Research article

Male and Female Adult Population Health Status in China: A Cross-Sectional National Survey

Jing Shi¹, Meina Liu², Qiuju Zhang², Mingshan Lu³ and Hude Quan*⁴

Address: ¹Division of Preventive Medicine, Department of Basic Medical Science, Hebei Medical University, Shijiazhuang, PR China, ²Department of Biostatistics, School of Public Health, Harbin Medical University, Harbin, PR China, ³Department of Economics, University of Calgary, Calgary, Canada and ⁴Department of Community Health Sciences and Centre for Health and Policy Studies, University of Calgary, Calgary, Canada

Email: Jing Shi - shijing8989@yahoo.com.cn; Meina Liu - liumeina@ems.hrbmu.edu.cn; Qiuju Zhang - zqj81129@sina.com; Mingshan Lu - Lu@ucalgary.ca; Hude Quan* - hquan@ucalgary.ca

* Corresponding author

Abstract

Background: With rapid economic growth and globalization, lifestyle in China has been changing dramatically. This study aimed to describe the male and female adult Chinese population health status.

Methods: The Chinese Third National Health Services Survey was conducted in 2003 to collect information about health status and quality of life from randomly selected residents. Of the 193,689 respondents to the survey (response rate 77.8%), 139,831 (69,748 male and 70,083 female) respondents who were 18 years of age or older were analyzed.

Results: Among the respondents, fewer males than females rated their overall wellbeing as being poor or very poor (4.8% versus 6.2%), reported illness in the last 2 weeks (14.1% versus 17.4%), presence of physician diagnosed chronic disease (15.0% versus 17.7%) and at least one functional problem in seven items of the quality of life (26.9% versus 32.8%). More males than females were currently smoking (52.4% versus 3.4%) and drank alcohol more than three times per week (16.5% versus 1.1%). Physically inactive rate was similar between males and females (85.8% versus 87.0%). Fewer rural respondents reported chronic disease than urban respondents (13.0% versus 19.9% for males and 15.5% versus 22.8% for females). In all seven items of the quality of life measured, rural respondents reported less problems than urban respondents (26.2% versus 28.7% for males and 32.0% versus 34.7% for females).

Conclusion: Males had better health status than females in terms of self-perceived wellbeing, presence of illness, chronic disease, and quality of life. However, smoking and frequent alcohol drinking was more prevalent among males than that among females. In contrast with the social-economic gradient in health commonly found in the literature, the wealthier urban population in China was not found to be healthier than the rural population in terms of physician diagnosed chronic disease.

Background

China's population of 1.3 billion accounts for 20% of the world population, making it the most populated country in the world. With rapid economic growth and globaliza-
tion, Chinese people's lifestyle has been changing dramatically towards being more physically inactive, eating more fast food, and being overall more stressed compared to their old lifestyle. Because of the rapid change in lifestyle, population health is quickly shifting from a high mortality rate due to infectious and domestic diseases, related to 'poverty' before implementation of 'open door policy' in 1980, to a currently greater life expectancy and higher prevalence of chronic and non-communicable diseases brought on by 'affluence' [1].

In the last five decades, the Chinese population has become healthier as measured by decreased mortality rate and increased life expectancy. For example, infant mortality has decreased from 80.8/1000 live births in 1958 to 21.5/1000 live births in 2004 [2], maternal mortality has declined from 88.9/100000 live births in 1990 to 48.3/100000 live births in 2004, and life expectancy has increased from 57.0 years in 1957 to 71.8 years in 2004 [3]. The most recent data showed that heart disease, cancer and stroke are the major causes of death, accounting for 65% of all deaths and infectious disease has become the least important cause of death, only accounting for 3% of all deaths in Chinese population aged 40 or above [4].

Life expectancy is an internationally used health measure because many countries, including China, periodically calculated it using vital data. However, such measure mirrors mortality, and particularly infant mortality, but is insensitive to nonfatal and psychosocial conditions that contribute indirectly to death. Hence, it is imperative to assess population health using indicators that reflect contemporary health issues. This study aimed to describe the male and female adult Chinese population health status in multiple dimensions, including well-being, morbidity, quality of life, and health behaviors of smoking, alcohol consumption and physical activity, using data from the most recent National Health Services Survey from the Chinese government. Our descriptive study on Chinese population health status has application for international organizations because China's large population will influence global health status. Our study provided important information for generating research questions for future studies.

**Methods**

**Study Population**

We derived data from the China Third National Health Services Survey, which collected data through face-to-face interviews from September 18 to October 20, 2003. Of the 193,689 respondents surveyed, we included individuals who were 18 years of age or older and excluded 3,677 respondents with missing values, resulting in a total of 139,831 (69,748 males and 70,083 females) respondents in our analysis.

The national survey employed a multiple stage cluster sampling method to select the sample randomly. The mainland of China was clustered according to the government administrative geographic system (i.e., county, town and village in rural areas, and city, community, and neighbourhood in urban areas). Firstly, 95 counties and cities were randomly selected from rural and urban areas. Secondly, 5 towns and 5 communities were randomly selected in each county and city, respectively. Thirdly, 2 villages in each town and 2 neighbourhoods in each community were randomly selected. Fourthly, 60 households were randomly selected in each village and neighbourhood, respectively, resulting in about 57,000 households. All family members aged 15 years or older were invited to participate in the face-to-face interview.

**Data collection**

Medical doctors and nurses conducted the survey. Before the survey, interviewers were trained and practiced interviewing their understanding and knowledge about the survey method and content were examined through testing. During the survey, interviewers visited each household up to three times on different days and times. Interviewers explained the purposes and confidentiality of the survey, and then invited family members to participate. Respondents could choose not to participate and their participation in the survey was accepted as oral consent. The completeness of questionnaires was checked by a district survey manager at the end of every day. If there was missing information on the survey, individuals would be re-surveyed if possible. After the survey, 5% of households were randomly selected and re-surveyed on 14 questions to examine survey quality; the agreement was 95%. The survey response rate for adults was 77.8% [5].

**Demographic Characteristics**

Demographic variables included age, sex, marital status, education; rural/urban residence, and geographic region. Educational level was categorized into five categories, illiterate (it was defined as people who could not read newspaper or magazines, or write a short note), elementary school (i.e. those who attended up to 6 years of schooling or were not illiterate for those without schooling), junior high school (i.e. schooling 7 – 9 years), senior high school (i.e. schooling 10–12 years), and college or university or higher (i.e. complete or incomplete of post-secondary school). Residence was divided based on rural and urban area and then economic development. Rural area included towns and villages. Based on economic development, Eastern China, the most developed region, included 11 provinces and metropolitans such as Beijing, Shanghai, and Liaoning. Middle China included 8 provinces, such as provinces of Heilongiang, Shanxi, and Hunan. Western China, the least developed region, included 12...
Health Status Indicators
Self-perceived overall wellbeing was assessed using a five-point Likert-type scale of being excellent, good, fair, poor or very poor. Presence of illness in the last two weeks and physician-diagnosed chronic disease in the last six months was recorded. The two-week illness was surveyed by asking: "Have you had any physical and mental discomforts during the last two weeks?" Chronic disease referred to disease diagnosed by medical doctors and occurring in the last 6 months prior to the survey, or chronic disease that was diagnosed more than 6 months prior to the survey but reoccurred within the last 6 months and received treatment. Non-physician diagnosed chronic disease was not included because the validity of self-diagnosed medical conditions depends on the level of the respondent's knowledge and their perceptions on the definition of 'disease' and 'health'. Physician diagnosed chronic disease was further confirmed by asking diagnosis location including community clinics, county hospital, city hospital, provincial hospital, military hospital, and others. Respondent reported up to three specific chronic diseases. The reported diseases were coded and classified using the disease classification scheme designed by China Ministry of Health for the survey.

Quality of life was measured using a seven-item instrument. Respondents were asked about presence and level of severity of their dysfunction and disability in the last 30 days in 1) ability about washing or dressing themselves, 2) ability to do job work or housework, 3) feeling of pain or physical discomfort, 4) ability of concentration on work or study and memory, 5) ability of recognizing familiar people from 20 meters away (with glasses for those wearing glasses), 6) emotional discomfort due to restlessness, and 7) anxiety or depression. Under each item, five itemized answers about presence and severity were provided, including: none, mild, moderate, severe, and extremely severe.

Statistical Analysis
Proportion was employed to describe respondents in demographic characteristics, health status and health determinants. Because of the large sample size and multiple categories in some variables, the P-value for sex difference was not reported. Frequencies of variables in the survey were not weighted because sampling weight was not available. The same sampling method had been used in the previous two National Health Services Surveys in China. Analyses of previous surveys suggest that this sampling method is adequate to generate a nationally representative sample [5]. The survey respondent age and sex composition was comparable with the 2000 census. Finally, multiple logistic regressions were used to generate risk adjusted P-value for gender difference in health indicators after adjustment for demographic characteristics and correction of clustering of individuals within family using the repeated measure [6,7].

The data were analyzed at the health information centre of the Ministry of Health in Beijing. Confidentiality of the survey was protected through storing the data on password protected computers at the Ministry, and removing personal identifiable information (such as name and address) from the database available for researchers and examining analysis outputs for release of aggregated data by the centre staff.

Results
Demographic Characteristics
Demographic characteristics for respondents are presented in Table 1. A majority of the respondents were married (80.3%) and resided in rural areas (71.2%). There was a similar proportion of male and female (49.9% versus 50.1%). More males than females were unmarried (14.8% versus 9.2%) but had higher education (illiterate rate: 12.2% for males and 27.7% for females). The composition by age, rural/urban and region was similar between males and females.

Health Status and Determinant
Of the respondents, 5.5% rated their overall wellbeing as being poor or very poor, 15.8% reported illness in the last 2 weeks and 16.3% reported presence of chronic disease (see Table 2). Compared to males, more females rated their overall wellbeing as being poor or poorer (4.8% versus 6.2%, risk adjusted P < 0.001), and reported presence of illness in the last 2 weeks (14.1% versus 17.4%, risk adjusted P < 0.001) and chronic disease (15.0% versus 17.7%, risk adjusted P < 0.001). Males had lower prevalence of heart disease (1.4% versus 2.4%), hypertension (3.2% versus 4.0%) and rheumatologic arthritis (0.8% versus 1.1%) among females.
Table 1: Characteristics of the survey respondents aged 18 years or older in China

| Variables               | Total N (% of 139831) | Male N (% of 69748) | Female N (% of 70083) |
|-------------------------|-----------------------|---------------------|-----------------------|
| Age                     |                       |                     |                       |
| 18–34                   | 43055 (30.8)          | 21475 (30.8)        | 21580 (30.8)          |
| 35–44                   | 31770 (22.7)          | 15646 (22.5)        | 16124 (23.0)          |
| 45–54                   | 30023 (21.5)          | 15088 (21.6)        | 14935 (21.3)          |
| 55–64                   | 16942 (12.1)          | 8746 (12.5)         | 8196 (11.7)           |
| ≥ 65                    | 18041 (12.9)          | 8793 (12.6)         | 9248 (13.2)           |
| Marital status          |                       |                     |                       |
| Married                 | 112274 (80.3)         | 55622 (79.8)        | 56652 (80.8)          |
| Unmarried               | 16736 (12.0)          | 10324 (14.8)        | 6412 (9.2)            |
| Divorce                 | 1584 (1.1)            | 938 (1.3)           | 646 (0.9)             |
| Widow                   | 9237 (6.6)            | 2864 (4.1)          | 6373 (9.1)            |
| Education               |                       |                     |                       |
| Illiterate              | 27905 (20.0)          | 8494 (12.2)         | 19411 (27.7)          |
| Elementary school       | 38332 (27.4)          | 19374 (27.7)        | 18958 (27.1)          |
| Junior high school      | 45654 (32.7)          | 25788 (37.0)        | 19866 (28.3)          |
| Senior high school      | 15024 (10.7)          | 8787 (12.6)         | 6237 (8.9)            |
| College or university   | 12916 (9.2)           | 7305 (10.5)         | 5611 (8.0)            |
| Residence area          |                       |                     |                       |
| Urban                   | 40244 (28.8)          | 19516 (28.0)        | 20728 (29.6)          |
| Rural                   | 99587 (71.2)          | 50232 (72.0)        | 49355 (70.4)          |
| Region of China         |                       |                     |                       |
| East of China           | 48554 (34.7)          | 23957 (34.4)        | 24597 (35.1)          |
| Middle of China         | 39056 (27.9)          | 19541 (28.0)        | 19515 (27.8)          |
| West of China           | 52221 (37.4)          | 26250 (37.6)        | 25971 (37.1)          |

Table 2: Self-perceived overall physical and emotional wellbeing, illness, and morbidity in the respondents aged 18 years or older in China

| Variables                                  | Total N (% of 139831) | Male N (% of 69748) | Female N (% of 70083) |
|--------------------------------------------|-----------------------|---------------------|-----------------------|
| Physical and emotional wellbeing           |                       |                     |                       |
| Excellent                                  | 49088 (35.1)          | 25816 (37.0)        | 23272 (33.2)          |
| Good                                       | 50996 (36.5)          | 26156 (37.5)        | 24840 (35.5)          |
| Fair                                       | 32055 (22.9)          | 14447 (20.7)        | 17608 (25.1)          |
| Poor                                       | 6724 (4.8)            | 2873 (4.1)          | 3851 (5.5)            |
| Very poor                                  | 968 (0.7)             | 456 (0.7)           | 512 (0.7)             |
| Combination of poor and very poor*         | 7692 (5.5)            | 3329 (4.8)          | 4363 (6.2)            |
| Morbidity                                  |                       |                     |                       |
| Presence of illness in the last 2 weeks before the survey* | 22050 (15.8) | 9865 (14.1) | 12185 (17.4) |
| Presence of physician diagnosed chronic disease in the last 6 months before the survey* | 22808 (16.3) | 10432 (15.0) | 12376 (17.7) |
| Infectious and parasitic disease           | 485 (0.4)             | 303 (0.4)           | 182 (0.3)             |
| Cancer                                     | 231 (0.2)             | 122 (0.2)           | 109 (0.2)             |
| Diabetes                                   | 1062 (0.8)            | 472 (0.7)           | 590 (0.8)             |
| Heart disease*                             | 2644 (1.9)            | 997 (1.4)           | 1647 (2.4)            |
| Stroke                                     | 1257 (0.9)            | 693 (1.0)           | 564 (0.8)             |
| Chronic pulmonary disease*                 | 1911 (1.4)            | 1153 (1.7)          | 758 (1.1)             |
| Hypertension*                              | 4989 (3.6)            | 2203 (3.2)          | 2786 (4.0)            |
| Peptic ulcer                               | 707 (0.5)             | 446 (0.6)           | 261 (0.4)             |
| Chronic liver disease                      | 192 (0.1)             | 123 (0.2)           | 69 (0.1)              |
| Chronic renal disease                      | 258 (0.2)             | 83 (0.1)            | 175 (0.3)             |
| Rheumatologic arthritis*                  | 1598 (1.1)            | 334 (0.8)           | 1064 (1.5)            |

* Note: P value < 0.001 for males versus females after adjustment for age, marital status, education, urban/rural residence and geographic region.
versus 1.5%) than females. However, prevalence of chronic pulmonary disease was slightly higher for males than that for females (1.7% versus 1.1%).

In all seven items of the quality of life, 29.9% reported at least one problem (see Table 3). The rate was significantly lower for males than that for females (26.9% versus 32.8%, risk adjusted P < 0.001). Males were more likely than females to report no problems on all seven items (such as 86.6% versus 81.8% for pain, 88.1% versus 84.3% for concentration or memory, 90.6% versus 87.5% for vision, 88.2% versus 84.3% for emotional discomfort and 89.3% versus 86.1% for anxiety/depression).

Respondents aged 65 years or older had much poorer health status than those aged less than 65 years old among males and females (see Table 4). A similar proportion of rural and urban respondents rated their health status as being poor or very poor (4.8% versus 4.7% for males and 6.3% versus 6.1% for females), and reported the presence

Table 3: Quality of life in the respondents aged 18 years or older in China

| Quality of life                                                                 | Total N (% of 139831) | Male N (% of 69748) | Female N (% of 70083) |
|--------------------------------------------------------------------------------|-----------------------|---------------------|-----------------------|
| **Problem about washing or dressing yourself in the last 30 days**              |                       |                     |                       |
| No problem                                                                      | 131927 (94.4)         | 66277 (95.0)        | 65650 (93.7)          |
| Mild problem                                                                    | 5193 (3.6)            | 2216 (3.1)          | 2977 (4.2)            |
| Moderate problem                                                                | 1666 (1.2)            | 734 (1.1)           | 932 (1.3)             |
| Severe problem                                                                  | 777 (0.6)             | 389 (0.6)           | 388 (0.6)             |
| Extremely severe problem                                                        | 268 (0.2)             | 132 (0.2)           | 136 (0.2)             |
| **Problem about usual activities such as work, or housework in the last 30 days**|                       |                     |                       |
| No problem                                                                      | 126403 (90.4)         | 64061 (91.9)        | 62342 (89.0)          |
| Mild problem                                                                    | 8876 (6.3)            | 3621 (5.2)          | 5255 (7.5)            |
| Moderate problem                                                                | 2723 (2.0)            | 1186 (1.7)          | 1537 (2.2)            |
| Severe problem                                                                  | 1362 (1.0)            | 644 (0.9)           | 718 (1.0)             |
| Extremely severe problem                                                        | 467 (0.3)             | 236 (0.3)           | 231 (0.3)             |
| **Level of pain and physical discomfort in the last 30 days**                   |                       |                     |                       |
| No pain or physical discomfort                                                  | 117701 (84.2)         | 60364 (86.6)        | 57337 (81.8)          |
| Mild pain or physical discomfort                                                | 16228 (11.6)          | 6835 (9.7)          | 9393 (13.4)           |
| Moderate pain or physical discomfort                                           | 4373 (3.1)            | 1847 (2.7)          | 2526 (3.6)            |
| Severe pain or physical discomfort                                              | 1274 (0.9)            | 580 (0.8)           | 694 (1.0)             |
| Extremely severe pain or physical discomfort                                    | 255 (0.2)             | 122 (0.2)           | 133 (0.2)             |
| **Problem about concentration or memory in the last 30 days**                  |                       |                     |                       |
| No problem                                                                      | 120534 (86.2)         | 61433 (88.1)        | 59101 (84.3)          |
| Mild problem                                                                    | 14232 (10.2)          | 6173 (8.8)          | 8059 (11.5)           |
| Moderate problem                                                                | 3765 (2.7)            | 1533 (2.2)          | 2212 (3.2)            |
| Severe problem                                                                  | 1027 (0.7)            | 467 (0.7)           | 560 (0.8)             |
| Extremely severe problem                                                       | 273 (0.2)             | 122 (0.2)           | 151 (0.2)             |
| **Problem of recognizing a familiar person in 20 meter or more away**          |                       |                     |                       |
| (with glasses for people wearing glasses)                                       |                       |                     |                       |
| No problem                                                                      | 124449 (89.0)         | 63157 (90.6)        | 61292 (87.5)          |
| Mild problem                                                                    | 9895 (7.1)            | 4354 (6.1)          | 5541 (7.9)            |
| Moderate problem                                                                | 3772 (2.7)            | 1503 (2.2)          | 2269 (3.2)            |
| Severe problem                                                                  | 1316 (0.9)            | 558 (0.8)           | 758 (1.1)             |
| Extreme problem                                                                 | 399 (0.3)             | 176 (0.3)           | 223 (0.3)             |
| **Problem about emotional discomfort due to restlessness in the last 30 days**  |                       |                     |                       |
| No problem                                                                      | 120632 (86.3)         | 61542 (88.2)        | 59090 (84.3)          |
| Mild problem                                                                    | 15504 (11.1)          | 6680 (9.6)          | 8824 (12.6)           |
| Moderate problem                                                                | 2938 (2.1)            | 1185 (1.7)          | 1753 (2.5)            |
| Severe problem                                                                  | 586 (0.4)             | 258 (0.4)           | 328 (0.5)             |
| Extremely severe problem                                                       | 171 (0.1)             | 83 (0.1)            | 88 (0.1)              |
| **Anxiety or depression in the last 30 days**                                   |                       |                     |                       |
| No anxiety or depression                                                       | 122612 (87.7)         | 62263 (89.3)        | 60349 (86.1)          |
| Mild anxiety or depression                                                      | 13230 (9.4)           | 5786 (8.3)          | 7444 (10.6)           |
| Moderate anxiety or depression                                                  | 3040 (2.2)            | 1271 (1.8)          | 1769 (2.5)            |
| Severe anxiety or depression                                                    | 764 (0.6)             | 349 (0.5)           | 415 (0.6)             |
| Extremely severe anxiety or depression                                          | 185 (0.1)             | 79 (0.1)            | 106 (0.2)             |
| **Presence of mild, moderate, severe or extremely severe problem on any one of** |                       |                     |                       |
| seven items above*                                                             | 41756 (29.9)          | 18753 (26.9)        | 23003 (32.8)          |

* Note: P value < 0.001 for males versus females after adjustment for age, marital status, education, urban/rural residence and geographic region.
of illness in the last 2 weeks (14.2% versus 14.0% for males and 17.3% versus 17.6% for females). However, fewer rural respondents reported chronic disease than urban respondents (13.0% versus 19.9% for males and 15.5% versus 22.8% for females). In all seven items of the quality of life measured, rural respondents reported fewer problems than urban respondents (26.2% versus 28.7% for males and 32.0% versus 34.7% for females).

Of the respondents, 27.9% were smoking, 8.8% drank alcohol frequently and 13.6% exercised regularly (see Table 5). Compared to males, females were significantly less likely to smoke (52.4% versus 3.4%, risk adjusted \( P < 0.001 \)), drink alcohol (frequent alcohol consumption 16.5% versus 1.1%, risk adjusted \( P < 0.001 \)) but less likely to do regular exercise (14.2% versus 13.0%, risk adjusted \( P < 0.001 \)). Smoking and frequent alcohol consumption rate were particularly high among males aged 35 to 64 years.

Table 4: Self-perceived overall physical and emotional wellbeing, illness, morbidity and quality of life by age and region in the male and female respondents aged 18 years or older in China

| Quality of life | Male Age | Female Age | Male Residence | Female Residence |
|----------------|----------|------------|---------------|-----------------|
|                | < 65 N (%) | ≥ 65 N (%) | < 65 N (%) | ≥ 65 N (%) | Rural N (%) | Urban N (%) | Rural N (%) | Urban N (%) |
| Total N (denominator) | 60955 | 8793 | 60835 | 9248 | 50232 | 19516 | 49355 | 20728 |
| Perceived poor or very poor physical and emotional wellbeing | 1905 (3.1) | 1424 (16.2) | 2589 (4.3) | 1774 (19.2) | 2419 (4.8) | 910 (4.7) | 3106 (6.3) | 1257 (6.1) |
| Presence of illness in the last 2 weeks before the survey | 7198 (11.8) | 2667 (30.3) | 9194 (15.1) | 2991 (32.3) | 7142 (14.2) | 2723 (14.0) | 8533 (17.3) | 3652 (17.6) |
| Presence of physician diagnosed chronic disease in the last 6 months before the survey | 6899 (11.3) | 3533 (40.2) | 8575 (14.1) | 3801 (41.1) | 6541 (13.0) | 3891 (19.9) | 7659 (15.5) | 4717 (22.8) |
| Presence of mild to extremely severe problem in the last 30 days on any one of seven items below | 13173 (21.6) | 5580 (63.5) | 16376 (26.9) | 6627 (71.7) | 13144 (26.2) | 5609 (28.7) | 15814 (32.0) | 7189 (34.7) |

- Washing or dressing yourself
- Usual activities such as work, or housework
- Pain and physical discomfort
- Concentration or memory
- Recognizing a familiar person in 20 meter or more away (with glasses for people wearing glasses)
- Emotional discomfort due to restlessness
- Anxiety or depression

Table 5: Prevalence of smoking, alcohol consumption and physical activity in the respondents aged 18 years or older in China

| Factors | Total N (% of 139831) | Male N (% of 69748) | Female N (% of 70083) |
|---------|-----------------------|---------------------|----------------------|
| Currently smoking* | 38943 (27.9) | 36544 (52.4) | 2399 (3.4) |
| Frequency of alcohol consumption** # | | | |
| No or rarely | 109283 (78.1) | 42749 (61.3) | 66534 (95.0) |
| Sometimes (< 3 times per week) | 18258 (13.1) | 15507 (22.2) | 2751 (3.9) |
| Frequently (≥ 3 times per week) | 12290 (8.8) | 11492 (16.5) | 798 (1.1) |
| Regular exercise in the last 6 months*** & | 19057 (13.6) | 9932 (14.2) | 9125 (13.0) |

* Note: \( P \) value < 0.001 for males versus females after adjustment for age, marital status, education, urban/rural residence and geographic region.

**P-value < 0.001 for frequent alcohol drinkers versus none, rare or sometimes drinkers.

***Regularity of exercise was determined based on respondent’s perception.
years and regular exercise rate was especially high among male and female seniors (age ≥ 65 years) and among urban respondents (see Table 6).

**Discussion**

This study highlighted the Chinese adult population health status as the following: 1) only a small proportion of Chinese adults perceived their health as being poor; 2) chronic diseases were high, particularly hypertension, heart disease, chronic pulmonary disease and diabetes; 3) one third of Chinese had a functional problem; 4) prevalence of emotional and/or mental health problems surpassed prevalence of physical functional problems; 5) smoking and alcohol abuse was very common in men; 6) most of the Chinese surveyed were physical inactive and 7) male health status was better than female health status.

Non-communicable, rather than communicable, diseases are the major burden in China and the burden has dramatically increased in the last decade as that in some developing countries [8-10]. Compared to the self-reported health conditions in 1993 [2], our analysis of 2003 national survey data showed that prevalence of hypertension and stroke had doubled and prevalence of diabetes had tripled while the prevalence of pulmonary disease and infectious disease had declined by half. In reality, the prevalence of chronic diseases should be higher than our reports because of unawareness of their presence. For example, we reported prevalence of 3.6% for hypertension and 0.8% for diabetes. Based on previous report of unawareness rate of 55.3% for hypertension [11] and 66.6% for diabetes in China [12], the prevalence should be 8.1% for hypertension and 2.4% for diabetes.

In contrast with the social-economic gradient in health commonly found in the literature [13-16], the wealthier urban population in China is not found to be healthier than the rural population in terms of physician diagnosed chronic disease. Our findings are consistent with a previous report in China [17]. That study measured glucose tolerance among 42,751 residents who were randomly selected from 11 provinces in China, and reported diabetes prevalence rates of 5.8% in municipal areas, 2.9% in high income rural areas and 1.8% in low income rural areas [17].

There are several possible explanations for the above findings. First, the rural population had lower incidence of chronic disease compared with the urban population. The urban population, who has benefited most from China's economic development, has experienced a dramatic lifestyle change in the past two decades. Compared with before, they are becoming more physically inactive (commuting by cars rather than bicycles), and eating more fast food and high protein/fat food. Prior to the implementation of the "open door policy" in the 1980s, China's population health was characterized with a high prevalence of infectious diseases as a result of poverty. It has now shifted to a high prevalence of chronic and non-communicable diseases, brought on by 'affluence.' Such change is much more dominant in urban than rural populations. Of all daily sources of energy, cereals accounted for 61.4% and meat 10.8% for rural residents, compared with 48.5% and 17.6% respectively for urban residents [18].

The second possible explanation is that compared with the urban population, the rural population had a higher mortality rate (6.1/1000 versus 5.6/1000) [19], with a shorter duration from disease occurrence to death, and thus a lower life expectancy (69.5 versus 75.2 years) [20,21]. It was reported that the rural population had higher rates of heart disease and stroke specific mortality than the urban population (330.7 versus 279.5/100,000 person-years for heart disease and 304.1 versus 256.1/100,000 person-years for stroke) [22].

### Table 6: Prevalence of smoking, frequent alcohol consumption and physical activity by age and gender in the respondents aged 18 years or older in China

|                | Male          | Female        |
|----------------|---------------|---------------|
|                | Smoking N (%) | Frequently drinking alcohol* N (%) | Regular exercise# N (%) | Smoking N (%) | Frequently drinking alcohol* N (%) | Regular exercise# N (%) |
| **Age**        |               |               |                       |               |               |                               |
| 18–34          | 8966 (41.8)   | 1656 (7.7)    | 2478 (11.5)           | 218 (1.0)     | 62 (0.3)      | 1961 (9.1)                     |
| 35–44          | 9504 (60.7)   | 2902 (18.6)   | 1525 (9.8)            | 409 (2.5)     | 183 (1.1)     | 1405 (8.7)                     |
| 45–54          | 9425 (62.4)   | 3517 (23.3)   | 1807 (12.0)           | 580 (3.9)     | 230 (1.5)     | 2015 (13.5)                    |
| 55–64          | 4842 (55.4)   | 1914 (21.9)   | 1723 (19.7)           | 464 (5.7)     | 147 (1.8)     | 1763 (21.5)                    |
| ≥ 65           | 3807 (43.3)   | 1503 (17.1)   | 2399 (27.3)           | 728 (7.9)     | 176 (1.9)     | 1981 (21.4)                    |
| **Residence**  |               |               |                       |               |               |                               |
| Rural          | 27245 (54.2)  | 8736 (17.4)   | 2789 (5.6)            | 1615 (3.3)    | 572 (1.2)     | 1759 (3.6)                     |
| Urban          | 9299 (47.7)   | 2756 (14.1)   | 7143 (36.6)           | 784 (3.8)     | 226 (1.1)     | 7366 (35.5)                    |

* Note: Frequent drinker was defined as drinking ≥ 3 times per week.

# Regularity of exercise was determined based on respondent's perception.
was common for both men and women. Interestingly, physical inactivity smoking's dangers was over 60% in some provinces and the proportion who were unaware of 

Chinese seniors were more active than the younger populations.

Hypertension is an important risk factor for many chronic diseases, particularly for stroke, heart disease and chronic renal disease. He and colleagues [4] found that hypertension contributed 11.7% to total mortality, smoking 7.9% and physical inactivity 6.8%, resulting in a total of 28.4% (when combined) to mortality in the Chinese adult population. However, these factors were very poorly controlled. About 30% of hypertensive patients took antihypertensive medication with 8.1% achieved blood pressure control [11], and 27.2% of diabetics took medication with 9.7% controlled diabetes [12]. The huge gap between presence, awareness, treatment and control of hypertension strongly indicates imperative needs for a national education program that targets the public, clinicians and decision makers to eliminate the gap. Reforming the healthcare system towards the universal insurance coverage is also essential to remove financial barrier to access the system.

There are four major limitations in the study. First limitation was that validity of self-report health condition was suboptimal. Our prevalence of chronic disease was likely underestimated as stated above. Second limitation was that we did not conduct risk factorial analysis for health status due to the nature of the cross sectional survey. Third limitation is that we did not assess child health status. The reason for that is the survey did not include children under age 15. Fourth limitation is that we only analyzed three major risk factors but were unable to assess other important risk factors of diet and obesity.

Conclusion
Our analysis demonstrated that males had better health status than females in terms of presence of self-perceived poor wellbeing, illness, chronic disease, and poor quality of life. However, smoking and frequent drinking of alcohol was more prevalent among males than that among females. Our results also indicated that prevalence of chronic illnesses was higher among the urban residents, as compared with rural residents among males and females. Along with reduction of the risk factors to chronic diseases, promotion of emotional and mental health should be considered to increase quality of life. Further research on measuring mental health is imperative. Without intervening preventable risk factors for chronic diseases (i.e. reducing hypertension, smoking, alcohol abuse, and physical inactivity), the Chinese population health status will deteriorate even faster as the population ages rapidly due to one-child per family policy in the last thirty years.

Competing interests
The authors declare that they have no competing interests.
Authors’ contributions
JS designed the study and drafted the manuscript. ML performed the statistical analysis, interpreted the results and participated in coordination. QZ performed the statistical analysis and interpreted the results. MLu participated in the study design and interpretation of the results. HQ conceived the study, participated in its design and drafted the manuscript. All authors read and approved the final manuscript.

Acknowledgements
Dr. Hude Quan is supported by a Population Health Investigator Award from the Alberta Heritage Foundation for Medical Research, and a New Investigator Award from the Canadian Institutes of Health Research, Canada. Dr. Mingshan Lu acknowledges the financial support from the Institute of Health Economics in Alberta. The authors thank the China Ministry of Health for providing the data for analysis.

References
1. Cook IG, Dummer TJ: Changing health in China: re-evaluating the epidemiological transition model. Health Policy 2004, 67:229-43.
2. China Ministry of Health: Health Statistics Yearbook 2006 Beijing: China Ministry of Health; 2006. [in Chinese]
3. China Ministry of Health: Life expectancy. [http://www.moh.gov.cn/publicfiles/business/htmlfiles/zwgkzt/pjty/digest2008/qb6.htm]. [in Chinese]. Accessed on August 14, 2008
4. He J, Gu D, Wu X, Reynolds K, Duan X, Yao C, Wang J, Chen CS, Chen J, Wildman RP, Klug MJ, Whelton PK: Major causes of death among men and women in China. N Engl J Med 2005, 353:1124-37.
5. China Ministry of Health: The Third National Health Services Survey Design Beijing, China Ministry of Health: 2003. [in Chinese]
6. McNutt LA, Wu C, Xue X, Hafner JP: Estimating the relative risk in cohort studies and clinical trials of common outcomes. Am J Epidemiol 2003, 157:940-3.
7. Spiegelman D, Hertzmark E: Easy SAS calculations for risk or prevalence ratios and differences. Am J Epidemiol 2005, 162:199-200.
8. Ebrahim S, Smeeth L: Non-communicable diseases in low and middle-income countries: a priority or a distraction? Int J Epidemiol 2003, 34:961-6. [in Chinese]
9. Lopez AD, Mathers CD, Ezzati M, Jamison DT, Murray CJ: Global and regional burden of disease and risk factors, 2001: systematic analysis of population health data. Lancet 2006, 368:1747-57.
10. Anderson GF, Chu E: Expanding priorities – confronting chronic disease in countries with low income. N Engl J Med 2007, 356:209-11.
11. Gu D, Reynolds K, Wu X, Chen J, Duan X, Muntner P, et al: Prevalence, awareness, treatment, and control of hypertension in China. Hypertension 2002, 40:920-7.
12. Wu YF, Xie GQ, Li Y, Zhao LC, Zhou BF: The current status on the prevalence, awareness, treatment and control of diabetes mellitus in several Chinese subpopulations. Chinese J of Epidemiology 2005, 26:564-568. [in Chinese]
13. Deaton A: Policy implications of the gradient of health and wealth. Health Aff 2002, 21:13-30.
14. Wright Rj: Further evidence that the wealthier are healthier: negative life events and asthma-specific quality of life. Thorax 2007, 62:106-8.
15. McLaren L: Socioeconomic status and obesity. Epidemiol Rev 2007, 29:29-48.
16. Lorant V, Deliege D, Eaton W, Robert A, Philippot P, Ansseau M: Socioeconomic inequalities in depression: a meta-analysis. Am J Epidemiol 2003, 157:98-112.
17. Wang KA, Li TL, Xiang DH, Liu ZY, Bai J, Feng JG, Fu ZY, Ma LM, Chen JS, Jin SX, Li YQ, Qian RL, Chen H, Sun Tj, Man QQ: Study on the epidemiological characteristics of diabetes mellitus and IGT in China. Chinese J of Epidemiology 1998, 19:282-85. [in Chinese]
18. Li LM, Rao KQ, Kong LZ, Yao CH, Xiang HD, Zhai FY, Ma GS, Yang XG: A description on the Chinese national nutrition and health survey in 2002. Chinese J of Epidemiology 2005, 26:478-84. [in Chinese]
19. Ministry of Health, China: China Health Statistics Yearbook 2004 [http://www.moh.gov.cn/publicfiles/business/htmlfiles/zwjgkzt/pinj/ year2004/p264.htm]. [in Chinese]. Accessed on July 31, 2008
20. China Statistics Department: Statistics of 1% national sample, 2005 Beijing, China Statistics Department; 2006. [in Chinese]
21. Information Centre, Helath Ministry of China: China health development report, 1997–2001 Beijing, Health Ministry of China: 2003. [in Chinese]
22. Jia F: Health sector reform and reproductive health services in rural poor rural China. Health Policy Plan 2004, 19(Suppl 1):i40-i49.
23. Blumenthal D, Hsiao W: Privatization and its discontent – the evolving Chinese health care system. N Engl J Med 2005, 353:1163-70.
24. Ma J, Lu M, Quan H: Healthcare system from central planning to market-based: lessons from China. Health Aff 2008, 27:937-48.
25. Liu M, Zhang Q, Lu M, Kwon CS, Quan H: Rural and urban disparity in health services utilization in China. Med Care 2007, 45:767.
26. Liang XY, Nie SF, Qu KY, Peng XX, Wei S, Zhu GB, Wu LJ, Guo XH, Xiao R, Ju LR, Wang W: Evaluation of health-related quality of life among hypertensive patients in a rural area, PR China. J Hum Hypertens 2006, 20:227-9.
27. Tang WL, Wang YM, Du WM, Cheng NN, Chen BY: Assessment of quality of life and relevant factors in elderly diabetic patients in the Shanghai community. Pharmacoeconomic Drug Saf 2006, 15:123-30.
28. Xu J, Wang M, Xiang Y, Hu X: Quality of life for people with intellectual disabilities in China: a cross-cultural perspectives study. J Intellect Disabil Res 2005, 49:745-9.
29. Leung B, Lu N, So L, Quan H: Comparing three measures of health status (perceived health with Likert-type scale, EQ-5D, and number of chronic conditions) in Chinese and White Canadians. Med Care 2007, 45:610-7.
30. Ma GS, Sun LZ, Luan DC, Li YP, Hu XQ, Wang JZ, Yang XG: The description analysis of the smoking pattern of people in China. Chinese J of Prevention and Control for Chronic Disease 2005, 13:95-99. [in Chinese]
31. Yang GH, Ma J, Liu N, Zhou LN: Smoking and passive smoking in China, 2002. Chinese J of Epidemiology 2005, 26:77-83. [in Chinese]

Pre-publication history
The pre-publication history for this paper can be accessed here:
http://www.biomedcentral.com/1471-2458/8/277/prepub

Publish with BioMed Central and every scientist can read your work free of charge
"BioMed Central will be the most significant development for disseminating the results of biomedical research in our lifetime."
Sir Paul Nurse, Cancer Research UK

Your research papers will be:
- available free of charge to the entire biomedical community
- peer reviewed and published immediately upon acceptance
- cited in PubMed and archived on PubMed Central
- yours — you keep the copyright

Submit your manuscript here:
http://www.biomedcentral.com/info/publishing_adv.asp