

# Nutrition and physical activity of older Chinese immigrants

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## ABSTRACT

**Background.** Immigrants are at-risk for poor nutrition due to economic and adaptive reasons such as different food preferences and language barriers. Immigrants modify their diet and physical activity based on economic dependency and the availability of ethnic foods and exercise programmes. This paper explores the dietary and physical activity profiles of older Chinese immigrants and some sociocultural factors influencing their adaptations.

**Methods.** Semi-quantitative nutritional and physical activity instruments were used. Some data from the Qualitative Sociocultural Adaptation Questionnaire were included. Participants were recruited through snowball sampling, 'word-of-mouth' approach, friends, religious networks and a local organisation. The qualitative data were coded, and thematic analysis was performed.

**Results.** 31 Mandarin-speaking older Chinese immigrants participated. Although the immigrants preferred to keep their traditional diet, their children and grandchildren's food preferences and other sociocultural factors influenced their eating habits. Motivating factors for physical activity included programmes in their own language and support from family/friends. Barriers included lack of time/transportation, and language difficulties.

**Conclusion.** Healthy eating habits and regular physical activity are important in achieving life satisfaction and should be included in sociological studies of immigration and settlement.

**Key words:** Acclimatization; Cross-cultural comparison; Emigrants and immigrants; Motor activity; Nutrition surveys; Nutritional status

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## INTRODUCTION

Elderly immigrants, especially those who immigrate in later life, are more vulnerable with regard to their health and life satisfaction.<sup>1-3</sup> Nutrition, dietary habits, and physical activity of older immigrants in Canada remain understudied. Remaining active and eating well enable healthy/successful ageing and life satisfaction. Modifying behaviours related to nutrition and physical activity has profound effects on the health status of older immigrants.<sup>4</sup>

Recent immigrants have better health than their Canadian-born counterparts.<sup>1,5</sup> This is partly due to self-selection at the immigration process, as only those who are healthy choose to emigrate or are granted permission to immigrate after meeting health status criteria.<sup>5,6</sup> Nonetheless, with increasing period of residing in Canada, immigrants' health worsens more rapidly than that of the mainstream population.<sup>1,2,5,6</sup> This may be attributed to health deterioration because of ageing,<sup>5</sup> acquisition of unhealthy lifestyles,<sup>2,6</sup> differential use of health care facilities,<sup>1,6</sup> and sociocultural differences in defining health.<sup>6</sup>

Immigrants are at risk of poor nutrition due to economic/adaptive factors such as different food preferences and customs, special needs, language barriers, and acquisition of unhealthy lifestyles.<sup>4,6,7</sup> Immigrants often need to modify their dietary patterns and physical activity according to the availability of food, eating habits of their children, and acculturation of their grandchildren to the mainstream eating patterns, socialisation opportunities, desire to integrate into the new culture, and economic dependency. Economic dependency, changing power relationships, and escalating intergenerational conflicts may have long-term effects on the overall health status and life satisfaction of older immigrants.<sup>3,8</sup>

Studies on older immigrants concentrate on health care needs and lifestyle factors, but often ignore nutrition and physical activity issues.<sup>3,8,9</sup> These issues are inseparable parts of overall health.<sup>4</sup> The health of the immigrants provides the link between immigration and public health,<sup>1,5</sup> as this population grows, the demand for traditional and western health care increases.<sup>1</sup> Information on seniors' access to programmes related to nutrition, health care, and physical activity is limited.<sup>2,5,7,10</sup> Coupled with the language barrier, the older immigrants do not have equitable access to these services. Nutrition and physical activity as part of health and health care services may influence health promotion and disease prevention programmes to adopt culturally sensitive and physically appropriate strategies for older immigrants.

Chinese-Canadians make up the largest non-European ethnic minority in Canada. In fact, the Chinese-speaking community is the third largest other than English and French communities. In 2001, over one million Chinese lived in Canada, representing 4% of the total Canadian population.<sup>11</sup> To encourage ethnic immigration and multiculturalism, health and life satisfaction of new immigrants should be considered in programme planning and implementation.

This study aimed to examine the dietary and physical activity profiles of older Chinese immigrants and to determine factors that influenced these behaviours, particularly sociocultural variables such as language problems, financial issues, social networks, and transportation barriers.

## METHODS

This study was approved by the institutional research ethics board. Participants were recruited through a mix of sampling methods including snowball or 'word-of-mouth' approach. The first participants were recruited from their church/congregation and were requested to refer other immigrants who met the inclusion criteria. Some participants were recruited through friends' networks via a local Chinese organisation. The target population was older Chinese immigrants aged  $\geq 55$  years who had resided in Canada for  $\leq 13$  years, living independently or with their children's families.

Five questionnaires<sup>4,7</sup> were used for data collection and translated into the Chinese (Mandarin) language. The Chinese translation was then back-translated into English to assess the accuracy of the translations.

### Nutrition screening checklist

This initial screening tool, adapted from the Nutrition Screening Initiative,<sup>12</sup> provided warning signs of poor nutritional status. It considered educational, social, financial and psychosocial issues that may influence the ability of older individuals to achieve/maintain adequate nutrition. Based on the results of the screening, the need for nutrition education/counselling, social support and health services may be identified.

### Nutrition background information

This questionnaire dealt with factors affecting older adults' food choices including special dietary concerns, supplement use, and food-related problems. It sought information on what older immigrants desire regarding nutrition information and their perceived barriers to healthy eating. Being aware of their needs and barriers, programme planners may gain an understanding of possible educational/sociological approaches and health strategies that may be effective in promoting nutrition and its importance in seniors' health.

### Usual one-day food recall

A list of foods and beverages eaten within 24 hours was recorded using a standardised protocol.<sup>13</sup> A well-conducted recall can provide a quick insight into a person's diet and nutrient intake. It is easy to administer and is suitable for participants with low

literacy or English language abilities.<sup>13</sup> There may be errors in memory and estimation of food portion, but a number of strategies could help reduce the errors.<sup>13</sup>

### Physical activity questionnaire

The type, frequency, duration of activities, barriers and facilitators to physical activity were obtained using the form developed based on existing tools.<sup>14</sup> This form has also been used among older immigrants.<sup>7</sup>

### Sociocultural adaptation questionnaire

This included questions on immigration decision-making, living arrangements, family relations and support systems, services needs and utilisation, socialisation and community participation, self-perceived health status, cultural perceptions and practices of ageing, sociocultural adaptation and life satisfaction. Living arrangement, economic dependency, English-language proficiency, years residing in Canada, and patient age were also recorded.

Descriptive analysis of data from the nutrition screening checklist was performed, and nutritional background information and physical activity were assessed by a questionnaire.<sup>15</sup> The usual one-day food intake was analysed for nutrient content using the ESHA Food Processor Plus.<sup>16</sup> The more common

food items eaten at each meal were compiled and evaluated to show usual food intake. Given the limitations of the snowball sampling approach and a small sample size, few statistical comparisons (such as correlation and regression analysis) were performed on the participants' nutritional and physical activity profiles and some demographic and sociocultural data. Relevant qualitative data (i.e. free-text comments of the participants) from the sociocultural adaptation questionnaire were included to explain some of the findings.

## RESULTS

31 Mandarin-speaking older immigrants from China currently living in London and Markham in the province of Ontario, Canada were included. There were 11 men (mean age, 71 years) and 20 women (mean age, 69 years). Their body mass index was 18 to 29 kg/m<sup>2</sup>; 8 women and 3 men were overweight and 3 men were slightly underweight. 21 participants had university/college degrees and 9 had completed high school. 97% of the participants reported their health status as good/fair. **TABLE 1** shows other sociological factors that influenced their life satisfaction.

Economic dependency was strongly correlated with living with their children's families ( $p < 0.001$ ).

**TABLE 1**  
Effects of sociocultural factors on life satisfaction

Factors	Life satisfaction (%)	
	Male (n=11)	Female (n=20)
Living arrangement		
With child's family	82	65
On their own	18	35
Economically dependent		
Yes	82	65
No	18	35
English language proficiency		
Fair	36	35
Poor	64	65
Years living in Canada		
≤5	54	40
6-13	46	60
Age (years)		
55-64	9	40
65-74	64	40
≥75	27	20

Among the men, older age was moderately correlated with more years residing in Canada, living with their children's families, and economic dependency ( $p < 0.05$ ), but this was not observed among the women. Their main reason to immigrate to Canada was family reunification with their children, and they were needed to help with the care of their grandchildren.

### Food intake patterns

There was no significant difference in meal patterns in male and female participants. 22 participants had a westernised breakfast pattern (bread or cereal with milk, boiled egg, water). One participant "... preferred to eat Chinese foods, but had to eat what her grandchildren liked to eat because she took care of their breakfast..." (F4). Only 9 of the participants had a traditional breakfast of Chinese rice porridge (*congee*) or noodles with pickled/boiled vegetables, steamed bun or dumpling, water, milk, tea, or soymilk; they were living independently.

The dietary patterns of lunch were similar to their diet in China. For 16 participants, the meal included white rice (boiled), fish or pork or chicken (fried, roasted or boiled), vegetables (Chinese cabbage, celery, carrots [boiled or stir-fried]), water or green tea. For 12 of the participants, their lunch consisted of Chinese noodles (*ramen*) or dumpling, fried or boiled egg, boiled vegetables (cabbage, mushroom with *tofu*), and water or green tea. Only one participant reported eating a fruit (Chinese pear). For some, especially those living independently, a larger version of the lunch would be consumed again at dinner "...so there was no need to cook again..." (F17). Two participants indicated that they don't usually eat lunch because they regularly eat a late breakfast around 10 am and an early dinner at about 4 pm, with some snacks (cookies, tea) taken before going to bed. One reported consuming just bread and milk at lunch and had a more substantial dinner together with family members.

For 21 participants, dinner consisted of white rice (boiled), pork, chicken, fish and sometimes beef (cooked with vegetables such as snow peas, carrots, broccoli) with enough broth for soup. With the hot soup, no additional beverages were reported. Nine participants reported having Chinese noodles (or dumpling or porridge or steamed bun) with boiled vegetables usually Chinese cabbage (*napa* or *bokchoy*)

or bitter melon, fish or shrimps, water or Chinese tea. One participant reported eating breakfast food at dinner, such as bread with margarine, cereal, cheese and milk, and soda pop because "...I am too lazy to cook after working in the restaurant all afternoon..." (F5).

42% of the participants consumed snacks consisting mostly of fruits (watermelon, apples, pears, bananas) with tea or water as beverage. 55% only drank tea or water or fruit juice between meals. The rest of the participants did not consume any between-meal snacks.

### Nutrient intake

TABLE 2 shows the nutrient intake of the participants compared to Canadian recommendations for good health and nutrition. There was no significant difference in the nutrient intake in male and female participants.

The participants' intake for protein, iron, phosphorus, and sodium exceeded or met the Canadian recommendations. Moderate intake (70-90% of recommendations) was achieved for calories, carbohydrates, cholesterol, vitamin C, folate and zinc. All the other nutrients (especially fat, vitamins A, D, E, calcium, magnesium and potassium) were at lower ranges (mostly  $\leq 50\%$  of recommendations). There was no significant correlation between most of the nutrient intake and the sociological influences for both males and females, except for vitamin A intake and economic dependency and older age in men ( $r = 0.891$ ,  $p < 0.05$ ).

### Medications and supplements

Almost two-thirds of the participants reported taking medications and vitamin and mineral supplements for health considerations. Some took prescription drugs for high blood pressure, cardiovascular disease, thyroid or bone problem, high blood lipids, overactive bladder and infections. Most also took non-prescription drugs (Chinese herbs for 'low bone', hypertension, or diabetes; omega-3 fish oil, wild fish oil blend; super lecithin). Percentages of participants were: calcium (65%), multivitamins (52%), vitamin C (23%), vitamin E (13%), omega-3 fatty acid (10%), glucosamine and chondroitin or vitamin D (6%).

### Nutrition issues

The nutritional risk scores calculated from the

**TABLE 2**  
**Nutrient intake of older Chinese immigrants**

Nutrient intake	Male (n=11)	% of recommendation	Female (n=20)	% of recommendation
Calories (kcal)	1234	64	1162	71
Protein (g)	63	129	60	127
Carbohydrates (g)	183	68	167	74
Fat (g)	28	47	29	57
Cholesterol (mg)	207	69	232	77
Vitamin A, RAE (RAE)	403	45	344	49
Vitamin C (mg)	44	49	61	81
Vitamin D (mcg)	3.3	3	27	27
Vitamin E, $\alpha$ -T (mg)	1.3	9	2.0	13
Folate, DFE (mcg)	361	90	370	93
Calcium (mg)	573	48	611	51
Iodine (mcg)	98	65	88	59
Iron (mg)	9.4	124	10.5	131
Magnesium (mg)	158	38	108	47
Phosphorus (mg)	886	125	695	99
Potassium (mg)	1592	34	1471	31
Sodium (mg)	1560	126	1572	125
Zinc (mg)	6.3	58	6.7	84

nutrition screening checklist indicated 35% of the participants were at high risk and 42% at moderate risk. Only 23% had 'good nutrition'. The nutritional risk factors included eating few fruits and vegetables or milk products (100% of participants), tooth or mouth problems that make it hard to eat (45%), eating alone frequently (32%), illness or conditions (diabetes, hypertension, cardiovascular disease) that changed their eating habits (23%), taking  $\geq 3$  drugs per day (23%), and not having enough money to buy their ethnic foods (16%).

Some special dietary concerns related to health issues included the need for soft foods owing to denture problems (26%), high salt intake and high blood pressure (10%), high cholesterol and cardiovascular disease (6%), high carbohydrate or sugar intake and diabetes (6%), and low fruit and vegetable intake and eye problems (6%).

#### **Perceived problems related to food and nutrition**

61% reported not having transportation to do their own food shopping in an ethnic store as a major issue. 45% reported low income or no money (as most participants depended on their children to

support them in their first few years in Canada). 26% cited language barrier and health problems (high blood pressure, cardiovascular disease) as factors that influence their food intake and nutrition.

#### **Desired programmes and services related to food and nutrition**

35% of the participants desired transport for food shopping in ethnic stores and being offered social services in the Chinese language. They wanted socialisation programmes to meet other older Chinese immigrants and education on good nutrition (29%).

#### **Physical activity**

28 of the 31 participants reported doing some physical exercise, including walking (89%, mostly by men), gardening and housework (25% mostly by women). Other activities included *Tai Chi* (54%) and other forms of Chinese body movements, playing *ping pong* (mostly by men), climbing stairs, exercising by following a TV programme (mostly by women) and swimming. About 61% believed they should do more exercise. With regard to the frequency of exercising, 86% reported doing it daily and 11% did so 3 to 4 times per week. In terms of duration

of physical activity, 71% reported doing it around 30 minutes and 29% indicated  $\geq 1$  hour. Most agreed that while in China they did more physical exercise because programmes are available in the parks near their residences and they could undertake physical activities with their friends and neighbours. "...Our parks are equipped with exercise beams or bicycles, walking pathways, and huge spaces for group exercises..." (M6).

Reasons for exercising included: for improved health (57%), to reduce risk of health problems (39%), for enjoyment/fun (29%), to improve physical condition or to get stronger (25%), to socialise with friends (21%), to lose weight (18%), and to feel better or release stress (14%). If they were unable to exercise regularly, the reasons given were not enough time to do it (19%), no place to exercise (13%), interferes with family/work and social activities (13%), no programmes available in the Chinese language or no transportation (13%), poor physical condition or not enough energy to exercise (10%), and bad weather/snow (10%). 16% of participants reported exercise information in the Chinese language, health problem or illness, support from family or friends, and doctor's recommendation as factors that might motivate them to start physical activity.

## DISCUSSION

### Demographic/sociocultural factors

Older adults, aged  $\geq 60$  years, are one of the Canada's fast-growing populations. A fairly large proportion of this population is made up of immigrants. Based on the Landed Immigration Data System from 1980 to 2001, about 7% of the immigrants were  $\geq 65$  years.<sup>17</sup> In London, Ontario, slightly >1100 immigrants aged 60 to 79 years arrived from 1990 to 2001 and approximately 4000 settled in Markham. Research examining the immigrants' health and profiles regarding dietary habits and physical activity is limited.<sup>4,7</sup> Such studies provide data for evidence-based, culturally sensitive health promotion programmes/strategies.

In the current study, more women than men were interviewed; there was no significant difference between genders. The participants were similar to other community-based populations in terms of age and gender distribution<sup>7,18</sup>; their incomes were also similarly low. Although they were highly

educated (22 with university/college degrees), many did not speak, write, read, or comprehend English well. This language barrier is considered a factor for a slower/lower levels of acculturation into the mainstream society.<sup>7,19</sup> In terms of demographic and sociological characteristics, there was no significant difference between the participants from London or Markham.

### Nutrition and health status

Excess weight and obesity are more commonly observed in elderly Canadians than Chinese immigrants.<sup>4,7</sup> The healthy weights also need to be considered in the light of the 'healthy immigrant effect' whereby recent immigrants are healthier than those already in the host country regarding chronic health conditions, disability and dependence, mortality effects, and life expectancy.<sup>1,2,5,6</sup> With increasing duration of residence in Canada, this trend reverses and the health of immigrants becomes worse than the mainstream population. The current study also indicated that 77% of them were at high or moderate nutritional risk, particularly due to the consumption of few fruits, vegetables and milk products, or mouth and tooth problems that make them hard to eat. The medications and vitamin/mineral supplements taken by the participants may help delay the progression of chronic illnesses, but some were taking non-prescription drugs based on their experiences in China. Low income and the use of multiple medications (prescribed or not) have also been observed in the mainstream Canadian elderly population<sup>7,20</sup>; possible over-consumption may result in negative drug-nutrient interactions. Some participants attributed long waiting lists or wait times for not accessing health care services, particularly for medical appointments to obtain prescription medication. Reasons for not consulting physicians for drug prescriptions included expense and the language barrier. This was similar to findings from surveys of other immigrants to Canada.<sup>1,2,5,6</sup>

The major nutrition problems of elderly Canadians appear to be low intake of energy, calcium, zinc, iron and vitamins A, C, and D, and excessive intake of dietary fat.<sup>4,7</sup> In the current study, there were similar low intake for calories, vitamins A, D, E, calcium, iodine, magnesium, potassium, and fat. For all Canadian elderly, low vitamin D intake is singled out as a problem. Thus, vitamin D supplementation is recommended.

## Dietary intake

Compared with average Canadian diets,<sup>21</sup> the participants reported high intake of protein-rich foods (particularly meat and poultry), moderate to low intake of carbohydrates, and low intake of fat; all three macronutrients contributed to about 2/3 of the total calorie intake, compared to Canadian recommendations. This pattern is quite different from the traditional Chinese way of eating, i.e., moderate intake of protein, high intake of carbohydrates and fats.<sup>22</sup> In this study, the older Chinese immigrants preferred their traditional consumption patterns such as consumption of rice and noodles as well as typical vegetables (bittermelon, *bok choy*, *napa*, and mushrooms). In general, the Chinese eat fresh fruit infrequently<sup>22</sup> and this was consistent with the findings in the current study, in which fruit was consumed by some participants as snacks but hardly eaten with the main meals. Although hot soup or tea was the beverage that usually accompanied a meal, some participants learned to adapt the habit of drinking milk. This adaptation was similar to that noted in Chinese-Americans<sup>22</sup> who did not routinely consume dairy products in China.

Studies in the US indicate that 30% of immigrants altered their diet.<sup>22</sup> In the current study, the major change in their diet was at the first meal of the day, whereby 71% of the participants consumed a westernised breakfast of cold cereal with milk and boiled egg with toast instead of the customary hot rice porridge (*congee*) seasoned with small amounts of meat, fish or pickled vegetables.<sup>22</sup> This was mostly attributed to the preferences of grandchildren: "At home, ...[the children] are the centre of the family, and everything is based on their preferences, such as the types of food like cereals or eggs...for me, ... I would be very happy if I just have some corn flour porridge...that is what I want." (F12)

Breakfast and snacks tend to be more easily westernised; dinner remains the most traditional Chinese meal.<sup>22</sup> Immigrants often make changes to their diet for integration or by necessity.<sup>7,18</sup> For example, the primary staple of rice or noodles may be replaced by wheat bread. The current nutrient intake of the older Chinese immigrants could be attributed to continuing their traditional food choices at the lunch and dinner meals (e.g. low fruits and dairy products, higher consumption of fish and pork, fruit juice or tea) and consumption of special ethnic foods

such as pickled vegetables and *tofu*. Calcium intake was low and this could be due to the overall low consumption of milk and dairy products, particularly among Asians.<sup>7,22</sup> Sodium intake was higher than Canadian recommendations,<sup>7,22</sup> which is partly due to the use of salty fish sauce, pickled vegetables, and dried *ramen* noodles. The high intake of iron could have resulted from the consumption of enriched cereals at breakfast although actual amounts absorbed may be hindered by drinking tea. Dietary acculturation appears to be a passive and gradual process strongly influenced by daily life issues such as social support, cost and convenience.<sup>23</sup> Food practices are often the last habits to change, as groups migrate from one country to another.<sup>24</sup> For example, Chinese-American women retained a preference for Chinese food, though they also accepted foods commonly consumed by white American women such as cheeses, legumes, and raw vegetables in salads.<sup>24</sup> More studies are needed to assess the food consumption changes over time and determine the impact of acculturation.

It is inappropriate to compare their dietary intake to the Chinese Food Guide Pagoda, because it was designed based on the Dietary Guidelines for Chinese Residents in China<sup>25</sup> and most participants had been residing in Canada for sometime. The Pagoda suggests a relatively ideal dietary pattern and the principles are expressed in relative amounts of a variety of specific foods.<sup>25</sup> Even with these limitations, assessment of dietary intake indicated that fruit and vegetable, and milk and milk product intake did not meet the recommended amounts for the elderly, which are slightly lower than the average amounts recommended for healthy Chinese adults in China.<sup>25</sup>

The nutrition risk among older Chinese immigrants was due to limited financial resources, lack of transportation to buy ethnic foods, and non-finance-related factors. Similar findings were reported in low-income Canadian seniors in general.<sup>20</sup> Nutrition is closely linked to health and immigration intersects with public health through immigrant health status, which deteriorates with increasing duration of residence in the host country.<sup>1,2,5,6</sup> All these factors need consideration in planning/developing appropriate culturally sensitive educational programmes for minorities. Thus, for acculturated individuals, emphasis might be placed

on healthy traditional Chinese diets and on healthy modifications of westernised foods.<sup>23</sup>

### Physical activity issues

Two studies analysed the patterns and nature of leisure activities among Chinese-Americans in the US.<sup>26,27</sup> These included playing *mah-jong*, watching television, reading, walking, shopping, doing *Tai Chi*, attending church, gardening and sewing. Their activities tend to be culturally oriented, and serve as ways of maintaining their traditions and heritage, which constitutes an important social link.<sup>27</sup> Most participants believed that physical exercise and doing household work keep the body functioning. This affirms their belief that physical activity is linked to health. Most reported that their main reason for exercising was 'for improved health' and about 25% wanted to improve their physical condition or get stronger. There may be some differences in perception of physical activity and there is a lack of standardised measures for older adults. Although most participants reported doing some activity [including "...domestic work ... it is a kind of exercise" (F11, M18)], they felt less active in their new environment compared to when they were in their home country. Their physical activities included limited components that build on strength, flexibility and balance as recommended by Canada's Physical Active Guide for Older Adults.<sup>28</sup> Also, the time spent on exercising was minimal compared to recommendations.<sup>28</sup> Therefore, any educational activity targeting these participants needs to emphasise the health benefits of exercise and promote appropriate physical activity. In London, Ontario, there are exercise programmes intended for older adults (e.g. those offered by the Canadian Center for Activity and Aging<sup>29</sup>), but are conducted in English, and the associated fees and transportation required may discourage participation. In Markham, older immigrants also had similar barriers to physical activity (language, transportation, economic dependency and cultural differences). Other sociological factors prevented physical activity included no accessible place to exercise, not enough time, bad weather/snow, and no access to organised activities (especially in their own language). It is therefore important to consider these issues when planning, marketing and managing activity programmes for older immigrants from different ethnic groups. Walking was reported to be the most common form of physical activity, as it is the most economical.<sup>7,27</sup> As such, it might be a

good strategy to develop walking programmes for older adults and perhaps recruit bilingual/bicultural professionals to understand elderly immigrants' needs for adequate leisure and physical activities.<sup>27</sup> Further research is needed to measure physical activity in older individuals in an objective way, e.g. by means of pedometers or accelerometers, and to gauge their perceptions of what physical activity means to them.

### Sociocultural influences

A high degree of life satisfaction among Chinese elderly immigrants significantly correlates to activity levels, general health, psychological health, social support, self-esteem, and sense of personal control.<sup>30</sup> In the current study, many factors such as economic independence, English language proficiency, and independent living arrangement were all reported by the participants as positive influences on their self-perceived life satisfaction/improvement with regard to settling in. Satisfactory adjustment to life in Canada may be facilitated by adequate leisure activities/programmes, easy availability of their preferred foods. "I don't feel my life here has been improved in terms of what I eat... In China, it is convenient to dine out... Restaurants are everywhere. You can find whatever dishes you like." (M14) "I find that most food, such as vegetables, is suitable for natives but very limited food fits for us. There is a smaller variety of fruits in Canada than in China. However, the quality of food is good here." (F8)

Life satisfaction is an important component of a healthy life, particularly for recent immigrants who face barriers to health services due to language or cultural differences, lack of information, and inexperience with the health care system.<sup>1,2,5,6</sup> This could lead to worsening immigrant health status over time owing to under-use of preventative health screening and under-diagnosis and treatment of chronic health problems.<sup>1,2,5,6</sup> The participants were economically dependent on their children (especially for housing and food) and felt their poor English to be a barrier to interacting with others from different ethnic groups. Their old age and lack of English proficiency precluded them from pursuing gainful employment that could enable financial independence from their children.

### Strengths and limitations

This study provided an opportunity to understand

the dietary and physical activity patterns of older Chinese immigrants and the sociological factors that influence adaptations to these health practices. Adequate dietary intake and regular physical activity are well established as means of health promotion and disease prevention strategies in Canada and around the world. However, these 2 areas are seldom included in research on health, immigration and settlement.

The quantitative findings are supplemented by qualitative/free-text comments to explain some of the numbers. Adaptations in dietary habits and physical activity after immigration and the influencing sociocultural factors are highlighted.

There are inherent methodological limitations in studies on minority groups, e.g. small sample size, non-standardised verbal referrals, snowball sampling, as well as language barriers affecting the perspectives of both the participants and researchers. Although immigration of older adults for family reunification has been encouraged, the absolute number of older Chinese especially in London and Markham, Ontario remains small (compared to large metropolitan cities such as Toronto and Vancouver). The qualitative sociological component of the survey dictated a small sample size, particularly for conducting in-depth face-to-face interviews (lasting 1.5 to 2 hours), which was tiring for some participants. The snowball sampling and the use of friends' networks may have contributed to self-selection bias. Some of the potential participants refused to be interviewed because their children did not want them to, and they feared that voicing out their needs might jeopardise their stay in the country. Although the small sample size limited the generalisation of the findings, this study provided data reflecting nutritional and physical activity profiles.

Comparison with Canada's Food Guide<sup>21</sup> may not be appropriate for Chinese immigrants when they had not been acculturated into the mainstream culture. Nor is comparison with the Chinese Food Pagoda practical, as it is intended for residents living in mainland China.<sup>25</sup> The Chinese in North America are diverse; some are more resistant to assimilation due to strong desires to maintain their own culture and heritage.<sup>23,30</sup> Canadian nutritional intake recommendations for the older population encompass a wide range of ages (50-75+ years), and

the values may not be suitable for participants aged >70 years; yet there is no other basis for comparison in the Canadian context. Moreover, data analysis based on gender differences is limited due to the small number of male participants and small sample sizes.

## RELEVANCE TO PRACTICE

Implications for developing evidence-based health promotion strategies for older immigrants include: (1) Combining nutrition education and physical activity interventions for better health and incorporating evidenced-based, culturally sensitive, family-oriented, appropriate and relevant nutrition information and physical activities. (2) Recognising the special needs of immigrants to help health professional market and manage health promotion programmes, taking account of cultural contexts (immigrants are unlikely to use mainstream health promotion programmes conducted in English). (3) Addressing nutrition and physical activity issues of older immigrants in sociological studies on immigration and settlement. As Canada continues to allow immigration of ethnic populations, it is critical to ensure the health and life satisfaction of immigrant families, especially older individuals.

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