

SURNAME  
METHODOLOGY IN  
DEFINING ETHNIC  
POPULATIONS:  
CHINESE CANADIANS

**Alberta**  
HEALTH AND WELLNESS

**Surname Methodology in Defining Ethnic Populations:**

**Chinese Canadians**

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## **EXECUTIVE SUMMARY**

A Chinese surname list to define Chinese ethnicity was developed through literature review, a panel review, and a telephone survey of a randomly selected sample in Calgary. It was validated with the Canadian Community Health Survey (CCHS). Results show that the proportion who self-reported as Chinese has high agreement with the proportion identified by the surname list in the CCHS.

The surname list was applied to the Alberta Health Insurance Plan registry database to define the Chinese ethnic population, and to the Vital Statistics Death Registry to assess the Chinese ethnic population mortality in Alberta. Results reveal that the Chinese ethnic population has lower mortality and longer life expectancy than non-Chinese Albertans. This preliminary analysis suggests that the Chinese ethnic population has better health status than Albertans. Reasons for the health gap between Chinese and non-Chinese ethnic populations should be further explored.

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**PART ONE:**

**DEVELOPMENT AND VALIDATION OF CHINESE SURNAME LIST IN  
DEFINING CHINESE CANADIANS**

## 1.1 OBJECTIVES

This study has attempted to develop a sensitive, comprehensive and valid Chinese surname list with which Chinese ethnicity can be defined in large databases.

## 1.2 BACKGROUND

Many secondary databases cannot be readily used to study ethnic variations in population health because of the lack of information on ethnicity. To overcome this limitation, surnames have been used as an alternative source of information for defining ethnicity.<sup>1-4</sup> Surnames have the potential to identify accurately ancestral origin because they are passed on from generation to generation. Six Chinese surname lists have been developed as an indicator of Chinese ethnicity. In 1990, Hage et al.<sup>4</sup> developed a list of 145 Chinese surnames by checking the Melbourne telephone directory. In 1993, Choi et al.<sup>5</sup> using the Ontario Vital Statistics registry developed two Chinese surname lists that included 217 distinctive male surnames and 194 female surnames. In 2001, Tjam<sup>6</sup> selected all possible Chinese names from the Waterloo telephone directory in Canada following Cantonese and Mandarin phonological rules, resulting in 266 distinctive Chinese surnames. In 2004, Quan et al.<sup>7</sup> assessed the agreement between self-perceived Chinese ethnicity and the ethnicity assigned using Tjam's list<sup>6</sup> and proposed a surname list, including 259 surnames for defining Chinese ethnicity.

These published lists are inconsistent in the number and content of surnames due to inherent limitations, namely, a relatively small sample and/or including only a small geographic area. Thus, the comprehensiveness and validity of these lists are uncertain when this methodology is applied to a large database.

## 1.3 METHODS AND MATERIALS

For developing and validating the Chinese surname list, a comprehensive Chinese surname list based on the literature was generated and the list was revised through a panel review. Then, the list was further revised after assessment in a Calgary community-based survey

(internal validation). Finally, the list was validated via comparison between Chinese ethnicity defined using the surname list and self-reported ethnicity (reference standard) in the Canadian Community Health Survey (CCHS, external validation).

### ***1.3.1 Generation of a Comprehensive Chinese Surname List***

Chinese surnames contained in the published surname lists by Hage et al. <sup>4</sup>, Choi et al. <sup>5</sup>, Tjam<sup>6</sup> and Quan et al. <sup>7</sup> were extracted. The list was then enhanced by adding additional surnames from the book of “A Hundred Chinese Surnames,” <sup>8</sup> and Chinese surnames reported in the US census.<sup>9</sup> Chinese surnames that were identified as insensitive in previous studies<sup>4-7</sup> were excluded. These would include, for example, surnames that are shared between ethnic groups, like Young or Lee.

### ***1.3.2 Panel Review of the Comprehensive Chinese Surname List***

Five people (one Mandarin speaking Chinese, one Cantonese speaking Chinese, one Korean/Chinese, one European-origin Canadian, and one Vietnamese) reviewed the list independently. They were instructed to identify Chinese surnames that had the same English spelling with non-Chinese ethnic origin surnames.

Two members of the review panel assessed the frequency of those surnames identified by the five reviewers by cross-checking them with the telephone directory of the City of Edmonton, Alberta, Canada (about 45 000 Chinese in the city). For surnames with high frequencies, possible Chinese were determined through review of first or middle names in addition to the surname. Common surnames in both Chinese and non-Chinese (such as the surname Lee) in the telephone directory were excluded from the comprehensive Chinese surname list.

### ***1.3.3 Validation in Calgary Community Survey (Internal Validation)***

The Calgary community survey collected information on ethnicity and surname through random-digital telephone surveys using a structured questionnaire. The question for Chinese ethnicity was: “People living in Canada come from many different cultural and racial backgrounds. Would you describe your ethnic origins as Chinese?” Primary residential

telephone numbers were randomly selected from the 2003 telephone directory in Calgary. One respondent aged 18 or over at each telephone number was interviewed. The interview was conducted in English, Chinese (Mandarin or Cantonese – the two most common spoken Chinese dialects), or South Asian dialects (Hindi, Urdu, Punjabi and Gujarati). These languages were chosen since Chinese and South Asian Canadians are the two largest visible minority populations in Calgary.<sup>10</sup>

The agreement between self-reported Chinese ancestry in the Calgary community survey and surname-defined Chinese ethnicity was assessed. Discordant cases were examined and the list was modified as appropriate, creating a sensitive and comprehensive surname list. The surname list contained 761 Chinese surnames (in this report, it is referred to as the Second Revised Chinese surname list, or the Second Revision. See Appendix I).

#### ***1.3.4 Validation in CCHS (External validation)***

The CCHS (cycle 1.1) targeted household residents aged 12 years or older in all Canadian provinces and territories; it excluded populations on Indian Reserves, Canadian Forces Bases, and some remote areas. A multiple stage and complex sampling methodology was employed to locate households in 136 health regions across Canada. One respondent per household was selected randomly for telephone interview.<sup>11</sup>

The CCHS collected information on ethnicity through asking: “To which ethnic or cultural groups did your ancestors belong?” Under the question, a list of 18 ethnic groups (including Chinese) was provided. Other demographic information, such as age, sex, marital status, education, household income, country of birth, and year of immigration, was collected by using the structured questionnaire, primarily through telephone interview. Cases with missing data for surname and/or self-reported ethnicity were excluded.

#### ***1.3.5 Data Analysis***

Chinese ethnicity was identified using the surname list by Hage et al.,<sup>4</sup> Choi et al.,<sup>5</sup> Tjam,<sup>6</sup> Quan et al.,<sup>7</sup> and the Second Revision, respectively. The validity of surname-defined Chinese ethnicity was measured by sensitivity (the probability of correctly identifying Chinese using the surname list among those who perceived themselves as Chinese), specificity (the

probability of correctly identifying non-Chinese among those who perceived themselves as non-Chinese), positive predictive value (the extent to which a Chinese detected using the surname list are truly Chinese), and negative predictive value (the extent to which a non-Chinese defined using the surname list are truly non-Chinese). The self-perceived ethnicity was used as a reference standard.

## 1.4 RESULTS

### 1.4.1 Calgary Community Survey (*Internal Validation*)

Of 6,585 telephone numbers dialled, 5,124 people were contacted and 3,021 were surveyed. After excluding surveys with missing data, 2808 respondents were analyzed (54.8% of 5124 surveyed). Self-reported Chinese accounted for 5.4% of the 2,808 respondents. When six Chinese surname lists were applied, the proportion of Chinese ethnicity defined by the Second Revision was 5.2%, which was higher than that defined by Hage's, Choi's, Tjam's and Quan's lists (ranging from 3.4% to 4.8%). Among the six surname lists, the Second Revision had the highest sensitivity (88.2%) and positive predictive value (91.8%). That is, using the Second Revised Surname list, 88% of Chinese were identified and only 12% were missed. The positive predictive value for the Second Revision demonstrates that 92% of persons identified as Chinese with the Second Revision were indeed Chinese or, put another way, 8% who were identified as Chinese were in fact not Chinese. Specificity and negative predictive value were higher than 97% for all six surname lists (See table 1.1).

Table 1.1 Agreement of Chinese ethnicity between self-report and six versions of Chinese surname list in internal data, Calgary survey (N=2808)

| Surname list                 | Prevalence (%) | Sensitivity (%) | PPV (%) | Specificity (%) | NPV (%) |
|------------------------------|----------------|-----------------|---------|-----------------|---------|
| Hage <sup>4</sup>            | 3.4            | 59.9            | 83.5    | 99.3            | 97.7    |
| Choi for male <sup>5</sup>   | 4.3            | 67.7            | 91.3    | 99.6            | 98.0    |
| Choi for female <sup>5</sup> | 3.4            | 60.0            | 91.5    | 99.7            | 97.9    |
| Tjam <sup>6</sup>            | 4.8            | 73.0            | 82.2    | 99.1            | 98.5    |
| Quan <sup>7</sup>            | 4.5            | 72.4            | 88.0    | 99.4            | 98.4    |
| Second Revision              | 5.2            | 88.2            | 91.8    | 99.5            | 99.3    |

Note: PPV- positive predictive value. NPV-negative predictive value

**1.4.2 Canadian Community Health Survey (External Validation)**

Of 131,535 respondents, 19,083 (14.5%) were excluded due to missing or incomplete data of surname or ethnicity, leaving 112,452 respondents for final analysis. The proportion of Chinese defined by the Second Revision (1.5%) was very close to self-report (1.6%, see table 1.2), and the estimated proportions across several socio-demographic variables was similar between the Second Revision and self-report.

Table 1.2. Socio-demographic characteristics specified proportion of Chinese for self-report and the second revision of Chinese surname list in external data, CCHS (N=112 452)

| Characteristics | Self-report<br>Number of Chinese<br>(%) | Second Revision<br>Number of Chinese<br>(%) |
|-----------------|---|---|
| Overall         | 1,800 (1.6)                             | 1,693 (1.5)                                 |
| Sex             |   |   |
| Male            | 915 (1.8)                               | 884 (1.7)                                   |
| Female          | 885 (1.5)                               | 809 (1.3)                                   |
| Age             |   |   |
| 12-17           | 256 (2.2)                               | 228 (2.0)                                   |
| 18-24           | 282 (2.7)                               | 256 (2.4)                                   |
| 25-34           | 295 (1.8)                               | 280 (1.7)                                   |
| 35-44           | 405 (1.9)                               | 388 (1.8)                                   |
| 45-54           | 286 (1.6)                               | 265 (1.4)                                   |
| 55-64           | 109 (0.8)                               | 109 (0.8)                                   |
| 65+             | 167 (0.8)                               | 167 (0.8)                                   |
| Education       |   |   |
| Elementary      | 87 (0.5)                                | 97 (0.5)                                    |
| Secondary       | 284 (1.8)                               | 267 (1.7)                                   |
| Post-secondary  | 1,367 (1.8)                             | 1,275 (1.7)                                 |
| Unknown         | 62 (3.0)                                | 54 (2.7)                                    |
| Marital status  |   |   |
| Single          | 737 (2.2)                               | 675 (2.1)                                   |
| Married         | 907 (1.8)                               | 860 (1.7)                                   |
| Common Law      | 30 (0.4)                                | 23 (0.3)                                    |
| Separated       | 36 (1.0)                                | 33 (0.9)                                    |
| Divorced        | 33 (0.5)                                | 37 (0.5)                                    |
| Widowed         | 53 (0.5)                                | 59 (0.6)                                    |

| Characteristics                         | Self-report<br>Number of Chinese<br>(%) | Second Revision<br>Number of Chinese<br>(%) |
|---|---|---|
| Unknown                                 | 4 (6.3)                                 | 6 (9.4)                                     |
| <b>Income</b>                           |   |   |
| < \$30,000                              | 327 (1.2)                               | 323 (1.2)                                   |
| \$30,000-49,999                         | 322 (1.5)                               | 321 (1.5)                                   |
| \$50,000-79,999                         | 333 (1.4)                               | 302 (1.3)                                   |
| \$80,000+                               | 312 (1.7)                               | 268 (1.5)                                   |
| Unknown                                 | 506 (2.3)                               | 479 (2.1)                                   |
| <b>Speaking English or French</b>       |   |   |
| Yes                                     | 1,510 (1.4)                             | 1,420 (1.3)                                 |
| No                                      | 290 (18.1)                              | 273 (17.1)                                  |
| <b>Length of stay in Canada (years)</b> |   |   |
| ≤ 5                                     | 359 (18.7)                              | 360 (18.8)                                  |
| 6-10                                    | 350 (22.5)                              | 319 (20.5)                                  |
| 11-15                                   | 218 (15.2)                              | 194 (13.5)                                  |
| 16-20                                   | 131 (14.8)                              | 122 (13.8)                                  |
| > 20                                    | 339 (4.0)                               | 287 (3.4)                                   |
| Born in Canada                          | 374 (0.4)                               | 385 (0.4)                                   |
| <b>Canadian province</b>                |   |   |
| British Columbia                        | 836 (5.7)                               | 761 (5.2)                                   |
| Ontario                                 | 570 (1.7)                               | 541 (1.6)                                   |
| Alberta                                 | 190 (1.6)                               | 175 (1.5)                                   |
| Quebec                                  | 77 (0.4)                                | 72 (0.4)                                    |
| Saskatchewan                            | 48 (0.7)                                | 54 (0.8)                                    |
| Manitoba                                | 40 (0.5)                                | 37 (0.5)                                    |
| Atlantic                                | 23 (0.1)                                | 45 (0.3)                                    |
| N.W.T./Yukon/Nunavut                    | 16 (0.8)                                | 8 (0.4)                                     |

Table 1.3 shows the agreement between surname lists and self-reported Chinese. Among the six surname lists, the Second Revision had the highest sensitivity (77.4%) and second highest positive predictive value (82.3%), which was slightly lower than Choi's list for males (83.4%). That is, using the Second Revision, 77% of Chinese were identified and 23% were missed. The positive predictive value for the Second Revision demonstrates that 82% of persons identified as Chinese with the Second Revision were indeed Chinese or, put another way, 18% who were identified as Chinese were in fact not Chinese. Specificity and negative predictive value were over 99% for all six surname lists.

Table 1.3 Agreement of Chinese ethnicity between self-report and six versions of Chinese surname list in external data, CCHS (N=112 452)

| Surname list                 | Prevalence<br>(%) | Sensitivity<br>(%) | PPV<br>(%) | Specificity<br>(%) | NPV<br>(%) |
|------------------------------|-------------------|--------------------|------------|--------------------|------------|
| Hage <sup>4</sup>            | 1.16              | 56.2               | 75.5       | 99.7               | 99.3       |
| Choi for male <sup>5</sup>   | 1.38              | 65.4               | 83.4       | 99.8               | 99.4       |
| Choi for female <sup>5</sup> | 0.92              | 50.2               | 79.9       | 99.8               | 99.3       |
| Tjam <sup>6</sup>            | 1.82              | 68.9               | 60.8       | 99.3               | 99.5       |
| Quan <sup>7</sup>            | 1.33              | 64.1               | 76.8       | 99.7               | 99.4       |
| Second Revision              | 1.51              | 77.4               | 82.3       | 99.7               | 99.6       |

PPV- positive predictive value. NPV-negative predictive value

Table 1.4 shows that when Chinese ethnicity was assigned using the Second Revision, sensitivity and/or positive predictive value were lower for females than males, people with marital status of common-law, separated, divorced or widowed than people with single or married, elementary education, and income greater than \$80,000. Sensitivity decreased as the number of years in Canada increased. Sensitivity and positive predictive value also varied by Canadian provinces. The provinces with higher proportions of recent Chinese immigrants (i.e. British Columbia, Ontario and Alberta) had higher sensitivity and positive predictive value.

Table 1.4 Agreement of Chinese ethnicity between self-report and the second revision of Chinese surname list by socio-demographic characteristics in external data, CCHS (N=112 452)

|        | Sensitivity<br>(%) | PPV<br>(%) | Specificity<br>(%) | NPV<br>(%) |
|--------|--------------------|------------|--------------------|------------|
| Age    |                    |            |                    |            |
| 12-17  | 77.3               | 83.4       | 99.8               | 99.6       |
| 18-24  | 72.5               | 72.5       | 99.8               | 99.8       |
| 25-34  | 77.8               | 77.8       | 99.8               | 99.8       |
| 35-44  | 74.2               | 83.3       | 99.7               | 99.4       |
| 45-54  | 80.1               | 88.3       | 99.7               | 99.5       |
| 55-64  | 77.6               | 81.8       | 99.7               | 99.6       |
| 65+    | 78.8               | 82.2       | 99.7               | 99.6       |
| Sex    |                    |            |                    |            |
| Male   | 81.0               | 83.8       | 99.7               | 99.7       |
| Female | 73.8               | 80.7       | 99.7               | 99.6       |



|   | Sensitivity<br>(%) | PPV<br>(%) | Specificity<br>(%) | NPV<br>(%) |
|---|--------------------|------------|--------------------|------------|
| <b>Education</b>                        |                    |            |                    |            |
| Elementary                              | 72.4               | 64.9       | 99.8               | 99.9       |
| Secondary                               | 78.5               | 83.5       | 99.7               | 99.6       |
| Post-Secondary                          | 77.6               | 83.2       | 99.7               | 99.6       |
| Unknown                                 | 75.8               | 87.0       | 99.6               | 99.2       |
| <b>Marital Status</b>                   |                    |            |                    |            |
| Single                                  | 77.5               | 84.6       | 99.7               | 99.5       |
| Married                                 | 78.7               | 83.0       | 99.7               | 99.6       |
| Common Law                              | 63.3               | 82.6       | 100.0              | 99.9       |
| Separated                               | 63.9               | 69.7       | 99.7               | 99.7       |
| Divorced                                | 66.7               | 59.5       | 99.8               | 99.8       |
| Widowed                                 | 77.4               | 69.5       | 99.8               | 99.9       |
| <b>Income</b>                           |                    |            |                    |            |
| <\$30,000                               | 78.3               | 82.3       | 99.8               | 99.7       |
| \$30,000-49,999                         | 81.7               | 83.8       | 99.8               | 99.7       |
| \$50,000-79,999                         | 71.2               | 84.0       | 99.8               | 99.6       |
| \$80,000+                               | 67.6               | 83.4       | 99.8               | 99.4       |
| Unknown                                 | 78.1               | 85.7       | 99.7               | 99.5       |
| <b>Speaking English or French</b>       |                    |            |                    |            |
| Yes                                     | 76.0               | 80.8       | 99.8               | 99.7       |
| No                                      | 84.8               | 90.1       | 97.9               | 96.7       |
| <b>Length of stay in Canada (years)</b> |                    |            |                    |            |
| ≤ 5                                     | 89.1               | 88.9       | 97.4               | 97.5       |
| 6-10                                    | 84.9               | 93.1       | 98.2               | 95.7       |
| 11-15                                   | 82.1               | 92.3       | 98.8               | 96.9       |
| 16-20                                   | 82.4               | 88.5       | 98.1               | 97.0       |
| > 20                                    | 72.6               | 85.7       | 99.5               | 98.9       |
| Born in Canada                          | 58.6               | 56.9       | 99.8               | 99.8       |
| <b>Canadian province</b>                |                    |            |                    |            |
| British Columbia                        | 81.3               | 89.4       | 99.4               | 98.9       |
| Ontario                                 | 77.5               | 81.7       | 99.7               | 99.6       |
| Alberta                                 | 75.8               | 82.3       | 99.7               | 99.6       |
| Saskatchewan                            | 70.8               | 63.0       | 99.7               | 99.8       |
| Quebec                                  | 63.6               | 68.1       | 99.9               | 99.9       |
| Manitoba                                | 60.0               | 64.9       | 99.8               | 99.8       |
| Atlantic                                | 53.8               | 39.6       | 99.8               | 99.9       |
| NWT/Yukon/Nunavut                       | 31.3               | 62.5       | 99.8               | 99.4       |

Note: PPV- positive predictive value. NPV-negative predictive value

To examine the impact of marital status on agreement, we stratified the analysis by gender and marital status (see table 1.5). Married females demonstrated lower sensitivity and positive predictive value when compared to never-married females for the Second Revision. In

contrast, married men demonstrated higher sensitivity and positive predictive value compared to never married men for the Second Revision.

Table 1.5 Agreement of Chinese ethnicity between self-report and the second reversion of Chinese surname list by gender and marital status in external data, CCHS (N=112 452)

| Gender | Marital status | Sensitivity (%) | PPV (%) | Specificity (%) | NPV (%) |
|--------|----------------|-----------------|---------|-----------------|---------|
| Male   | Married        | 82.2            | 87.5    | 99.8            | 99.7    |
|        | Never married  | 76.6            | 85.9    | 99.7            | 99.4    |
| Female | Married        | 71.6            | 82.0    | 99.7            | 99.5    |
|        | Never married  | 74.0            | 86.6    | 99.8            | 99.4    |

Note: PPV- positive predictive value. NPV-negative predictive value

Traditionally, in writing Chinese names, Chinese people place the surname first, and then the given name follows, and do not have a middle name, such as Wong (surname) Teng (given name). Chinese residing in Western countries often choose a Western name (for example David) and still retain their Chinese given name. When the Western and Chinese given names and surname are put together, there are several ways of writing a complete name: Wong David, David Teng Wong, and Wong Teng. To assess the impact of applying the concept of first name and surname sequence order on identifying Chinese, a short Chinese surname list (including 214 surnames) was generated through excluding surnames that were likely to be shared in Chinese and non-Chinese populations or those that had the same spelling with non-Chinese first names from the Second Revision (see Appendix II).

The short surname list was used to screen the first, and/or middle location of name and the Second Revision Chinese surname list was employed to screen last location of name for surnames. Application of these two surname lists for screening different location of names for surname slightly increased sensitivity but sacrificed positive predictive value of identifying Chinese in CCHS (See Table 1.6).

Table 1.6 Agreement of Chinese ethnicity between self-report and the Second Revision of Chinese surname list by screening different location for surnames in external data, CCHS (N=112 452)

| Location of name      | Sensitivity (%) | PPV (%) | Specificity (%) | NPV (%) |
|-----------------------|-----------------|---------|-----------------|---------|
| Last                  | 77.4            | 82.3    | 99.7            | 99.6    |
| First or last         | 78.1            | 80.1    | 99.7            | 99.6    |
| First, middle or last | 78.3            | 79.1    | 99.7            | 99.6    |

Note: PPV- positive predictive value. NPV-negative predictive value

## 1.5 DISCUSSION

This study has generated a Chinese surname list through literature review, a panel review and a community survey in a Canadian city and then validated the list in the Canadian national community survey data. This Second Revision surname list had 77% sensitivity, 82% positive predictive value and over 99% specificity and negative predictive value in the external validation comparison using data from the Canadian Community Health Survey. It is more valid for defining Chinese ethnicity compared with previously published Chinese surname lists.

The validity of Chinese surname lists in identifying Chinese ethnicity relates to the fact that English letter combinations for many Chinese surnames are unique. Chinese surnames are commonly composed of one short word or syllable, such as ‘Zhang’, ‘Wang’ or ‘Liu’. Surnames with two or more -syllables such as ‘Ouyang’ and ‘Sima’ are less frequent in the Chinese population than in non-Chinese ethnic populations. A second unique feature of Chinese surnames is that over 90% of Chinese people use 100 or so common surnames even though there are hundreds of distinctive surnames.<sup>8</sup> Historically, there are over 11,000 designative Chinese surnames. However, uncommon Chinese surnames have gradually become rare or disappeared over time. This is likely because Chinese people traditionally favour and are proud of large families with male children who can carry on the surname. Marriage between persons with the same surname is generally prohibited. Therefore, populations of larger families increased faster than small families.

The second revised Chinese surname list contains 761 surnames, far less than the total number of Chinese distinctive surnames, but more than the number of common Chinese

surnames. This results largely from the fact that Chinese surname translation (from Chinese into English) has not been formalized internationally. The same Chinese surname has many different English spellings. For example, a Chinese surname is spelled as either ‘Wang’, ‘Wong’ or ‘Vong’ as different methods are used to romanize Chinese names. Therefore, to capture one Chinese surname, more than one spelling has to be included in the Chinese surname list.

The different methods of romanizing Chinese surnames is a major reason for misclassification of Chinese ethnicity when surname lists are used to define ethnicity in Western countries. Romanization results in some identical non-Chinese and Chinese surnames. For example, the surname ‘Lee’ could be European, Korean or Chinese. The second reason for misclassification is surname change after marriage. Traditionally, Chinese women retain their surnames even after marriage. However, some Chinese women who have married European or non-Chinese descendants follow Western norms, and change their surnames after marriage. In addition, non-Chinese women who marry into Chinese families may change their surnames. These practices are even more prevalent in Western countries. As such the Second Revised Chinese surname list has slightly lower sensitivity and positive predictive value among married than never married women.

While applying the surname list, the proportion of Chinese and prevalence of certain Chinese dialects in the geographic area should be considered. This study found that the surname list has a high validity in Canadian provinces with many recent immigrants mainly from Hong Kong, Mainland China and Taiwan. Recent immigrants from mainland China speak Mandarin and spell their surnames following the Mandarin “Pinyin” which is used in mainland China to romanize Chinese name on official documents (e.g., passport). The Pinyin system includes many English letters (e.g., a, c, e, l, n, m, o); however, pronunciation of these letters in the Pinyin system is completely different from English. The majority of recent immigrants from Hong Kong speak Cantonese, and from Taiwan speak Mandarin. They do not use the Pinyin system but romanize their surnames following the pronunciation of Cantonese or Mandarin and English letters following certain unofficial patterns. However, earlier Chinese immigrants in Canada speak various dialects and did not follow any rules or patterns when they initially romanized their surnames. For example, ‘Wang’ follows Mandarin using Pinyin pronunciation, ‘Wong’ follows Cantonese pronunciation, and ‘Vong’ follows other dialects and English letters. Therefore, it is challenging to capture Chinese surnames romanized without rules.

## **1.6 LIMITATIONS**

The validity of Chinese surname lists was assessed collectively in identifying Chinese, without specifying the validity of individual surnames. The CCSH data included information on people age 12 years or older. Validity of surname lists under 12 years old is unknown. Self-reported ancestry is employed as a ‘reference standard’ of Chinese ethnicity. Under Chinese ethnicity, there are many ethnic groups. The largest ethnic group is ‘Han’, accounting for 95% of Chinese population and remaining ethnic groups are minorities. The surname list assessed in this study was targeted to the Chinese ‘Han’ ethnic group only, not to other ethnic groups who consider themselves as Chinese.

## **1.7 CONCLUSIONS**

The Chinese surname list appears to be a valid method to identify Chinese ethnicity. Our surname list could be applied to secondary databases containing surnames for defining Chinese ethnicity. This could potentially save time and reduce costs for identifying target ethnic populations through screening a large population (for example, screening potential Chinese from telephone books).

The list performed well when applied to data from the Canadian Community Health Survey. However, misclassification of Chinese ethnicity cannot be avoided in certain instances because the surname list contained common Chinese surnames and missed rare surnames. The validity may depend on the geographic origin and Chinese dialects in given populations, and researchers may need to test and revise the list in their populations as necessary.

**PART TWO:**

**HEALTH STATUS OF CHINESE CANADIANS IN ALBERTA:**

**A PRELIMINARY ANALYSIS**

## 2.1 OBJECTIVES

The objective of this study was to conduct a preliminary assessment of the feasibility of using a standardized Chinese surname list to assess Chinese population health status in Alberta. For the purposes of this demonstration project, the health indicator chosen was mortality.

## 1.2 BACKGROUND

Much of the data on health status and health services utilization in Canada have been conducted on the entire population. Much of our knowledge of the epidemiology of life-threatening chronic diseases such as cardiovascular disease and cancer are based on populations of European descent.<sup>12</sup> Yet the ethnic origins of Canada are changing dramatically. Whereas immigration during the settlement and growth of this country were principally from Europe, in recent years immigrants have been increasingly from Asia. According to Census data, prior to 1961, 91% of all immigrant residents had come from Europe and 3% from Asia. As of 2001, only 42% of all immigrant residents of Canada had come from Europe whereas 37% were from Asia.\* Thus Canada is becoming more racially and ethnically diverse. Alberta is the fourth largest provincial destination of immigrants in Canada.

The 2001 Canadian population census showed that 11.2% of the Alberta population were visible minorities, the third highest proportion in Canada. Visible minorities are defined as persons, other than Aboriginal persons, who are not white in race or colour.<sup>†</sup> Among them, the Chinese constituted the largest minority group, accounting for 25.8% of all visible minorities in Canada and 30.0% of all visible minorities in Alberta. It has been predicted that this ethnic group will be the fastest growing minority population in this country. Growth in the immigrant and visible minority population speaks to the importance of research and policy attention to ensure that optimal population health is achieved, and that a high quality health care system is accessible to all citizens without barriers.

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\* <http://www.statcan.ca/english/Pgdb/popula.htm#imm>

† <http://www.statcan.ca/english/Pgdb/defdemo52a.htm>

## 2.3 METHODS AND MATERIALS

There were four data sources in this study:

1. Alberta Health Care Insurance Plan (AHCIP) Stakeholder Registry from 1995 to 2003;
2. Vital Statistics Birth Registry from 1995 to 2003;
3. Vital Statistics Death Registry from 1995 to 2003;
4. Canadian Census for 2001.

The AHCIP Stakeholder Registry includes virtually all Alberta residents, except for members of the armed forces, Royal Canadian Mounted Police and prisoners in federal penitentiaries. Demographic and administrative information of each registrant is collected at the time of registration and updated when a registrant reports changes. Mortality data included all deaths registered with the Alberta Vital Statistics Death Registry of residents of Alberta. Vital Statistics Birth data were used to define the population of less than one year of age. This was done because of possible incompleteness in the AHCIP Registry for infants of less than one year since registration of infants with AHCIP may sometimes be delayed until some time after birth. The Canadian Census population estimates are based on a 20% sample of the population in which ethnicity was self-identified.

A standardized list of Chinese surnames as described earlier in this report (Second Revision surname list, see Appendix I) was matched to the surnames on the last location of names, and the short list of surnames (see Appendix II) was matched on the first and middle location of names in the AHCIP Registry to identify Alberta residents of Chinese ethnicity. The two surname lists were also matched to the surnames in the Vital Statistics Death and Birth Registries from 1995 to 2003 to identify deaths and births of Alberta residents of Chinese ethnicity.

The proportion of the population who were Chinese as identified in the AHCIP Registry using the surname list was compared to the proportion of Chinese identified from the 2001 Census. Comparisons of mortality were also made between mortality rates for ethnic Chinese and the rest of the Alberta population from 1995 through 2003. All analyses were performed internally at Alberta Health and Wellness.



Population counts were determined by June 30 of each year for the AHCIP registrants to provide denominators for rate calculations. Rates were directly age-standardized using the 1996 Census population as the reference population.

## 2.4 RESULTS

Table 2.1 illustrates the agreement between the proportion of Chinese in Alberta using the 2001 Census (self-identification) compared to the proportion identified by the surname lists in the AHCIP for 2001. Overall, the proportion of ethnic Chinese in the population was slightly lower in the AHCIP Registry (3.3%) compared to the 2001 Census (3.7%). This finding reflects the decision to exclude Chinese surnames that were commonly shared with non-Chinese in the process of development of the surname list. In other words, the surname list is geared towards identifying true Chinese despite missing some Chinese. For each demographic grouping, the proportion identified as Chinese is very close between the Census and the AHCIP Registry, indicating that the surname list is a valid method for identifying Chinese. A slightly smaller proportion of males than females were Chinese in both methods. By age groups, the name list identified 3.0% of 0-14 year olds as Chinese compared to 3.3% in the Census (ratio AHCIP/Census 0.89). For all other age groups the ratios were near to 1.0. By RHA, discrepancies were relatively large for the RHAs of Palliser, David Thompson, East Central, and Peace Country, with more Chinese identified using the name list than self-identified in the Census. These RHAs have small populations and the Census population estimates may therefore be less accurate. The largest proportion of Chinese was located in the two major cities of Calgary and Edmonton. In both cities the Census self-identification yielded higher proportions of Chinese than the name list search of the AHCIP.

Table 2.1: Agreement between census and Alberta population registry in 2001

|                   | Census    |         |     | AHCIP Registry |         |     | Ratio* |
|-------------------|-----------|---------|-----|----------------|---------|-----|--------|
|                   | Total     | Chinese | %   | Total          | Chinese | %   |        |
| Overall           | 2,941,145 | 108,055 | 3.7 | 3,040,312      | 101,605 | 3.3 | 0.89   |
| Sex               |           |         |     |                |         |     |        |
| Male              | 1,461,020 | 47,920  | 3.3 | 1,519,036      | 49,284  | 3.2 | 0.99   |
| Female            | 1,459,315 | 51,060  | 3.5 | 1,521,276      | 52,321  | 3.4 | 0.98   |
| Age               |           |         |     |                |         |     |        |
| 0-14              | 613,585   | 20,155  | 3.3 | 611,275        | 18,456  | 3.0 | 0.92   |
| 15-24             | 430,505   | 15,335  | 3.6 | 444,032        | 15,156  | 3.4 | 0.96   |
| 25-44             | 937,040   | 30,535  | 3.3 | 959,663        | 32,911  | 3.4 | 1.05   |
| 45-64             | 654,875   | 22,625  | 3.5 | 687,411        | 24,053  | 3.5 | 1.01   |
| 65+               | 284,335   | 10,335  | 3.6 | 318,252        | 11,027  | 3.5 | 0.95   |
| RHA               |           |         |     |                |         |     |        |
| R1-Chinook        | 144,905   | 1,530   | 1.1 | 151,161        | 1,438   | 1.0 | 0.90   |
| R2-Palliser       | 92,435    | 625     | 0.7 | 96,358         | 852     | 0.9 | 1.31   |
| R3-Calgary        | 1,042,855 | 57,315  | 5.5 | 1,061,483      | 53,114  | 5.0 | 0.91   |
| R4-DavidThompson  | 278,575   | 1,710   | 0.6 | 290,292        | 2,091   | 0.7 | 1.17   |
| R5-EastCentral    | 105,560   | 425     | 0.4 | 108,441        | 752     | 0.7 | 1.72   |
| R6-Capital        | 928,785   | 44,430  | 4.8 | 946,810        | 40,533  | 4.3 | 0.89   |
| R7-Aspen          | 165,130   | 890     | 0.5 | 174,631        | 869     | 0.5 | 0.92   |
| R8-PeaceCountry   | 121,900   | 545     | 0.4 | 127,765        | 862     | 0.7 | 1.51   |
| R9-NorthernLights | 61,000    | 585     | 1.0 | 64,041         | 582     | 0.9 | 0.95   |

\*Note: Ratio = proportion of Chinese estimated in Alberta Health Insurance Plan Registry divided by proportion of Chinese estimated in 2001 census

Figure 2.1 shows the distribution of the population of Chinese and non-Chinese. This figure demonstrates that the Chinese population is somewhat younger, with a noticeable population “bulge” between the ages of 35 and 54.

Figures 2.1: Non-Chinese and Chinese population distributions, Alberta, 2003

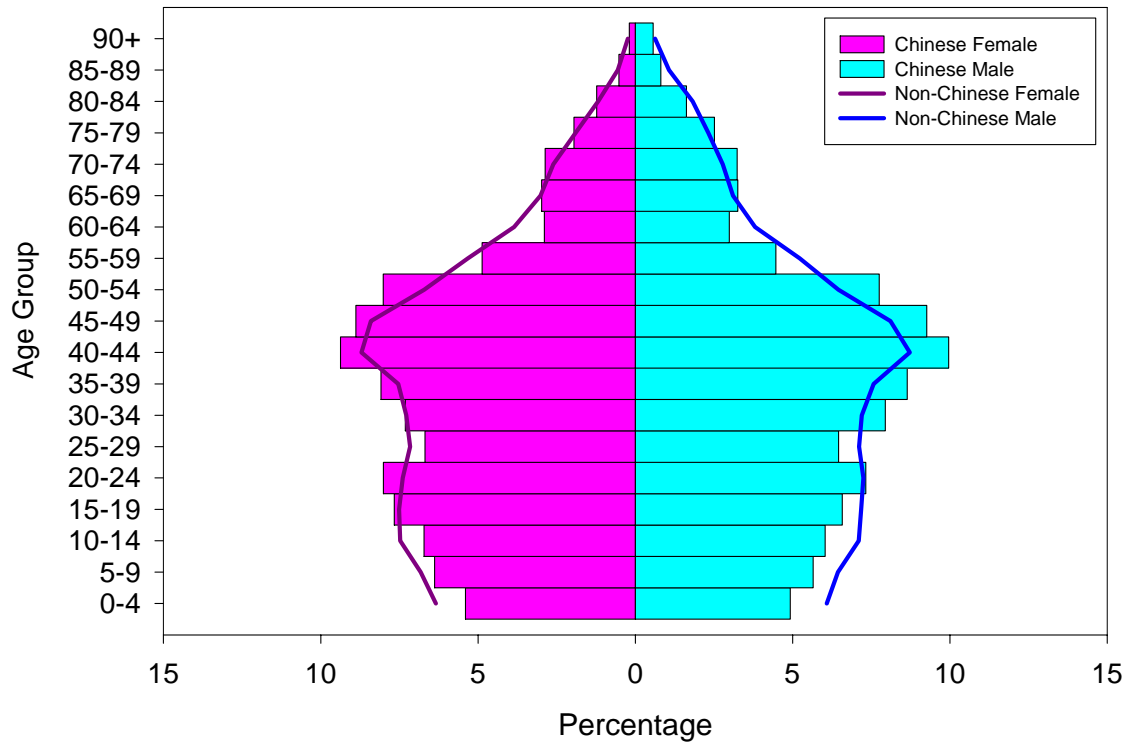


Table 2.2 and Figures 2.2-2.4 show the age-adjusted mortality rate for Chinese and non-Chinese for females, males and both sexes from 1995 to 2003. Population figures were based on the AHCIP Registry mid-year population in each year; to calculate the non-Chinese population, the Chinese population was subtracted from the total population. The standard population used to age-adjust the rates was the 1996 Canadian Census.

In every year, the death rate among Chinese was much lower than for non-Chinese. The last column of Table 2.2 compares the Chinese age-standardized death rates and the non-Chinese age-standardized death rates. For both sexes combined, the Chinese death rate was as low as 53% of the non-Chinese in 1997 up to a maximum of 68% in 2003. Thus, Chinese death rates were about one-half to two-thirds the death rates for non-Chinese. The percentages for females seemed to be increasing over the time period; for the first three years, it was 60% or less, then rose to approximately 65% from 1998 through 2001, then up to around 75% during the last two years. For males, the percentages fluctuated from year to year but, unlike females, did not

demonstrate a pattern of increase or decrease. The lowest percentage was 52% in 1997 and the highest was 71% in 1995.

Table 2.2. Age adjusted mortality rate, Alberta, 1995-2003 (per 1000 population)

| Sex    | Year | Chinese    |       |      | Non-Chinese |        |      | Chinese/<br>Non-Chinese* |
|--------|------|------------|-------|------|-------------|--------|------|--------------------------|
|        |      | Population | Death | Rate | Population  | Death  | Rate |                          |
| Female | 1995 | 45,281     | 132   | 3.83 | 1,314,577   | 7,048  | 6.37 | 60%                      |
|        | 1996 | 46,189     | 137   | 3.86 | 1,317,852   | 7,386  | 6.60 | 58%                      |
|        | 1997 | 47,487     | 141   | 3.48 | 1,351,428   | 7,538  | 6.38 | 55%                      |
|        | 1998 | 48,116     | 152   | 3.96 | 1,381,618   | 7,475  | 6.21 | 64%                      |
|        | 1999 | 49,236     | 165   | 4.13 | 1,413,514   | 7,872  | 6.31 | 66%                      |
|        | 2000 | 50,696     | 165   | 3.96 | 1,434,507   | 7,949  | 6.16 | 64%                      |
|        | 2001 | 52,088     | 171   | 3.82 | 1,460,015   | 7,971  | 5.95 | 64%                      |
|        | 2002 | 53,988     | 215   | 4.60 | 1,490,073   | 8,480  | 6.13 | 75%                      |
|        | 2003 | 55,973     | 222   | 4.41 | 1,511,757   | 8,577  | 5.98 | 74%                      |
| Male   | 1995 | 42,873     | 174   | 5.08 | 1,308,597   | 8,299  | 7.14 | 71%                      |
|        | 1996 | 43,649     | 151   | 4.21 | 1,308,178   | 8,519  | 7.28 | 58%                      |
|        | 1997 | 44,840     | 135   | 3.54 | 1,345,913   | 8,416  | 6.84 | 52%                      |
|        | 1998 | 45,358     | 160   | 4.22 | 1,376,619   | 8,810  | 7.04 | 60%                      |
|        | 1999 | 46,503     | 185   | 4.65 | 1,413,203   | 8,782  | 6.78 | 69%                      |
|        | 2000 | 47,661     | 181   | 4.28 | 1,434,312   | 8,739  | 6.55 | 65%                      |
|        | 2001 | 49,015     | 168   | 3.73 | 1,460,715   | 9,040  | 6.51 | 57%                      |
|        | 2002 | 50,861     | 182   | 3.82 | 1,490,641   | 9,119  | 6.35 | 60%                      |
|        | 2003 | 52,698     | 194   | 3.93 | 1,512,473   | 9,361  | 6.30 | 62%                      |
| Both   | 1995 | 88,154     | 306   | 4.43 | 2,623,174   | 15,347 | 6.79 | 65%                      |
|        | 1996 | 89,838     | 288   | 4.02 | 2,626,030   | 15,905 | 6.98 | 58%                      |
|        | 1997 | 92,327     | 276   | 3.51 | 2,697,341   | 15,954 | 6.65 | 53%                      |
|        | 1998 | 93,474     | 312   | 4.10 | 2,758,237   | 16,285 | 6.67 | 62%                      |
|        | 1999 | 95,739     | 350   | 4.41 | 2,826,717   | 16,654 | 6.58 | 67%                      |
|        | 2000 | 98,357     | 346   | 4.10 | 2,868,819   | 16,688 | 6.39 | 64%                      |
|        | 2001 | 101,101    | 339   | 3.76 | 2,920,730   | 17,011 | 6.28 | 60%                      |
|        | 2002 | 104,849    | 397   | 4.20 | 2,980,714   | 17,599 | 6.29 | 67%                      |
|        | 2003 | 108,671    | 416   | 4.18 | 3,024,230   | 17,939 | 6.19 | 68%                      |

\*Note: Chinese/Non-Chinese = Chinese mortality/non-Chinese mortality

Figure 2.2: Female age-adjusted mortality for Chinese and non-Chinese, Alberta, 1995-2003 (per 1000 population)

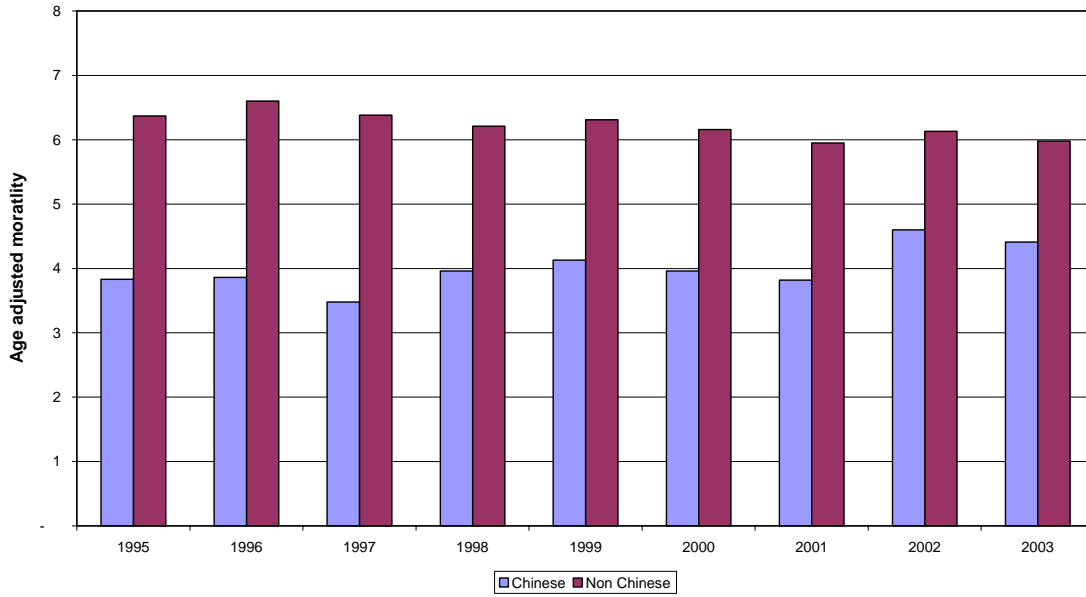


Figure 2.3: Male age-adjusted mortality for Chinese and non-Chinese, Alberta, 1995-2003 (per 1000 population)

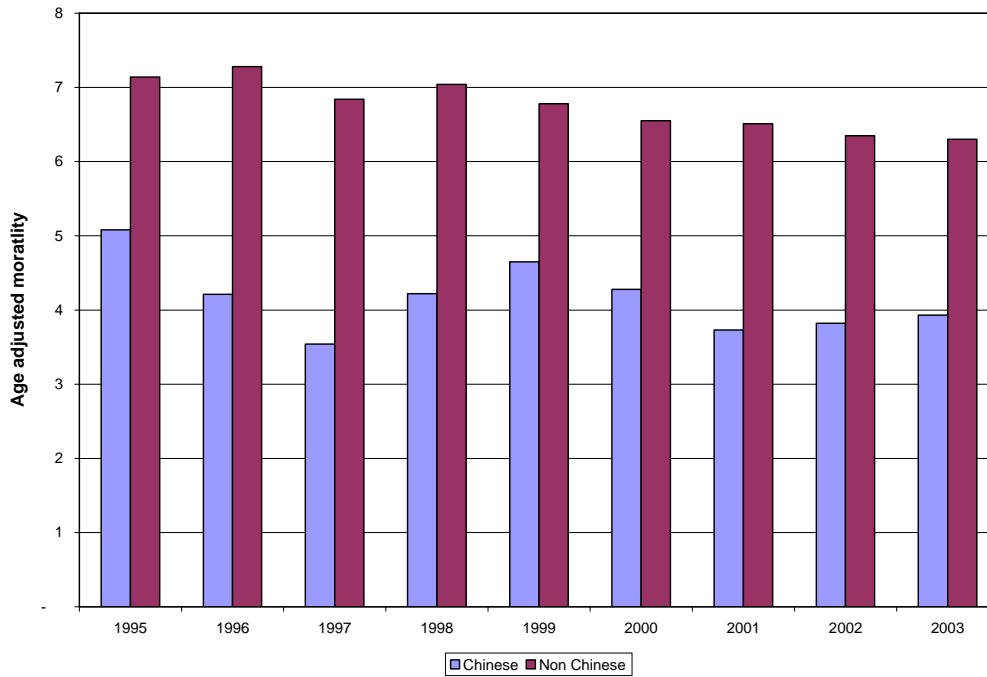


Figure 2.4: Both sexes age-adjusted mortality for Chinese and non-Chinese, Alberta, 1995-2003 (per 1000 population)

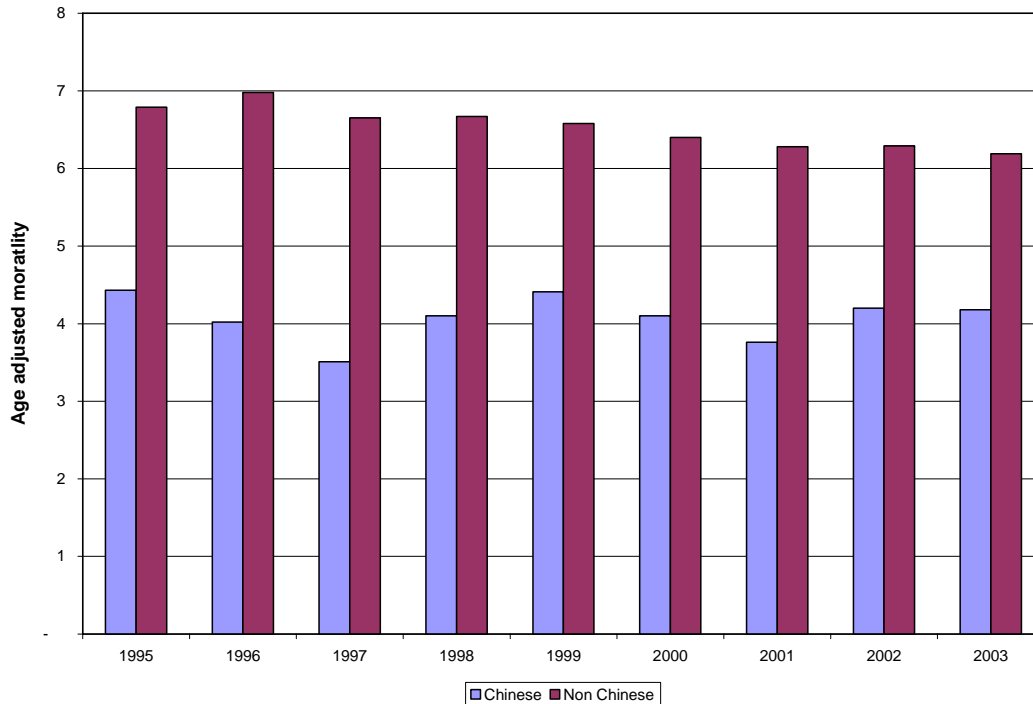


Table 2.3 and Figures 2.5-2.6 explore further the lower mortality rate for Chinese compared to non-Chinese. In this table, both sexes and all years were combined, but each age group was looked at separately. The percentage comparison is closest for infants under one year, where the Chinese mortality rate was 84% of the non-Chinese rate (figure 2.6). After the age of one and up to about age 39, the number of deaths was quite small, making comparisons between the two difficult. From age 40 to age 64, the Chinese rate was about 55% of the non-Chinese rate. Then the ratio begins to rise in the older age groups. However, even in the oldest old, age 85 and up, the rate for Chinese was less than three-quarters of the rate for non-Chinese.

Table 2.3: Age-Specific mortality rate, Alberta 1995 to 2003 (per 1000 population)

|       | Chinese    |       |        | Non-Chinese |        |        | Chinese/Non-Chinese* |
|-------|------------|-------|--------|-------------|--------|--------|----------------------|
|       | Population | Death | Rate   | Population  | Death  | Rate   |                      |
| < 1   | 9703       | 48    | 4.95   | 330,225     | 2,043  | 6.19   | 80%                  |
| 1-4   | 40,388     | 7     | 0.18   | 1,376,695   | 429    | 0.31   | 56%                  |
| 5-9   | 55,355     | 5     | 0.09   | 1,863,856   | 256    | 0.14   | 66%                  |
| 10-14 | 60,728     | 4     | 0.07   | 1,937,079   | 320    | 0.17   | 40%                  |
| 15-19 | 66,241     | 15    | 0.23   | 1,867,964   | 1,155  | 0.62   | 37%                  |
| 20-24 | 64,248     | 25    | 0.39   | 1,784,013   | 1,381  | 0.77   | 50%                  |
| 25-29 | 57,245     | 28    | 0.49   | 1,829,182   | 1,248  | 0.68   | 72%                  |
| 30-34 | 67,818     | 38    | 0.56   | 1,975,959   | 1,810  | 0.92   | 61%                  |
| 35-39 | 82,927     | 46    | 0.56   | 2,211,365   | 2,579  | 1.17   | 48%                  |
| 40-44 | 86,810     | 78    | 0.90   | 2,214,446   | 3,583  | 1.62   | 56%                  |
| 45-49 | 78,300     | 99    | 1.26   | 1,894,751   | 4,362  | 2.30   | 55%                  |
| 50-54 | 53,680     | 107   | 1.99   | 1,502,279   | 5,307  | 3.53   | 56%                  |
| 55-59 | 31,809     | 97    | 3.05   | 1,144,384   | 6,615  | 5.78   | 53%                  |
| 60-64 | 29,391     | 151   | 5.14   | 907,462     | 8,593  | 9.47   | 54%                  |
| 65-69 | 30,510     | 288   | 9.44   | 795,284     | 12,165 | 15.30  | 62%                  |
| 70-74 | 25,573     | 350   | 13.69  | 679,547     | 16,348 | 24.06  | 57%                  |
| 75-79 | 17,689     | 395   | 22.33  | 521,672     | 19,973 | 38.29  | 58%                  |
| 80-84 | 10,567     | 437   | 41.36  | 349,513     | 22,069 | 63.14  | 65%                  |
| 85-89 | 5,351      | 411   | 76.81  | 191,283     | 20,310 | 106.18 | 72%                  |
| 90+   | 2,982      | 401   | 134.48 | 99,248      | 18,836 | 189.79 | 71%                  |

\*Note: Chinese/Non-Chinese = Chinese mortality/non-Chinese mortality

Figure 2.5: Age-Specific Chinese and non-Chinese mortality, Alberta, 1995-2003 (per 1000 population)

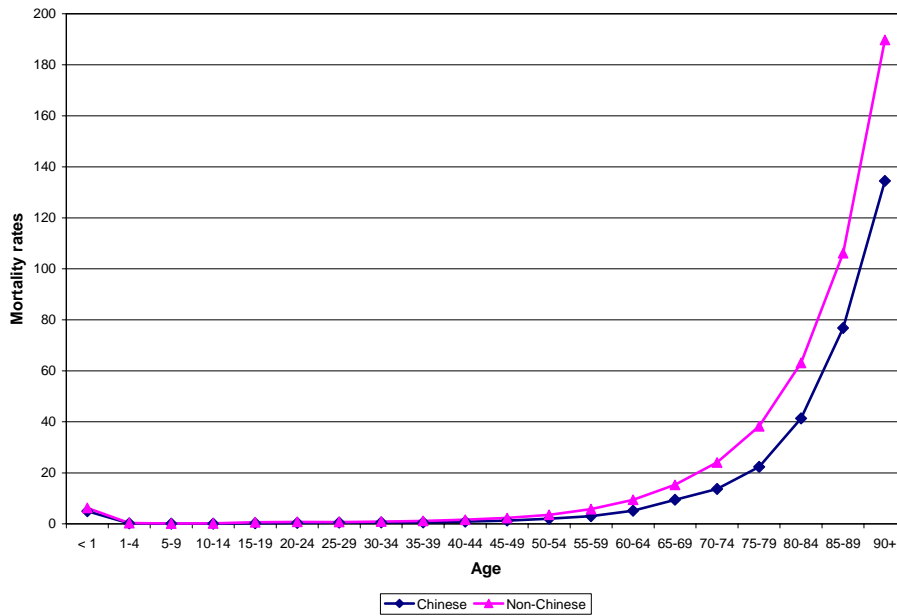


Figure 2.6: Age-Specific Chinese and non-Chinese mortality ratio, comparison of rates, Alberta, 1995-2003

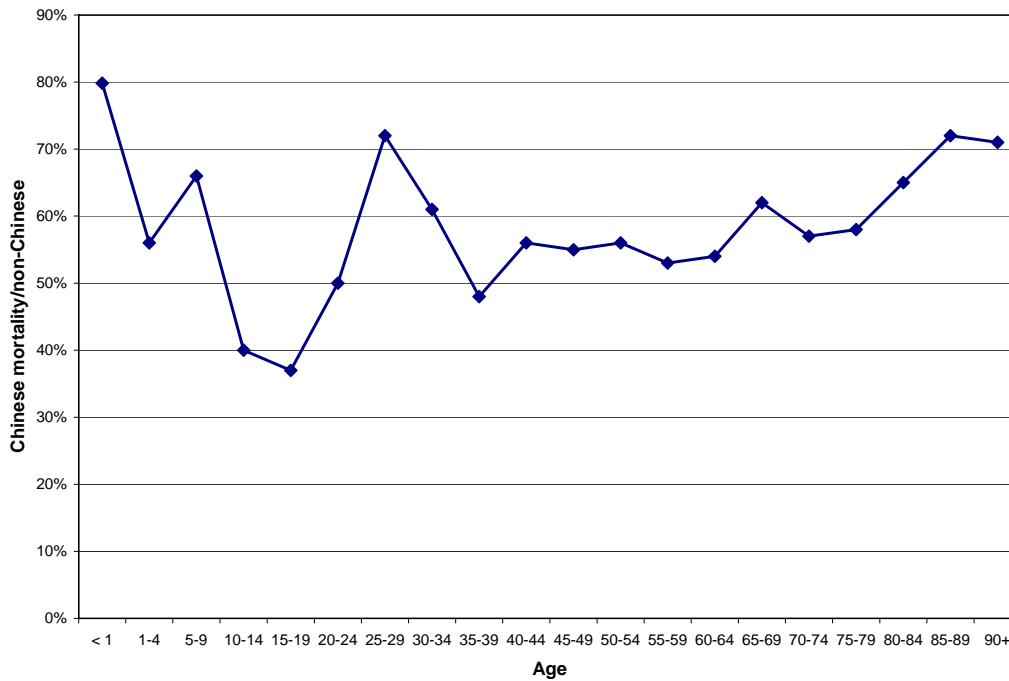




Table 2.4 provides two other mortality-related measures. Infant mortality is the rate of deaths per 1000 live births before the first birthday. As for other mortality rates, infant mortality was lower for Chinese (4.9/1000) than non-Chinese (6.2/1000). Not surprisingly, given the lower death rates for Chinese, the life expectancy at birth was estimated to be 4.6 years longer for Chinese males compared to non-Chinese, and 5.4 years longer for Chinese females compared to non-Chinese.

Table 2.4: Infant mortality and life-expectancy, Alberta, 1995-2003

|                           | Chinese | Non- Chinese |
|---------------------------|---------|--------------|
| Infant mortality (1/1000) | 4.9     | 6.2          |
| Life expectancy (Year)    |         |              |
| Male                      | 83.3    | 77.0         |
| Female                    | 87.9    | 82.5         |

## 2.5 DISCUSSION

We have demonstrated the application of the Second Revised Chinese surname list for identifying Chinese in the Alberta population. The reason for identifying Chinese or other ethnic minorities is to understand their health and health service needs. In this demonstration project, we compared mortality between Chinese and non-Chinese from 1995 to 2003. Mortality in each year, for both sexes and in all age groups was lower by as much as 50% for Chinese compared to non-Chinese. What might be the reasons for this finding?

First, there could be an out-migration of Chinese back to their home countries when they are nearing death. These persons may still have a record in the Alberta Health Care Insurance Plan Registry but their death record would be missing, resulting in lower death rates. We would likely see this happen more commonly in older age groups, resulting in a larger difference of mortality between Chinese and non-Chinese in the older age groups. However, we found that the mortality difference applied to all age groups.

Second, the Second Revised surname list may identify Chinese ethnic people differentially between the AHCIP Registry and Vital Statistics. The high mortality could result if the surname list was more sensitive in identifying Chinese in the AHCIP Registry than Vital Statistics. To explore this possibility, the AHCIP Registry and Vital Statistics Death data were linked using a combination of surname, sex and birth. Over 90% of death records were linked, and the proportion of Chinese among linked records (1.9%) was similar to that among unlinked records (2.0%). Therefore, it is unlikely that the surname list differentially identifies Chinese in the AHCIP Registry compared to the Vital Statistics Death Registry

There may in fact be lower mortality among Chinese than non-Chinese. Immigrant populations are generally healthier than native-born Canadians.<sup>13-15</sup> This is partly because of the process of gaining immigrant status, which requires that applicants be in good health and employable. Furthermore, younger and healthier persons are more likely to emigrate from their original countries. Sheth et al.<sup>16</sup> estimated mortality aged 35 to 74 for Canadians of Chinese, South Asian and all other Canadians. Chinese had mortality rates of 6.01 per 1000, compared with 7.61 for South Asians and 10.94 for all other Canadians. However, there is also evidence that this generally better health deteriorates as immigrants are in Canada longer.<sup>14,17,18</sup> Singh et al.<sup>18</sup> in a study of US immigrant populations noted that immigrant Chinese had lower life expectancy than US-born Chinese, but both were longer than the total US-born population. For males, life expectancy for all US born was 71.5 years, for US-born Chinese 81.6 years, and foreign-born Chinese 80.6 years; for females these were 78.6, 87.1 and 85.9 years, respectively. These findings are consistent with data reported in this study.

The Chinese identified in this study were not divided into those who immigrated recently, those who immigrated some time ago, and those born in Canada. Note that the difference of mortality between Chinese and non-Chinese (table 2.3) showed a gradual increase after the age of 40. People who immigrate are likely younger. The older age groups may represent people who have lived here for a longer duration, with their mortality rate moving closer to the rest of the population.

It would be valuable to conduct not only all-cause mortality analyses, but also cause-specific mortality analyses. Much of what we know about the major causes of death in Canada is based on Canadians of European origins. Sheth et al.<sup>12</sup> demonstrated that ethnic Chinese had lower rates of death than other Canadians for ischemic heart disease and diabetes, but higher

rates for cancer. In Singh's study of US immigrant populations,<sup>18</sup> foreign-born Chinese had lower rates of death than native-born Americans for most causes, except for infectious disease and some types of cancer. Knowing the major causes of death among ethnic populations will help health care planners to provide services that are more appropriately targeted towards these populations.

Infant mortality was also found to be lower for Chinese compared to non-Chinese. There is little published research on this finding. However, a similar finding was reported in the United States where the infant mortality for infants born to foreign-born immigrant Chinese was 3.4 per 1000 live births, compared to 7.3 for the US-born population.<sup>18</sup>

Death is not the only measure of health status that has been compared between populations. Chen et al.<sup>13</sup> noted that the prevalence of chronic conditions was 57% in native-born Canadians, 37% in recent non-European immigrants and 51% in non-European immigrants of over ten years duration. Other studies that have looked at chronic conditions, disability, and health services use report similar patterns: health of recent immigrants tends to be better than longer-duration immigrants which tends to be better than native-born residents.<sup>14,17</sup>

Lower rates of health services use may be related to better health, or it might represent barriers to access, such as language or unfamiliarity with the system. Immigrant Chinese in British Columbia were found to have much lower rates of physician visits and hospital discharges; the difference was even more pronounced for the use of mental health services.<sup>19</sup> This finding could represent problems with accessing mental health services or with lower rates of mental health problems. Lai, however, found that older Chinese tend to report better physical health but poorer mental health than other Canadians.<sup>20</sup> Given the demonstrated validity of the Second Revised surname list, it would now be useful to look at the use of healthcare services of ethnic Chinese compared to the rest of the Alberta population.

## **2.6 SUGGESTIONS FOR FURTHER RESEARCH**

Only one ethnic population was studied for this report. Populations with different ethnic origins may be shown to have different mortality and health profiles than Chinese.<sup>12,14,21</sup> Chinese are only one ethnic minority in Alberta; similar name-based research may also be possible with South Asians (i.e., from India, Pakistan, Bangladesh or Sri Lanka) and Vietnamese. Through

work with ethnic or non-government groups, it may also be possible to identify other groups of immigrants and assess health and services utilization.

Only overall mortality was investigated because the purpose was to demonstrate the utility of identifying ethnic Chinese through the surname list. Further research should compare specific causes of death to understand better the healthcare needs of ethnic Chinese. Use of the health system between the two groups—hospitalizations, physician visits, specialist physician visits, Emergency Room use, pharmaceutical use—would reveal much more about the healthcare needs of ethnic Chinese and permit decision-makers and providers to identify, plan and deliver targeted programs.

## **2.7 CONCLUSIONS**

It is feasible to identify ethnic Chinese in the Alberta population by use of a surname list consisting of 761 Chinese surnames. Measures of population health status can then be compared between Chinese and non-Chinese, to assist policy-makers to understand the needs of the Chinese population. This is important since much of the epidemiological information available in Canada has been based traditionally on Canadians of European origin. Ethnic populations may have different health status because of genetics, culture, health behaviours, or the stresses of immigration itself. This study demonstrates that mortality in ethnic Chinese is lower than that of non-Chinese in Alberta and suggests several areas of further research.

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**APPENDIX I: The Second Revised Chinese surname list (761 Surnames)**

(SAS code is available upon request. Contact Dr. Fu-lin Wang: [Fu-lin.Wang@gov.ab.ca](mailto:Fu-lin.Wang@gov.ab.ca))

AI, AN, ANG, AO, AU, AUYONG, AYE, BA, BAI, BAK, BAO, BAT, BAW, BEI, BEN, BI, BIAN, BIAO, BING, BO, BOK, BONG, BOU, BU, BUK, BUY, CAI, CAN, CANG, CAO, CEN, CHA, CHAI, CHAIM, CHAK, CHAN, CHANG, CHAO, CHAT, CHAU, CHAW, CHE, CHEAH, CHEAR, CHEE, CHEN, CHENG, CHEONG, CHERN, CHEU, CHEUI CHEUK, CHEUNG, CHEUNJ, CHEW, CHHAY, CHHOR, CHI, CHIA, CHIANG, CHIEH, CHIEN, CHIEN, CHIEU, CHIK, CHIM, CHIN, CHING, CHINN, CHIONG, CHIOU, CHIU, CHIUZ, CHO, CHOH, CHONG, CHOO, CHOONG, CHOU, CHOUNN, CHOUW, CHOW, CHOWN, CHOY, CHU, CHUA, CHUANG, CHUE, CHUENG, CHUI, CHUK, CHUN, CHUNG, CHUONG, CHUP, CHUY, CHYE, CING, CIU, CO, COI, CONG, COU, COY, CU, CUAN, CUI, CYU, CYUN, DAI, DAN, DAU, DEA, DEE, DENG, DEONG, DER, DIAN, DIAO, DIEC, DIEP, DIK, DIN, DING, DIU, DJENG, DO, DOI, DONG, DOOH, DOU, DOUNG, DOW, DU, DUAN, DUANMU, DUGU, DUNG, DUO, DUONG, EAR, ENG, FAH, FAI, FAN, FANG, FAT, FEI, FENG, FO, FOK, FONG, FOO, FOONG, FU, FUI, FUK, FUN, FUNG, GA, GAA, GAI, GAM, GAN, GANG, GANN, GAO, GAU, GAUK, GAW, GE, GEI, GEN, GENE, GENG, GEOI, GEUNG, GIANG, GING, GO, GOENG, GOH, GOK, GONG, GOO, GOOI, GOU, GOY, GU, GUAN, GUANG, GUI, GUK, GUM, GUN, GUO, GWAI, GWANG, GWIK, GWOCK, GWOK, GWONG, GYUN, HA, HAHM, HAI, HAK, HAN, HANG, HAO, HAP, HAU, HE, HECK, HEI, HENG, HEOI, HEU, HEUNG, HING, HO, HOI, HOM, HON, HONG, HOO, HOP, HOR, HOU, HOUNG, HSIANG, HSIAO, HSIEH, HSING, HSIUNG, HSU, HSUEH, HU, HUA, HUAI, HUAN, HUANG, HUE, HUEI, HUEN, HUI, HUIE, HUK, HUM, HUMS, HUN, HUNE, HUNG, HUO, HUU, HWANG, ING, IP, JAIN, JAM, JANG, JAU, JEA,

JEE, JEHN, JEN, JENG, JEW, JI, JIA, JIAN, JIANG, JIAO, JIE, JIN, JING, JIP, JIU, JOENG,  
 JOIE, JONG, JOO, JOY, JU, JUAN, JYU, JYUN, KAI, KAM, KAMKAN, KAN, KANG, KAO,  
 KAT, KAU, KE, KEE, KEET, KEH, KEI, KEOI, KER, KEUNG, KEW, KHOR, KHU, KIN,  
 KIP, KIT, KIU, KLYHN, KO, KOE, KOH, KOK, KOO, KOT, KOU, KOW, KOY, KU, KUAI,  
 KUAN, KUANG, KUEN, KUI, KUK, KUM, KUN, KUNG, KUO, KUON, KUT, KWA,  
 KWAI, KWAIN, KWAN, KWOK, KWON, KWONG, KYOK, LA, LAI, LAM, LAN, LAO,  
 LAU, LEI, LEM, LENG, LEONG, LEU, LEUNG, LEW, LI, LIAN, LIANG, LIAO, LIEU,  
 LIEW, LIK, LIN, LING, LIOU, LIU, LIV, LO, LOENG, LOH, LOI, LOK, LOO, LOONG,  
 LOR, LOU, LOUEN, LOUIE, LOUNG, LU, LUAN, LUI, LUK, LUM, LUN, LUNG, LUO,  
 LUONG, LYUN, MA, MAH, MAI, MAK, MAN, MANG, MAO, MAR, MAT, MAU, MAW,  
 MEI, MEN, MENG, MI, MIAN, MIAO, MIN, MING, MIU, MO, MOH, MOI, MOK, MON,  
 MONG, MONK, MOU, MOW, MOY, MU, MUA, MUI, MUK, MUN, MUQI, NA, NAN,  
 NANG, NANN, NAP, NAU, NEI, NENG, NEU, NEW, NG, NGAI, NGAN, NGAU, NGEUN,  
 NGHEM, NGHIEM, NGOK, NGU, NGUY, NI, NIAN, NIE, NIN, NING, NIP, NIPP, NIU,  
 NOE, NOI, OCK, OEI, ONG, OOI, OR, OU, OUYANG, OWYANG, PAI, PAK, PAN, PANG,  
 PAU, PEI, PENG, PHANG, PHUNG, PI, PIAN, PIN, PING, PO, POK, PON, PONG, POON,  
 POU, PU, PUN, QI, QIAN, QIANG, QIAO, QIN, QING, QIU, QU, QUAN, QUE, QUELCH,  
 QUON, QUONG, QWONG, RAN, REN, RONG, ROUGH, RU, RUAN, RUI, RUO, SA, SAI,  
 SAM, SAN, SAT, SAU, SE, SEAH, SEC, SEEN, SEID, SEK, SEN, SENG, SEON, SEOW,  
 SETO, SEZTO, SHA, SHAM, SHAN, SHANG, SHANGGUAN, SHAO, SHAZHA, SHE,  
 SHEIH, SHEK, SHEN, SHENG, SHENH, SHEUNG, SHEW, SHI, SHIEH, SHINN, SHIU,  
 SHOU, SHU, SHUANG, SHUE, SHUI, SHUM, SHUNG, SI, SIAUW, SIE, SIEU, SIEW,  
 SIKONG, SIMA, SIMA, SIN, SIT, SITOU, SITU, SIU, SO, SOK, SONG, SOO, SOONG, SOP,



SOU, SU, SUE, SUEN, SUI, SUK, SUM, SUN, SUNG, SUO, SUTU, SY, SYU, SYUN, SZE, SZETO, TA, TAAM, TAI, TAM, TAN, TANG, TAO, TAT, TAY, TCHENG, TENG, TEO, TEOH, THEAN, THIAN, THOO, TI, TIAN, TIAO, TIEN, TIEO, TIGHT, TIN, TING, TIONG, TIU, TO, TOI, TOM, TON, TONG, TOU, TOV, TOW, TOWE, TOY, TRI, TROUNG, TSAI, TSAN, TSANG, TSAO, TSE, TSENG, TSEUNG, TSIN, TSO, TSOI, TSOU, TSOW, TSOY, TSUEI, TSUI, TSUNG, TU, TUIN, TUNG, TZE, TZENG, UEN, UNG, VANG, VHANG, VONG, VUON, VUONG VY, WAH, WAI, WAN, WANG, WAT, WEE, WEI, WEN, WENG, WEY, WHENG, WHU, WING, WIP, WO, WON, WONG, WOO, WOON, WU, WUENG, WUN, XHOU, XI, XIA, XIAN, XIANG, XIAO, XIE, XIN, XING, XIONG, XU, XUAN, XUE, XUN, YAM, YAN, YANG, YAO, YAP, YAU, YE, YEAP, YEE, YEH, YEN, YENG, YEOH, YEP, YEUNG, YEUONG, YEW, YI, YIEN, YIM, YIN, YING, YIP, YIU, YO, YONG, YOON, YOU, YU, YUAN, YUCHI, YUE, YUEN, YUI, YUK, YUM, YUN, YUNG, ZAI, ZAM, ZAN, ZANG, ZAU, ZE, ZEE, ZENG, ZEON, ZHA, ZHAI, ZHAN, ZHANG, ZHAO, ZHE, ZHEN, ZHENG, ZHI, ZHONG, ZHOU, ZHU, ZHUANG, ZHUGE, ZHUO, ZHUONG, ZI, ZIK, ZIU, ZOENG, ZONG, ZOU, ZU, ZUK, ZUO, ZUOREN, ZYU

**APPENDIX II:** A short Chinese surname list for identifying Chinese at the first and middle name location (214 Surnames)

AO, AU, BAI, BI, BOU, CAI, CEN, CHAI, CHAN, CHAO, CHAW, CHEAH, CHEE, CHEN, CHENG, CHEU, CHEUNG, CHEW, CHHOR, CHI, CHIA, CHIANG, CHIEN, CHIK, CHIU, CHOH, CHOO, CHOU, CHOUW, CHOW, CHU, CHUANG, CHUENG, CHUI, CU, DAI, DENG, DIU, DONG, DOUNG, DU, FAN, FANG, FENG, FONG, FOO, FU, GAO, GE, GO, GUAN, GUO, HAO, HE, HON, HSIAO, HSIEH, HUE, HUEI, HUI, HUNG, ING, IP, JEA, JI, JIAN, JIANG, KIU, KLUTH, KOE, KOH, KOO, KU, KUAN, KUNG, KUO, KWA, KWAN, KWOK, KWONG, KYOK, LA, LAI, LAN, LAU, LEI, LI, LIAN, LIANG, LIU, LIV, LO, LOH, LOU, LOUEN, LOUNG, LUI, LUK, LUM, LUNG, LUO, MA, MAO, MENG, MIAO, MOK, MOU, MU, MUI, NANN, NGAN, NGHAI, NGU, NGUY, OOI, OU, PAN, PON, PONG, POON, PUN, QI, QIAN, QIN, QIU, QUONG, QWONG, RUAN, SHANG, SHAO, SHE, SHEN, SHEW, SHI, SHIEH, SHIU, SHU, SHUM, SIAUW, SIE, SIN, SIT, SIU, SONG, SOO, SU, SUN, SY, SZE, SZETO, TA, TAI, TCHENG, TENG, TI, TIAN, TO, TONG, TOU, TOV, TOWE, TROUNG, TSANG, TSE, TSENG, TSEUNG, TSO, TSOI, TSUI, UNG, VHANG, VUON, VY, WAI, WAN, WANG, WEI, WHU, WIP, WONG, WU, XHOU, XI, XIANG, XIE, XIN, XING, XU, XUE, YAN, YANG, YAU, YE, YEH, YEN, YENG, YIEN, YIM, YING, YIP, YIU, YOU, YUAN, YUN, ZENG, ZHAI, ZHANG, ZHAO, ZHEN, ZHENG, ZHONG, ZHOU, ZHU, ZHUO