1)	0.7 (0.6, 0.8)*	0.7 (0.6, 0.8)*
Kidney	0.7 (0.5, 1.1)	0.5 (0.3, 0.9)*	0.3 (0.2, 0.4)*	0.4 (0.3, 0.4)*
Thyroid Gland	1.0 (0.4, 2.5)	2.1 (0.8, 5.1)	0.9 (0.8, 1.1)	1.0 (0.9, 1.1)
Others	0.6 (0.5, 0.7)*	0.6 (0.5, 0.8)*	n/a	n/a
All (but 173)	0.9 (0.8, 0.9)*	0.8 (0.7, 0.9)*	1.1 (1.0, 1.1)	0.7 (0.7, 0.8)*
All	0.8 (0.7, 0.8)*	0.7 (0.6, 0.7)*	0.9 (0.8, 0.9)*	0.6 (0.5, 0.6)*

* p < 0.05

Figure 16. All Cancer Combined ASIRR Among Canadian-born (ref.), Chinese Migrants and Shanghai Chinese (Males)

Figure 17. All Cancer Combined ASIRR Among Canadian-born (ref.), Chinese Migrants and Shanghai Chinese (Females)

**Figure 18. ASIRRs Among Canadian-born (ref.), Chinese Migrants and Shanghai Chinese
Chinese by Cancer Sites, 1974-1993 (Males)**

**Figure 19. ASIRRs Among Canadian-born (ref.), Chinese Migrants and Shanghai Chinese
Chinese by Cancer Sites, 1974-1993 (Females)**

2.3.1 Overall 20 years

Chinese immigrants vs. Canadian-born

During the entire 20 year study period (1974-93), the ASIRR was significantly less than "1" (at the 5% level) when comparing the ASIR in Chinese male and female immigrants with the Canadian-born males and females for all cancer combined (excl.173). The ASIRRs were significantly greater than "1" for cancers of nasopharynx, esophagus, liver, and gallbladder while the ASIRRs were significantly less than "1" for cancers of the prostate, bladder, and "all others". When comparing the ASIR in Chinese female immigrants with the ASIR in Canadian-born females, the ASIRRs for nasopharynx and liver cancers were significantly greater than "1", while the ASIRRs for rectum, pancreas, lung, breast, uterus, kidney, and others were significantly less than "1". (Results are presented in table 25 and Appendix J)

Shanghai Chinese vs. Canadian-born

The ASIRRs of all cancer combined, nasopharynx, esophagus, stomach, liver, gallbladder, and lung cancers were significantly greater than "1" (except lung cancer in Shanghai Chinese females) when comparing the ASIRs of Shanghai Chinese males and females to these of Canadian-born males and females respectively. Meanwhile, the ASIRRs of colon, rectum, pancreas, bladder, and kidney cancers were significantly less than "1" in both Shanghai Chinese males and females. The ASIRRs of prostate cancer and female breast, cervix, uterus, ovary cancers were significantly less than "1". (Results are presented in table 25 and Appendix J)

Chinese immigrants vs. Shanghai Chinese

Comparing the ASIRs in Chinese male immigrants with Shanghai Chinese males, the ASIRRs for all cancer combined, esophagus, stomach, liver, gallbladder and lung cancers were significantly less than "1", but the ASIRRs for nasopharynx, colon, rectum, prostate, thyroid and kidney cancers were significant greater than "1". The ASIRRs for female Chinese immigrants were significantly less than "1" in cancers of esophagus, stomach, rectum, liver, pancreas, lung, and bladder, but significantly greater than "1" for cancers of nasopharynx, colon, breast, cervix, uterus, ovary and thyroid (results are presented in Appendix K, table K-3).

2.3.2 Each study period

Chinese immigrants vs. Canadian-born

Appendix L illustrates the descriptive analysis results of ASIRRs between Canadian-born populations and Chinese immigrants comparison of ASIRs in each study period separately. Overall, the ASIRRs of males for all cancer sites combined were significantly less than "1" during the study periods of 1984-88 and 1989-93, while they were marginally less than "1" (ASIRR = 0.93) during 1974-78 and marginally greater than "1" (ASIRR = 1.1) during 1979-83, (not significant at the 5% level). The ASIRR for all cancer sites combined for females was significantly less than "1" for Chinese immigrants during three study periods (1979-83, 1984-88, 1989-93).

More specifically, the ASIRRs of nasopharynx and liver cancers were consistently significantly greater than "1" when comparing the ASIRs between Chinese male immigrants and Canadian-born males during all four study periods (except liver cancer was not significantly during 1974-78). The ASIRRs of prostate and female breast cancers were consistently significantly less than "1", while the ASIRR of liver cancer was significantly greater than "1" during three study periods (1979-83, 1984-88, and 1989-93).

Shanghai Chinese vs. Canadian-born

As shown in appendix L, the ASIRRs of nasopharynx, esophagus, stomach, and liver cancers were significantly greater than "1" when comparing the ASIRs of Shanghai Chinese males with that of Canadian-born males in all the four study periods. The ASIRR was significantly greater than "1" for lung cancer in three study periods (exception in 1984-88) and for all cancers combined (except ICD9 173) in two study periods (1974-78, 1979-83). The ASIRR of gallbladder cancer was greater than "1" for males, but not significantly so during 1974-78 and 1984-88. In contrast, the ASIRRs of colon, rectum and pancreas (not significant in 1974-78), prostate, bladder and kidney cancers were significantly less than "1" when comparing the ASIRs of Shanghai males with Canadian-born males in all the four study periods. All cancer combined ASIRR was significantly less than "1" when comparing the ASIR between Shanghai males and Canadian-born males in two study periods (1984-88 and 1989-93).

The ASIRRs for nasopharynx, esophagus, stomach, liver and gallbladder cancers were significantly greater than "1" for Shanghai females compared to Canadian-born females during all the four study periods. The ASIRR of lung cancer in Shanghai Chinese females was significantly greater than "1" comparing with Canadian-born females during two study periods (1974-78 & 1979-83), as were ASIRRs for all cancer combined, cervix, pancreas, and thyroid during the first study period. In contrast, the ASIRRs of colon, breast, uterus, ovary, bladder, and kidney in Shanghai females were significantly less than "1" compared with Canadian-born females during all the four study periods. For all cancer combined ASIRR was significantly less than "1" in Shanghai females compared with the Canadian-born females during three study periods (1974-78 was the exception).

Chinese immigrants vs. Shanghai Chinese

ASIRRs significantly less than "1" were recorded for Chinese male immigrants in cancers of esophagus, stomach and liver in all the four study periods (not significant in 1984-88 for liver cancer) compared with Shanghai Chinese males. The ASIRRs of prostate and nasopharynx was significantly greater than "1" in Chinese male immigrants for all four study periods (not significant for nasopharynx during 1974-1978). For Chinese female immigrants, the ASIRRs of stomach cancer was consistently less than "1" compared to Shanghai females in each of the study periods. The ASIRR of nasopharynx cancer was significantly greater than "1" for Chinese female immigrants compared with Shanghai females during 1979-1983 and 1984-1988; a similar pattern occurred for breast and cervix

cancers during the study periods 1984-1988 and 1989-1993 (results are presented in Appendix L).

2.3.3 Birthplace missing adjusted cancer cases for Alberta residents

The results of the birthplace missing adjusted (BMA) analysis were very similar to birthplace missing unadjusted (BMU) analysis (Appendix M). All the significantly different cancer sites for BMA appeared for the BMU except the marginal significantly different cancer sites (e.g. for all cancer sites combined, the ASIRR for Chinese female immigrants was significantly less than "1" compared with Canadian-born females during 1974-78 for the BMA but not for the BMU; during 1989-93, the ASIRR for pancreas cancer for Chinese female immigrants was significantly less than "1" while thyroid gland cancer was significantly greater than "1" compared to Canadian-born females in the BMA, but neither was significant in the BMU).

3. Poisson Regression Analysis

Only common cancer sites with a sufficient number of cases were tested using the Poisson regression model: Males - all cancer (exclude skin cancer), lung, prostate, colon, liver; Females - all cancer (exclude skin cancer), lung, breast, colon, liver. The initial Poisson regression model included age, period and birthplace as predictors. The relative risks estimated by Poisson regression analysis were presented in table 26 (with 95% CI in parentheses). All of these models had significant lack of fit (appendix N). Therefore, the basic models were expanded by including interaction terms between the primary factors (age

Table 26. Estimates of relative risk from Poisson regression analysis for Chinese (immigrants and Shanghai) relative to Canadian-born, adjusted for age and period, by sex and site

Site	Chinese immigrants		Chinese in Shanghai	
	Males	Females	Males	Females
	RR (95% CI)	RR (95% CI)	RR (95% CI)	RR (95% CI)
All	0.92 (0.85, 1.00)	0.74 (0.68, 0.81)	1.04 (1.03, 1.05)	0.73 (0.72, 0.74)
Lung	0.99 (0.84, 1.17)	0.83 (0.65, 1.05)	1.19 (1.15, 1.22)	0.89 (0.85, 0.93)
Prostate	0.29 (0.22, 0.39)	n/a	0.04 (0.03, 0.05)	n/a
Liver	12.02 (8.91, 16.20)	7.28 (4.57, 11.60)	22.00 (19.21, 25.20)	14.31 (11.87, 17.25)
Colon	0.88 (0.66, 1.17)	0.96 (0.73, 1.25)	0.61 (0.58, 0.63)	0.63 (0.60, 0.66)
Breast	n/a	0.53 (0.45, 0.63)	n/a	0.32 (0.32, 0.33)

Table 27. Estimates of relative risk from Poisson regression analysis for Chinese (immigrants and Shanghai) relative to Canadian-born, adjusted for age and period, by sex and site and overdispersion adjusted

Site	Chinese immigrants		Chinese in Shanghai	
	Males	Females	Males	Females
	RR (95% CI)	RR (95% CI)	RR (95% CI)	RR (95% CI)
All	0.92 (0.48, 1.15)	0.74 (0.48, 1.15)	1.04 (0.96, 1.13)	0.73 (0.68, 0.79)
Lung	0.99 (0.62, 1.56)	0.83 (0.37, 1.86)	1.19 (1.10, 1.28)	0.89 (0.78, 1.02)
Prostate	0.29 (0.18, 0.47)	n/a	0.04 (0.02, 0.06)	n/a
Liver	12.02 (6.00, 24.07)	7.28 (3.52, 15.07)	22.00 (16.05, 30.16)	14.31 (10.69, 19.16)
Colon	0.88 (0.42, 1.89)	0.96 (0.39, 2.35)	0.61 (0.53, 0.69)	0.63 (0.53, 0.74)
Breast	n/a	0.53 (0.37, 0.77)	n/a	0.32 (0.29, 0.36)

and period) with 'birthplace' yielding three additional models for each cancer site. All the interaction terms were significant (appendix N) but the best models still displayed lack of fit (deviance/df>2). This lack of fit might indicate that important covariates (e.g. smoking status) have been omitted from the model. However, in common with most immigration studies,^{5,6,7} information on such covariates is not available. Therefore, the lack of fit was handled as an overdispersion effect (see Chapter 2 Material and Methods). This led to increased confidence intervals for the relative risks (Table 27).

The presence of significant interaction terms involving birthplace indicates statistically significant effect modification on the relationship between birthplace and cancer incidence. The model including both interaction terms was used to provide estimates of the relative risk within each age-period group (appendix N). Table 28 presents a summary which includes the crude relative risk (from table 27) with the range of the age-period specific relative risks.

The twenty models can be divided into three groups based on the magnitude interaction of the effect modification. One group (designated by either an † or an ‡) has relative risks markedly different from "1.0" (in the same direction) in all age-period groups. A second group (designated by "≈") has relative risks close to "1.0" (in most cases the 95% CI of the crude RR overlaps 1.0) with a range of age-period RR's which is close to "1.0". The final group (designated by "≈") represents situations with important effect modification

(values both importantly above and below “1.0”). Interpretation of these results are discussed in chapter 4 (Discussion section).

Table 28. Crude Relative Risks (RRs) With Range for Period/Age Specific RRs

Cancer sites	Chinese immigrants	Sign	Chinese in Shanghai	Sign
Males				
All (but ICD 173)	0.92 [0.67 - 1.40]*	≈	1.04 [0.61 - 1.84]	≈
Lung	0.99 [0.57 - 1.72]	≈	1.19 [0.84 - 2.02]	≈
Prostate	0.29 [0.13 - 0.80]	↓	0.04 [0.03 - 0.05]	↓
Liver	12.02 [2.01 - 48.62]	↑	22.00 [3.96 - 229.82]	↑
Colon	0.88 [0.38 - 1.94]	≈	0.61 [0.24 - 1.54]	≈
Females				
All (but ICD 173)	0.74 [0.55 - 0.84]	≈	0.73 [0.50 - 1.14]	≈
Lung	0.83 [0.21 - 2.47]	≈	0.89 [0.51 - 3.45]	≈
Breast	0.53 [0.17 - 0.80]	↓	0.32 [0.15 - 0.58]	↓
Liver	7.30 [3.49 - 19.30]	↑	14.30 [3.41 - 34.00]	↑
Colon	0.98 [0.16 - 1.56]	≈	0.63 [0.15 - 1.90]	≈

* RR [RR_L - RR_U] where we have:

RR = relative risk from Poisson regression without interaction terms;

RR_L = Lowest relative risk within a period/age groups based on Poisson regression model with Period*Birthplace and Birthplace*Age interactions;

RR_U = Highest relative risk within a period/age groups based on Poisson regression model with Period*Birthplace and Birthplace*Age interactions;

≈: equal or near “1”; ≈: vary; ↑: upper than “1”; ↓: less than “1”.

4. Age-period-cohort (APC) Analysis

Age-period-cohort analysis is a technique may be applied to assess the effects of age, temporal trend and cohort concurrently. It is appropriate to apply this analysis technique in this study to split the immigration cohort effect of cancer development of from period change of cancer risk. However, due to the limited number of cases, the investigation of APC effects was restricted to lung cancer in males. A total of 6,208 newly diagnosed lung cancer cases in Canadian-born males aged 40 to 80+ were reported to the Alberta Cancer Registry between 1974 and 1993. Age-standardized incidence rates of lung cancer increased in Canadian-born males during the study period, from 26.84 per 10,000 in 1974-1978 to 50.95 per 10,000 in 1989-1993. Table 29 presents the analysis of APC models for incidence of lung cancer in Canadian-born males, 1974-1993. The goodness-of-fit statistic for the full model (age-period-cohort model) is not significant, indicating that the data patterns are reasonably explained by the models based on the Poisson assumption for Canadian-born male lung cancer cases ($X^2 = 14.61$, degree of freedom = 14).

Figure 20-21 shows the cohort and period effect on the incidence of lung cancer in Canadian-born males. Figure 20 shows that Canadian-born males in age groups 60-64 to 80-84 lung cancer incidence was lower in the earlier than in the recent birth cohort. For age groups 40-44 to 55-59 lung cancer incidence in Canadian-born males was lower in the recent than in the earlier birth cohort. Figure 21 shows it is obvious that the lung cancer incidence in Canadian-born males in age groups 40-44 to 55-59 was lower in the most recent diagnostic period (i.e. 1989-1993) than in 1984-88.

Table 29. Analysis of Age-period-cohort models for incidence of lung cancer in Canadian-born males (aged 40-80+), 1974-93

Models	Deviance (D)	Degrees of freedom (df)	D/df	Δ Deviance	Δ df	p-value
Age only	323.23	27	*11.97			
Age period	76.05	24	*3.17	P/A 247.19	3	0.0001
Age cohort	65.23	16	*4.07	C/A 258.00	11	0.0001
Age-period-cohort	14.62	14	1.04	C/AP 61.43 P/AC 50.61	10 2	0.0001 0.0001

A: age; P: period; C: cohort; * significant lack of fit.

Table 30. Analysis of Age-period-cohort models for incidence of lung cancer in Chinese-born male immigrants (aged 50-79), 1974-93

Models	Deviance (D)	Degrees of freedom (df)	D/df	Δ Deviance	Δ df	p-value
Age only	7.28	17	0.43			
Age period	6.28	14	0.45	P/A 1.00	3	not significant
Age cohort	4.26	10	0.43	C/A 3.02	7	not significant
Age-period-cohort	3.17	8	0.40	C/AP 3.11 P/AC 1.09	6 2	not significant not significant

A: age; P: period; C: cohort;

Figure 20. Age-specific Incidence Rate of Lung Cancer in Canadian-born Males by Birth Cohort

Figure 21. Age-specific Incidence Rate of Lung Cancer in Canadian-born Males by Diagnosis Period

In Chinese male immigrants, a total of 120 lung cancer cases (aged 50-79) were registered in the Alberta Cancer Registry during 1974-1993. Age-standardized incidence rates of lung cancer increased in Chinese-born males during the study period, from 27.96 per 10,000 in 1974-1978 to 45.49 per 10,000 in 1989-1993. The full age-period-cohort models and various sub-models were fitted for lung cancer in Chinese-born males for ages 50-79. The goodness-of-fit statistics for each of the sub-models and the full model are not significant (table 30) indicating that the age only model alone can explain the lung cancer trends in Chinese male immigrants. This is possibly due to the insufficient number of cancer cases to detect the cohort or period effect in this population. This analysis is provided to indicate the type of analysis which should be undertaken on a more extensive basis in a data set which has a larger number of cancer in immigrants.

CHAPTER 4 DISCUSSION

1. General

1.1 Strengths of the study

1.1.1 Quality of the Cancer Registration Record

The project utilized incidence reporting records produced by the Alberta Cancer Registry and the Shanghai Cancer Registry. These registries have long histories of generating high quality cancer incidence data and are considered among the best in their country.³⁸ Over the past few years, special efforts have been made to improve international comparability among cancer registries.⁶¹ IARC has developed a quality control guideline to ensure that data provided by its collaborators meets the high standard required for comparative studies. Both the Alberta and Shanghai Cancer Registries have participated in the IARC international collaboration project, have followed the IARC guideline, and have demonstrated the quality of their data.

Major factors enabling cancer incidence comparisons between Alberta and Shanghai are their registries' use of the same classification and coding systems -- the International Classification of Diseases (ICD) and the International Classification of Diseases for Oncology (ICD-O) -- as well as high data quality. Indicators of the quality of cancer registration data are completeness of registration and validity of the registration data items. The proportion of cases reported to the registry by death certificate only (DCO) is the most commonly used measure of completeness of registration. The Alberta Cancer Registry had a DCO registration rate of less than 3%, compared to 5-10% in the

Shanghai Cancer Registry.¹⁴ The percentage of cases verified histologically is an indicator of the validity of cancer registry data items. Both the Alberta Cancer Registry and the Shanghai Cancer Registry had high percentage of histologically confirmed cases for those cancer sites under study (89-97% in Alberta) than (70-89%).¹⁴ Moreover, The percentage of under reporting cancer cases is considered low in both of these cancer registries (6% in the Shanghai Cancer Registry and less than 3% in the Alberta Cancer Registry).⁶²

1.1.2 Census population tables

The population counts were derived from special tabulations based on the Canadian censuses of 1971, 1981, 1986, and 1991. Detailed counts for the five-year age groups (0-4, ... 80+) and the combined groups (0-24, 25-49, 50-59, ..., 80+) by birthplace (China, Canada, and others) for each census was provided by Statistics Canada. The calculation of person-years of exposure by birthplace was more precise than would have been possible using published tables.

1.1.3 Incidence rate

Cancer incidence (strictly, cancer registration) data have several inherent advantages, both procedurally and biologically, over mortality data for the study of time trends in cancer risk. First, because most registries carry out regular quality control activities, diagnoses on cancer registries are more accurate and precise than those on death certificates. Secondly, the date of diagnosis of cancer is closer in time to the causal exposure(s) than the date of death, particularly for the less rapidly fatal cancers. Thirdly,

for many cancers, incidence data are more relevant than mortality data for understanding aetiology and for determining the priorities for cancer prevention because the latter are affected by not only causal factors, but also survival.⁶³ The results of this project are the first estimation of cancer incidence in Chinese immigrants compared to Canadian-born populations in Canada.

1.2 Limitations of the study

1.2.1 Marked variation in annual number of immigrants from China and short period of duration of stay in Canada

The annual number of immigrants from China increased markedly after 1986, peaked in 1994, and then decreased slightly. This nonlinear growth in the Chinese population made linear interpolation of the number of Chinese immigrants between census years difficult. We estimated person-years by multiplying the census population numbers by 5. The underlying assumption was that the number of Chinese immigrants is constant over 5 years. This may have resulted in an underestimate of person years in the study period 1984-1988 since the number of Chinese immigrants increased rapidly after 1986. In other study periods this method of calculating the person years was less affected by variation in the annual number of immigrants from China.

Table 7 (on page 34) shows that as of 1991, over 80% of Albertans who were born in China had lived in Canada less than 20 years. This, combined with the relatively small number of Chinese residents in Alberta and their relatively young age, we may not be

ability to detect true changes in risk among migrants. Therefore, the future follow up studies in Chinese immigrants will be recommended.

1.2.2 Absence of data on variables of potential interest

Cancer incidence in the second generation of Chinese immigrants could not be obtained, since the ethnicity of an individual is not available in the Alberta Cancer Registry data, nor in any other cancer registry in Canada. Moreover, no duration of stay or age at immigration was available for Chinese immigrants. Therefore, valuable information on the time dimension could not be examined to study the speed with which any change in disease risk occurred.

Information relating to the risk factor status of individuals, (such as socio-economic status, marital status, education, smoking, diet, etc.) was also not available in the Alberta Cancer Registry data. Hence the analysis of the data could not take the potential effects of these factors into account. However, since there is no causal inference in the study, the inability to adjust for these possible confounders was not considered to be a substantive problem from the point of view of interpreting the findings.

The results of the present study should be interpreted with caution for the following reason. Place of origin at the provincial level within China was not available for either the cancer registry or population data, and national cancer incidence is not available for China. The Shanghai Cancer Registry data were the best available for

comparing cancer incidence in Alberta with Chinese in China, but are not representative of the whole nation of PR China. Therefore, it was not possible to adjust for regional differences when comparing cancer incidence among Chinese immigrants with Chinese in China. To illustrate, we found a higher ASIR of nasopharynx cancer in Chinese immigrants than in Shanghai Chinese. Chinese immigrants from PR China were originally residents of different provinces of PR China. Guangdong province is noted to have the highest incidence of nasopharynx cancer in China. However, we were unable to compare the rate in immigrants with the rate in Guangdong province, and we were not able to determine whether Chinese immigrants with nasopharynx cancer were largely from Guangdong province.

1.2.3 Environmental differences between Alberta and Shanghai

Shanghai is the largest city in PR China with 6,138 square kilometers and a population of 6,932,127 in 1985. Alberta is the fourth largest province in Canada. Its area is 661,190 square kilometers and the average population size in the period 1983-1987 was 2,355,805. Shanghai is situated at latitude $31^{\circ} 14'N$, and longitude $121^{\circ} 29'E$, while Alberta lies between latitudes 49° and $60^{\circ}N$ and longitudes 110° and $120^{\circ}W$. Life style and socioeconomic status are also very different between those two populations. We were not able to determine whether the difference in cancer incidence between these two populations was due to physical environment or to life style and socioeconomic effects; however, we can still generate hypotheses for possible differences after comparing the ASIRs in those two populations.

1.2.4 Missing birthplace

According to a letter from Dr. Heather Bryant of the Alberta Cancer Board (Appendix P), the birthplace variable was introduced to the Alberta Cancer Registry in 1981. Thus, information for this variable is rarely missing on registrations from 1981 onwards. Subsequent to the introduction of the variable, there was a clean-up of some Cancer Registry variables (including birthplace) for registrations between 1972 and 1978. Where available, birth place information would have been added at that time. The drop in availability of birthplace in the 1979 data is probably because this pre-dated the 1981 official entry of this variable and the 1979 registrations were not included in the clean-up.

The pattern of missing birthplace data prior to 1981 may contain some artifact. Consequently, the method applied to obtain birthplace missing adjusted cases might be biased before 1981. There is a possibility that higher Caucasian/Chinese ratio of the birthplace missing cases than non-missing group. Since Chinese are visible minority, when they seek medical care in varies institutions, there is less chance to miss their birthplace than Caucasians. Therefore, over estimate of Chinese cancer cases may occur after adjusting birthplace missing cases.

As shown in figure 7 & 8 (chapter 3), the percentage distribution of site-specific cancer cases was similar between birthplace missing cases and non-missing cases, except for male lung and prostate cancers and female breast cancer. The results of analyses with and without adjustment for cases with birthplace missing were quite similar, suggesting

that these cases did not have much effect on the cancer incidence comparison between Canadian-born and Chinese-born immigrants.

The percentage of cancer cases with birthplace available was lower during the first study period (1974-1978) than during the other study periods. The estimated ASIRs in the Canadian-born population were lower in the first study period compared to published tables in 'Cancer Incidence in Five Continents', vol IV.¹⁴ When the ASIRs were calculated for all Alberta residents, regardless of birthplace, the results were similar to the published tables. Therefore, the ASIRs in the present study were possibly underestimated for the earlier study period due to the higher percentage of cases with missing birthplace.

1.2.5 Multiple comparisons

In this project, comparisons of cancer incidence rates were made among three populations, two genders, four time periods and 17 cancer sites. When repeat apply such a large quantity of statistical tests in one study, there is a potential of generating a few of the false-positive results due to random variation.⁶⁴ Traditionally, when the number of multiple comparison is not so large, the method of reducing p-values or Tukey's Honor test could be adopted. However, with a number of multiple comparison over hundred, there is no convenient solution for the problem. The only practice is to interpret the results with caution. In any case, since this project is descriptive in nature, i.e. it is more for hypothesis generation than hypothesis testing, the bias due to multiple comparison is unlikely to be a big issue.

Ninety five percent confidence interval calculation was used to test the significance between incidence rates in this study. Conventionally, When $p = 0.05$, 95% confidence interval is a special application for statistical tests (T or Z test) to reach a significance level and $p = 0.01$ a highly significant level. The reason confidence intervals were used quite frequently for hypothesis test is because a few of the journals (e.g. The Journal of National Cancer Institute) encourage the authors to present the confidence intervals instead of p-values.

1.2.6 The institutionalized population

The institutionalized population in Alberta was not included in the population at risk (denominator) since no birthplace information was available for this particular population in the census. However, we could not exclude such cases from the numerator since it was not possible to identify the institutionalized population in the Alberta Cancer Registry Data. This resulted in an overestimation of the age- sex-specific cancer incidence rate for Alberta residents. However, the institutionalized proportion of the Canadian-born and Chinese immigrant populations was small and similar. Therefore, it would have had only a small effect on the comparisons.

2. Comparison with other studies

2.1 Consistent results with other studies

The ASIR of “all cancers” (ICD9 140-208) in Chinese male and female immigrants was consistently and significantly lower than that for Canadian-born Alberta males and

females during the 20 year period and for each of the five year study periods (not significant during 1979-83 in Chinese males). “Other malignant neoplasm of skin” (ICD9 173) is rare in Chinese-born immigrants, but more common in Canadian-born populations. When ICD9 173 was excluded, the ASIR of “all cancer combined” (ICD9 140-208, excl. 173) of Chinese male and female immigrants was still significantly lower than that of the Canadian-born population during the entire 20 year period and the last two study periods (1984-1988, 1989-1993). These results confirm other studies.^{6,65} A possible explanation could be the “healthy immigrant effect” which was mentioned in many immigrant studies.^{66,67,68} In addition, all potential immigrants undergo medical screening.⁶⁹ As well, Canada selects immigrants partially on the basis of employability, which suggests reasonably sound health.

2.1.1 Cancers for which the incidence in Chinese immigrants was intermediate between Canadian-born and Shanghai Chinese

For cancers of the liver, stomach, esophagus (only for males), kidney, uterus, and ovary we found consistently and significantly higher ASIRs in both Chinese male and female immigrants than in Canadian-born populations, but significantly lower ASIRs than for Chinese in Shanghai. In contrast, the ASIRs for colon cancer in Chinese male and female immigrants, female breast cancer and prostate cancer were consistently and significantly lower than in the Canadian-born populations, but significantly higher than in Shanghai Chinese. Thus, an environmental effect is likely responsible for part of the etiology of these cancers. Previous studies have had similar observations.^{7,21,29}

Liver

A working group of the International Agency for Research on Cancer (IARC) concluded that chronic hepatitis B virus (HBV) infection is carcinogenic to humans (IARC, 1994). Infection by HBV early in life is much more common in PR China than in Canada and would help explain why Chinese immigrants seem to retain a high risk for liver cancer when they migrate. The present study confirms the results of other studies.^{6,7,24,65,23}

However, co-factors in the etiology of liver cancer that act later in life cannot be ignored. Factors such as exposure to aflatoxin-contaminated food and consumption of contaminated drinking water have been found to be important in the etiology of this cancer in Asia.^{70,71,72} This could explain the observation in this and other studies that Chinese immigrants had significantly lower ASIRs of liver cancer than Chinese in China.^{21,20} Wide use of the HBV vaccine in Canada could reduce the risk of HBV infection in Chinese immigrants. Changing alcohol consumption could be another reason for reduced risk in Chinese immigrants; consumption of highly alcoholic beverages is more common in China than in Canada.

Stomach

The results of this project indicate that Chinese immigrants had significantly higher ASIRs for stomach cancer than the Canadian-born population but significantly lower ASIRs than Shanghai Chinese. Some studies have suggested that dietary factors are important in the etiology of this cancer, with consumption of preserved meats and

vegetables increasing risk, and consumption of fresh fruits and vegetables providing protection.⁵ The organism *Helicobacter pylori* has been implicated.⁷³ The results of the present study are consistent with others, indicating again that dietary change in later life might affect the risk of stomach cancer.

Esophagus

About half the cases of esophageal cancer occurring in the world each year are estimated to occur in China where esophageal cancer is the second most common cancer after stomach cancer.¹⁹ The distribution of this disease over the country is highly regional, occurring mainly in a few clearly demarcated areas (such as Henan, Shanxi, and Jiangsu provinces in the central region) and is rare over large tracts of the country.

Tobacco, betel, opium and alcohol use are considered to be the major risk factors for this cancer.¹⁹ Poor nutrition, such as ingestion of pickled vegetables and preserved food highly contaminated with mould (*Aspergillus flavus*)⁶ is another risk factor, while higher intake of fruits and vegetables reduces risk.⁶ Changes in diet and alcohol consumption by Chinese immigrants after migration could partially account for their reduced risk of this disease. This has been mentioned in other studies.^{29,7} It is also possible that Chinese immigrants came from areas of China with a lower incidence of esophageal cancer, producing a biased estimate of the effect of migration.

Kidney

The ASIR of kidney cancer in Chinese immigrants is significantly higher than in Shanghai Chinese and significantly lower than in Canadian-born males and females. Previous case-control and cohort studies have found a positive association between cigarette smoking and kidney cancer, and several have demonstrated a dose-response relationship.¹⁹ Elevated risks associated with higher per capita consumption of fat and protein have also been reported.¹⁹ Correlation studies suggest an association between kidney cancer and per capita consumption of coffee, tea and alcohol, but the results have not been confirmed in analytic studies. Differences in cigarette smoking alone could not explain the results of the present study. Life style change in Chinese immigrants could possibly alter the risk of kidney cancer.

Uterus and ovary

The ASIRs for uterus and ovarian cancer of Chinese immigrants were significantly lower than those of Canadian-born females and significantly higher than in Shanghai Chinese. The magnitude of the reduced risk for these two cancer sites is similar to that found for breast cancer and confirms the results of other studies.^{6,7} Hormonal and dietary factors likely play important etiologic roles in these cancers.

Colon

This study shows that Chinese immigrants had significantly lower ASIRs for colon cancer than that of Canadian-born Alberta residents, but significantly higher risk than

Shanghai Chinese. A similar result was found in other studies.^{6,7} Adopting a westernized dietary style might increase the risk of colon cancer in Chinese immigrants. The total dietary fat intake in the US is 2.7 times as high as in China.⁵⁶ A dietary fat intake comparison between Canada and China was not available, but we can assume that the diet of Canadians is similar to that of Americans in the US. A population-based case-control study of colorectal cancer among Chinese men and women in western North America and the People's Republic of China found that colorectal cancer risk increased with duration of exposure to a sedentary life-style and a diet rich in saturated fat.²⁶ Among immigrants, risk increased with duration of residence in North America.

Female breast cancer

Chinese female immigrants had consistently and significantly lower ASIRs of breast cancer than Canadian-born females, but significantly higher rates than Shanghai female Chinese. This confirms the results of other studies.^{6,7,65,74} A population-based case-control study that examined migration patterns and breast cancer risk in Asian-American women concluded that exposure to Western lifestyles had a substantial impact on breast cancer risk in Asian immigrants to the US.⁷⁵ For example, early age at first full-term pregnancy has been found to be protective against breast cancer in both Caucasians and Chinese.^{76,77} Breast cancer screening programs are used widely in Canada but are not common in China. This could result in the earlier diagnosis of cases of breast cancer in Chinese female immigrants than in Shanghai women.

Prostate

The ASIR of prostate cancer in Chinese immigrants was significantly lower than that in Canadian-born males and significantly higher than in Shanghai Chinese. This results agrees with the results of other studies.^{6,7,65,74} One case-control study found a positive association between prostate cancer risk and dietary fat intake in men above age 69.²⁸ Sexual behaviour, such as promiscuity and infection with sexually transmitted diseases, also could be a risk factor for prostate cancer.⁷⁵ Changes in diet and sexual behavioural after immigration could be responsible for the higher risk of prostate cancer in Chinese immigrants than in Shanghai Chinese. However, prostate specific antigen (PSA) screening, widely available in Canada, may be responsible for early detection of cases in Chinese immigrants, resulting in biased estimates of the ASIR relative to Shanghai where there is no similar prostate cancer screening.

2.1.2 Cancers for which the incidence in Chinese immigrants was higher than Canadian-born Alberta residents and the Shanghai Chinese

Nasopharynx

We found significantly higher ASIRs for nasopharynx cancer in both male and female Chinese-born immigrants than in the Shanghai Chinese and the Canadian-born. The Shanghai Chinese had higher nasopharynx ASIRs than Canadian-born populations. This observation also appeared in two other Canadian studies.^{6,7}

Nasopharynx cancer displays a remarkable racial and geographic distribution. The highest rates in the world are found among the Cantonese populations of southern China.⁷⁸ Since a large portion of Chinese immigrants from Hongkong trace their origins to the Cantonese-speaking province of Guangdong in PR China,¹² the higher nasopharynx ASIR for Chinese immigrants suggests that the Cantonese carried their specific risk with them when they immigrated from Hongkong or PR China. No current population-based data on cancer incidence are available from Guangdong province. The ASIR of nasopharynx in Chinese immigrants (both male and female) was close to (but lower than) that reported from Hongkong populations during the study periods 1979-83, 1984-88, and 1989-93.^{37,38,14,39}

The results of the present study could be explained by either genetic risk factors or a risk factor acting early in life. Many immigrant studies suggest that environmental factors play an important role in the etiology of nasopharyngeal cancer and it has long been recognized that Epstein-Barr virus (EBV) infection in early childhood is associated with nasopharyngeal cancer.⁷⁹ One study indicated that the prevalence of EBV antibody in children in Hawaii (particularly among Asians and Hawaiians) was higher than in children in Connecticut.⁸⁰ Other important risk factors, such as consumption of salted fish and exposure to hard wood dust we were not able to adjust in this study.

2.1.3 Cancers for which the incidence in Chinese immigrants was lower than Canadian-born Alberta residents and the Shanghai Chinese

Bladder

Chinese immigrants (both males and females) had a reduced risk of bladder cancer (significant for male only) compared to both the Canadian-born population and the Shanghai Chinese (not significant), while Shanghai Chinese had significantly lower ASIRs than that of the Canadian-born population. This agrees with some mortality studies.⁶ Smoking is a risk factor for bladder cancer, yet smoking alone could not explain this observation since smoking is much more popular in Shanghai Chinese than in the Canadian population. Occupational hazards which could not be adjusted for in this study may be partially responsible for the results.

2.2 Different results compared to other studies

Lung

Chinese male immigrants had a significantly lower ASIR of lung cancer than Shanghai males and a marginally lower (not significant) ASIR than Canadian-born males during the entire twenty years. Shanghai Chinese males had a significantly higher ASIR of lung cancer than Canadian males. It has been estimated that between 80% and 85% of all lung cancer deaths can be attributed to tobacco use.⁸¹ Lower lung cancer risk in Chinese male immigrants is possibly due to the lower smoking rate in that ethnic group. Millar et al. found that Chinese ethnic populations have lower smoking rates than other ethnic groups.⁸² Healthy immigrant effect could be possibly explain the lower lung cancer ASIR

in Chinese immigrants. The higher ASIR of Shanghai Chinese males is probably due to the high smoking rate in China; a recent report indicated that 69% of males over the age of 20 in China are current smokers.⁸³ Results of some previous studies found that Chinese male immigrants had a higher ASIR (or SMR) for lung cancer than populations in the adopted countries,^{24,7} while other studies reported results similar to those from the present study.^{20,21} Inconsistent observations of lung cancer rates in Chinese immigrants may have resulted from the unadjusted effect of length of stay in the adopted countries. Due to their limited economic situation, new immigrants may have lower smoking rates than immigrants who have been in the host country longer.

Chinese female immigrants had a significantly lower ASIR of lung cancer than Canadian females, but not significantly lower than Shanghai Chinese females. Smoking is rare among Chinese females. Some studies have found a high rate of lung cancer among Cantonese women but have concluded that it is not necessarily related to smoking;⁸⁴ cooking oil has been considered a risk factor for Chinese female lung cancer.⁸⁵ This could possibly explain the reduced lung cancer risk in Chinese female immigrants compared to Chinese women in Shanghai, as the cooking oil quality and kitchen conditions are better in Canada than in PR China. A lower ASIR of lung cancer in Chinese female immigrants than in Canadian-born females is possibly due to the lower smoking rate in this ethnic group.⁸²

Rectum

The results for rectal cancer were unexpected and inconsistent. The ASIR for male immigrants was higher and the ASIR for Shanghai Chinese lower than that for Canadian-born males. For female Chinese immigrants, the ASIR for rectal cancer was lower than both Canadian-born and Shanghai females. These results differ from the pattern of colon cancer for Chinese immigrants and may have resulted from the relatively few cases for this cancer in Chinese immigrants.

Thyroid gland

There was a higher ASIR of thyroid gland cancer in Chinese immigrants than in both Canadian-born and Shanghai males and females. This result is quite different from other studies which usually indicated that Chinese immigrants had lower thyroid gland cancer rates than populations in China.^{6,7} While radiation has been studied extensively, the risk associated with adult exposure to external radiation and childhood exposure to iodine is still not well described. A protective effect of cruciferous vegetables has been observed and consumption of certain sea foods has been linked with thyroid cancer in some studies.¹⁹ However, no direct explanation of the higher risk of thyroid gland cancer in Chinese immigrants could be found. Further analytic study in this particular population may identify the risk factors.

Cervix

A significantly higher ASIR for cervix cancer in Chinese female immigrants compared to Canadian-born females was consistently observed during each study period. Similar results have been shown in other studies.^{6,7} When compared with Shanghai Chinese females, Chinese female immigrants had a higher risk than Chinese in China (especially during the study period of 1984-88 and 1989-93), while Canadian-born females had higher ASIR of cervix cancer than Shanghai females. Higher risk in Chinese female immigrants could possibly be due to in part to increased access to the cytological screening programmes in Canada. Research has confirmed that the large majority of cases of cervical cancer worldwide can be attributed to papilloma viruses (HPV) infection. Changing sexual behaviour after immigration could be another reason for the greater risk in Chinese female immigrants.

3. Implications of Effect Modification

As shown in appendix N, there was statistically significant effect modification by age and period for all cancers in both Chinese immigrants and residents of Shanghai. While the age-period specific relative risks can provide interesting information, in most cases the qualitative conclusions are very similar to these already discussed using the models without interaction. Following the classification given in table 28, we will discuss briefly each model.

Eight of the models (liver, prostate and breast in both groups) display consistently elevated (liver) or reduced (prostate and breast) relative risks. The wide range of age-period specific RR's suggests that future studies focusing on differential risks of immigrants of different age might yield interesting results about age or period-specific risk factors.

Five models (all cancer in males, lung cancer in males and all cancer in female immigrants) have age-period specific relative risks which are close to "1.0" although they range from values below "1.0" to values over "1.0". This might suggest that immigration has a protective effect for some immigrants while being harmful for others. However, the closeness of the RRs to "1.0" and the lack of statistical significance for the crude RRs suggest that this might over interpret the results.

For the remaining models, the situation is more complex. Each model will be discussed separately.

The RR (without interaction model) for female lung cancer is not significantly lower in Chinese immigrants and only marginally significantly lower in Shanghai Chinese compared with Canadian-born. However, the age-period specific RR's include low and high values. For Shanghai, the relative risks are all above 1.5 in the first period but drop steadily to values under 1.0 in the last period. This might reflect differential patterns of

female smoking in Shanghai and Canada. There is no obvious pattern in the immigrants although the rates are all less than 1.0 in the last period.

For male and female colon cancer, there is marked heterogeneity of the age-period specific RR's. The RRs (without interactions) in Shanghai Chinese were <1 compared to Canadian-born males and females. The age-period specific RRs in both male and female Shanghai Chinese were less than '1.0' in all the periods and all the age groups (except age 25-49 in all periods and age 50-59 in females in the last period). Moreover, it is consistently observed that the younger age group Shanghai Chinese (both males and females) had higher RRs than the older age groups. This raises the possibility of diagnostic artifact due to incomplete case ascertainment in elderly residents of Shanghai.

For both males and females colon cancer, the RRs (without interactions) in Chinese immigrants compared to Canadian born is not statistically significant different from 1.0. The RRs (with interactions) in both male and female Chinese immigrants were greater than '1' during 1974-78 and in all the age groups (except age 80+ in females). During 1979-83, the RRs in both male and female Chinese immigrants were less than '1'. During 1984-88, the RRs in Chinese male immigrants were less than '1' in all the age groups and the RRs in Chinese female immigrants were greater than '1' in all the age groups (except age 80+). During 1989-93, the RRs in both Chinese male and female immigrants were greater than '1' in all the age groups (except age 80+ in males and age 60-69 in females).

Finally, the crude RR for 'all cancer' in female residents of Shanghai is significantly less than '1.0'. The age period specific RR vary over a narrow range and are consistent with a lower incidence in Shanghai than Canada.

4. Potential Application of Age-Period-Cohort Analysis

The results from the APC analysis indicated an increasing cancer incidence trend in early birth cohorts of Canadian-born males (born prior to 1904) and a decreasing trend for late birth cohorts (born after 1939). This is partially accounted for by smoking rates in this population.⁸⁶ In the early 1920s, adults aged 15 and over each consumed an average of 1.4 kg of tobacco annually. By the mid-1960s, this had risen to an average of 4.5 kg. Since then, smoking has become less common, and by 1991, average annual tobacco consumption had dropped to 2.1 kg per adult. Smoking is a risk factor for several cancers, but the most common of these is lung cancer. The average lag time between starting to smoke and developing lung cancer is over twenty years.⁸⁷ Consequently, the trend in lung cancer incidence is a reflection of the smoking habits of people at least twenty years earlier. We were unable to detect the lung cancer trends in the 1940s in this project. However, the age-standardized lung cancer death rate rose sharply between 1940 (5 deaths for every 100,000 people) and 1988 (51 deaths for every 100,000 people), and has since remained relatively stable. This trend parallels the tobacco consumption patterns of about twenty years earlier.⁸⁷

The period effect for lung cancer showed a lower ASIR in the age groups 40-44 to 50-59 in the most recent diagnosis period (1989-1993) possibly due to the reduction in the smoking rate 20 years ago (mid 1960s) in Canadian-born males.

For Chinese male immigrants, no period or cohort effect could be detected from the age-period-cohort analysis. This is possibly due to an insufficient number of cancer cases in this group.

5. Future Directions

A natural expansion of this study would be to use the 'Health Canada Surveillance Study' data to identify second generation Chinese immigrants (both birthplace and ethnicity have been collected) to examine the cancer incidence pattern of this group.

Conducting world-wide search among countries have similar quality cancer registry data as Alberta. If the birthplace information was collected in these registries and sufficient cases of Chinese immigrants were obtained, an international comparison would be feasible.

Using data linkage tools to link the Cancer Registry data with immigration data to obtain additional information (such as age at immigration and duration of stay), one could design a cohort study to examine the time course of cancer in Chinese immigrants. One possible approach would be to examine age and duration of stay, or age and age at arrival

separately to see which provides the more plausible pattern of change of risk, bearing in mind that duration of stay and age at arrival are collinear with age at diagnosis. Change in risk of different cancers according to duration of stay or to age at migration can be interpreted in terms of the degree to which immigrants change their life-style (and therefore their exposure to causative factors), or alternatively, the liability of different cancers to changes in exposure to causative factors. Thus, a fairly rapid change in risk implies a change in exposure and the fact that the relevant factors act at a fairly late stage in carcinogenesis. No change might imply that the agent is more important with regard to exposures early in life (so that subsequent change has no effect), or that immigrants do not alter their life-style.

6. Recommendations

Canada is a country with a multicultural population ideal for studying disease causation. Health records on immigrants could be collected and followed for monitoring special diseases. Information on ethnicity, birthplace, period of immigration and duration of stay would be very useful to determine the risk factors and interpretation of patterns of certain diseases. This information should be collected in the Canadian census and by provincial cancer registries in as much detail as possible.

Government and funding agencies should collaborate with public health workers to deal with research issues such as etiology studies to compare Chinese cancer rate with general populations for nasopharynx, liver, breast, and prostate cancers. As well as

etiology studies to assess cancer risk among Chinese immigrants by length of residence in Canada adjusting for life style factors.

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APPENDIX A

LETTER FROM DR. HEATHER BRYANT REGARDING RELEASING THE ALBERTA CANCER REGISTRY DATA

November 6, 1996

Dr. Yang Mao
Head, Environmental Risk Assessment & Case Control
Laboratory Centre for Disease Control
Cancer Bureau, Health Canada
LCDC Building, Address Locator: 0601C1
Ottawa, Ontario K1A 0L2

Dear Yang,

As we discussed on the telephone, the Alberta Cancer Registry gives permission to you and your student to carry out a project on cancer incidence rates in Alberta, on the understanding that you will be accessing only the non-identifying data from the Alberta Cancer Registry already available to you as part of LCDC's file of the Central Cancer Registry. This would include being able to break down the data by birthplace. I would be grateful, however, if you would let us review the data prior to any publication or release.

Every good wish for success in your project,

Yours truly,

Heather Bryant, MD, PhD, CCFP, FRCP
Director

APPENDIX B

SAS PROGRAM TO OBTAIN AGE-, SEX-SPECIFIC CANCER CASES IN EACH STUDY PERIOD

```

/* program to produce the cancer cases */

libname direct      '/home/luowei/data';
libname library     '/home/luowei/data';
filename in         '/home/luowei/data/alt6993';

proc format;

  value icd9m
    162 = '162 lun'
    185 = '185 pro'
    153 = '153 col'
    154 = '154 rec'
    188 = '188 bla'
    151 = '151 sto'
    189 = '189 kid'
    157 = '157 pan'
    147 = '147 nas'
    150 = '150 eso'
    155 = '155 liv'
    156 = '156 gal'
    193 = '193 thy'
    other = 'others';

  value agegrpm
    1- 6 = ' 0-24'
    7-11 = '25-49'
    12-13 = '50-59'
    14-15 = '60-69'
    16-17 = '70-79'
    18-19 = '80+';

  value sexm
    1 = 'male'
    2 = 'female';

  value birthm
    0 = 'missing'
    1 = 'Canada'
    2 = 'China'
    3 = 'Others';

data alt6993;

```

```

infile in;

input
  @1 reptprov      $2.
  @27 sex         1.
  @28 birthdat    8.
  @37 source      2.
  @56 agegrp      2.
  @58 marstat     1.
  @59 agecalc     3.
  @70 icdo_t      3.
  @73 icdo_m      5.
  @78 icd9        3.
  @95 diagyear    2.
  @117 ressgc     2.
  @124 birth      1.
  @125 patst      1.
  @126 mthd       1.;

if (ressgc = 48);

if (icd9 >= 140 & icd9 <= 172) | (icd9 >= 174 & icd9 <= 208);

if (diagyear >= 89 & diagyear <= 93);

if (sex = 1);

if (birth = 1);

format
  icd9          icd9m.
  sex           sexm.
  agegrp        agegrpm.
  birth         birthm.;

proc freq data=alt6993 formchar = '          ';
  title 'Canadian-born male site-specific cancer cases by agegrp, 1989-93';
  tables icd9*agegrp / norow nopercent;
run;

```

APPENDIX C

FORMULA FOR STATISTICAL CALCULATION

Formula for Calculating ASIR and ASIRR

$$ASIR = \frac{\sum_{i=1}^6 (a_i * w_i)}{\sum_{i=1}^6 w_i}$$

Where a_i = age-specific cancer incidence rate per 100,000 in the i th age group;
 w_i = world population (Segi, 1960) in the i th age group.

$$Var (ASIR) = \frac{\sum_{i=1}^6 (a_i * w_i^2 * 10^5 / n_i)}{\left(\sum_{i=1}^6 w_i \right)^2}$$

Where n_i = person-years in the i th age group;

(Poisson Approximation, Cancer Registration: Principles and Methods, p138. Originally from Muir CS. Cancer incidence in five continents, Vol. V, 1987, P790-795)

$$s.e. (ASIR) = \sqrt{Var(ASIR)}$$

$$ASIRR \text{ (age-standardized incidence rate ratio)} = ASIR_1 / ASIR_2$$

$$95\% \text{ CI of ASIRR: } (ASIR_1 / ASIR_2)^{1 \pm (Z_{\alpha/2} / X)}$$

$$\text{Where } X = \frac{(ASIR_1 - ASIR_2)}{\sqrt{s.e.(ASIR_1)^2 + s.e.(ASIR_2)^2}}$$

and $Z_{\alpha/2} = 1.96$ (at the 95% level)

Interpretation:

If the interval includes 1.0, the standardized rates $ASIR_1$ and $ASIR_2$ are not significantly different (at the 5% level if $Z_{\alpha/2} = 1.96$ has been used).

Formula for Calculating ASIR and ASIRR

$$ASIR = \frac{\sum_{i=1}^6 (a_i * w_i)}{\sum_{i=1}^6 w_i}$$

Where a_i = age-specific cancer incidence rate per 100,000 in the i th age group;
 w_i = world population (Segi, 1960) in the i th age group.

$$Var (ASIR) = \frac{\sum_{i=1}^6 (a_i * w_i^2 * 10^5 / n_i)}{\left(\sum_{i=1}^6 w_i \right)^2}$$

Where n_i = person-years in the i th age group;

(Poisson Approximation, Cancer Registration: Principles and Methods, p138. Originally from Muir CS. Cancer incidence in five continents, Vol. V, 1987, P790-795)

$$s.e. (ASIR) = \sqrt{Var(ASIR)}$$

$$ASIRR \text{ (age-standardized incidence rate ratio)} = ASIR_1 / ASIR_2$$

$$95\% \text{ CI of ASIRR: } (ASIR_1 / ASIR_2)^{1 \pm (Z_{\alpha/2} / X)}$$

$$\text{Where } X = \frac{(ASIR_1 - ASIR_2)}{\sqrt{s.e.(ASIR_1)^2 + s.e.(ASIR_2)^2}}$$

and $Z_{\alpha/2} = 1.96$ (at the 95% level)

Interpretation:

If the interval includes 1.0, the standardized rates $ASIR_1$ and $ASIR_2$ are not significantly different (at the 5% level if $Z_{\alpha/2} = 1.96$ has been used).

APPENDIX D

PROCEDURE TO ADJUST FOR MISSING BIRTHPLACE

Table D-I. Cancer cases by sex, birthplace (including birthplace missing) and age groups, 1989-1993

Males	Age groups							
Birthplaces	0-24	25-49	50-59	60-69	70-79	80+	Total	
Missing (%)	96 (20.69)	422 (19.70)	607 (22.29)	1386 (23.31)	1511 (24.39)	800 (25.57)	4823	
Canada	341 (73.49)	1376 (64.24)	1654 (60.74)	3377 (56.80)	3475 (56.10)	1096 (35.03)	11319	
China	1 (0.22)	42 (1.96)	41 (1.51)	76 (1.28)	73 (1.18)	46 (1.47)	279	
Others	26 (5.60)	302 (14.10)	421 (15.46)	1106 (18.60)	1135 (18.32)	1187 (37.94)	4177	
Total	464 (100)	2142 (100)	2723 (100)	5945 (100)	6194 (100)	3129 (100)	20598	
Females	0-24	25-49	50-59	60-69	70-79	80+	Total	
Missing	84 (22.52)	612 (15.47)	448 (14.55)	739 (16.37)	805 (19.20)	526 (19.58)	3215	
Canada	270 (72.39)	2669 (67.48)	2078 (67.47)	2784 (61.69)	2579 (61.52)	1021 (38.01)	11401	
China	6 (1.61)	57 (1.44)	41 (1.33)	36 (0.80)	50 (1.19)	33 (1.23)	223	
Others	13 (3.49)	617 (15.60)	513 (16.66)	954 (21.14)	758 (18.08)	1106 (41.18)	3961	
Total	373 (100)	3955 (100)	3080 (100)	4513 (100)	4192 (100)	2686 (100)	18800	

Table D-II. Cancer cases by sex, birthplace (excluding birthplace missing) and age groups, 1989-1993

Males	Age groups								
Birthplaces	0-24	25-49	50-59	60-69	70-79	80+	Total		
Canada (%)	341 (92.66)	1376 (80.00)	1654 (78.17)	3377 (74.20)	3475 (74.20)	1096 (47.06)	11319		
China	1 (0.27)	42 (2.44)	41 (1.94)	76 (1.67)	73 (1.56)	46 (1.98)	279		
Others	26 (7.07)	302 (17.56)	421 (19.90)	1106 (24.26)	1135 (24.24)	1187 (50.97)	4177		
Total	368 (100)	1720 (100)	2116 (100)	4559 (100)	4683 (100)	2329 (100)	15775		
Females	0-24	25-49	50-59	60-69	70-79	80+	Total		
Canada	270 (93.43)	2669 (79.84)	2078 (78.95)	2784 (73.77)	2579 (76.14)	1021 (47.27)	11401		
China	6 (2.08)	57 (1.71)	41 (1.56)	36 (0.95)	50 (1.48)	33 (1.53)	223		
Others	13 (4.50)	617 (18.46)	513 (19.49)	954 (25.28)	758 (22.38)	1106 (51.20)	3961		
Total	289 (100)	3343 (100)	2632 (100)	3774 (100)	3387 (100)	2160 (100)	15585		

Table D-III. Cancer cases by sex, birthplace (adjusted) and age groups, 1989-1993

Malcs	Age groups								
Birthplaces	0-24	25-49	50-59	60-69	70-79	80+	Total		
Canada (%)	430 (92.66%)*464)	1714 (80.00*2142)	2129 (78.17*2723)	4403 (74.20*5945)	4596 (74.20*6194)	1473 (47.06*3129)	14744		
China	2 (0.27*464)	53 (2.44*2142)	53 (1.94*2723)	100 (1.67*5945)	97 (1.56*6194)	62 (1.98*3129)	365		
Others	33 (7.07*464)	377 (17.56*2142)	542 (19.90*2723)	1443 (24.26*5945)	1502 (24.24*6194)	1595 (50.97*3129)	5490		
Total excl. M [^]	368	1720	2116	4559	4683	2329	15775		
Total incl. M	464	2142	2723	5945	6194	3129	20598		
Females	0-24	25-49	50-59	60-69	70-79	80+	Total		
Canada	349 (93.43*373)	3158 (79.84*3955)	2432 (78.95*3080)	3330 (73.77*4513)	3192 (76.14*4192)	1270 (47.27*2686)	11401		
China	8 (2.08*373)	68 (1.71*3955)	49 (1.56*3080)	43 (0.95*4513)	63 (1.48*4192)	42 (1.53*2686)	223		
Others	17 (4.50*373)	731 (18.46*3955)	601 (19.49*3080)	1141 (25.28*4513)	939 (22.38*4192)	1376 (51.20*2686)	3961		
Total excl. M	289	3343	2632	3774	3387	2160	15585		
Total incl. M	373	3955	3080	4513	4192	2686	18800		

M[^] = birthplace missing; excl. = excluding; incl. = including.

Table D-IV. Canadian-born male site-specific Cancer cases (birthplace missing unadjusted) by age groups, 1989-1993

Sites	Age groups	25-49	50-59	60-69	70-79	80+	Total
	0-24 (%)						
Nasopharynx	1 (0.29)	3 (0.22)	6 (0.36)	4 (0.12)	1 (0.03)	0 (0.00)	15
Esophageal	0 (0)	8 (0.58)	29 (1.75)	47 (1.39)	38 (1.09)	5 (0.46)	127
Stomach	1 (0.29)	33 (2.40)	72 (4.35)	105 (3.11)	117 (3.37)	46 (4.20)	374
Colon	2 (0.59)	64 (4.65)	122 (7.38)	209 (6.19)	253 (7.28)	109 (9.95)	759
Rectum	1 (0.29)	57 (4.14)	122 (7.38)	179 (5.30)	192 (5.53)	55 (5.02)	606
Liver	7 (2.05)	7 (2.05)	6 (0.44)	21 (1.27)	23 (0.68)	34 (0.98)	12 (1.09)
Gallbladder	0 (0)	5 (0.36)	9 (0.54)	15 (0.44)	26 (0.75)	11 (1.00)	66
Pancreas	0 (0)	25 (1.82)	67 (4.05)	125 (3.70)	107 (3.08)	54 (4.93)	378
Lung	2 (0.59)	122 (8.87)	357 (21.58)	840 (24.87)	777 (22.36)	191 (17.43)	2289
Prostate	2 (0.59)	12 (0.87)	182 (11.00)	816 (24.16)	1051 (30.24)	306 (27.92)	2369
Bladder	1 (0.29)	26 (1.89)	48 (2.90)	124 (3.67)	146 (4.20)	61 (5.57)	406
Kidney	8 (2.35)	34 (2.47)	56 (3.39)	92 (2.72)	88 (2.53)	26 (2.37)	304
Thyroid Gland	3 (0.88)	32 (2.33)	9 (0.54)	8 (0.24)	6 (0.17)	1 (0.09)	59
Others	313 (91.79)	949 (68.97)	554 (33.49)	790 (23.39)	639 (18.39)	219 (19.98)	3464
Total	341 (100)	1376 (100)	1654 (100)	3377 (100)	3475 (100)	1096 (100)	11319

Table D-V. Canadian-born male site-specific Cancer cases (birthplace missing adjusted) by age groups, 1989-1993

Sites	Age groups	25-49	50-59	60-69	70-79	80+	Total
	0-24						
Nasopharynx	2 (0.29%)*430)	4 (0.22*1714)	8 (0.36*2129)	6 (0.12*4403)	2 (0.03*4596)	0 (0.00*1473)	20
Esophageal	0 (0*430)	10(0.58*1714)	38 (1.75*2129)	62 (1.39*4403)	51 (1.09*4596)	7 (0.46*1473)	166
Stomach	2 (0.29*430)	42 (2.40*1714)	93 (4.35*2129)	137 (3.11*4403)	155 (3.37*4596)	62 (4.20*1473)	489
Colon	3 (0.59*430)	80 (4.65*1714)	158 (7.38*2129)	273 (6.19*4403)	335 (7.28*4596)	147 (9.95*1473)	993
Rectum	2 (0.29*430)	71 (4.14*1714)	158 (7.38*2129)	234 (5.30*4403)	255 (5.53*4596)	74 (5.02*1473)	791
Liver	9 (2.05*430)	8 (0.44*1714)	27 (1.27*2129)	30 (0.68*4403)	45 (0.98*4596)	16 (1.09*1473)	135
Gallbladder	0 (0*430)	7 (0.36*1714)	12 (0.54*2129)	20 (0.44*4403)	35 (0.75*4596)	15 (1.00*1473)	87
Pancreas	0 (0*430)	32 (1.82*1714)	87 (4.05*2129)	163 (3.70*4403)	142 (3.08*4596)	73 (4.93*1473)	495
Lung	3 (0.59*430)	152 (8.87*1714)	460 (21.58*2129)	1096 (24.87*4403)	1028 (22.36*4596)	257 (17.43*1473)	2994
Prostate	3 (0.59*430)	15 (0.87*1714)	235 (11.00*2129)	1064 (24.16*4403)	1390 (30.24*4596)	412 (27.92*1473)	3117
Bladder	2 (0.29*430)	33 (1.89*1714)	62 (2.90*2129)	162 (3.67*4403)	193 (4.20*4596)	82 (5.57*1473)	532
Kidney	10 (2.35*430)	43 (2.47*1714)	73 (3.39*2129)	120 (2.72*4403)	117 (2.53*4596)	35 (2.37*1473)	396
Thyroid G.	4 (0.88*430)	40 (2.33*1714)	12 (0.54*2129)	11 (0.24*4403)	8 (0.17*4596)	2 (0.09*1473)	75
Others	395 (91.79*430)	1182 (68.97*1714)	713 (33.49*2129)	1030 (23.39*4403)	846 (18.39*4596)	295 (19.98*1473)	4459
Total	341	1376	1654	3377	3475	1096	11319
Canada from table D-III	430 (92.66*464)	1714 (80.00*2142)	2129 (78.17*2723)	4403 (74.20*5945)	4596 (74.20*6194)	1473 (47.06*3129)	14744

APPENDIX E

SAS PROGRAM TO OBTAIN CASES WITH BIRTHPLACE MISSING BY AGE, SEX, AND DIAGNOSIS YEARS


```
/* program to produce the missing birthplace cancer cases */
```

```
libname direct      '/home/luowei/data';  
libname library     '/home/luowei/data';  
filename in         '/home/luowei/data/alt6993';
```

```
proc format;
```

```
value icd9m
```

```
147 = '147 nas'
```

```
150 = '150 eso'
```

```
151 = '151 sto'
```

```
153 = '153 col'
```

```
154 = '154 rec'
```

```
155 = '155 liv'
```

```
156 = '156 gal'
```

```
157 = '157 pan'
```

```
162 = '162 lun'
```

```
174 = '174 bre'
```

```
180 = '180 cer'
```

```
182 = '182 ute'
```

```
183 = '183 ova'
```

```
185 = '185 pro'
```

```
188 = '188 bla'
```

```
189 = '189 kid'
```

```
193 = '193 thy'
```

```
other = 'others';
```

```
value diagyearm
```

```
74-78 = '7478'
```

```
79-83 = '7983'
```

```
84-88 = '8488'
```

```
89-93 = '8993';
```

```
value agegrpm
```

```
1- 6 = '0-24'
```

```
7-11 = '25-49'
```

```
12-13 = '50-59'
```

```
14-15 = '60-69'
```

```
16-17 = '70-79'
```

```
18-19 = '80+';
```

```
value sexm
```

```
1 = 'male'
```

```
2 = 'female';
```

```

value birthm
0 = 'missing'
1 = 'Canada'
2 = 'China'
3 = 'Others';

data temp;
    infile in;
input
    @1 reptprov      $2.
    @27 sex          1.
    @28 birthdat     8.
    @37 source       2.
    @56 agegrp       2.
    @58 marstat      1.
    @59 agecalc      3.
    @70 icdo_t       3.
    @73 icdo_m       5.
    @78 icd9         3.
    @95 diagyear     2.
    @117 ressgc      2.
    @124 birth       1.
    @125 patst       1.
    @126 mthd        1.;

if (ressgc = 48);

if (icd9 >= 140 & icd9 <= 172) | (icd9 >= 174 & icd9 <= 208);

if (diagyear >= 74 & diagyear <= 93);

if (birth = 0);

format
    icd9          icd9m.
    sex           sexm.
    agegrp        agegrpm.
    diagyear      diagyearm.
    birth         birthm.;

proc freq data=temp formchar = ' ';
    title 'Birthplace missing cases by sex, agegroups and diagnosis year, 1974-93';
    tables sex*diagyear*agegrp;
run;

```

APPENDIX F

CANCER CASES BY SITE, AGE GROUPS, BIRTHPLACE, SEX, AND PERIOD

Table F-1. Number of cancer cases by site, sex and age groups of Canadian-born Alberta residents (1974-1978)

Age groups	0-24	25-49	50-59	60-69	70-79	80+	0-24	25-49	50-59	60-69	70-79	80+
Site (ICD9)	Males						Females					
Nasopharynx (147)	0	3	1	3	1	0	0	2	4	0	1	0
Esophagus (150)	1	10	14	17	6	1	0	3	1	3	1	1
Stomach (151)	0	26	45	49	35	9	0	11	14	20	8	5
Colon (153)	2	45	66	118	55	21	2	57	87	106	59	25
Rectum (154)	1	43	57	90	43	12	1	25	57	55	24	10
Liver (155)	4	3	2	4	1	1	0	6	2	2	0	0
Gallbladder (156)	0	7	5	5	2	0	0	1	4	10	2	0
Pancreas (157)	0	17	20	30	8	3	0	5	12	19	5	4
Lung (162)	0	82	206	288	110	22	1	39	69	70	18	10
Prostate (185)	0	6	76	250	197	73	n/a	n/a	n/a	n/a	n/a	n/a
Bladder (188)	1	24	46	97	53	18	0	4	13	29	9	14
Kidney (189)	6	21	42	35	15	4	7	13	21	29	8	3
Thyroid g. (193)	7	23	8	6	3	1	20	48	21	12	5	0
Breast (174)	n/a	n/a	n/a	n/a	n/a	n/a	2	608	538	410	131	47
Cervix (180)	n/a	n/a	n/a	n/a	n/a	n/a	8	154	28	38	8	6
Uterus (182)	n/a	n/a	n/a	n/a	n/a	n/a	0	51	172	153	28	10
Ovary (183)	n/a	n/a	n/a	n/a	n/a	n/a	11	80	73	68	18	6
Others	231	438	402	355	122	41	162	268	192	193	86	30
All (140-208, ex 173)	253	748	990	1347	651	206	214	1375	1308	1217	411	171
All (140-208)	256	951	1260	1758	846	318	228	1531	1482	1410	533	263

Table F-2. Number of cancer cases by site, sex and age groups of Canadian-born Alberta residents (1979-1983)

Age groups	0-24	25-49	50-59	60-69	70-79	80+	Females					
Site (ICD9)	Males											
Nasopharynx (147)	0	5	6	3	1	0	2	1	1	2	1	1
Esophagus (150)	0	3	20	29	11	3	0	2	5	7	7	2
Stomach (151)	0	22	53	87	53	15	1	14	20	37	31	11
Colon (153)	1	69	103	181	122	47	4	49	96	166	138	53
Rectum (154)	0	34	97	148	93	29	0	38	80	101	65	21
Liver (155)	3	4	7	7	9	5	2	1	5	5	2	4
Gallbladder (156)	0	3	5	10	6	3	0	2	13	18	12	5
Pancreas (157)	0	14	58	67	50	8	0	15	25	50	49	15
Lung (162)	7	91	293	507	283	48	0	83	139	184	79	16
Prostate (185)	0	7	115	484	420	147	n/a	n/a	n/a	n/a	n/a	n/a
Bladder (188)	0	15	41	109	86	29	2	11	17	32	18	12
Kidney (189)	7	36	44	63	44	11	9	20	20	28	27	6
Thyroid g. (193)	8	23	10	10	2	0	28	80	22	12	7	2
Breast (174)	n/a	n/a	n/a	n/a	n/a	n/a	3	693	564	589	243	105
Cervix (180)	n/a	n/a	n/a	n/a	n/a	n/a	11	218	37	39	24	5
Uterus (182)	n/a	n/a	n/a	n/a	n/a	n/a	0	43	129	180	67	14
Ovary (183)	n/a	n/a	n/a	n/a	n/a	n/a	17	111	107	98	43	8
Others	305	632	456	591	325	73	215	376	278	359	255	90
All (140-208,ex 173)	331	958	1308	2296	1505	418	294	1757	1558	1907	1068	370
All (140-208)	334	1156	1577	2771	1824	554	300	1928	1756	2190	1276	481

Table F-3. Number of cancer cases by site, sex and age groups of Canadian-born Alberta residents (1984-1988)

Age groups	0-24	25-49	50-59	60-69	70-79	80+	0-24	25-49	50-59	60-69	70-79	80+
Site (ICD9)	Males						Females					
Nasopharynx (147)	2	4	6	5	1	0	1	4	2	3	3	0
Esophagus (150)	0	4	39	34	36	5	0	0	6	13	9	1
Stomach (151)	1	38	55	98	87	34	0	17	19	42	52	25
Colon (153)	1	63	120	219	217	65	0	56	103	196	194	95
Rectum (154)	2	58	103	172	129	26	0	34	71	105	96	31
Liver (155)	6	8	14	27	18	6	2	5	7	7	12	11
Gallbladder (156)	0	3	16	17	15	7	0	4	8	19	28	15
Pancreas (157)	0	34	62	104	99	33	1	25	48	62	103	39
Lung (162)	0	124	424	733	583	118	0	96	275	343	227	52
Prostate (185)	0	11	131	479	640	208	n/a	n/a	n/a	n/a	n/a	n/a
Bladder (188)	0	15	57	76	120	48	1	4	9	23	35	21
Kidney (189)	16	43	79	81	51	19	16	35	26	43	39	12
Thyroid g. (193)	0	28	13	14	6	2	20	64	26	25	12	0
Breast (174)	n/a	n/a	n/a	n/a	n/a	n/a	2	887	707	783	477	136
Cervix (180)	n/a	n/a	n/a	n/a	n/a	n/a	10	280	46	62	26	10
Uterus (182)	n/a	n/a	n/a	n/a	n/a	n/a	2	72	166	219	150	25
Ovary (183)	n/a	n/a	n/a	n/a	n/a	n/a	21	141	108	126	86	18
Others	329	772	554	693	526	160	213	475	348	397	376	137
All (140-208, ex 173)	357	1205	1673	2752	2528	731	289	2199	1975	2468	1925	628
All (140-208)	363	1355	1897	3181	3005	913	296	2374	2133	2749	2225	781

Table F-4. Number of cancer cases by site, sex and age groups of Canadian-born Alberta residents (1989-1993)

Age groups	0-24	25-49	50-59	60-69	70-79	80+	0-24	25-49	50-59	60-69	70-79	80+
Site (ICD9)	Males						Females					
Nasopharynx (147)	1	3	6	4	1	0	2	1	1	1	1	7
Esophagus (150)	0	8	29	47	38	5	0	2	5	19	5	53
Stomach (151)	1	33	72	105	117	46	1	21	27	58	38	188
Colon (153)	2	64	122	209	253	109	0	55	87	218	140	686
Rectum (154)	1	57	122	179	192	55	1	43	55	117	54	381
Liver (155)	7	6	21	23	34	12	4	7	6	11	8	47
Gallbladder (156)	0	5	9	15	26	11	0	4	12	36	17	86
Pancreas (157)	0	25	67	125	107	54	0	11	40	112	68	325
Lung (162)	2	122	357	840	777	191	0	150	292	391	96	1350
Prostate (185)	2	12	182	816	1051	306	n/a	n/a	n/a	n/a	n/a	n/a
Bladder (188)	1	26	48	124	146	61	0	10	16	35	31	125
Kidney (189)	8	34	56	92	88	26	8	21	28	30	21	164
Thyroid g. (193)	3	32	9	8	6	1	18	111	27	13	6	184
Breast (174)	n/a	n/a	n/a	n/a	n/a	n/a	3	1128	818	718	195	3751
Cervix (180)	n/a	n/a	n/a	n/a	n/a	n/a	8	289	51	42	17	451
Uterus (182)	n/a	n/a	n/a	n/a	n/a	n/a	0	81	155	165	35	651
Ovary (183)	n/a	n/a	n/a	n/a	n/a	n/a	20	151	108	94	31	531
Others	313	949	554	790	639	219	205	584	350	505	519	258
All (140-208, ex 173)	341	1376	1654	3377	3475	1096	270	2669	2078	2784	2579	1021
All (140-208)	344	1499	1756	3597	3729	1226	272	2772	2182	2936	2741	1109

Table F-5. Number of cancer cases by site, sex and age groups of Chinese migrants (1974-1978)

Age groups	0-24	25-49	50-59	60-69	70-79	80+	Females					
Site (ICD9)	Males											
Nasopharynx (147)	0	4	1	1	0	0	0	0	1	2	0	0
Esophagus (150)	0	1	0	2	1	0	0	0	0	0	0	0
Stomach (151)	0	0	1	1	1	0	0	0	0	0	1	0
Colon (153)	0	1	2	1	2	1	0	0	1	1	4	0
Rectum (154)	0	1	0	2	0	1	0	0	0	0	4	0
Liver (155)	0	0	1	0	0	0	0	0	0	0	0	0
Gallbladder (156)	0	0	0	0	0	0	0	0	0	1	1	0
Pancreas (157)	0	0	0	2	0	0	0	0	0	0	0	0
Lung (162)	0	0	3	2	4	3	0	0	0	1	1	2
Prostate (185)	0	0	0	1	2	3	n/a	n/a	n/a	n/a	n/a	n/a
Bladder (188)	0	0	1	1	2	0	0	0	0	0	0	0
Kidney (189)	0	0	1	0	0	0	0	0	0	0	0	0
Thyroid g. (193)	0	0	0	0	0	0	0	0	0	0	1	0
Breast (174)	n/a	n/a	n/a	n/a	n/a	n/a	0	0	5	3	3	0
Cervix (180)	n/a	n/a	n/a	n/a	n/a	n/a	0	0	2	0	2	0
Uterus (182)	n/a	n/a	n/a	n/a	n/a	n/a	0	0	2	0	3	1
Ovary (183)	n/a	n/a	n/a	n/a	n/a	n/a	0	0	1	0	1	0
Others	1	1	2	3	1	0	1	3	0	0	1	2
All (140-208,ex 173)	1	8	12	16	13	8	1	15	8	22	10	1
All (140-208)	2	8	12	17	13	8	1	16	8	23	11	2

Table F-6. Number of cancer cases by site, sex and age groups of Chinese migrants (1979-1983)

Age groups	0-24	25-49	50-59	60-69	70-79	80+	Females					
Site (ICD9)	Males											
Nasopharynx (147)	0	5	6	2	1	1	0	5	2	0	0	0
Esophagus (150)	0	0	0	0	1	0	0	0	0	1	0	0
Stomach (151)	0	0	0	2	3	1	0	0	0	0	0	1
Colon (153)	0	0	2	1	3	1	0	3	1	1	1	1
Rectum (154)	1	2	3	0	5	2	0	0	0	0	2	1
Liver (155)	0	2	2	2	1	1	0	1	2	0	1	1
Gallbladder (156)	0	0	0	0	1	1	0	0	0	0	0	0
Pancreas (157)	0	1	0	0	1	2	0	0	0	0	0	1
Lung (162)	0	1	4	6	11	3	0	2	1	9	2	1
Prostate (185)	0	0	0	0	4	3	n/a	n/a	n/a	n/a	n/a	n/a
Bladder (188)	0	0	0	1	1	0	0	0	0	1	1	1
Kidney (189)	0	1	0	0	4	0	0	0	1	0	0	1
Thyroid g. (193)	0	0	0	0	0	0	0	1	0	1	0	0
Breast (174)	n/a	n/a	n/a	n/a	n/a	n/a	0	8	3	5	1	3
Cervix (180)	n/a	n/a	n/a	n/a	n/a	n/a	0	3	2	0	2	0
Uterus (182)	n/a	n/a	n/a	n/a	n/a	n/a	0	3	3	0	0	2
Ovary (183)	n/a	n/a	n/a	n/a	n/a	n/a	0	2	0	2	0	1
Others	1	4	8	6	4	3	1	1	8	7	2	5
All (140-208, ex 173)	2	16	25	20	40	18	1	29	23	27	12	19
All (140-208)	2	16	26	20	40	18	1	29	23	28	15	20

Table F-7. Number of cancer cases by site, sex and age groups of Chinese migrants (1984-1988)

Age groups	0-24	25-49	50-59	60-69	70-79	80+	0-24	25-49	50-59	60-69	70-79	80+
Site (ICD9)	Males						Females					
Nasopharynx (147)	0	8	3	3	2	0	1	1	0	6	0	1
Esophagus (150)	0	0	2	2	1	0	0	0	0	0	0	0
Stomach (151)	0	0	1	2	1	3	0	3	0	0	2	4
Colon (153)	0	2	0	1	3	2	0	2	3	8	6	0
Rectum (154)	0	1	2	1	4	4	0	0	0	2	1	2
Liver (155)	1	5	7	4	1	2	0	2	0	3	1	1
Gallbladder (156)	0	1	1	0	0	2	0	0	1	0	1	0
Pancreas (157)	0	1	1	2	3	2	0	0	0	1	0	4
Lung (162)	0	1	7	13	15	8	0	1	5	4	14	5
Prostate (185)	0	0	2	3	4	5	n/a	n/a	n/a	n/a	n/a	n/a
Bladder (188)	0	0	2	2	2	2	0	0	0	0	0	1
Kidney (189)	0	0	0	2	0	0	0	0	0	2	0	1
Thyroid g. (193)	0	3	1	0	1	0	0	0	1	0	2	0
Breast (174)	n/a	n/a	n/a	n/a	n/a	n/a	0	10	13	8	5	3
Cervix (180)	n/a	n/a	n/a	n/a	n/a	n/a	0	5	4	5	0	1
Uterus (182)	n/a	n/a	n/a	n/a	n/a	n/a	0	0	4	2	0	1
Ovary (183)	n/a	n/a	n/a	n/a	n/a	n/a	0	2	0	2	0	1
Others	2	5	5	7	8	1	0	6	8	6	7	7
All (140-208,ex 173)	3	27	34	42	45	31	1	32	39	49	39	32
All (140-208)	3	27	37	43	48	31	1	32	41	49	39	32

Table F-8. Number of cancer cases by site, sex and age groups of Chinese migrants (1989-1993)

Age groups	0-24	25-49	50-59	60-69	70-79	80+	Females						
Site (ICD9)	Males												
Nasopharynx (147)	0	13	5	8	0	1	0	3	0	0	0	0	3
Esophagus (150)	0	0	2	0	3	3	0	0	0	0	0	0	0
Stomach (151)	0	3	1	5	4	2	0	0	2	1	2	8	
Colon (153)	0	3	3	8	6	6	0	0	3	5	3	22	
Rectum (154)	0	4	4	4	4	1	0	2	2	0	0	6	
Liver (155)	0	2	5	9	2	5	0	1	2	1	4	8	
Gallbladder (156)	0	0	2	0	2	1	0	1	0	0	0	5	
Pancreas (157)	0	0	1	3	3	3	0	2	0	0	2	7	
Lung (162)	0	3	10	19	26	7	0	4	0	1	6	19	
Prostate (185)	0	0	2	4	5	6	n/a	n/a	n/a	n/a	n/a	n/a	
Bladder (188)	0	0	0	1	1	2	0	0	0	1	2	3	
Kidney (189)	0	1	1	3	1	1	0	0	0	1	1	2	
Thyroid g. (193)	0	0	0	0	0	0	3	1	3	1	1	9	
Breast (174)	n/a	n/a	n/a	n/a	n/a	n/a	0	22	15	14	4	60	
Cervix (180)	n/a	n/a	n/a	n/a	n/a	n/a	0	5	2	2	2	12	
Uterus (182)	n/a	n/a	n/a	n/a	n/a	n/a	0	4	3	2	2	14	
Ovary (183)	n/a	n/a	n/a	n/a	n/a	n/a	1	7	5	1	1	17	
Others	1	13	5	12	16	8	2	5	4	6	8	3	
All (140-208, ex 173)	1	42	41	76	73	46	6	57	41	36	50	33	
All (140-208)	1	43	41	76	74	46	6	57	41	37	52	34	

Table F-9. Number of cancer cases by site, sex and age groups of Shanghai Chinese (1975)

Age groups	0-24	25-49	50-59	60-69	70-79	80+	Females					
Site (ICD9)	Males											
Nasopharynx (147)	11	78	47	26	12	0	7	36	23	10	8	0
Esophagus (150)	0	74	187	222	129	17	0	22	62	66	76	18
Stomach (151)	1	220	475	513	259	24	16	140	162	191	117	19
Colon (153)	3	52	51	52	27	2	14	34	53	54	26	8
Rectum (154)	10	61	59	66	28	6	11	55	52	43	18	2
Liver (155)	8	277	342	221	87	12	9	57	70	81	55	9
Gallbladder (156)	0	3	9	11	5	0	0	10	13	15	9	1
Pancreas (157)	0	18	35	41	14	2	4	12	17	26	15	1
Lung (162)	1	121	338	544	265	28	4	64	106	212	127	22
Prostate (185)	0	0	5	5	11	0	n/a	n/a	n/a	n/a	n/a	n/a
Bladder (188)	0	30	34	78	42	6	0	6	9	17	9	2
Kidney (189)	1	9	11	15	1	1	3	8	5	9	4	0
Thyroid g. (193)	9	42	21	17	0	0	62	136	33	17	3	1
Breast (174)	n/a	n/a	n/a	n/a	n/a	n/a	4	257	165	126	58	11
Cervix (180)	n/a	n/a	n/a	n/a	n/a	n/a	0	156	273	181	82	7
Uterus (182)	n/a	n/a	n/a	n/a	n/a	n/a	0	35	63	20	8	2
Ovary (183)	n/a	n/a	n/a	n/a	n/a	n/a	32	51	35	24	7	1
Others	135	283	225	211	117	10	20	217	150	106	73	12
All (140-208, ex 173)	177	1263	1836	2019	997	108	180	1290	1290	1198	694	116
All (140-208)	180	1274	1852	2044	1008	113	181	1297	1299	1205	707	124

Table F-10. Number of cancer cases by site, sex and age groups of Shanghai Chinese (1978-1982)

Age groups	0-24	25-49	50-59	60-69	70-79	80+	0-24	25-49	50-59	60-69	70-79	80+
Site (ICD9)	Males						Females					
Nasopharynx (147)	23	239	263	185	54	4	18	134	82	86	24	8
Esophagus (150)	2	151	715	1190	1066	206	2	93	340	546	516	189
Stomach (151)	24	893	2252	3484	2463	385	28	612	959	1431	1219	345
Colon (153)	42	226	336	410	339	60	21	247	336	421	325	80
Rectum (154)	35	272	363	415	361	74	37	245	350	357	245	91
Liver (155)	51	1212	1923	1673	883	132	21	243	550	676	548	152
Gallbladder (156)	2	32	63	90	72	15	2	46	114	152	102	20
Pancreas (157)	6	87	198	325	225	40	3	62	181	254	182	42
Lung (162)	11	492	1908	3653	2489	329	10	263	732	1259	989	240
Prostate (185)	0	10	19	86	114	38	n/a	n/a	n/a	n/a	n/a	n/a
Bladder (188)	8	86	205	362	340	83	2	22	66	124	92	23
Kidney (189)	13	31	65	99	64	8	8	20	55	58	35	11
Thyroid g. (193)	18	92	59	31	16	3	55	307	114	78	24	10
Breast (174)	n/a	n/a	n/a	n/a	n/a	n/a	9	1206	989	738	351	108
Cervix (180)	n/a	n/a	n/a	n/a	n/a	n/a	2	169	503	537	332	86
Uterus (182)	n/a	n/a	n/a	n/a	n/a	n/a	4	131	245	131	58	7
Ovary (183)	n/a	n/a	n/a	n/a	n/a	n/a	55	279	271	200	100	21
Others	540	1090	1276	1457	1016	192	435	1068	1017	1047	729	263
All (140-208, ex 173)	768	4911	9644	13455	9499	1569	706	5146	6901	8095	5870	1695
All (140-208)	772	4946	9699	13541	9570	1590	706	5165	6948	8146	5928	1740

Table F-11. Number of cancer cases by site, sex and age groups of Shanghai Chinese (1983-1987)

Age groups	0-24	25-49	50-59	60-69	70-79	80+	0-24	25-49	50-59	60-69	70-79	80+
Site (ICD9)	Males						Females					
Nasopharynx (147)	19	258	264	175	68	12	12	139	111	68	37	4
Esophagus (150)	0	90	516	1113	893	260	2	48	258	502	479	189
Stomach (151)	28	833	2170	3691	2870	623	30	653	976	1526	1308	427
Colon (153)	6	286	400	590	460	86	13	277	469	580	451	146
Rectum (154)	12	294	393	516	415	84	12	267	362	456	330	110
Liver (155)	35	1119	1929	1779	1077	206	17	212	552	798	630	213
Gallbladder (156)	2	31	91	136	115	24	0	50	160	271	182	47
Pancreas (157)	1	99	246	420	321	79	3	56	190	321	261	89
Lung (162)	16	471	2222	4133	3203	544	7	283	777	1483	1211	336
Prostate (185)	2	9	19	104	144	49	n/a	n/a	n/a	n/a	n/a	n/a
Bladder (188)	4	81	219	440	412	129	2	28	60	140	129	45
Kidney (189)	19	34	105	133	79	11	9	40	78	85	43	9
Thyroid g. (193)	18	74	38	28	15	7	42	222	74	74	38	7
Breast (174)	n/a	n/a	n/a	n/a	n/a	n/a	12	1452	1169	983	504	151
Cervix (180)	n/a	n/a	n/a	n/a	n/a	n/a	4	45	240	364	263	73
Uterus (182)	n/a	n/a	n/a	n/a	n/a	n/a	5	110	302	171	50	13
Ovary (183)	n/a	n/a	n/a	n/a	n/a	n/a	43	297	252	245	128	22
Others	558	1330	1462	1829	1292	311	427	1221	1081	1295	929	379
All (140-208, ex 173)	716	5003	10071	15083	11359	2422	634	5397	7107	9361	6972	2259
All (140-208)	717	5037	10131	15171	11435	2456	638	5433	7145	9422	7027	2311

Table F-12. Number of cancer cases by site, sex and age groups of Shanghai Chinese (1988-1992)

Age groups	0-24	25-49	50-59	60-69	70-79	80+	0-24	25-49	50-59	60-69	70-79	80+
Site (ICD9)	Males						Females					
Nasopharynx (147)	18	391	235	247	96	10	12	166	82	78	41	9
Esophagus (150)	0	88	395	1026	1060	289	0	26	191	480	450	192
Stomach (151)	8	1072	1707	3923	3270	782	14	939	847	1668	1554	563
Colon (153)	6	420	472	950	764	186	8	408	576	932	686	154
Rectum (154)	3	362	363	677	545	148	5	377	369	604	404	130
Liver (155)	30	1283	1659	2011	1199	277	12	260	473	825	747	261
Gallbladder (156)	0	40	93	196	194	58	1	49	159	364	324	76
Pancreas (157)	0	143	226	527	441	110	0	60	175	390	380	115
Lung (162)	9	559	2014	5241	4289	890	4	364	740	1762	1622	404
Prostate (185)	0	8	43	151	252	78	n/a	n/a	n/a	n/a	n/a	n/a
Bladder (188)	5	116	209	538	522	173	0	36	54	148	171	77
Kidney (189)	19	92	153	203	132	34	22	65	75	121	71	19
Thyroid g. (193)	12	104	43	49	32	3	19	389	106	102	46	9
Breast (174)	n/a	n/a	n/a	n/a	n/a	n/a	12	2435	1413	1313	695	216
Cervix (180)	n/a	n/a	n/a	n/a	n/a	n/a	1	71	138	329	257	62
Uterus (182)	n/a	n/a	n/a	n/a	n/a	n/a	2	164	352	249	82	10
Ovary (183)	n/a	n/a	n/a	n/a	n/a	n/a	36	451	324	308	166	40
Others	542	1800	1438	2261	1646	459	404	1511	1003	1564	1153	442
All (140-208, ex 173)	645	6478	9048	17994	14438	3496	548	7769	7077	11231	8843	2777
All (140-208)	650	6521	9111	18101	14540	3540	550	7800	7115	11314	8913	2831

APPENDIX G

AGE GROUPS-, SEX-SPECIFIC INCIDENCE RATES BY BIRTHPLACE AND STUDY PERIODS

Table G-1. Age groups, sex-specific incidence rates (per 100,000) in Canadian-born Alberta residents (1974-1978)

Age groups	0-24	25-49	50-59	60-69	70-79	80+	Crude r.	60-69	70-79	80+	Crude r.
Site (ICD9)	Males						Females				
Nasopharynx (147)	0.00	0.23	0.33	1.77	1.73	0.00	0.20	0.16	1.34	0.00	0.18
Esophagus (150)	0.05	0.75	4.58	10.00	10.40	5.59	1.20	0.24	0.34	4.36	0.23
Stomach (151)	0.00	1.95	14.71	28.83	60.64	50.35	4.03	0.88	4.69	21.79	1.48
Colon (153)	0.09	3.38	21.58	69.43	95.30	117.48	7.54	4.54	29.17	108.93	8.58
Rectum (154)	0.05	3.23	18.64	52.95	74.51	67.13	6.04	1.99	19.11	43.57	4.39
Liver (155)	0.18	0.23	0.65	2.35	1.73	5.59	0.37	0.48	0.67	0.00	0.26
Gallbladder (156)	0.00	0.53	1.63	2.94	3.47	0.00	0.47	0.08	1.34	0.00	0.43
Pancreas (157)	0.00	1.28	6.54	17.65	13.86	16.78	1.92	0.40	4.02	17.43	1.15
Lung (162)	0.00	6.16	67.35	169.45	190.60	123.08	17.36	3.10	23.14	43.57	5.29
Prostate (185)	0.00	0.45	24.85	147.09	341.34	408.39	14.79	n/a	n/a	n/a	n/a
Bladder (188)	0.05	1.80	15.04	57.07	91.83	100.70	5.87	0.32	4.36	61.00	1.76
Kidney (189)	0.27	1.58	13.73	20.59	25.99	22.38	3.02	1.03	7.04	13.07	2.07
Thyroid (193)	0.32	1.73	2.62	3.53	5.20	5.59	1.18	3.82	7.07	0.00	2.71
Breast (174)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	48.40	180.40	204.79	44.34
Cervix (180)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	12.26	9.39	26.14	6.18
Uterus (182)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	4.06	57.67	43.57	10.57
Ovary (183)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	6.37	24.48	26.14	6.54
Others	10.56	32.88	131.44	208.87	211.39	229.37	39.04	7.75	64.38	130.72	23.78
All (140-208, ex 173)	11.57	56.16	323.69	792.53	1128.00	1152.45	103.05	109.47	438.60	745.10	119.94
All (140-208)	11.70	71.40	411.97	1034.34	1465.87	1779.02	132.39	121.89	496.94	1145.97	139.12

Table G-2. Age groups, sex-specific incidence rates (per 100,000) in Canadian-born Alberta residents (1979-1983)

Age groups	0-24	25-49	50-59	60-69	70-79	80+	Crude r.	0-24	25-49	50-59	60-69	70-79	80+	Crude r.
Site (ICD9)	Males							Females						
Nasopharynx (147)	0.00	0.30	1.76	1.34	1.34	0.00	0.3	0.09	0.06	0.30	0.81	1.11	5.10	0.23
Esophagus (150)	0.00	0.18	5.88	12.96	14.69	20.94	1.40	0	0.13	1.52	2.85	7.76	10.20	0.71
Stomach (151)	0.00	1.33	15.58	38.89	70.78	104.71	4.87	0.04	0.91	6.08	15.07	34.39	56.12	3.51
Colon (153)	0.04	4.18	30.27	80.90	162.94	328.10	11.06	0.17	3.18	29.17	67.62	153.08	270.41	15.76
Rectum (154)	0.00	2.06	28.51	66.15	124.21	202.44	8.48	0	2.47	24.31	41.14	72.10	107.14	9.09
Liver (155)	0.12	0.24	2.06	3.13	12.02	34.90	0.74	0.09	0.06	1.52	2.04	2.22	20.41	0.61
Gallbladder (156)	0.00	0.18	1.47	4.47	8.01	20.94	0.57	0	0.13	3.95	7.33	13.31	25.51	1.56
Pancreas (157)	0.00	0.85	17.05	29.95	66.78	55.85	4.17	0	0.97	7.60	20.37	54.35	76.53	4.82
Lung (162)	0.29	5.51	86.12	226.62	377.96	335.08	26.00	0	5.39	42.23	74.96	87.63	81.63	14.22
Prostate (185)	0.00	0.42	33.80	216.34	560.93	1026.18	24.82	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Bladder (188)	0.00	0.91	12.05	48.72	114.86	202.44	5.92	0.09	0.71	5.16	13.04	19.97	61.22	2.86
Kidney (189)	0.29	2.18	12.93	28.16	58.76	76.79	4.34	0.39	1.30	6.08	11.41	29.95	30.61	3.15
Thyroid (193)	0.33	1.39	2.94	4.47	2.67	0.00	1.12	1.22	5.20	6.68	4.89	7.76	10.20	3.53
Breast (174)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.13	45.02	171.35	239.94	269.55	535.71	60.13
Cervix (180)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.48	14.16	11.24	15.89	26.62	25.51	7.94
Uterus (182)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.00	2.79	39.19	73.33	74.32	71.43	12.50
Ovary (183)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.74	7.21	32.51	39.92	47.70	40.82	10.22
Others	12.59	38.27	134.03	264.16	434.06	509.60	50.39	9.37	24.43	84.46	146.25	282.86	459.18	43.23
All (140-208, ex 173)	13.66	58.01	384.45	1026.26	2010.02	2917.98	144.19	12.82	114.14	473.34	776.86	1184.69	1887.76	194.08
All (140-208)	13.79	69.99	463.52	1238.57	2436.06	3867.36	173.81	13.08	125.25	533.50	892.15	1415.42	2454.08	223.83

Table G-3. Age groups, sex-specific incidence rates (per 100,000) in Canadian-born Alberta residents (1984-1988)

Age groups	0-24	25-49	50-59	60-69	70-79	80+	Crude r.	0-24	25-49	50-59	60-69	70-79	80+	Crude r.
Site (ICD9)	Males							Females						
Nasopharynx (147)	0.09	0.21	1.60	2.01	0.83	0.00	0.36	0.05	0.22	0.55	1.09	2.02	0.00	0.27
Esophagus (150)	0.00	0.21	10.38	13.69	29.97	26.77	2.37	0.00	0.00	1.65	4.74	6.07	3.49	0.60
Stomach (151)	0.04	1.97	14.63	39.47	72.42	182.06	6.30	0.00	0.92	5.23	15.31	35.05	87.18	3.19
Colon (153)	0.04	3.27	31.93	88.21	180.65	348.06	13.78	0.00	3.04	28.34	71.44	130.75	331.30	13.23
Rectum (154)	0.09	3.01	27.41	69.28	107.39	139.22	9.86	0.00	1.84	19.53	38.27	64.70	108.11	6.93
Liver (155)	0.26	0.42	3.73	10.88	14.98	32.13	1.59	0.09	0.27	1.93	2.55	8.09	38.36	0.90
Gallbladder (156)	0.00	0.16	4.26	6.85	12.49	37.48	1.17	0.00	0.22	2.20	6.92	18.87	52.31	1.52
Pancreas (157)	0.00	1.77	16.50	41.89	82.41	176.71	6.68	0.05	1.36	13.21	22.60	69.42	136.01	5.71
Lung (162)	0.00	6.44	112.82	295.24	485.33	631.86	39.86	0.00	5.21	75.66	125.01	152.99	181.34	20.41
Prostate (185)	0.00	0.57	34.86	192.93	532.78	1113.79	29.55	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Bladder (188)	0.00	0.78	15.17	30.61	99.90	257.03	6.36	0.05	0.22	2.48	8.38	23.59	73.23	1.91
Kidney (189)	0.70	2.23	21.02	32.63	42.46	101.74	5.81	0.72	1.90	7.15	15.67	26.28	41.85	3.51
Thyroid (193)	0.00	1.45	3.46	5.64	4.99	10.71	1.27	0.91	3.47	7.15	9.11	8.09	0.00	3.02
Breast (174)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.09	48.10	194.51	285.38	321.48	474.28	61.49
Cervix (180)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.45	15.18	12.66	22.60	17.52	34.87	8.92
Uterus (182)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.09	3.90	45.67	79.82	101.10	87.18	13.03
Ovary (183)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.95	7.65	29.71	45.92	57.96	62.77	10.28
Others	14.41	40.10	147.41	279.13	437.88	856.76	61.02	0.91	25.76	95.74	144.69	253.41	477.77	39.99
All (140-208, ex 173)	15.63	62.59	445.15	1108.45	2104.47	3914.30	185.96	13.09	119.25	543.37	899.50	1297.39	2190.06	194.90
All (140-208)	15.89	70.38	504.76	1281.24	2501.56	4888.89	215.49	13.41	128.74	586.84	1001.91	1499.58	2723.63	216.97

Table G-4. Age groups, sex-specific incidence rates (per 100,000) in Canadian-born Alberta residents (1989-1993)

Age groups	0-24	25-49	50-59	60-69	70-79	80+	Crude r.	0-24	25-49	50-59	60-69	70-79	80+	Crude r.
Site (ICD9)	Males							Females						
Nasopharynx (147)	0.04	0.14	1.51	1.39	0.62	0.00	0.28	0.09	0.05	0.26	0.33	0.48	1.93	0.13
Esophagus (150)	0.00	0.37	7.28	16.37	23.65	15.80	2.38	0.00	0.10	1.29	7.34	9.09	9.67	1.01
Stomach (151)	0.04	1.53	18.08	36.57	72.83	145.34	7.02	0.05	1.01	6.95	14.35	27.75	73.47	3.59
Colon (153)	0.09	2.97	30.64	72.80	157.49	344.39	14.24	0.00	2.64	22.41	62.06	104.32	270.66	13.09
Rectum (154)	0.04	2.65	30.64	62.35	119.51	173.78	11.37	0.05	2.06	14.17	37.03	55.99	104.40	7.27
Liver (155)	0.30	0.28	5.27	8.01	21.16	37.91	1.93	0.18	0.34	1.55	3.67	5.26	15.47	0.90
Gallbladder (156)	0.00	0.23	2.26	5.22	16.18	34.76	1.24	0.00	0.19	3.09	5.67	17.23	32.87	1.64
Pancreas (157)	0.00	1.16	16.82	43.54	66.60	170.62	7.09	0.00	0.53	10.30	31.36	53.59	131.46	6.20
Lung (162)	0.09	5.67	89.65	292.58	483.66	603.48	42.95	0.00	7.19	75.20	140.46	187.10	185.60	25.76
Prostate (185)	0.09	0.56	45.70	284.22	654.22	966.82	44.45	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Bladder (188)	0.04	1.21	12.05	43.19	90.88	192.73	7.62	0.00	0.48	4.12	11.01	16.75	59.93	2.38
Kidney (189)	0.35	1.58	14.06	32.04	54.78	82.15	5.70	0.36	1.01	7.21	18.68	14.36	40.60	3.13
Thyroid (193)	0.13	1.49	2.26	2.79	3.73	3.16	1.11	0.82	5.32	6.95	3.00	6.22	11.60	3.51
Breast (174)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.14	54.07	210.68	296.61	343.58	376.99	71.57
Cervix (180)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.36	13.85	13.14	14.68	20.10	32.87	8.60
Uterus (182)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.00	3.88	39.92	71.73	78.96	67.67	12.42
Ovary (183)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.91	7.24	27.82	42.37	44.98	59.93	10.13
Others	13.61	44.11	139.12	275.17	397.76	691.94	65.00	9.29	27.99	90.14	168.49	248.36	498.79	46.19
All (140-208, ex 173)	14.82	63.96	415.34	1176.25	2163.09	3462.90	212.39	12.24	127.94	535.19	928.85	1234.12	1973.90	217.52
All (140-208)	14.95	69.68	440.96	1252.87	2321.20	3873.62	228.00	12.33	132.87	561.97	979.56	1311.64	2144.03	229.18

Table G-5. Age groups, sex-specific incidence rates (per 100,000) in Chinese-born Alberta residents (1974-1978)

Age groups	0-24	25-49	50-59	60-69	70-79	80+	Crude r.	0-24	25-49	50-59	60-69	70-79	80+	Crude r.
Site (ICD9)	Males							Females						
Nasopharynx (147)	0.00	20.37	32.79	43.48	0.00	0.00	17.40	0.00	5.94	52.29	0.00	0.00	0.00	9.07
Esophagus (150)	0.00	5.09	0.00	86.96	71.43	0.00	11.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Stomach (151)	0.00	0.00	32.79	43.48	71.43	0.00	8.70	0.00	0.00	0.00	32.65	58.38	0.00	6.05
Colon (153)	0.00	5.09	65.57	43.48	142.86	148.15	20.30	0.00	5.94	26.14	130.59	0.00	0.00	18.14
Rectum (154)	0.00	5.09	0.00	86.96	0.00	148.15	11.60	0.00	0.00	0.00	130.59	116.75	0.00	18.14
Liver (155)	0.00	0.00	32.79	0.00	0.00	0.00	2.90	0.00	0.00	0.00	0.00	58.38	0.00	3.02
Gallbladder (156)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	26.14	32.65	0.00	0.00	6.05
Pancreas (157)	0.00	0.00	0.00	86.96	0.00	0.00	5.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lung (162)	0.00	0.00	98.36	86.96	285.71	444.44	34.81	0.00	0.00	26.14	32.65	116.75	0.00	12.09
Prostate (185)	0.00	0.00	0.00	43.48	142.86	444.44	17.40	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Bladder (188)	0.00	0.00	32.79	43.48	142.86	0.00	11.60	0.00	0.00	0.00	0.00	58.38	0.00	3.02
Kidney (189)	0.00	0.00	32.79	0.00	0.00	0.00	2.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Thyroid (193)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	32.65	0.00	0.00	3.02
Breast (174)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.00	29.72	78.43	97.94	0.00	0.00	33.26
Cervix (180)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.00	11.89	0.00	65.30	0.00	142.86	15.12
Uterus (182)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.00	11.89	0.00	97.94	58.38	0.00	18.14
Ovary (183)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.00	5.94	0.00	32.65	0.00	0.00	6.05
Others	13.49	5.09	65.57	130.43	71.43	0.00	23.20	14.39	17.83	0.00	32.65	116.75	0.00	21.16
All (140-208, ex 173)	13.49	40.74	393.44	695.65	928.57	1185.19	168.23	14.39	89.15	209.15	718.25	583.77	142.86	172.33
All (140-208)	26.98	40.74	393.44	739.13	928.57	1185.19	174.03	14.39	95.10	209.15	750.90	642.15	285.71	184.42

Table G-6. Age groups, sex-specific incidence rates (per 100,000) in Chinese-born Alberta residents (1979-1983)

Age groups	0-24	25-49	50-59	60-69	70-79	80+	Crude r.	0-24	25-49	50-59	60-69	70-79	80+	Crude r.
Site (ICD9)	Males							Females						
Nasopharynx (147)	0.00	16.56	112.68	74.77	74.07	190.48	29.35	0.00	18.64	34.48	0.00	0.00	0.00	13.67
Esophagus (150)	0.00	0.00	0.00	0.00	74.07	0.00	1.96	0.00	0.00	0.00	24.69	0.00	0.00	1.95
Stomach (151)	0.00	0.00	0.00	74.77	222.22	190.48	11.74	0.00	0.00	0.00	0.00	0.00	86.96	1.95
Colon (153)	0.00	0.00	37.56	37.38	222.22	190.48	13.70	0.00	11.18	17.24	24.69	37.04	86.96	13.67
Rectum (154)	9.07	6.62	56.34	0.00	370.37	380.95	25.44	0.00	0.00	0.00	0.00	74.07	86.96	5.86
Liver (155)	0.00	6.62	37.56	74.77	74.07	190.48	15.66	0.00	3.73	34.48	0.00	37.04	86.96	9.77
Gallbladder (156)	0.00	0.00	0.00	0.00	74.07	190.48	3.91	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pancreas (157)	0.00	3.31	0.00	0.00	74.07	380.95	7.83	0.00	0.00	0.00	0.00	0.00	86.96	1.95
Lung (162)	0.00	3.31	75.12	224.30	814.81	571.43	48.92	0.00	7.46	17.24	222.22	74.07	86.96	29.30
Prostate (185)	0.00	0.00	0.00	0.00	296.30	571.43	13.70	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Bladder (188)	0.00	0.00	0.00	37.38	74.07	0.00	3.91	0.00	0.00	0.00	24.69	37.04	86.96	5.86
Kidney (189)	0.00	3.31	0.00	0.00	296.30	0.00	9.78	0.00	0.00	17.24	0.00	0.00	86.96	3.91
Thyroid (193)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.73	0.00	24.69	0.00	0.00	3.91
Breast (174)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.00	29.82	51.72	123.46	37.04	260.87	39.06
Cervix (180)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.00	11.18	34.48	0.00	74.07	0.00	13.67
Uterus (182)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.00	11.18	51.72	0.00	0.00	173.91	15.63
Ovary (183)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.00	7.46	0.00	49.38	0.00	86.96	9.77
Others	1.00	13.25	150.23	224.30	296.30	571.43	50.88	9.37	3.73	137.93	172.84	74.07	434.78	46.88
All (140-208, ex 173)	18.14	52.98	469.48	747.66	2962.96	3428.57	236.79	9.37	108.11	396.55	666.67	444.44	1652.17	216.80
All (140-208)	18.14	52.98	488.26	747.66	2962.96	3428.57	238.75	9.37	108.11	396.55	691.36	555.55	1739.13	226.56

Table G-7. Age groups, sex-specific incidence rates (per 100,000) in Chinese-born Alberta residents (1984-1988)

Age groups	0-24	25-49	50-59	60-69	70-79	80+	Crude r.	Females							
Site (ICD9)	Males														
Nasopharynx (147)	0.00	22.24	33.71	52.17	65.04	0.00	24.07	8.75	2.94	0.00	86.64	0.00	71.43	13.38	
Esophagus (150)	0.00	0.00	22.47	34.78	32.52	0.00	7.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Stomach (151)	0.00	0.00	11.24	34.78	32.52	342.86	10.53	0.00	8.81	0.00	0.00	42.78	285.71	13.38	
Colon (153)	0.00	5.56	0.00	17.39	97.56	228.57	12.03	0.00	5.87	34.19	115.52	128.34	0.00	28.25	
Rectum (154)	0.00	2.78	22.47	17.39	130.08	457.14	18.05	0.00	0.00	0.00	28.88	21.39	142.86	7.43	
Liver (155)	8.40	13.90	78.65	69.57	32.52	228.57	30.09	0.00	5.87	0.00	43.32	21.39	71.43	10.41	
Gallbladder (156)	0.00	2.78	11.24	0.00	0.00	228.57	6.02	0.00	0.00	11.40	0.00	21.39	0.00	2.97	
Pancreas (157)	0.00	2.78	11.24	34.78	97.56	228.57	13.54	0.00	0.00	0.00	14.44	0.00	285.71	7.43	
Lung (162)	0.00	2.78	78.65	226.09	487.80	914.29	66.19	0.00	2.94	56.98	57.76	299.47	357.14	43.12	
Prostate (185)	0.00	0.00	22.47	52.17	130.08	571.43	21.06	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Bladder (188)	0.00	0.00	22.47	34.78	65.04	228.57	12.03	0.00	0.00	0.00	0.00	0.00	71.43	1.49	
Kidney (189)	0.00	0.00	0.00	34.78	0.00	0.00	3.01	0.00	0.00	0.00	28.88	0.00	71.43	4.46	
Thyroid (193)	0.00	8.34	11.24	0.00	32.52	0.00	7.52	0.00	0.00	11.40	0.00	42.78	0.00	4.46	
Breast (174)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.00	29.37	148.15	115.52	106.95	214.29	57.99	
Cervix (180)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.00	14.68	45.58	72.20	0.00	71.43	22.30	
Uterus (182)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.00	0.00	45.58	28.88	0.00	71.43	10.41	
Ovary (183)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.00	5.87	0.00	28.88	0.00	71.43	7.43	
Others	16.81	13.90	56.18	121.74	260.16	114.29	42.12	0.00	17.62	91.17	86.64	149.73	500.00	50.56	
All (140-208,ex 173)	25.21	75.05	382.02	730.43	1463.41	3542.86	273.79	8.75	93.98	444.44	707.58	834.22	2285.71	285.50	
All (140-208)	25.21	75.05	415.73	747.83	1560.98	3542.86	284.32	8.75	93.98	467.24	707.58	834.22	2285.71	288.48	

Table G-8. Age groups, sex-specific incidence rates (per 100,000) in Chinese-born Alberta residents (1989-1993)

Age groups	0-24	25-49	50-59	60-69	70-79	80+	Crude r.	0-24	25-49	50-59	60-69	70-79	80+	Crude r.
Site (ICD9)	Males							Females						
Nasopharynx (147)	0.00	28.46	45.05	89.39	0.00	67.80	31.44	0.00	6.43	0.00	0.00	0.00	0.00	3.38
Esophagus (150)	0.00	0.00	18.02	0.00	60.30	203.39	9.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Stomach (151)	0.00	6.57	9.01	55.87	80.40	135.59	17.47	0.00	0.00	20.41	9.78	47.81	69.57	9.01
Colon (153)	0.00	6.57	27.03	89.39	120.60	406.78	30.28	0.00	0.00	30.61	48.90	175.30	104.35	24.79
Rectum (154)	0.00	8.76	36.04	44.69	80.40	67.80	19.80	0.00	4.29	20.41	0.00	31.87	0.00	6.76
Liver (155)	0.00	4.38	45.05	100.56	40.20	338.98	26.78	0.00	2.14	20.41	9.78	0.00	139.13	9.01
Gallbladder (156)	0.00	0.00	18.02	0.00	40.20	67.80	5.82	0.00	2.14	0.00	0.00	63.75	0.00	5.63
Pancreas (157)	0.00	0.00	9.01	33.52	60.30	203.39	11.64	0.00	4.29	0.00	0.00	47.81	69.57	7.89
Lung (162)	0.00	6.57	90.09	212.29	522.61	474.58	75.69	0.00	8.58	0.00	9.78	127.49	208.70	21.41
Prostate (185)	0.00	0.00	18.02	44.69	100.50	406.78	19.80	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Bladder (188)	0.00	0.00	0.00	11.17	20.10	135.59	4.66	0.00	0.00	0.00	9.78	0.00	69.57	3.38
Kidney (189)	0.00	2.19	9.01	33.52	20.10	67.80	8.15	0.00	0.00	0.00	9.78	0.00	34.78	2.25
Thyroid (193)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	23.17	2.14	30.61	9.78	0.00	34.78	10.14
Breast (174)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.00	47.18	153.06	136.92	79.68	139.13	67.61
Cervix (180)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.00	10.72	20.41	19.56	15.94	69.57	13.52
Uterus (182)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.00	8.58	30.61	19.56	47.81	69.57	15.77
Ovary (183)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	7.72	15.01	51.02	9.78	31.87	34.78	19.15
Others	7.30	28.46	45.05	134.08	321.61	542.37	64.05	15.44	10.72	40.82	58.68	127.49	104.35	31.55
All (140-208, ex 173)	7.30	91.96	369.37	849.16	1467.34	3118.64	324.89	46.33	122.25	418.37	352.08	796.81	1147.83	251.27
All (140-208)	7.30	94.14	369.37	849.16	1487.44	3118.64	327.22	46.33	122.25	418.37	361.86	828.69	1182.61	255.77

Table G-9. Age groups, sex-specific incidence rates (per 100,000) in Shanghai Chinese (1975)

Age groups	0-24	25-49	50-59	60-69	70-79	80+	Crude r.	0-24	25-49	50-59	60-69	70-79	80+	Crude r.
Site (ICD9)	Males							Females						
Nasopharynx (147)	0.80	8.12	14.61	14.08	19.35	0.00	6.08	0.54	3.85	7.18	5.33	8.62	0.00	3.02
Esophagus (150)	0.00	7.70	58.03	124.73	208.31	205.94	22.17	0.00	2.35	19.40	35.13	82.06	80.54	8.83
Stomach (151)	0.08	22.88	148.12	288.24	418.29	290.71	52.67	1.28	15.02	50.71	101.74	126.30	84.99	23.33
Colon (153)	0.23	5.40	15.89	29.23	43.57	24.19	6.60	1.12	3.65	16.58	28.77	28.08	35.80	6.82
Rectum (154)	0.76	6.25	18.10	37.03	45.22	72.68	8.05	0.86	5.81	16.27	2.90	19.46	8.97	6.50
Liver (155)	0.57	28.80	106.62	124.18	140.48	145.36	33.40	0.69	6.02	21.92	43.15	59.37	40.29	10.11
Gallbladder (156)	0.00	0.31	2.80	6.17	8.07	0.00	0.99	0.00	0.97	4.08	8.00	9.73	4.48	1.71
Pancreas (157)	0.00	1.77	10.91	23.02	22.63	24.19	3.85	0.26	1.28	5.32	13.86	16.18	4.48	2.68
Lung (162)	0.08	12.58	105.40	305.63	427.97	339.12	45.78	0.32	6.86	33.18	112.94	137.12	98.44	19.36
Prostate (185)	0.00	0.00	1.55	2.29	17.78	0.00	0.71	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Bladder (188)	0.00	3.10	10.61	43.30	67.83	72.71	6.67	0.00	0.55	2.77	9.08	9.68	8.97	1.52
Kidney (189)	0.08	0.84	3.39	8.44	1.62	12.12	1.30	0.25	0.85	1.54	4.77	4.29	0.00	1.04
Thyroid (193)	0.67	4.28	6.55	9.56	0.00	0.00	3.10	5.07	14.59	10.32	9.06	3.23	4.48	9.09
Breast (174)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.26	27.58	51.68	67.14	62.63	49.18	22.45
Cervix (180)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.00	16.75	85.45	96.42	88.54	31.32	25.31
Uterus (182)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.00	3.66	19.71	10.66	8.62	8.97	4.60
Ovary (183)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	2.60	5.38	10.68	12.77	7.56	4.48	5.34
Others	10.31	29.35	69.93	118.54	188.98	121.07	34.55	1.66	23.28	47.01	56.42	77.83	53.41	20.89
All (140-208, ex 173)	13.58	131.37	572.50	1134.49	1610.12	1308.09	225.93	14.89	138.42	403.80	638.15	749.29	518.81	172.60
All (140-208)	13.58	132.50	577.50	1148.52	1627.90	1368.72	228.40	14.97	139.16	406.64	641.86	763.41	554.59	174.23

Table G-10. Age groups, sex-specific incidence rates (per 100,000) in Shanghai Chinese (1978-1982)

Age groups	0-24	25-49	50-59	60-69	70-79	80+	Crude r.	0-24	25-49	50-59	60-69	70-79	80+	Crude r.
Site (ICD9)	Males							Females						
Nasopharynx (147)	0.43	4.07	13.92	16.36	11.4	5.12	5.20	0.34	2.51	4.17	6.99	4.01	4.63	2.43
Esophagus (150)	0.04	2.57	37.80	105.41	226.34	265.70	22.54	0.04	1.73	17.38	44.51	86.30	110.41	11.69
Stomach (151)	0.44	15.20	119.04	308.76	522.97	496.55	64.31	0.55	11.44	49.07	116.56	203.87	201.49	31.88
Colon (153)	0.78	3.85	17.76	36.29	71.96	77.36	9.56	0.40	4.62	17.18	34.31	54.36	46.72	9.92
Rectum (154)	0.65	4.63	19.20	36.77	76.68	95.47	10.29	0.71	4.58	17.93	29.05	40.98	53.16	9.19
Liver (155)	0.95	20.63	101.64	148.19	187.49	170.25	39.75	0.41	4.53	28.16	55.06	91.62	88.72	15.19
Gallbladder (156)	0.03	0.53	3.28	7.90	15.12	19.36	1.83	0.04	0.86	5.83	12.37	17.06	11.66	3.02
Pancreas (157)	0.11	1.47	10.44	28.78	47.78	51.59	5.95	0.04	1.15	9.25	20.71	30.45	24.50	5.01
Lung (162)	0.19	8.38	100.86	323.68	528.50	424.32	60.12	0.18	4.92	37.46	102.53	165.40	140.13	24.23
Prostate (185)	0.00	0.17	1.00	7.62	24.18	49.06	1.81	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Bladder (188)	0.13	1.46	10.83	32.02	72.20	107.03	7.33	0.04	0.40	3.35	10.12	15.39	13.40	2.28
Kidney (189)	0.23	0.53	3.43	8.71	13.39	10.34	1.88	0.14	0.37	2.80	4.71	5.83	6.45	1.29
Thyroid (193)	0.32	1.56	3.10	2.73	3.22	3.87	1.47	1.06	5.74	5.82	6.33	4.01	5.82	4.07
Breast (174)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.17	22.53	50.59	60.08	58.67	63.09	23.59
Cervix (180)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.04	3.16	25.74	43.76	55.51	50.21	11.31
Uterus (182)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.07	2.44	12.52	10.67	9.69	3.52	3.98
Ovary (183)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1.07	5.21	13.85	16.30	16.57	12.29	6.41
Others	10.12	18.56	67.44	129.13	215.63	247.62	37.71	8.51	19.96	52.02	85.24	121.95	153.58	31.63
All (140-208,ex 173)	14.41	83.62	509.75	1192.35	2016.90	2023.60	269.73	13.82	96.16	353.12	659.32	981.65	989.77	197.14
All (140-208)	14.48	84.20	512.65	1200.02	2032.02	2050.70	271.56	13.82	96.53	355.52	663.30	991.38	1016.00	198.66

Table G-11. Age groups, sex-specific incidence rates (per 100,000) in Shanghai Chinese (1983-1987)

Age groups	0-24	25-49	50-59	60-69	70-79	80+	Crude r.	0-24	25-49	50-59	60-69	70-79	80+	Crude r.
Site (ICD9)	Males							Females						
Nasopharynx (147)	0.36	3.55	12.03	12.54	11.21	10.31	4.73	0.24	2.11	4.98	4.40	5.01	1.78	2.29
Esophagus (150)	0.00	1.24	23.55	79.78	147.40	223.94	17.09	0.03	0.73	11.51	32.90	65.09	83.63	9.13
Stomach (151)	0.53	11.48	99.06	264.66	474.17	536.63	60.81	0.60	9.93	43.58	100.10	177.78	189.05	30.42
Colon (153)	0.10	3.93	18.25	42.26	75.86	74.08	10.87	0.25	4.21	20.94	38.05	61.29	64.61	11.96
Rectum (154)	0.23	4.05	17.92	36.98	68.57	72.36	10.20	0.24	4.07	16.16	29.90	44.89	48.73	9.51
Liver (155)	0.67	15.42	88.03	127.56	177.92	177.44	36.58	0.34	3.22	24.63	52.36	85.59	94.28	14.97
Gallbladder (156)	0.02	0.42	4.15	9.74	18.86	19.83	2.36	0.00	0.76	7.13	17.79	24.75	20.39	4.38
Pancreas (157)	0.02	1.36	11.22	30.07	53.04	68.06	6.94	0.05	0.85	8.48	21.07	35.47	39.37	5.69
Lung (162)	0.29	6.49	101.43	296.35	529.21	468.59	63.04	0.14	4.30	34.68	97.24	164.60	148.78	25.32
Prostate (185)	0.03	0.12	0.85	7.45	23.80	42.22	1.94	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Bladder (188)	0.07	1.11	10.00	31.51	67.93	111.15	7.64	0.03	0.42	2.66	9.16	17.51	19.91	2.49
Kidney (189)	0.35	0.47	4.77	9.51	13.03	9.43	2.26	0.17	0.60	3.45	5.57	5.83	4.00	1.62
Thyroid (193)	0.33	1.01	1.73	1.98	2.35	5.19	1.05	0.86	3.38	3.27	4.84	5.05	3.11	2.82
Breast (174)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.24	22.06	52.18	64.50	68.50	66.86	26.40
Cervix (180)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.07	0.68	10.70	23.85	35.72	32.30	6.10
Uterus (182)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.09	1.66	13.46	11.21	6.78	5.77	4.01
Ovary (183)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.88	4.51	11.25	16.10	17.38	9.73	6.10
Others	10.65	18.33	66.74	131.10	213.41	267.10	40.36	8.77	18.55	48.26	84.94	126.25	167.74	32.96
All (140-208, ex 173)	13.66	68.97	459.74	1081.49	1876.76	2086.31	265.86	13.02	82.04	317.33	613.98	947.50	1000.04	196.17
All (140-208)	13.68	69.43	462.48	1087.79	1889.29	2115.57	267.60	13.10	82.57	319.03	617.99	955.05	1023.09	197.69

Table G-12. Age groups, sex-specific incidence rates (per 100,000) in Shanghai Chinese (1988-1992)

Age groups	0-24	25-49	50-59	60-69	70-79	80+	Crude r.	0-24	25-49	50-59	60-69	70-79	80+	Crude r.
Site (ICD9)	Males							Females						
Nasopharynx (147)	0.35	4.53	11.91	15.36	12.94	5.31	5.48	0.24	2.16	4.10	4.26	4.35	2.98	2.23
Esophagus (150)	0.00	1.02	20.01	63.81	143.04	169.73	15.72	0.00	0.33	9.63	26.19	47.72	64.06	7.70
Stomach (151)	0.16	12.42	86.52	244.00	441.29	459.26	59.21	0.29	12.20	42.71	90.97	165.11	187.90	32.14
Colon (153)	0.11	4.87	23.91	59.05	103.07	109.22	15.39	0.16	5.30	29.07	50.80	72.79	51.37	15.89
Rectum (154)	0.04	4.19	18.42	42.10	73.52	86.90	11.54	0.10	4.91	18.60	32.95	42.83	43.40	10.87
Liver (155)	0.59	14.85	84.10	125.07	161.82	162.69	35.53	0.26	3.38	23.88	44.98	79.37	87.10	14.84
Gallbladder (156)	0.00	0.46	4.69	12.15	26.06	33.51	3.18	0.02	0.63	8.01	19.82	34.41	25.32	5.59
Pancreas (157)	0.00	1.65	11.46	32.74	59.39	64.62	7.95	0.00	0.78	8.81	21.25	40.34	38.38	6.44
Lung (162)	0.17	6.48	102.10	326.02	578.82	522.67	71.54	0.08	4.73	37.34	96.12	172.36	134.88	28.18
Prostate (185)	0.00	0.08	2.14	9.34	34.00	45.81	2.91	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Bladder (188)	0.08	1.34	10.60	33.41	70.42	101.62	8.59	0.00	0.46	2.72	8.06	18.08	25.69	2.79
Kidney (189)	0.36	1.06	7.77	12.58	17.70	19.98	3.47	0.48	0.84	3.78	6.59	7.51	6.34	2.14
Thyroid (193)	0.24	1.20	2.16	3.04	4.30	1.74	1.33	0.40	5.05	5.35	5.52	4.90	2.70	3.85
Breast (174)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.26	31.66	71.29	71.63	73.84	72.05	35.02
Cervix (180)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.02	0.92	6.99	17.91	27.28	20.66	4.93
Uterus (182)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.04	2.13	17.75	13.58	8.62	3.29	4.93
Ovary (183)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.78	5.87	16.35	16.78	17.55	13.04	7.62
Others	10.73	20.84	72.92	140.66	222.10	269.85	44.82	8.73	19.63	50.59	85.28	122.52	147.63	34.97
All (140-208, ex 173)	12.82	75.00	485.71	1119.32	1948.46	2052.92	286.66	11.84	100.98	356.99	612.67	939.57	926.81	220.12
All (140-208)	12.88	75.49	461.89	1125.98	1962.23	2079.03	288.65	11.88	101.38	358.92	617.19	947.02	944.83	221.72

APPENDIX H

ASIRS IN THREE POPULATIONS AND IN EACH OF THE STUDY PERIODS

Table H-1. Age-standardized (world population) incidence rates (per 100,000) and 95% confidence intervals (in parentheses) for Canadian-born Alberta residents, Chinese migrants in Alberta, and Shanghai Chinese, Males, 1974-1978.

Cancer Sites (ICD9)	Canadian-born	Chinese migrants	Shanghai Chinese (1975)
All cancers	199.71 (194.16, 205.27)	152.84 (111.53, 194.16)	243.89 (237.60, 250.18)
All cancer (excl. 173)	153.50 (148.65, 158.34)	143.33 (104.46, 182.19)	240.88 (234.64, 247.12)
Nasopharynx (147)	0.28 (0.08, 0.48)	12.51 (4.22, 27.92)	5.86 (4.98, 6.75)
Esophargus (150)	1.74 (1.24, 2.25)	9.86 (2.47, 25.70)	24.73 (22.65, 26.80)
Stomach (151)	6.29 (5.29, 7.29)	8.14 (1.61, 23.95)	56.32 (53.30, 59.34)
Colon (153)	11.96 (10.58, 13.34)	16.34 (6.25, 34.24)	6.86 (5.84, 7.89)
Rectum (154)	9.35 (8.14, 10.56)	9.20 (2.16, 24.28)	8.67 (7.46, 9.88)
Liver (155)	0.49 (0.23, 0.75)	2.95 (0.75, 16.44)	33.44 (31.20, 35.69)
Gallbladder (156)	0.63 (0.33, 0.92)	0.00	1.02 (0.64, 1.41)
Pancreas (157)	2.82 (2.17, 3.46)	6.09 (0.74, 21.98)	4.08 (3.27, 4.89)
Lung (162)	26.84 (24.80, 28.88)	27.96 (13.99, 49.54)	51.18 (48.22, 54.13)
Prostate (185)	27.00 (24.81, 29.20)	11.77 (4.01, 26.19)	0.83 (0.46, 1.20)
Bladder (188)	9.71 (8.44, 10.98)	10.28 (2.70, 26.54)	7.74 (6.55, 8.92)
Kidney (189)	4.32 (3.52, 5.11)	2.95 (0.75, 16.44)	1.37 (0.89, 1.85)
Thyroid gland (193)	1.40 (0.98, 1.82)	0.00	2.95 (2.33, 3.57)
Others	50.68 (48.07, 53.29)	25.28 (9.67, 51.94)	35.81 (33.48, 38.15)

Table H-2. Age-standardized (world population) incidence rates (per 100,000) and 95% confidence intervals (in parentheses) for Canadian-born Alberta residents, Chinese migrants in Alberta, and Shanghai Chinese, Females, 1974-1978.

Cancer Sites (ICD9)	Canadian-born	Chinese migrants	Shanghai Chinese (1975)
All cancers	178.86 (174.01, 183.72)	130.85 (96.46, 165.23)	161.69 (157.09, 166.29)
All cancer (excl. 173)	152.41 (147.95, 156.87)	123.48 (89.88, 157.08)	160.12 (155.54, 164.69)
Nasopharynx (147)	0.22 (0.05, 0.38)	6.61 (1.34, 19.37)	2.77 (2.17, 3.37)
Esophargus (150)	0.31 (0.10, 0.52)	0.00	8.23 (7.18, 9.27)
Stomach (151)	2.05 (1.51, 2.59)	4.04 (0.46, 14.67)	21.74 (20.05, 23.43)
Colon (153)	11.94 (10.64, 13.24)	13.40 (4.89, 29.19)	6.41 (5.49, 7.33)
Rectum (154)	6.02 (5.10, 6.93)	12.64 (4.85, 27.63)	6.01 (5.13, 6.90)
Liver (155)	0.29 (0.11, 0.47)	1.75 (0.44, 9.76)	9.43 (8.32, 10.55)
Gallbladder (156)	0.62 (0.32, 0.92)	4.65 (0.56, 16.75)	1.57 (1.12, 2.03)
Pancreas (157)	1.62 (1.14, 2.11)	0.00	2.51 (1.94, 3.09)
Lung (162)	7.06 (6.08, 8.03)	8.14 (2.16, 20.96)	18.34 (16.77, 19.90)
Breast (174)	55.57 (52.90, 58.24)	23.42 (11.64, 42.00)	20.67 (19.03, 22.31)
Cervix (180)	7.0 (6.14, 7.95)	9.80 (3.10, 23.04)	22.77 (21.07, 24.47)
Uterus (182)	14.20 (12.74, 15.50)	12.41 (4.51, 27.10)	4.04 (3.33, 4.75)
Ovary (183)	8.20 (7.17, 9.22)	4.19 (0.49, 15.17)	5.09 (4.27, 5.92)
Bladder (188)	2.63 (2.00, 3.26)	1.75 (0.44, 9.76)	1.44 (1.00, 1.88)
Kidney (189)	2.74 (2.13, 3.35)	0.00	0.99 (0.63, 1.36)
Thyroid gland (193)	3.0 (2.42, 3.59)	2.29 (0.58, 12.73)	8.81 (7.71, 9.90)
Others	28.96 (27.05, 30.87)	18.40 (5.17, 41.85)	19.29 (17.71, 20.88)

Table H-3. Age-standardized (world population) incidence rates (per 100,000) and 95% confidence intervals (in parentheses) for Canadian-born Alberta residents, Chinese migrants in Alberta, and Shanghai Chinese, Males, 1979-1983.

Cancer Sites (ICD9)	Canadian-born	Chinese migrants	Shanghai Chinese (1978-82)
All cancers	269.19 (262.99, 275.39)	245.12 (200.00, 290.24)	245.50 (243.02, 247.98)
All cancer (excl. 173)	221.04 (215.46, 226.62)	243.43 (198.43, 288.42)	243.76 (241.29, 246.23)
Nasopharynx (147)	0.39 (0.19, 0.59)	24.80 (13.36, 41.67)	4.30 (3.99, 4.61)
Esophagus (150)	2.14 (1.61, 2.68)	2.22 (0.56, 12.38)	21.07 (20.32, 21.81)
Stomach (151)	7.72 (6.67, 8.77)	13.82 (5.01, 30.14)	58.06 (56.85, 59.26)
Colon (153)	17.91 (16.27, 19.55)	14.57 (5.76, 30.19)	8.68 (8.21, 9.14)
Rectum (154)	13.61 (12.20, 15.01)	26.46 (13.22, 46.57)	9.35 (8.86, 9.84)
Liver (155)	1.25 (0.80, 1.70)	14.86 (6.02, 29.95)	33.91 (33.02, 34.79)
Gallbladder (156)	0.95 (0.57, 1.34)	4.13 (0.49, 14.93)	1.68 (1.47, 1.89)
Pancreas (157)	6.46 (5.52, 7.41)	7.09 (1.78, 18.48)	5.43 (5.06, 5.80)
Lung (162)	40.21 (37.86, 42.55)	53.68 (32.31, 75.05)	54.61 (53.44, 55.77)
Prostate (185)	45.41 (42.68, 48.15)	14.60 (5.85, 30.13)	1.89 (1.65, 2.13)
Bladder (188)	10.26 (8.98, 11.53)	4.84 (0.57, 17.52)	6.98 (6.55, 7.42)
Kidney (189)	6.50 (5.56, 7.45)	9.95 (3.05, 23.57)	1.70 (1.50, 1.91)
Thyroid g. (193)	1.26 (0.91, 1.61)	0.00	1.26 (1.09, 1.43)
Others	66.96 (64.10, 69.82)	52.42 (31.12, 73.71)	34.85 (33.90, 35.80)

Table H-4. Age-standardized (world population) incidence rates (per 100,000) and 95% confidence intervals (in parentheses) for Canadian-born Alberta residents, Chinese migrants in Alberta, and Shanghai Chinese, Females, 1979-1983.

Cancer Sites (ICD9)	Canadian-born	Chinese migrants	Shanghai Chinese (1978-82)
All cancers	223.83 (218.75, 228.91)	157.23 (127.24, 187.23)	155.85 (149.36, 162.34)
All cancer (excl. 173)	194.08 (189.38, 198.78)	151.30 (121.79, 180.81)	154.68 (152.86, 156.50)
Nasopharynx (147)	0.23 (0.06, 0.40)	9.07 (3.60, 18.76)	2.00 (1.79, 2.21)
Esophargus (150)	0.71 (0.41, 1.01)	1.73 (0.44, 9.63)	8.94 (8.51, 9.37)
Stomach (151)	3.51 (2.84, 4.17)	0.87 (0.22, 4.84)	24.63 (23.91, 25.35)
Colon (153)	15.76 (14.34, 17.17)	8.84 (3.44, 18.42)	7.72 (7.31, 8.12)
Rectum (154)	9.09 (8.05, 10.14)	3.09 (0.62, 9.07)	7.22 (6.82, 7.61)
Liver (155)	0.61 (0.32, 0.90)	6.28 (1.95, 14.83)	11.67 (11.18, 12.16)
Gallbladder (156)	1.56 (1.12, 2.01)	0.00	2.31 (2.09, 2.53)
Pancreas (157)	4.82 (4.04, 5.60)	0.87 (0.22, 4.84)	3.83 (3.55, 4.11)
Lung (162)	14.22 (12.95, 15.49)	22.58 (12.45, 37.54)	18.57 (17.95, 19.19)
Breast (174)	60.13 (57.54, 62.72)	26.56 (14.63, 38.49)	18.44 (17.82, 19.07)
Cervix (180)	7.94 (7.07, 8.81)	8.90 (3.53, 18.44)	8.58 (8.16, 9.00)
Uterus (182)	12.50 (11.30, 13.69)	9.97 (4.18, 19.87)	3.02 (2.77, 3.26)
Ovary (183)	10.22 (9.18, 11.27)	6.71 (2.04, 15.94)	5.19 (4.85, 5.53)
Bladder (188)	2.86 (2.25, 3.46)	3.71 (0.64, 11.14)	1.75 (1.56, 1.94)
Kidney (189)	3.15 (2.55, 3.76)	2.42 (0.21, 8.99)	1.01 (0.86, 1.16)
Thyroid g. (193)	3.53 (2.95, 4.10)	2.92 (0.31, 10.68)	3.49 (3.20, 3.78)
Others	43.23 (41.02, 45.44)	36.77 (20.60, 52.94)	26.32 (25.53, 27.10)

Table H-5. Age-standardized (world population) incidence rates (per 100,000) and 95% confidence intervals (in parentheses) for Canadian-born Alberta residents, Chinese migrants in Alberta, and Shanghai Chinese, Males, 1984-1988.

Cancer Sites (ICD9)	Canadian-born	Chinese migrants	Shanghai Chinese (1983-87)
All cancers	289.20 (283.44, 294.96)	208.14 (176.66, 239.62)	224.39 (222.26, 226.51)
All cancer (excl. 173)	247.46 (242.16, 252.76)	200.96 (169.94, 231.98)	222.88 (220.76, 224.99)
Nasopharynx (147)	0.42 (0.22, 0.61)	15.75 (7.98, 23.53)	3.71 (3.44, 3.97)
Esophagus (150)	3.13 (2.55, 3.70)	5.43 (1.75, 12.71)	14.76 (14.21, 15.31)
Stomach (151)	8.73 (7.70, 9.75)	7.85 (3.14, 16.20)	50.96 (49.95, 51.97)
Colon (153)	19.02 (17.52, 20.51)	8.21 (3.51, 16.23)	8.93 (8.51, 9.34)
Rectum (154)	12.94 (11.75, 14.12)	12.60 (6.49, 22.05)	8.39 (7.98, 8.79)
Liver (155)	2.13 (1.64, 2.62)	23.69 (11.79, 35.59)	29.22 (28.48, 29.96)
Gallbladder (156)	1.66 (1.21, 2.11)	4.19 (1.13, 10.75)	1.96 (1.77, 2.16)
Pancreas (157)	9.22 (8.18, 10.27)	9.55 (4.34, 18.17)	5.83 (5.49, 6.17)
Lung (162)	53.76 (51.31, 56.21)	47.57 (33.45, 61.70)	52.65 (51.63, 53.68)
Prostate (185)	43.95 (41.58, 46.31)	15.29 (8.33, 25.69)	1.79 (1.59, 1.99)
Bladder (188)	9.32 (8.23, 10.42)	8.69 (3.73, 17.16)	6.65 (6.27, 7.02)
Kidney (189)	7.52 (6.61, 8.43)	2.43 (0.30, 8.79)	1.90 (1.70, 2.10)
Thyroid g (193)	1.43 (1.06, 1.80)	4.66 (1.51, 10.78)	0.90 (0.76, 1.04)
Others	74.26 (71.74, 77.04)	35.04 (19.74, 50.34)	35.23 (34.36, 36.11)

Table H-6. Age-standardized (world population) incidence rates (per 100,000) and 95% confidence intervals (in parentheses) for Canadian-born Alberta residents, Chinese migrants in Alberta, and Shanghai Chinese, Females, 1984-1988.

Cancer Sites (ICD9)	Canadian-born	Chinese migrants	Shanghai Chinese (1983-87)
All cancers	242.81 (238.08, 247.53)	173.74 (148.07, 199.41)	143.56 (141.96, 145.17)
All cancer (excl. 173)	217.13 (212.68, 221.59)	171.69 (146.18, 197.20)	142.46 (140.87, 144.06)
Nasopharynx (147)	0.28 (0.13, 0.43)	11.92 (3.75, 25.44)	1.72 (1.54, 1.89)
Esophargus (150)	0.70 (0.44, 0.95)	0.00	6.38 (6.05, 6.70)
Stomach (151)	3.76 (3.15, 4.37)	6.96 (3.14, 13.29)	21.62 (21.01, 22.23)
Colon (153)	15.76 (14.51, 17.00)	16.89 (9.16, 24.63)	8.50 (8.12, 8.88)
Rectum (154)	8.05 (7.17, 8.92)	4.09 (1.28, 9.65)	6.80 (6.46, 7.14)
Liver (155)	1.11 (0.77, 1.45)	6.27 (2.47, 13.00)	10.59 (10.16, 11.01)
Gallbladder (156)	1.84 (1.41, 2.27)	1.67 (0.16, 6.13)	3.08 (2.85, 3.30)
Pancreas (157)	6.67 (5.87, 7.47)	3.87 (1.23, 9.09)	3.99 (3.73, 4.25)
Lung (162)	23.63 (22.14, 25.12)	22.67 (14.23, 31.11)	17.79 (17.25, 18.34)
Breast (174)	67.31 (64.85, 69.76)	36.17 (24.70, 47.64)	19.11 (18.54, 19.69)
Cervix (180)	8.67 (7.84, 9.50)	14.57 (8.14, 24.06)	4.28 (4.01, 4.55)
Uterus (182)	14.90 (13.72, 16.07)	6.84 (2.72, 14.13)	2.83 (2.61, 3.05)
Ovary (183)	11.16 (10.16, 12.15)	4.62 (1.48, 10.81)	4.63 (4.33, 4.92)
Bladder (188)	2.34 (1.85, 2.83)	0.71 (0.18, 3.98)	1.75 (1.58, 1.92)
Kidney (189)	3.90 (3.31, 4.50)	2.74 (0.54, 8.06)	1.19 (1.04, 1.34)
Thyroid g (193)	3.07 (2.57, 3.57)	2.31 (0.43, 6.87)	2.31 (2.09, 2.53)
Others	44.00 (42.01, 46.00)	29.40 (19.35, 39.45)	25.90 (25.17, 26.63)

Table H-7. Age-standardized (world population) incidence rates (per 100,000) and 95% confidence intervals (in parentheses) for Canadian-born Alberta residents, Chinese migrants in Alberta, and Shanghai Chinese, Males, 1989-1993.

Cancer Sites (ICD9)	Canadian-born	Chinese migrants	Shanghai Chinese (1988-92)
All cancers	265.23 (260.42, 270.05)	202.12 (177.73, 226.52)	230.39 (228.39, 232.39)
All cancer (excl. 173)	246.82 (242.18, 251.46)	200.82 (176.50, 225.14)	228.77 (226.78, 230.76)
Nasopharynx (147)	0.32 (0.15, 0.48)	20.10 (12.50, 27.69)	4.20 (3.94, 4.47)
Esophagus (150)	2.79 (2.30, 3.28)	5.46 (2.34, 10.80)	12.58 (12.12, 13.05)
Stomach (151)	8.34 (7.47, 9.20)	10.59 (5.90, 17.51)	46.75 (45.86, 47.64)
Colon (153)	17.02 (15.78, 18.25)	18.48 (11.34, 25.62)	12.08 (11.63, 12.53)
Rectum (154)	13.31 (12.23, 14.39)	12.26 (6.40, 18.13)	9.04 (8.65, 9.43)
Liver (155)	2.28 (1.84, 2.73)	17.09 (10.08, 24.10)	27.84 (27.16, 28.53)
Gallbladder (156)	1.48 (1.11, 1.84)	3.51 (1.12, 8.22)	2.54 (2.33, 2.75)
Pancreas (157)	8.64 (7.75, 9.53)	7.00 (3.33, 12.91)	6.28 (5.95, 6.61)
Lung (162)	50.95 (48.83, 53.07)	45.49 (34.35, 56.64)	56.75 (55.77, 57.73)
Prostate (185)	53.52 (51.33, 55.72)	11.83 (6.17, 17.49)	2.35 (2.15, 2.55)
Bladder (188)	9.17 (8.26, 10.08)	2.74 (0.74, 7.04)	6.89 (6.55, 7.24)
Kidney (189)	6.65 (5.88, 7.41)	5.14 (2.05, 10.61)	2.83 (2.60, 3.05)
Thyroid g (193)	1.08 (0.80, 1.36)	0.00	1.05 (0.91, 1.19)
Others	71.28 (68.85, 73.71)	41.12 (28.92, 53.33)	37.59 (36.74, 38.44)

Table H-8. Age-standardized (world population) incidence rates (per 100,000) and 95% confidence intervals (in parentheses) for Canadian-born Alberta residents, Chinese migrants in Alberta, and Shanghai Chinese, Females, 1989-1993.

Cancer Sites (ICD9)	Canadian-born	Chinese migrants	Shanghai Chinese (1988-92)
All cancers	228.37 (224.20, 232.55)	161.03 (134.94, 187.12)	151.51 (149.96, 153.07)
All cancer (excl. 173)	216.76 (212.70, 220.83)	159.04 (133.03, 185.05)	150.47 (148.92, 152.02)
Nasopharynx (147)	0.14 (0.03, 0.24)	2.06 (0.42, 6.02)	1.63 (1.47, 1.80)
Esophargus (150)	1.03 (0.75, 1.31)	0.00	4.88 (4.62, 5.14)
Stomach (151)	3.54 (3.02, 4.06)	4.65 (1.83, 9.47)	21.09 (20.53, 21.65)
Colon (153)	13.04 (12.04, 14.04)	12.48 (7.02, 17.94)	10.64 (10.24, 11.04)
Rectum (154)	7.27 (6.53, 8.02)	4.17 (1.44, 9.23)	7.32 (6.99, 7.65)
Liver (155)	0.90 (0.64, 1.17)	4.60 (1.76, 9.44)	9.76 (9.37, 10.14)
Gallbladder (156)	1.58 (1.24, 1.92)	2.60 (0.82, 6.11)	3.60 (3.37, 3.83)
Pancreas (157)	6.21 (5.52, 6.90)	3.50 (1.34, 7.34)	4.12 (3.88, 4.37)
Lung (162)	26.37 (24.93, 27.81)	9.34 (5.00, 13.68)	18.16 (17.65, 18.67)
Breast (174)	71.17 (68.84, 73.50)	42.24 (31.29, 53.19)	24.62 (24.00, 25.24)
Cervix (180)	7.75 (7.02, 8.48)	7.81 (3.90, 13.85)	3.21 (3.00, 3.43)
Uterus (182)	12.90 (11.89, 13.91)	9.00 (4.75, 15.35)	3.54 (3.30, 3.78)
Ovary (183)	10.17 (9.29, 11.05)	15.09 (5.84, 24.35)	5.55 (5.24, 5.86)
Bladder (188)	2.40 (1.97, 2.83)	1.38 (0.04, 3.44)	1.76 (1.60, 1.91)
Kidney (189)	3.29 (2.78, 3.80)	1.03 (0.08, 2.97)	1.59 (1.41, 1.76)
Thyroid g (193)	3.23 (2.76, 3.71)	15.59 (4.70, 33.63)	2.85 (2.63, 3.07)
Others	45.76 (43.90, 47.62)	23.49 (11.38, 35.61)	26.15 (25.44, 26.86)

APPENDIX I

ASIRS IN THREE POPULATIONS AND IN EACH OF THE STUDY PERIODS (FIGURES)

Figure I-1. Age-standardized (world) Incidence Rate per 100,000 Person-years for All Cancer Sites (ICD9 140-208, excl. 173), of Males in Three Populations

Figure I-2. Age-standardized (world) Incidence Rate per 100,000 Person-years for All Cancer Sites (ICD9 140-208, excl. 173), of Females in Three Populations

Figure I-3. Age-standardized (world) Incidence Rate per 100,000 Person-years of Prostate Cancer (ICD9 185) in Three Populations

Figure I-4. Age-standardized (world) Incidence Rate per 100,000 Person-years of Breast Cancer (ICD9 174) in Three Populations

**Figure I-5. Age-standardized (world) Incidence Rate per 100,000 Person-years
of Male Nasopharynx Cancer (ICD9 147) in Three Populations**

Diagnosis Periods

Figure I-6. Age-standardized (world) Incidence Rate per 100,000 Person-years of Female Nasopharynx Cancer (ICD9 147) in Three Populations

Figure I-7. Age-standardized (world) Incidence Rate per 100,000 Person-years of Male Liver Cancer (ICD9 155) in Three Populations

Figure I-8. Age-standardized (world) Incidence Rate per 100,000 Person-years of Female Liver Cancer (ICD9 155) in Three Populations

Figure I-9. Age-standardized (world) Incidence Rate per 100,000 Person-years of Male Lung Cancer (ICD9 162) in Three Populations

Figure I-10. Age-standardized (world) Incidence Rate per 100,000 Person-years of Female Lung Cancer (ICD9 162) in Three Populations

**Figure I-11. Age-standardized (world) Incidence Rate per 100,000 Person-years
of Male Esophagus Cancer (ICD9 162) in Three Populations**

Figure I-12. Age-standardized (world) Incidence Rate per 100,000 Person-years of Female Esophagus Cancer (ICD9 162) in Three Populations

Figure I-13. Age-standardized (world) Incidence Rate per 100,000 Person-years of Male Stomach Cancer (ICD9 151) in Three Populations

Figure I-14. Age-standardized (world) Incidence Rate per 100,000 Person-years of Female Stomach Cancer (ICD9 151) in Three Populations

Figure I-15. Age-standardized (world) Incidence Rate per 100,000 Person-years of Male Colon Cancer (ICD9 153) in Three Populations

Figure I-16. Age-standardized (world) Incidence Rate per 100,000 Person-years of Female Colon Cancer (ICD9 153) in Three Populations

APPENDIX J

ASIRRS IN EACH OF THE STUDY PERIOD

Table J-1. Estimates of ASIRRs for Chinese immigrants and Chinese in Shanghai relative to Canadian-born adjusted for age, by sex and site, 1974-1978

Cancer Sites	Chinese Migrants		Chinese in Shanghai	
	Males	Females	Males	Females
	RR (95%CI)	RR (95%CI)	RR (95%CI)	RR (95%CI)
Nasopharynx	45.2 (1.7, 1181.6)*	30.6 (0.5, 1710.7)	21.1 (12.8, 34.7)*	12.8 (6.9, 23.8)*
Esophagus	5.7 (0.7, 47.5)	0.00	14.2 (11.1, 18.2)*	26.4 (17.0, 41.0)*
Stomach	1.3 (0.4, 4.8)	1.9 (0.3, 13.6)	8.9 (7.7, 10.3)*	10.6 (8.6, 13.1)*
Colon	1.4 (0.6, 3.3)	1.1 (0.5, 2.6)	0.6 (0.5, 0.7)*	0.5 (0.4, 0.6)*
Rectum	0.9 (0.4, 2.8)	2.1 (0.7, 6.6)	0.9 (0.8, 1.1)	0.9 (0.8, 1.2)
Liver	6.0 (0.1, 408.5)	6.0 (0.1, 410.8)	68.1 (50.9, 90.9)*	32.4 (21.1, 49.8)*
Gallbladder	0	7.4 (0.3, 185.3)	1.6 (0.9, 2.9)	2.5 (1.5, 4.3)*
Pancreas	2.2 (0.3, 15.9)	0.00	1.4 (1.1, 1.9)*	1.5 (1.1, 2.2)*
Lung	1.0 (0.6, 1.9)	1.2 (0.4, 3.4)	1.9 (1.7, 2.1)*	2.6 (2.2, 3.0)*
Prostate	0.4 (0.3, 0.7)*	n/a	0.03 (0.02, 0.04)*	n/a
Breast	n/a	0.4 (0.3, 0.6)*	n/a	0.4 (0.3, 0.4)*
Cervix	n/a	1.4 (0.5, 3.9)	n/a	3.2 (2.8, 3.7)*
Uterus	n/a	0.8 (0.4, 1.9)	n/a	0.3 (0.2, 0.3)*
Ovary	n/a	0.5 (0.2, 1.4)	n/a	0.6 (0.5, 0.7)*
Bladder	1.0 (0.4, 2.9)	0.7 (0.1, 3.3)	0.8 (0.6, 0.9)*	0.5 (0.4, 0.8)*
Kidney	0.7 (0.1, 3.5)	0.00	0.3 (0.2, 0.4)*	0.4 (0.2, 0.5)*
Thyroid	0	0.7 (0.1, 4.2)	2.1 (1.5, 3.0)*	2.9 (2.3, 3.7)*
Others	0.5 (0.3, 0.8)*	0.6 (0.3, 1.3)	n/a	n/a
All (but 173)	0.9 (0.7, 1.2)	0.8 (0.6, 1.0)	1.6 (1.5, 1.6)*	1.1 (1.0, 1.1)*
All	0.8 (0.6, 0.9)*	0.7 (0.6, 0.9)*	1.2 (1.1, 1.3)*	0.9 (0.8, 0.9)*

* p < 0.05

Table J-2. Estimates of ASIRRs for Chinese immigrants and Chinese in Shanghai relative to Canadian-born adjusted for age, by sex and site, 1979-1983

Cancer Sites	Chinese Migrants		Chinese in Shanghai	
	Males	Females	Males	Females
	RR (95%CI)	RR (95%CI)	RR (95%CI)	RR (95%CI)
Nasopharynx	63.7 (6.8, 596.8)*	39.2 (2.3, 652.2)*	11.0 (8.8, 13.8)*	8.6 (6.2, 12.0)*
Esophagus	1.0 (0.1, 7.7)	2.4 (0.1, 47.1)	9.8 (8.8, 10.9)*	12.5 (10.7, 14.7)*
Stomach	1.8 (0.6, 5.2)	0.2 (0.1, 0.6)*	7.5 (7.0, 8.0)*	7.0 (6.4, 7.7)*
Colon	0.8 (0.4, 1.6)	0.5 (0.3, 0.9)*	0.5 (0.4, 0.6)*	0.5 (0.4, 0.6)*
Rectum	1.9 (0.8, 4.3)	0.3 (0.2, 0.6)*	0.7 (0.6, 0.8)*	0.8 (0.7, 0.9)*
Liver	11.9 (1.6, 84.4)*	10.2 (1.0, 103.5)*	27.1 (24.5, 29.9)*	19.1 (16.4, 22.2)*
Gallbladder	4.3 (0.3, 61.6)	0.00	1.7 (1.2, 2.5)*	1.5 (1.1, 1.9)*
Pancreas	1.1 (0.4, 3.2)	0.2 (0.1, 0.4)*	0.8 (0.7, 0.9)*	0.8 (0.6, 0.9)*
Lung	1.3 (0.8, 2.1)	1.6 (0.8, 3.0)	1.3 (1.2, 1.4)*	1.3 (1.2, 1.4)*
Prostate	0.3 (0.2, 0.5)*	n/a	0.04 (0.04, 0.05)*	n/a
Breast	n/a	0.4 (0.3, 0.6)*	n/a	0.3 (0.2, 0.4)*
Cervix	n/a	1.1 (0.5, 2.5)	n/a	1.1 (0.9, 1.2)
Uterus	n/a	0.8 (0.4, 1.5)	n/a	0.2 (0.2, 0.3)*
Ovary	n/a	0.7 (0.3, 1.4)	n/a	0.5 (0.4, 0.6)*
Bladder	0.5 (0.2, 1.2)	1.3 (0.3, 5.0)	0.7 (0.6, 0.8)*	0.6 (0.5, 0.8)*
Kidney	1.5 (0.5, 4.6)	0.7 (0.2, 2.7)	0.3 (0.2, 0.3)*	0.3 (0.2, 0.4)*
Thyroid	0.00	0.8 (0.2, 3.0)	0.9 (0.7, 1.4)	0.9 (0.8, 1.2)
Others	0.8 (0.5, 1.1)	0.8 (0.6, 1.3)	n/a	n/a
All (but 173)	1.1 (0.9, 1.3)	0.8 (0.7, 0.9)*	1.1 (1.0, 1.1)*	0.8 (0.7, 0.8)*
All	0.9 (0.7, 1.1)	0.7 (0.6, 0.8)*	0.9 (0.8, 0.9)*	0.7 (0.6, 0.7)*

* p < 0.05

Table J-3. Estimates of ASIRRs for Chinese immigrants and Chinese in Shanghai relative to Canadian-born adjusted for age, by sex and site, 1984-1988

Cancer Sites	Chinese Migrants		Chinese in Shanghai	
	Males	Females	Males	Females
	RR (95%CI)	RR (95%CI)	RR (95%CI)	RR (95%CI)
Nasopharynx	37.7 (6.0, 237.5)*	42.9 (1.8, 1026.8)*	8.8 (7.1, 11.0)*	6.2 (4.6, 8.3)*
Esophagus	1.7 (0.5, 5.5)	0.00	4.7 (4.2, 5.3)*	9.1 (7.8, 10.7)*
Stomach	0.9 (0.4, 1.8)	1.8 (0.7, 4.5)	5.8 (5.5, 6.2)*	5.7 (5.3, 6.3)*
Colon	0.4 (0.3, 0.7)*	1.1 (0.7, 1.7)	0.5 (0.4, 0.5)*	0.5 (0.4, 0.6)*
Rectum	0.9 (0.6, 1.7)	0.5 (0.3, 0.9)*	0.6 (0.5, 0.7)*	0.8 (0.7, 0.9)*
Liver	11.1 (2.9, 42.2)*	5.6 (1.2, 27.5)*	13.7 (12.6, 14.9)*	9.6 (8.4, 10.9)*
Gallbladder	2.5 (0.6, 11.5)	0.9 (0.2, 3.6)	1.2 (0.9, 1.6)	1.7 (1.4, 2.0)*
Pancreas	1.0 (0.5, 2.0)	0.6 (0.3, 1.1)	0.6 (0.5, 0.7)*	0.6 (0.5, 0.7)*
Lung	0.9 (0.7, 1.2)	0.9 (0.6, 1.4)	0.9 (0.9, 1.0)	0.7 (0.6, 0.8)*
Prostate	0.3 (0.3, 0.5)*	n/a	0.04 (0.03, 0.04)*	n/a
Breast	n/a	0.5 (0.5, 0.7)*	n/a	0.3 (0.2, 0.3)*
Cervix	n/a	1.7 (0.9, 3.2)	n/a	0.5 (0.4, 0.6)*
Uterus	n/a	0.4 (0.3, 0.8)*	n/a	0.2 (0.1, 0.2)*
Ovary	n/a	0.4 (0.2, 0.7)*	n/a	0.4 (0.3, 0.5)*
Bladder	0.9 (0.5, 1.8)	0.3 (0.1, 0.9)*	0.7 (0.6, 0.8)*	0.7 (0.5, 0.9)*
Kidney	0.3 (0.1, 0.7)*	0.7 (0.3, 1.8)	0.3 (0.2, 0.3)*	0.3 (0.2, 0.4)*
Thyroid	3.3 (0.7, 14.6)	0.8 (0.3, 2.1)	0.6 (0.4, 0.9)*	0.7 (0.6, 0.9)*
Others	0.5 (0.4, 0.6)*	0.7 (0.5, 0.9)*	n/a	n/a
All (but 173)	0.8 (0.7, 0.9)*	0.8 (0.7, 0.9)*	0.9 (0.8, 0.9)*	0.6 (0.63, 0.67)*
All	0.7 (0.6, 0.8)*	0.7 (0.6, 0.8)*	0.8 (0.7, 0.8)*	0.6 (0.57, 0.61)*

* p < 0.05

Table J-4. Estimates of ASIRRs for Chinese immigrants and Chinese in Shanghai relative to Canadian-born adjusted for age, by sex and site, 1989-1993

Cancer Sites	Chinese Migrants		Chinese in Shanghai	
	Males	Females	Males	Females
	RR (95%CI)	RR (95%CI)	RR (95%CI)	RR (95%CI)
Nasopharynx	63.3 (12.8, 311.7)*	14.8 (0.5, 391.0)	13.2 (10.8, 16.3)*	11.7 (8.5, 16.3)*
Esophagus	1.9 (0.7, 5.1)	0.00	4.5 (4.1, 5.0)*	4.7 (4.0, 5.5)*
Stomach	1.3 (0.7, 2.3)	1.3 (0.6, 3.1)	5.6 (5.3, 5.9)*	5.9 (5.5, 6.4)*
Colon	1.1 (0.7, 1.6)	0.9 (0.6, 1.5)	0.7 (0.6, 0.8)*	0.8 (0.7, 0.9)*
Rectum	0.9 (0.6, 1.5)	0.6 (0.3, 1.1)	0.7 (0.6, 0.8)*	1.0 (0.8, 1.1)
Liver	7.5 (2.9, 19.4)*	5.1 (1.1, 23.4)*	12.2 (11.2, 13.2)*	10.8 (9.5, 12.2)*
Gallbladder	2.4 (0.6, 8.9)	1.6 (0.5, 5.1)	1.7 (1.4, 2.1)*	2.2 (1.9, 2.7)*
Pancreas	0.8 (0.4, 1.4)	0.5 (0.3, 1.0)	0.7 (0.6, 0.8)*	0.7 (0.6, 0.8)*
Lung	0.9 (0.7, 1.1)	0.3 (0.2, 0.5)*	1.1 (1.0, 1.2)*	0.7 (0.6, 0.7)*
Prostate	0.2 (0.2, 0.3)*	n/a	0.04 (0.03, 0.05)*	n/a
Breast	n/a	0.6 (0.5, 0.7)*	n/a	0.34 (0.32, 0.36)*
Cervix	n/a	1.0 (0.5, 1.8)	n/a	0.4 (0.3, 0.5)*
Uterus	n/a	0.7 (0.4, 1.1)	n/a	0.3 (0.2, 0.3)*
Ovary	n/a	1.5 (0.7, 3.1)	n/a	0.5 (0.4, 0.6)*
Bladder	0.3 (0.2, 0.5)*	0.6 (0.2, 1.4)	0.7 (0.6, 0.8)*	0.7 (0.6, 0.9)*
Kidney	0.8 (0.4, 1.5)	0.3 (0.1, 0.7)*	0.4 (0.3, 0.5)*	0.5 (0.3, 0.6)*
Thyroid	0.00	4.8 (0.9, 25.6)	0.9 (0.7, 1.3)	0.9 (0.7, 1.0)
Others	0.6 (0.5, 0.7)*	0.5 (0.4, 0.7)*	n/a	n/a
All (but 173)	0.8 (0.7, 0.9)*	0.7 (0.6, 0.8)*	0.92 (0.91, 0.94)*	0.7 (0.6, 0.7)*
All	0.7 (0.6, 0.8)*	0.7 (0.6, 0.8)*	0.86 (0.85, 0.89)*	0.7 (0.6, 0.7)*

* p < 0.05

APPENDIX K

**DESCRIPTIVE ANALYSIS RESULTS OF BIRTHPLACE MISSING
UNADJUSTED CASES IN CANADIAN-BORN, CHINESE-BORN
ALBERTA RESIDENTS AND SHANGHAI CHINESE, 1974-1993**

Table K-1. 1974-1993 ASIR comparison between Canadian-born and Chinese-born Alberta residents

Male	Canadian-born		Chinese-born					
ICD9	ASIR 1	SE 1	ASIR 2	SE 2	X	ASIR2/ASIR1	lower	upper
147 nasopharynx	0.35	0.05	18.44	2.33	7.75	53.27	19.49	145.60 y
150 esophagus	2.55	0.14	5.45	1.29	2.23	2.13	1.10	4.16 y
151 stomach	7.91	0.25	9.43	1.71	0.88	1.19	0.81	1.76
153 colon	16.83	0.36	14.30	2.08	-1.20	0.85	0.65	1.11
154 rectum	12.53	0.31	14.25	2.26	0.76	1.14	0.81	1.59
155 liver	1.68	0.11	16.74	2.46	6.11	9.97	4.77	20.86 y
156 gallbladder	1.27	0.10	3.16	0.95	1.97	2.49	1.00	6.17 y
157 pancreas	7.28	0.24	7.53	1.52	0.16	1.03	0.69	1.55
162 lung	45.21	0.59	44.53	3.71	-0.18	0.98	0.84	1.16
185 prostate	44.30	0.60	13.07	1.98	-15.08	0.30	0.25	0.35 y
188 bladder	9.48	0.28	5.52	1.31	-2.95	0.58	0.41	0.83 y
189 kidney	6.41	0.22	4.57	1.19	-1.52	0.71	0.46	1.10
193 thyroid gland	1.29	0.09	1.33	0.60	0.06	1.03	0.42	2.55
others	67.23	0.68	38.79	4.01	-7.00	0.58	0.49	0.67 y
All cancers, but 17	224.31	1.30	197.09	8.12	-3.31	0.88	0.81	0.95 y
All cancers	260.31	1.41	201.51	8.26	-7.02	0.77	0.72	0.83 y
Females	Canadian-born		Chinese-born					
ICD9	ASIR 1	SE 1	ASIR 2	SE 2	X	ASIR2/ASIR1	lower	upper
147 nasopharynx	0.21	0.04	6.89	1.70	3.92	32.67	5.71	186.89 y
150 esophagus	0.74	0.07	0.29 *	0.29	-1.53	0.39	0.12	1.30
151 stomach	3.34	0.15	4.30	0.99	0.96	1.29	0.77	2.16
153 colon	14.17	0.31	13.45	1.87	-0.38	0.95	0.73	1.24
154 rectum	7.70	0.22	4.74	1.09	-2.67	0.62	0.43	0.88 y
155 liver	0.77	0.07	5.02	1.13	3.75	6.51	2.45	17.30 y
156 gallbladder	1.50	0.10	2.16	0.74	0.89	1.44	0.64	3.23
157 pancreas	5.25	0.19	2.53	0.72	-3.67	0.48	0.33	0.71 y
162 lung	19.52	0.36	15.39	1.93	-2.10	0.79	0.63	0.98 y
174 breast	64.75	0.64	34.86	3.10	-9.44	0.54	0.47	0.61 y
180 cervix	7.91	0.21	10.25	1.67	1.39	1.30	0.90	1.87
182 uterus	13.69	0.30	9.12	1.58	-2.85	0.67	0.50	0.88 y
183 ovary	10.11	0.25	8.44	1.81	-0.92	0.83	0.57	1.23
188 bladder	2.53	0.13	1.62	0.59	-1.51	0.64	0.36	1.14
189 kidney	3.30	0.15	1.67	0.66	-2.42	0.51	0.29	0.88 y
193 thyroid gland	3.22	0.13	6.64	2.19	1.55	2.06	0.83	5.12
others	41.63	0.51	26.74	3.32	-4.43	0.64	0.53	0.78 y
All cancers, but 17	200.34	1.13	154.11	7.04	-6.49	0.77	0.71	0.83 y
All cancers	222.10	1.19	157.53	7.09	-8.98	0.71	0.66	0.76 y

* cases less than 5

y - significant

$X = (ASIR2 - ASIR1) / \sqrt{SE1^2 + SE2^2}$

lower: $(ASIR2 / ASIR1)^{(1-1.96/X)}$

upper: $(ASIR2 / ASIR1)^{(1+1.96/X)}$

See p135-139 'Cancer Registration, Principles and Methods' by Jensen OM et al., 1991 IARC

Table K-2. 1974-1993 ASIR comparison between Canadian-born pop and Shanghai Chinese

Males		Canadian-born, 1974-93		Shanghai, 1975-92				
ICD9	ASIR 1	SE 1	ASIR 2	SE 2	X	ASIR2/ASIR1	lower	upper
147 nasopharynx	0.35	0.05	4.16	0.08	40.79	12.01	10.66	13.54 y
150 esophagus	2.55	0.14	16.00	0.17	62.62	6.27	5.92	6.64 y
151 stomach	7.91	0.25	51.63	0.29	113.87	6.53	6.32	6.74 y
153 colon	16.83	0.36	10.00	0.13	-17.69	0.59	0.56	0.63 y
154 rectum	12.53	0.31	8.93	0.12	-10.86	0.71	0.67	0.76 y
155 liver	1.68	0.11	30.19	0.22	115.27	17.98	17.12	18.89 y
156 gallbladder	1.27	0.10	2.08	0.06	6.97	1.64	1.43	1.89 y
157 pancreas	7.28	0.24	5.85	0.10	-5.54	0.80	0.74	0.87 y
162 lung	45.21	0.59	54.78	0.30	14.52	1.21	1.18	1.24 y
185 prostate	44.30	0.60	2.00	0.06	-69.62	0.05	0.04	0.05 y
188 bladder	9.48	0.28	6.87	0.11	-8.75	0.73	0.67	0.78 y
189 kidney	6.41	0.22	2.16	0.06	-18.84	0.34	0.30	0.38 y
193 thyroid gland	1.29	0.09	1.15	0.04	-1.36	0.89	0.76	1.05
others	67.23	0.68	36.04	0.25	-42.92	0.54	0.52	0.55 y
All but 173	224.31	1.30	231.83	0.62	5.21	1.03	1.02	1.05 y
All	260.31	1.41	231.83	0.62	-18.52	0.89	0.88	0.90 y
Females		Canadian-born, 1974-93		Shanghai, 1975-92				
ICD9	ASIR 1	SE 1	ASIR 2	SE 2	X	ASIR2/ASIR1	lower	upper
147 nasopharynx	0.21	0.04	1.82	0.05	24.79	8.61	7.26	10.21 y
150 esophagus	0.74	0.07	6.56	0.10	49.14	8.84	8.11	9.65 y
151 stomach	3.34	0.15	22.25	0.18	81.43	6.67	6.37	6.98 y
153 colon	14.17	0.31	8.99	0.11	-15.81	0.63	0.60	0.67 y
154 rectum	7.70	0.22	7.10	0.10	-2.44	0.92	0.86	0.98
155 liver	0.77	0.07	10.54	0.12	68.70	13.64	12.66	14.70 y
156 gallbladder	1.50	0.10	3.02	0.07	12.73	2.02	1.81	2.25 y
157 pancreas	5.25	0.19	3.96	0.07	-6.44	0.75	0.69	0.82 y
162 lung	19.52	0.36	18.16	0.16	-3.48	0.93	0.89	0.97 y
174 breast	64.75	0.64	20.96	0.18	-66.45	0.32	0.31	0.33 y
180 cervix	7.91	0.21	5.87	0.09	-8.89	0.74	0.70	0.79 y
182 uterus	13.69	0.30	3.17	0.07	-34.33	0.23	0.21	0.25 y
183 ovary	10.11	0.25	5.16	0.09	-18.57	0.51	0.48	0.55 y
188 bladder	2.53	0.13	1.75	0.05	-5.57	0.69	0.61	0.79 y
189 kidney	3.30	0.15	1.27	0.04	-13.33	0.38	0.33	0.44 y
193 thyroid gland	3.22	0.13	3.20	0.07	-0.17	0.99	0.90	1.09
others	41.63	0.51	25.72	0.21	-28.93	0.62	0.60	0.64 y
All but 173	200.34	1.13	149.93	0.47	-41.30	0.75	0.74	0.76 y
All	222.10	1.19	149.93	0.47	-56.49	0.68	0.67	0.68 y

* cases less than 5

$X = (ASIR2 - ASIR1) / \sqrt{SE1^2 + SE2^2}$

lower: $(ASIR2 / ASIR1)^{(1-1.96/X)}$

upper: $(ASIR2 / ASIR1)^{(1+1.96/X)}$

See p135-139 'Cancer Registration, Principles and Methods' by Jensen OM et al., 1991 IARC

Table K-3. 1974-1993 ASIR comparison between Chinese immigrants and Shanghai Chinese

Males	Shanghai, 1975-92		Chinese immigrants 74-93					
ICD9	ASIR 1	SE 1	ASIR 2	SE 2	X	ASIR2/ASIR1	lower	upper
147 nasopharynx	4.16	0.08	18.44	2.33	6.11	4.43	2.75	7.15 y
150 esophagus	16.00	0.17	5.45	1.29	-8.10	0.34	0.26	0.44 y
151 stomach	51.63	0.29	9.43	1.71	-24.36	0.18	0.16	0.21 y
153 colon	10.00	0.13	14.30	2.08	2.06	1.43	1.02	2.01 y
154 rectum	8.93	0.12	14.25	2.26	2.35	1.60	1.08	2.35 y
155 liver	30.19	0.22	16.74	2.46	-5.44	0.55	0.45	0.69 y
156 gallbladder	2.08	0.06	3.16	0.95	1.12	1.52	0.73	3.13
157 pancreas	5.85	0.10	7.53	1.52	1.11	1.29	0.82	2.01
162 lung	54.78	0.30	44.53	3.71	-2.75	0.81	0.70	0.94 y
185 prostate	2.00	0.06	13.07	1.98	5.59	6.55	3.39	12.66 y
188 bladder	6.87	0.11	5.52	1.31	-1.03	0.80	0.53	1.22
189 kidney	2.16	0.06	4.57	1.19	2.03	2.12	1.02	4.39 y
193 thyroid gland	1.15	0.04	1.33	0.60	0.29	1.15	0.45	2.97
others	36.04	0.25	38.79	4.01	0.68	1.08	0.87	1.33
All, but 173	231.83	0.62	197.09	8.12	-4.27	0.85	0.79	0.92 y
All	231.83	0.62	201.51	8.26	-3.66	0.87	0.81	0.94 y
Females	Shanghai, 1975-92		Chinese immigrants 74-93					
ICD9	ASIR 1	SE 1	ASIR 2	SE 2	X	ASIR2/ASIR1	lower	upper
147 nasopharynx	1.82	0.05	6.89	1.70	2.98	3.79	1.58	9.13 y
150 esophagus	6.56	0.10	0.29 *	0.29	-20.67	0.04	0.03	0.06 y
151 stomach	22.25	0.18	4.30	0.99	-17.81	0.19	0.16	0.23 y
153 colon	8.99	0.11	13.45	1.87	2.38	1.50	1.07	2.09 y
154 rectum	7.10	0.10	4.74	1.09	-2.16	0.67	0.46	0.96 y
155 liver	10.54	0.12	5.02	1.13	-4.85	0.48	0.35	0.64 y
156 gallbladder	3.02	0.07	2.16	0.74	-1.16	0.72	0.41	1.26
157 pancreas	3.96	0.07	2.53	0.72	-1.97	0.64	0.41	1.00 y
162 lung	18.16	0.16	15.39	1.93	-1.43	0.85	0.68	1.06
174 breast	20.96	0.18	34.86	3.10	4.47	1.66	1.33	2.08 y
180 cervix	5.87	0.09	10.25	1.67	2.62	1.74	1.15	2.65 y
182 uterus	3.17	0.07	9.12	1.58	3.77	2.88	1.66	4.98 y
183 ovary	5.16	0.09	8.44	1.81	1.81	1.64	0.96	2.78
188 bladder	1.75	0.05	1.62	0.59	-0.22	0.93	0.46	1.85
189 kidney	1.27	0.04	1.67	0.66	0.61	1.32	0.55	3.18
193 thyroid gland	3.20	0.07	6.64	2.19	1.57	2.08	0.83	5.17 y
others	25.72	0.21	26.74	3.32	0.31	1.04	0.81	1.33
All, but 173	149.93	0.47	154.11	7.04	0.59	1.03	0.94	1.13
All	149.93	0.47	157.53	7.09	1.07	1.05	0.96	1.15

* cases less than 5

$$X = (ASIR2 - ASIR1) / \text{SQRT}(SE1^2 + SE2^2)$$

$$\text{lower: } (ASIR2 / ASIR1) ^ (1-1.96/X)$$

$$\text{upper: } (ASIR2 / ASIR1) ^ (1+ 1.96/X)$$

See p135-139 'Cancer Registration, Principles and Methods' by Jensen OM et al., 1991 IARC

APPENDIX L

DESCRIPTIVE ANALYSIS RESULTS OF COMPARISON BETWEEN CANADIAN-BORN, CHINESE-BORN ALBERTA RESIDENTS AND SHANGHAI CHINESE BY DIAGNOSTIC PERIOD

Table L-1. 1974-1978 ASIR comparison between Canadian-born and Chinese-born Alberta residents

Males		Canadian-born		Chinese-born				
ICD9	ASIR 1	SE 1	ASIR 2	SE 2	X SIR2/ASIR1	lower	upper	
147 nasopharynx	0.28	0.10	12.51	5.35	2.29	45.16	1.73	1181.67 y
150 esophagus	1.74	0.26	9.86 *	5.08	1.60	5.66	0.67	47.50
151 stomach	6.29	0.51	8.14 *	4.75	0.39	1.29	0.35	4.77
153 colon	11.96	0.71	16.34	6.38	0.68	1.37	0.56	3.35
154 rectum	9.35	0.62	9.20 *	4.83	-0.03	0.98	0.35	2.76
155 liver	0.49	0.13	2.95 *	2.95	0.83	6.01	0.09	408.52
156 gallbladder	0.63	0.15	0.00 *	0.00	-4.19	0.00	0.00	0.00
157 pancreas	2.82	0.33	6.09 *	4.30	0.76	2.16	0.29	15.87
162 lung	26.84	1.04	27.96	8.34	0.13	1.04	0.57	1.90
185 prostate	27.00	1.12	11.77	5.00	-2.97	0.44	0.25	0.75 y
188 bladder	9.71	0.65	10.28 *	5.21	0.11	1.06	0.38	2.97
189 kidney	4.32	0.40	2.95 *	2.95	-0.46	0.68	0.13	3.47
193 thyroid gland	1.40	0.21	0.00 *	0.00	-6.60	0.00	0.00	0.00
others	50.68	1.33	25.28	9.71	-2.59	0.50	0.29	0.84 y
All cancers (but 173	153.50	2.47	143.33	19.83	-0.51	0.93	0.72	1.22
All cancer	199.71	2.83	152.84	21.08	-2.20	0.77	0.60	0.97 y
Females		Canadian-born		Chinese-born				
ICD9	ASIR 1	SE 1	ASIR 2	SE 2	X SIR2/ASIR1	lower	upper	
147 nasopharynx	0.22	0.08	6.61 *	3.83	1.67	30.63	0.55	1710.71
150 esophagus	0.31	0.11	0.00 *	0.00	-2.93	0.00	0.00	0.00
151 stomach	2.05	0.27	4.04 *	2.88	0.69	1.97	0.28	13.58
153 colon	11.94	0.66	13.40	5.48	0.26	1.12	0.48	2.64
154 rectum	6.02	0.47	12.64	5.20	1.27	2.10	0.67	6.61
155 liver	0.29	0.09	1.75 *	1.75	0.83	6.01	0.09	410.83
156 gallbladder	0.62	0.15	4.64 *	3.28	1.22	7.43	0.30	185.26
157 pancreas	1.62	0.25	0.00 *	0.00	-6.61	0.00	0.00	0.00
162 lung	7.06	0.50	8.14 *	4.11	0.26	1.15	0.40	3.36
174 breast	55.57	1.36	23.42	7.10	-4.45	0.42	0.29	0.62 y
180 cervix	7.05	0.46	9.80	4.44	0.62	1.39	0.49	3.97
182 uterus	14.12	0.70	12.41	5.10	-0.33	0.88	0.41	1.88
183 ovary	8.20	0.52	4.19 *	2.97	-1.33	0.51	0.19	1.38
188 bladder	2.63	0.32	1.75 *	1.75	-0.49	0.67	0.13	3.34
189 kidney	2.74	0.31	0.00 *	0.00	-8.82	0.00	0.00	0.00
193 thyroid gland	3.00	0.30	2.29 *	2.29	-0.31	0.76	0.14	4.24
others	28.96	0.98	18.40	8.36	-1.25	0.64	0.31	1.29
All cancers but 173	152.41	2.27	123.48	17.14	-1.67	0.81	0.63	1.04
All cancers	178.86	2.48	130.85	17.54	-2.71	0.73	0.58	0.92 y

* cases less than 5 y = significant

$X = (ASIR2 - ASIR1) / \sqrt{SE1^2 + SE2^2}$

lower: $(ASIR2 / ASIR1)^{(1-1.96/X)}$

upper: $(ASIR2 / ASIR1)^{(1+1.96/X)}$

See p135-139 'Cancer Registration, Principles and Methods' by Jensen OM et al., 1991 IARC

Table L-2. 1979-1983 ASIR comparison between Canadian-born and Chinese-born

Males

	Canadian-born, 7983		Chinese-born, 7983					
ICD9	ASIR 1	SE 1	ASIR 2	SE 2	X	ASIR2/ASIR1	lower	upper
147 nasopharynx	0.39	0.10	24.80	6.71	3.64	63.67	6.79	596.80 y
150 esophagus	2.14	0.28	2.22 *	2.22	0.03	1.04	0.14	7.73
151 stomach	7.72	0.54	13.81	5.67	1.07	1.79	0.62	5.19
153 colon	17.91	0.84	14.57	5.57	-0.59	0.81	0.41	1.61
154 rectum	13.61	0.72	26.46	7.86	1.63	1.95	0.87	4.33
155 liver	1.25	0.23	14.86	5.50	2.47	11.88	1.67	84.44 y
156 gallbladder	0.95	0.20	4.13 *	2.93	1.08	4.33	0.30	61.59
157 pancreas	6.46	0.48	7.09 *	3.65	0.17	1.10	0.38	3.18
162 lung	40.21	1.19	53.68	10.90	1.23	1.34	0.84	2.12
185 prostate	45.41	1.40	14.60	5.54	-5.40	0.32	0.21	0.49 y
188 bladder	10.26	0.65	4.84 *	3.43	-1.55	0.47	0.18	1.22
189 kidney	6.50	0.48	9.95	4.57	0.75	1.53	0.50	4.65
193 thyroid gland	1.26	0.18	0.00 *	0.00	-7.08	0.00	0.00	0.00
others	66.96	1.46	52.42	10.86	-1.33	0.78	0.55	1.12
All cancer (but 173)	221.04	2.85	243.43	22.96	0.97	1.10	0.91	1.34
All cancer	269.19	3.16	245.12	23.02	-1.04	0.91	0.76	1.09

Females

ICD9	ASIR 1	SE 1	ASIR 2	SE 2	X	ASIR2/ASIR1	lower	upper
147 nasopharynx	0.23	0.09	9.07	3.45	2.56	39.20	2.36	652.16 y
150 esophagus	0.71	0.15	1.73 *	1.73	0.59	2.42	0.12	47.06
151 stomach	3.51	0.34	0.87 *	0.87	-2.83	0.25	0.09	0.65 y
153 colon	15.76	0.72	8.84	3.41	-1.98	0.56	0.32	0.99 y
154 rectum	9.09	0.53	3.09 *	1.80	-3.20	0.34	0.18	0.66 y
155 liver	0.61	0.15	6.28	2.87	1.97	10.25	1.01	103.53 y
156 gallbladder	1.56	0.23	0.00 *	0.00	-6.89	0.00	0.00	0.00
157 pancreas	4.82	0.40	0.87 *	0.87	-4.13	0.18	0.08	0.41 y
162 lung	14.22	0.65	22.58	5.95	1.40	1.59	0.83	3.04
174 breast	60.13	1.32	26.56	6.09	-5.39	0.44	0.33	0.59 y
180 cervix	7.94	0.44	8.90	3.40	0.28	1.12	0.50	2.49
182 uterus	12.50	0.61	9.97	3.61	-0.69	0.80	0.42	1.51
183 ovary	10.22	0.53	6.71	3.09	-1.12	0.66	0.31	1.37
188 bladder	2.86	0.31	3.71 *	2.23	0.38	1.30	0.34	5.01
189 kidney	3.15	0.31	2.42 *	1.78	-0.41	0.77	0.21	2.75
193 thyroid gland	3.53	0.29	2.92 *	2.10	-0.29	0.83	0.23	3.02
others	43.23	1.13	36.77	8.25	-0.78	0.85	0.57	1.28
All cancers (but 173)	194.08	2.40	151.30	15.06	-2.81	0.78	0.66	0.93 y
All cancers	223.83	2.59	157.23	15.30	-4.29	0.70	0.60	0.83 y

* cases less than 5

$$X = (ASIR2 - ASIR1) / \sqrt{SE1^2 + SE2^2}$$

$$\text{lower: } (ASIR2 / ASIR1) ^ (1-1.96/X)$$

$$\text{upper: } (ASIR2 / ASIR1) ^ (1+ 1.96/X)$$

See p135-139 'Cancer Registration, Principles and Methods' by Jensen OM et al., 1991 IARC

Table L-3. 1984-1988 ASIR comparison between Canadian-born and Chinese-born

Males

ICD9	Canadian-born, 8488		Chinese-born, 8488		X	ASIR2/ASIR1	lower	upper
	ASIR 1	SE 1	ASIR 2	SE 2				
147 nasopharynx	0.42	0.10	15.75	3.97	3.86	37.67	5.98	237.49 y
150 esophagus	3.13	0.30	5.43	2.44	0.94	1.74	0.55	5.52
151 stomach	8.73	0.52	7.85	2.98	-0.29	0.90	0.44	1.84
153 colon	19.02	0.76	8.21	2.92	-3.58	0.43	0.27	0.68 y
154 rectum	12.94	0.61	12.60	3.65	-0.09	0.97	0.55	1.72
155 liver	2.13	0.25	23.69	6.07	3.55	11.14	2.94	42.20 y
156 gallbladder	1.66	0.23	4.19 *	2.10	1.19	2.52	0.55	11.50
157 pancreas	9.22	0.53	9.55	3.20	0.10	1.04	0.53	2.04
162 lung	53.76	1.25	47.57	7.21	-0.85	0.88	0.67	1.17
185 prostate	43.95	1.21	15.29	4.10	-6.70	0.35	0.26	0.47 y
188 bladder	9.32	0.56	8.69	3.09	-0.20	0.93	0.47	1.85
189 kidney	7.52	0.46	2.43 *	1.72	-2.85	0.32	0.15	0.70 y
193 thyroid gland	1.43	0.19	4.66	2.09	1.54	3.26	0.73	14.64
others	74.26	1.42	35.04	7.80	-4.94	0.47	0.35	0.64 y
All cancers, but 173	247.46	2.70	200.96	15.83	-2.90	0.81	0.71	0.93 y
All cancers	289.20	2.94	208.14	16.06	-4.97	0.72	0.63	0.82 y

Females

ICD9	ASIR 1	SE 1	ASIR 2	SE 2	X	ASIR2/ASIR1	lower	upper
147 nasopharynx	0.28	0.08	11.92	5.02	2.32	42.90	1.79	1026.84 y
150 esophagus	0.70	0.13	0.00 *	0.00	-5.34	0.00	0.00	0.00
151 stomach	3.76	0.31	6.96	2.35	1.35	1.85	0.76	4.52
153 colon	15.76	0.63	16.89	3.95	0.28	1.07	0.66	1.73
154 rectum	8.05	0.45	4.09	1.86	-2.06	0.51	0.27	0.97 y
155 liver	1.11	0.17	6.27	2.40	2.15	5.66	1.16	27.53 y
156 gallbladder	1.84	0.22	1.67 *	1.21	-0.14	0.91	0.23	3.58
157 pancreas	6.67	0.41	3.87	1.75	-1.56	0.58	0.29	1.15
162 lung	23.63	0.76	22.67	4.31	-0.22	0.96	0.66	1.39
174 breast	67.31	1.25	36.17	5.85	-5.20	0.54	0.43	0.68 y
180 cervix	8.67	0.42	14.57	3.77	1.55	1.68	0.87	3.23
182 uterus	14.90	0.60	6.84	2.60	-3.02	0.46	0.28	0.76 y
183 ovary	11.16	0.51	4.62	2.08	-3.06	0.41	0.23	0.73 y
188 bladder	2.34	0.25	0.71 *	0.71	-2.15	0.31	0.10	0.90 y
189 kidney	3.90	0.30	2.74 *	1.60	-0.72	0.70	0.27	1.85
193 thyroid gland	3.07	0.26	2.31 *	1.37	-0.55	0.75	0.27	2.09
others	44.00	1.02	29.40	5.13	-2.79	0.67	0.50	0.89 y
All cancers, but 173	217.13	2.27	171.69	13.02	-3.44	0.79	0.69	0.90 y
All cancers	242.81	2.41	173.74	13.10	-5.19	0.72	0.63	0.81 y

* cases less than 5

$X = (ASIR2 - ASIR1) / \sqrt{SE1^2 + SE2^2}$

lower: $(ASIR2 / ASIR1)^{(1-1.96/X)}$

upper: $(ASIR2 / ASIR1)^{(1+1.96/X)}$

See p135-139 'Cancer Registration, Principles and Methods' by Jensen OM et al., 1991 IARC

Table L-4. 1989-1993 ASIR comparison between Canadian-born and Chinese-born

Males

ICD9	Canadian-born, 1989-93		Chinese-born, 1989-93		X	ASIR2/ASIR1		
	ASIR 1	SE 1	ASIR 2	SE 2		lower	upper	
147 nasopharynx	0.32	0.08	20.10	3.88	5.10	63.34	12.87	311.72 y
150 esophagus	2.79	0.25	5.46	1.95	1.36	1.96	0.75	5.15
151 stomach	8.34	0.44	10.59	2.75	0.81	1.27	0.71	2.27
153 colon	17.02	0.63	18.48	3.64	0.40	1.09	0.72	1.63
154 rectum	13.31	0.55	12.26	2.99	-0.34	0.92	0.58	1.47
155 liver	2.28	0.23	17.09	3.58	4.13	7.48	2.88	19.44 y
156 gallbladder	1.48	0.19	3.51	1.58	1.27	2.37	0.63	8.98
157 pancreas	8.64	0.45	7.00	2.23	-0.72	0.81	0.46	1.44
162 lung	50.95	1.08	45.49	5.69	-0.94	0.89	0.71	1.13
185 prostate	53.52	1.12	11.83	2.89	-13.46	0.22	0.18	0.28 y
188 bladder	9.17	0.47	2.74 *	1.38	-4.42	0.30	0.18	0.51 y
189 kidney	6.65	0.39	5.14	1.95	-0.76	0.77	0.40	1.50
193 thyroid gland	1.08	0.14	0.00 *	0.00	-7.49	0.00	0.00	0.00
others	71.28	1.24	41.12	6.23	-4.75	0.58	0.46	0.72 y
All cancers, but 173	246.82	2.37	200.82	12.41	-3.64	0.81	0.73	0.91 y
All cancers	265.23	2.46	202.12	12.44	-4.98	0.76	0.68	0.85 y

Females

ICD9	Canadian-born, 1989-93		Chinese-born, 1989-93		X	ASIR2/ASIR1		
	ASIR 1	SE 1	ASIR 2	SE 2		lower	upper	
147 nasopharynx	0.14	0.05	2.06 *	1.19	1.61	14.81	0.56	391.04
150 esophagus	1.03	0.14	0.00 *	0.00	-7.12	0.00	0.00	0.00
151 stomach	3.54	0.26	4.65	1.76	0.63	1.31	0.56	3.09
153 colon	13.04	0.51	12.48	2.78	-0.20	0.96	0.62	1.48
154 rectum	7.27	0.38	4.17	1.76	-1.73	0.57	0.30	1.08
155 liver	0.90	0.13	4.60	1.76	2.09	5.09	1.11	23.45 y
156 gallbladder	1.58	0.17	2.60	1.18	0.85	1.64	0.53	5.13
157 pancreas	6.21	0.35	3.50	1.37	-1.92	0.56	0.31	1.01
162 lung	26.37	0.73	9.34	2.22	-7.30	0.35	0.27	0.47 y
174 breast	71.17	1.19	42.24	5.59	-5.07	0.59	0.49	0.73 y
180 cervix	7.75	0.37	7.81	2.33	0.03	1.01	0.56	1.83
182 uterus	12.90	0.52	9.00	2.51	-1.53	0.70	0.44	1.11
183 ovary	10.17	0.45	15.09	4.72	1.04	1.48	0.70	3.13
188 bladder	2.40	0.22	1.38 *	0.84	-1.17	0.58	0.23	1.45
189 kidney	3.29	0.26	1.03 *	0.77	-2.78	0.31	0.14	0.71 y
193 thyroid gland	3.23	0.24	15.59	6.69	1.85	4.82	0.91	25.65
others	45.76	0.95	23.49	6.18	-3.56	0.51	0.36	0.74 y
All cancers, but 173	216.76	2.07	159.04	13.27	-4.30	0.73	0.64	0.85 y
All cancers	228.37	2.13	161.03	13.31	-5.00	0.71	0.61	0.81 y

* cases less than 5

$$X = (ASIR2 - ASIR1) / \sqrt{SE1^2 + SE2^2}$$

$$\text{lower: } (ASIR2 / ASIR1) ^{(1-1.96/X)}$$

$$\text{upper: } (ASIR2 / ASIR1) ^{(1+1.96/X)}$$

See p135-139 'Cancer Registration, Principles and Methods' by Jensen OM et al., 1991 IARC

Table L-5. 1974-1978 ASIR comparison between Chinese immigrants and Shanghai Chinese

Males		Shanghai, 1975		Chinese immigrants, 7478				
ICD9	ASIR 1	SE 1	ASIR 2	SE 2	X	ASIR2/ASI	lower	upper
147 nasopharynx	5.86	0.45	12.51	5.35	1.24	2.13	0.64	7.08
150 esophagus	24.73	1.06	9.86 *	5.08	-2.87	0.40	0.21	0.75 y
151 stomach	56.32	1.54	8.14 *	4.75	-9.65	0.14	0.10	0.21 y
153 colon	6.86	0.52	16.34	6.38	1.48	2.38	0.76	7.51
154 rectum	8.67	0.62	9.20 *	4.83	0.11	1.06	0.36	3.09
155 liver	33.44	1.14	2.95 *	2.95	-9.64	0.09	0.05	0.14 y
156 gallbladder	1.02	0.20	0.00 *	0.00	-5.18	0.00	0.00	0.00
157 pancreas	4.08	0.41	6.09 *	4.30	0.46	1.49	0.28	8.07
162 lung	51.18	1.51	27.96	8.34	-2.74	0.55	0.35	0.84 y
185 prostate	0.83	0.19	11.77	5.00	2.19	14.14	1.31	152.17 y
188 bladder	7.74	0.60	10.28 *	5.21	0.48	1.33	0.42	4.19
189 kidney	1.37	0.24	2.95 *	2.95	0.53	2.15	0.13	35.95
193 thyroid gland	2.95	0.32	0.00 *	0.00	-9.31	0.00	0.00	0.00
others	35.81	1.19	25.28	9.71	-1.08	0.71	0.37	1.33
All, but 173	240.88	3.18	143.33	19.83	-4.86	0.60	0.48	0.73 y
All	243.89	3.21	152.84	21.08	-4.27	0.63	0.51	0.78 y
Females		Shanghai, 1975		Chinese immigrants, 7478				
ICD9	ASIR 1	SE 1	ASIR 2	SE 2	X	ASIR2/ASI	lower	upper
147 nasopharynx	2.77	0.31	6.61 *	3.83	1.00	2.39	0.43	13.15
150 esophagus	8.23	0.53	0.00 *	0.00	-15.48	0.00	0.00	0.00
151 stomach	21.74	0.86	4.04 *	2.88	-5.89	0.19	0.11	0.33 y
153 colon	6.41	0.47	13.40	5.48	1.27	2.09	0.67	6.52
154 rectum	6.01	0.45	12.64	5.20	1.27	2.10	0.67	6.62
155 liver	9.43	0.57	1.75 *	1.75	-4.17	0.19	0.08	0.41 y
156 gallbladder	1.57	0.23	4.64 *	3.28	0.93	2.95	0.30	28.58
157 pancreas	2.51	0.29	0.00 *	0.00	-8.55	0.00	0.00	0.00
162 lung	18.34	0.80	8.14 *	4.11	-2.44	0.44	0.23	0.85 y
174 breast	20.67	0.83	23.42	7.10	0.39	1.13	0.60	2.14
180 cervix	22.77	0.87	9.80	4.44	-2.87	0.43	0.24	0.77 y
182 uterus	4.04	0.36	12.41	5.10	1.64	3.07	0.80	11.77
183 ovary	5.09	0.42	4.19 *	2.97	-0.30	0.82	0.23	2.94
188 bladder	1.44	0.22	1.75 *	1.75	0.18	1.22	0.14	10.71
189 kidney	0.99	0.19	0.00 *	0.00	-5.33	0.00	0.00	0.00
193 thyroid gland	8.81	0.56	2.29 *	2.29	-2.77	0.26	0.10	0.67 y
others	19.29	0.81	18.40	8.36	-0.11	0.95	0.40	2.29
All, but 173	165.73	2.38	123.48	17.14	-2.44	0.75	0.59	0.94 y
All	161.69	2.35	130.85	17.54	-1.74	0.81	0.64	1.03

* cases less than 5

$$X = (ASIR2 - ASIR1) / \sqrt{SE1^2 + SE2^2}$$

$$\text{lower: } (ASIR2 / ASIR1)^{(1-1.96/X)}$$

$$\text{upper: } (ASIR2 / ASIR1)^{(1+1.96/X)}$$

See p135-139 'Cancer Registration, Principles and Methods' by Jensen OM et al., 1991 IARC

Table L-6. 1979-1983 ASIR comparison between Chinese immigrants and Shanghai Chinese

Males		Shanghai, 1978-82		Chinese immigrants, 1979-83					
ICD9	ASIR 1	SE 1	ASIR 2	SE 2	X	ASIR2/ASIR1	lower	upper	
147 nasopharynx	4.30	0.16	24.80	6.71	3.05	5.77	1.87	17.75 y	
150 esophagus	21.07	0.38	2.22 *	2.22	-8.36	0.11	0.06	0.18 y	
151 stomach	58.06	0.61	13.81	5.67	-7.76	0.24	0.17	0.34 y	
153 colon	8.68	0.24	14.57	5.57	1.06	1.68	0.64	4.39	
154 rectum	9.35	0.25	26.46	7.86	2.18	2.83	1.11	7.22 y	
155 liver	33.91	0.45	14.86	5.50	-3.45	0.44	0.27	0.70 y	
156 gallbladder	1.68	0.11	4.13 *	2.93	0.84	2.46	0.30	20.29	
157 pancreas	5.43	0.19	7.09 *	3.65	0.46	1.31	0.41	4.13	
162 lung	54.61	0.60	53.68	10.90	-0.08	0.98	0.66	1.46	
185 prostate	1.89	0.12	14.60	5.54	2.30	7.71	1.35	44.11 y	
188 bladder	6.98	0.22	4.84 *	3.43	-0.62	0.69	0.22	2.20	
189 kidney	1.70	0.11	9.95	4.57	1.80	5.85	0.86	39.80	
193 thyroid gland	1.26	0.09	0.00 *	0.00	-14.32	0.00	0.00	0.00	
others	34.85	0.48	52.42	10.86	1.62	1.50	0.92	2.47	
All, but 173	243.76	1.26	243.43	22.96	-0.01	1.00	0.83	1.20	
All	245.50	1.27	245.12	23.02	-0.02	1.00	0.83	1.20	
Females		Shanghai, 1978-82		Chinese immigrants, 1979-83					
ICD9	ASIR 1	SE 1	ASIR 2	SE 2	X	ASIR2/ASIR1	lower	upper	
147 nasopharynx	2.00	0.11	9.07	3.45	2.05	4.54	1.07	19.34 y	
150 esophagus	8.94	0.22	1.73 *	1.73	-4.14	0.19	0.09	0.42 y	
151 stomach	24.63	0.37	0.87 *	0.87	-25.19	0.04	0.03	0.05 y	
153 colon	7.72	0.21	8.84	3.41	0.33	1.15	0.51	2.58	
154 rectum	7.22	0.20	3.09 *	1.80	-2.28	0.43	0.21	0.89 y	
155 liver	11.67	0.25	6.28	2.87	-1.87	0.54	0.28	1.03	
156 gallbladder	2.31	0.11	0.00	0.00	-20.75	0.00	0.00	0.00	
157 pancreas	3.83	0.14	0.87 *	0.87	-3.36	0.23	0.10	0.54 y	
162 lung	18.57	0.32	22.58	5.95	0.67	1.22	0.69	2.15	
174 breast	18.44	0.32	26.56	6.09	1.33	1.44	0.84	2.46	
180 cervix	8.58	0.21	8.90	3.40	0.10	1.04	0.48	2.23	
182 uterus	3.02	0.13	9.97	3.61	1.93	3.31	0.98	11.15	
183 ovary	5.19	0.17	6.71	3.09	0.49	1.29	0.46	3.61	
188 bladder	1.75	0.10	3.71 *	2.23	0.88	2.12	0.40	11.33	
189 kidney	1.01	0.08	2.42 *	1.78	0.79	2.40	0.28	20.84	
193 thyroid gland	3.49	0.15	2.92 *	2.10	-0.27	0.84	0.23	3.04	
others	26.32	0.40	36.77	8.25	1.27	1.40	0.83	2.35	
All, but 173	154.68	0.93	151.30	15.06	-0.22	0.98	0.81	1.19	
All	155.32	3.31	157.23	15.30	0.12	1.01	0.83	1.23	

* cases less than 5

$$X = (ASIR2 - ASIR1) / \sqrt{SE1^2 + SE2^2}$$

$$\text{lower: } (ASIR2 / ASIR1)^{(1-1.96/X)}$$

$$\text{upper: } (ASIR2 / ASIR1)^{(1+1.96/X)}$$

See p135-139 'Cancer Registration, Principles and Methods' by Jensen OM et al., 1991 IARC

Table L-7. 1984-1988 ASIR comparison between Chinese immigrants and Shanghai Chinese

Males		Shanghai, 1983-87		Chinese immigrants 1984-88				
ICD9	ASIR 1	SE 1	ASIR 2	SE 2	X	ASIR2/ASIR1	lower	upper
147 nasopharynx	3.71	0.13	15.75	3.97	3.03	4.25	1.67	10.82 y
150 esophagus	14.76	0.28	5.43	2.44	-3.79	0.37	0.22	0.62 y
151 stomach	50.96	0.51	7.85	2.98	-14.27	0.15	0.12	0.20 y
153 colon	8.93	0.21	8.21	2.92	-0.24	0.92	0.47	1.80
154 rectum	8.39	0.21	12.60	3.65	1.15	1.50	0.75	3.00
155 liver	29.22	0.38	23.69	6.07	-0.91	0.81	0.52	1.27
156 gallbladder	1.96	0.10	4.19 *	2.10	1.05	2.13	0.52	8.69
157 pancreas	5.83	0.17	9.55	3.20	1.16	1.64	0.71	3.77
162 lung	52.65	0.52	47.57	7.21	-0.70	0.90	0.68	1.20
185 prostate	1.79	0.10	15.29	4.10	3.29	8.55	2.38	30.70 y
188 bladder	6.65	0.19	8.69	3.09	0.66	1.31	0.59	2.90
189 kidney	1.90	0.10	2.43 *	1.72	0.31	1.28	0.27	6.15
193 thyroid gland	0.90	0.07	4.66	2.09	1.80	5.19	0.86	31.14
others	35.23	0.45	35.04	7.80	-0.02	0.99	0.64	1.54
All, but 173	222.88	1.08	200.96	15.83	-1.38	0.90	0.78	1.04
All	224.39	1.08	208.14	16.06	-1.01	0.93	0.80	1.07
Females		Shanghai, 1983-87		Chinese immigrants 1984-88				
ICD9	ASIR 1	SE 1	ASIR 2	SE 2	X	ASIR2/ASIR1	lower	upper
147 nasopharynx	1.72	0.09	11.92	5.02	2.03	6.95	1.07	45.04 y
150 esophagus	6.38	0.17	0.00 *	0.00	-38.32	0.00	0.00	0.00
151 stomach	21.62	0.31	6.96	2.35	-6.19	0.32	0.22	0.46 y
153 colon	8.50	0.19	16.89	3.95	2.12	1.99	1.05	3.75 y
154 rectum	6.80	0.17	4.09	1.86	-1.45	0.60	0.30	1.20
155 liver	10.59	0.22	6.27	2.40	-1.79	0.59	0.33	1.05
156 gallbladder	3.08	0.12	1.67 *	1.21	-1.16	0.54	0.19	1.53
157 pancreas	3.99	0.13	3.87	1.75	-0.07	0.97	0.40	2.32
162 lung	17.79	0.28	22.67	4.31	1.13	1.27	0.84	1.94
174 breast	19.11	0.29	36.17	5.85	2.91	1.89	1.23	2.91 y
180 cervix	4.28	0.14	14.57	3.77	2.73	3.41	1.41	8.22 y
182 uterus	2.83	0.11	6.84	2.60	1.54	2.41	0.79	7.42
183 ovary	4.63	0.15	4.62	2.08	-0.01	1.00	0.41	2.42
188 bladder	1.75	0.09	0.71 *	0.71	-1.44	0.41	0.12	1.38
189 kidney	1.19	0.08	2.74 *	1.60	0.97	2.30	0.42	12.44
193 thyroid gland	2.31	0.11	2.31 *	1.37	0.00	1.00	0.31	3.21
others	25.90	0.37	29.40	5.13	0.68	1.14	0.79	1.64
All, but 173	142.46	0.81	171.69	13.02	2.24	1.21	1.02	1.42 y
All	143.56	0.82	173.74	13.10	2.30	1.21	1.03	1.42 y

* cases less than 5

$$X = (ASIR2 - ASIR1) / \sqrt{SE1^2 + SE2^2}$$

y = significant

lower: $(ASIR2 / ASIR1)^{(1-1.96/X)}$ upper: $(ASIR2 / ASIR1)^{(1+1.96/X)}$

See p135-139 'Cancer Registration, Principles and Methods' by Jensen OM et al., 1991 IARC

Table L-8. 1988-1992 ASIR comparison between Chinese immigrants and Shanghai Chinese

Males		Shanghai, 1988-92		Chinese immigrants 1989-93				
ICD9	ASIR 1	SE 1	ASIR 2	SE 2	X	ASIR2/ASIR1	lower	upper
147 nasopharynx	4.20	0.14	20.10	3.88	4.10	4.78	2.26	10.10 y
150 esophagus	12.58	0.24	5.46	1.95	-3.63	0.43	0.28	0.68 y
151 stomach	46.75	0.45	10.59	2.75	-12.97	0.23	0.18	0.28 y
153 colon	12.08	0.23	18.48	3.64	1.75	1.53	0.95	2.46
154 rectum	9.04	0.20	12.26	2.99	1.08	1.36	0.78	2.37
155 liver	27.84	0.35	17.09	3.58	-2.99	0.61	0.45	0.85 y
156 gallbladder	2.54	0.11	3.51 *	1.58	0.61	1.38	0.49	3.90
157 pancreas	6.28	0.17	7.00	2.23	0.32	1.11	0.58	2.16
162 lung	56.75	0.50	45.49	5.69	-1.97	0.80	0.64	1.00 y
185 prostate	2.35	0.10	11.83	2.89	3.28	5.03	1.92	13.21 y
188 bladder	6.89	0.18	2.74	1.38	-2.99	0.40	0.22	0.73 y
189 kidney	2.83	0.12	5.14 *	1.95	1.18	1.82	0.68	4.90
193 thyroid gland	1.05	0.07	0.00	0.00	-14.96	0.00	0.00	0.00
others	37.59	0.44	41.12	6.23	0.57	1.09	0.80	1.49
All but 173	228.77	1.02	200.82	12.41	-2.24	0.88	0.78	0.98 y
All	230.39	1.02	202.12	12.44	-2.26	0.88	0.78	0.98 y

Females		Shanghai, 1988-92		Chinese immigrants 1989-93				
ICD9	ASIR 1	SE 1	ASIR 2	SE 2	X	ASIR2/ASIR1	lower	upper
147 nasopharynx	1.63	0.09	2.06	1.19	0.36	1.26	0.35	4.49
150 esophagus	4.88	0.13	0.00 *	0.00	-36.29	0.00	0.00	0.00
151 stomach	21.09	0.29	4.65	1.76	-9.24	0.22	0.16	0.30 y
153 colon	10.64	0.20	12.48	2.78	0.66	1.17	0.73	1.88
154 rectum	7.32	0.17	4.17	1.76	-1.79	0.57	0.31	1.06
155 liver	9.76	0.20	4.60	1.76	-2.91	0.47	0.28	0.78 y
156 gallbladder	3.60	0.12	2.60 *	1.18	-0.85	0.72	0.34	1.53
157 pancreas	4.12	0.12	3.50	1.37	-0.45	0.85	0.42	1.72
162 lung	18.16	0.26	9.34	2.22	-3.95	0.51	0.37	0.72 y
174 breast	24.62	0.32	42.24	5.59	3.15	1.72	1.23	2.40 y
180 cervix	3.21	0.11	7.81	2.33	1.97	2.43	1.00	5.89 y
182 uterus	3.54	0.12	9.00	2.51	2.18	2.54	1.10	5.89 y
183 ovary	5.55	0.16	15.09	4.72	2.02	2.72	1.03	7.17 y
188 bladder	1.76	0.08	1.38 *	0.84	-0.44	0.79	0.27	2.27
189 kidney	1.59	0.09	1.03 *	0.77	-0.72	0.65	0.20	2.11
193 thyroid gland	2.85	0.11	15.59 *	6.69	1.90	5.47	0.95	31.47
others	26.15	0.36	23.49	6.18	-0.43	0.90	0.55	1.47
All but 173	150.47	0.79	159.04	13.27	0.64	1.06	0.89	1.25
All	151.51	0.79	161.03	13.31	0.71	1.06	0.90	1.26

* cases less than 5

$X = (ASIR2 - ASIR1) / \sqrt{SE1^2 + SE2^2}$ y = significant

lower: $(ASIR2 / ASIR1)^{(1-1.96/X)}$

upper: $(ASIR2 / ASIR1)^{(1+1.96/X)}$

See p135-139 'Cancer Registration, Principles and Methods' by Jensen OM et al., 1991 IARC

Table L-9. 1974-1978 ASIR comparison between Canadian-born pops and Shanghai Chinese

Males		Canadian-born, 1974-78		Shanghai, 1975				
ICD9	ASIR 1	SE 1	ASIR 2	SE 2	X	ASIR2/ASIR1	lower	upper
147 nasopharynx	0.28	0.10	5.86	0.45	12.05	21.16	12.88	34.76 y
150 esophagus	1.74	0.26	24.73	1.06	21.06	14.19	11.09	18.17 y
151 stomach	6.29	0.51	56.32	1.54	30.84	8.95	7.79	10.29 y
153 colon	11.96	0.71	6.86	0.52	-5.80	0.57	0.48	0.69 y
154 rectum	9.35	0.62	8.67	0.62	-0.77	0.93	0.77	1.12
155 liver	0.49	0.13	33.44	1.14	28.61	68.06	50.98	90.88 y
156 gallbladder	0.63	0.15	1.02	0.20	1.61	1.64	0.90	2.99
157 pancreas	2.82	0.33	4.08	0.41	2.39	1.45	1.07	1.97 y
162 lung	26.84	1.04	51.18	1.51	13.28	1.91	1.73	2.10 y
185 prostate	27.00	1.12	0.83	0.19	-23.04	0.03	0.02	0.04 y
188 bladder	9.71	0.65	7.74	0.60	-2.22	0.80	0.65	0.97 y
189 kidney	4.32	0.40	1.37	0.24	-6.24	0.32	0.22	0.46 y
193 thyroid gland	1.40	0.21	2.95	0.32	4.06	2.11	1.47	3.02 y
others	50.68	1.33	35.81	1.19	-8.32	0.71	0.65	0.77 y
All but 173	153.50	2.47	240.88	3.18	21.69	1.57	1.51	1.63 y
All	199.71	2.83	243.89	3.21	10.32	1.22	1.18	1.27 y
Females		Canadian-born, 1974-78		Shanghai, 1975				
ICD9	ASIR 1	SE 1	ASIR 2	SE 2	X	ASIR2/ASIR1	lower	upper
147 nasopharynx	0.22	0.08	2.77	0.31	8.08	12.84	6.91	23.85 y
150 esophagus	0.31	0.11	8.23	0.53	14.60	26.43	17.03	41.03 y
151 stomach	2.05	0.27	21.74	0.86	21.75	10.59	8.56	13.10 y
153 colon	11.94	0.66	6.41	0.47	-6.80	0.54	0.45	0.64 y
154 rectum	6.02	0.47	6.01	0.45	-0.01	1.00	0.81	1.23
155 liver	0.29	0.09	9.43	0.57	15.87	32.39	21.08	49.78 y
156 gallbladder	0.62	0.15	1.57	0.23	3.43	2.52	1.49	4.28 y
157 pancreas	1.62	0.25	2.51	0.29	2.31	1.55	1.07	2.23 y
162 lung	7.06	0.50	18.34	0.80	11.98	2.60	2.22	3.04 y
174 breast	55.57	1.36	20.67	0.83	-21.86	0.37	0.34	0.41 y
180 cervix	7.05	0.46	22.77	0.87	15.99	3.23	2.80	3.73 y
182 uterus	14.12	0.70	4.04	0.36	-12.75	0.29	0.24	0.35 y
183 ovary	8.20	0.52	5.09	0.42	-4.62	0.62	0.51	0.76 y
188 bladder	2.63	0.32	1.44	0.22	-3.05	0.55	0.37	0.81 y
189 kidney	2.74	0.31	0.99	0.19	-4.83	0.36	0.24	0.55 y
193 thyroid gland	3.00	0.30	8.81	0.56	9.17	2.93	2.33	3.69 y
others	28.96	0.98	19.29	0.81	-7.63	0.67	0.60	0.74 y
All but 173	152.41	2.27	165.73	2.38	4.05	1.09	1.04	1.13 y
All	178.86	2.48	161.69	2.35	-5.03	0.90	0.87	0.94 y

* cases less than 5

$$X = (ASIR2 - ASIR1) / \sqrt{SE1^2 + SE2^2}$$

$$\text{lower: } (ASIR2 / ASIR1)^{(1-1.96/X)}$$

$$\text{upper: } (ASIR2 / ASIR1)^{(1+1.96/X)}$$

See p135-139 'Cancer Registration, Principles and Methods' by Jensen OM et al., 1991 IARC

Table L-10. 1979-1983 ASIR comparison between Canadian-born pops and Shanghai Chinese

Males		Canadian-born, 1979-83		Shanghai, 1978-82				
ICD9	ASIR 1	SE 1	ASIR 2	SE 2	X	ASIR2/ASIR1	lower	upper
147 nasopharynx	0.39	0.10	4.30	0.16	20.77	11.04	8.80	13.85 y
150 esophagus	2.14	0.28	21.07	0.38	40.35	9.82	8.79	10.98 y
151 stomach	7.72	0.54	58.06	0.61	61.67	7.52	7.05	8.02 y
153 colon	17.91	0.84	8.68	0.24	-10.61	0.48	0.42	0.55 y
154 rectum	13.61	0.72	9.35	0.25	-5.60	0.69	0.60	0.78 y
155 liver	1.25	0.23	33.91	0.45	64.17	27.11	24.51	29.98 y
156 gallbladder	0.95	0.20	1.68	0.11	3.24	1.76	1.25	2.48 y
157 pancreas	6.46	0.48	5.43	0.19	-2.01	0.84	0.71	1.00 y
162 lung	40.21	1.19	54.61	0.60	10.79	1.36	1.28	1.44 y
185 prostate	45.41	1.40	1.89	0.12	-31.06	0.04	0.03	0.05 y
188 bladder	10.26	0.65	6.98	0.22	-4.77	0.68	0.58	0.80 y
189 kidney	6.50	0.48	1.70	0.11	-9.72	0.26	0.20	0.34 y
193 thyroid gland	1.26	0.18	1.26	0.09	-0.01	1.00	0.73	1.36
others	66.96	1.46	34.85	0.48	-20.87	0.52	0.49	0.55 y
All but 173	221.04	2.85	243.76	1.26	7.30	1.10	1.07	1.13 y
All	269.19	3.16	245.50	1.27	-6.95	0.91	0.89	0.94 y

Females		Canadian-born, 1979-83		Shanghai, 1978-82				
ICD9	ASIR 1	SE 1	ASIR 2	SE 2	X	ASIR2/ASIR1	lower	upper
147 nasopharynx	0.23	0.09	2.00	0.11	12.77	8.64	6.20	12.02 y
150 esophagus	0.71	0.15	8.94	0.22	30.86	12.54	10.68	14.73 y
151 stomach	3.51	0.34	24.63	0.37	42.40	7.02	6.42	7.69 y
153 colon	15.76	0.72	7.72	0.21	-10.72	0.49	0.43	0.56 y
154 rectum	9.09	0.53	7.22	0.20	-3.29	0.79	0.69	0.91 y
155 liver	0.61	0.15	11.67	0.25	37.96	19.05	16.36	22.18 y
156 gallbladder	1.56	0.23	2.31	0.11	2.95	1.48	1.14	1.91 y
157 pancreas	4.82	0.40	3.83	0.14	-2.34	0.79	0.66	0.96 y
162 lung	14.22	0.65	18.57	0.32	6.05	1.31	1.20	1.42 y
174 breast	60.13	1.32	18.44	0.32	-30.69	0.31	0.28	0.33 y
180 cervix	7.94	0.44	8.58	0.21	1.29	1.08	0.96	1.21
182 uterus	12.50	0.61	3.02	0.13	-15.22	0.24	0.20	0.29 y
183 ovary	10.22	0.53	5.19	0.17	-8.99	0.51	0.44	0.59 y
188 bladder	2.86	0.31	1.75	0.10	-3.42	0.61	0.46	0.81 y
189 kidney	3.15	0.31	1.01	0.08	-6.73	0.32	0.23	0.45 y
193 thyroid gland	3.53	0.29	3.49	0.15	-0.11	0.99	0.82	1.19
others	43.23	1.13	26.32	0.40	-14.13	0.61	0.57	0.65 y
All but 173	194.08	2.40	154.68	0.93	-15.32	0.80	0.77	0.82 y
All	223.83	2.59	155.32	3.31	-16.29	0.69	0.66	0.73 y

* cases less than 5

$X = (ASIR2 - ASIR1) / \sqrt{SE1^2 + SE2^2}$ y = significant

lower: $(ASIR2 / ASIR1) ^ (1-1.96/X)$

upper: $(ASIR2 / ASIR1) ^ (1+ 1.96/X)$

See p135-139 'Cancer Registration, Principles and Methods' by Jensen OM et al., 1991 IARC

Table L-11. 1984-1988 ASIR comparison between Canadian-born pop and Shanghai Chinese

Males		Canadian-born, 1984-88		Shanghai, 1983-87					
ICD9	ASIR 1	SE 1	ASIR 2	SE 2	X	ASIR2/ASIR1	lower	upper	
147 nasopharynx	0.42	0.10	3.71	0.13	19.64	8.86	7.13	11.02	y
150 esophagus	3.13	0.30	14.76	0.28	28.47	4.72	4.24	5.25	y
151 stomach	8.73	0.52	50.96	0.51	57.63	5.84	5.50	6.20	y
153 colon	19.02	0.76	8.93	0.21	-12.74	0.47	0.42	0.53	y
154 rectum	12.94	0.61	8.39	0.21	-7.10	0.65	0.58	0.73	y
155 liver	2.13	0.25	29.22	0.38	59.61	13.74	12.61	14.98	y
156 gallbladder	1.66	0.23	1.96	0.10	1.21	1.18	0.90	1.55	
157 pancreas	9.22	0.53	5.83	0.17	-6.04	0.63	0.55	0.73	y
162 lung	53.76	1.25	52.65	0.52	-0.82	0.98	0.93	1.03	
185 prostate	43.95	1.21	1.79	0.10	-34.83	0.04	0.03	0.05	y
188 bladder	9.32	0.56	6.65	0.19	-4.55	0.71	0.62	0.82	y
189 kidney	7.52	0.46	1.90	0.10	-11.85	0.25	0.20	0.32	y
193 thyroid gland	1.43	0.19	0.90	0.07	-2.63	0.63	0.44	0.89	y
others	74.26	1.42	35.23	0.45	-26.24	0.47	0.45	0.50	y
All but 173	247.46	2.70	222.88	1.08	-8.45	0.90	0.88	0.92	y
All	289.20	2.94	224.39	1.08	-20.68	0.78	0.76	0.79	y
Females		Canadian-born, 1984-88		Shanghai, 1983-87					
ICD9	ASIR 1	SE 1	ASIR 2	SE 2	X	ASIR2/ASIR1	lower	upper	
147 nasopharynx	0.28	0.08	1.72	0.09	11.97	6.17	4.58	8.31	y
150 esophagus	0.70	0.13	6.38	0.17	26.86	9.15	7.78	10.75	y
151 stomach	3.76	0.31	21.62	0.31	40.75	5.75	5.29	6.25	y
153 colon	15.76	0.63	8.50	0.19	-10.94	0.54	0.48	0.60	y
154 rectum	8.05	0.45	6.80	0.17	-2.61	0.84	0.74	0.96	y
155 liver	1.11	0.17	10.59	0.22	34.25	9.55	8.39	10.87	y
156 gallbladder	1.84	0.22	3.08	0.12	4.97	1.67	1.36	2.04	y
157 pancreas	6.67	0.41	3.99	0.13	-6.22	0.60	0.51	0.70	y
162 lung	23.63	0.76	17.79	0.28	-7.21	0.75	0.70	0.81	y
174 breast	67.31	1.25	19.11	0.29	-37.43	0.28	0.27	0.30	y
180 cervix	8.67	0.42	4.28	0.14	-9.84	0.49	0.43	0.57	y
182 uterus	14.90	0.60	2.83	0.11	-19.80	0.19	0.16	0.22	y
183 ovary	11.16	0.51	4.63	0.15	-12.33	0.41	0.36	0.48	y
188 bladder	2.34	0.25	1.75	0.09	-2.23	0.75	0.58	0.97	y
189 kidney	3.90	0.30	1.19	0.08	-8.65	0.30	0.23	0.40	y
193 thyroid gland	3.07	0.26	2.31	0.11	-2.71	0.75	0.61	0.92	y
others	44.00	1.02	25.90	0.37	-16.70	0.59	0.55	0.63	y
All but 173	217.13	2.27	142.46	0.81	-30.93	0.66	0.64	0.67	y
All	242.81	2.41	143.56	0.82	-38.99	0.59	0.58	0.61	y

* cases less than 5

$$X = (ASIR2 - ASIR1) / \sqrt{SE1^2 + SE2^2}$$

$$\text{lower: } (ASIR2 / ASIR1)^{(1-1.96/X)}$$

$$\text{upper: } (ASIR2 / ASIR1)^{(1+1.96/X)}$$

See p135-139 'Cancer Registration, Principles and Methods' by Jensen OM et al., 1991 IARC

Table L-12. 1989-1993 ASIR comparison between Canadian-born pop and Shanghai Chinese

Males		Canadian-born, 1989-93		Shanghai, 1988-92					
ICD9	ASIR 1	SE 1	ASIR 2	SE 2	X	ASIR2/ASIR1	lower	upper	
147 nasopharynx	0.32	0.08	4.20	0.14	24.44	13.25	10.77	16.30 y	
150 esophagus	2.79	0.25	12.58	0.24	28.39	4.51	4.07	5.01 y	
151 stomach	8.34	0.44	46.75	0.45	60.76	5.61	5.30	5.93 y	
153 colon	17.02	0.63	12.08	0.23	-7.35	0.71	0.65	0.78 y	
154 rectum	13.31	0.55	9.04	0.20	-7.29	0.68	0.61	0.75 y	
155 liver	2.28	0.23	27.84	0.35	61.13	12.19	11.25	13.20 y	
156 gallbladder	1.48	0.19	2.54	0.11	4.95	1.72	1.39	2.13 y	
157 pancreas	8.64	0.45	6.28	0.17	-4.89	0.73	0.64	0.83 y	
162 lung	50.95	1.08	56.75	0.50	4.87	1.11	1.07	1.16 y	
185 prostate	53.52	1.12	2.35	0.10	-45.51	0.04	0.04	0.05 y	
188 bladder	9.17	0.47	6.89	0.18	-4.58	0.75	0.67	0.85 y	
189 kidney	6.65	0.39	2.83	0.12	-9.43	0.43	0.36	0.51 y	
193 thyroid gland	1.08	0.14	1.05	0.07	-0.18	0.97	0.72	1.31	
others	71.28	1.24	37.59	0.44	-25.62	0.53	0.50	0.55 y	
All but 173	246.82	2.37	228.77	1.02	-7.00	0.93	0.91	0.95 y	
All	265.23	2.46	230.39	1.02	-13.09	0.87	0.85	0.89 y	
Females		Canadian-born, 1989-93		Shanghai, 1988-92					
ICD9	ASIR 1	SE 1	ASIR 2	SE 2	X	ASIR2/ASIR1	lower	upper	
147 nasopharynx	0.14	0.05	1.63	0.09	14.77	11.75	8.48	16.30 y	
150 esophagus	1.03	0.14	4.88	0.13	19.49	4.74	4.05	5.54 y	
151 stomach	3.54	0.26	21.09	0.29	45.15	5.95	5.51	6.43 y	
153 colon	13.04	0.51	10.64	0.20	-4.38	0.82	0.75	0.89 y	
154 rectum	7.27	0.38	7.32	0.17	0.11	1.01	0.90	1.13	
155 liver	0.90	0.13	9.76	0.20	37.38	10.80	9.54	12.24 y	
156 gallbladder	1.58	0.17	3.60	0.12	9.63	2.28	1.93	2.69 y	
157 pancreas	6.21	0.35	4.12	0.12	-5.60	0.66	0.57	0.77 y	
162 lung	26.37	0.73	18.16	0.26	-10.54	0.69	0.64	0.74 y	
174 breast	71.17	1.19	24.62	0.32	-37.84	0.35	0.33	0.37 y	
180 cervix	7.75	0.37	3.21	0.11	-11.69	0.41	0.36	0.48 y	
182 uterus	12.90	0.52	3.54	0.12	-17.65	0.27	0.24	0.32 y	
183 ovary	10.17	0.45	5.55	0.16	-9.66	0.55	0.48	0.62 y	
188 bladder	2.40	0.22	1.76	0.08	-2.75	0.73	0.59	0.91 y	
189 kidney	3.29	0.26	1.59	0.09	-6.18	0.48	0.38	0.61 y	
193 thyroid gland	3.23	0.24	2.85	0.11	-1.42	0.88	0.74	1.05	
others	45.76	0.95	26.15	0.36	-19.32	0.57	0.54	0.60 y	
All sites but 173	216.76	2.07	150.47	0.79	-29.86	0.69	0.68	0.71 y	
All	228.37	2.13	151.51	0.79	-33.83	0.66	0.65	0.68 y	

* cases less than 5

$$X = (ASIR2 - ASIR1) / \sqrt{SE1^2 + SE2^2}$$

$$\text{lower: } (ASIR2 / ASIR1) ^ (1-1.96/X)$$

$$\text{upper: } (ASIR2 / ASIR1) ^ (1+ 1.96/X)$$

See p135-139 'Cancer Registration, Principles and Methods' by Jensen OM et al., 1991 IARC

APPENDIX M

DESCRIPTIVE ANALYSIS RESULTS OF BIRTHPLACE MISSING ADJUSTED CASES IN CANADIAN-BORN AND CHINESE-BORN ALBERTA RESIDENTS, 1989-1993

Table M-1. 1989-1993 ASIR comparison (birthplace missing cases adjusted)

Males

ICD9	Canadian		Chinese		X	ASIR2/ASIR1	lower	upper
	ASIR 1	SE 1	ASIR 2	SE 2				
147 nasopharynx	0.41	0.09	25.64	4.38	5.76	62.53	15.30	255.50 y
150 esophagus	3.63	0.29	7.25	2.24	1.60	1.99	0.86	4.65
151 stomach	10.93	0.50	13.82	3.14	0.91	1.26	0.76	2.10
153 colon	22.33	0.72	24.24	4.17	0.45	1.09	0.76	1.55
154 rectum	17.42	0.63	15.89	3.41	-0.44	0.91	0.61	1.37
155 liver	2.99	0.26	22.34	4.09	4.72	7.48	3.24	17.23 y
156 gallbladder	1.94	0.21	4.61	1.82	1.47	2.38	0.75	7.62
157 pancreas	11.33	0.52	9.27	2.56	-0.79	0.82	0.50	1.35
162 lung	66.76	1.24	59.84	6.53	-1.04	0.90	0.73	1.10
185 prostate	70.53	1.29	15.69	3.33	-15.38	0.22	0.18	0.27 y
188 bladder	12.05	0.53	3.82	1.63	-4.81	0.32	0.20	0.51 y
189 kidney	8.67	0.44	6.69	2.23	-0.87	0.77	0.43	1.38
193 thyroid gland	1.38	0.16	0.00 *	0.00	-8.44	0.00	0.00	0.00
others	92.19	1.41	53.40	7.07	-5.38	0.58	0.47	0.71 y
All cancer sites	322.56	2.71	262.51	19.09	-3.11	0.81	0.71	0.93

Females

ICD9	Canadian		Chinese		X	ASIR2/ASIR1	lower	upper
	ASIR 1	SE 1	ASIR 2	SE 2				
147 nasopharynx	0.18	0.06	2.44	1.29	1.75	13.73	0.73	259.37
150 esophagus	1.24	0.16	0.00 *	0.00	-7.83	0.00	0.00	0.00
151 stomach	4.29	0.29	5.61	1.92	0.68	1.31	0.60	2.83
153 colon	15.82	0.56	15.13	3.05	-0.22	0.96	0.65	1.42
154 rectum	8.80	0.42	4.96	1.91	-1.96	0.56	0.32	1.00
155 liver	1.10	0.15	5.51	1.92	2.29	4.99	1.26	19.83 y
156 gallbladder	1.93	0.19	3.18	1.30	0.95	1.65	0.59	4.62
157 pancreas	7.55	0.39	4.27	1.51	-2.11	0.57	0.33	0.96 y
162 lung	31.70	0.80	11.42	2.44	-7.88	0.36	0.28	0.46 y
174 breast	85.11	1.30	50.17	6.08	-5.62	0.59	0.49	0.71 y
180 cervix	9.24	0.41	9.31	2.54	0.02	1.01	0.58	1.74
182 uterus	15.47	0.57	10.77	2.73	-1.69	0.70	0.46	1.06
183 ovary	12.21	0.49	18.29	5.28	1.15	1.50	0.75	2.99
188 bladder	2.91	0.24	1.68 *	0.93	-1.29	0.58	0.25	1.33
189 kidney	3.97	0.29	1.25 *	0.84	-3.06	0.31	0.15	0.66 y
193 thyroid gland	3.88	0.27	19.67	7.59	2.08	5.07	1.10	23.41 y
others	55.44	1.05	28.92	6.96	-3.77	0.52	0.37	0.73 y
All cancer sites	260.85	2.28	192.58	16.41	-4.12	0.74	0.64	0.85

* cases less than 5

$$X = (ASIR2 - ASIR1) / \sqrt{SE1^2 + SE2^2}$$

$$\text{lower: } (ASIR2 / ASIR1)^{(1-1.96/X)}$$

$$\text{upper: } (ASIR2 / ASIR1)^{(1+1.96/X)}$$

See p135-139 'Cancer Registration, Principles and Methods' by Jensen OM et al., 1991 IARC

APPENDIX N

Results of Poisson Regression Analysis Including Interaction Terms

Table N-1. Poisson regression analysis including interaction models for males

Cancer site	Models	Deviance (D)	Degrees of freedom (df)	D/df	Δ Deviance†	Δ df‡	p-value
All	APB	2007.30	50	* 40.15			
	APB P*B	1195.54	44	* 27.17	811.75	6	0.0001
	APB B*A	1468.34	42	* 34.96	538.96	8	0.0001
	APB P*B B*A	708.74	36	* 19.69	298.56	14	0.0001
Lung	APB	384.09	50	* 7.68			
	APB P*B	216.05	44	* 4.91	168.04	6	0.0001
	APB B*A	357.28	42	* 8.51	26.81	8	0.0001
	APB P*B B*A	182.35	36	* 14.00	201.74	14	0.0001
Colon	APB	329.32	50	* 6.59			0.0001
	APB P*B	272.55	44	* 6.19	56.77	6	0.0001
	APB B*A	136.05	42	* 3.24	193.27	8	0.0001
	APB P*B B*A	69.43	36	* 1.93	59.89	14	0.0001
Liver	APB	270.14	50	* 5.40			
	APB P*B	196.95	44	* 4.48	73.19	6	0.0001
	APB B*A	172.65	42	* 4.11	97.49	8	0.0001
	APB P*B B*A	106.90	36	* 2.97	163.24	14	0.0001
Prostate	APB	98.48	39	* 2.53			
	APB P*B	91.99	33	* 2.79	6.49	6	NS
	APB B*A	68.91	33	* 2.09	29.57	6	0.0001
	APB P*B B*A	63.65	27	* 2.36	34.83	12	0.0001

A: age; P: period; B: birthplace; * significant lack of fit; † compared to 'APB' model; ‡ compared to 'APB' model.

Table N-2. Poisson regression analysis including interaction models for females

Cancer site	Models	Deviance (D)	Degrees of freedom (df)	D/df	Δ Deviance†	Δ df‡	p-value
All	APB	1410.37	50	* 28.21			
	APB P*B	1019.83	44	* 23.18	390.54	6	0.0001
	APB B*A	1108.64	42	* 26.40	301.73	8	0.0001
	APB P*B B*A	701.97	36	* 19.50	708.40	14	0.0001
Lung	APB	559.85	50	* 11.20			
	APB P*B	263.80	44	* 6.00	296.05	6	0.0001
	APB B*A	424.32	42	* 10.10	135.53	8	0.0001
	APB P*B B*A	92.70	36	* 2.58	467.15	14	0.0001
	APB	554.44	50	* 11.09			0.0001
	APB P*B	493.66	44	* 11.22	60.78	6	0.0001
	APB B*A	191.30	42	* 4.55	363.14	8	0.0001
	APB P*B B*A	107.80	36	* 2.99	446.64	14	0.0001
	APB	121.78	50	* 2.43			
	APB P*B	107.58	44	* 2.44	14.20	6	0.0275
Breast	APB B*A	89.93	42	* 2.14	31.84	8	0.0001
	APB P*B B*A	76.33	36	* 2.12	45.44	14	0.0001
	APB	972.54	50	* 19.45			
	APB P*B	933.22	44	* 21.21	39.32	6	0.0001
	APB B*A	163.92	42	* 3.90	808.62	8	0.0001
	APB P*B B*A	121.51	36	* 3.38	851.03	14	0.0001

A: age; P: period; B: birthplace; * significant lack of fit; † compared to 'APB' model; ‡ compared to 'APB' model.

Table N-3. Relative risks by period, age, sex for all cancer (except skin)

All cancer (excl. skin)		Males		Females	
Group		Chinese immigrants	Chinese in Shanghai	Chinese immigrants	Chinese in Shanghai
Without interactions		0.92 (0.85, 1.00)	1.04 (1.03, 1.05)	0.74 (0.68, 0.81)	0.73 (0.72, 0.74)
Period	Age				
1974-78	25-49	0.96	1.82	0.89	1.10
	50-59	0.87	1.84	0.76	0.93
	60-69	0.66	1.66	0.65	1.02
	70-79	0.74	1.55	0.62	1.14
	80+	1.05	1.07	0.78	0.74
1979-83	25-49	1.29	1.28	0.94	0.86
	50-59	1.16	1.29	0.81	0.73
	60-69	0.88	1.16	0.69	0.80
	70-79	0.98	1.09	0.66	0.90
	80+	1.40	0.75	0.83	0.58
1984-88	25-49	0.97	1.05	0.98	0.71
	50-59	0.88	1.06	0.84	0.60
	60-69	0.67	0.95	0.72	0.66
	70-79	0.74	0.89	0.69	0.74
	80+	1.06	0.61	0.87	0.48
1989-93	25-49	1.02	1.03	0.78	0.74
	50-59	0.93	1.05	0.67	0.63
	60-69	0.71	0.94	0.57	0.69
	70-79	0.79	0.88	0.55	0.77
	80+	1.12	0.61	0.69	0.50

Table N-4. Relative risks by period, age, sex for lung cancer

Lung cancer		Males		Females	
Group		Chinese immigrants	Chinese in Shanghai	Chinese immigrants	Chinese in Shanghai
Without interactions		0.99 (0.84, 1.17)	1.19 (1.15, 1.22)	0.83 (0.65, 1.05)	0.89 (0.85, 0.93)
Period	Age				
1974-78	25-49	0.62	1.85	1.34	2.29
	50-59	0.89	1.72	0.54	1.64
	60-69	0.77	1.88	0.80	2.55
	70-79	1.24	2.02	1.71	3.45
	80+	1.28	1.58	1.99	2.73
1979-83	25-49	0.83	1.35	1.67	1.18
	50-59	1.19	1.25	0.67	0.85
	60-69	1.04	1.37	0.99	1.32
	70-79	1.66	1.47	2.13	1.78
	80+	1.72	1.15	2.47	1.41
1984-88	25-49	0.57	0.98	1.29	0.70
	50-59	0.81	0.91	0.52	0.51
	60-69	0.71	0.99	0.77	0.78
	70-79	1.13	1.07	1.65	1.06
	80+	1.17	0.84	1.92	0.84
1989-93	25-49	0.57	1.12	0.51	0.63
	50-59	0.82	1.04	0.21	0.45
	60-69	0.72	1.14	0.30	0.71
	70-79	1.15	1.23	0.65	0.95
	80+	1.19	0.96	0.76	0.75

Table N-5. Relative risks by period, age, sex for colon cancer

Colon cancer		Males		Females	
Group		Chinese immigrants	Chinese in Shanghai	Chinese immigrants	Chinese in Shanghai
Without interactions		0.88 (0.66, 1.17)	0.61 (0.58, 0.64)	0.96 (0.73, 1.25)	0.63 (0.60, 0.66)
Period	Age				
1974-78	25-49	1.94	1.26	1.56	1.10
	50-59	1.23	0.69	1.08	0.63
	60-69	1.01	0.59	1.16	0.48
	70-79	1.18	0.54	1.01	0.40
	80+	1.32	0.29	0.26	0.15
1979-83	25-49	1.21	1.00	0.98	1.12
	50-59	0.77	0.55	0.68	0.64
	60-69	0.63	0.47	0.73	0.49
	70-79	0.73	0.43	0.63	0.40
	80+	0.82	0.23	0.16	0.16
1984-88	25-49	0.72	1.02	1.68	1.26
	50-59	0.46	0.56	1.16	0.72
	60-69	0.38	0.48	1.26	0.55
	70-79	0.44	0.44	1.09	0.45
	80+	0.49	0.24	0.28	0.18
1989-93	25-49	1.74	1.54	1.67	1.90
	50-59	1.11	0.85	1.16	1.08
	60-69	0.91	0.73	1.25	0.83
	70-79	1.06	0.66	1.08	0.68
	80+	1.19	0.36	0.28	0.27

Table N-6. Relative risks by period, age, sex for liver cancer

Liver cancer		Males		Females	
Group		Chinese immigrants	Chinese in Shanghai	Chinese immigrants	Chinese in Shanghai
Without interactions		12.02 (8.91, 16.20)	22.00 (19.21, 25.20)	7.28 (4.57, 11.60)	14.31 (11.87, 17.25)
Period	Age				
1974-78	25-49	48.62	229.82	8.65	23.31
	50-59	28.28	113.23	7.19	29.64
	60-69	21.37	80.33	5.03	34.92
	70-79	4.96	50.21	3.21	32.10
	80+	20.81	23.81	4.08	8.44
1979-83	25-49	32.11	91.13	19.31	20.03
	50-59	18.68	44.90	16.05	25.47
	60-69	14.12	31.86	11.23	30.00
	70-79	3.28	19.91	7.17	27.58
	80+	13.75	9.44	9.12	7.25
1984-88	25-49	24.72	42.67	9.73	9.42
	50-59	14.38	21.02	8.08	11.98
	60-69	10.87	14.91	5.66	14.12
	70-79	2.52	9.32	3.61	12.98
	80+	10.58	4.42	4.59	3.41
1989-93	25-49	19.47	38.29	9.39	11.01
	50-59	11.32	18.86	7.81	14.01
	60-69	8.56	13.38	5.46	16.51
	70-79	1.99	8.37	3.49	15.17
	80+	8.33	3.97	4.43	3.99

Table N-7. Relative risks by period, age, for male prostate and female breast cancers

		Prostate Cancer (Males)		Breast Cancer (Females)	
Group		Chinese immigrants	Chinese in Shanghai	Chinese immigrants	Chinese in Shanghai
Without interactions		0.29 (0.22, 0.39)	0.04 (0.03, 0.05)	0.53 (0.45, 0.63)	0.32 (0.31, 0.33)
Period	Age				
1974-78	25-49	n/a	n/a	0.55	0.58
	50-59	0.56	0.03	0.47	0.34
	60-69	0.27	0.03	0.34	0.27
	70-79	0.38	0.04	0.17	0.25
	80+	0.80	0.04	0.31	0.19
1979-83	25-49	n/a	n/a	0.63	0.50
	50-59	0.42	0.03	0.54	0.29
	60-69	0.20	0.03	0.39	0.24
	70-79	0.28	0.05	0.20	0.22
	80+	0.60	0.04	0.35	0.17
1984-88	25-49	n/a	n/a	0.75	0.47
	50-59	0.45	0.03	0.65	0.27
	60-69	0.22	0.03	0.46	0.22
	70-79	0.31	0.05	0.24	0.20
	80+	0.65	0.04	0.42	0.15
1989-93	25-49	n/a	n/a	0.80	0.56
	50-59	0.28	0.03	0.68	0.32
	60-69	0.13	0.03	0.49	0.26
	70-79	0.19	0.05	0.26	0.24
	80+	0.39	0.05	0.45	0.18

n/a: not available

APPENDIX O

**LETTER FROM DR. HEATHER BRYANT REGARDING THE
DATA QUALITY OF ALBERTA CANCER REGISTRY, 1969-1993**

July 8, 1997

Dr. Yang Mao, Chief
Environmental Risk Assessment and Case Surveillance Division
Cancer Bureau, Health Canada
Tunney's Pasture, Postal Locator O601C1
Ottawa, Ontario K1A 0L1

Re: Birth places on the Alberta Cancer Registry

Dear Yang,

I sent your letter on to Tom Snodgrass and Penny Brasher who have provided the following information which may be helpful to you. The variable of birth place was only introduced in 1981. Thus, there is a low missing percentage from 1981 onward. Subsequent to introduction of the variable, there was a clean-up of some Cancer Registry variables, which is believed to have included the years of approximately 1972 - 1978. Thus, additional birth place information would have been added at that time. The drop in the 1979 data would probably be because this pre-dated the 1981 official entry of this variable on the entry, but it was not included in the clean-up years.

I hope this information is helpful to you. Tom has asked whether you have any additional information on the form of the information which was sent to you as there have been a number of changes to that field over time. My understanding is that you are using the Canadian Cancer Registry data, and that this means you're using the data reported by the Registry at the close of each reporting year; do you know whether any subsequent clean-ups done by Registries are included in the data for the Canadian Cancer Registry? If you have further detail on this, please let us know and we'll try to provide you with interpretation of what the data fields may mean over time.

I hope this information is helpful to you. Hope you're having a wonderful summer.

With best wishes,

Yours truly,

Heather Bryant, MD, PhD, CCFP, FRCP
Director

*Heritage Medical Research Building, Room 322, 3330 Hospital Drive N.W.
Calgary, Alberta, Canada T2N 4N1 Tel: (403) 220-4302 Fax: (403) 270-3898*

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